MEMORANDUM

SUBJECT: EPA Comments on draft "Assessment of Dam Safety of Coal Combustion Surface Impoundments: Gainesville Regional Utilities Deerhaven"

DATE: September 19, 2013

EPA Comments:

- In Section 1.3.1.7 "Conclusions regarding…," please include the groundwater monitoring information that was submitted by GRU to EPA in the final report
- In Section 2.1 "Location and…," it may be advantageous to include Figure 1 and Figure 2 in the text for ease of reference.
- **Per Table 1, exclude Lime Sludge Cells #1 and #2 from the scope of the assessment as they are <6'.**
- In Section 2.2 "Coal Combustion…," it may be advantageous to expand the description of CCW handling, specifically identifying the CCW streams generated by the facility, the existence or lack of FGD gypsum, and specific handling at the facility of each CCW stream.
- **Per Table 3, based on the "Basis" for Significant Hazard Potential Rating, typically EPA has considered units in which a potential release would limit damage to the owner's property as LOW hazard potential units if there are no additional circumstances warranting a higher rating. EPA may want to consider lowering the hazard potential classification to LOW if this basis is the sole basis for SIGNIFICANT hazard potential classification.**
- In both Section 4.1.1 "Impoundment…" and 4.2.3 "Current CCW…," it would be advantageous to detail if there exists a hydraulic connection, e.g., culvert, weir, between the cells of each unit. Typically, a direct hydraulic connection between units has ben the basis for definition of units due to potential for hydrologic head differential. Reference any provided material from GRU that may be relevant to this discussion
- In Section 6 "Hydrologic/Hydraulic…," it would be appropriate to address any observations CDM made regarding contributing area to the units regarding storm water run-on or other misc. run-on. Additionally, the report should address in this section the presence or lack of emergency overflow spillways at the units.

GRU Comments

Section 1.2
GRU: Remove final sentence on Page 1-1 "The stormwater ponds…"
EPA: Remove sentence

Section 1.3.1.2
GRU: Unaware of the applicability of Section 1.3.1.2
EPA: Elaborate on the applicability of FEMA Federal Dam Safety Guidelines IDF Selection Document, i.e., that this is guidance and not regulatory requirement, IDF based on relevant hazard potential

Section 1.3.1.7, Last Sentence, First Paragraph
GRU: Well data not requested

EPA: Include well data provided by GRU in final report

Section 1.3.1.8
GRU: There is nothing indentified as a deficiency in this report
EPA: There are several deficiencies (Deficiency – n. a failing or shortcoming), i.e., “minor signs of areas of erosion, erosion rills, and scarps observed on the exterior and interior slopes of the embankments”, **Keep language as is**

Section 1.4.2
GRU: There is nothing indentified as a deficiency in this report
EPA: There are several deficiencies (Deficiency – n. a failing or shortcoming), i.e., “minor signs of areas of erosion, erosion rills, and scarps observed on the exterior and interior slopes of the embankments”, **Keep language as is**

Section 2.2, Last Sentence
GRU: There is only one coal-fired unit
EPA: Make correction if accurate

Section 2.2.1
GRU: There is no discharge. Replace discharge with “conveyed to the process ponds”
EPA: Make change if accurate

Section 2.4
GRU: Change “discharged” to “conveyed”(X2), strike “and transported”
EPA: Make changes if accurate

Section 2.6, Last Sentence
GRU: “GPU” to “GRU”
EPA: Make change
Section 3.1
GRU: Strike “however, no documentation was available to confirm or disprove this statement.”
EPA: Strike sentence, “No safety reports…” in previous sentence is sufficient

Section 3.2
GRU: Paragraph should read “The Deerhaven Plant has not been issued a permit under the National Pollutant Discharge Elimination System (NPDES) authorizing discharge to the surrounding streams because it is a zero-discharge facility, which reuses all process water.”
EPA: Make change

Section 3.3
GRU: Strike last sentence
EPA: Make change

Section 4.1.1, First Paragraph
GRU: Should read “The Deerhaven Plant began operation in 1972 with one oil-fired unit and a coal-fired unit that was added in 1981. The coal-fired generating unit can each produce up to 251 megawatts of power.
EPA: Make changes

Section 4.1.1, Second Paragraph
GRU: Change “second unit” to “coal-fired unit”

EPA: Make change

Section 4.1.1, Second Paragraph, Fourth paragraph
GRU: "195 feet" to "195 feet NGVD", "184 feet" to "184 feet NGVD"
EPA: Make change

Section 4.1.2
GRU: Strike last sentence
EPA: Make change

Section 4.1.3
GRU: Strike first sentence
EPA: Make change

Section 4.2.1, Second bullet
GRU: Change to "Limited amounts of fly ash are conveyed to process ponds during annual maintenance outage activities"
EPA: Make change

Section 4.2.3, Second paragraph
GRU: "discharged" to "conveyed"
EPA: Make change

Section 5.1
GRU: Strike "(formerly known as Ash ponds)
EPA: Make change

Section 5.1
GRU: How is FEMA Guidelines for Dam Safety applicable to GRU, who has non-disposal ponds
EPA: Add the following sentence "These guidelines apply to management practices for dam safety of all Federal agencies responsible for the planning, design, construction, operation, or regulation of dams and has been used throughout EPA's CCR Dam Assessment as a consistent and conservative approach to dam safety."

Section 5.2, 5.2.2, 5.2.3, 5.3.1, 5.3.3
GRU: Condition based on what criteria
EPA: Remove the bold and capital font i.e., **FAIR** to fair. Ensure there is sufficient detail in each section to make it obvious to the reader the basis for the "description" of fair. Only issue one overall condition rating for each impoundment and remove condition ratings for individual components of the impoundment i.e., the crest, toe

Section 5.2.3
GRU: Strike "It was difficult to determine… be due to seepage." Strike. Typically a wet area, refer to rainfall data in section 5.1. No one asked about the normal condition of this area.
EPA: Keep first sentence, add reference to rainfall data in Section 5.1, strike second sentence.

Section 5.2.4, 2nd-4th Sentence
GRU: Change to "…and the decant water is pumped back to the plant for reuse. Other details about the outlet structures are not known. The Process Water Ponds are part of a zero-discharge facility; therefore, there is not a general outlet/discharge structure."
EPA: Make change

Section 5.3
GRU: Strike first paragraph, not relevant to or part of workscope
EPA: Keep paragraph, this eliminates these units from consideration and is helpful to reader who may view map of site and see multiple un-assessed units without explanation

Section 5.3.2
GRU: Strike section
EPA: Strike section, outside scope

Section 5.3.3
GRU: change “undergoing construction” to “undergoing improvements”
EPA: Make change

Section 5.3.4
GRU: Strike section
EPA: Strike section, outside scope

Section 6.2
GRU: Documentation not available since it was neither required or needed for the design and construction of these process units
EPA: Change to “Hydrologic and hydraulic documentation was not provided by GRU for CDM Smith to review” if accurate. EPA feels that H&H has significant bearing on overall safety of CCR units. If documentation provided by GRU is adequate H&H (EPA does not believe this is so), change this statement. Recommended IDF should be 100-year for Low hazard, 1000-year for Sign. hazard, PMP for High hazard

Section 7.1
GRU: This information is not available and was not required for this type of pond
EPA: Include the following information: “Following the issuance for comment of the draft report to GRU by EPA, EPA allowed 8 weeks for GRU to provide slope stability analyses or technical documentation to support the embankments’ structural stability. EPA feels that quantitative slope stability analyses are essential in determining the condition of an above-ground CCR surface impoundment. EPA was not provided with this documentation.”

Section 8.2
GRU: Records were not requested
EPA: Please include documentation provided by GRU

Section 8.3
GRU: Strike section
EPA: Please include submitted documentation by GRU in making a determination of adequacy of operating procedures

Section 8.3.2
GRU: Strike second sentence, no noted deficiencies
EPA: Revise to “However, based on the minor deficiencies described in Section 4, maintenance procedures are rated as inadequate.” See previous comments re: deficiencies

Section 9.1
GRU: CDM did not request supporting documentation
EPA: Include documentation on surveillance submitted by GRU if relevant

Section 9.2
GRU: Strike last sentence, “Groundwater monitoring monitoring is performed quarterly and submitted to FDEP accordingly. No documentation was requested nor does it appear to be part of this workscope.”
EPA: Include gw monitoring data provided by GRU. This is part of the scope of the assessment.

Section 9.3.1
GRU: Strike first sentence. “Documentation on “regular maintenance issues” implies that there are issues. No documentation was requested. As previously stated daily visual observations occur.”
EPA: Include documentation on monitoring submitted by GRU

Section 9.3.2
GRU: Should read “One monitoring well was observed, southeast of the Pump Back Cell #1. Saturated areas at the toe of Ash Cell #1’s northwest and southwest embankments were observed. conditions or indications of potential failure of the embankments were not observed during CDM Smith’s visual assessment. “
EPA: Make changes, include well data submitted by GRU

From:	Embry, Regina G
To:	Englander, Jana
Cc:	Hoffman, Stephen; Klemans, Robert W
Subject:	RE: Comment Request on Coal Ash Site Assessment Round 12 Draft Report - Gainesville Regional Utilities - Deerhaven Power Station
Date:	Tuesday, December 10, 2013 1:27:20 PM
Attachments:	Section 1 Deerhaven Plant with GRU edits.docx Section 2 Deerhaven Plant with GRU edits.docx Section 3 Deerhaven Plant with GRU edits.docx Section 4 Deerhaven Plant with GRU edits.docx Section 5 Deerhaven Plant with GRU edits.docx Section 6 Deerhaven Plant with GRU edits.docx Section 7 Deerhaven Plant with GRU edits.docx Section 8 Deerhaven Plant with GRU edits.docx Section 9 Deerhaven Plant with GRU edits.docx Section 10 Deerhaven Plant.docx

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Hi Jana,

Attached are the Word report sections provided me with corrections, edits, and comments inserted. In addition to the details throughout, there are a few points to consider that apply to the report and work scope, generally.

As we discussed by phone a few weeks ago, the function of Deerhaven process ponds does not seem to meet the workscope for these assessments nor would it fit the 'intent' of the assessments, this EPA initiative being a result of the TVA ash disposal pond breach.

The Deerhaven process ponds system contains two cells that receive sluicing water with bottom ash from the boiler furnace. Water from the ponds is recycled back to the power generation process for continued use. Deerhaven is a zero-discharge facility. The system is designed to allow for one pond/cell to be de-watered, and ash removed as needed, (historically every 5 years or so); the other pond/cell is available to receive water containing sluiced ash during a cleanout. Water passes through these ponds for reuse at the facility and the ponds are not permanent disposal units for ash.

The CDM contractors on site for this assessment understood how this system works and how it differs from other sites where they performed assessments. Review of the report indicates CDM representatives evaluated the Deerhaven site using the same "checklist' as for sites such as the TVA site – i.e. sites with ponds functioning as disposal units for ash.

This inaccurate characterization of the ponds design and function could certainly be misleading to the report reader – particularly if the reader lacks industry knowledge and understanding of the general concepts or knowledge of the specifics of the Deerhaven facility's design. Neither GRU nor EPA is properly represented by availing information to the public which does not provide an accurate description of the pond system function. Potential third party confusion should be avoided.

The report indicates that the Deerhaven facility should be rated "poor" for lacking static, hydrologic and seismic engineering studies. Again, the design and function of these ponds did not require these studies; therefore, the studies do not exist. The report repeatedly states various analyses were not provided CDM by GRU. These statements are misleading to the reader as it could imply that GRU has information and didn't provide it, which is not the case. All available and applicable information requested has been provided. There are also references to FEMA federal guidelines/standards in this evaluation. I am unaware of any regulatory applicability of FEMA to this system.

After your review of the edited report, perhaps it would be helpful to have a conference call to discuss any aspects of the system function that may not be fully understood or made clear through this report review and general points. I would be happy to further discuss and assist as possible to make your effort successful.

Thanks!

Regina Embry
Principal Engineer
Gainesville Regional Utilities
Voice - (352) 393-1299
Cell - (352) 538-7143
Fax - (352) 334-3151
embryrg@gru.com

From: Englander, Jana [mailto:Englander.Jana@epa.gov]
Sent: Tuesday, December 03, 2013 11:04 AM
To: Embry, Regina G
Cc: Hoffman, Stephen; Englander, Jana
Subject: FW: Comment Request on Coal Ash Site Assessment Round 12 Draft Report - Gainesville Regional Utilities - Deerhaven Power Station

Hello Regina,

We are awaiting your comments on the DRAFT Coal Ash Assessment Report for the Deerhaven facility.

Thank you very much,

Regards,

Jana

Jana Englander
Office of Resource Conservation and Recovery,
Materials Recovery Waste Management Division
Energy Recovery and Waste Disposal Branch
U.S. Environmental Protection Agency
703-308-8711

From: Englander, Jana
Sent: Monday, November 04, 2013 12:57 PM
To: 'Embry, Regina G'
Cc: Hoffman, Stephen
Subject: RE: Comment Request on Coal Ash Site Assessment Round 12 Draft Report - Gainesville Regional Utilities - Deerhaven Power Station

Hi Regina,

Just following up from our conversation last week. Per my request, Bill Friers of CDM sent you the DRAFT Report text in a Microsoft Word document to make your comment package simpler to work. I did want to also provide to you the specific language we used to define the scope of our Assessment Program:

Surface Impoundments included in our CCR Assessment Program are CCR surface impoundments that meet the following criteria:

- Above ground unit with a diked portion raised above the natural topography of the area comprising a structural embankment.
- Receive or have received coal combustion residuals (CCRs), including fly ash, bottom ash, boiler slag or flue gas desulphurization (FGD).
- Have the ability to impound water, i.e., have not been breached or graded to disallow impoundment of water.
- Have not been formally closed by the appropriate state authority.

We look forward to receiving your comments. When might you be submitting them?

Regards,

Jana

Jana Englander
Office of Resource Conservation and Recovery,
Materials Recovery Waste Management Division
Energy Recovery and Waste Disposal Branch
U.S. Environmental Protection Agency
703-308-8711

From: Embry, Regina G [mailto:EMBRYRG@gru.com]
Sent: Thursday, October 31, 2013 1:10 PM
To: Englander, Jana
Subject: RE: Comment Request on Coal Ash Site Assessment Round 12 Draft Report - Gainesville Regional Utilities - Deerhaven Power Station

Hi Jana,

I just left you voicemail regarding discussion of this – just wanted you to have my contact information. Thanks!

Regina Embry
Principal Engineer
Gainesville Regional Utilities
Voice - (352) 393-1299
Cell - (352) 538-7143
Fax - (352) 334-3151
embryrg@gru.com

From: Klemans, Robert W
Sent: Tuesday, October 08, 2013 10:24 AM
To: Embry, Regina G
Subject: FW: Comment Request on Coal Ash Site Assessment Round 12 Draft Report - Gainesville

Regional Utilities - Deerhaven Power Station

Did you get this?

From: Englander, Jana [mailto:Englander.Jana@epa.gov]
Sent: Monday, September 30, 2013 3:10 PM
To: Klemans, Robert W
Cc: Hoffman, Stephen; Dufficy, Craig; Kelly, PatrickM; Englander, Jana
Subject: Comment Request on Coal Ash Site Assessment Round 12 Draft Report - Gainesville Regional Utilities - Deerhaven Power Station

Dear Mr. Hunzinger,

The draft assessment report for Gainesville Regional Utilities - Deerhaven Power Station is ready for review. EPA would appreciate it if you would review and submit your comments on this report to us within 30 calendar days of receipt of this email. **Please confirm receipt of this email and send your comments to:**

Mr. Stephen Hoffman
US Environmental Protection Agency (5304P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

If you are using overnight of hand delivery mail, please use the following address:

Mr. Stephen Hoffman
US Environmental Protection Agency
Two Potomac Yard
2733 South Crystal Drive
5th Floor, N-5237
Arlington, VA 22202-2733

You may also provide your comments by e-mail to hoffman.stephen@epa.gov and englander.jana@epa.gov.

You may assert a business confidentiality claim covering all or part of the information requested, in the manner described by 40 C. F. R. Part 2, Subpart B. Information covered by such a claim will be disclosed by EPA only to the extent and only by means of the procedures set forth in 40 C.F.R. Part 2, Subpart B. If no such claim accompanies the information when EPA receives it, the information may be made available to the public by EPA without further notice to you. If you wish EPA to treat any of your response as “confidential” you must so advise EPA when you submit your response.

The draft report can be accessed at the secured link below. The secured link will expire on November 15, 2013.

Here is the link for the report:

http://www.hightail.com/download/OGhkeFVSZ1BtMEpESjhUQw

Please let me know if you have trouble accessing the reports or have any questions/requests.

Respectfully,

Jana Englander

Jana Englander
Office of Resource Conservation and Recovery,
Materials Recovery Waste Management Division
Energy Recovery and Waste Disposal Branch
U.S. Environmental Protection Agency
703-308-8711

Section 1

Conclusions and Recommendations

1.1 Introduction

Following the December 22, 2008 dike failure at the Tennessee Valley Authority's Kingston, Tennessee coal combustion waste (CCW) ash pond dredging cell that resulted in a spill of over 1 billion gallons of coal ash slurry, covering more than 300 acres that impacted residences and infrastructure, the United States Environmental Protection Agency (USEPA) is embarking on an initiative to prevent the catastrophic failure from occurring at other facilities located at electrical utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impounded slurry.

This assessment of the stability and functionality of the Gainesville Regional Utilities (GRU) Deerhaven Plant CCW impoundments is based on a review of limited available documents, site assessments conducted by CDM Smith on August 28 and 29, 2012, and technical information provided subsequent to the site visit. In summary, GRU Deerhaven Plant ash impoundment embankments are rated as **POOR** for continued safe and reliable operation, because static and seismic engineering studies following the best professional engineering practice to support acceptable safety factors have not been presented. However, a **FAIR** classification and acceptable performance is expected with minor remedial actions and providing that analyses documenting structural stability under all required loading conditions are conducted.

It is critical to note that the condition of the embankment(s) depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the embankments will continue to represent the condition of the embankments at some point in the future. Only through continued care and inspection can there be a chance that unsafe conditions will be detected.

1.2 Purpose and Scope

CDM Smith was contracted by the USEPA to perform site assessments of selected surface impoundments. As part of this contract, CDM Smith conducted site assessments of the following CCW impoundments at the Deerhaven Plant: Ash Cell #1, Ash Cell #2, Pump Back Cell #1, and Pump Back Cell #2. These impoundments, referred to as the Process Water Ponds, are located northwest of the generation plant. The purpose of this report is to provide the results of the assessments and evaluations of the conditions and potential for waste release from the CCW impoundments. Six additional impoundments, including three stormwater ponds, Coal Stockpile Runoff Collection Pond, Lime Sludge Cell #1, and Lime Sludge Cell #2 were observed during CDM Smith's site assessment. Lime Sludge Cell #1 and Lime Sludge Cell #2 (Lime Sludge Ponds) receive the solid by-products generated by the treatment of groundwater extracted from the Floridian aquifer and process wastewater, treated by the brine concentrator at the water treatment plant. ~~The stormwater ponds, Coal Stockpile Runoff Collection Pond and the Lime Sludge Ponds are not used to store/process CCW and therefore do not fall within EPA's assessment scope criteria.~~

Commented [ERG1]: This sentence should be removed as is not part of the workscope

Site visits were conducted by CDM Smith representatives on August 28 and 29, 2012 to collect relevant information, inventory the impoundments, and perform visual assessments of the CCW impoundments.

1.3 Conclusions and Recommendations

1.3.1 Conclusions

The following conclusions are based on our visual observations during site assessments on August 28 and 29, 2012 and a review of the limited documentation provided by GRU.

1.3.1.1 Conclusions Regarding Structural Soundness of the CCW impoundments

CCW impoundments appear to be structurally sound based on visual observations of the structural element components (i.e. inlet structures, earth embankments and outlet structures). No documentation to evaluate and assess structural stability and soundness of the impoundments was provided.

1.3.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of CCW impoundments

Supporting technical documentation was not provided. No probable maximum precipitation (PMP) analysis required under Federal Emergency Management Agency (FEMA) standards was provided. Visual examination of the impoundment earth structures did not show evidence of previous overtopping of the embankment.

Commented [ERG2]: I am unaware of applicability of this to Deerhaven process ponds. Under what regulatory program is this applied?

1.3.1.3 Conclusions Regarding Adequacy of Supporting Technical Documentation

Supporting data and documentation have not been provided. Liquefaction potential analyses for embankment foundations have not been performed, and original record drawings available for the Process Water Ponds are incomplete. Therefore, supporting documentation was not sufficient with regard to a complete analysis of impoundment safety.

1.3.1.4 Conclusions Regarding Description of the CCW impoundments

The description of the CCW impoundments provided by a GRU representative was generally consistent with the visual observations by CDM Smith during our site assessment. However, only four (4) sheets of the record drawings were provided, making it difficult to assess potential discrepancies against the intended design of the CCW impoundments. Drawings provided are included in Appendix A-1.

1.3.1.5 Conclusions Regarding Field Observations

During visual observations and site assessments, minor signs of areas of erosion, erosion rills, and scarps were observed on the exterior and interior slopes of the embankments. No apparent unsafe conditions or conditions in need of immediate remedial action were observed.

1.3.1.6 Conclusions Regarding Adequacy of Maintenance and Methods of Operation

Current maintenance and operation procedures appear to be adequate. There was no evidence of previous spills and release of impounded coal ash slurry outside of the impoundments.

1.3.1.7 Conclusions Regarding Adequacy of Surveillance and Monitoring Program

The impoundments at the Deerhaven plant function as a zero-discharge facility; wastewater is treated on-site and is reused in the plant process. Therefore, there is no National Pollutant Discharge Elimination System (NPDES) Permit from the Florida Department of Environmental Protection (FDEP) that requires a continuing surveillance and monitoring program. Saturated areas at the toe of slope of the embankments were observed, which indicates that potential seepage may be occurring. The GRU representative indicated several monitoring wells are installed around the site to monitor for water levels and water quality. One monitoring well was observed, southeast of the Pump Back Cell #1. ~~Well data were not provided to CDM Smith.~~

Commented [ERG3]: Well data was not requested

The limited amount of data available documenting the maintenance and operation procedures for the management unit is not sufficient to allow CDM Smith to make an evaluation of the adequacy of the maintenance and operations for the impoundment. The lack of regular documentation for current maintenance and methods of operation of this management unit makes these practices inadequate.

1.3.1.8 Conclusions Regarding Suitability for Continued Safe and Reliable Operation

The primary embankments do not show evidence of unsafe conditions requiring immediate remedial efforts, ~~although maintenance to correct deficiencies noted above is required.~~

Commented [ERG4]: There is nothing identified as a "deficiency" in this report.

1.3.2 Recommendations

Based on CDM Smith visual assessment of the Process Water Ponds and a review of documentation provided by GRU, the following recommendations are provided.

1.3.2.1 Recommendations Regarding the Hydrologic/Hydraulic Safety

It is recommended that a qualified professional engineer assist GRU in evaluating the hydrologic and hydraulic capacity of the CCW impoundments to withstand design storm events, without overtopping.

1.3.2.2 Recommendations Regarding the Technical Documentation for Structural Stability

A complete set of record drawings and/or as-built drawings should be developed or made readily available for future reference. It is recommended that a qualified professional engineer assist GRU in the evaluation of the Process Water Ponds embankment stability, including liquefaction analyses.

1.3.2.3 Recommendations Regarding Field Observations

Erosion rills and scarps were observed on the interior slopes of the Ash Cell #1 and Ash Cell #2, primarily on the northwest embankment. These areas should be repaired with compacted structural fill and regraded to match adjacent existing contours. After slope restoration, it is recommended that the exposed surface of the embankment be stabilized with riprap consisting of a heterogeneous mixture of irregular-shaped rocks placed over the compacted fill and a geotextile fabric to match existing riprap stabilization.

Animal burrows were observed on the southeast and northwest embankments exterior slopes. Although not seen in other areas, high vegetation cover on the embankments may have hidden other animal burrows. CDM Smith recommends documenting areas disturbed by animal activity, removing the animals and backfilling the burrows with compacted structural fill to protect the integrity of the embankments. Vegetation should be maintained at a height that potential animal burrows can be readily observed.

1.3.2.4 Recommendations Regarding Surveillance and Monitoring Program

CDM Smith recommends an instrumentation monitoring program to monitor potential areas of seepage along the southeast, southwest and northwest embankments of Ash Cell #1 and Ash Cell #2 and Pump Back Cell #1.

1.3.2.5 Recommendations Regarding Continued Safe and Reliable Operation

Inspections should be made following periods of heavy and/or prolonged rainfall, and the occurrence of these events should be documented. Inspection records should be retained at the facility for a minimum of three years.

Major repairs and slope restoration should be designed by a registered professional engineer experienced with earthen dam design.

None of the conditions observed requires immediate attention or remediation. However, the above recommendations should be implemented during a reasonable time frame to maintain continued safe and reliable operation of the CCW impoundments.

1.4 Participants and Acknowledgment

1.4.1 List of Participants

CDM Smith representatives William L. Fox, P.E. and Eduardo Gutiérrez-Pacheco, P.E. were accompanied during visual assessment by Regina Embry, Principal Engineer, representative from GRU.

1.4.2 Acknowledgement and Signature

CDM Smith acknowledges that the Process Water Ponds referenced herein were assessed by William L. Fox, P.E. and Eduardo Gutiérrez-Pacheco, P.E. Based on the limited documentation provided, the Process Water Ponds are rated **POOR**. The facility lacks static, hydrologic and seismic engineering studies following best professional engineering practice to support safety factors under normal loading conditions (static, hydrologic, seismic) in accordance with the applicable safety regulatory criteria. ~~Minor deficiencies exist that require remedial measures.~~

We certify that the management units referenced herein were assessed on August 28 and 29, 2012.

____

E. Woody Lingo, P.E.
Senior Geotechnical Engineer
Florida Registration No. 9326

Commented [ERG5]: There is nothing identified as a "deficiency" in this report.

Section 2
Description of the Coal Combustion Waste Impoundments

2.1 Location and General Description

The Deerhaven Plant is located in Alachua County, Florida, northwest of the City of Gainesville. The site is on the east side of U.S. Route 441/SR20, as shown on **Figure 1.** Critical infrastructure located within approximately five miles downgradient of the Deerhaven Plant is shown on **Figure 2.**

Deerhaven Plant's coal combustion waste (CCW) impoundments consist of the Process Water Ponds (formerly known as Ash Ponds), which are divided into four cells that are hydraulically connected: Ash Cell #1, Ash Cell #2, Pump Back Cell #1, and Pump Back Cell #2. Ash Cells #1 and #2 outlets discharge decant water to Pump Back Cells #1 and #2, respectively. Decant water is pumped from Pump Back Cells #1 and #2 to the plant for reuse in plant operations. As described in Section 1, there are additional impoundments that are not classified as CCW impoundments: Lime Sludge Ponds, Coal Stockpile Runoff Collection Pond, and Stormwater Ponds

An aerial view of the Deerhaven Plant including the Process Water Ponds, is shown on **Figure 3.** The total perimeter of the embankments for the Process Water Ponds is approximately 1,950 feet; these ponds have an approximate surface area of 6.7 acres. **Table 1** provides a summary of the approximate size and dimensions of the Process Water Ponds.

Table 1 – Summary of Process Water Ponds Cells Approximate Dimensions and Size

	Process Water Ponds			
	Ash Cell #1	Ash Cell #2	Pump Back Cell #1	Pump Back Cell #2
Embankment Height (ft)	14	14	9	9
Typical Crest Width (ft)	25	25	25	25
Length (ft)	730	360	500	360
Interior Slopes H:V	3:1	3:1	3:1	3:1
Exterior Slopes H:V	4:1	4:1	4:1	4:1

Divider embankments between the four cells of the Process Water Ponds are about 1,200 feet long.

2.1.1 Horizontal and Vertical Datum

Site survey provided by GRU to CDM Smith used the horizontal and vertical control network established by the National Geodetic Survey (NGS). Horizontal survey data in this study reference the North Zone of the Florida State Plane Coordinate System based on North American Datum (NAD) of 1983, 2007 adjustment. Elevations noted herein are in feet and are referenced to North American Vertical Datum of 1988 (NAVD 88) unless otherwise noted.

2.1.2 Site Geology

The Deerhaven Plant is located east of U.S. 441/SR 20 in Alachua County, Florida. Based on review of the Alachua 7.5-Minute USGS Topographic Quadrangle Map, ground surface elevations in the area of the management units range from about El. 180 to El. 185. According to the Geologic Map of the Eastern Portion of the USGS, 1:100,000 Scale Gainesville Quadrangle, Northern Florida, the Deerhaven Plant is located in the Coosawhatchie Formation of the Hawthorn Group that consists of soils deposited in ancient marine and fluvio-deltaic depositional environments. The Deerhaven Plant is located in an area composed of a complex sequence of Tertiary-aged carbonate and siliclastic sediments. The overlying surficial deposits are lithologically variable, pinching out and inter-fingering both laterally and vertically. They consist of gray to bluish-gray sandy clay or clayey sand with phosphate grains, and limestone to dolostone. Lenses of relatively pure quartz sands, clays, or carbonate are uncommon. Numerous karst features are present in the area, which include springs and sinkholes.

Boring logs available provided by GRU indicate that existing soils present within the area of the embankments consist of loose to medium dense silty and clayey sand, underlain by soft to stiff clay and sandy clay. Subsurface information, boring location and boring logs that were provided by GRU are included in **Appendix A.**

2.2 Coal Combustion Residue Handling

The Process Water Ponds receive residual sluiced ash and waste water from the plant process before being treated in the on-site water treatment plant for re-use in the plant process. The Process Water Ponds are part of the zero-discharge water treatment plan, which treats water effluent from ~~both of~~ the coal-fired units.

Commented [ERG1]: There is only one coal-fired unit

2.2.1 Fly Ash

Limited amounts of fly ash are ~~discharged~~ conveyed to the process ponds during annual maintenance outage activities and transported by pipeline to Ash Cells #1 and #2.

Commented [ERG2]: There is no discharge

2.2.2 Bottom Ash

Bottom ash is transported by pipeline to the Ash Cells in slurry form. The CCW impoundments are used as settling ponds for CCW. GRU periodically dredges the CCW from the Ash Cells and disposes of it in the on-site Ash Landfill.

2.2.3 Boiler Slag

The GRU Deerhaven plant is not a slag-production type furnace, however a small amount of Boiler Slag is typically found in bottom ash.

2.2.4 Flue Gas Desulfurization Gypsum

The GRU plant has not produced flue gas desulfurization gypsum.

2.3 Size and Hazard Classification

According to the United States Army Corps of Engineers (USACE) Guidelines for Safety Inspection of Dams (1979), the impoundments may be placed in the size classification per **Table 2.**

Table 2 – USACE ER 1110-2-106 Size Classification

Category	Impoundment	
	Storage (Ac-ft)	Height (Ft)
Small	50 to < 1000	25 to < 40
Intermediate	1000 to < 50,000	40 to < 100
Large	> 50,000	> 100

Based on storage capacity and embankments height, the Deerhaven Plant impoundments are considered SMALL impoundments.

It is not known if the Deerhaven Plant impoundments currently have a Hazard Potential Classification. Based on the USEPA classification system as presented on Page 2 of the USEPA checklist (**Appendix B**) and our review of the site and downstream areas, recommended hazard ratings have been assigned to the impoundments as summarized in **Table 3**:

Table 3 – Recommended Impoundment Hazard Classification Rating

Impoundment	Recommended Hazard Rating	Basis
Process Water Ponds	Low Hazard	▪ Failure or misoperation could result in economic loss and environmental damage to plant infrastructure, operations, and utilities. ▪ Loss of human life as a result of failure is not anticipated.

2.4 Amount and Type of Residuals Currently Contained in the Unit(s) and Maximum Capacity

At the time of the assessments, CDM Smith did not have information on the amounts of residuals currently stored in the units. The pool area of the Process Water Ponds is approximately 6.7 acres. These cells receive process water from plant operations, including cooling tower blow down, plant drains, industrial process water, and sluiced bottom ash. Limited amounts of fly ash are ~~discharged~~ conveyed during annual maintenance outage activities ~~and transported~~ by pipeline to Ash Cells #1 and #2. Limited amounts of fly ash are ~~discharg~~conveyed during annual maintenance outage activities and transported by pipeline to Ash Cells #1 and #2.

2.5 Principal Project Structures

The primary components of the Process Water Ponds include the following:

- A set of two, 15-inch-diameter steel inlet pipes located near the east corner of Ash Cell #1 and near the south corner of Ash Cell #2.
- Earthen perimeter embankments composed of compacted soil.
- Four concrete outlet riser-type with stop logs structures, one at each ash cell and lime sludge cell.
- A pump house located near the east corner of Pump Back Cell #1.

2.6 Critical Infrastructure within Five Miles Downgradient

Based on available topographic maps, surface drainage in the vicinity of the Deerhaven Plant does not appear to have a preferred drainage direction, since the surrounding topography is relatively uniform. Critical infrastructure, including schools, hospitals, waterways, roadways and bridges, and other major facilities, identified within five miles downgradient of the Deerhaven Plant includes the following:

- U.S. Highway 441/SR 20/25 (southwest)
- William S. Talbot Elementary School
- Trinity United Methodist Church
- Dove World Outreach Center
- Country Crossroads Baptist Church
- Hague Baptist Church
- Pleasant Hill Baptist Church

The Gainesville Municipal Airport is located approximately 8 miles from the Deerhaven Plant.

A breach of the impoundment embankments would most likely impact G~~P~~RU property only and is not expected to result in loss of human life.

Section 3

Summary of Relevant Reports, Permits and Incidents

3.1 Summary of Reports on the Safety of the CCW Impoundments

At the time of CDM Smith's on-site assessment, no safety reports on the CCW impoundments were available. According to plant representatives, there have been no known structural or operational problems associated with the impoundments., ~~however no documentation was available to confirm or disprove this statement.~~

Commented [ERG1]: Documentation does not exist for an event that hasn't occurred.

3.2 Summary of Local, State, and Federal Environment Permits

Currently, the CCW impoundments are regulated by Florida Department of Environmental Protection (FDEP).

The Deerhaven Plant has not been issued a permit under the National Pollutant Discharge Elimination System (NPDES) authorizing discharge to ~~the surrounding~~the surrounding streams ~~in accordance with effluent limitations, monitoring requirements, and other conditions set forth in the permit~~ because it is ~~considered~~ a zero-discharge facility, ~~which reuses~~which reuses all process~~ed~~ water.

3.3 Summary of Spill/Release Incidents

According to plant representatives, there have been no known spills or releases related to the impoundments. ~~No documentation was available to confirm or disprove this statement.~~

Commented [ERG2]: See comment above

Section 4

Summary of History of Construction and Operation

4.1 Summary of Construction History

4.1.1 Impoundment Construction and Historical Information

The Deerhaven Plant began operation in 1972 with one oil-fired unit and a coal-fired ~~second~~ unit was added in 1981. The ~~two~~ coal-fired generating unit~~s~~ can each produce up to 251~~32~~ megawatts of power.

Historical information on the Process Water Ponds was not readily available in the documentation provided by GRU. Based on our understanding and the limited available data, it appears that the Process Water Ponds were constructed in 1981 with the addition of the coal-fired~~second~~ unit to the Deerhaven Plant. The Process Water Ponds were constructed by the placement of dikes around the perimeter to form the impoundments. The dike perimeter crest elevation of the Process Water Ponds (Ash Cell #1 and Ash Cell#2) is about 195 feet NGVD.

Based on the limited drawings that were provided, the interior slopes of each cell were constructed at 3 horizontal to 1 vertical (3H:1V), and exterior slopes were constructed at 4H:1V. Design drawings for the Process Water Ponds were developed by Burns & McDonnell. A complete set of drawings was not available. Based on information provided by GRU and CDM Smith visual observations, the Process Water Ponds perimeter embankments have a crest width of 25 feet.

Information regarding the soils that were used for the embankment construction was not available. A cutoff slurry wall was shown on~~ f~~ drawings furnished by GRU to be constructed within the perimeter embankments and keyed into the existing natural clay layer. The top of the slurry wall was shown to be at approximately El. 184 feet NGVD. A compacted clay cut-off blanket was placed on the interior slopes of the perimeter embankments and it intersects the top of the slurry wall. Details regarding the design, materials used and methods of constructing the slurry walls were not provided.

Drawings provided by GRU showing typical cross sections of the embankments are presented in **Appendix A-1.**

4.1.2 Significant Changes/Modifications in Design since Original Construction

The GRU representative indicated that there have not been significant changes or modifications to the design. ~~There was no documentation provided that indicates any changes or modifications to the original design.~~

4.1.3 Significant Repairs/Rehabilitation since Original Construction

~~Information regarding major repairs or rehabilitation to the embankments of the Process Water Ponds was not provided.~~ No evidence of prior releases, failures or remedial work was observed on the embankments during the CDM Smith visual assessment. There was no documentation provided that indicates any repairs or rehabilitation has occurred since the original construction.

4.2 Summary of Operational Procedures

4.2.1 Original Operating Procedures

The Process Water Ponds at the Deerhaven Plant have historically been used as settling ponds for plant wastes including:

- Industrial process water including sluiced bottom ash
- Limited amounts of fly ash are ~~discharg~~conveyed to process ponds during annual maintenance outage activities
- Limited amounts of boiler slag are generated with bottom ash.
- Cooling tower blow-down water
- Plant drains
- Plant runoff

4.2.2 Significant Changes in Operational Procedures and Original Startup

No significant changes in the operational procedures appear to have been made to the Process Water Ponds. There was no documentation provided that indicates there have been any changes in operation procedures since start-up.

4.2.3 Current CCW Impoundment Configuration

Current operational procedures of the Process Water Ponds are consistent with the original operating procedures. The Process Water Ponds are currently divided into four cells as previously described and as shown on **Figure 3.** The approximate crest elevations of the embankments and impoundment areas are shown in **Table 4.**

During normal plant operations, most of the residual ash sedimentation occurs in Ash Cell #1. Ash sluice water is convey~~discharg~~ed to Ash Cell #1. Ash Cell #1 and Ash Cell #2 are hydraulically connected by a corrugated HDPE pipe, approximately 12 inches in diameter. The outlet structures for Ash Cells #1 and #2 consist of concrete drop structures with stop logs. Ash Cells #1 and #2 outlets discharge decant water to Pump Back Cells #1 and #2, respectively. Decant water is pumped from Pump Back Cells #1 and #2 to the plant for reuse in plant operations.

Table 4 – Approximate Crest Elevations and Surface Areas

Ash Pond	Approximate Crest Elevation (Feet)	Approximate Pond Surface Area (Acres)
Ash Cell # 1	195	2.75
Ash Cell #2	195	2.75
Pump Back Cell #1	188	0.6
Pump Back Cell #2	188	0.6

4.2.4 Other Notable Events since Original Startup

No additional information was provided to CDM Smith regarding other notable events, which have impacted operations and /or regular maintenance and inspection of the Process Water Ponds.

Section 5

Field Observations

5.1 Project Overview and Significant Findings (Visual Observations)

CDM Smith performed visual assessments of the CCW impoundments at the GRU Deerhaven Plant. The CCW impoundments assessed included the Process Water Ponds ~~(formerly known as Ash Ponds).~~ The Process Water Ponds are comprised of Ash Cell #1, Ash Cell #2, Pump Back Cell #1, and Pump Back Cell #2. The assessments were completed following the general procedures and considerations contained in the Federal Emergency Management Agency (FEMA) Federal Guidelines for Dam Safety (April 2004). These guidelines require that observations of embankment settlement, movement, erosion, seepage, leakage, cracking, and deterioration be performed. A Coal Combustion Dam Inspection Checklist and Coal Combustion Waste (CCW) Impoundment Inspection Form, developed by the USEPA, were completed for the impoundments. Copies of the completed forms are included in **Appendix B**. The locations of photographs that were taken during our field assessments are shown on **Figures 4A and 4B**, and these photographs are included in **Appendix C**. The locations of the photographs were logged using a handheld GPS device, and the coordinates are also listed in Appendix C.

Commented [ERG1]: Author is referring to ponds by both names throughout document so can't say fka

Commented [ERG2]: How would this apply to our process ponds? Our process ponds are not disposal ponds. Water, with some sluiced bottomash, is conveyed to and through the process ponds back to the water treatment plant for reuse.

CDM Smith visited the plant on August 28 and 29, 2012, to conduct visual assessments of the CCW impoundments. The weather was generally cloudy with daytime high temperatures up to 80 degrees Fahrenheit. The daily precipitation for one week and total precipitation for one month immediately prior to our site visit are shown in **Table 5**. These data were recorded at the St. Johns River Water Management District, Station 00260033, at the Alachua County Fairgrounds in Gainesville, Florida, which is approximately 8.25 miles southeast of the Deerhaven Plant.

Table 5 – Approximate Precipitation Prior to Site Visit

Dates of Site Visit – August 28 and 29, 2012		
Day	**Date**	**Precipitation (inches)**
Monday	August 27	0.82
Sunday	August 26	0.22
Saturday	August 25	0.00
Friday	August 24	0.01
Thursday	August 23	0.03
Wednesday	August 22	0.00
Tuesday	August 21	1.65
Total	**Month Prior to Site Visit (July 28 to August 27, 2012)**	**10.91**

Note: Precipitation data from www.webapub.sjrwmd.com. Station Location: Alachua County Fairgrounds (00260033) at Gainesville, Florida. Lat. 29.682856; Lon.-82.284769; EL. 158 feet

5.2 Process Water Ponds

At the time of the assessment, Ash Cell #1 and Ash Cell #2 contained residual ash and water with approximately 1 foot and 4 feet of freeboard, respectively. It was indicated by plant personnel that Ash Cell #1 has been dredged once or twice to remove accumulated ash. It is not currently known if the other cell had been dredged. It was not readily visible if Pump Back Cell #1 and Pump Back Cell #2 contain residual ash. Each cell had approximately 3 feet of freeboard.

5.2.1 Crest

The crest of the perimeter embankments and divider embankments appeared to be in **FAIR** condition (Photographs 13-15, 22-25 and 38). Signs of previously repaired scarps and erosion areas were observed at the crest of the northwest embankment of the Ash Cell #2. The crest widths were typically 25 feet wide. The crest of the embankments has paved surfaces with exposure to limited vehicle traffic during normal operations. In general, no major cracks or evidence of settlement were observed on the crests of any of the embankments. Minor depression and areas of erosion were observed near Ash Cell #2 on the northwest embankment (Photographs 26 and 27).

A concrete u-shape channel structure and metal grates located on the northeast side of the divider embankment between Ash Cell #1 and Ash Cell #2 protect the inlet pipes that extend from the plant (Photographs 41 and 42). A small cave-in of the pavement behind Ash Cell #2 inlet pipe concrete structure (Photographs 34 and 35) was observed. A pump house and pump system is located near the east corner of the southeast embankment of Pump Back Cell #1 (Photographs 8 and 9). Inlet pipes are located at the divider embankment between Ash Cells #1 and #2 (Photographs 40 and 43).

5.2.2 Interior Slopes

The interior slopes of the cells appear to be in FAIR condition with riprap armoring (Photographs 38, 42, 46 and 47) and sparse vegetative cover. The interior slopes appeared to have a slope of approximately 3H: 1V. Discontinuities and eroded areas (Photographs 28, 29, and 31) were observed along the interior slopes of the northwest embankment at Ash Cell #2.

5.2.3 Exterior Slopes

The exterior slopes appear to be in **SATISFACTORY** condition. The exterior slopes of the embankments are approximately 4H:1V. They have a grass cover that was approximately 6 to 8 inches high at the time of the visual assessment (Photographs 1, 3, 7, 76, 77, and 79). At some areas on the northwest embankment, the grass cover was somewhat higher (Photographs 83, 84 and 86). Some saturated areas were observed along the toe of the slope of the southwest embankment (Photograph 2 and 78) and the northwest embankment (Photographs 82 and 85). A runoff swale is located at the toe of slope of the southeast embankment of Pump Back Cells #1 and #2 (Photographs 3, 10 and 11). ~~It was difficult to determine if these wet areas were caused by seepage or the relatively heavy rainfall prior to our assessments. Based on the embankment height, embankment geometry and surface water elevation, these areas could potentially be due to seepage~~. Based on review of drawings the perimeter embankments were constructed with a cutoff slurry wall, keyed into the existing natural clay layer (as discussed in Section 4). It is noted however that the top of slurry wall was shown to be at elevation 184 and the observed water level in Ash Cell #1 was about elevation 194 during the condition assessment.

Commented [ERG3]: "FAIR"; based on what criteria?

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Commented [ERG4]: See previous comment

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Commented [ERG5]: See previous comment

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Commented [ERG6]: This is a typically wet' area; also, please see the rainfall data included in your section 5.1. Additionally, no one asked about the normal condition of this area

Minor erosion rills were observed on the exterior slope of the southeast embankment of Pump Back Cell #1 (Photographs 5 and 6). An animal burrow was observed on the northwest embankment of Ash Cell #1 (Photograph 80).

5.2.4 Outlet Structures

The outlet structures for the Ash Cells #1 and #2 consist of a concrete drop structure with stop logs (Photographs 30, 32 and 33). We understand that these cells are hydraulically connected to Pump Back Cells #1 and #2 and ~~then~~ the decant water is pumped back ~~in~~to the plant for reuse. Other details about the outlet structures are not known. The Process Water Ponds are part of a zero-discharge facility; therefore, there is not a general outlet/discharge structure.

5.3 Additional Unit Observations

~~Additional units including a coal stockpile runoff collection pond, three stormwater ponds and two lime sludge ponds were identified during our visual assessments at the plant. The GRU representative indicated that these units are not part of the coal combustion waste impoundments and are not used to store CCW.~~

Commented [ERG7]: This is not relevant to or part of the workscope

Another unit observed was the Ash Dry Stack Landfill Area that receives and stores the ash that results from the plant operation. Reportedly, the landfill receives boiler ash, bottom ash, and fly ash.

5.3.1 Coal Stockpile Runoff Collection Pond

The coal stockpile runoff collection pond receives all runoff collected in a swale located north of the coal stockpile and from ditches that extend along the east, south and west sides of the coal stockpile (Photographs 50, 53 and 55). The crest of the perimeter embankments appears to be in fair condition, and they are grass covered with some tire ruts (Photographs 49, 56, 57, 63 and 64).

Commented [ERG8]: Based on what criteria?

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The interior slopes are riprap armored and appear to have 3H:1V slopes (Photograph 51 and 52). A pump station is located near the southwest corner of the impoundment (Photograph 58).

Exterior slopes appear to be approximately 4H:1V and are covered with grass that is about 6 to 12 inches high. No signs of depressions, cracks, bulging or discontinuities were observed. Animal burrows were not observed along the embankments.

Two, 24-inch-diameter corrugated metal outlet pipes (Photographs 59, 61 and 62) are located on the west embankment. Water was not flowing from these outlet pipes at the time of our visual assessment and they appeared to be blocked.

Surrounding areas to the west and southwest of the Coal Stockpile Runoff Collection Pond had relatively low and standing water (Photograph 66).

~~5.3.2 Stormwater Ponds~~

~~The stormwater ponds were observed when driving along the perimeter embankments and the embankments appeared to be in good condition. No signs of depressions, scarps, erosion or cracks were readily observed on these embankments. General photographs were taken as part of the visual assessment (Photographs 67 to 71). The northeastern portion (Photograph 98) of the pond located southwest of the Process Water Ponds and south of the Ash Dry Stack Landfill Area, is covered by high dense vegetation (i.e. cattails).~~

Commented [ERG9]: This is not part of the workscope

5.3.3 Ash Dry Stack Landfill Area

The Ash Dry Stack Landfill Area, located west of the Process Water Ponds, receives the ash produced by the Deerhaven Plant operations. At the time of the assessment the Ash Dry Stack Landfill Area was ~~under~~undergoing improvements ~~construction~~. Based on visual observations the landfill area appears to be in fair condition. The south embankment of the landfill appears to have a 4H:1V slope (Photograph 72). Small ash stockpiles were observed within the landfill area (Photographs 73 to 74).

Commented [ERG10]: Based on what?

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~~5.3.4 Lime Sludge Ponds~~

~~The Lime Sludge Ponds are situated northwest of the Process Water Ponds. Lime Sludge Cells #1 and #2 share the southwest divider embankment with Ash Cell #2 and Pump Back Cell #2. The Lime Sludge Ponds contained standing water and accumulated lime from the water treatment plant at the time of this assessment, and they had approximately 2 feet of freeboard.~~

~~The crest of the Lime Sludge Ponds appears to be in fair condition. The typically crest width is approximately 25 feet (Photographs 14, 17, 19, 92 and 93). No evidence of settlement or major cracks was observed on the crests. The interior slopes appear to be in fair condition and they appear to be approximately 3H:1V. These slopes are riprap armored with sparse vegetation cover (Photograph 18 and 93). A concrete valve box for the inlet pipes was observed at the northwest embankment at each Sludge Cell (Photograph 20). Dry lime sludge piles near the east corner of Sludge Cell #1 (Photograph 94) were observed. The exterior slopes appear to be in satisfactory condition and they are approximately 4H:1V. They are covered with grass that was approximately 6 to 8 inches high at the time of the visual assessment (Photographs 87 to 91). Lime sludge pipes are located at the toe of slope of the northeast embankment exterior slope of Sludge Cell #2 (Photographs 96 and 97). An animal burrow was observed on the southeast embankment exterior slope of Sludge Cell #2 (Photograph 16).~~

Commented [ERG11]: Not part of the workscope

Section 6
Hydrologic/Hydraulic Safety

6.1 Impoundment Hydraulic Analysis

The State of Florida does not currently have requirements related to the hydrologic or hydraulic design of CCW impoundments. FEMA standards require impoundments to have the capacity to store some percentage of the Probable Maximum Precipitation (PMP) for a 6-hour storm event over a 10 square-mile area in the vicinity of the site. Low hazard structures are required to store precipitation of a 100-year storm event. The 100-year storm event in the vicinity of the site over a 6 -hour period is approximately 8.6 inches. The drainage area contributing to the impoundments at this site appears to be limited to the storage area within the impoundments. Preliminary evaluations indicate that there is enough storage capacity and freeboard in the impoundments at the current operating pools to safely store a 100-year storm event without being overtopped.

6.2 Adequacy of Supporting Technical Documentation

Hydrologic and hydraulic documentation and/or PMP analyses were not provided by GRU for CDM Smith to review.

Commented [ERG1]: This documentation is not available since it was neither required or needed for the design and construction of these process ponds.

6.3 Assessment of Hydrologic/Hydraulic Safety

Hydrologic and hydraulic safety of the management units appears to be FAIR based on the following:

- Reportedly, overtopping of the embankments has never occurred. During our visual observations and site assessments, no signs of plugged, collapsed or blocked pipes, or other detrimental hydrologic/hydraulic conditions were observed at the Process Water Ponds.

- No signs of recent cracks, major scarps and erosion were observed on the perimeter embankments, or the divider embankments. Signs of previously repaired scarps and erosion areas were observed at the crest of the northwest embankment of the Ash Cell #2.

- At least 1 foot of freeboard at Ash Cell #1, 4 feet at Ash Cell #2, and 3 feet at Pump Back Cells were observed at the time of the assessments.

Hydrologic/hydraulic documentation or PMP analyses were not provided therefore the Process Water Ponds are rated as **POOR**. EPA requirements state that "if a facility has not conducted hydrologic, static and seismic engineering studies following best professional engineering practice to support factors of safety, the facility must be rated POOR".

Section 7
Structural Stability

7.1 Supporting Technical Documentation

The Gainesville Regional Utilities did not provide CDM Smith with slope stability analyses or technical documentation to support the embankments' structural stability.

Commented [ERG1]: This information is not available and was not required for this type of ponds

7.1.1 Stability Analyses and Load Cases Analyzed

Currently the State of Florida does not have regulations regarding CCW impoundments. Procedures established by the United States Army Corps of Engineers (USACE), the United States Bureau of Reclamation, the Federal Energy Regulatory Commission, and the Natural Resources Conservation Service are generally accepted engineering practice. Minimum required factors of safety outlined by the USACE in EM 1110-2-1902, Table 3-1 and seismic factors of safety by FEMA Federal Guidelines for Dam Safety, Earthquake Analyses and Design of Dams (pgs. 31, 32 and 38, May 2005) are provided in **Table 6**.

Table 6 - Minimum Safety Factors

Load Case	Minimum Required Factor of Safety
Steady-State Condition at Normal Pool or Maximum Storage Pool Elevation	1.5
Rapid Drawdown Condition from Normal Pool Elevation	1.3
Maximum Surcharge Pool (Flood) Condition	1.4
Seismic Condition at Normal Pool Elevation	1.1
Liquefaction	1.3

Notes: Above safety factors are based on requirements established by the USACE. Required safety factors have not been established by the State of Florida for CCW impoundments.

7.1.2 Design Parameters and Dam Materials

General soil properties and soil parameters used for the slope stability or design of the embankments were not provided to CDM Smith for review.

7.1.3 Uplift and/or Phreatic Surface Assumptions

Since no stability analyses were provided, uplift and/or phreatic surface assumptions were not available.

7.1.4 Factors of Safety and Base Stresses

Factors of safety and base stresses were not available for review.

7.1.5 Liquefaction Potential

Documentation provided by GRU did not include evaluation of liquefaction potential.

7.1.6 Critical Geological Conditions

Based on the U. S. Geological Survey Map, *Sinkhole Type, Development, and Distribution in Florida,* 1985, prepared in cooperation with the Florida Department of Environmental Regulation, Bureau of Water Resources Management and the Florida Department of Natural Resources, Bureau of Geology, there are four generalized areas of different types of sinkhole occurrence in Florida. The Deerhaven Plant is located near the boundary of two of these types of sinkholes. Area I has a bare or thinly covered limestone formation. Sinkholes in these areas are few, generally shallow and broad, and develop gradually. In these areas solution sinkholes dominate. Area III has a cover over the limestone that is generally between 30 to 200 feet thick and it consists mainly of cohesive clayey sediments of low permeability. Sinkholes are most numerous; they vary in size, and can develop abruptly. Cover collapse sinkholes are predominant in the area.

Based on the 2008 USGS National Seismic Hazard Map, a Peak Ground Acceleration (PGA) of 2% probability of exceedance in 50 years indicates that Florida is in the lowest hazard potential area for seismic activity.

7.2 Adequacy of Supporting Technical Documentation

Structural stability and liquefaction documentation has not been provided.

7.3 Assessment of Structural Stability

Existing conditions and visual observations yield a poor rating for structural stability of Process Water Ponds based on the following:

- It is not known if critical studies or investigations have been performed to confirm that potential safety deficiencies do not exist.

Stability analyses on different cross sections representing the typical embankments and liquefaction analyses are required in order to obtain a FAIR rating for structural stability. These types of analyses were not provided.

Because of the lack of documentation and analyses the assessed rating is **POOR**. A poor rating is assigned when a dam safety deficiency is recognized for loading conditions that may realistically occur and remedial action is necessary. Also, if a facility has not conducted static and seismic engineering studies following the best professional engineering practice to support Factors of Safety, the facility must be rated as **POOR**.

Section 8

Adequacy of Maintenance and Methods of Operation

8.1 Operating Procedures

As described in Section 2, the Process Water Ponds (formerly known as the Ash Ponds) are divided into four cells: Ash Cell #1, Ash Cell #2, Pump Back Cell #1 and Pump Back Cell #2. Wastewater enters Ash Cell #1 and #2 through 15-inch-diameter steel pipes. Decant water then flows to the Pump Back cells and is then pumped back to the plant for reuse.

8.2 Maintenance of the Dam and Project Facilities

GRU provided no documentation on procedures or records of maintenance operations for the Process Water Ponds. According to a plant representative inspections occur on a daily basis during the regular plant operation walk–around. ~~Records of these daily inspections were not provided.~~

Commented [ERG1]: Records were not requested

8.3 Assessment of Maintenance and Methods of Operations

8.3.1 Adequacy of Operating Procedures

~~Based on CDM Smith's visual observations and the verbal information provided by GRU, the operating procedures are considered to be **INADEQUATE** because written documentation is lacking.~~

8.3.2 Adequacy of Maintenance

Commented [ERG2]: Process water is conveyed to the process ponds and pumped back for processing and reuse at the Plant. How is this inadequate …?

No major maintenance issues that compromise the structural stability and operation of the Process Water ~~Ponds were~~Ponds were identified. ~~However, based on the lack of documentation provided and minor deficiencies described in Section 4, maintenance procedures are rated as **INADEQUATE**.~~

Commented [ERG3]: There are no noted deficiencies

Section 9

Adequacy of Surveillance and Monitoring Program

9.1 Surveillance Procedures

According to a plant representative inspections occur on a daily basis during the regular plant operation walk–around. ~~CDM Smith was not provided with inspection logs or inspection reports which support this statement.~~

Commented [ERG1]: CDM Smith did not request supporting documentation

9.2 Instrumentation Monitoring

According to Regina Embry, representative of GRU, several monitoring wells are installed around the site and groundwater monitoring is recorded on a regular basis. CDM Smith observed one monitoring well on the southeast embankment of the Process Water Ponds~~; however no written documentation confirming the frequency of monitoring well observations was provided to CDM Smith~~.

Commented [ERG2]: Groundwater monitoring is performed quarterly and submitted to FDEP accordingly. No documentation was requested nor does it appear to be part of this workscope.

The Process Water Pond embankments do not have an instrumentation monitoring system to monitor structural stability, seepage or ground displacement.

9.3 Assessment of Surveillance and Monitoring Program

9.3.1 Adequacy of Inspection Programs

~~Based on our visual observations and verbal information provided by GRU during the site assessment, the inspection program appears to be inadequate due to the lack of written documentation on regular maintenance issues and surveillance of the Process Water Ponds.~~ No condition that needs immediate remedial action was observed.

Commented [ERG3]: Documentation on "regular maintenance issues" implies that there are issues. No documentation was requested. As previously stated daily visual observations occur.

9.3.2 Adequacy of Instrumentation Monitoring Program

GRU representative's indicated several monitoring wells are installed around the site to monitor for water levels and water quality. One monitoring well was observed, southeast of the Pump Back Cell #1. ~~Well data were not provided to CDM Smith.~~ Saturated areas at the toe of Ash Cell #1's northwest and southwest embankments were observed. ~~This condition indicates potential seepage may be occurring, however~~ conditions or indications of potential failure of the embankments were not observed during CDM Smith's visual assessment.

Commented [ERG4]: Not requested

Commented [ERG5]: Supposition; this is a low lying area and there is no data to support seepage.

An earth embankment that is safe under current conditions may not be safe in the future if conditions change. Conditions that may change include changes in the phreatic surface, embankment deformation, or changes in seepage patterns. Therefore, an instrumentation monitoring program to monitor structural stability, seepage, or ground movement is recommended.

Section 10

Reports and References

The following is a list of reports and drawings that were provided by Gainesville Regional Utilities that were used during the preparation of this report and the development of the conclusions and recommendations presented herein.

1. Subsurface Information for Deerhaven Generation Station Site, prepared by Burns & McDonnell, 1978

2. Deerhaven Generation Station Topography (CAD File 331F2-5.DWG), prepared by Applied Technology & Management, October 06, 1993

3. Deerhaven Generation Station, Unit 2, Construction Drawings, Grading Sections 1, Drawing No. Y80, by Burns & McDonnell, July 1, 1981

4. Deerhaven Generation Station, Unit 2, Construction Drawings, Grading Sections 2, Drawing No. Y81, by Burns & McDonnell, July 1, 1981

5. Deerhaven Generation Station, Unit 2, Construction Drawings, Grading Sections 3, Drawing No. Y82, by Burns & McDonnell, July 1, 1981

6. Deerhaven Generation Station, Unit 2, Construction Drawings, Grading Sections 4, Drawing No. Y83, by Burns & McDonnell, July 1, 1981

GAINESVILLE

76-077-1 [illegible] 1 DVF

General

1) All side slopes will be 4:1
2) All ponds will have 5' freeboard
3) All ponds will be lined with [illegible] material
4) Ponds will be built primarily above grade.

Ash Ponds (Dim & vol given for [illegible] cell)

1) Bottom dimensions = 135' x 275'
2) Storage depth = 12'
3) Volume = 717,000 ft³ = 26560 CY = 5,363,[illegible]
4) Dike ht = 15'
[illegible] Vol based on 8.75% ash content over 1 y[illegible]
5) Bottom elev ~ 178

Storage Basin

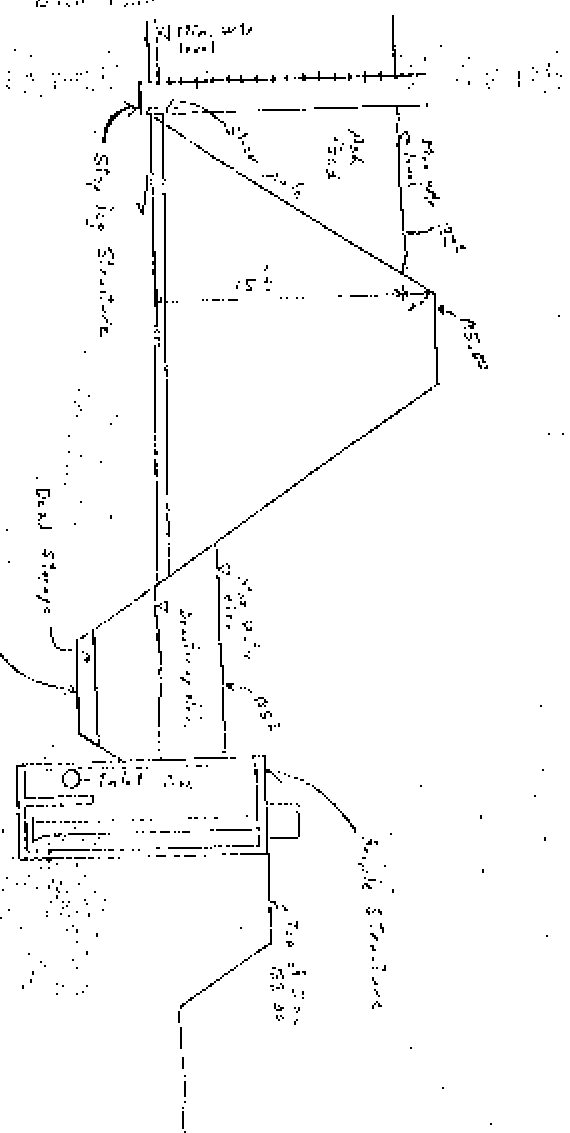
1) Bottom dimensions = 190' x 110'
2) Volume = 221,160 ft³ = 8191 CY = 1,654,[illegible]
3) Storage depth = 5'
4) Dike ht varies from 8' to 15'.
5) Bottom elev ~ 178

GAINES FL

76-5131 5-21-79 Gerber

[illegible] Ash Pond and

Pump Back Pond



CONTRACT 29C

YARD STRUCTURES

INDEX

DRAWINGS - REVISIONS

18B - BITUMINOUS PRIME AND TACK COAT

3. DRAWING Y85:

   a. At location (A,3) change "E 9978.0" to "E 9988.0."

   b. At location (J,17) add "3+86.00" in detail title.

4. DRAWING A86:

   a. Delete building coordinates on floor plan.

   b. Add "Fill With Grout" to note on Bond Beam on "Bearing Wall at High Point" detail.

   c. Revise 9'-4" dimension on floor plan to 9'-3-3/4".

   d. Correct dimensions of Gravel Stop height on "Bearing Wall at High Point" detail to 7 1/8" and 5/8".

   e. Revise "Isometric of Scupper" and "Scupper Detail" per sketch no. SK-077-29C-8.

5. DRAWING A87:

   a. Indicate "screen" to be galvanized in detail of "Fan in Masonry Wall."

   b. Correct dimensions on "Head" of "Door Details" to read 2", 1'-10", and 2".

   c. Correct "½" Expansion Bolts" on Type C Hook Detail to "½" Ø Expansion Anchors."

6. DRAWING S223:

   a. Section D: Revise the size of rebars in box slab as #7@12 for bars along the width and as #6 @ 12 for bars along the length of the wall to agree with Section C.

   b. Section C and Section F: Add 2# 5 x 4'-6" long. Add bars in retaining wall at abrupt change in wall height.

7. DRAWING S224:

   a. Include in the bid the work of assembling "ASH POND STOPLOG BAFFLE" around Ash Pond Stop-Log structure at El. 179'-3".

   b. Delete sixteen Clay & Bailey #3232 steps, indicated in Section C, on the outside of the S-W wall. Delete 3/16" galv. chain indicated in Section C and provide continuous handrail on top of S-W wall.

8. DRAWING S225: Delete twelve Clay & Bailey steps on S-E wall and 3/16" galv. chain, both indicated in Section C. Provide continous hand rail on top of S-E wall.

DRAWINGS:

1. DRAWING Y0-1: Revised drawing enclosed with this addendum supercedes drawing Y0.

2. DRAWING Y67-1: Revised drawing enclosed with this addendum supercedes drawing Y67.

3. DRAWING Y68: At drawing location (E,13), change "Y65" to "Y63."

4. DRAWING Y70: At drawing location (L,10), add the following note:

   "1. For Manhole locations, see U dwgs."

5. DRAWING Y71: At drawing location (E,14), add the following note:

   "3. For manhole locations, see U dwgs."

6. DRAWING Y72-1: Revised drawing enclosed with this addendum supercedes drawing Y72.

7. DRAWING Y73-1: Revised drawing enclosed with this addendum supercedes drawing Y73.

8. DRAWING Y75: At drawing location (A,15), add the following note:

   "2. For manhole locations, see U dwgs."

9. DRAWING Y77-1: Revised drawing enclosed with this addendum supercedes drawing Y77.

10. DRAWING Y80: At drawing locations (J,14) and (L,3), change "Y86" to "Y87."

11. DRAWING Y81-1: Revised drawing enclosed with this addendum supercedes drawing Y81.

12. DRAWING Y82-1: Revised drawing enclosed with this addendum supercedes drawing Y82.

13. DRAWING Y83-1: Revised drawing enclosed with this addendum supercedes drawing Y83.

14. DRAWING Y85: For "Detail 2" add the following note:

    "For pump structure details, see dwg. S237."

15. <u>DRAWING Y86-1</u>: Revised drawing enclosed with this addendum supercedes drawing Y86.

16. <u>DRAWING Y87-1</u>: Revised drawing enclosed with this addendum supercedes drawing Y87.

17. <u>DRAWING U8-2</u>: Revised drawing enclosed with this addendum supercedes drawing U8-1.

18. <u>DRAWING U9-2</u>: Revised drawing enclosed with this addendum supercedes drawing U9-1.

19. <u>DRAWING U10-1</u>: Revised drawing enclosed with this addendum supercedes drawing U10.

20. <u>DRAWING U11-1</u>: Revised drawing enclosed with this addendum supercedes drawing U11.

21. <u>DRAWING U12-1</u>: Revised drawing enclosed with this addendum supercedes drawing U12.

22. <u>DRAWING UP43-1</u>: Revised drawing enclosed with this addendum supercedes drawing UP43.

23. <u>DRAWING UP44-1</u>: Revised drawing enclosed with this addendum supercedes drawing UP44.

24. <u>DRAWING UP46-1</u>: Revised drawing enclosed with this addendum supercedes drawing UP46.

25. <u>DRAWING UP47-1</u>: Revised drawing enclosed with this addendum supercedes drawing UP47.

26. <u>DRAWING UP48-1</u>: Revised drawing enclosed with this addendum supercedes drawing UP48.

27. <u>DRAWING UP50-1</u>: Revised drawing enclosed with this addendum supercedes drawing UP50.

28. <u>DRAWING UP51-1</u>: Revised drawing enclosed with this addendum supercedes drawing UP51.

29. <u>DRAWING UP52-1</u>: Revised drawing enclosed with this addendum supercedes drawing UP52.

30. <u>DRAWING UP53-1</u>: Revised drawing enclosed with this addendum supercedes drawing UP53.

31. <u>DRAWING UP54-1</u>: Revised drawing enclosed with this addendum supercedes drawing UP54.

32. DRAWING UP55-1: Revised drawing enclosed with this addendum supercedes drawing UP55.

ACKNOWELDGEMENT:

Each bidder shall acknowledge receipt of this Addendum No. 3 by his signature below, and shall attach a copy of this Addendum to his bid.

BURNS & McDONNELL
Engineering Company

* * * * *

CERTIFICATION BY BIDDER

The undersigned acknowledges receipt of this Addendum No. 3 and the Bid submitted is in accordance with information, instructions and stipulations set forth herein.

Bidder: ______________________________

By: ______________________________

Date: ______________________________

9. DRAWING S227:

   a. The steel section ST 9 x 25 should read as WT 9 x 25.

   b. Section E: Weld slide bearing backing plate to structural steel by 1/8 inch fillet weld.

10. DRAWING S231: Add a concrete pad 18'-0" x 4'-0" x 1'-0" thick, with #4 @ 12" O.C. rebars each way at mid-depth, on S-E face of Ash Pond Electrical Equipment Building Foundation with expansion joint EJ-2, 18'-0" long, between the foundation and the pad.

11. DRAWING S232: Indicate the bent plate for the pipe support in Section C as ½" thick.

12. DRAWING S235:

   a. Indicate construction joint at El. 182'-6" in Sections A, B, C, and D for perimeter walls only, to be of type CJ-8 with water stop instead of type CJ-9.

   b. The 8'-6" dimension in Section H should be 7'-0".

   c. Provide #6 @ 12 dowels instead of #5 @ 12 for wall in Section J.

13. DRAWING S236: Indicate construction joint at El. 181'-6" in Sections A, B, C, and D for perimeter walls only to be type CJ-8 with waterstop instead of type CJ-9.

14. DRAWING S237: Indicate construction joint at El. 182'-3" in Sections A, B, and C for perimeter walls only to be type CJ-8 with waterstop instead of type CJ-9.

15. DRAWING UP47: Add two ½" x 4" headed studs welded to the embedded steel plate on both Detail 4 and Detail 6.

ACKNOWLEDGEMENT:

Each Bidder shall acknowledge receipt of this Addendum No. 4 by his signature below, and shall attach a copy of this Addendum to his bid.

BURNS & McDONNELL
Engineering Company

* * * * *

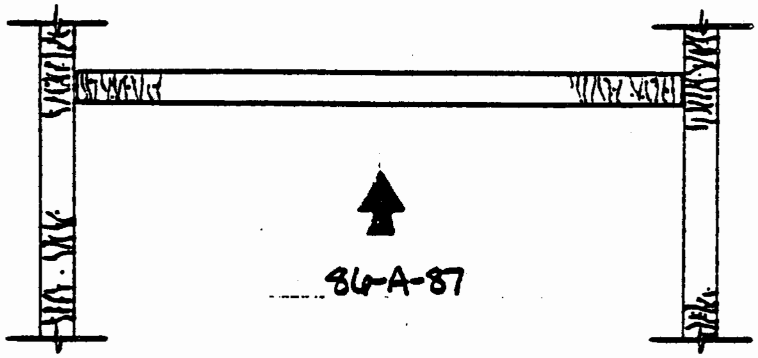
CERTIFICATION BY BIDDER

The undersigned acknowledges receipt of this Addendum No. 4 and the Bid submitted is in accordance with information, instructions and stipulations set forth herein.

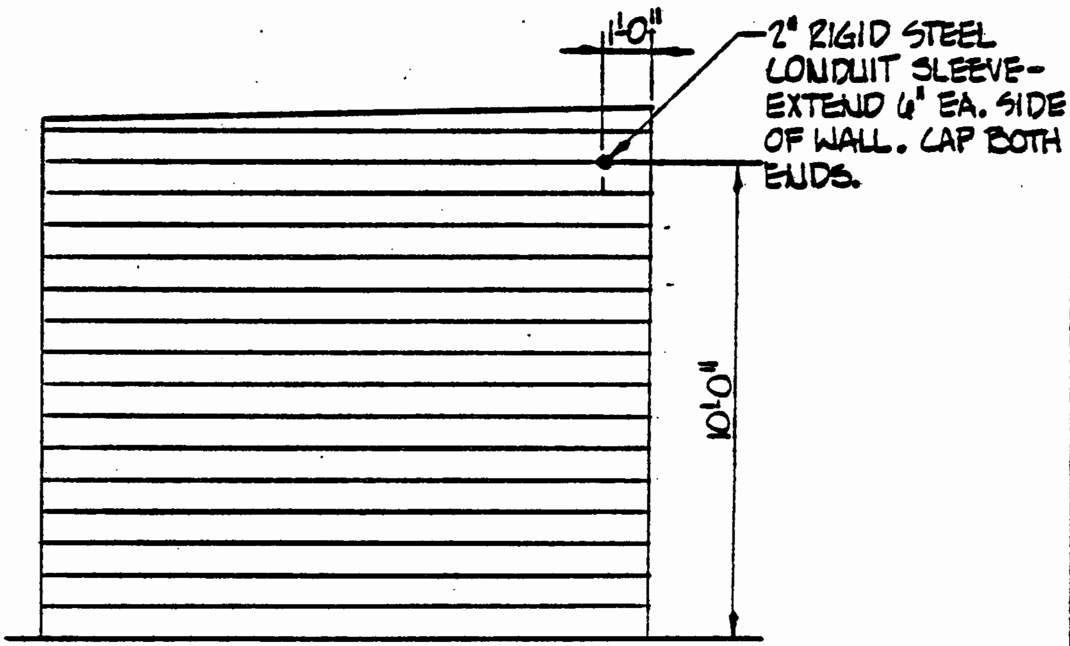
Bidder: ____________________

By: ____________________

Date: ____________________



PARTIAL FLOOR PLAN

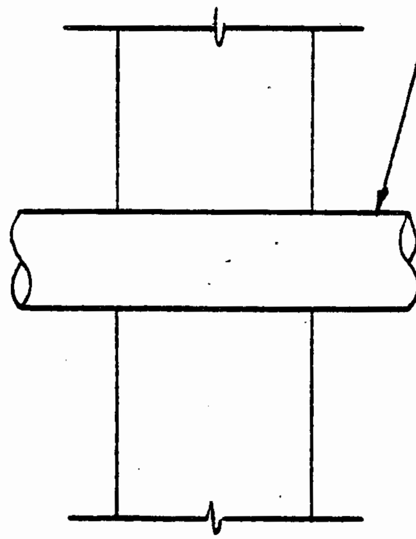


ELEVATION 86-A-87

ADDENDUM NO. 1

date MAR. 5, 1980	DEERHAVEN GENERATING STATION UNIT 2 CITY OF GAINESVILLE GAINESVILLE-ALACHUA COUNTY REGIONAL UTILITIES BOARD FLORIDA	project 76-077-1
ref. dwg. no. A86 & A87		contract 29C-YARD STRUCTURES III
Burns & McDonnell Engineers Architects Consultants Kansas City, Missouri		SK-077-29C-1

Form GCO-1-8 051978



CONDUIT THROUGH MASONRY WALL

NOT TO SCALE

ADDENDUM NO. 1

date MAR. 5, 1980 ref. dwg. no. A87 Burns & McDonnell Engineers Architects Consultants Kansas City, Missouri	DEERHAVEN GENERATING STATION UNIT 2 CITY OF GAINESVILLE GAINESVILLE-ALACHUA COUNTY REGIONAL UTILITIES BOARD FLORIDA	project 76-077-1 contract 29C-YARD STRUCTURES III SK-077-29C-2

Form GCO-1-8 051978

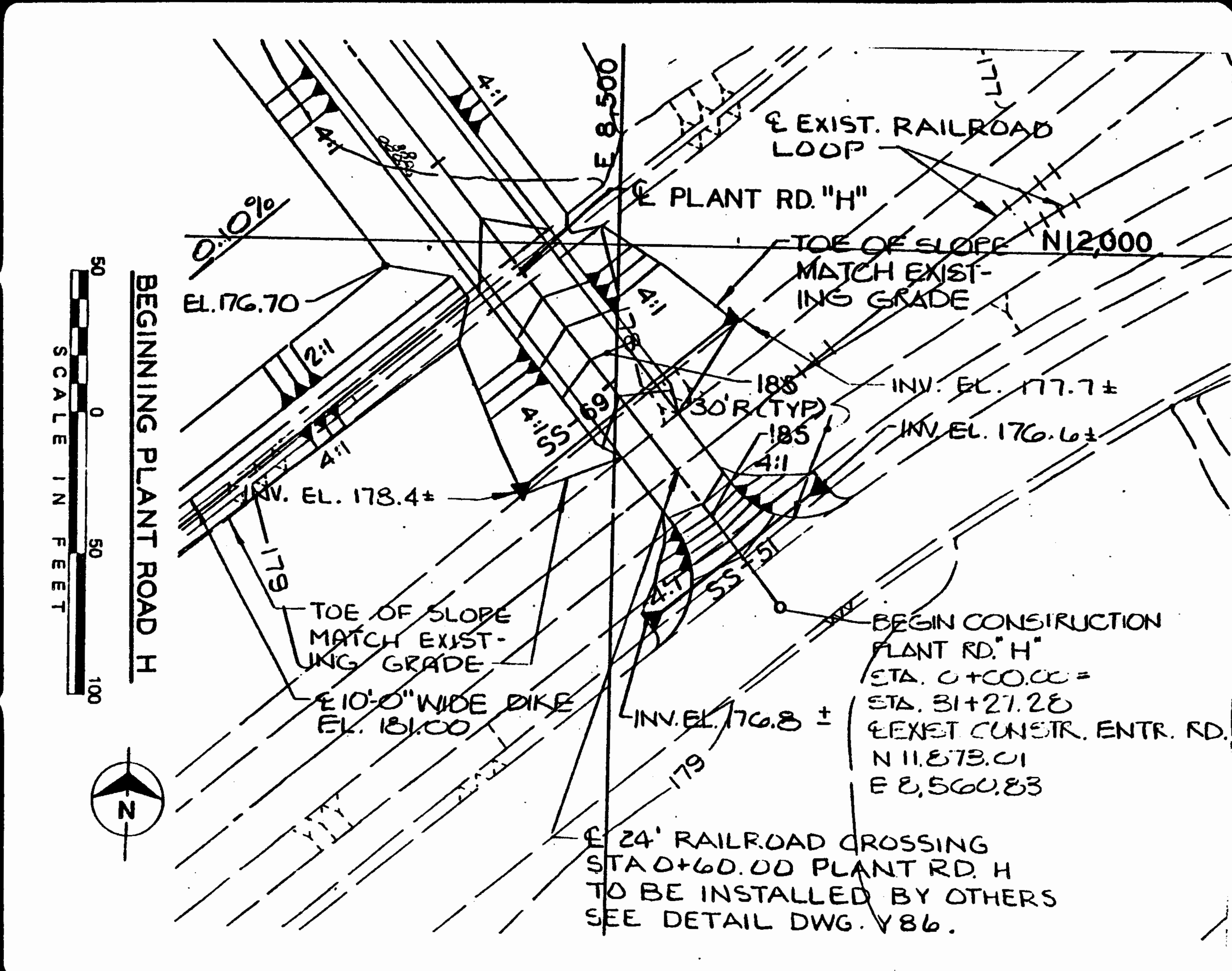
Form GCO-1-8 051978

date MARCH 5, 1980
ref. dwg. no. Y69

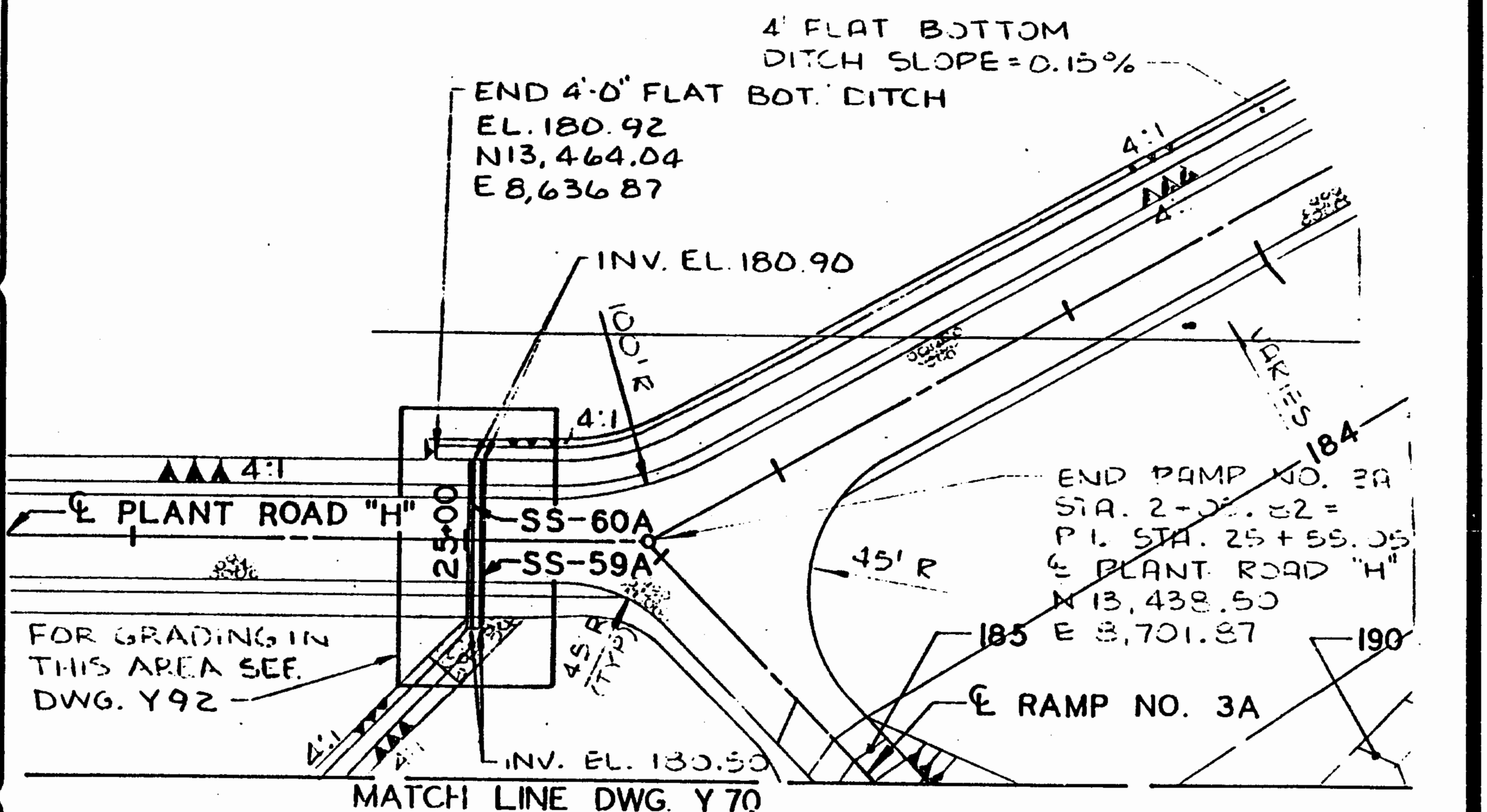
Burns & McDonnell
Engineers
Architects
Consultants
Kansas City, Missouri

project 76-077-1
contract 29C-YARD STRUCTURES III

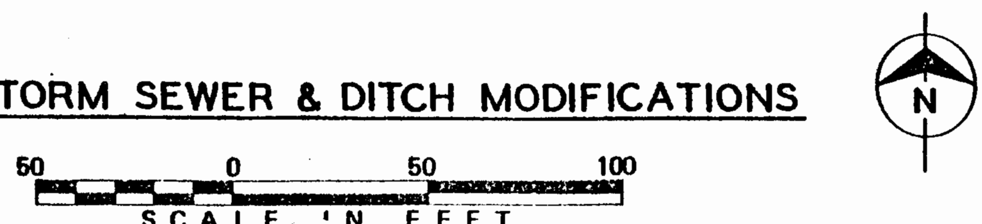
SK-077-29C-3



Form GCO-1-8   051978



STORM SEWER & DITCH MODIFICATIONS

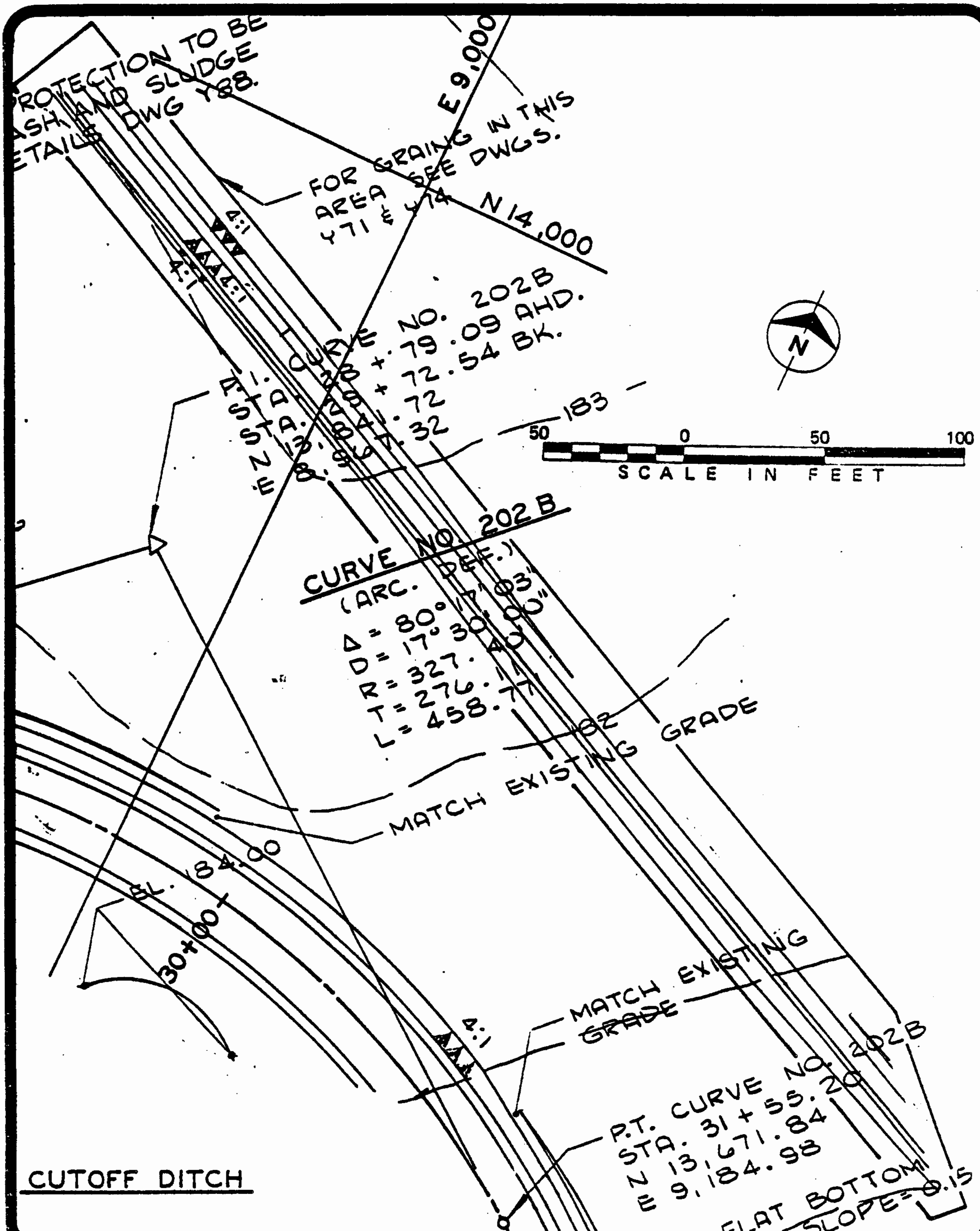


date MARCH 5, 1980
ref. dwg. no. Y71

Burns & McDonnell
Engineers Architects Consultants
Kansas City, Missouri

project 76-077-1
contract 29C-YARD STRUCTURES II

SK-077-29C-4



Form GCO-1-8 051978

date MARCH 5, 1980	DEERHAVEN GENERATING STATION UNIT 2	project 76-077-1
ref. dwg. no. Y75	CITY OF GAINESVILLE/ GAINESVILLE-ALACHUA COUNTY	contract 29C-YARD STRUCTURES III
Burns & McDonnell Engineers Architects Consultants Kansas City, Missouri		SK-077-29C-5

Form GCO-1-8 051978

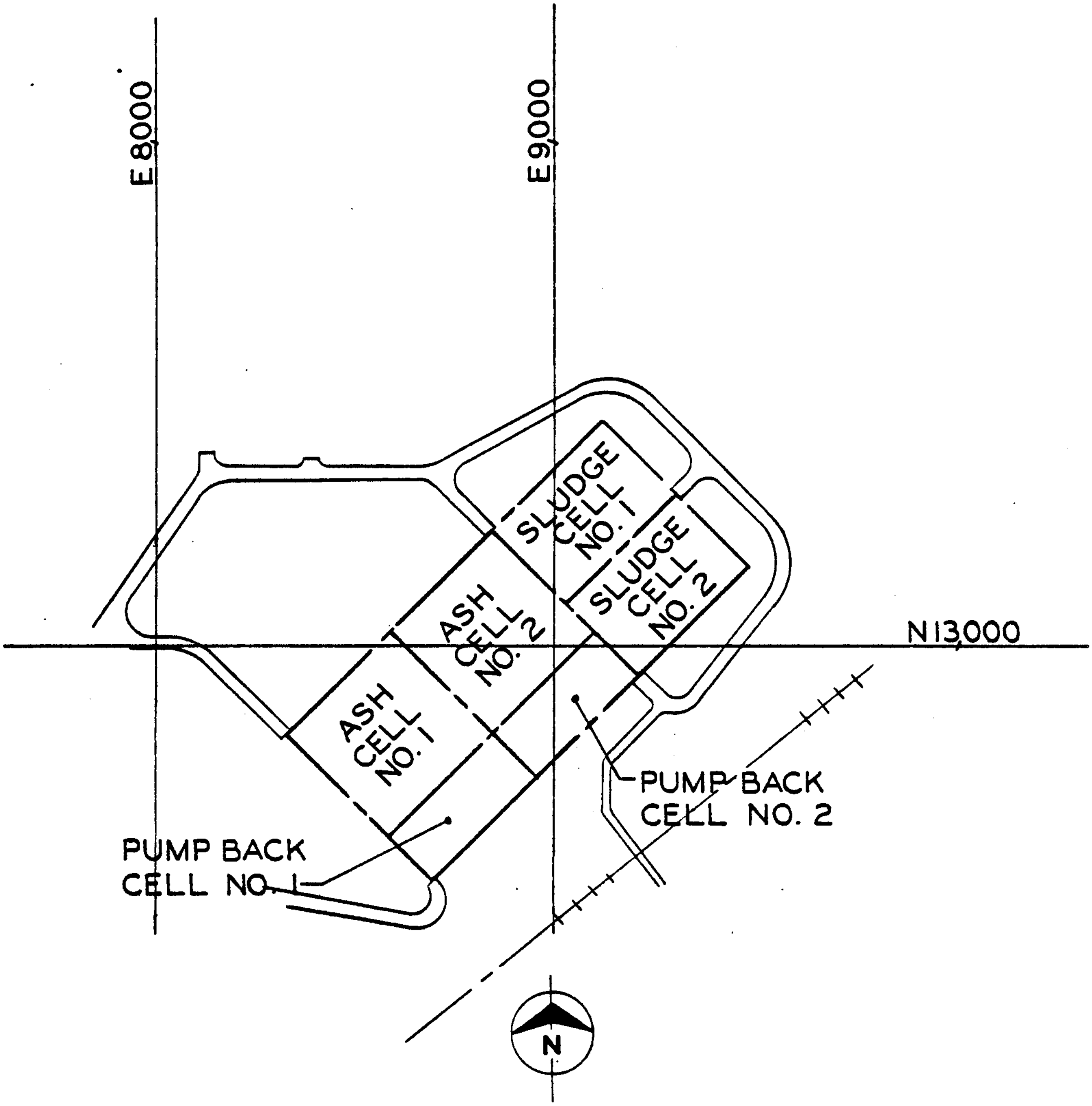
CASING PIPE SCHEDULE

CASING NO.	LENGTH	INVERT ELEVATION		INVERT COORDINATES		SLOPE FT./FT.	SIZE	CMP GA.
		UPPER	LOWER	UPPER	LOWER			
CP1A	50'	182.12	181.94	N12,912.55 E 9,263.18	N12,877.19 E 9,227.82	0.0035	30"	16
CP1B	50'	182.16	182.00	N12,926.70 E 9,277.34	N12,891.34 E 9,241.98	0.0032	30"	16
CP2A	40'	186.00	185.80	N13,278.82 E 9,382.70	N13,307.10 E 9,410.98	0.0050	12"	16
CP2B	45.92'	186.00	185.77	N13,312.76 E 9,369.96	N13,345.23 E 9,402.43	0.0050	12"	16
CP3A	40'	184.81	184.75	N13,420.25 E 9,312.69	N13,391.97 E 9,340.97	0.0017	12"	16
CP3B	50'	184.81	184.74	N13,485.31 E 9,277.34	N13,449.95 E 9,312.70	0.0014	12"	16
CP4A	40'	186.00	185.80	N13,461.97 E 9,199.55	N13,490.25 9,227.83	0.0050	12"	16
CP4B	45.92	186.00	185.77	N13,542.58 E 9,140.16	N13,575.05 E 9,172.63	0.0050	12"	16

date MARCH 5, 1980
ref. dwg. no. Y91

Burns & McDonnell
Engineers Architects Consultants
Kansas City, Missouri

project 76-077-1
contract 29C-YARD STRUCTURES III
SK-077-29C-6



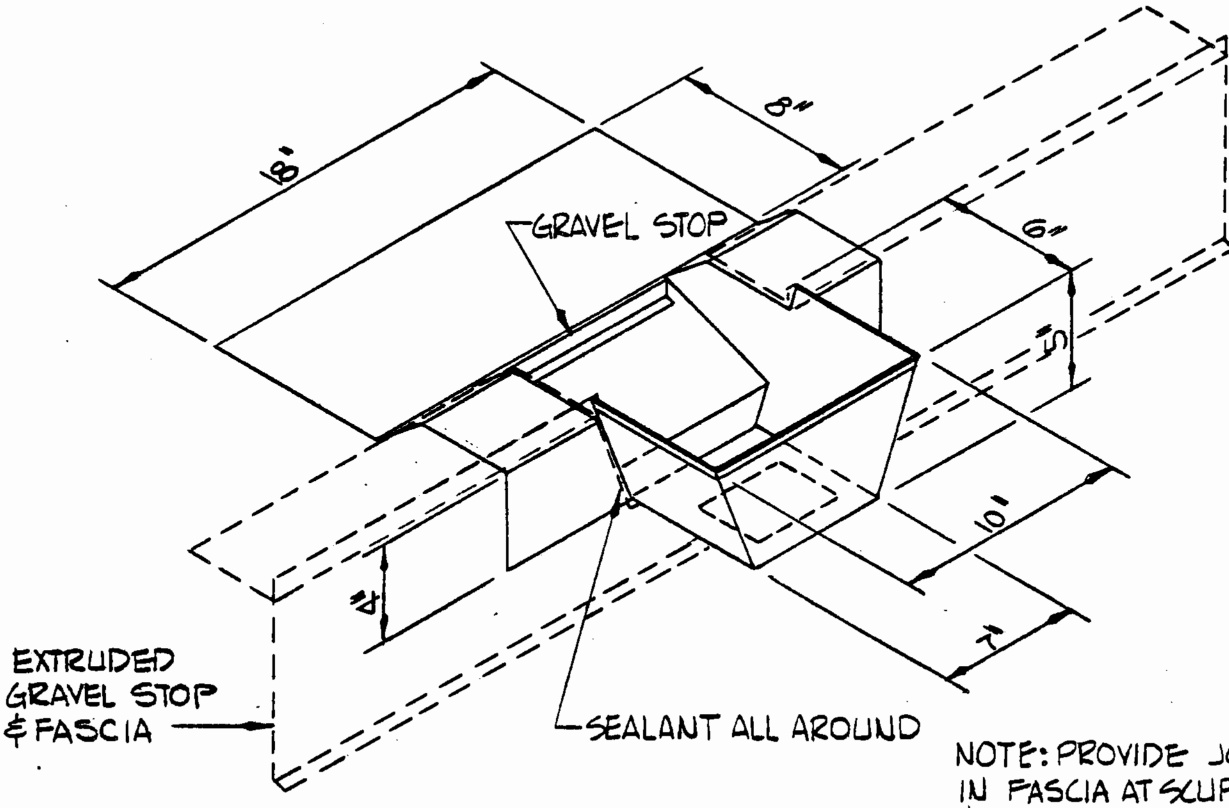
ASH, SLUDGE, & PUMP BACK CELL LABELING

400 0 400 800

SCALE IN FEET

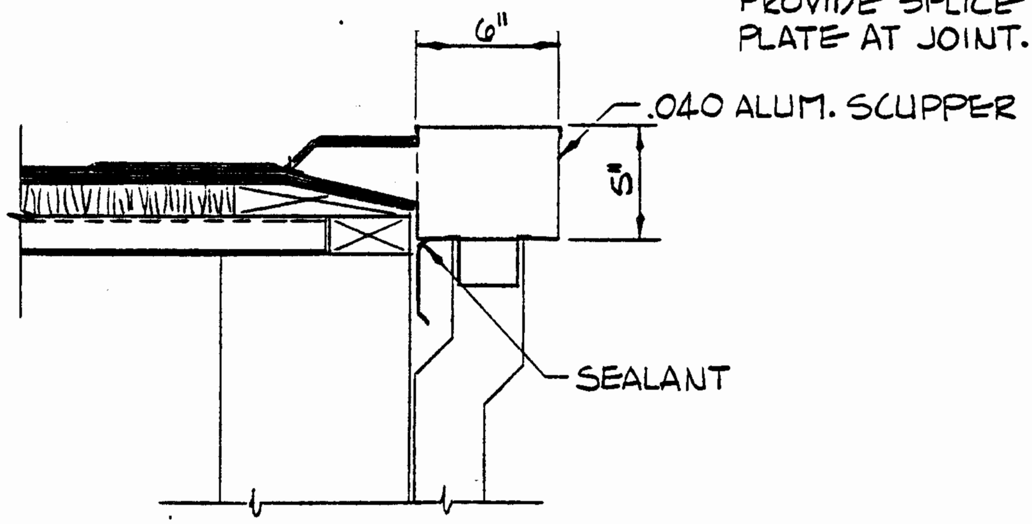
date MARCH 17, 1980	DEERHAVEN GENERATING STATION	project 76-077-1
ref. dwg. no. Y62 & Y63	UNIT 2	contract 29C-YARD STRUCTURES III
Burns & McDonnell Engineers Architects Consultants Kansas City, Missouri	CITY OF GAINESVILLE/ GAINESVILLE-ALACHUA COUNTY [illegible]	SK-077-29C-7

Form GCO-1-8 051978



ISOMETRIC OF SCUPPER
NOT TO SCALE

NOTE: PROVIDE JOINT IN FASCIA AT SCUPPER & NOTCH FASCIA AROUND SCUPPER. PROVIDE SPLICE PLATE AT JOINT.



SCUPPER DETAIL
NOT TO SCALE

ADDENDUM NO. 4

date MARCH 28, 1980 ref. dwg. no. A86 Burns & McDonnell Engineers Architects Consultants Kansas City, Missouri	DEERHAVEN GENERATING STATION UNIT 2 CITY OF GAINESVILLE GAINESVILLE-ALACHUA COUNTY REGIONAL UTILITIES BOARD FLORIDA	project 76-077-1 contract 29C-YARD STRUCTURES III SK-077-29C-8

Form GCO-1-9 051978

2A	Topsoil from Stockpile Northwest of Coal Pile Runoff Retention Pond	1,200	cu yd	$ 1.00	$ 1,200.00
2B	Clay Excavation and Stockpiling	25,000	cu yd	$ 1.00	$ 25,000.00
2C	Bentonite - Stored on Site for Owner's future use	200	tons	$ 120.00	$ 24,000.00

Amount included in Base Bid for above tabulated quantities TOTAL $ 180,200.00

The following rates shall be used for adjusting the Contract Price upward or downward if the services of field service personnel are required for more or less than the number of days and trips set forth in Article IB-6. (Applies to Alternate Bid No. 3 only).

	Adjustment Rates	
	Per Day	Per Trip
Bentonite	$ 350.00	$ 1000.00
Slurry Wall	$ 500.00	$ 1000.00

CASH ALLOWANCE: (See Article IB-6A.)

The base bid price shall include the following amount as a cash allowance for work to be defined in detail subsequent to the award of the Contract. The Contract Price shall be adjusted in the final settlement by the difference between cash allowance and the cost of any work authorized with the costs determined in accordance with the provisions of Article GC-10B.

Division	Item	Cash Allowance
All	Undefined	$250,000

If no work is authorized, the entire cash allowance shall be deducted from the Contract Price.

SCHEDULE OF ADJUSTMENT UNIT PRICES FOR ADDITIONAL, OMITTED, OR CHANGED WORK:

In the event the Work indicated or specified in the Contract Documents is increased or decreased, the following unit prices shall apply to changes in the Work under Article GC-10B.4.b. These rates shall be inclusive of overhead, profit and other supplemental cost of subcontractors and prime contractors.

Item No.	Item	Unit	Unit Price
1.	Unclassified Excavation, Section 2A		
	A. Excavation for site work by machine	cu yd	$ 1.94
	B. Excavation for structures and foundation by machine	cu yd	3.50
	C. Excavation for pipe trenching	cu yd	3.50

	D. Excavation by hand in restricted area	cu yd	5.00
	E. Removal of excess excavation	cu yd	1.94
2.	Embankment, Section 2A		
	A. Compacted Embankment by Machine	cu yd	2.50
	B. Compacted Fill by Hand	cu yd	6.50
3.	Riprap, Section 2A		
	A. Stone, In-Place	ton	75.00
	B. Sand-Cement Type, In-Place	cu yd	150.00
	C. Fabriform, In Place	sq yd	30.00
4.	Backfilling in Pipe Trenches, Section 2A		
	A. Granular Fill Material	cu yd	22.75
	B. Granular Bedding Material	cu yd	12.75
	C. Native Soil	cu yd	2.50
5.	Liner Construction		
	A. Clay, In-Place, Section 2B	sq yd	2.50
	B. Bentonite, 4 lb./S.F., In-Place, Section 2C	sq yd	3.75
	C. Asphaltic Concrete Surface Course, In-Place, Section 2D	sq yd	20.00
6.	Seeding, Section 2E	sq yd	0.15
7.	Form Work Including Labor, Section 3A	sq ft	3.00
8.	Reinforcing Steel, In-Place Including Detailing, Section 3B	lb	0.55
9.	Concrete (4000 psi), In-Place, Section 3C		
	A. Addition, Type I Cement	cu yd	450.00
	B. Deletion, Type I Cement	cu yd	400.00

	C. Addition, Type II Cement	cu yd	450.00
	D. Deletion, Type II Cement	cu yd	400.00
	E. Moisture Barrier, Section 3C	sq ft	0.38
	F. Concrete Finish, Section 3C		
	(1) Float Finish	sq ft	0.20
	(2) Hand Trowelled Finish	sq ft	0.30
	(3) Burlap Finish	sq ft	0.24
10.	Openings Through Concrete— Furnish and Install, Section 3C		
	A. Type CO-8 or CO-9		
	(1) 12" or less in diameter or equivalent area	each	150.00
	(2) Larger than 12" but less than 30" diameter or equivalent area	each	300.00
	B. Type CO-16 or CO-17		
	(1) 12" or less in diameter or equivalent area	each	160.00
	(2) Larger than 12" but less than 30" diameter or equivalent area	each	340.00
11.	Structural Steel Including Detailing, Fabricating and Erecting Section 5A (as defined in AISC Code excluding anchor bolts)	lb	2.00
12.	Miscellaneous Steel Including Detailing, Fabricating and Erecting including Edge Plates, Angles, Handrail Grating, Checkered Plate, Section 5A	lb	2.50
13.	Type I Anchor Bolt Assemblies (Furnished and Installed)	lb	4.00
14.	Type II Anchor Bolt Assemblies (Furnished and Installed)	lb	4.00
15.	Chemical Resistant Coating on Concrete Surfaces, Section 7G	sq ft	1.75

16.	Chemical Resistant Coating on Steel Surface, Section 7G	sq ft	2.10

The prices set forth above are not subject to price adjustment clauses.

COMPLIANCE SUBMITTALS:

All Compliance Submittals which require Engineer's acceptance prior to the manufacture or fabrication of the materials and equipment to be furnished shall be submitted within 60 days following the Date of contract, and in accordance with the following schedule:

Days After Date of Contract	Type of Drawing or Submittal
60	Asphaltic Concrete Job-Mix Data (Alternative Bid No. 2)
30	Concrete Mix Design and Aggregate Data
30	Reinforcing Steel Details
60	Structural Steel
60	Miscellaneous Steel
60	Piping Material and Equipment
60	Pump Outline Drawings
60	Mechanical Materials and Equipment
60	Piping Specials
60	All Other Specified Submittals

Submittals requiring revision shall be resubmitted within 14 days after receiving Engineer's review action copies.

DELIVERY:

The delivery of the equipment and material shall be in accordance with the following schedule:

Days After Date of Contract	Equipment and Material
30	Bentonite (if alternative bid is selected)
40	Reinforcing Steel

N/A	Pumps
120	Pipe and Valves

FIELD WORK SCHEDULE:

This bid is based on using Open Shop labor for all work on the project site and the undersigned will commence work upon Notice of Award and move onto the site 10 days after the Date of Contract, or Notice to Commence Work at the Site. (See Aricle GC-2).

The undersigned agrees that time is of the essence in the performance of the Work included in this contract.

All work necessary to make the following major phases of the work or items of work ready and available for the Owner's use shall be completed within the following contract times:

Days After the Date Stated in the Notice to Commence Work at the Site					Phase or Item of Work
Base Bid	Alt. No. 1 (bent)	Alt. No 2 (asphalt)	Alt. No. 3 (Slurry)	Alt. No. 4 (Slurry)	N/A = not affected by alternative bid and time is same as for base bid) (Ash pond system includes all six ponds)
10	10	[illegible]	10	10	Move in and commence work
60	60	60	60	60	Order all required equipment and material
90	90	90	90	90	Complete Temporary Construction Runoff Pond No. 1
80	80	80	80	N/A	Complete clearing and grubbing borrow area
120	120	N/A	N/A	110	Complete coal yard areas based on assumption that work can continue in concurrent segments without delays between segments. (Day for day extensions will be granted for delays between segments).
120	120	N/A	N/A	110	Complete coal yard ready to receive coal
40	40	40	N/A	40	Commence ash pond system embankments
230	170	230	N/A	170	Complete ash pond system embankments
40	40	40	N/A	40	Commence ash pond system structures
170	160	170	N/A	150	Complete ash pond system structures
200	180	200	N/A	180	Substantial completion electrical equipment building (desired ASAP)

190	190	N/A	190	165	Commence secure landfill cut-off walls
230	220	N/A	210	180	Complete secure landfill cut-off walls
290	280	N/A	270	260	Complete secure landfill area
As soon as access to structure available.					Complete concrete floor - stock-out tower
126	110	126	N/A	95	Complete recycle pump structure - pump back pond
260	250	N/A	240	230	Complete secure landfill pump structure
250	240	N/A	N/A	220	Complete ash landfill pump structure
280	280	280	280	260	Complete installation of piping systems ready for testing.
290	260	290	260	240	Substantial completions as required for preliminary plant operation and testing
300	300	300	300	280	Complete finish grading and seeding
330	330	330	330	310	Complete all work

EQUIPMENT AND MATERIAL DATA:

The Bidder will furnish equipment and material as follows:

1. Air Conditioner, make and model no. Trane - PTHA - 1501 - JA
2. Fiberglass Pipe, mfgr. Fibercast or Fowlco
3. Valves, steel over 2" size, mfgr. As Specified
4. Valves, steel under 2" size, mfgr. As Specified
5. Valves, plug, mfgr. and model As Specified
6. Valves, butterfly, mfgr. and type As Specified
7. Seal water pumps, mfgr. and type Not Required-Addendum No. 3

DIVISION 1 - GENERAL REQUIREMENTS

1-1 SUMMARY OF WORK

A. DESCRIPTION OF PROJECT:
1. The Deerhaven Generating Station is in Alachua County on U.S. 441 about 10 miles northwest of the City of Gainesville near Hague, Florida. The station is of the indoor type and contains one 1250 psig, 950 F, 80-MW gas-oil fired unit.
2. The site is served by Seaboard Coast Line and Louisville and Nashville Railroad and has spur tracks adjacent to the generating station and fuel oil tanks. Fuel oil delivery is currently by truck.
3. This project includes the addition of a semi-indoor 1800-psig, 1000/1000 F, 235-MW pulverized coal-fired unit-type plant to be located contiguous to the existing station.
4. Commercial operation date for Unit 2 is scheduled for first quarter 1981.

B. WORK UNDER THIS CONTRACT:
1. Work shall include construction of embankments, linings, cut-off trenches, concrete and masonry structures, roads, piping, construction runoff retention pond, ash ponds, sludge ponds, pump-back ponds, concrete floors, and other miscellaneous Work including installation and erection of equipment, material, testing, and placing systems and equipment in service as specified.
2. This Contract includes, but is not limited to, the following items which are listed for the convenience of the Contractor in understanding the scope of the work:
   a. Furnishing temporary equipment and material required to accomplish the Work.
   b. Earthwork including pond and landfill, embankments, linings, grading, clearing, grubbing, etc.
   c. Reinforced concrete structures.
   d. Masonry structures.
   e. Structural and miscellaneous iron including castings and roadway grating.
   f. Waterproofing and roofing.
   g. Hardware and finishes.
   h. Yard piping, wells and equipment erection.
   i. Mechanical and minor electrical work.
   j. Roads and drives.
   k. All other Work as indicated and as specified including all services and Work required to place the installed equipment in operation.
3. In general work is part of the new addition to Deerhaven Generating Station.
4. Complete performance of the Work requires furnishing everything necessary to construct runoff retention pond, ash ponds, sludge ponds, other ponds, related structures and piping, ash and secure landfill areas, and make the disposal systems and equipment installed ready for commercial operation including natural and forced drainage systems,

except where specific mention is made that the equipment, material and work will be furnished by others.

C. OTHER CONTRACTS:

1. Other contracts related to this contract will include equipment Contracts and construction contracts which will include all general construction, mechanical and electrical work. All contracts have a completion schedule. Each item of equipment, phase of construction work, and each contract must be completed and all equipment operational by the scheduled dates to permit placing Unit 2 in commercial operation as soon as possible.
2. Other contracts and contractors related to this contract include the following:
   a. Construction Contracts:
      (1) Some contractors currently engaged in construction and erection work at the site include the following:

Contract Number	Contractor	General Scope of Work
3	Riley Stoker	Erection of Steam Generator
18	Midwest Conveyor	Erection of Coal Handling Equipment
19	Marley Cooling Tower Company	Cooling Tower
28	Greenhut Construction Company	Structural - Building Work
29A	Wood-Hopkins Construction Co.	Yard Structures I - coal Handling Structures
29B	Greenhut Construction Company	Yard Structures II - Yard Buildings and Yard Piping Work
31	Atlas RR Construction Company	Railroad Track
32	Prairie Tank and Construction Co.	Field Erected Tanks
33	Unicon Corporation	Breeching Steel, Breeching, and Installation
34	W. W. Gay	Erection of Machinery
35	National Valve and Manufacturing Co.	Power Piping
40	Alford Timber Company	Tree Removal - Work Completed

      (2) Contracts for construction work to be issued concurrently or subsequent to this Contract include the following:

Contract Number	General Scope of Work and Description of Areas
36	Power Wiring
56	Water Treatment Plant

      (3) Copies of contracts issued previously or concurrently with this Contract are available for inspection at the office of the Engineer or at the jobsite.

b. Equipment Contracts:

(1) Contracts for furnishing equipment and material have been awarded and some of the items have been delivered and stored at the jobsite. Other material will be delivered subsequently.

1a (2) Responsibility for receiving, installing, and initial operation of equipment is summarized by contract number in the following table:

Contract Number	Equipment or Material Included in Contract	Contractor or Manufacturer	Contractor Responsible for: Unload, Storing Contr. No.*	Install Contr. No.	Initial Operation Contr. No.
9	Pumps*	Worthington	29C	29C	29C
17B	Ash Pipe*	M. H. Detrick	29B	29B & C	35 & 29C

*This Contractor is only responsible for pumps and pipe installed under this Contract and not the other pumps and pipe included under Contracts 9 & 17B.

D. PROVIDED BY OWNER:

1. Under other contracts the Owner will provide the following:
   a. Pumps as follows:
      (1) Three ash recycle pumps.
      (2) Three pond blow-down pumps.
      (3) Two landfill runoff pumps.
      (4) Two secure landfill runoff pumps.
      (5) One secure landfill drain pumps.
   b. Ash sluice pipe and fittings in general in 18-foot long lengths.
   c. Pipe lines up to the point of interface with lines installed under this Contract.
   d. Doors for ash pond electrical equipment building.
   e. Other items as specified or indicated to be provided by others.
   f. Electrical wiring and instrument tubing.
2. For this Contract the Owner will provide the following:
   1b a. Utility poles for pond liner protection.
   b. Water for hydrostatic testing. Electric and water utilities as specified.
   c. Operating labor for placing equipment in service.
   d. Operating labor as required to treat and discharge water from construction runoff ponds indicated or constructed under this Contract but only after the acceptance of new ponds for operation.

E. CONTINUOUS SERVICE OF EXISTING FACILITIES:

1. Owner required services for operation of system as set forth in ARTICLE IB-3 C.
2. Owner will require use of RR loop track and coal storage area during coal deliveries.
3. Owner will require use of the ash, sludge, and pump back pond during start-up of the system and a portion of both landfill areas when unit is placed in initial start-up and testing phase.

4. Once unit is placed in operation, continuous use of one pond of each type will be required.

F. COORDINATION:

1. The pipelines must match and line up with lines installed under Contract 29B. The roads must match and line up with RR crossing.
2. The work areas in the coal yard must be coordinated with erection schedule for Contract 18 and construction schedule for Contract 29A. The entire coal yard area will not be available for lining and grading at one time. It may be necessary due to the urgent need for coal handling facilities, to require this contractor to periodically discontinue work in certain areas because of priorities and schedules under other contracts.
3. Continuous access corridors are required to the conveyor structures.

1-2 ADMINISTRATIVE MATTERS

A. INITIAL COORDINATION SUBMITTALS: Within ten (10) days after the Date of Contract, Contractor shall submit to Engineer for review and acceptance:

1. A preliminary Work progress and procurement schedule,
2. A tentative schedule of Compliance Submittals,
3. A tentative schedule of values for partial pay purposes, and
4. Certification of insurance or copies of policies, all as described in the Contract Documents.

B. INITIAL COORDINATION CONFERENCE: Within twenty days after the Date of Contract, a conference will be held at Deerhaven Generating Station to review initial coordination submittals, Compliance Submittals, review procedures for handling Compliance Submittals, review procedures for payment of Contractor, discuss equipment details, discuss site use and establish a working understanding between the parties as to their relationships during conduct of the Work.

The conference shall be attended by:

1. Contractor's Project Manager and his Superintendent.
2. Representatives of principal Subcontractors performing construction of structures or special slurry cut-off walls, if accepted.
3. Engineer's Resident Project Representative.
4. Owner or his representative.

C. WORK PROGRESS AND PROCUREMENT SCHEDULE:

1. Contractor shall submit to Engineer for acceptance a detailed Work progress and procurement schedule within thirty (30) days after the Date of Contract.
2. The schedule shall show the Work in a graphic format suitable for displaying scheduled and actual progress or a network diagram and shall be submitted on a reproducible media.
3. The schedule shall show the Work broken down into major phases and key items. Schedule shall include anticipated time for design, approval of submittals, fabrication, delivery for equipment and materials not readily available upon two months' notice from a supplier or

1-8 MANUFACTURER'S FIELD SERVICES: continued

D. PERFORMANCE TESTS:
  1. Equipment and Materials Furnished under this Contract:
    a. Owner may conduct acceptance tests after installation to determine if the equipment and materials installed as part of the Work perform as specified and as guaranteed. Final acceptance of equipment and materials and start of guarantee period will be based on acceptable results of such tests.
    b. Contractor will be notified so that he can have a representative, or manufacturer's representative, present during any tests of equipment or materials if desired, but without additional cost to Owner.
    c. The tests will be made as set forth in the Specifications unless the interested parties mutually agree upon some other manner of testing.
  2. Equipment and Materials Furnished by Others:
    a. Contractor shall not be required to participate in the testing of equipment.

1-9 PLACING EQUIPMENT, MATERIALS AND SYSTEMS IN OPERATION

A. SPECIAL REQUIREMENTS: Special requirements for placing specific equipment, materials and systems into operation are covered in the technical divisions of these specifications.

B. RESPONSIBILITY AND TAGGING:
  1. The Owner will accept equipment and systems for operation that have been placed into successful operation by the Contractor. "Acceptance for operation" means that the Owner will release the Contractor from operation of the particular equipment, system, or portion of the work, and will assume responsibility for operation and routine maintenance by supplying his own operating and maintenance personnel. "Routine maintenance" includes lubrication and minor adjustments, but does not include repairs, realignment, flange tightening, gasket replacement, valve repacking, strainer cleaning, or work resulting from defective material or workmanship. Acceptance for operation and placing in service does not relieve the Contractor from responsibilities related to defective materials and workmanship; neither does it constitute final acceptance for making final payment.
  2. Acceptance for operation will be made in writing by the Owner and appropriate tags shall be attached to valves and controls. Contractor's personnel shall not operate any equipment or material tagged by the Owner without obtaining proper authorization in accordance with Owner's tagging procedures.
    a. Contractor will be notified so that he can if he desires have a representative, or manufacturer's representative, present during any tests of equipment or materials for which manufacturer's field service is not specified.
    b. The tests will be made as set forth in the Specifications unless the interested parties mutually agree upon some other manner of testing.

C. EQUIPMENT AND MATERIALS FURNISHED BY OTHERS: Contractor may observe the performance testing of equipment at his expense but is not required to be present during this testing.

1-10 LIST OF DRAWINGS

A. CONTRACT DRAWINGS: Each sheet of the Contract Drawings prepared by Engineer as a basis for this Contract bears the following general title:

DEERHAVEN GENERATING STATION UNIT 2

Individual sheet numbers and titles are:

Dwg No	Title
Y0	General Site Plan
Y62	Site Plan
Y63	Clearing & Grubbing Limits
Y64	Grading Plan 1
Y65	Grading Plan 2
Y66	Grading Plan 3
Y67	Grading Plan 4
Y68	Grading Plan 5
Y69	Grading Plan 6
Y70	Grading Plan 7
Y71	Grading Plan 8
Y72	Grading Plan 9
Y73	Grading Plan 10
Y74	Grading Plan 11
Y75	Alternative Grading Plan
Y76	Road Profiles 1
Y77	Road Profiles 2
Y78	Ramp Profiles
Y79	Unassigned
Y80	Grading Sections 1
Y81	Grading Sections 2
Y82	Grading Sections 3
Y83	Grading Sections 4
Y84	Unassigned
Y85	Grading Details 1
Y86	Grading Details 2
Y87	Grading Details 3
Y88	Grading Details 4
Y89	Grading Details 5
Y90	Unassigned
Y91	Storm Drainage Details 1
Y92	Storm Drainage Details 2
Y93	Storm Drainage Details 3
Y94	Unassigned
Y95	Unassigned

1-10 LIST OF DRAWINGS: continued

A86	Ash Pond Electrical Equipment Plan and Details
A87	Ash Pond Electrical Equipment Building Details
S1	Standard Details
S2	Standard Details
S3	Standard Details
S4	Standard Details
S5	Standard Details
S222	Recycle Pump Structure
S223	Ash Pond Electrical Equipment Building Retaining Wall
S224	Ash Pond Stoplog Structure Nos. 1 & 2
S225	Sludge Pond Stoplog Structure Nos. 1 & 2
S226	Headwalls & Bridge Abutments
S227	Stoplog Structure Bridges
S228	Crossing Structure No. 6
S229	Crossing Structure No. 7
S230	Crossing Structure No. 8 and Slurry Wall Crossing Nos. 1 & 2
S231	Ash Pipe Drain Pit Structure & Ash Pond Elec. Equip. Bldg.
S232	Pipe Supports
S233	Unassigned
S234	Concrete Slab on Stockout Tower & Stair Tower Guard Posts
S235	Coal Pile Runoff Pond Pump Structure & Headwall & Temp. Construction Runoff Pond No. 1 Outlet
S236	Secure Landfill Runoff Retention Pond Pump Structure and Intake Structure
S237	Ash Landfill Pump Structure
S238	Unassigned
S239	Unassigned
S240	Unassigned
M35	HVAC & Plumbing Ash Pond Electrical Equipment Building
U7	Drawing Reference & Legend
U8	Yard Utilities - Ash & Sludge Ponds (6:1)
U9	Yard Utilities - Ash & Sludge Ponds (3:1)
U10	Yard Utilities - Secure Landfill
U11	Yard Utilities - Ash Landfill
U13	Unassigned
UP43	Isometric Details I
UP44	Isometric Details II
UP45	Unassigned
UP46	Miscellaneous Piping Details I
UP47	Miscellaneous Piping Details II
UP48	Miscellaneous Piping Details III
UP49	Unassigned
UP50	Yard Enlargement Details I
UP51	Yard Enlargement Details II
UP53	Valve List, Piping Schedules
UP54	Unassigned
UP55	Piping Design Tables

1-10 LIST OF DRAWINGS: continued

B. REFERENCE DRAWINGS: The following listed reference drawing is included in the bound set of drawings for information:

Dwg. No.	Title
Midwest L-114	Floor Plans Structural Steel Design Layout Stockout Tower El. 286'-3", El. 306'-3", and El. 324'-3"

Drawings of existing facilities and facilities under construction are available for inspection at Deerhaven Generating Station.

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DIVISION 2 - SITE WORK

2A - SITE PREPARATION AND EARTHWORK

2A-1 GENERAL

A. DESCRIPTION:

1. This Section includes site preparation activities and certain items of earthwork common to other related work as necessary to complete the Work.
2. Related Work Specified Elsewhere:
   a. Natural Clay Construction: SECTION 2B.
   b. Bentonite Soil Sealant: SECTION 2C.
   c. Slurry Wall Construction: SECTION 2E.
   d. Storm Drainage System: SECTION 2F.
   e. Roads, Drives, and Walks: DIVISION 18.

B. QUALITY ASSURANCE:

1. Applicable Standards:
   a. American Association of State Highway and Transportation Officials Standard Method of Test (AASHTO):
      (1) T99 - The Moisture-Density Relations of Soils Using a 5.5-Pound (2.5 Kg) Rammer and a 12-Inch (305 mm) Drop.
      (2) T104 - Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Test.
      (3) M147 - Materials for Soil Aggregate Subbase, Base, and Surface Courses.
      (4) M80 - Coarse Aggregate for Portland Cement Concrete.
   b. American Society for Testing and Materials (ASTM):
      (1) D2049 - Relative Density of Cohesionless Soils.
      (2) D2922 - Test for Density of Soil and Soil-Aggregate in Place by Nuclear Method.
      (3) ASTM 1970, 5th Edition, Special Procedures for Testing Soil and Rock for Engineering Purposes (STP 479), "Burmister Method."
   c. U.S. Department of Interior, Bureau of Reclamation, Earth Manual, 2nd Edition, Designation E-12, Relative Density of Cohesionless Soils, Alternative Method.
   d. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction.

C. JOB CONDITIONS:

1. Lines and grades shall be as indicated. Engineer will designate bench marks, base lines, and reference points as necessary to permit the Contractor to lay out and construct the work properly.
2. Maintain carefully all bench marks, monuments, and other reference points and replace as directed if disturbed or destroyed.
3. Explosives: Blasting will not be permitted.
4. Disposition of Utilities:
   a. Adequately protect from damage all active utilities and remove or relocate only as indicated or specified.

b. Report inactive and abandoned utilities encountered in excavating and grading operations. Remove, plug, or cap as directed.

5. Make provisions for temporarily accommodating flows in existing facilities to be relocated or disturbed.

2A-2 EQUIPMENT AND MATERIALS

A. MATERIALS:

1. Materials Encountered:
   a. All materials encountered, regardless of type, character, composition, and condition thereof, shall be unclassified.
   b. Excavation shall include all materials found within the designated limits for excavation.
   c. Determine quantity of various materials to be excavated prior to submitting Bid Form. If encountered, remove rock at no extra cost to Owner.
   d. Arrangements for entry to site for purpose of conducting subsurface investigations, including test borings, shall be made with Engineer.
   e. Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands exclusive of clayey and silty material--materials which are free-draining and for which impact compaction will not produce a well-defined moisture-density relationship curve and for which the maximum density by impact methods will generally be less than by vibratory methods.
   f. Cohesive materials include silts and clays generally exclusive of sands and gravel--materials for which impact compaction will produce a well-defined moisture-density relationship curve.
2. Waste Materials:
   a. Includes materials unsuitable for use in the Work.
      (1) Unsuitable materials include all material that contains debris, roots, organic matter, frozen matter, rock (with any dimension greater than one-half the loose layer thickness) or other materials that are determined by Engineer as too wet or otherwise unsuitable for providing a stable subgrade or stable foundation for structures.
      (2) Suitable materials include material that is free of debris, roots, organic matter, refuse, ashes, cinders, frozen matter and, which is free of rock with any dimension greater than one-half the specified loose layer thickness.
   b. Remove unsuitable materials from work area as excavated.
   c. Deposit waste materials in locations and within areas designated by Engineer and as indicated.
   d. Grade seed, and areas indicated to remain and leave them free draining and with an orderly and neat appearance.
3. Borrow Materials:
   a. Refers to all fill materials and topsoil obtained from approved locations either on or off the jobsite.
   b. Borrow shall include all clearing and grubbing, excavating, handling, and final disposal of materials as specified. Borrow, if required, to bring the embankments to the lines and grades indicated, shall be furnished by the Contractor, as specified, without additional compensation.

c. Borrow areas either on or off site shall be:
   (1) Arranged for by Contractor at no additional cost to Owner.
   (2) Subject to approval by Engineer.

d. Material removed from borrow areas shall be as approved by Engineer.

e. Upon completion of on-site borrow operations, if any, backfill borrow areas with unsuitable material from excavations, designated stockpiles and waste areas.
   All overburden removed during clay borrow operations, and not used in the Work, shall also be replaced in the borrow area.

f. Leave borrow areas graded to drain, seeded and to present a neat appearance. Construct ditches as required to drain low areas to natural drainage channels.

4. Embankment Material:
   a. Includes suitable approved material from excavations stockpiles and borrow areas.
   b. Embankment material shall be friable sandy or silty clay containing fine material sufficient to provide a dense mass free of voids and capable of satisfactory compaction.
   c. Do not use material containing gravel, stones, or shale particles greater in dimension than one-half the depth of the layer to be compacted.
   d. Material shall be free of roots or other organic matter, refuse, ashes, cinders, frozen earth or other unsuitable material.
   e. All suitable clay stockpiled by others east of the track hopper shall be used for embankment material.
      (1) A sufficient amount of sand shall be thoroughly disked into the clay to make it workable.
      (2) The material shall be capable of being compacted to density specified.
      (3) The material shall be capable of meeting performance requirements.

5. Cover Material:
   a. Shall be generally cohesionless material free of debris, roots, organic matter, rock or other materials that are determined by Engineer as unsuitable for providing a stable subgrade.
   b. Shall be defined as having a gradation with 100 percent passing a No. 1 sieve, 75 percent passing a No. 4 sieve, and not more than 10 percent passing a No. 200 sieve.
   c. Use as cover over natural clay or bentonite liners as specified in SECTION 2B and SECTION 2C, respectively.

6. Trench Stabilization Material: Material shall be as follows:
   a. As specified for granular fill material, or
   b. Conform to AASHTO M147, Grading A or B, well graded, with not more than 10 percent passing No. 200 sieve.

7. Granular Fill Material:
   a. Material shall be crushed stone or crushed natural gravel with the following gradation:

Sieve Size (Square Openings)	Percent Passing (By Weight)
1"	100
3/4"	90-100
3/8"	30-65
No. 4	5-25
No. 8	0-10
No. 16	0-5

b. Material shall not have a loss of more than 15 percent after 5 cycles when tested for soundness with sodium sulfate as described in AASHTO T104.

c. Use for the following:
   (1) Pipe embedment for other than plastic pipe.
   (2) Trench stabilization.

8. Granular Bedding Material:

a. Material shall be crushed stone or natural sand with the following gradation:

Sieve Size (Square Openings)	Percent Passing (By Weight)
3/8"	100
No. 4	95-100
No. 16	65-98
No. 50	5-35
No. 100	0-7

b. Material shall not have a loss of more than 15 percent after 5 cycles when tested for soundness with sodium sulfate as described in AASHTO T104.

c. Use for plastic pipe embedment.

9. Topsoil Materials:

a. Includes those materials obtained from stripping and excavation which are most suitable and stockpiled for such purpose, or

b. Borrow when required.

10. Filter Blanket Material:

a. Material shall conform to all applicable requirements of AASHTO M80 and shall be reasonably well graded within the following limits:

Sieve Size (Square Opening)	Percent Passing (By Weight)
4-inch	100
3-inch	80-100
2-inch	70-90
3/4-inch	45-60
No. 4	20-30
No. 10	5-15
No. 40	0-5

b. Gradation shall not vary from low limit on one sieve to high limit on adjacent sieve or vice versa.

c. Shall be reasonably free from lumps or balls of clay, organic matter, objectionable coatings or other foreign materials and shall be durable and sound.

d. Shall be reasonably free from flat and/or elongated particles in an amount exceeding 20 percent. Flat or elongated defined to be no greater in length than 5 times the average thickness.
e. Crushed rock conforming to the gradation specified may be used.
f. Furnish Engineer certification from an approved laboratory that the material conforms to these specifications.

11. Riprap Material:
a. All stone shall be durable and of suitable quality to ensure permanence in the structure and in the climate in which it is to be used.
b. Boulders or quarried rock may be used and shall be graded as follows:

Weight in Pounds Per Stone	Percent of Total Weight Lighter Than or Passing
300	100
150	55-75
50	25-45
2-inch screen	5-15

c. Quantity of rock with an elongation greater than 3:1 shall not exceed 20 percent of the mass. No stone shall have an elongation greater than 4:1.
d. Material shall be free from cracks, seams, or other defects that would tend to increase its deterioration from natural causes.
e. Objectionable quantities of dirt, sand, clay and rock fines will not be permitted.
f. Not more than 10 percent of the stone shall show splitting, crumbling, or spalling when subjected to 5 cycles of the sodium soundness test as required by AASHTO T104.
g. Furnish Engineer certification from an approved laboratory that the material conforms to these specifications.
h. In lieu of conforming to above specified test requirements, material with a proven history of satisfactory performance will be approved for use in the work provided certification of this history is acceptable to the Engineer.
i. Contractor shall furnish a sample of stone for acceptance.
j. Acceptable alternative riprap materials:
(1) Filter point sytle mats of Fabriform as manufactured by Construction Techniques, Inc., or approved equal.
(2) Sand-cement meeting the requirements of the FDOT Standard Specifications for Road and Bridge Construction, Section 530-Riprap.

12. Weed Killer: Weed killer shall be "Krovar I" as manufactured by E. I. duPont or equal product approved by Engineer and meeting Federal, State, and local regulations controlling the use of this material.

B. EQUIPMENT:
1. Compaction equipment shall conform to the following requirements and be subject to the approval of the Engineer.
a. Tamping Rollers:
(1) Tamping roller may be towed or self-propelled.

(2) Rollers shall have staggered uniformly spaced knobs or feet. When fully loaded, they shall exert at least 300 psi on combined area of tamping feet in contact with ground.
(3) Rollers shall be equipped with cleaning fingers maintained at full length to prevent accumulation of material between feet.
(4) Maintain all equipment in good repair.

b. Rubber-tired rollers shall have two axles, not less than 9 wheels with pneumatic tires, a rigid steel frame, and a body suitable for ballast loading.
c. Power tampers shall be used for compaction of material in areas where it is impractical or unsafe to use heavy equipment, and as directed by the Engineer.
d. Vibratory compactor shall have a steel drum 42 inches in diameter, with a vibrating force of 300 pounds per cycle per inch of drum width and a vibrating frequency of 1,200 cycles per minute.
e. Vibatory plate compactor shall be used for compaction of material in areas where it is impractical or unsafe to use heavy equipment, and as directed by the Engineer.

2A-3 PERFORMANCE

A. CLEARING AND GRUBBING:

1. Perform clearing and grubbing where indicated to perform excavation, trenching, embankment, borrow and other work required.
2. Clearing:
   a. Clearing includes felling and disposal of trees, brush, and other vegetation.
   b. Conduct work in a manner to prevent damage to property and to provide for the safety of employees and others.
   c. Keep operations within areas indicated.
3. Grubbing:
   a. Removal and disposal of tree stumps and roots larger than 3 inches in diameter.
   b. Remove to a depth of at least 18 inches below existing grade elevation.
   c. Backfill all excavated depressions with approved material and grade to drain.

B. DISPOSAL OF DEBRIS:

1. Dispose of noncombustible debris by burying on the site in location approved by the Engineer.
2. Place debris buried on the site a minimum of 5 feet below finished grade in approved areas. Indicate locations of buried debris on Contractor-furnished construction record drawings.
3. Contractor may claim and salvage any timber or other debris which he may consider of value, but shall not delay in any manner either this contract or other work with salvaging operations.

4. Combustible waste material and debris shall be burned on site in accordance with DIVISION 1.

C. STRIPPING:
1. Remove topsoil from areas within limits of excavation, trenching, borrow and areas designated to receive embankment and compacted fill.
2. Scrape areas clean of all brush, grass, weeds, roots and other materials.
3. Strip to a minimum depth of 6 inches, but to a sufficient depth to remove excessive roots in heavy vegetation or brush areas and as required to segregate topsoil.
4. Stockpile topsoil in areas designated where it will not interfere with construction operations or existing facilities. Stockpiled topsoil shall be reasonably free of subsoil, debris, and stones larger than 2-inch diameter.
5. Dispose of waste on the site at locations indicated and as approved by the Engineer.

D. SHEETING AND BRACING:
1. Requirements:
   a. Use as necessary to conform with the following:
      (1) Federal and state laws and local ordinances.
      (2) To protect life, property and the work.
      (3) To avoid excessively wide cuts in unstable material.
   b. Use is mandatory where construction is adjacent to existing structures and utilities.
2. Approved Materials:
   a. Provide on site prior to start of excavation in each section, and make such adjustments as are required to meet unexpected conditions.
   b. Space and arrange sheeting and bracing as required to exclude adjacent material and according to the stability of excavation slopes.
   c. Remove simultaneously with backfilling, except as otherwise approved, and fill voids left after withdrawal with sand or other approved material.
   d. Leave in place when required by conditions of supported material and cut off at approved elevation below the surface.
      (1) No higher than one foot below finished surface grade, and
      (2) No lower than one foot above top of buried pipe or conduits.

E. DEWATERING:
1. Control grading around excavations to prevent surface water from flowing into excavation areas.
2. Drain or pump as required to continually maintain all excavations, structures and trenches free of water or mud from any source, and discharge to approved drains or channels that drain to a construction runoff retention pond. Commence when water first appears and continue until work is complete to the extent that no damage will result from hydrostatic pressure, flotation, or other causes.

3. Use pumps of adequate capacity to ensure rapid drainage of area, and construct and use drainage channels and subdrains with sumps as required. Drain to construction runoff retention ponds.
4. Remove unsuitable excessively wet subgrade materials and replace with approved backfill material.

F. STOCKPILING:
1. Stockpile in amounts sufficient for and in a manner to segregate materials suitable for the following:
   a. Topsoiling.
   b. Constructing embankments and fills.
   c. Backfilling.
   d. Cover material.
   e. Waste only.
2. Do not obstruct or prevent access to the following:
   a. Roads and driveways.
   b. Utility control devices.
   c. Ditches or natural drainage channels.
3. Perform in a manner to avoid endangering the work, or stability of banks or structures.
4. Maintain safe distance between toe of stockpile and edge of excavation or trench.
5. Stockpile in other areas when adjacent structures or other restrictions prohibit sufficient storage adjacent to the Work.
6. After construction is completed, stockpile all excess suitable material in area indicated. Grade stockpile to drain, and seed.

G. COMPACTION:
1. Compact subgrades, fills, embankments and backfills using spreading equipment, tamping rollers, rubber-tired rollers, vibratory compactors, or power tampers, as required to obtain reasonable uniformity.
2. Perform within moisture content range as specified to obtain required results with equipment used.
3. Achieve minimum densities specified as referenced to:
   a. Cohesive soils - Maximum density at optimum moisture, AASHTO T99.
   b. Cohesionless soils - Relative density.
      (1) ASTM D2049.
      (2) ASTM D2922.
      (3) ASTM 1970 (STP 479).
      (4) U.S. Department of Interior, Bureau of Reclamation, Earth Manual, 2nd Edition, Designation E-12.
4. Compact areas not otherwise specified or indicated to a minimum of:
   a. Cohesive soils - 90 percent maximum density.
   b. Cohesionless soils - 70 percent relative density.

H. SITE GRADING:
1. Excavate, fill, compact fill, and rough grade to bring project area to subgrades and elevations indicated:
2. Rock:

a. If encountered in grading areas , the provisions contained herein shall apply.
b. Backfill to grade, with earth compacted in place after removing rock to 24 inches below finished grade.

3. Fill:
   a. Fill as required to raise existing grades to the new grades as indicated.
   b. Perform as specified in "EMBANKMENT," this Section.
   c. Remove all debris subject to termite attack, rot, or corrosion from areas to be filled.
4. Rough Grading:
   a. Grade and compact all areas within the project, including excavated and filled sections, and adjacent transition areas reasonably smooth and free from irregular surface changes.
   b. Degree of finish shall be that ordinarily obtained from blade grader or scraper operations, except as otherwise specified.
   c. Finished rough grades shall generally be not more than 0.25-foot above or below established grade or approved cross-sections with due allowance for topsoil.
   d. Tolerance for areas within 10 feet of structures shall not exceed 0.15-foot above or below established subgrade.
   e. Finished subgrades for roads, drives and surfaced areas shall not be lower than indicated, nor higher than 0.1-foot above that indicated.
   f. Finish all ditches, swales, and gutters to drain readily.
   g. Unless otherwise indicated, slope the subgrade evenly to provide drainage away from building and structure walls in all directions at a grade not less than 1/4-inch per foot.
   h. Provide roundings at top and bottom of banks and at other breaks in grade.

I. EXCAVATION:

1. General:
   a. Perform excavation by any recognized method of good practice to complete the job in the most expeditious manner.
   b. Take precautions to ensure no damages to existing facilities or equipment, or other work.
2. Trenching:
   a. Extent of Work:
      (1) Includes excavation, sheeting, bracing and all operations necessary for the preparation of trenches for bedding of pipes and all appurtenances thereto.
      (2) Remove material as required for alignment and elevation of work as indicated.
   b. Equipment and Methods:
      (1) Types of equipment and methods may be at Contractor's option, where structures or other facilities are not endangered.
      (2) Equipment and methods shall be subject to approval of jurisdictional agency where stability or usefulness of other facilities may be impaired.

(3) Perform by hand methods when required to save existing culverts, utilities or other structures above or below ground.
(4) Maximum length of open trench shall be limited as necessary to conform to local codes.

c. Side Walls:
(1) Make vertical below top of pipe.
(2) Make vertical or sloped from a plane 12 inches above top of pipe down to top of pipe.
(3) Make vertical or sloped as required for stability, above a plane 12 inches above top of pipe.
(4) Sheet and brace where necessary.
(5) Excavate without undercutting.

d. Trench Depth:
(1) Depth shall be sufficient to provide the minimum bedding requirements for the pipe being placed.
(2) Do not exceed depth indicated where conditions of bottom are satisfactory.
(3) Increase depth as necessary to remove unsuitable supporting materials.

e. Trench Bottom:
(1) Protect and maintain when suitable natural materials are encountered.
(2) Remove rock fragments and materials disturbed during excavation or raveled from trench walls.
(3) Restore to proper subgrade with granular fill material or compacted backfill as approved by the Engineer.

f. Trench Stabilization: Compact in lifts not exceeding 6 inches to approved firm condition with penumatic or vibratory equipment.

g. Trench Width:
(1) Excavate trench to a minimum width which will permit satisfactory jointing of the pipe and thorough tamping of bedding.
(2) Maintain trench widths below a plane 12 inches above top of pipe as follows:

	Trench Width	
Nominal Pipe Size	Minimum	Maximum
Less than 24"	Pipe od + 1'	Pipe od + 2'
24" to 60"	Pipe od + 1'	Pipe od + 2'

(3) Maximum trench width limitations shall apply beginning 3 feet from manhole or structure walls.
(4) Maximum width shall be as near the minimum specified as can be controlled by construction equipment and methods utilized.
(5) Restore trench width to maximum specified when overexcavated at no additional cost to the Owner.
(a) Trench widths over maximum shall be restored with granular material specified for the type of pipe material being used, for a minimum height of twelve (12) inches above top of pipe.
(b) Obtain approval of Engineer before proceeding.

h. Trenching Under Existing Utilities: The pipe trench walls shall be maintained vertical under existing duct banks and other utilities. This shall be accomplished by driving steel H-section beams each side of the utility and placing timber lagging between the beams. All excavation under utilities shall be by hand methods.

i. Trenching Across Drainage Ditches: Open cuts through existing drainage ditches shall be provided with protection from flows entering the trench. Methods of blocking and disposing of flows shall be by methods as approved by the Engineer.

j. Test Pits (Contractor's Option):
  (1) Excavate test pits sufficiently in advance of trenching to enable adequate planning of construction procedure.
  (2) Locate as follows:
    (a) Where unstable material is suspected that may require special protective measures.
    (b) Where ground water may require special handling methods.
    (c) Where approved.
    (d) Where interference or conflict with other utilities or structures could affect alignment of pipe.
  (3) With lateral dimension not less than minimum trench width specified for location excavated.
  (4) To depth required to obtain information desired.

k. Fill Areas: Perform trenching in fill areas only after compacted fill has reached an elevation of not less than one foot above the top of the pipe.

3. Structures: Perform as specified for "Trenching," and as follows:
  a. Excavate area adequate to permit efficient erection and removal of forms.
  b. Trim to neat lines where details call for concrete to be deposited against earth.
  c. Excavate by hand in areas where space and access will not permit use of machines.
  d. Notify Engineer immediately when excavation has reached the depth indicated. Do not proceed further until approved.
  e. Restore bottom of excavation to proper elevation in areas overexcavated for structures supported by footings, with concrete.

J. BACKFILLING:
  1. Trenches: Perform as specified for "Embankment," this section, with the following additional provisions:
    a. Complete promptly after approval to proceed.
      (1) Upon completion of pipe embedment.
      (2) Only after concrete encasement (when required) has attained 70 percent of design strength.
    b. Use hand methods to a plane 12 inches above top of pipe.
    c. Use approved mechanical methods where hand backfill is not required.
    d. Until compacted depth over conduit exceeds 3 feet, do not drop fill material over 5 feet. Distance may then be increased 2 feet for each additional foot of cover.
    e. Ensure thorough compaction of fill under and around the conduit for the full length.
    f. Accomplish without inundation or flooding.

g. Backfill failing to meet required densities shall be removed or scarified and recompacted as necessary to achieve specified results.
h. All backfill under existing utilities shall be granular pipe embedment, vibratory compacted to 70 percent relative density.

2. Granular Pipe Embedment:
   a. Materials shall be as follows:
      (1) For plastic pipe, bedding shall be as specified for granular bedding material.
      (2) For all other pipe, bedding shall be as specified for either granular bedding material or granular fill material.
   b. Place granular bedding to conform to the following:
      (1) Level bottom layer at proper grade to receive and uniformly support pipe barrel throughout its length.
      (2) Form depression under each joint such that no part of bell or coupling is in contact with trench when pipe is placed in position.
      (3) Add second layer simultaneously to both sides of the pipe with care to avoid displacement.
      (4) Complete promptly after approval to proceed.
      (5) Substitute for any part of earth backfill to within 2 feet of final grade at Contractor's option.
   c. Compact granular bedding as follows:
      (1) In lifts not exceeding 12 inches in compacted depth.
      (2) Rod, spade, or use pneumatic or vibratory equipment as follows:
         (a) As required to obtain not less than 70 percent relative density as determined by test methods specified.
         (b) Throughout depth of embedment.
   d. Include arch or total concrete encasement as follows:
      (1) In locations indicated or approved by Engineer.
      (2) Construct full width of trench.
      (3) Place 4000-psi concrete, plain or reinforced, conforming to DIVISION 3, as required.
      (4) Start and terminate encasement at a pipe joint.
      (5) Install keyed construction joints coincident with pipe joints at 30- to 36-foot intervals. Provide separation of at least 75 percent of cross-section area at construction joints. Do not run horizontal steel through joint.
      (6) Suitably support and block pipe to maintain position and prevent flotation.
      (7) Place promptly after installation of granular bedding.
      (8) Protect against damage by heavy equipment with layer of earth.
   e. Include concrete cradle as follows:
      (1) In locations designated by Engineer to reinforce unstable trench bottom.
      (2) Place on undisturbed trench bottom or on stabilized subbase.
      (3) Construct full width of trench.
      (4) Place 4000-psi concrete, plain or reinforced, conforming to DIVISION 3, as required.
      (5) Start and terminate cradle at a pipe joint.
      (6) Place without horizontal construction joints other than indicated.

(7) Suitably support and block pipe to maintain position and prevent flotation.
(8) Provide anchorage where approved.

3. Structures:
   a. Backfill only after concrete has attained 70 percent design strength.
   b. Backfill adjacent to structures only after, in the opinion of Engineer, a sufficient portion of the structure has been built to resist the imposed load.
   c. Remove all debris from excavation prior to placement of material.
   d. Use material free of gravel, rock, or shale particles larger than 2 inches within one foot of structure.
   e. Perform backfilling simultaneously on all sides of structures.
   f. Place backfill in level layers within compacting ability of equipment used.
   g. Exercise extreme care in the use of heavy equipment in areas adjacent to structures.
   h. Accomplish compaction without inundation or flooding.
   i. Compact as specified.

K. EMBANKMENT:

1. Placement:
   a. Place embankment to the contours and elevations indicated, using suitable approved material from excavations or borrow areas.
   b. Place fill material in 8-inch maximum layers (uncompacted depth) in areas requiring 95 percent compaction and in 12-inch maximum layers (uncompacted depth) in all other embankment areas.
   c. Place embankment only on ground surfaces which have been compacted by rolling, roughened by discing or scarifying to 6 inches deep, wetted or dried as required to obtain correct moisture content, and approved by Engineer.
   d. Do not place frozen earth in fill and do not place fill on a frozen surface.
2. Compaction: Obtain compaction by normal methods and equipment during the placing and grading of layers or to the minimum density specified for particular locations.
3. Perform any wetting or drying of the material as required to obtain the specified density when compacted and to maintain moisture content at time of placement to not more than one percent below or more than three percent above optimum as determined by AASHTO T99.

L. SUBGRADE PREPARATION:

1. General:
   a. Excavate or backfill as required to construct subgrades to the elevations and grades indicated.

b. Remove all unsuitable material and replace with approved fill material, and perform all wetting, drying, shaping, and compacting required to prepare a suitable subgrade.

2. Subgrade for Fills and Embankments: Roughen by discing or scarifying and wet or dry top 6 inches as required to ensure bond with fill or embankment.
3. Subgrade for Roadways, Drives, Parking Areas:
   a. Extend subgrade as indicated.
   b. Compact subgrade embankments to 90 percent except for the top six inches.
   c. Compact the top six inches of subgrades for traffic areas, including pond dike tops, in embankment or excavation to a minimum of 95 percent for cohesive and 80 percent for cohesionless soils as determined by test methods specified.
4. Subgrades for Concrete Slabs on Grade: Compact subgrade in embankment areas and in the top six inches in excavation areas to a minimum of 95 percent for cohesive and 80 percent for cohesionless soils as determined by test methods specified.

M. TOPSOILING:

1. Place topsoil on all outside slopes of pond dikes.
2. Subgrade Treatment:
   a. Clear site of vegetation heavy enough to interfere with proper grading and tillage operations.
   b. Clear surfaces of all stones or other objects larger than 3 inches in thickness or diameter, all roots, brush, wire, grade stakes, or other objectionable material.
   c. Loosen subgrade by discing or scarifying to a depth of 2 inches wherever compacted by traffic or other causes to permit bonding of the topsoil to the subgrade.
3. Placement:
   a. Distribute over required areas without compaction other than that obtained with spreading equipment.
   b. Place to extent material is available within following limits:
      (1) Not less than 4 inches in depth.
      (2) Do not exceed 6 inches in depth.
   c. Shape to contours shown.
   d. Grade to match contours of adjacent areas and permit good natural drainage.
4. After topsoil has been spread, clear surface of stones or other objects larger than 2 inches in thickness or diameter and all other objects that might interfere with planting and maintenance operations.
5. Protect topsoiled areas from the elements until grass is established. Repair eroded areas as required.
6. Keep paved areas clean. Promptly remove topsoil or other dirt dropped on surfacing.

N. FILTER BLANKET:

1. Foundation Preparation:

a. Areas on which filter blankets are to be placed shall be uniformly trimmed and dressed to conform to cross sections indicated within an allowable tolerance of plus or minus 2 inches from the theoretical slope lines and grades.
b. Where such areas are below the allowable minus tolerance limit they shall be brought to grade by filling with filter blanket material.
c. Slopes shall be approved by Engineer prior to placing filter blanket materials.

2. Placement of Filter Blanket Materials:
   a. Place on the slopes within the limits as indicated.
   b. Direct dump down the slope from the top shall not be permitted.
   c. Material shall be spread uniformly on the prepared base, in a neat and satisfactory manner to a thickness of six (6) inches.
   d. Placing or spreading of material by methods which will tend to segregate particle sizes within the filter will not be permitted.
   e. Any damage to the surfaces of the filter blanket foundation during the placing of the filter blanket material shall be repaired before proceeding with the Work.
   f. Compaction of the filter blanket material will not be required, but it shall be finished to present a reasonably even surface free from mounds, depressions or windrows.

O. RIPRAP:
1. Foundation Preparation:
   a. Trim and dress areas requiring riprap to conform to cross-sections indicated within an allowable tolerance of plus or minus 2 inches from the theoretical slope lines and grades.
   b. Where such areas are below the allowable minus tolerance limit, they shall be brought to grade by filling with riprap.
2. Placement of Riprap:
   a. Place on the slopes within the limits as indicated.
   b. Place riprap on the prepared base in such a manner as to produce a reasonably well-graded mass of rock with a minimum practicable percentage of voids.
   c. Place to its full course thickness in one operation in a manner to avoid displacing the base material.
   d. Finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones. Hand-place only if necessary to secure the desired results.
   e. A tolerance of plus or minus 4 inches from the slope lines and grades will be allowed to the extremes that such a tolerance shall not be continuous over an area greater than 200 square feet.
   f. Maintain the riprap protection until accepted and replace any material displaced by any cause.
3. Placement of Alternative Riprap Materials:
   a. Install Fabriform according to manufacturer's recommendations with a minimum six-inch thick mat thickness.
   b. Install sand-cement according to requirements of FDOT Standard Specifications for Road and Bridge Construction, Section 530 - Riprap. No filter blanket will be required with this material.

P. WEED KILLER:
 1. Use in the following areas:
  a. Road subgrades and dike tops indicated to receive limerock surfacing.
  b. Interior pond subgrades indicated to receive bituminous liner material.
 2. Shall be used in accordance with manufacturer's recommendations and all local, state, and federal regulations.

Q. MAINTENANCE AND REPAIR:
 1. Maintenance:
  a. Protect newly graded and topsoiled areas from actions of the elements.
  b. Settling or erosion occurring prior to landscaping shall be filled and repaired and grades reestablished to the required elevations and slopes.
 2. Correction of Settlement:
  a. Under provisions of the guarantee, Contractor is responsible for correcting any settlement in excess of the amount of the specified grading tolerance for the specific areas of embankments or backfill and damages created thereby within one year after acceptance of the Work.
  b. Make repairs within 10 days from and after due notification by Owner of embankment or backfill settlement and resulting damage.
  c. Make own arrangements for access to the site for purposes of repair.

R. BASE BID QUANTITIES:
 1. Include in the base bid the quantities indicated and in addition include the following quantites:

Item	Estimated Quantity
a. Embankment material from stockpile east of the track hopper	130,000 CY
b. Topsoil material from stockpile northwest of coal pile runoff retention pond	1,200 CY

 2. The Contract Price shall be adjusted in the final settlement using the unit prices in the Bid Form for adjusting the difference between the specified base bid quantities and the quantities actually provided.

* * * * *

2B - NATURAL CLAY CONSTRUCTION

2B-1 GENERAL

A. DESCRIPTION:

1. This Section includes activities associated with the excavation and dewatering of an on-site clay borrow pit, and the installation of natural clay material in the following areas as base bid construction:
   a. Natural clay liner for the ash, sludge, and pump back cells.
   b. Natural clay liner for coal yard and coal pile runoff retention pond.
   c. Natural clay cutoff walls around, and liner in, secure landfill.
   d. Natural clay liner for ash landfill.
2. Related Work Specified Elsewhere:
   a. Site Preparation and Earthwork: SECTION 2A.
   b. Yard Piping: DIVISION 17.

B. QUALITY ASSURANCE:

1. Applicable Standards:
   a. American Association of State Highway and Transportation Officials Standard Method of Test (AASHTO):
      (1) T99 - The Moisture-Density Relations of Soils Using a 5.5-Pound (2.5-Kg) Rammer and a 12-Inch (305 mm) Drop.
   b. American Society for Testing and Materials (ASTM):
      (1) D2049 - Relative Density of Cohesionless Soils.
      (2) D2922 - Test for Density of Soil and Soil-Aggregate in Place by Nuclear Method.
      (3) ASTM 1970, 5th Edition, Special Procedures for Testing Soil and Rock for Engineering Purposes (STP479), "Burmister Method."
   c. U.S. Department of Interior, Bureau of Reclamation, Earth Manual, 2nd Edition, Designation E-12, Relative Density of Cohesionless Soils, Alternative Method.

C. COMPLIANCE SUBMITTALS:

1. Submit as specified in DIVISION 1.
2. Includes, but not limited to certified test results that material meets specifications.

2B-2 EQUIPMENT AND MATERIALS

A. MATERIALS:

1. Suitable clay material for liner construction shall be cohesive material, as specified in SECTION 2A, and shall conform to the following:
   a. AASHTO Classification Group A-2-6, or A-6, or, A-2-7
   b. Unified Classification CL, CH, SC, or OH.
   c. Generally free of rock and calcareous material.

2B - NATURAL CLAY CONSTRUCTION: continued

2. Suitable clay material for the cutoff wall construction shall generally conform to the above requirements except as follows:
   a. Material classified as AASHTO A-7-5 or A-7-6, and material with small amounts of calcareous material distributed through it will be allowed.
3. Cover material shall be as specified in SECTION 2A.
4. All materials shall be subject to approval of the Engineer.

B. EQUIPMENT:
1. All equipment shall be subject to approval of Engineer.
2. Compaction equipment shall be as specified in SECTION 2A.

2B-3 PERFORMANCE

A. BORROW PIT DEWATERING:
1. General:
   a. Perform as specified in SECTION 2A and as follows.
   b. Dewatering of surface sand layer and excavation in clay shall be continuous until completion of borrow operations.
   c. Control grading around excavations to prevent surface water from flowing into excavation areas.
      (1) Construct temporary dike around top edge of excavation as required to divert surface water. Minimum dike section shall be 18 inches high with 4-foot top width.
      (2) Make provisions to prevent surface water from entering through areas used as construction access ramps.
   d. Dewatering of surface sand layer shall be by underdrain system or wellpoint system, as specified below, at Contractor's option.
2. Underdrain System:
   a. Construct a trench as indicated to a depth of at least one foot into the underlying existing clay layer.
   b. Slope trench such that water will be conveyed to a collection point.
   c. Install in the trench a 6-inch diameter perforated pipe as indicated in Piping Design Table 93. Wrap pipe in Mirafi-140S filter cloth or approved equal.
   d. Backfill trench with cohesionless material having the following gradation:

Sieve Size	Percent Passing (by weight)
No. 4	90-100
No. 8	30-90
No. 16	0-30
No. 100	0-5

   e. Install a sump at the collection point and connect peripheral drain pipe to sump.
   f. Install a pump of adequate capacity to handle the flow of water into the sump.

g. Keep sump dewatered at all times and pump water from sump to drainage channels which convey runoff to Temporary Construction Runoff Retention Pond No. 1.

h. Underdrain system may be left in place or removed after completion of borrow operations at Contractor's option.

3. Wellpoint System:

a. Install perimeter wellpoint system so as to lower groundwater level to top of underlying existing clay layer.

b. Construct a ditch at the top of the clay layer within the wellpoint system to collect water that passes beneath the wellpoints.

c. Slope ditch such that water will be conveyed to a collection point and install a pump of adequate capacity to handle the flow of water.

d. Keep ditch dewatered at all times and pump water from ditch to drainage channels which convey runoff to Temporary Construction Runoff Retention Pond No. 1.

e. Remove entire wellpoint system after completion of construction.

B. EXCAVATION:

1. At Contractor's option, excavation for on-site borrow pit and for clay cutoff wall construction may be accomplished by using unbraced open-cut, sheeting and bracing, or a combination thereof.
2. Excavate borrow pit to lines and grades necessary to obtain clay required for construction. Keep operations within limits of borrow area indicated except with approval of Engineer.
3. Excavate for cutoff walls to a depth of at least two feet into the underlying existing clay layer.
4. Unbraced slopes shall be as flat as required to maintain sides of excavation throughout borrow operations, but in no case shall be steeper than 1.5 horizontal to 1 vertical. If slopes become unstable during excavation or while pit is open, Contractor must take immediate action to stabilize sides of excavation by installing sheeting and bracing, flattening slopes, or by other methods acceptable to the Engineer. This shall be done at no additional cost to the Owner.
5. Compact areas to be used as borrow pit access ramps as specified in SECTION 2A.

C. SHEETING AND BRACING:

1. Use as specified in SECTION 2A.
2. Use in areas other than those specified is at Contractor's option.

D. GRADING:

1. Place and compact embankment for pond dikes as specified in SECTION 2A.
2. Prepare all subgrades to receive clay, as specified in Article 2A-3.L.1., prior to placing clay liner.

E. CLAY PLACEMENT:

1. Clay material shall not be placed until authorized by the Engineer.
2. Place clay material on approved subgrade or in cutoff wall excavation in 8-inch maximum layers (uncompacted depth).
3. Compact clay to obtain a minimum density of 95 percent in the ponds, ash landfi[ll] secure landfill, and coal yard, and 90 percent in the cutoff wall as determined by AASHTO T99.
4. Perform any wetting or drying of the material as required to obtain the specified density when compacted and to maintain moisture content at time of placement to not more than one percent below or more than three percent above otpimum as determined by AASHTO T99.
5. Place and compact clay to lines and grades indicated.

F. TESTING:

1. After clay liner has been placed and compacted, percolation tests will be made by the Engineer on the pond bottoms, dikes, ash and secure landfill, and in the coal yard as required.
2. The seepage rate of finished liners shall not exceed the following rates per foot of water depth at any point:
   a. In the ash, sludge, and pump back ponds, the ash and secure landfills, 1×10^{-7} cm/sec.
   b. In the coal yard and coal pile runoff retention pond, 5×10^{-8} cm/sec.
3. In the event the percolation rate exceeds the specified value, the undesirable material shall be removed and replaced at no additional cost to the Owner.

G. COVER PLACEMENT:

6e 1. Cover material over clay layer in ponds landfills and coal yard, and dike above cutoff wall, shall not be placed until authorized by the Engineer.
2. Place material in 12-inch maximum layers (uncompacted depth).
3. Compact to a minimum density of 70 percent in all areas except top six inches of ramps, pond bottoms, coal yard, and landfills which shall be compacted to 80 percent as determined by test methods specified. Moisture content shall be maintained at the level necessary to achieve the specified density.
4. Place to lines and grades indicated.
5. Place filter blanket and riprap, as specified in SECTION 2A, on cover layer in ponds as indicated.

H. BORROW PIT CLOSURE:

1. Upon completion of borrow operations, backfill borrow pit with unsuitable material from excavations, designated stockpiles and waste areas.
2. Grade area to leave it free draining and with an orderly and neat appearance.
3. Seed area as specified in SECTION 2G.

* * * * *

2C - BENTONITE SOIL SEALANT

2C-1 GENERAL

A. DESCRIPTION:

1. This Section includes activities associated with the installation of a bentonite soil sealant to be used in the following construction (Alternative Bid No. 1):
   a. Liner for ash, sludge and pump back cells.
   b. Liner for coal yard and coal pile runoff retention pond.
   c. Liner for secure landfill.
   d. Liner for ash landfill.
2. Related Work Specified Elsewhere:
   a. Site Preparation and Earthwork: SECTION 2A.

B. QUALITY ASSURANCE:

1. Applicable Standards:
   a. American Association of State Highway and Transportation Officials Standard Method of Test (AASHTO).
      (1) T180 - Moisture-Density Relations of Soils Using a 10-pound (4.54 Kg) Rammer and an 8-inch (457 mm) Drop.
   b. American Society for Testing and Materials (ASTM):
      (1) D2049 - Relative Density of Cohesionless Soils.
      (2) D2922 - Test for Density of Soil and Soil-Aggregate in Place by Nuclear Method.
      (3) ASTM 1970, 5th Edition, Special Procedures for Testing Soil and Rock for Engineering Purposes (STP 479), "Burmister Method."
   c. U.S. Department of Interior, Bureau of Reclamation, Earth Manual, 2nd Edition, Designation E-12, Relative Density of Cohesionless Soils, Alternative Method.

C. SUBMITTALS:

1. Information to be submitted with bid:
   a. Modified bentonite manufacturer:
      (1) Name.
      (2) History of past projects.
   b. Manufacturer's standard catalog information.
   c. Qualifications of contractor who will perform bentonite installation which shall include completion of at least two projects of similar scope and magnitude. Names of Owners and locations of previous projects to be included with information.

   3 d. Guarantee:
      (1) Fully guarantee all materials and workmanship to meet specified liner permeability requirements for a period of not less than thirty (30) years under normal operation and weathering.

      (2) Guarantee to be submitted with bid in writing.
2. Compliance Submittals:
   a. Submit as specified in DIVISION 1.
   b. Includes, but not limited to, certified test results for all testing done during construction.

2C-2 EQUIPMENT AND MATERIALS

A. MATERIALS:

1. General Requirements:
   a. Material shall be a free-flowing, high-swelling Wyoming-type sodium bentonite soil sealant.
   b. All material shall be first-quality products selected specifically for the purposes of this work and which have been satisfactorily demonstrated by prior use to be suitable and durable for containing contaminated wastes from the areas specified to be lined.
2. Acceptable Products:
   a. Volclay PLS-50, manufactured by American Colloid Co., Stokie, Illinois.
   b. International Seal, manufactured by International Minerals and Chemical Corp., Detroit, Michigan.
   c. Or Approved Equal.
3. Cover material shall be as specified in SECTION 2A.
4. All materials shall be subject to approval of the Engineer.

B. EQUIPMENT:

1. Spreading equipment shall be an agricultural seed or lime spreader.
2. Mixing equipment shall be a rotary mill or drum mixer.
3. Compaction equipment shall be a vibratory compactor or, either a flat-steel wheel roller or a sled-type compactor which has been approved by the Engineer after a demonstration of its effectiveness. Sheepsfoot rollers will not be allowed.
4. Other suitable equipment may be used with approval of the Engineer.

2C-3. PERFORMANCE

A. SHIPMENT AND STORAGE:

1. Conform to the applicable requirements of DIVISION 1 for shipment.
2. Contractor shall be responsible for protecting bulk or bagged material stored on-site from action of the elements.

B. MANUFACTURER'S FIELD SERVICES:

1. Provide as specified in DIVISION 1.
2. Manufacturer's field services shall be required during installation of the modified bentonite.

C. TESTS:

1. Earthwork compaction tests as specified.
2. Percolation tests will be made by the Engineer on the lined areas as required.
3. Seepage rate of finished liners shall not exceed 1×10^{-7} cm/sec per foot of water depth at any point on ash, sludge, and pump back pond bottoms, inside slopes of dikes, and secure and ash landfills, and 5×10^{-8} cm/sec in the coal yard and coal pile runoff retention pond.
4. In the event the percolation rate exceeds the specified rate, the undesirable material shall be removed and be replaced with modified bentonite-treated material at no additional cost to the Owner.

D. INSTALLATION:

1. Material shall be installed by Contractor in strict accordance with Engineer-approved manufacturer's recommendations.
2. Material shall not be placed until authorized by the Engineer.
3. Material shall be applied in pure form with no foreign materials intermixed.
4. bentonite seal shall be installed as follows:
   a. The top 6 inches (minimum) of the areas designated to receive modified bentonite shall be Unified Soil Classification SM type soil compacted to 85 percent maximum density as determined by AASHTO T180 at optimum moisture content ±2 percent.
   b. Spread modified bentonite over the entire surfaces to receive modified bentonite treatment as follows:
      (1) In the amount of 215 lbs per 100 square feet in an east-west direction and 215 lbs per 100 square feet in a north-south direction in the ash, sludge, and pump back ponds.
      (2) In the amount of 200 lbs per 100 square feet in an east-west direction and 200 lbs per 100 square feet in a north-south direction in the ash and secure landfills.
      (3) In the amount of 210 lbs per 100 square feet in an east-west direction and 210 lbs per 100 square feet in a north-south direction in the coal yard and coal pile runoff retention pond.
   c. The modified bentonite shall be thoroughly mixed into the top 4 to 6 inches of soil by means of the equipment specified to satisfaction of Engineer.
   d. Compact the modified bentonite-treated mixture to 85 percent of maximum density as determined by AASHTO T180 at optimum moisture content ±2 percent.
   e. Minimum compacted layer thickness shall be 4 inches.
   f. Contractor shall work only on an area that can be completed in one working day.
5. Seal around structures, pipes, and appurtenances as follows:
   a. Structures to be installed as indicated and as specified.
   b. Material around interior pond, landfill, or coal yard structures to be installed as indicated.
   c. Soil to be thoroughly intermixed with bentonite in the amount of 1 part bentonite to 4 parts soil, by volume, prior to backfilling.
      (1) Soil and bentonite shall be blended dry.
      (2) Hand apply and hand compact dry mixture as specified herein.
   d. Backfill material shall be placed as specified in DIVISION 2.
6. Cover material:
   a. Install only after authorization of Engineer.
   b. Install so as not to damage bentonite-treated material.
   c. Place material in 12-inch maximum layers (uncompacted depth).
   d. Compact to a minimum density of 80 percent relative density, in the top six inches of the ramps, pond bottoms, coal yard, and landfills, and 70 percent relative density in all other areas as determined by test methods specified. Moisture content shall be maintained at the level necessary to achieve the specified density.
   e. Place to lines and grades indicated.
   f. Place filter blanket and riprap, as specified in SECTION 2A, on cover layer in ponds as indicated.

2C - BENTONITE SOIL SEALANT: continued

7. All bentonite soil-sealant liners to be hydrated with fresh water as required by bentonite manufacturer immediately after installation of cover material.

* * * * *

2D - BITUMINOUS LINER MATERIALS

2D-1 GENERAL

A. DESCRIPTION:

1. This Section includes hot-mix asphaltic concrete liner materials, mixed-in-place bitumious base materials, equipment, placement, and testing to be used for lining the ash, sludge, and pump back ponds (Alternative Bid No. 2).
2. Related Work Specified Elsewhere:
   a. Site Preparation and Earthwork: SECTION 2A.
   b. Bituminous Prime and Tack Coat: SECTION 18B.

B. QUALITY ASSURANCE:

1. Applicable Standards:
   a. American Society for Testing and Materials (ASTM):
      (1) C29 - Test for Unit Weight of Aggregate.
      (2) C117 - Test for Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing.
      (3) C127 - Test for Specific Gravity and Absorption of Coarse Aggregate.
      (4) C128 - Test for Specific Gravity and Absorption of Fine Aggregate.
      (5) C131 - Test for Abrasion of Coarse Aggregate by Use of the Los Angeles Machine.
      (6) C136 - Test for Sieve or Screen Analysis of Fine and Coarse Aggregate.
      (7) C183 - Sampling Hydraulic Cement.
      (8) D75 - Sampling Stone, Slag, Gravel, Sand, and Stone Block for Use as Highway Materials.
      (9) D140 - Sampling Bituminous Materials.
      (10) D242 - Mineral Filler for Sheet Asphalt and Bituminous Concrete Pavements.
      (11) D977 - Emulsified Asphalt.
      (12) D979 - Standard Methods of Sampling Bituminous Paving Mixtures.
      (13) D1559 - Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
   b. American Association of State Highway and Transportation Officials (AASHTO):
      (1) M29 - Sand for Bituminous Mixtures.
      (2) M6 - Vitified Clay Pipe, Extra Strength, Standard Strength and Perforated.
      (3) T101 - Standard Method of Determining Swell Characteristics of Aggregates when Mixed with Bituminous Materials.
      (4) T102 - Spot Test of Asphaltic Materials.
   c. Federal Specifications (FS):
      (1) SS-A-706(D) - Asphalt, Petroleum: Road and Pavement Construction. (Asphalt Cement)
   d. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction:
      (1) Section 320 - Hot-Bituminous Mixtures - Plant, Methods and Equipment.

C. SUBMITTALS:

1. Samples: Furnish samples as specifed. Samples shall be delivered to the laboratory designated by the Engineer. Sampling shall be under the observation of the Engineer when required.
   a. Furnish samples of aggregates and asphalt cement to be used in the Work at least 30 days prior to beginning production of the mixed-in-place bituminous base and the hot-mix asphaltic concrete liner mixtures. Sampling methods shall conform to the following:
      (1) Asphalt cement: ASTM D140.
      (2) Coarse and Fine Aggregates: ASTM D75.
      (3) Mineral Filler: ASTM C183, paragraphs 3, 4, and 6.
   b. Furnish at least one sample from each 300 tons of the hot-mixed asphaltic concrete liner being produced. Sampling method shall conform to ASTM D979.
   c. Completed Liner: Core or saw undamaged samples of the size and number required by the Engineer.
      (1) Take samples in sets of three at locations designated by Engineer.
      (2) Replace liner material at sample locations with fresh bituminous mixture and thoroughly compact repaired area.
   d. Furnish additional samples prior to and during construction of the number and size requested by the Engineer.
2. Job-Mix Formula: Hot-mixed Asphaltic Concrete Liner Material.
   a. Formula shall indicate the definite percentage of each sieve fraction, percentage of asphalt, and the temperature of the completed mixture as it is to be discharged from the mixer.
   b. Formula shall be furnished by Contractor 30 days prior to beginning production of paving mixtures, and approved by Engineer following testing of the aggregates and bitumen before any bituminous mixtures are manufactured.
   c. Formula shall permit adjustments of the bitumen content and aggregate gradation within the limits of the gradation table specified to improve the paving mixtures as required by Engineer.
   d. Restrict formula to values such that application of the following tolerances will not cause the limits in the gradation table to be exceeded.

Material	Hot-Mixed Asphaltic Concrete Liner
Aggregate passing No. 4 sieve or larger	±4 percent
Aggregate passing No. 10 and 40 sieves	±3 percent
Aggregate passing No. 200 sieve	1.0 percent
Asphalt	±0.3 percent

D. TESTING:

1. Engineer will test all materials and mixes to determine conformance with these specifications. Tests will be performed without cost to the Contractor.

E. JOB CONDITIONS:
1. Weather Limitations: Hot-mix asphaltic concrete and mixed-in-place bituminous base shall not be mixed or placed when the ambient temperature is below 40 degrees F.

2D-2 EQUIPMENT AND MATERIALS

A. EQUIPMENT:
1. Maintain all equipment, tools, and machines used in the performance of the Work required by this Section in a satisfactory working condition at all times.
2. Equipment shall be industry standard equipment designed to accomplish the work for which it is used.
3. Equipment shall conform to FDOT Section 320.
4. All equipment shall be subject to the approval of the Engineer.

B. MATERIALS:
1. Aggregates:
a. Hot-Mix Asphaltic Concrete Liner
(1) General Requirements: Aggregate shall be inert, noncarbonate crushed stone, crushed gravel, crushed vitrified clay pipe, screenings, sand, and mineral filler, as approved by Engineer prior to use in the work, and defined as follows:
(a) Coarse Aggregate - Retained on a No. 10 sieve.
(b) Fine Aggregate - Passing the No. 10 sieve and retained on a No. 200 sieve.
(c) Mineral Filler - Passing a No. 200 sieve.
(d) Aggregate shall not contain more than 0.75 percent soft fragments nor more than 0.5 percent clay, coal or lignite.
(2) Coarse Aggregate:
(a) Crushed stone shall consist of inert, noncarbonate, clean, sound, durable fragments free from an excess of soft, or disintegrated pieces, dust, dirt, or other objectionable matter.
(b) Crushed gravel shall be sound, durable, free from adherent coatings of clay, dirt, dust, and other objectionable matter. Crushed gravel shall contain at least 75 percent by weight of crushed pieces having two or more fractured surfaces.
(c) Crushed Vitrified Clay Pipe shall conform to AASHTO M65 and shall be resistant to sulfuric acid.
(d) Particle shape shall be generally spherical or conical and contain not more than 20 percent by weight of flat and elongated particles defined as follows:
1. Flat particle - Ratio of width to thickness greater than three.
2. Elongated particle - Ratio of length to width greater than three.
(e) Percentage of wear shall not exceed 40 after 500 revolutions as determined by ASTM C131.
(3) Fine Aggregate:
(a) Fine aggregate shall be angular and may be any approved combination of natural sand and manufactured sand prepared by crushing stone.

(b) Natural sand content shall be restricted as required to produce a mixture having the specified Marshall test properties.
(c) Fine aggregate shall conform to AASHTO Standard M29 except as follows:
1. Aggregate or combinations which do not conform to the gradation table in paragraph 3 of AASHTO M29 may be used, provided the finished mixture conforms to the gradation or gradations specified.
(4) Mineral Filler: Mineral filler shall conform to ASTM D242.
(5) Swell Test (for Bituminized Aggregate): Test shall conform to AASHTO Standard T101. Aggregate shall not swell more than 1.5 percent.
(6) Stripping Test (for Aggregates): Test shall show no detrimental amount of stripping when tested as follows:
(a) Mix sample of aggregate and bitumen to be used at the temperature specified, then spread in a loose, thin layer and allow to air season for 24 hours.
(b) Place portion of the sample, not over one-half the capacity of the jar, in a glass jar and completely cover with distilled water.
(c) Fit jar with tight screw cap and allow to stand for a period of 24 hours.
(d) Shake jar vigorously for a period of 15 minutes.
(e) Examine sample of the mixture for stripping.
(f) If stripping occurs, the aggregate will be rejected or an acceptable method of treatment specified to change the material from a hydrophilic to hydrophobic state as requested by Engineer.

b. Mixed-in-place bituminous base:
(1) General Requirements: Aggregate shall be sands in the ash pond area as approved by the Engineer.
(2) Sands shall be free from an excess of soft, or disintegrated pieces, dust, dirt, or other objectional matter.

2. Asphalt:
a. For hot-mixed asphaltic concrete liner asphalt cement shall conform to FS SS-A-706D AC-20 (penetration grade 60-70) and show a negative spot when subjected to the spot test specified in AASHTO T102, using the standard naptha specified in paragraph 3.
b. For mixed-in-place bituminous base emulsified asphalt shall conform to ASTM D977, Type SS-1.

C. MIXES:
1. Hot-mixed asphaltic concrete liner:
a. Composition of the Mix: Hot-mixed asphaltic concrete mixtures shall consist of aggregates and asphalt cement within the following limits:

A S P H A L T   M I X T U R E S

Sieve Designation (Square Opening)	*Percentage Passing (By Weight) Type A	Type B	Type C
3/4-inch	100	100	-----
1/2-inch	85-100	95-100	-----
3/8-inch	-----	-----	100

No. 4	55-80	60-80	90-97
No. 8	-----	45-60	70-85
No. 10	35-60	-----	-----
No. 30	-----	28-39	45-52
No. 40	18-30	-----	-----
No. 100	-----	16-25	20-28
No. 200	5-12	8-15	10-16
Asphalt Cement	6.5-9.0	6.5-8.5	7.5-9.5

*Based on uniform specific gravities.

b. Aggregate Gradations: Gradation of aggregate shall be determined conforming to ASTM C117 and C136.

c. Mixture Test Properties: Laboratory test specimens of the mix, combined in proportions of the job-mix formula, will be tested by the Engineer in accordance with ASTM D1559. Test properties shall be as follows for the liner mixture:

Marshall Stability .... 1200 minimum
Number of compaction blows 75
Marshall flow 8-16
Percent air voids - laboratory specimen.........3-5
Percent voids filled with asphalt........... 75-82

2. Mixed-in-place bituminous base shall consist of existing sands mixed with 14 percent ± 2 percent of emulsified asphalt (SS-1).

2D-3 PERFORMANCE

A. PREPARATION OF MIXTURE:

1. Hot-mix asphaltic concrete liner shall be produced in a mixing plant conforming to FDOT SECTION 320.
   a. Preparation of mixture shall be as specified in FDOT SECTION 330-6.
   b. Temperature of the mix as it is discharged from the mixer shall be 300 degrees F ±25 degrees F.
2. Mixed-in-place bituminous base shall be prepared by one of the following methods:
   a. Grader and Road-Mixer Method.
      (1) Windrow aggregate material that is to receive the bituminous material.
      (2) Flatten windrow of aggregate and apply bitminous material by means of a pressure distributor.
      (3) First application of bituminous material shall not exceed one-half of the total quantity required and there shall be at least three applications of the bituminous material.
      (4) Mixing operation shall be carried on in the central portion of the base.
      (5) Reshape windrow to a uniform cross-section as necessary before subsequent applications of bituminous material so that bituminous material will be applied to the mixed material at a uniform rate.
      (6) Before mixing with a grader, the treated aggregate shall be given a preliminary mixing with either a spring-tooth harrow, a disk, or a

rotary speed mixer immediately after each application of bituminous material.
(7) When using a road mixer, the treated aggregate shall be mixed after each application of bituminous material.
(8) Continue mixing until the mixture is free from lumps, homogeneous, and of uniform color.
(9) Mixing shall be performed in such a manner as to prevent segregation of the various aggregate sizes or loss of the fine aggregate, and to agitate the entire mixture without distrubing the base.
(10) More bituminous material or aggregate may be added after mixing at Engineer's direction if mixture does not contain the proper amount of bituminous material.
(11) After preparation, the bituminous mixture shall be windrowed on one side of the area to be lined.

b. Traveling - Plant Method
(1) Windrow aggregate material that is to receive the bituminous material.
(2) The application of the bituminous material shall be made so that the resulting mixture will be homogeneous and uniform in color.
(3) If one operation of the traveling plant does not produce a uniform bituminous mixture, the windrow shall be remixed with the traveling plant, grader, road mixer, or by other methods approved by the Engineer.
(4) More bituminous material or aggregate may be added after mixing at Engineer's direction if mixture does not contain the proper amount of bituminous material.

B. TRANSPORTATION OF HOT-MIXED ASPHALTIC CONCRETE LINER MATERIAL:
1. Haul trucks shall be as specified in PART 2D-2. Provide trucks of such size, operating speed, and condition to ensure orderly and continuous operation.
2. When necessary to prevent adhesion of mixture to truck beds, coat truck beds with a minimum quantity of paraffin oil, lime solution, or other approved material.
3. Haul trucks shall make no direct frame contact with the paver, and shall not bear down on the paver during dumping operations.
4. Deliveries shall be made so that spreading and rolling of all the mixture prepared for a day's run can be completed during daylight.
5. Deliver to the area to be paved in such a manner that the temperature at the time of dumping into the spreader will not be less than hereinafter specified.
6. Hauling over freshly laid material will not be permitted.
7. Loads wet excessively by rain will be rejected.

C. PLACING MIXTURE:
1. Subgrade: Prepare as specified in SECTION 18B.
2. Mixed-in-place bituminous base:
a. Spread windrow of mixture uniformly upon the base.
b. Spreading shall be done in such a manner that segregation will be kept to a minimum.
c. The finished surface will be smooth and of uniform texture.

d. Care shall be taken to smooth out junctions of successive operations.
e. Unless the mixture can be spread to the final cross section and compacted the same day as mixed, it shall be left in the windrow.

3. Hot-mixed Asphaltic Concrete Liner.
   a. Temperature of Mixture shall be within the range determined by Engineer and not be less than 235 degrees F when dumped into the mechanical spreader or it will be rejected.
   b. Automatic screed controls shall be actuated by the following grade references installed by Contractor:
      (1) An erected stringline on each side of the first strip placed in each course, independently actuating screed control mechanisms on each side of the paver.
      (2) A traveling stringline operated on the adjacent completed strip, and an erected stringline on the subgrade or previously completed pavement course, independently actuating screed control mechanism on each side of the paver for the second and all successive strips of each course.
      (3) Erected stringlines will be required on only one side of the first paving strip of each course for all pavements having a width of 24 feet or less providing automatic slope controls produce finish transverse slopes within the specified tolerances for smoothness and grade.
   c. Adjust spreader and regulate speed so the surface of the course is smooth and of such depth that when compacted it will conform to the cross section, grade, and contour as indicated.
   d. Paving Strips:
      (1) Begin on high side of a section of an area with a one-way slope.
      (2) Place in strips with a minimum width of 10 feet.
      (3) Roll, leaving a 6-inch unrolled strip adjacent to the area on which additional material is to be laid, except when the work is to be discontinued.
      (4) Place strips in succeeding order while the unrolled 6-inch section of the adjoining strip is hot and in a readily compactable condition, and roll.
      (5) Paving strips shall be of such length as determined by Engineer, before placing the succeeding strips.
      (6) Place material as nearly continuous as possible.
      (7) Paving strips shall be as approved by Engineer.
   d. Handwork:
      (1) Use a sufficient number of experienced shovelers and rakers following the spreading machine to produce a course that will conform to all requirements specified.
      (2) In areas where use of machine spreading is impractical, place mixture on dumpboards outside the area to be paved, distribute by hot shovels and spread with hot rakes in a uniformly loose layer of such thickness that when compacted it will conform to the required grade and thickness.
      (3) Rakers shall not be permitted to stand in hot mix without stilt sandals.
   e. Contact Surfaces:
      (1) Defined as previously constructed.

(2) Coat with a thin coat of hot bituminous material prior to placing the bituminous mixture.

D. COMPACTION OF MIXTURES:

1. Rollers:
   a. Use three-wheeled, pneumatic and steel-wheeled rollers as approved by the Engineer.
   b. Begin as soon after placing as mixture will bear the roller without undue displacement. Delays in rolling freshly-spread mixture will not be permitted.
2. Operation of Rollers:
   a. Only competent and experienced men shall operate rollers.
   b. Do not exceed speeds of 3 miles per hour for steel-wheeled rollers and 5 miles per hour for pneumatic rollers, and at all times speed shall be slow enough to avoid displacement of the mixture.
   c. Moisten wheels to prevent adhesion of the mixture to the wheels, but an excess of water will not be permitted.
   d. Provide a minimum of one steel-wheeled roller.
   e. Pass over the unprotected edge of the course only when the laying of the course is to be discontinued for such length of time as to permit the mixture to become cold.
3. Mixed-in-place bituminous base.
   a. Roll surface longitudinally.
   b. Rolling shall start at the edges and progress toward the center.
   c. Successive trips shall overlap by at least 1/2 the width at the roller.
   d. Roll entire surface twice in this manner, unless additional rolling is directed by the Engineer.
4. Hot-mixed Asphaltic Concrete Liner
   a. Rolling Order: Roll pavement in the following order:
      (1) Transverse joints (on pond bottoms only).
      (2) Longitudinal joints at adjacent completed paving strip.
      (3) Outside edge of first and last paving strips not adjacent to completed pavement.
      (4) Breakdown rolling beginning on the low side and progressing toward the high side.
      (5) Second rolling beginning at the low side and progressing toward the high side.
      (6) Finish rolling.
   b. Joint Rolling:
      (1) Roll joints directly behind the paving operation.
      (2) Make first pass with approximately a 6-inch width of roll on the joint and the remainder supported by the previously completed mat.
      (3) Shift position of roll on joint in 6- to 8-inch increments on successive passes and continue rolling until a thoroughly compacted neat joint is obtained.
   c. Breakdown Rolling:
      (1) Use either steel-wheeled or pneumatic rollers.
      (2) Operate with drive wheels or rolls nearest the paver.
      (3) Roll as close to the paver as possible without causing undue displacement of the mat.

d. Second Rolling:
   (1) Use pneumatic or vibratory rollers specified.
   (2) Accomplish while paving mix is still at a temperature that will result in maximum density and following breakdown rolling as closely as possible.
   (3) Continue rolling until the mix is thoroughly and uniformly compacted to the specified density but make not less than three complete coverages of the mat.

e. Finish Rolling:
   (1) Use two-axle or three-axle tandem rollers specified.
   (2) Roll while mat is of sufficient temperature to permit removal of roller marks.
   (3) Continue rolling until all roller marks have been removed and a uniform surface texture is obtained.

f. Hand Tampers:
   (1) Use in all places not accessible to the rollers.
   (2) Weight of tamper shall not be less than 25 pounds, with a tamping face of not more than 50 square inches.
   (3) Use while mixture is hot.

5. Repair:
   a. Repair any mixture that becomes mixed with foreign material or is in any way defective.
   b. Remove and replace with fresh mixture and compact to the density of the surrounding area.
   c. Do not skin-patch an area that has been rolled.

E. JOINTS:

1. General Requirements:
   a. Joints shall present the same texture, density, and smoothness as other sections of the course.
   b. Carefully make joints in such manner as to ensure a continuous bond between the contact surface of the course.
   c. Paint with a thin, uniform coat of hot bituminous material just before the fresh mixture is placed on all contact surfaces of previously constructed pavements.
   d. Transverse joints will not be allowed in pavement on slopes. Paving will be performed in such a manner that paving strips will be continuous from top to toe of slopes.

2. Transverse Joints (on pond bottoms only):
   a. Pass roller over the unprotected end of freshly laid mixture only when the laying of the course is to be discontinued or for hot-mixed asphaltic concrete liner when delivery of mixture is interrupted to the extent that the unrolled material may become cold.
   b. Cut back previously laid course to expose an even, vertical surface for the full thickness of the course.
   c. Rake fresh material against the joint, thoroughly tamping with hot tampers, and smoothing with hot smoothers, followed by rolling.

3. Longitudinal Joints:
   a. Cut back edge to expose an even vertical surface for the full thickness of the previously laid course prior to constructing the adjacent base or liner.

b. Rake fresh mixture against the joint, thoroughly tamping for hot-mixed asphaltic concrete tamp with hot tampers and smoothing with hot smoothers. After tamping roll joint thoroughly.
c. Joints shall not be irregular, honeycombed, or poorly compacted.

F. PROTECTION OF PAVEMENT:
1. Protect base and liner from all traffic of any kind until it has cooled and hardened, and in no case less than six hours.

G. SURFACE SMOOTHNESS:
1. Tests:
a. Make tests after completion of the final rolling.
b. Correct the irregularities that exceed the specified tolerances or that retain water on the surface, as requested by Engineer.
2. Tolerances:
a. Measure with a 10-foot straightedge, applied both parallel and at right angles to the centerline of the paved area.
b. Smoothness tolerances shall be:
(1) Liner - $\pm$1/4-inch.
(2) Base - $\pm$1/4-inch.

H. DENSITY:
1. Density of completed hot-mixed asphaltic concrete liner shall be equal to or greater than 97 percent of the density of a laboratory specimen made from the same day's mixture and compacted in accordance with ASTM D1559.

J. WAYBILLS AND DELIVERY TICKETS:
1. Submit waybills and delivery tickets to Engineer for each load of paving mixture placed in completed portions of the project.
a. Submit at the end of each day pavement is placed.
b. Submit as each load is dumped in the hopper of the paver when requested by Engineer.
2. Submit waybills and refinery analysis for each load of bituminous material on the day received.
a. Certificates shall indicate:
(1) Penetration.
(2) Specific gravity.
(3) Temperature.
(4) Net weight or gallonage of shipment.

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2E - SLURRY WALL CONSTRUCTION

2E-1 GENERAL

A. DESCRIPTION:

1. This Section includes activities associated with the installation of soil-bentonite (S-B) slurry cutoff walls for seepage control around the secure landfill cell. (Alternative Bid No. 3.)
2. Installation of the slurry walls shall be performed by, or under the supervision of, a qualified slurry trench contractor.
3. Inspection and testing of the slurry trench shall be performed by an independent consultant, retained by the Contractor, and acceptable to the Engineer:
   a. Acceptable consultant: Resource Management Products, 2940 Malmo Drive, Arlington Heights, Illinois 60005, Mr. Edward H. Grody.
4. Related Work Specified Elsewhere:
   a. Site Preparation and Earthwork: SECTION 2A.
   b. Yard Piping: DIVISION 17.

B. QUALITY ASSURANCE:

1. American Society for Testing and Materials (ASTM):
   a. C143 - Slump of Portland Cement Concrete.
2. American Petroleum Institute (API):
   a. 13A - Oil-Well Drilling - Fluid Materials.
   b. RP-13B - Standard Procedure for Testing Drilling Fluids.

C. SUBMITTALS:

1. Information to be submitted with bid:
   a. Name of slurry trench contractor.
   b. Qualifications of slurry trench contractor which shall include the following:
      (1) At least three years' experience in slurry trench construction.
      (2) Completion of at least two projects of similar scope and magnitude. Names of Owners and locations of previous projects to be included with information.

Δ4 2. Guarantee:
   a. To be submitted in writing with bid.
   b. Fully guarantee all materials and workmanship to meet the required maximum permeability of 1×10^{-7} cm/sec. for a period of not less than 10 years.
3. Compliance Submittals:
   a. Submit as specified in DIVISION 1.
   b. Includes, but not limited to, the following:
      (1) Certification that materials meet specifications.
      (2) Test Results: Independent lab or consultant.

2E-2 EQUIPMENT AND MATERIALS

A. EQUIPMENT:

1. All equipment shall be subject to the approval of the Engineer.

2E - SLURRY WALL CONSTRUCTION: continued

2. Trenching equipment shall have the capability of excavating trench to the required depths.
3. The width of the excavating bucket shall be at least the specified width of the cutoff wall.

B. MATERIALS:
   1. Bentonite used in preparing slurry shall be pulverized natural Wyoming sodium bentonite and shall meet API Standard 13A.
   2. Potable water shall be used to manufacture slurry. If water other than potable water is proposed for use, it shall be the responsibility of the Contractor that the resulting slurry meets the necessary standards to ensure a stable excavation.

2E-3 PERFORMANCE

A. MIXING SLURRY:
   1. Bentonite slurry shall be a stable colloidal suspension of pulverized Wyoming sodium bentonite in water.
   2. The bentonite will be initially mixed with water in a centrifugal digestor, colloidal mixer, venturi flash-mixer, or any method that achieves complete dispersion of the bentonite particles.
   3. After mixing, the slurry shall be allowed to hydrate before introduction into the trench, hydration being defined as the stabilizing of the viscosity and filtrate loss properties.
   4. Hydration may be accomplished by:
      a. Maintenance of high speed circulation until process is complete.
      b. Storage in a tank or pond with a low speed circulation system.
   5. Slurry shall be stored under essentially constant circulation until used.

B. TESTING:
   1. The following properties shall be measured according to procedures defined in API RP-13B:
      a. Viscosity.
      b. Filtrate loss.
      c. Specific gravity.
   2. The properties of the slurry in the trench shall be within the following optimum ranges:
      a. The viscosity shall not be less than 40 seconds Marsh at 68 degrees F.
      b. The filtrate loss shall not be more than 30 ml in 30 minutes.
      c. The specific gravity of the slurry shall not be less than 1.03 gm/cc nor greater than 1.30 gm/cc.
      d. The pH of the slurry shall not be less than 8.
      e. If the properties of the slurry in the trench do not meet the requirements, the addition of recently made slurry shall be required for correction.
      f. Addition of water will not be permitted.

C. EXCAVATION:

1. Excavation shall be carried to final depth at the point where excavation is started and entire depth of cut shall be carried along the trench line.
2. Slurry shall be introduced into the trench at the beginning of excavation.
3. The level of the slurry shall be maintained above the existing ground water level and not more than 3 feet below the top of the trench at all times during excavation.
4. Stability of the excavated trench shall be maintained at all times for its full depth.
5. The rate of trench excavation shall be such that the excavation is at least 75 feet from the toe of the backfill being placed in the trench.
6. Material suitable for backfilling the trench shall be stockpiled for reuse. Stockpiles shall be located so that slurry draining from the excavated material will not contaminate natural surface runoff.
7. The Contractor shall provide a suitable measuring device, with projecting markers at 1-foot intervals, and shall probe the entire bottom of the trench under the observation of the Consultant.
8. The slurry cutoff trench shall be keyed into the underlying existing clay layer to a minimum depth of 3 feet.
9. When the bottom of the slurry trench has been reached, the foundation surface shall be checked for boulders, gravel, or excessive sediment. Any such material encountered shall be removed by an air lift pump, clamshell, or similar equipment.
10. If the density of the slurry exceeds the specified limits, or becomes unworkable, the slurry shall be cleaned by recirculating, screening, or other approved method to decrease the sand content.

D. TRENCH BACKFILL:

1. Preparation:
   a. Material for trench backfilling shall be composed of a mixture of slurry and soils obtained from the excavation of the trench or from an approved borrow source.
   b. Backfill shall consist of well-graded silty or clayey sands with a minimum of 20 to 30 percent plastic fines.
   c. Minimum bentonite content shall be 1 percent.
   d. Soil shall be thoroughly mixed with the slurry to form a homogenous mass just prior to the backfilling operation. The mass shall be free from lumps of clay or silt and pockets of sand and gravel.
   e. Sluicing with water shall not be permitted.
   f. A sufficient amount of slurry shall be added to the backfill to produce a slump cone reading of 3 to 6 inches tested in accordance with ASTM C 143-66.
2. Placement:
   a. No backfill material shall be placed until trench has been inspected and approved by the Consultant.
   b. Initially, backfill shall be placed by lowering the material to the bottom of the trench in a clamshell bucket until the surface of the backfill rises above the slurry level in the trench and a slope at the

angle of repose has been formed from the bottom of the trench to the surface.

c. Free dropping of backfill material into the trench, or any other backfilling operation which will produce segregation of the material, shall not be permitted.

d. Backfill material shall be pushed into the trench in a manner that will cause the material to slide progressively down the slope of previously placed backfill.

e. Backfilling operations shall follow the excavation operations as closely as possible to minimize sloughing and at no time shall the bottom of the excavation be farther than 200 feet ahead of the toe of the backfill.

f. If necessary, the excavation shall be delayed sufficiently to permit backfilling operations to catch up.

g. All pipes penetrating walls shall be installed after placement of backfill:

(1) Use shoring to maintain trench through wall.

(2) Replace backfill and repair liner as required to ensure tie-in to walls.

h. Crossing structures shall be installed as indicated after installation of the slurry walls.

3. Permeability of the finished wall shall not exceed 1×10^{-7} cm/sec.

E. CLEANUP:

1. After completion of wall construction, all remaining materials shall be disposed of as follows:

a. Excess slurry shall be removed from the site.

b. Excess suitable material from trench excavation shall be stockpiled in areas indicated.

c. Unsuitable material shall be disposed of in waste areas designated by Engineer.

* * * * *

2F - STORM DRAINAGE SYSTEM

2F-1 GENERAL

A. DESCRIPTION:

1. This Section includes storm drainage pipe and appurtenances, and inlet and outlet structures.
2. Related Work Specified Elsewhere:
   a. Site Preparation and Earthwork: SECTION 2A.
   b. Concrete: DIVISION 3.

B. QUALITY ASSURANCE:

1. Applicable Standards:
   a. American Society for Testing and Materials (ASTM):
      (1) A48 - Gray Iron Castings.
      (2) C76 - Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
      (3) C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Flexible, Watertight, Rubber Gaskets.
   b. American Association of State Highway and Transportation Officials (AASHTO):
      (1) M36 - Zinc Coated (Galvanized) Corrugated Iron or Steel Culverts and Underdrains.
      (2) M190 - Bituminous Coated Corrugated Metal Culvert Pipe and Arches.
   c. American Water Works Association (AWWA):
      (1) M9 - Installation of Concrete Pipe.

C. COMPLIANCE SUBMITTALS:

1. Submit as specified in DIVISION 1.
2. Includes, but not limited to, the following:
   a. Certification from the manufacturer that culvert pipe material conforms to the specifications.
   b. Reinforcing steel schedules.

2F-2 MATERIALS

A. REINFORCED CONCRETE:

1. Conform to applicable requirements of DIVISION 3.
2. Concrete shall be 4,000-psi concrete.

B. IRON CASTINGS: Conform to ASTM A48, of the type and size indicated.

C. CORRUGATED METAL PIPE:

1. Pipe shall conform to AASHTO M36 or M190 steel and be either:
   a. Full-circle riveted type with lap joint construction.
   b. Spiral with continuous lock or welded joints.
2. Coating, where indicated, shall be AASHTO M190 Type A.
3. End sections shall be galvanized metal with toe plates.
4. All pipe shall be 2-2/3-inch by 1/2-inch corrugations unless otherwise noted.

5. Pipe shall be of size, length and gauge thickness as indicated.
6. Coupling bands shall conform to AASHTO M36 and as follows:
   a. "Two-piece" coupling bands for full-circle riveted and continuous lock seam pipe.
   b. Hugger-type bands with "O"-rings for continous welded pipe.

D. REINFORCED CONCRETE PIPE:
   1. Design of circular pipe to conform to ASTM C76 except as modified herein.
   2. Furnish in lengths of not less than 8 feet, except fittings, closure pieces and specials.
   3. Joints shall be rubber and concrete to conform to ASTM C443. Rubber gaskets shall be of O-ring cross section.
   4. Select an independent testing laboratory to perform testing and inspection of all material except reinforcing steel. Laboratory shall be acceptable to Owner.

2F-3 PERFORMANCE

A. EXCAVATION, TRENCHING AND BACKFILLING: Perform excavation, trenching and backfilling of trenches and excavation and backfilling for storm drainage structures as specified in SECTION 2A.

B. PIPE INSTALLATION: Pipe may be either corrugated metal or reinforced concrete, at Contractor's option, unless otherwise indicated. All pipe shall be carefully laid true to lines and grades indicated. Any pipe which is not in true alignment or which shows undue settlement after laying shall be taken up and relaid at the Contractor's expense.
   1. Corrugated Metal Pipe:
      a. Install to conform to manufacturer's recommendations.
      b. Lift or roll pipe to protect coating. Do not drag over gravel or rock. Avoid striking rocks or hard objects when lowering into trench.
         (1) Pipe on which coatings have been damaged may be rejected at the site of the work regardless of previous approvals.
      c. Join pipe sections with firmly bolted coupling bands of the same material as the pipe.
      d. Install pipe with longitudinal laps at the side or quarter points, and with inside circumferential laps pointing downstream.
      e. Install lower portion of two-piece connecting band before positioning succeeding pipe length. Make sure corrugations of band and pipe sections line up.
      f. Backfill pipe in layers six inches deep, deposited simultaneously on each side of pipe. Thoroughly tamp each layer. Do not compact by puddling or jetting with water.
      g. Attach end sections with bolted coupling bands.
      h. Install end sections where indicated.
   2. Reinforced Concrete Pipe:
      a. Install to conform to AWWA M9 and as follows:
      b. Perform jointing to conform to pipe manufacturer's recommendations.
      c. Clean joints thoroughly, and coat bell and spigot and gasket with recommended lubricant before jointing.

d. Check position of rubber gasket with feeler prior to shoving pipe home.
e. Fill exterior pipe with a 1:2 cement mortar of pouring consistency and cover with a waterproof paper or cloth diaper wired in position. Rod mortar with a stiff wire curved to the radius of the pipe.
f. Fill interior of joint with stiff mix of 1:1 cement mortar troweled into place to provide a continuous smooth surface across joint (pipe 24 inches in diameter and larger).
g. Completely cover all steel appurtenances with hot asphalt after installation and before backfilling.
h. Install end sections where indicated in accordance with manufacturer's recommendations.

C. CASTINGS: Install all castings as indicated.

* * * * *

2G - SEEDING

2G-1 GENERAL

A. DESCRIPTION:

1. This Section includes seedbed preparation, seeding, mulching, and fertilizing of areas specified and indicated, and all areas disturbed by construction.

B. QUALITY ASSURANCE:

1. Applicable Standards: Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction.

C. SUBMITTALS:

1. Certificates:
   a. Seed shall be accompanied by certificate from vendor that seed meets requirements of these specifications.
   b. Fertilizer shall be accompanied by certificate from vendor that fertilizer meets requirements of these specifications.

2G-2 MATERIALS

A. SEED:

1. Seed shall conform to all applicable laws of the State of Florida.
2. Seed shall be labeled according to the U.S. Department of Agriculture Federal Seed Act and shall be furnished in containers with tags showing seed mixture, purity, germination, weed content, name of seller, and date on which seed was tested.
   a. Seed shall meet the following minimum percentage requirements for purity and germination:

Seed Name	Purity	Germination
Bermuda MK37	98	85
Argentine Bahia	90	85
Perennial Rye Grass	98	90
Brown Top Millet	--	--

   b. Moldy seed or seed that has been damaged in storage shall not be used.
   c. 50 percent of Argentine Bahia seed shall be scarified.

B. FERTILIZER:

1. Fertilizer shall comply with FDOT Section 982 - Commercial Fertilizer.
   a. Chemical designation of 10-10-10 with FTE 503 trace materials.
   b. Uniform in composition.
   c. Free flowing and suitable for application with approved equipment.
2. Deliver to site in labeled bags or containers.

C. MULCH:
  1. Vegetative Mulch: Mulch shall be straw with stalks of wheat, rye, oats, or hay from fields of pangola, peanut, coastal bermuda, or bahia grass, and shall be partially decomposed.

D. DOLOMITE: Dolomitic limestone shall be suitable for agricultural use delivered to the site on the ground.

2G-3 PERFORMANCE

A. SEEDBED PREPARATION:
  1. Dispose of any growth, rocks, or other obstructions which might interfere with tilling, seeding, or later maintenance operations.
  2. Thoroughly loosen and pulverize topsoil to a depth of at least three inches.
  3. Maintain tilled areas until seeded and mulched, to provide a smooth area with no gullies or depressions.

B. DOLOMITING:
  1. Apply dolomite at the rate of 2 tons per acre to properly prepared seedbeds.
  2. Incorporate dolomite into the soil to a depth of at least 4 inches by discing, harrowing, or raking.

C. FERTILIZING:
  1. Apply fertilizer at the rate of 400 pounds per acre to properly prepared seedbeds and sodbeds.
  2. Incorporate fertilizer into the soil to a depth of at least 2 inches by discing, harrowing or raking.

D. SEEDING:
  1. Seed mixture and rate of application shall be as follows:

Seed Name	Quantity Per Acre
Bermuda MK37	10 lbs
Argentine Bahia	50 lbs
Perennial Rye	1/2 bushel
Brown Top Millet	20 lbs*

* Reduced to 5 pounds on slopes greater than 4:1.

  2. No seeding shall be done when the ground is unduly wet, or otherwise not in a tillable condition.
  3. Methods of Application:
    a. Dry Seeding: Accomplish sowing by use of approved equipment, having drills no more than 4 inches apart.
      (1) Drill seed to an average depth of 1/2-inch.
      (2) Overlap successive seed strips to provide uniform coverage. Repeat where skipped areas appear after a show of green.
    b. Hydraulic Seeding: Mix seed with water and constantly agitate. Do not add seed to water more than 4 hours before application.

(1) On slopes of 2 horizontal to 1 vertical or flatter, apply seed separately from fertilizer. Cover seed with soil to an average depth of 1/2-inch by raking or other approved methods.

E. MULCHING:

1. Apply a mulch covering to slopes steeper than 6 horizontal to 1 vertical only.
2. Apply vegetative mulch at the rate of 2-1/2 tons per acre by means of a mechanical spreader or other approved methods.
3. Cut in mulch to a depth of 3 to 4 inches.
4. Immediately following the application of the mulch, water the seeded area in one watering, in sufficient amount to penetrate the seedbed to a minimum depth of 2 inches. Perform so as not to cause erosion or damage to the seeded surface.

F. MAINTENANCE:

1. Erect and maintain signs or barricades to exclude traffic from seeded areas.
2. Seeded Areas: Perform maintenance until the acceptance of the completed contract.
   a. Water seeded areas as required by good practice, and as necessary to obtain a flourishing cover.
   b. Any portion of the seeded surface which becomes gullied or otherwise damaged, or the seeding becomes damaged or destroyed, shall be repaired at no additional cost to the Owner.

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DIVISION 3 - CONCRETE

3A - FORMS

3A-1 GENERAL

A. DESCRIPTION:
  1. This Section includes formwork for concrete.
  2. Related Work Specified Elsewhere:
    a. Concrete: SECTION 3C.
    b. Steel Reinforcement: SECTION 3B.

B. QUALITY ASSURANCE:
  1. Applicable Standards:
    a. American Concrete Institute (ACI):
      (1) ACI 318 - Building Code Requirements for Reinforced Concrete.
      (2) ACI 347 - Recommended Practice for Concrete Formwork.

3A-2 EQUIPMENT AND MATERIALS

A. MATERIALS FOR FACING:
  1. Where concrete will be exposed to view after construction:
    a. Smooth finish exterior grade plywood at least 5/8-inch thick.
    b. Steel.
  2. Where concrete will not be exposed to view after construction:
    a. Exterior grade plywood at least 5/8-inch thick.
    b. Steel.
    c. Wood fiberboard.
    d. Dressed lumber free of loose knots.
  3. Treat forms to prevent bonding to concrete with lacquer, form oil or other acceptable material. Material shall not stain or cause injury to exposed concrete surfaces or affect them in any manner to prevent bond of specified surface application.
  4. Clean forms of sawdust, dust, dirt, and other foreign materials.

B. FORM TIES:
  1. Break-back, coil, or screw-type, except where otherwise specified.
  2. Water seal coil type in walls below grade and walls of water-bearing structures.
  3. Coil-type shall leave conical depression in concrete.
  4. Space as required against pressure of fresh concrete.

C. CHAMFER STRIPS:
  1. 3/4-inch chamfer except where otherwise indicated.
  2. Place in all forms to provide chamfer where concrete will have exposed projecting corners.

3A-3 PERFORMANCE

A. FORM CONSTRUCTION:

1. Conform to ACI 318 and ACI 347.
2. Adequately brace, stiffen and support forms to prevent perceptible deflection or settlement, and to hold plumb or level and true to line.
3. Construct sufficiently tight to prevent mortar leakage.
4. Avoid offsets between adjacent forms and construct so that shores, braces and stiffening members are in line with those below.
5. Space studs and stringers as required to support facing against concrete pressure but not more than 12 inches for 5/8-inch plywood or 16 inches for 3/4-inch plywood.
6. Use wales, strongbacks, shores and bracing as required.
7. Form all necessary openings or chases for piping, ductwork and similar items where indicated or as required for the Work.
8. Construct forms to be removable in sections without marring concrete surface.
9. Surface of forms shall provide smooth, dense, plane surface to finished concrete where exposed to view.
10. Contractor shall be responsible for structural adequacy of formwork.

B. TIME IN PLACE FOR FORMS:

1. No shores, bracing, supports or other formwork shall be loosened or removed until the concrete members supported thereby have acquired sufficient strength to support safely their own weight and any other possible loads.
2. The minimum time between concrete placement and form removal shall be determined either by field-cured test specimens or in accordance with the time specified for the member involved.
3. If Contractor elects to determine the required time by means of test specimens, all costs in connection therewith shall be his responsibility.
4. Test specimens shall be made, field-cured and tested as specified in SECTION 3C. No forms or supports shall be loosened or removed until tests indicate strength of members as follows:

Structural Member	Percent of design compressive or flexural strength
Unshored slab and beam forms for forms which can be removed without disturbing shores	70
Slab or beam shoring	85
Wall, column and beam side forms	40

5. If field-cured test cylinders or beams are not used as the basis for determination of time in place for formwork, the following criteria shall apply:

Structural Member	Time in Place for Forms*
Slab or beam shoring	12 days
Slab forms or beam soffits	7 days
Wall, column and beam side forms	18 hours

*These periods are a cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the concrete surface is above 50 degrees F.

C. REMOVAL OF FORMS: Remove forms in a manner to avoid damage to the structure, with particular care for corners and edges.

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3B - STEEL REINFORCEMENT

3B-1 GENERAL

A. DESCRIPTION:
  1. This Section includes steel reinforcement bars, ties, bolsters, chairs supports and accessories.
  2. Related Work Specified Elsewhere:
     a. Concrete: SECTION 3C.
     b. Forms: SECTION 3A.

B. QUALITY ASSURANCE:
  1. Applicable Standards:
     a. American Society for Testing and Materials (ASTM):
        (1) A82 - Cold Drawn Wire.
        (2) A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
        (3) A615 - Deformed Billet Steel Bars for Concrete Reinforcement.
     b. American Concrete Institute (ACI):
        (1) ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures, as modified by interim reports.
        (2) ACI 318 - Building Code Requirements for Reinforced Concrete.
     c. American Welding Society (AWS):
        (1) AWS D12.1 - Recommended Practice for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction.
        (2) AWS B3.0 - Standard Qualification Procedures for Welders.

C. SUBMITTALS:
  1. Compliance Submittals:
     a. Submit as specified in DIVISION 1.
     b. Include, but not limited to, the following:
        (1) Complete bar schedule, bar details and erection drawings to conform to ACI 315.
        (2) Each type of bar marked with identification corresponding to identification tag on bar.
        (3) Erection drawings shall be clear, easily legible and to a minimum scale of:
            (a) 1/4-inch = 1 foot.
            (b) 1/8-inch = 1 foot if bars in each face are shown in separate views.
        (4) Size and location of all openings.

D. DELIVERY, STORAGE AND HANDLING:
  1. Store steel reinforcement blocked up off the ground and in orderly stacks.
  2. Store only bars with the same identifying label in the same stack.

E. TESTING:
  1. Perform at the mill for each heat.
  2. Submit certified test results to Engineer upon request.

3B-2 EQUIPMENT AND MATERIALS

A. REINFORCEMENT BARS, TIES AND STIRRUPS:

1. Materials:
   a. Conform to ASTM A615, Grade 60 except as otherwise specified.
   b. Column ties and stirrups of any size and all #3 bars shall conform to ASTM A615, Grade 40 unless otherwise indicated.
2. Fabrication of Bars:
   a. Fabricate with cold bends conforming to the recommended dimensions shown in ACI 318.
   b. Field fabrication will be allowed only if Contractor has equipment to properly fabricate steel.
   c. Attach metal tags with identifying mark.
   d. Contractor may at his option continue steel reinforcement through openings in walls and slabs, then field-cut the opening.

B. WELDED WIRE FABRIC:

1. Conform to ASTM A185 using bright basic wire conforming to ASTM A82.
2. Wire gauges #11 and smaller shall be galvanized.

C. BOLSTERS, CHAIRS AND ACCESSORIES:

1. Conform to ACI 315 and the Manual of Standard Practices of the Concrete Reinforcing Steel Institute.
2. Provide all spacers, bolsters, chairs, ties, and other devices necessary to properly space, place, support and fasten steel reinforcement in place during the concrete placement.
3. Metal accessories shall be galvanized or plastic coated where legs will be exposed in finished concrete surfaces.
4. Do not use rocks, broken bricks, wood blocks, or concrete fragments for support of steel reinforcement.
5. Bolsters, chairs and accessories used for Grade slab reinforcement shall not puncture the moisture barrier.

D. PRECAST CONCRETE BLOCK BAR SUPPORTS:

1. May be used only for bar supports in slabs on ground.
2. Blocks shall be made with a minimum of nine sacks of cement per cubic yard and have a compressive strength of 6,000 psi in seven days.
3. Each block shall have a minimum of 9 square inches of bearing area. Space as required by the particular condition of weight, bearing surface and rigidity of the steel reinforcement.

3B-3 PERFORMANCE

A. PLACEMENT OF STEEL REINFORCEMENT:

1. Place in accordance with Chapters 7 and 12 of ACI 318 and the Manual of Standard Practice of the Concrete Reinforcing Steel Institute.
2. Tie securely with 16-gauge or larger annealed iron wire.
3. Place to maintain concrete cover to conform to Chapter 7 of ACI 318 unless otherwise indicated.

4. Splice steel to conform to Chapter 12 of ACI 318.
   a. Lapped splices shall be not less than 30-bar diameters for A615, Grade 40 steel and 42-bar diameters for A615, Grade 60 steel unless otherwise indicated or as required in accordance with ACI 318.
   b. Splices shall be staggered and located at mid-span for top steel and at support for bottom steel of flexural members unless otherwise indicated or as marked on compliance submittal by Engineer.
   c. Use arc-weld splices:
      (1) For bar sizes No. 14 and No. 18.
      (2) For bars smaller than No. 14 where indicated.
      (3) In other locations at Contractor's option.
   d. Cadweld splices of Type C Series may be used as an alternative to arc-welded splices.
   e. Arc-welds shall be full penetration butt welds using low-hydrogen type electrodes of Class AWS A5.5 Class E90XX-D1, G or M for shielded metal-arc welding. Arch-welded splices may be tested by Owner. Contractor shall pay for testing and correcting of the defective welds.
5. Lap welded wire fabric not less than the length of one mesh plus 2 inches unless otherwise indicated.

* * * * *

3C - CONCRETE

3C-1 GENERAL

A. DESCRIPTION:

1. This Section includes concrete and related items.
2. Related Work Specified Elsewhere:
   a. Forms: SECTION 3A.
   b. Steel Reinforcement: SECTION 3B.

B. QUALITY ASSURANCE:

1. Applicable Standards:
   a. American Society for Testing and Materials (ASTM):
      (1) C31 - Making and Curing Concrete Compression and Flexure Test Specimens in the Field.
      (2) C33 - Concrete Aggregates.
      (3) C39 - Compressive Strength of Cylindrical Concrete Specimens.
      (4) C40 - Organic Impurities in Sands for Concrete.
      (5) C42 - Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
      (6) C78 - Test for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
      (7) C88 - Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
      (8) C94 - Ready-Mixed Concrete.
      (9) C143 - Slump of Portland Cement Concrete.
      (10) C150 - Portland Cement.
      (11) C172 - Sampling Fresh Concrete.
      (12) C192 - Making and Curing Concrete Test Specimens in the Laboratory.
      (13) C231 - Air Content of Freshly Mixed Concrete by the Pressure Method.
      (14) C233 - Testing Air-Entraining Admixtures for Concrete.
      (15) C260 - Air-Entraining Admixtures for Concrete.
      (16) C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
      (17) C494 - Chemical Admixtures for Concrete.
      (18) C595 - Blended Hydraulic Cements.
      (19) C618 - Standard Specification for Fly Ash and Raw Calcined Natural Pozzolans for Use in Portland Cement Concrete.
      (20) D1752 - Preformed Expansion Joint Fillers for Concrete.
   b. American Concrete Institute (ACI):
      (1) ACI 211.1 - Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete.
      (2) ACI 211.2 - Recommended Practice for Selecting Proportions for Structural Lightweight Concrete.
      (3) ACI 214 - Recommended Practice for Evaluation of Compression Test Results of Field Concrete.
      (4) ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
      (5) ACI 305 - Committee Report on Hot-Weather Concreting.
      (6) ACI 306 - Committee Report on Cold-Weather Concreting.
      (7) ACI 309 - Recommended Practice for Consolidation of Concrete.

(8) ACI 313 - Bin Wall Design and Construction.
(9) ACI 318 - Building Code Requirements for Reinforced Concrete.
(10) ACI 506 - Recommended Practice for Shotcreting.

c. Associated General Contractors (AGC) of America, Mixer Manufacturers Bureau Concrete Mixer Standards.
d. National Bureau of Standards (NBS) Specifications for Scales.
e. National Ready-Mix Concrete Association, "Truck Mixer, and Agitator Standards of the Truck Mixer Manufacturers' Bureau."

2. Acceptable Manufacturers: Specified in PART 3C-2.

C. SUBMITTALS:

1. Compliance Submittals:
   a. Submit as specified in DIVISION 1.
   b. Include, but not limited to, the following:
      (1) Grouts.
      (2) Expansion joint materials.
      (3) Sealants.
      (4) Waterstops.
2. Test Reports: Submit as specified in DIVISION 1 and PART 3C-2.

3C-2 MATERIALS

A. CONCRETE:

1. Materials:
   a. Portland Cement Type II or Type IP (MS) for all structures unless indicated otherwise. Type II shall conform to ASTM C150. Type IP (MS) shall not contain more than 25 percent pozzolan. Fly ash shall not be used at batching plant.
   b. Fine Aggregate:
      (1) Conform to ASTM C33.
      (2) Approved service record of at least 3 years.
      (3) Limits of fineness modulus shall be 2.3 to 3.1.
      (4) Maintain fine aggregate free of ice and frozen lumps.
   c. Coarse Aggregate:
      (1) Conform to ASTM C33.
      (2) Blast furnace slag will not be permitted.
      (3) Maintain coarse aggregate free of ice and frozen lumps.
      (4) Grading Requirements: From 1-inch to No. 4 for all concrete unless otherwise specified.
   d. Mixing Water:
      (1) Only potable water will be acceptable without testing. Expense of testing water shall be paid by contractor.
      (2) Non-potable water may be used if it produces concrete with at least 95 percent of the strength of similar specimens made with potable water, subject to approval of qualitative analysis.
   e. Admixtures:
      (1) Water Reducing Type:
         (a) Conform to ASTM C494, Type A.
         (b) Conform to manufacturer's recommendations for use.
         (c) Technical assistance of the manufacturer's field representative shall be furnished upon request.

(2) Air-Entraining Type:
(a) Conform to ASTM C260.
(b) Conform to manufacturer's recommendations for use.
(c) Technical assistance of the manufacturer's field representative shall be furnished upon request.
(d) Testing of air-entraining admixtures shall conform to ASTM C233.
(3) Other Admixtures: Used only with Engineer's written concurrence.
(a) Water Reducing, Retarding Type: Conform to ASTM C494, Type D and shall not contain any chloride ions added during manufacture.

2. Laboratory Testing of Materials for Use in Concrete:
a. An approved independent testing laboratory shall be selected and paid by Contractor to perform all required laboratory tests of materials proposed for use in the production of concrete and to determine mix proportions when laboratory trial batches are required.
b. The laboratory shall report the results of the testing and mix designs as follows:
(1) Engineer, Kansas City Office (1 copy).
(2) Resident Project Representative, Field Office (1 copy).
(3) Contractor (1 copy).
(4) Concrete supplier (1 copy).
(5) Owner (2 copies).
c. Contractor shall deliver representative samples of all proposed concrete materials to the laboratory for the following testing:
(1) Fine Aggregate:
(a) ASTM C33 as amended by PART 3C-2 "Concrete-Materials."
(b) ASTM C40.
(c) ASTM C88.
(2) Coarse Aggregate:
(a) ASTM C33 as amended by PART 3C-2 "Concrete-Materials."
(b) ASTM C88.
(3) Mixing water, if other than potable water is proposed for use and in the opinion of Engineer there is reason to suspect its acceptability:
(a) With the design mix the laboratory shall make two concrete test cylinders using proposed water and two concrete test cylinders using potable water conforming to ASTM C192.
(b) All cylinders shall be tested conforming to ASTM C39. Age of cylinders at test shall be 28 days unless an earlier age is authorized.
(4) Air-entraining admixture shall be tested conforming to ASTM C233.

3. Concrete Qualities Required:
a. Compressive Strength:
(1) Minimum 28-day strength = 4000 psi for all construction unless otherwise indicated.
(2) Minimum 28-day strength = 3000 psi for fill concrete and seal coats.
b. Slump of concrete shall be 3 inches plus or minus 1 inch.
c. Air Content: 4 to 6 percent.

4. Mix Proportions:
a. Concrete shall be homogeneous, readily placeable and uniformly workable; proportioned to conform to ACI 211.1.

b. Mix proportions for all concrete unless otherwise specified shall be selected preferably on the basis of field experience; but in the case where sufficient or suitable strength test data is not available, concrete shall be proportioned on the basis of laboratory trial mix design.
   (1) Field experience using test results within the preceding 90 days with the materials and plant to be employed may be the basis of mix proportioning provided that not less than 30 consecutive satisfactory compressive strength tests on concrete using the proposed materials with a similar mix are available. A compressive strength test is defined as the average 28-day compressive strength of two companion cylinders made conforming to ASTM C172 and ASTM C31 and tested conforming to ASTM C39. The standard deviation of such tests shall be computed as a basis for design of the mix. The design average strength shall exceed the specified strength in accordance with the following formulae:
      (a) When standard deviation is less than 500 psi, Design Average Strength = Specified Minimum Strength + 1.343 x Standard Deviation.
      (b) When standard deviation is greater than 500 psi, Design Average Strength = Specified Minimum Strength -500 + 2.326 x Standard Deviation.
      (c) Submit previous test data, calculated standard deviation, and the proposed mix proportions to Engineer for approval prior to placing concrete.
   (2) When laboratory trial batches are used as a basis for determining mix proportions, all such work shall be performed by the laboratory as specified in this PART "Laboratory Testing of Materials for Use in Concrete."
      (a) Laboratory trial batches shall be used to establish a water-cement ratio compression strength curve with at least three points, each representing the strength of a separate trial batch. At least one point shall be above and one below the strength required. Each point on the curve shall represent the average of at least three specimens tested at 28 days or an earlier age when approved by Engineer. The slump and air content shall be at the maximum limits specified in this PART "Concrete Qualities Required."
      (b) A point on the water-cement ratio compressive strength curve shall be selected that will provide an average strength at least 1200 psi greater than the specified minimum strength.
      (c) Laboratory reports establishing mix proportions shall be sent to Engineer, and his approval obtained prior to placing all concrete.

5. Measurement of Materials:
   a. General Requirements:
      (1) Conform to ACI 304.
      (2) Measure materials within one percent by weight for aggregates and cement, and within 1-1/2 percent by volume or weight for water.
   b. Apparatus:
      (1) Beam or springless dial-type scale conforming with NBS - "Specifications for Scales."

(2) Volumetric measurement of water shall be performed with an approved automatic valve.

6. Mixing and Delivery:
   a. Conform to ACI 304.
   b. Cement temperature when added to mix shall not exceed 170 degrees F.
   c. Batch Plant Mixer:
      (1) Conform to Mixer Manufacturers Bureau Concrete Mixer Standards, AGC, adequate to handle one or more full-sack batches.
      (2) Charge with 5 percent to 10 percent of the mixing water both in advance and after the addition of aggregates and cement.
      (3) Charge with remaining water uniformly with the other materials.
      (4) Avoid charging in excess of manufacturer's rating.
      (5) Discharge mixed concrete completely prior to recharging.
      (6) Mixing Time:
         (a) Start immediately when all ingredients except the last of the water are in the mixer.
         (b) Minimum mixing time shall conform with mixer manufacturer's instructions, but not be less than the following:

Capacity of Mixer Cubic Yards	Minimum Time of Mixing, Minutes
1 or less	1 minute
2	1 minute, 15 seconds
3	1 minute, 30 seconds
4	1 minute, 45 seconds
5	2 minutes
6	2 minutes, 15 seconds

Add 15-second mixing time for each additional cubic yard of concrete.

   d. Mixing of Concrete at Plant Off Jobsite:
      (1) Mix concrete in central mixer or truck mixer. Transport in truck mixer turning at agitation speeds only.
      (2) Water added to concrete having a slump below the specified minimum shall be at Contractor's risk. If the water added produces a slump greater than the specified maximum, the concrete will be rejected. If water is added the concrete shall be remixed for a minimum of 25 revolutions.
      (3) Truck mixer shall conform to "Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers Bureau," of the National Ready-Mix Concrete Association.
      (4) Ready-mixed concrete shall be produced and delivered conforming to ASTM C94 as applicable.
      (5) Contractor shall furnish Owner with a concrete delivery ticket for each load of concrete. The ticket shall have the following information recorded:
         (a) Ticket number.
         (b) Time batched.
         (c) Time arrived on jobsite.
         (d) Amount of concrete (by volume).

(e) Mix number.
(f) Amount of all water added at jobsite by Contractor.

B. GROUT:
1. Plain Grout:
a. 1 part portland cement to 2 parts sand by volume.
b. Keep water to a minimum as required for placing by the dry packing method.
c. Place after the mixed grout has been allowed to stand for two hours.
d. The sand and cement shall be as specified for concrete.
2. Nonshrinking Grout:
a. Required for setting handrail posts, for setting equipment recommended by the manufacturer to be set with nonshrinking grout, and in other places indicated.
b. Grout shall be non-metallic, as manufactured by one of the following:
(1) Crystex, L and M Construction Chemicals, Inc.
(2) Five Star grout, U. S. Grout Corporation.
(3) Masterflow 713 grout, Master Builder's Company.
(4) Sauereisen F-100, Sauereisen Cements Company.
(5) Supreme Grout, Gifford-Hill & Company.
c. Prepare and place conforming to manufacturer's printed instructions.
3. Grout for Bonding:
a. 1 part cement to 1-1/2 parts sand by weight.
b. Keep water to a minimum.

C. BONDING AGENT:
1. Provide moisture insensitive, epoxy-resin bonding agent as manufactured by one of the following:
a. Epoxtite; W. R. Grace.
b. Euco Epoxy; Euclid Chemical Company.
c. Sikastix 370; Sika Chemical Company.
2. Use where indicated or specified.
3. Use in conformance with manufacturer's printed instructions.

D. CONCRETE ACCESSORIES:
1. Water Stops:
a. Serrated polyvinyl chloride equal to one of the following.
(1) Servicized/Durajoint Type 13, W. R. Grace Company.
(2) 6-inch heavy-duty Flextrip, Water Seals, Inc.
(3) Vulco VP 8044, Heavy Vulcan Metal Products Company.
2. Elastomeric Water Stop Joint:
a. Water Stop Sealant: Two component polysulfide system as manufactured by one of the following:
(1) Hornflex L, Davis-Culler.
(2) Sikaflex Polysulfide Sealant, Sika Chemical Corporation.
(3) Synthacalk GC-2, Pecora, Inc.
b. Primer: Product compatible with sealant and manufactured by sealant manufacturer.
c. Backup Rod:
(1) Material shall be butyl rubber, neoprene or polyethylene foam.

(2) 100 percent closed cell, nonabsorptive.
(3) Flexible, round rod of indicated diameter.

3. Expansion Joints:
   a. Expansion Joint Filler: Premolded cork of thickness indicated and conforming to ASTM D1752, Type II, cork.
   b. Bond Breaker: Polyethelene strip.
   c. Joint Sealant: Two component polysulfide system as manufactured by one of the following:
      (1) Hornflex L, Davis-Culler.
      (2) Sikaflex Polysulfide Sealant, Sika Chemical Corporation.
      (3) Synthacalk GC-2, Pecora, Inc.
4. Dovetail Anchor Slots: 24-gauge zinc alloy, 1-inch wide back x 1-inch deep x 5/8-inch throat as manufactured by one of the following:
   a. Gateway Products.
   b. Heckmann Building Products, Inc.
   c. Hohmann & Barnard, Inc.

E. CURING AGENT:
   1. Liquid membrane forming compound conforming to ASTM C309, Type 1. ASTM C309 Type 2 shall be used as specified in PART 3C-3 "Hot Weather Concreting."

F. MOISTURE BARRIER:
   1. Extent of Work: Install moisture barrier between the base and concrete slab on grade as indicated.
   2. Materials:
      a. One of the following:
         (1) Laminated with polyethylene film or both surfaces of reinforced-fibered Kraft. Manufactured by Sisalkraft Division, St. Regis Paper Company - "Moistop."
         (2) Polyethylene film, 6-mil thickness, black, as manufactured by:
            (a) Gering Plastics Co., Dept. of Monsanto - "Ger-Pak."
            (b) Ethyl Corp. - Visqueen Division, Baton Rouge, La.
            (c) Cadillac Plastic and Chemical Co. - "Construction Film."
      b. Adhesive or tape recommended by moisture barrier manufacturer.

3C-3 PERFORMANCE

A. PREPARATION FOR CONCRETE PLACEMENT:
   1. Openings Through Concrete: Provide openings through concrete as indicated and for the proper installation of all equipment, piping, wiring, ductwork and similar items, installed under this contract.
   2. Installation of Embedded Items:
      a. Provide for accurate installation of embedded items installed under this Contract.
      b. Securely fix floor drains in place to prevent flotation while placing concrete. Uniformly and accurately slope finish floor slab toward the drains.
      c. Embedded items shall be as indicated or specified, or as selected by Contractor and approved by Engineer.

d. Protect pipe sleeves from moisture during cold weather.
e. Grease anchor bolt threads to protect from concrete splatter.

3. Installation of Joints:
   a. Construction Joints:
      (1) Location:
         (a) Locate joints, which are not indicated or specified, in conformance with ACI 318.
         (b) Obtain Engineer's approval of joints located by Contractor prior to preparation of reinforcing steel drawings.
      (2) Preparation and Installation:
         (a) Clean and break laitance or other foreign material from bonding surface.
         (b) Tighten forms remaining in place (where applicable) to prevent seepage between forms and hardened concrete.
         (c) Provide water stops keys as indicated or specified and as required in any new construction joint requested by Contractor. Provide shear keys at all construction joints.
      (3) Waterstops:
         (a) Install in all construction joints where indicated.
         (b) Install conforming to manufacturer's printed instructions.
         (c) All joints and splices of pvc waterstop shall be 100 percent fused.
   b. Expansion Joints:
      (1) Location: As indicated.
      (2) Install expansion joint filler of premolded cork of the thickness as indicated.
      (3) Completely cover the top surface of the joint filler with a polyethelene strip bond breaker prior to sealing joint.
      (4) Seal top of expansion joint with joint sealant applied conforming to manufacturer's instructions. Depth of sealant shall be 1/2 the joint width unless otherwise indicated. During cold weather protect joint from moisture prior to installation of joint sealant.
4. Cutting and Bonding to Existing Concrete: (if required)
   a. Cutting Existing Concrete:
      (1) Use methods and equipment that will avoid damage to adjacent parts of the structure from heavy blows or vibration.
      (2) Cut existing concrete with power concrete saw where possible to prevent spalling and chipping and to form neat straight edge.
      (3) Remove all loose or cracked pieces resulting from cutting existing concrete, leaving only sound, undamaged concrete adjacent to new work.
      (4) Leave access opening edges with a neat, true grout surface to the opening size indicated.
      (5) Cut reinforcing steel with sufficient length remaining for bending and lapping into new construction as required per SECTION 3B.

b. Bonding to Existing Concrete:
(1) Roughen concrete by use of a pneumatic chipping hammer or other approved means.
(2) Thoroughly clean the concrete surface and apply the bonding agent. Place the fresh concrete after the bonding agent becomes tacky.

5. Installation of Moisture Barrier:
a. Install moisture barrier on the base, lapping joints a minimum of 6 inches.
b. Exercise care to avoid puncturing or tearing the material during installation and patch tears as they occur.
c. Seal lapped joints and patches with a pressure-sensitive adhesive or tape not less than 2 inches wide.

B. PLACING OF CONCRETE:

1. Conventional Placing:
a. General Requirements:
(1) Conform to ACI 304.
(2) Bonding surfaces shall be clean, free of laitance and foreign materials.
(3) Face horizontal bonding surfaces with 1-inch-thick coat of fresh "grout for bonding." Wet all other surfaces.
(4) Place concrete on properly prepared and unfrozen subgrade and only in dewatered excavation and forms.
(5) Use forms for all concrete except where otherwise indicated or specified.
(6) Do not place concrete that has partially hardened or has been contaminated by foreign materials.
(7) Prevent mud or foreign materials from entering the concrete or forms during placement operations.

b. Conveying:
(1) Convey concrete from the mixer and deposit in place by methods which will prevent the segregation or loss of materials.
(2) Equipment for chuting, pumping, and pneumatically conveying concrete shall be of such size and design as to provide a practically continuous flow of concrete at the delivery end.
(3) Aluminum conveying equipment shall not be used.

c. Depositing:
(1) Place concrete in continuous horizontal lifts not to exceed 2 feet, and place concrete against bulkheads and keyways at vertical joints.
(2) Maximum free drop of concrete shall be 5 feet in walls 10 inches or less in thickness with 1-foot additional drop allowed for each inch of wall thickness over 10 inches, with a maximum drop of 10'-0".
(3) When moisture barrier is used, keep lapped joints closed and take precautions to avoid puncturing the barrier.

d. Consolidation of Concrete:
(1) Consolidate concrete in conformance with ACI 309. Characteristics and application of concrete vibrators shall be as set forth in Table I of the Report.
(2) Provide an adequate number of vibrators of sufficient capacity to keep up with the maximum rate of concrete placement. Keep on hand adequate standby equipment in good operating condition.

(3) Vibrate concrete only until the concrete is thoroughly consolidated and the voids filled as evidenced by the leveled appearance of the concrete at the exposed surface and the embedment of the surface aggregate.
(4) Insert internal vibrators vertically to the full depth of the layer being placed and into the previous layer. Do not drag vibrators through the concrete. Insert and withdraw vibrator slowly with the vibrator running continuously so that no hole will be left in the concrete. Do not flow concrete from one location to another by use of a vibrator.
(5) Consolidate concrete layer to full depth when using a surface vibrator. Use thinner layers or more powerful vibrator if necessary to achieve complete consolidation.
(6) Use form vibrators only where sections are too thin or where sections are inaccessible for internal vibrators.

e. Time Requirements:
(1) Place concrete at a sufficient rate to assure that lifts below have not taken initial set before fresh concrete is deposited.
(2) Place concrete within 45 minutes after mixing. This period may be extended to 1 hour and 30 minutes provided that the combined air temperature, relative humidity and wind velocity are such that the plasticity of the fresh concrete is satisfactory for placement and consolidation and that the specified mixing water is not exceeded. Concrete which has partially set shall not be retempered but shall be discarded.

f. Placing Concrete at Joints:
(1) Bed horizontal joints with 1 inch of grout for bonding.
(2) Take precautions to ensure tight, well-bonded construction joints with no air pockets or voids.
(3) Take special precautions to avoid bending or displacing waterstop while placing concrete around it.
(4) Delay construction at a joint a minimum of 16 hours where placement is continued past joint except where otherwise indicated.

C. FINISHING:

1. Unformed Surfaces:

a. Screed Finish:
(1) Use as first stage for all concrete finishes.
(2) Use as final finish on surfaces that will be covered by additional concrete, grout placement, mortar setting bed except as otherwise specified, or earth backfill.
(3) Immediately after screeding, use a wood float, darby or bullfloat to eliminate high and low spots and to embed large aggregate. This shall be done in a manner to produce even, uniform surfaces so that surface irregularities do not exceed 3/8-inch in 10 feet when used as final finish.

b. Floated Finish:
(1) Use as second stage of broomed, and troweled finish.
(2) Use as final finish on all areas unless indicated or specified otherwise.

(3) Float with mechanical float. Hand floating will be permitted only in areas inaccessible to mechanical float.
(4) On surfaces not to receive troweled finish, finish with wood or cork float after mechanical floating to a true uniform surface so that surface irregularities do not exceed 1/8-inch in 10 feet, except at floor drains.

c. Broomed Finish:
(1) Use as final finish on all slabs as indicated.
(2) After floated finish draw a stiff bristle broom across the surface making uniform corrugations, perpendicular to the direction of traffic, not more than 1/16-inch deep.

d. Troweled Finish:
(1) Use as final finish on floors and on other unformed surface as indicated or specified.
(2) Trowel with steel trowel, mechanical or hand, to obtain a smooth, dense finish. The final troweling shall be done after the concrete has become hard enough so that no mortar adheres to the edge of trowel and a ringing sound is produced as the trowel passes over the surface.
(3) Do not trowel before surface water has evaporated or been removed with a squeegee.
(4) Finish to a true uniform surface so that surface irregularities do not exceed 1/8-inch in 10 feet, except at floor drains.
(5) Do not add sand or cement to the floor surface.

e. Contraction Joints:
(1) Locate as indicated.
(2) Maintain true alignment with straightedge.
(3) Joints shall be grooved except where sawed joints or preformed joints are indicated.
(4) Grooved Joints:
(a) Perform during the finishing process.
(b) Width of groove shall not exceed 1/4-inch.
(c) Depth of groove shall be at least 1 inch.
(5) Sawed Joints:
(a) Cut joints with power blade as soon as concrete surface is firm enough to resist tearing or damage by the blade and before random shrinkage cracks can occur. (Usually required 4 to 12 hours after finishing.)
(b) Make joints approximately 1/8-inch wide with depth as indicated.
(c) Seal with the same type sealant specified for water stop sealant.
(6) Install preformed joints as recommended by manufacturer.

2. Formed Surfaces:
a. Repair surface defects as specified in this PART "Repair of Defective Surfaces," except for surfaces against which fill material or concrete is to be placed.

3. Repair of Defective Surfaces:
a. Defined as any concrete surface showing misalignment, rock pockets, poor joints, holes from ties, voids, honeycomb, or any other defective area.
b. Repairing:

(1) Repair as soon as forms have been removed.
(2) Chip surface back to minimum depth of 1/2-inch, chip edges perpendicular to surface, prewet depression and brush with neat cement immediately before patching.
(3) Patch surfaces using stiff mortar with same sand-cement ratio as original concrete and with minimum water for placing. Blend with white cement to match concrete color.
(4) Compact mortar into depressions so that after curing, hole is filled and mortar is flush with surface. Use hammer and ramming rod for compacting the holes.
(5) Moist-cure for three days or use curing compound.
(6) Engineer shall be notified of areas containing major defects or where reinforcing steel is exposed prior to determination of repair method.

D. CURING: Cure all concrete by one of the following methods:
1. Leaving in forms for a minimum of seven days. Keep formwork wet to prevent drying of concrete surfaces.
2. Use of saturated bats, soaker hoses, or sprinkler for a minimum of seven days. Keep concrete continuously wet.
3. Using one coat of a liquid membrane forming compound conforming to ASTM C309, Type 1. Apply immediately after removal of forms (which have been continuously wet); or in case of a slab, after the concrete has been finished and is hardened sufficiently to walk on.
4. Using polyethylene sheets applied in full contact with surfaces.
5. Curing of concrete during hot or cold weather shall conform to this PART "Hot Weather Concreting" and "Cold Weather Concreting."

E. HOT WEATHER CONCRETING:
1. When the temperature is 90 degrees F or above, or is likely to rise above 90 degrees F within the 24-hour period after concrete placement; or when there is any combination of high air temperature, low relative humidity and wind velocity which would impair concrete strength or quality, follow the recommendations of ACI 305.
2. Concrete shall have a maximum temperature of 85 degrees F during placement.
3. Dampen subgrade and forms with cool water immediately prior to placement of concrete.
4. Protect freshly placed concrete immediately after placement so that the rate of evaporation as determined by ACI 305 (Figure 2.15) does not exceed 0.2-pound per square foot per hour.
5. Protect concrete with suitable insulation if rapidly decreasing nighttime temperatures occur, which would cause thermal shock to concrete placed during warm daytime temperatures.
6. Protect the concrete with temporary wet covering during any appreciable delay between placement and finishing.
7. Begin curing unformed surfaces immediately after finishing and continue for 24 hours. Curing shall consist of application and maintenance of water saturated material to all exposed surfaces; horizontal, vertical and otherwise. After the 24-hour interval, continue curing, using one of the following methods:

a. Moist curing for six days.
b. Application of one coat of curing compound conforming to ASTM C309, Type 2.
c. Application and maintenance of curing paper or heat-reflecting plastic sheets for six more days.

8. Begin curing formed concrete immediately after placing. Curing shall consist of keeping forms continuously wet for 24 hours. Thereafter, continue curing using one of the following methods:
   a. Loosen forms and position soaker hose so that water runs down along concrete surfaces. Continue for six days.
   b. Strip forms and apply curing compound conforming to ASTM C309, Type 2. Do not allow concrete surfaces to dry prior to application of curing compound.

F. COLD WEATHER CONCRETING:

1. When the temperature is 40 degrees F or is likely to fall below 40 degrees F during the 24-hour period after concrete placement, follow the recommendations of ACI 306 to prevent loss of concrete strength or quality.
2. Minimum temperature for concrete as mixed shall be as indicated on lines 2, 3 and 4 of Table 1.4.1 of ACI 306. Maximum temperature for concrete as mixed shall be 10 degrees F greater than the corresponding minimum temperature.
3. Place and maintain concrete so that its temperature is never less than the temperature indicated on line 1 of Table 1.4.1 of ACI 306. Maintain the required temperature for the time duration indicated on Table 1.4.2 of ACI 306.
4. Monitor temperature of concrete in place at corners or edges of formwork as applicable.
5. Do not expose concrete to carbon monoxide or carbon dioxide fumes from heaters or engines. Oil or coke burning salamanders will not be permitted. Personnel shall be present at all times to maintain safe, continuous operation of heating system.
6. Control temperature and humidity of protected concrete so that excessive drying of concrete surfaces does not occur.
7. Calcium chloride will not be permitted as a concrete accelerator or to thaw frozen subgrade prior to concrete placement.
8. The maximum allowable temperature drop during the first 24-hour period after protection is discontinued shall be as indicated on line 5 of Table 1.4.1 of ACI 306.

G. LOW STRENGTH CONCRETE:

1. Low-Strength Concrete:
   a. Defined as concrete whose 28-day test (average of two cylinder breaks) is less than the minimum 28-day strength required.
   b. Remove and replace with acceptable concrete when the quality and location of the low-strength concrete is such that Engineer considers the strength of durability of the structure is impaired and so orders.
   c. Low-strength concrete shall be considered defective work as defined in GENERAL CONDITIONS.

2. Potentially Low-Strength Concrete:
   a. Defined as concrete whose 7-day and 14-day test (average of two cylinders) is less than 70 percent and 85 percent, respectively of the specified minimum 28-day compressive strength. The designated percentage for strength shall be adjusted if the history of the cement being used in the concrete mix produces a higher or lower compressive strength at the 7-day and 14-day tests.
   b. Potentially low-strength concrete shall remain accessible with no other work performed that relates to, or depends upon, the questionable concrete until a final decision as to the disposition of the concrete is made by Engineer.
3. Construction delays caused by low-strength or potentially low-strength concrete shall not relieve Contractor from responsibility for late completion even though extensions of time may be granted.

H. MISCELLANEOUS CONCRETE ITEMS:
1. Concrete Seal Coat:
   a. Apply to the ground surface immediately beneath all "on-grade" slabs and footings where indicated or specified.
   b. Seal coat shall consist of a 4-inch concrete slab.
   c. Accurately screed so that the top of the seal coat will not be higher than the bottom elevation of structural slabs or footings to be placed thereon.
   d. Do not place seal coat until after all excavating, in the area have been completed and all drain lines, conduits and other items under the area are completed and properly backfilled and compacted.
2. Equipment Bases:
   a. Construct equipment bases, pads, and foundations as indicated or, when not indicated, conforming to equipment manufacturer's requirements.
   b. Reinforce conforming to typical detail unless otherwise indicated.
   c. Equipment bases shall include concrete, reinforcing steel, form work as required, and anchor bolts. Place grout for equipment installed under this contract.
   d. Finish top area of bases between anchor bolts and forms with a troweled finish.

I. TESTING:
1. Field Testing of Concrete and Making of Concrete Test Cylinders During Construction:
   a. Contractor shall furnish test equipment, test cylinder molds, and trained personnel to perform all required field tests, make the required concrete test cylinders and deliver test cylinders to the testing laboratory. The prescribed tests shall be made in the presence of or with the concurrence of the Owner.
   b. Concrete sampling for tests and cylinder making shall be done conforming to ASTM C172.
   c. Perform the following tests:
      (1) Prepare concrete test cylinders for laboratory testing as follows:
         (a) Obtain cylinder molds from the laboratory, Universal Engineering Testing Company, Gainesville, Florida.

(b) Do not use concrete used in making slump or air tests.

(c) Make not less than one set of cylinders (6 cylinders) from each day's pour for each 150 cubic yards of concrete or fraction thereof nor less than one set for each 5,000 square feet of slab top surface area.

(d) Test cylinders shall be made and cured for the first 24 hours in accordance with ASTM C31.

(e) Pack cylinders in crates padded with foam rubber or damp sawdust. Keep continuously moist and at proper temperature during transit and deliver to laboratory, Universal Engineering Testing Company;, immediately after the one-day "on-the-jobsite" curing period.

(2) Slump Test conforming to ASTM C143.

(3) Air Content Test conforming to ASTM C231.

(4) Discard concrete used for slump and air tests.

(5) Slump and Air Test results shall be furnished to the Universal Engineering Testing Company, Gainesville, Florida, for inclusion in the Cylinder Test Reports.

2. Laboratory Testing of Concrete During Construction:

a. An independent testing laboratory, Universal Engineering Testing Company, Gainesville, Florida, will be selected and paid by the Owner to perform the required laboratory tests and statistical evaluations of concrete being used in the work.

b. The laboratory will report the results of all testing and statistical evaluations as specified in DIVISION 1.

(1) Engineer, Kansas City Office (1 copy).

(2) Resident Project Representative, Field office (1 copy).

(3) Contractor (1 copy).

(4) Concrete supplier (1 copy).

(5) Owner (2 copies).

c. Testing Field-Made Concrete Test Cylinders:

(1) The laboratory shall start curing the test cylinders conforming to ASTM C192 immediately upon receipt from Contractor.

(2) The laboratory shall test all cylinders conforming to ASTM C39, testing two at 7 days of age and two at 28 days of age. The average strength of the two cylinders (same age) shall be used as the result of the test.

(3) When the average compressive strength of the two 7-day tests is less than 70 percent of the specified minimum 28-day compressive strength, two cylinders shall be tested at 14 days.

(4) If the average strength of the two 14-day tests is less than 85 percent of the minimum 28-day compressive strength, the Contractor may, at his discretion and expense, and with Engineer's approval, take field cores on the 15th day after placement of the potentially low-strength concrete and within 24 hours have the laboratory test these cores (ASTM C42). The potentially low-strength concrete will be accepted if the average of the core tests is 85 percent or greater of the specified 28-day compressive strength.

(5) Contractor may, at his expense, make additional cylinders and have 3-day compression tests made of critical concrete placements where an early knowledge of strength is beneficial.

d. Contractor shall have the right to observe all phases of concrete cylinder curing and testing. Should Contractor observe any deviations from the prescribed testing procedures that he considers detrimental to concrete strength test results, he shall immediately notify Owner in writing.

e. The Contractor shall make arrangements with and pay to the testing laboratory if he wants additional copies of test reports.

f. Compliance With Strength Provisions:

(1) The laboratory shall maintain and submit with each test report a current stastistical evaluation (average strength and standard deviation - ACI 214) of the concrete quality, starting when ten each of 7- and 28-day tests have been performed. The evaluation shall be based on a moving average of the latest 10 test results.

(a) Should the statistical data indicate an unacceptable combination of average strength and standard deviation, Contractor shall take immediate corrective action. Noncompliance after two warnings from Engineer will be sufficient to refuse additional concrete from the noncomplying concrete supplier.

(b) Should the statistical data indicate an excessive margin of safety, the concrete mix may be modified subject to approval.

3. Preparation and Testing of Field-Cured Test Cylinders and Beams:

a. In addition to concrete test cylinders specified in the preceding Article, Contractor may prepare cylinders or beams to be field-cured and tested as a basis for determining time in place for formwork.

b. Cure field-cured test cylinders or beams on the project site under the same conditions as the concrete which the test specimens represent until proposed time of form removal.

c. Deliver concrete cylinders to the laboratory for immediate testing.

d. Field-cured flexural test specimens (beams) may be delivered to the laboratory for testing or may be tested at the jobsite on test apparatus furnished by the Contractor.

e. Field testing of flexural test specimens shall conform to ASTM C78 and be observed by Engineer. Design flexural strength shall be 20 percent of the specified design compressive strength.

f. The average strength of two cylinders or beams of the same age shall be considered as one test.

g. Testing of field-cured test cylinders and beams to determine time in place for form work will be selected and paid by the Contractor.

J. DAMPPROOFING: Exterior faces of walls below grade shall receive two coats of Dehydratine 4 as manufactured by A. C. Horn of Construction Products Division of W. R. Grace & Company or approved equal as indicated.

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DIVISION 4 - MASONRY

4A - MASONRY MORTARS

4A-1 GENERAL

A. DESCRIPTION:
  1. This Section includes mortar and grout for the following unit masonry materials:
    a. Concrete masonry units.
  2. Related Work Specified Elsewhere:
    a. Concrete Masonry Units - SECTION 4B.

B. QUALITY ASSURANCE:
  1. Applicable Standards:
    a. American Society for Testing and Materials (ASTM):
      (1) C144 - Aggregate for Masonry Mortar.
      (2) C150 - Portland Cement.
      (3) C207 - Hydrated Lime for Masonry Purposes.
      (4) C270 - Mortar for Unit Masonry.
      (5) C404 - Aggregates for Masonry Grout.
  2. Do not change source or brands of masonry mortar materials during the course of Work.

C. SUBMITTALS:
  1. Compliance Submittals:
    a. Submit as specified in DIVISION 1.
    b. Includes, but not limited to the following:
      (1) Specifications of materials.
      (2) Instructions for use.

D. DELIVERY, STORAGE AND HANDLING:
  1. Store materials off the ground and in dry location.
  2. Store in a manner to prevent deterioration or intrusion of foreign materials.

E. JOB CONDITIONS: Specified in each applicable section, this Division.

4A-2 EQUIPMENT AND MATERIALS

A. MATERIALS:
  1. Portland Cement: Conform to ASTM C150, Type 1, nonstaining, without air entrainment. Natural color.
  2. Hydrated Lime: Conform to ASTM C207, type S, high-calcium lime.
  3. Aggregates:
    a. Conform to ASTM C144, except for joints less than 1/4-inch, use aggregate graded with 100 percent passing No. 16 sieve.
  4. Water: Clean and free of deleterious materials which would impair strength or bond.

5. Admixtures:
   a. Do not use water repellents, plasticizing agents, anti-freeze liquid, salts, or other substances to lower freezing point of mortar.
   b. Do not use calcium chloride in mortar.

B. MORTAR MIXES:
   1. Mortar for Unit Masonry: Conform to ASTM C270, except limit materials to those specified herein, and limit ratio by volume, as follows:
      a. Type S:
         (1) Proportions:
            (a) Not more than 1/2-part lime per 1 part portland cement.
            (b) Aggregate not less than 2-1/4 and not more than 3 times the sum of the volumes of the cement and lime used.
         (2) Use in the following locations:
            (a) All concrete masonry unit walls.
      b. Grout for Bar Reinforcement:
         (1) Proportions:
            (a) 1 part portland cement.
            (b) 2 parts minimum to 3 parts maximum damp loose sand.
            (c) 2 parts coarse aggregate conforming to ASTM C404.
         (2) Use in the following locations where grout space is larger than 3 inches in its least dimension.
            (a) Reinforced vertical cells.
            (b) Bond beams.
            (c) Where items embedded into hollow concrete masonry unit cells.

4A-3 PERFORMANCE

A. MEASUREMENT AND MIXING:
   1. Conform to ASTM C270.
   2. The method of measuring materials shall be such that the specified proportions of the mortar materials can be controlled and accurately maintained.
   3. Mix all cementitious materials for at least 3 minutes with a maximum amount of water to produce a workable consistency. Mix in a mechanical batch mixer and completely empty prior to placing the succeeding batch therein.

B. INSTALLATION:
   1. Mortar may be retempered on the board to maintain satisfactory consistency.
   2. Do not use mortar which has greatly stiffened or in which the cementing material has started to set.
   3. Use and place mortar in final position within 2-1/2 hours.
   4. Specific installation instructions applicable to each material specified are as specified in their respective Section, this Division.

C. CLEANING AND REPAIR: Specified in each applicable Section, this Division.

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4B - CONCRETE MASONRY UNITS

4B-1 GENERAL

A. DESCRIPTION:
  1. This Section includes the following:
    a. Concrete masonry units.
    b. Concrete brick.
    c. Precast concrete lintels.
  2. Related Work Specified Elsewhere:
    a. Masonry Mortar: SECTION 4A.
    b. Masonry Accessories: SECTION 4C.
    c. Wall Insulation: SECTION 7A.
    d. Flashings and Sheet Metal: SECTION 7D.
    e. Joint Fillers: SECTION 7F.

B. QUALITY ASSURANCE:
  1. Applicable Standards:
    a. American Society for Testing and Materials (ASTM):
      (1) C55 - Concrete Building Brick.
      (2) C90 - Hollow Load-Bearing Concrete Masonry Units.
      (3) C145 - Solid Load-Bearing Concrete Masonry Units.
      (4) C33 - Concrete Aggregates.
      (5) A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

C. SUBMITTALS:
  1. Compliance Submittals:
    a. Submit as specified in DIVISION 1.
    b. Includes, but not limited to, the following:
      (1) Manufacturer's specifications.
  2. Test Reports or Certificates:
    a. Submit as specified in DIVISION 1.
    b. Submit certificate or test reports certifying that masonry units furnished meet or exceed the requirements of this specification.

D. DELIVERY, STORAGE AND HANDLING:
  1. Stack concrete masonry units aboveground on platform which allows air circulation under stacked units.
  2. Cover and protect concrete masonry units from the elements and soiling from earth or other materials.

4B-2 MATERIALS

A. HOLLOW LOAD-BEARING UNITS:
  1. Conform to ASTM C-90, Grade N for all concrete masonry work.
  2. Conform to ASTM C90, Type I Moisture Controlled Units.
  3. Nominal dimensions of 16-inch length x 8-inch height x width indicated.
  4. Normal weight aggregate units of concrete aggregate conforming to ASTM C33 for a minimum dry net weight of 125 pcf.

B. CONCRETE BUILDING BRICK:
1. Conform to ASTM C55, Grade N for exterior walls, Type 1 moisture-controlled units.

C. PRECAST CONCRETE LINTELS:
1. Construct of precast reinforced concrete with same face texture as wall in which lintel is to be built, and scored vertically to resemble mortar joints.
2. Reinforcing bars to conform to ASTM A615.
3. Construct length for 8-inch minimum bearing each side of opening, except as indicated.
4. Top of lintels marked to indicate lintel schedule number and the number and size of reinforcing bars.
5. Lintel size and reinforcing as indicated.

D. SPECIAL SHAPES:
1. Construct where indicated and where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
2. Provide square corner units at all window, door and louver jambs, outside corners, columns and pilasters, and in other locations indicated.
3. Provide solid block units at window and louver sills, and in other locations indicated.

E. MASONRY MORTAR: Specified in SECTION 4A.

4B-3 PERFORMANCE

A. GENERAL:
1. Build masonry construction to the thickness indicated.
2. Cut units with motor driven saw designed to cut masonry with clean, sharp, unchipped edges. Cut units as required to fit pattern indicated and to fit adjoining work neatly. Use full units without cutting wherever possible.
3. As the work progresses, build in all items, openings and recesses as required for the work of other trades. Where built in items are embedded in masonry cells, place layer of metal lath in the joint below and rod mortar or grout into core.
4. Lay up walls plumb and true, with courses level, accurately spaced and coordinated with other work.
5. When stopping and resuming work, step back 1/2 masonry unit length in each course. Do not tooth. Clean exposed surfaces of set masonry. Remove loose masonry units and mortar prior to laying fresh masonry.

B. JOB CONDITIONS:
1. Do not lay masonry units when temperature is below 40 degrees F, except under the following conditions:
   a. Heat all materials and maintain air temperature at 40 degrees F on both sides of wall for period of 72 hours after laying.

2. Do not use frozen materials or materials coated with ice or frost. Remove and replace masonry work damaged by frost or freezing.
3. Do not wet concrete masonry units.
4. Protect partially completed walls against weather, when work is not in progress, by covering top of walls with strong, waterproof, nonstaining membrane. Extend membrane at least 2 feet down both sides of wall and anchor securely in place.

C. INSTALLATION:

1. Bonding and Coursing:
   a. Lay concrete masonry units in running bond with vertical joints located at center of masonry units in alternate courses below.
   b. Bond and interlock each course at corners unless otherwise indicated. Do not use units with less than 4 inches horizontal face dimension at corners or jambs.
   c. Bond intersecting walls with continuous wire reinforcement as specified in SECTION 4C.
   d. Coordinate joints with those of adjoining walls.
   e. Install lintels with minimum bearing of 8 inches at each jamb unless otherwise indicated.
2. Joints:
   a. Lay walls with 3/8-inch joint and to maintain coursing.
   b. Tool joints concave which are exposed, including joints in finished and unfinished areas.
   c. Cut joints flush which are concealed or covered with other materials.
   d. Rake out mortar in preparation for application of caulking or sealants where indicated.
   e. Mortar Beds for Hollow Units:
      (1) Lay with full mortar coverage on horizontal and vertical face shells.
      (2) Lay with full mortar coverage on horizontal and vertical face shells and webs in all courses of the following:
         (a) Columns and pilasters.
         (b) Starting course on footings or solid foundation walls.
         (c) Where adjacent to cells or cavities to be filled with grout.
   f. Mortar Beds for Solid Units:
      (1) Lay with full mortar coverage on horizontal and vertical joints.
3. Masonry Accessories and Built in Work:
   a. Install the following items as masonry work progresses as indicated and as specified in their applicable Sections.
      (1) Reinforcing, ties, anchors and other accessories.
      (2) Through-wall flashing and built in sheet metal work.
      (3) Control and expansion joint fillers.
      (4) Precast lintels.
      (5) Frames, inserts, piping, conduit.
      (6) Anchor bolts.
   b. Where built-in items, excluding bar reinforcement, are embedded in cores of hollow masonry units, install metal lath in joint below and rod mortar or grout into core.

D. REPAIR AND POINTING:

1. Remove and replace masonry units which are loose, chipped, broken, stained, or otherwise damaged. Replace with new units to match. Install in fresh mortar or grout and point to match adjacent work.
2. During tooling of joints, enlarge any voids or holes as necessary, except weep holes, and completely fill with fresh mortar.

E. CLEANING: Clean exposed concrete masonry units by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings.

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4C - MASONRY ACCESSORIES

4C-1 GENERAL

A. DESCRIPTION:

1. This Section includes masonry accessories for concrete masonry units, and includes the following items:
   a. Continuous wire reinforcing.
   b. Horizontal and vertical bar reinforcement.
2. Related Work Specified Elsewhere:
   a. Masonry Mortar: SECTION 4A.
   b. Concrete Masonry Units: SECTION 4B.
   c. Flashing and Sheet Metal: SECTION 7D.

B. QUALITY ASSURANCE:

1. Applicable Standards:
   a. American Society for Testing and Materials (ASTM):
      (1) A82 - Cold-Drawn Steel Wire For Concrete.
      (2) A116 - Zinc-Coated (Galvanized) Iron or Steel Farm-Field and Railroad Right-of-Way Wire Fencing.
      (3) A615 - Deformed Billet Steel Bars for Concrete Reinformcement.
2. Acceptable Manufacturers: Proprietary names are specified for material identification. Similar products of the manufacturers listed below are acceptable.
   a. Continuous Wire Reinforcing:
      (1) AA Wire Products Company.
      (2) Dur-O-Wal.
      (3) Hohmann and Barnard, Inc.

C. SUBMITTALS:

1. Compliance Submittals:
   a. Submit as specified in DIVISION 1.
   b. Includes, but not limited to, the following:
      (1) Specifications, catalog cuts.
      (2) Installation instructions.

D. DELIVERY, STORAGE AND HANDLING:

1. Deliver all materials to site in manufacturer's original carton or packaging containing manufacturer's name, accessory type, and gauge.
2. Store all masonry accessories to prevent corrosion and deformation.

4C-2 EQUIPMENT AND MATERIALS

A. CONTINUOUS WIRE REINFORCEMENT:

1. Prefabricated welded wire units in straight lengths of not less than 10 feet, with matching corner and tee units.
2. Fabricated from cold-drawn steel wire conforming to ASTM A82, with deformed side rods and plain cross rods.
3. Unit width of 1-1/2 to 2 inches less than wall or partition thickness.
4. Truss type:

a. Fabricated with single pair of 3/16-inch side rods and 9-gauge continuous diagonal cross rods to form a truss design spaced not more than 16 inches oc.
b. Dur-O-Wal Truss Design.

5. Finish:
a. Mill-galvanized with minimum 0.8-oz zinc coating to conform to ASTM A116, Class 3.

B. BAR REINFORCEMENT:
1. Deformed steel bars to conform to ASTM A615, Grade 60.
2. Sizes as indicated.
3. Use for the following locations:
a. Vertical cell reinforcement.
b. Bond beams.

4C-3 PERFORMANCE

A. PREPARATION:
1. Prepare all surfaces to receive masonry anchors as required by type of anchor.
2. Build in all anchors as work progresses.

B. INSTALLATION:
1. Continuous wire reinforcement:
a. Install continuous horizontal joint reinforcing in all masonry walls.
b. Fully embed side rods in mortar for entire length with a minimum mortar cover of 5/8-inch on exterior side of wall and 1/2-inch at other locations.
c. Lap reinforcement a minimum of 6 inches.
d. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" Sections. Lap 6 inches at splices.
e. Space reinforcing as follows:
(1) 16 inches oc vertically, and in bed joint of top course.
(2) Wall openings greater than 1'-0" width: In two horizontal joints, 8 inches oc, both immediately above lintel and immediately below sill. Extend reinforcing a minimum of 2'-0" beyond jambs of opening.

2. Bar Reinforcement:
a. Align all cells of masonry units to maintain a clear, unobstructed, continuous cell.
b. Install bars with length as great as possible where splices are required, lap bars 30 bar diameters and wire tie.
c. Locate splices in vertical wall cells 1/5 to 1/4 of wall height from top or bottom of wall.
d. Hook bars into bond beams as indicated.

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DIVISION 5 - METALS: STRUCTURAL AND MISCELLANEOUS

5A - STEEL

5A-1 GENERAL

A. DESCRIPTION:

1. This Section includes fabrication and erection of the structural steel and other steel or metal items as defined in AISC Manual, Code of Standard Practice.

B. QUALITY ASSURANCE:

1. Applicable Standards:
   a. American Institute of Steel Construction (AISC):
      (1) Manual of Steel Construction.
      (2) Quality Criteria and Inspection Standards.
   b. American Welding Society Structural Welding Code (AWS D1.1 Code).
   c. American Society for Testing and Materials (ASTM):
      (1) A6 - General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use.
      (2) A36 - Structural Steel.
      (3) A53 - Welded and Seamless Steel Pipe.
      (4) A108 - Cold-Finished Carbon Steel Bars and Shafting.
      (5) A120 - Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses.
      (6) A123 - Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip.
      (7) A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.
      (8) A307 - Low-Carbon Steel Externally and Internally Threaded Standard Fasteners.
      (9) A325 - High-Strength Bolts for Structural Steel Joints, Including Suitable Nuts and Plain Hardened Washers.
      (10) A449 - Quenched and Tempered Steel Bolts and Studs.
      (11) A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
      (12) A563 - Specifications for Carbon Steel Nuts.
   d. Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation "Specifications for Structural Joints Using ASTM A325 Bolts or A490 Bolts" as approved by AISC.
   e. Steel Structures Painting Council (SSPC) - Steel Structures Painting Manual.
2. Acceptable Manufacturers: Specified in part 5A-2 and 5A-3.
3. Welder Qualifications:
   a. Welders shall be previously qualified (within the past twelve months) by passing the tests prescribed in the AWS Standard Qualification Procedure, or by passing such other tests as the Engineer may accept.
   b. Submit two certified copies of the qualification records, if requested, to Engineer as evidence of qualification to the above-mentioned code.

4. Inspection: Material or workmanship will be subject to inspection in the shop and field.

C. SUBMITTALS:
1. Compliance Submittals:
   a. Submit as specified in DIVISION 1.
   b. Includes, but not limited to, the following:
      (1) Fabrication and erection drawings for all work.
      (2) All necessary information for the fabrication, including filler metal for welds, of the component part of the structure, presented on drawings to conform to recognized standard practice, AISC Manual Part 5, and AWS Code.
      (3) Drawings indicating stud shear connector spacing regardless of whether connectors are shop applied or field applied.
      (4) Drawings showing each piece including anchor bolts marked for identification to correspond to erection drawings.
      (5) Fabricator's drawings may include reproductions from Contract Drawings but responsibility for checking all dimensions shown remains with Contractor. Reproducibles of Contract Drawings will be furnished to Contractor as specified in DIVISION 1.
2. Mill Tests:
   a. Perform for each melt of material used in the fabrication.
   b. Furnish two copies of each certified mill test to Engineer upon request.

D. DELIVERY, STORAGE AND HANDLING: Handle and store all steel and appurtenances as specified in DIVISION 1.

5A-2 MATERIALS

A. GENERAL:
1. Steel: Conform to ASTM A36, as designated in the AISC Manual, Part 1, unless otherwise indicated or specified.
2. Connection Bolts, Nuts and Washers: Conform to ASTM A325, unless otherwise indicated or specified.
3. Anchor Bolts:
   a. Conform to ASTM A307 using A36 steel, unless otherwise indicated to be stainless steel or high strength.
   b. Machine Bolts: Conform to ASTM A307.
   c. High Strength: Conform to ASTM A449 with nuts conforming to ASTM A563, Grade B for bolts with diameters less than or equal to 1-1/2 inches. Use grade A for bolts greater than 1-1/2 inches diameter.
4. Handrail: Conform to ASTM A53, Type E or S, Grade B; ASTM A106, Grade B; or ASTM A120 (with minimum yield strength of 33,000 psi).
5. Pipe for Structural Uses: Conform to ASTM A53, Type E or S, Grade B, or ASTM A106, Grade B.
6. Square and Rectangular Tubing: Conform to ASTM A500.
7. Grating:
   a. Main bars: Conform to ASTM A 569, Grade 1015.
   b. Cross bars: Conform to ASTM A 569, Grade 1010.

5A - STEEL: continued

8. Shear Stud Connectors: Manufacture from cold-finished carbon steel conforming to ASTM A 569, Grade 1015 or 1020.
9. Welding:
   a. Use E70 electrodes for shielded metal arc welding and F7 series electrodes for submerged arc.
   b. Select filler metal as required by AISC Manual, Part 5, Section 1.17.
10. Galvanizing: Galvanize steel after fabrication to conform to ASTM A123 and ASTM A153, where indicated or specified.

B. STEEL FABRICATION:
1. Fabricate all steel to conform to AISC specifications, codes and standards.
2. Permissible variations for sweep, camber, length and cross-section of all steel members shall conform to ASTM A6, AISC "Manual of Steel Construction, Part 1" and AISC "Quality Criteria and Inspection Standards" unless indicated otherwise.
3. Fabricator shall mark all shear connector locations (if field-applied) by means of center punch and paint circle or other approved means so that field layout of shear connectors is not required. Do not paint shear connector contact surface.
4. Welding:
   a. All welding shall be shielded metal arc or submerged arc.
   b. Conform to AWS Code, AISC Manual Part 4 and the AISC Quality Criteria and Inspection Standards.
   c. Inspection of welds will be in accordance with the AWS Code to determine the acceptability of welds. Correct defective welds.
5. Shop Connections:
   a. Weld, rivet, or bolt at Contractor's option except when otherwise indicated or specified.
   b. Shop portions of connections may be welded equivalent to any bolted connection specified if Engineer concurs.
   c. Welded connections shall be as indicated or in accordance with acceptable alternative designs.
      (1) Welds of connection angles to beam webs shall conform with AISC Manual Part 4, Tables III and IV with particular regard for minimum web thickness. Provide longer connection angles or reinforce web as required.
      (2) All butt joint groove welds shall be complete penetration welds unless otherwise indicated and shall conform to the applicable standards in AISC Manual Part 4 with special emphasis on maintaining root opening. Accomplish this for single-bevel butt joint welds by using backup plates or by chipping out and welding on the opposite side.
      (3) Prepare weld bevels with a mechanically guided cutting torch or by grinding.
      (4) Remove all run-out tabs.
   d. Bolted connections shall conform with AISC Manual Part 4.
      (1) All bolted connections shall be made with 3/4-inch A325 bolts, nuts and washers unless otherwise indicated or specified.

5A - STEEL: continued

(2) Capacity of beam connections shall be equal to that specified in AISC Manual Part 4, Tables I and II for ASTM A325 bolts in friction-type connections with the size of bolts and the number of bolt rows indicated.

(3) Use no less than the minimum number of rows of bolts for a given beam size as required by Tables 1 and 2 of AISC Manual, Part 4.

6. Provisions for Field Connections:
   a. Provide with bolted connections unless otherwise indicated or specified.
   b. Provide for field welding only when so indicated or when detail clearances make bolting impractical.
   c. Provide all members to be field welded with bolted erection connections adequate to resist erection stresses prior to field welding.
   d. All steel connections shall use either ASTM A325 bolts.

C. COLUMN BASE AND EQUIPMENT ANCHOR BOLTS:

1. Furnish for all columns and equipment furnished and installed under this Contract, and as required to install all equipment furnished by others for installation under this Contract unless otherwise indicated.
2. Install as indicated.
3. Galvanize after fabrication sleeved anchor bolts full length and nonsleeved anchor bolts from top of anchor bolt to 2 inch embedment in concrete foundation including exposed nuts.

D. HANDRAIL:

1. 1-1/2-inch nominal (1.9-inch outside diameter) round black standard-weight pipe.
2. Post spacing shall not exceed 6 feet from center to center.
3. Form and weld all handrail. Grind all welds smooth and even with the surface of the pipe, including field welds required for erection.
4. Carefully form all handrail where change of direction or elevation occurs. Provide rounded corners to avoid hazardous conditions where sloping handrail meets horizontal handrail.
5. Furnish pipe sleeves for posts of handrail sections indicated to be removable.
6. Handrail posts shall be vertical (plumb) unless otherwise indicated.
7. Hot-dip galvanize after fabrication.

E. EDGE ANGLES AND PLATES:

1. Furnish around openings as indicated.
2. Keep plates flush at intersections and fillet-weld to give a neat appearance at the exposed intersecting surfaces.
3. Hot-dip galvanize after fabrication.
4. Properly align, level and plumb before concrete is placed.

F. KICK PLATES:

1. Furnish at the edge of uncovered openings and at the edge of walkways and platforms, except as otherwise indicated.
2. Hot-dip galvanize after fabrication.

G. STEEL FLOOR GRATING:

1. One-piece, resistance-welded steel construction without notching of bearing or cross bars before welding.
2. Main Bars:
   a. Thickness: 3/16-inch.
   b. Depth: 1-1/4-inch unless indicated otherwise.
   c. Spacing: Not more than 1-3/16 inches on centers.
   d. Configuration of Top Surface of Main Bars: Serrated with flat tops unless otherwise indicated. Sharp saw-tooth edges shall not be permitted.
3. Cross Bars:
   a. Spacing: 4 inches on centers.
   b. One of the following shapes:
      (1) Hexagon with 5/16-inch diameter of inscribed circle.
      (2) Rectangular 1/2-inch x 3/16-inch.
      (3) Square 1/4-inch with spiral twist.
      (4) Round 21/64-inch diameter.
4. Fabrication:
   a. Main bars shall be vertical within a tolerance of 0.10-inch per inch of depth.
   b. Longitudinal bow (before fastening to supports) shall be less than 1/200 of the length.
   c. Transverse bow before fastening to supports shall be less than 3/8-inch in 3 feet.
   d. Crossbars shall not deviate from a straight line perpendicular to the main bars by more than 3/16-inch in 3 feet.
   e. Crossbars shall match crossbars of adjacent sections to form a continuous pattern of straight lines.
   f. Panel width and length tolerances shall be ±1/4 inch.
   g. Provide all openings in grating indicated and as required for installation of all piping, wiring and equipment installed under this Contract.
   h. Band all openings 4 inches and larger with a metal bar same size as main bearing bar. Weld to each bearing bar with a 3/16-inch fillet weld 3/4-inch long. Tack weld to all crossbars.
   i. Trim-band all locations as follows:
      (1) Open end of grating at head of a ladder.
      (2) Manway opening.
      (3) Hinged sections.
      (4) Grating panels with four crossbars or less.
      (5) Other locations as indicated.
5. Shop Finish:
   a. Hot-dip galvanize after fabrication.
6. Openings in Grating: Furnish for other contracts as indicated:
7. Manufacturer: Grating shall be manufactured by one of the following:
   a. Blaw Knox, Pittsburgh, Pennsyvlania.
   b. Dravo Corporation, Pittsburgh, Pennsylvania.
   c. IKG Industries.
   d. Klemp Corporation, Chicago, Illinois.
   e. Borden Metal Products Company, Elizabeth, New Jersey.

H. STAIRS: (If Required)
1. General Construction:
a. Stringer sizes indicated are minimum acceptable size.
b. Cross-brace stringers to provide lateral stability where the horizontal run exceeds 12 feet.
c. Provide struts and hangers where indicated, or as otherwise required for proper support.
2. Treads:
a. Open riser type with serrated grating conforming to "Steel Floor Grating" as specified herein, with main bars 1-1/4-inch x 3/16-inch unless indicated otherwise.
b. Provide standard checkered plate nosing.
c. Bolt tread to each stringer with a minimum of two 3/8-inch bolts.
3. Grating Landings:
a. Landings shall be of serrated grating conforming to "Steel Floor Grating" as specified herein, with 1-1/4-inch x 3/16-inch main bars unless indicated otherwise.
b. Provide subframing so that grating span will not exceed 3'-6".
c. Provide nosing as specified for "Treads" at the head of all stairs.

I. CHECKERED PLATE: (If Required)
1. Plate shall be of thickness indicated with surface deformations of the four-way type.
2. Hot-dip galvanize plate after fabrication.
3. Fasten in place with screws spaced at 18 inches with a minimum of one at each corner of each piece or as otherwise indicated.
4. Screws shall be 3/8-inch countersunk stainless steel of Allen head type.
5. Provide 1-inch holes at each corner of checkered plate sections.

J. STUD SHEAR CONNECTORS: (If Required)
1. General:
a. Conform to specification for Stud Shear Connectors in AISC Manual Part 5.
b. Use 1/2-inch diameter by 4-inch headed-type stud shear connectors unless otherwise indicated.
c. Number and spacing shall be as indicated.
2. Manufacturer: Connectors shall be manufactured by one of the following
a. KSM Products, Inc., Morrestown, New Jersey.
b. Nelson Stud Welding Company, Lorain, Ohio.
3. Stud Shear Connector Welding:
a. Workmanship and quality control shall conform to AWS Code for "Stud Welding" and recommendations of the connector manufacturer.
b. Stud shear connectors shall be shop or field welded at Contractor's option.
c. Stud welding, equipment, and power requirements for stud welding shall conform to manufacturer's recommendations.
d. Clean stud shear connector weld area of scale, rust, oil, paint and any other foreign substance that would inhibit sound welds.

4. Inspection: Workmanship of the stud shear connector welding will be verified as follows:
   a. Studs shall be at least 1/8-inch shorter after welding.
   b. Studs shall have a 360-degree weld fillet at base with no undercut.
   c. Any stud having a questionable weld will be subjected to a bend test by bending the stud away from its axis until failure occurs but not exceeding 30 degrees. Failure should occur in the stud, not in the weld. Replace studs that do not bend 30 degrees without failure or otherwise do not meet these Specifications.

K. CONCRETE AND MASONRY ANCHORS:
1. Manually expanded anchor type. Serrated type anchors shall not be used.
2. Furnish sizes indicated and install to conform to manufacturer's printed instructions.
3. Anchors shall be manufactured by one of the following:
   a. Phillips Drill Company, Inc., Michigan City, Indiana.
   b. Star Expansion Industries Corporation, Mountainville, New York.
   c. U.S. Expansion Bolt Company, York, Pennsylvania.

L. SHOP PAINTING:
1. Surface Preparation: Prepare all surfaces except galvanized (or otherwise specified) in accordance with SSPC-SP1 and SP6.
2. Shop Coat: Inorganic zinc rich primer (ethyl silicate base), 3 mils dry.
   a. Carboline - CZ11.
   b. Cook - 411-A-101.
   c. Mobil - 13F12.
   d. Tnemec - Tneme-Zinc 90-92E.
3. Apply shop coat to all steel, including connections except for the following surfaces:
   a. Where encased in concrete, apply paint on exposed faces only.
   b. Within 3 inches adjacent to field welds.
4. Application:
   a. Preparation of surfaces to be painted shall be in accordance with "Steel Structure Painting Councils" specification.
   b. Prepare only the amount of surface which can be painted the same working day to prevent rerusting of the surface.
   c. Remove grease, weld spatters, burrs and sharp edges prior to painting.
   d. Apply paint in strict accordance with manufacturer's written instructions.

5A-3 PERFORMANCE

A. PREPARATION:
1. Field-check location and elevation of anchor bolts and footings.

5A - STEEL: continued

B. STEEL ERECTION:

1. Erect all steel to conform to AISC specifications, codes and standards, AISC Quality Criteria and Inspection Standard or any local, State or Federal Codes which may exceed such requirements.
2. Protect steel from entrapped water that can cause damage from freezing or corrosion.
3. Baseplates:
   a. Grout under baseplates with a flowable nonshrink grout, taking special care not to disturb their grade and alignment.
   b. Flowable nonshrink grout shall be one of the following:
      (1) Masterflow 713 grout, Master Builders Company, Cleveland, Ohio.
      (2) Saurereisen F100, Saurereisen Cement Company, Pittsburgh, Pennsylvania.
      (3) Five Star Grout, U. S. Grout Corporation, Old Greenwich, Connecticut.
   c. Cut off exposed edges of the grout at 45 degrees along the edges of the baseplates after grout has acquired its initial set.
4. Erection Bracing:
   a. Provide all necessary temporary struts, ties, cables, temporary flooring, planking and scaffolding in connection with the erection of the structural steel or support of erection machinery.
   b. Place as required to maintain proper position against loads from erection equipment, construction material and wind.
   c. Leave bracing in place until sufficient steel connections, concrete slabs, exterior walls, and roof decks are in place to ensure stability of the structure.
5. Connections:
   a. Unless otherwise indicated, or clearance is insufficient, connections shall be bolted friction type.
   b. Tighten high-strength bolts to correct bolt tension in accordance with AISC Manual, Part 5, "Specification for Structural Joints using A325 or A490 Bolts."
   c. Furnish the inspecting wrench and one man to assist the Engineer when inspections are performed.
   d. Provide Skidmore-Wilhelm Bolt-Tension calibrator or approved equal for adjusting inspection wrench and/or calibrated wrench in accordance with AISC Manual, Part 5.
   e. Load Indicators:
      (1) The use of load indicators is an acceptable alternative to the requirements of paragraph 6.c. and 6.d. above in determining specified minimum bolt tension.
      (2) Use Coronet Load Indicators as manufactured by Cooper and Turner, Inc., East Hartford, Connecticut, or an approved equal.
      (3) Install in accordance with manufacturer's written instructions.
   f. All steel connections shall use ASTM A325 bolts unless indicated otherwise.
   g. Welded Connections:
      (1) Make welded connections as indicated and leave all erection bolts in place after completion of welding unless otherwise indicated.
      (2) Reinforce connections when members requiring fillet welds are not in contact.

(3) Use backup bars or spacer bars on all butt welds where root opening exceeds 3/16-inch.
(4) Remove all run-out tabs.

6. Welding and Welders:
   a. The requirements for erection welding and welders shall be the same as specified for steel fabrication.
   b. All welds shall be stamped with a mark identifying the welder. Remove welders from work after two defective welds.
7. Protect pipe sleeves, other anchorage members and concrete bases from deleterious materials at all times, and from water which may cause ice damage during freezing weather.
8. Handrail:
   a. Form and weld all handrail. Grind all welds smooth and even with the surface of the pipe.
   b. Carefully fit all handrail where change of direction or elevation occurs.
   c. Install all rails and posts plumb, level, straight and true and in alignment.
   d. Top rail shall clear all fixed objects by at least 3 inches vertically and horizontally.
   e. Furnish and install plates, bolts, and additional items as indicated or required for fastening to supporting members.
9. Grating:
   a. Space fasteners as required to overcome irregularities and maintain grating contact with supports. Minimum anchorage of each panel will be two fasteners at each end and one fastener at each intermediate support.
   b. All grating shall be removable unless otherwise indicated.
   c. Unless indicated as fixed, fasten with galvanized clips using welding studs.
   d. Where indicated as fixed, and if not galvanized, fasteners shall be 3/16-inch fillet welds 3/4-inch long.
   e. All grating shall be removable unless otherwise indicated.
10. Shear Stud Connectors: The requirements for field installed shear stud connectors shall be the same as specified for shop-installed connectors.
11. Field Painting: Surface preparation, priming and finish coating are specified in SECTION 9A.

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5B - STEEL JOISTS

5B-1 GENERAL

A. DESCRIPTION:
1. This Section includes steel joists, bridging, and accessories.

B. QUALITY ASSURANCE:
1. Applicable Standards:
a. Steel Joists Institute (SJI): "Standard Specifications for Open Web, Long Span and Deep Long Span Steel Joists."
b. Steel Structures Painting Council (SSPC) - Steel Structures Painting Manual.
2. Inspection and Tests:
a. The materials to be furnished shall be subject to inspection in the mill, shop, and field.
b. Joists shall be inspected by the manufacturer before shipment to ensure compliance of materials and workmanship with the Specifications.
c. Welders shall be qualified for type of work required.

C. COMPLIANCE SUBMITTALS:
1. Submit as specified in DIVISION 1.
2. Include, but not limited to, the following:
a. Fabrication and erection details, including end supports and bridging.
b. Splices, welding sequences, and procedures for field splices if required.
c. Two certified copies of all mill reports or laboratory reports covering the chemical and physical properties of the steel used in the Work if requested by the Engineer.

D. DELIVERY, STORAGE AND HANDLING:
1. Exercise care at all times to avoid damage through careless handling and storage.
2. Unload joists and stack either by crane or by hand.
3. Dumping or dropping of joists will not be permitted.

5B-2 MATERIALS

A. GENERAL REQUIREMENTS:
1. Joists series and sizes indicated are based on joists listed by SJI.
2. Steel used in the fabrication of joists, design and working stresses, and fabrication and erection procedures shall conform to the requirements of SJI, unless otherwise specified.
3. Contractor shall be responsible for all errors of fabrication and for the correct fitting of the joists in the field.
4. Joists shall be fabricated from new materials.

B. FABRICATION:

1. Connections: Joist members shall be joined by either resistance or arc welding in a manner that will produce a finished connection of the strength required.
2. Holes: Holes shall not be made or enlarged by burning.
3. Joists with cracked or improper welds, or joists otherwise damaged so as to affect their structural properties, will not be allowed.
4. Bearing and Anchorage:
   a. Bearing surfaces of the joist shall be in the same plane with full bearing on the supporting wall or beam.
   b. Provide for anchors as required and as indicated.
5. Bridging: Conform to SJI for type and quantity unless otherwise indicated.
6. Accessories: Furnish fittings and framing for openings, anchors, joist extensions, ceiling extensions, and as required.

C. SHOP PAINTING:

1. Surface Preparation: Prepare all surfaces except galvanized in accordance with SSPC-SP2 or SSPC-SP3.
2. First Coat: Medium oil alkyd, red lead, iron oxide primer, 2 mils dry.
   a. Cook - Armorcote Metal Primer 391-N-162.
   b. Mobil - Red Lead Oxide Primer 13-R-825.
   c. Tnemec - Red Metal Primer 10-99.

5B-3 PERFORMANCE

A. ERECTION:

1. Repair or replace damaged joists according to manufacturer's recommendations. Repair shall be made so that joist capacity is not reduced.
2. Fasten all joists in place prior to receiving construction loads.
3. Bridging:
   a. Install all bridging and bridging anchors before receiving construction loads.
   b. Bridging shall support the top chords against lateral movement and shall hold the steel joists in the plane indicated.
   c. Anchor the ends of bridging lines terminating at walls or beams at top and bottom chords.
   d. Anchor bridging to steel joists by welding or bolting.
   e. Welds for attachment of bridging shall not damage the joist members.
4. During the construction period, exercise care to avoid excessive concentrated loads. Distribute loads so as not to exceed carrying capacity of steel joists.

B. FIELD PAINTING: Surface preparation, priming and finish coating are specified in SECTION 9A.

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5C - METAL ROOF DECKS

5C-1 GENERAL

A. DESCRIPTION:
1. This Section includes structural metal roof deck and accessories.

B. QUALITY ASSURANCE:
1. Applicable Standards:
   a. American Iron and Steel Institute (AISI):
      (1) Design of Light-Gauge Cold-Formed Structural Steel Members.
   b. American Society for Testing and Materials (ASTM):
      (1) A446 - Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Physical (Structural) Quality.
      (2) A525 - Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, General Requirements.
      (3) A611 - Steel, Cold-Rolled Sheet, Carbon, Structural.
   c. American Welding Society Structural Welding Code (AWS D1.1 Code).
2. Qualification of Welding Work:
   a. Welding processes, qualification of welding operators and welding inspection shall be in accordance with AWS D1.1 Code.
   b. Prior to actual erection, welders shall demonstrate to the Engineer their ability to weld metal roof deck.

C. SUBMITTALS:
1. Compliance Submittals:
   a. Submit as specified in DIVISION 1.
   b. Include, but not limited to, the following:
      (1) Complete erection layouts, details, and installation instructions.
      (2) Details and layout of roof decking, showing lengths, locations, and markings of roof decking to correspond with the sequence and procedure to be followed in installing and fastening the decking.
      (3) Method of fastening and installation of accessories.
      (4) The size and number of holes to be cut in decking.

5C-2 MATERIALS

A. METAL DECK:
1. General Requirements:
   a. Deck design shall conform to AISI.
   b. Metal deck shall be formed from galvanized steel sheets conforming to ASTM A446, Grade A, and coated in accordance with ASTM A525.
      (1) The coating shall be class A60.
   c. Cut deck units to required lengths so that end joints will occur on supporting members. Lap ends not less than 2 inches.
2. Deck Type: (1-1/2-inch)
   a. 1-1/2-inch depth, 18 gauge.
   b. Inland-Ryerson Type "B", H. H. Robertson "Q" Deck Section 3, or approved equal.

5C - METAL ROOF DECKS: continued

3. Length of Individual Sheets: Extend over 3 or more supports where possible.

B. ACCESSORIES:
1. Furnish with the following:
   a. Cover plates - 18-gauge.
   b. Valley plates - 18-gauge.
   c. Recessed sump pans - 14-gauge.
   d. Metal closures (20-gauge) or neoprene filler.
2. Finish: Same as for metal deck.

5C-3 PERFORMANCE

A. ERECTION:
1. Conform to fabrication and erection drawings and manufacturer's printed instructions.
2. Fasten to every beam or joist by electric arc welding to conform to instructions and as follows:
   a. Place deck and adjust to proper bearing and alignment before being permanently fastened.
   b. Reinforce all openings to maintain design load requirements.
   c. Fasten deck to steel framing according to manufacturer's recommendations except in no case shall fastening be less than following:
      (1) At end and intermediate supports and at perimeter of roof: 3/4-inch diameter plug welds spaced at 12 inches on center.
      (2) Side lap connections: 1-1/2-inch-long welds spaced at 24 inches on center or button punched at 24 inches on center.
   d. Install deck with all accessories and provide closures as required to prevent the flow of bitumen through the joints.
3. Welding:
   a. The type and spacing of welds shall be as specified.
   b. Blowholes will be cause for rejection.
   c. Weld all metal fillers and closure pieces to the roof deck.

B. FIELD PAINTING: Surface preparation, priming and finish coating are specified in SECTION 9A.

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DIVISION 6 - WOOD AND PLASTICS

6A - ROUGH CARPENTRY

6A-1 GENERAL

A. DESCRIPTION:
  1. This Section includes rough carpentry as indicated and as follows:
    a. Miscellaneous Framing.
    b. Nailing strips, edge plates, blocking, sleepers.
    c. Related materials.
    d. Temporary doors.
    e. Wood Preservatives.
  2. Related Work: Specified Elsewhere:
    a. Wood Forms: SECTION 3A.

B. QUALITY ASSURANCE:
  1. Applicable Standards:
    a. Federal Specifications (FS):
      (1) FF-B-561 - Bolts, (Screw), Lag.
      (2) FF-B-575 - Bolts, Hexagon and Square.
      (3) FF-B-588 - Bolt, Toggle: Expansion Sleeve, Screw.
      (4) FF-H-111 - Shelf and Miscellaneous: Hardware, Builders.
      (5) FF-H-116 - Hinges, Hardware, Builders.
      (6) FF-N-105 - Nails, Brads, Staples and Spikes; Wire, Cut and Wrought.
      (7) FF-N-836 - Nut: Square, Hexagon, Cap, Slotted, Castle, Knurled, Welding and Single Ball Seat.
      (8) FF-P-101 - Padlocks.
      (9) FF-S-111 - Screw, Wood.
      (10) FF-S-325 - Shield, Expansion; Nail, Expansion; Nail, Drive Screw (Devices, Anchoring, Masonry).
    b. U.S. Department of Commerce - National Bureau of Standards (NBS), Product Standards (PS):
      (1) PS-1 - Construction and Industrial Plywood.
      (2) PS-20 - American Softwood Lumber Standard, for Yard, Structural, and Shop Use.
    c. American Plywood Association (APA).
    d. American Wood Preserves Association (AWPA).
    e. Southern Pine Information Bureau (SPIB).
    f. National Grading Rules (NGR).
  2. Lumber: Contractor shall use lumber produced in the state of Florida whenever possible, but shall provide species of lumber and treatments as specified. Lumber grading and wood species classifications shall conform to PS-20. Identify all lumber by applicable association grade marks. Grade stamp shall contain:
    a. Symbol of Grading Agency.
    b. Mill number.
    c. Grade of lumber.

d. Species or species grouping or combination designation.
e. Rules under which graded.
f. Condition of seasoning at time of manufacture.

3. Plywood grading and species classification shall conform to species classification, type of grades, and grademarking and certification requirements of PS-1. Identify each sheet of plywood with the grade trademark which shall contain the following:
   a. Grades of veneer of panel face and panel back.
   b. Species Group Number.
   c. Type - exterior or interior.
   d. Identification index if applicable.
   e. Product Standard governing manufacture.
   f. Mill number.

C. SUBMITTALS:
1. Compliance Submittals:
   a. Submit as specified in DIVISION 1.
   b. Include, but not limited to, the following:
      (1) Samples of exposed framing members and surfaces indicated to be a part of the finished project to show textures and color of material.
      (2) Fabrication shop drawings: Framing layouts, and other drawings necessary to proper installation of work.
   c. Certificates indicating compliance with the grading rules required.
      (1) Schedules showing species furnished.
2. Certificates:
   a. Submit certificate for wood preservatives by treating plant stating that material has been pressure treated as specified with name of preservative, process used and quantity retained per cubic foot of wood.

D. DELIVERY STORAGE AND HANDLING:
1. Keep materials dry. Store lumber and plywood with provisions for air circulation within the stack.
2. Store wood materials a minimum of 6 inches above ground on sleepers of sufficient spacing to prevent warpage.
   a. Protective Covers: Cover storage stacks with a protective waterproof covering providing proper air circulation and ventilation. Storage of seasoned materials in wet or damp areas is prohibited.
   b. Store materials for which maximum moisture content is specified, only in areas where relative humidity has been reduced to a level where specified moisture content can be maintained with a tolerance of plus or minus 1 percent.
3. Handle all materials in a manner to prevent damage or warping.

6A-2 MATERIALS

A. GENERAL REQUIREMENTS:
1. Lumber shall be free of decay, stain, blemishes and sapwood, conforming to PS-20.
2. Plywood shall conform to PS-1.

B. MISCELLANEOUS LUMBER:

1. Provide wood for support or attachment of other work such as miscellaneous framing, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes required or indicated, worked to shapes shown, and as follows:
   a. Moisture Content: 15 percent maximum for lumber items not specified to receive wood preservative treatment.
   b. Grade: Construction Grade light framing size lumber of any species, or board size lumber, as required. Provide Construction Grade boards (RIS or WCLIB) or No. 2 boards (SPIB or WWPA).

C. PLYWOOD:

1. Plywood Exposed - Exterior:
   a. Temporary Doors:
      (1) Structural II, C-D INT, Exterior Glue-APA.
      (2) Two plywood sheets laminated, 3/4-inch thickness each sheet.

D. RELATED MATERIALS:

1. Rough Hardware:
   a. Bolts: FS-FF-B-575.
   b. Nuts: FS-FF-N-836.
   c. Masonry Expansion Devices: FS-FF-S-325.
   d. Lag screws and Bolts: FS-FF-B-561.
   e. Toggle Bolts: FS-FF-B-588.
   f. Wood Screws: FS-FF-S-111.
   g. Nails and staples. FS-FF-N-105.
   h. Metal Nailing Discs: Flat caps, min. 1-inch-diameter, min. 30-gauge sheetmetal (galvanized). Formed to prevent dishing.
2. Builders Hardware: For temporary doors.
   a. Hinges - Half-surface: FS-FF-H-116.
   b. Hasp and Staple: FS-FF-H-111.
   c. Padlock and Key: FS-FF-P-101.
3. Plastic Fabric: Reinforced.
   a. Reinforced plastic fabric for building enclosures.
   b. 100-pound minimum tear strength.
   c. Type T-55FR as manufactured by Griffolyn Company, Inc.

E. TREATED WOOD:

1. Lumber requiring treatment; aboveground service.
   a. Nailers, blocking and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   b. Sleepers, blocking, furring and similar concealed members in contact with masonry or concrete.
   c. Elsewhere as indicated.
2. Lumber requiring treatment; ground contact service:
3. Wood Preservative Treatment:
   a. Water-borne preservative Chromated Copper Arsenate (CCA) conforming to AWPA standard P5 and applied by pressure process conforming to AWPA C2.

b. Retention of CCA dry salts in wood for aboveground service shall be 0.25 pcf of wood. Retention in wood for ground contact service shall be 0.40 pcf of wood.
c. Wood shall be kiln dryed to a maximum moisture content of 15 percent after treatment.
d. Liberally brush with the same preservative all field cut surfaces, bolt holes, and machined areas. Conform to AWPA Standard M4.

6A-3 PERFORMANCE

A. PREPARATION:
1. Examine all surfaces to receive rough carpentry materials.
   a. Verify that surfaces have been prepared to the tolerances and dimensions indicated and required.
   b. Verify that required rough hardware and anchors have been properly installed.
2. Thoroughly clean the supporting members of all debris, dirt, oil, grease and any other substances detrimental to the proper installation of materials specified in this section.

B. INSTALLATION:
1. Tolerances: Install all lumber and plywood that is indicated to be a permanent part of the project, within the following dimensional tolerances.
   a. Sills, joists, beams, ledgers, purlins, sole plates, cap plates. Variation from level - 1/4-inch in 8 feet.
   b. Studs, columns, posts: Variation from plumb - 1/8-inch in 8 feet.
   c. Edge Strips at Gravel Stops: Variation from level or slope indicated - 1/8-inch in 8 feet.
   d. Miscellaneous nailers, furring, cleats - 1/8-inch in 10 feet.
2. General Requirements:
   a. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate the work with a minimum of joints or the optimum jointing arrangement.
   b. Fit carpentry work to other work. Scribe and cope as required for accurate fit.
   c. Set carpentry work accurately to required levels and lines with members plumb and true.
   d. Shim with metal or slate for bearing on concrete and masonry substrates. Where indicated, grout with 1:3 Portland cement-sand grout for full-bearing.
   e. Securely attach carpentry work to substrates by anchoring and fastening as indicated and as required by recognized standards.
      (1) Provide washers under bolt heads and nuts in contact with wood.
      (2) Nail plywood to comply with the recommendations of the American Plywood Association.
3. Fasteners: Use common wire nails, except as otherwise indicated or specified herein. Use finishing nails for exposed work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Install fasteners without splitting of wood; predrill as required. Do not drive

threaded friction type fasteners; turn into place. Tighten bolts and lag screws at installation and retighten as required for tight connections prior to closing in or at completion of work.

4. Wood Grounds, Nailers, Blocking and Sleepers:
   a. Provide where indicated and where required for screeding or attachment of other work. Form to shape and cut as required for true line and level of work to be attached or screeded.
   b. Attach to substrates securely with anchor bolts or other attachment devices as indicated and as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry as work progresses, cutting to fit masonry unit size involved. Anchor to formwork before concrete placement.
5. Framing: Conform to applicable recommendations of NFPA for the fabrication and installation of wood framing.
6. Plywood: Comply with the recommendations of the American Plywood Association (APA) for the fabrication and installation of plywood work. Provide thickness indicated or if not indicated, as recommended by APA "Plywood Construction Guide."
7. Nailer Plates:
   a. Drill and countersink plates at centers required below. Diameter and depth of countersink shall be sufficient to receive bolt heads and washers or nuts and washers without projection beyond the surface of the plates.
   b. At roof edges, use 2-inch-thick stock by width as indicated. Drill holes for bolts at 4-foot centers and countersink.
      (1) On concrete deck. Set 3/8-inch self-drilling inserts at 4-foot centers. Install bottom plate using 3/8-inch bolts and washers. Nail top plate with 9d nails at 12-inch centers.
      (2) On Metal Deck: Install bottom plate using No. 14x2R self-drilling and tapping sheet metal screws at 4-foot centers. Drill holes in bottom plate so they occur in top flat area of deck.
8. Miscellaneous Blocking: Install as indicated. Countersink as required for bolt anchors.
9. Installing Related Materials: Conform to the manufacturer's recommendations, instructions and specifications.

C. ADJUST AND CLEAN:

1. Adjust and clean all items for proper alignment and as required for installation of finish treatment.
2. Protect all wood materials installed on exterior surfaces as a substrate for finish coverings with a protective waterproof covering, until finish coverings have been installed.

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7A - WALL INSULATION

7A-1 GENERAL

A. DESCRIPTION:
  1. This Section includes insulation for the following applications:
    a. Loose cavity wall insulation.
  2. Related Work Specified Elsewhere:
    a. Roof Insulation: SECTION 7B.

B. QUALITY ASSURANCE:
  1. Applicable Standards:
    a. Federal Specifications (FS):
      (1) HH-I-574 Insulation, Thermal (Perlite).
      (2) HH-I-585 Insulation, Thermal (Vermiculite).
  2. Acceptable Manufacturers:
    a. Loose Granular Insulation:
      (1) Grace Construction Products - Zonolite.
      (2) Grefco, Inc.
  3. Thermal Conductivity: The thicknesses shown are for the thermal conductivity (k-value at 75 degrees F) specified for each material. Provide adjusted thicknesses as required and approved by Engineer-Architect for the use of material having a different thermal conductivity.

C. SUBMITTALS:
  1. Compliance Submittals:
    a. Submit as specified in DIVISION 1.
    b. Includes, but not limited to, the following:
      (1) Specifications.
      (2) Installation instructions.

D. DELIVERY, STORAGE AND HANDLING:
  1. Protect from deterioration. Do not allow insulation materials to become wet or soiled, or covered with ice or snow. Conform to manufacturer's recommendations for handling, storage and protection during installation.

7A-2 MATERIALS

A. LOOSE GRANULAR INSULATION:
  1. Perlite: Expanded volcanic aggregate conforming to FS HH-I-574; thermal conductivity (k-value at 75 degrees F) of 0.35; conforming to recommendations of the Perlite Institute, Inc.
  2. Vermiculite: Expanded or exfoliated micaceous mineral aggregate conforming to FS HH-I-585; Type I; thermal conductivity (k-value at 75 degrees F) of 0.50.
  3. When used as cavity-wall or masonry-cell insulation, provide treatment of the perlite or vermiculite aggregate for water repellency.

7A-3 PERFORMANCE

A. PREPARATION:

1. Examine the substrate and the conditions under which the insulation work is to be performed for unsatisfactory conditions. Do not proceed with the insulation work until unsatisfactory conditions have been corrected.
2. Remove excess mortar, other projections, and deleterious substances which would affect installation.

B. INSTALLATION:

1. General:
   a. Conform to manufacturer's instructions for the particular conditions of installation in each case. If printed instructions are not available or do not apply to the project conditions, consult the manufacturer's technical representative for specific recommendations before proceeding with the work.
2. Loose Granular Masonry Cell Insulation:
   a. Pour granular insulation into cavities to completely fill the void spaces.
   b. Maintain inspection ports to show presence of insulation at the extremities of each pour area. Close ports only as directed after complete coverage has been confirmed.
   c. Limit fall of insulation to one story in height, but not to exceed 20'-0".
   d. Install where indicated.

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7B - ROOF INSULATION

7B-1 GENERAL

A. DESCRIPTION:
  1. This Section includes the following:
    a. Vapor barrier.
    b. Rigid insulation board.
  2. Related Work Specified Elsewhere:
    a. Metal Roof Deck: SECTION 5C.
    b. Wood Nailers: SECTION 6A.
    c. Coal Tar Bitumen Roofing: SECTION 7C.
    d. Flashings and Sheet Metal: SECTION 7D.

B. QUALITY ASSURANCE:
  1. Applicable Standards:
    a. Federal Specifications (FS):
      (1) HH-I-529 - Perlite Mineral Aggregate Board - Roof Insulation.

  2. Acceptable Manufacturers: Proprietary names are specified for material identification. Similar products of manufacturers listed below are acceptable.
    a. Insulation: Perlite.
      (1) Celotex Corporation.
      (2) Grefco, Inc.
      (3) Johns-Manville.
    b. Mechanical Fasteners:
      (1) E. S. Products, Inc.
      (2) Grefco, Inc.
      (3) Construction Fasteners, Inc.
    c. Vapor Barrier and Adhesives: (Vinyl)
      (1) Lexsuco, Inc.
      (2) Reflecto-Barrier Sales Co. Inc.

C. SUBMITTALS:
  1. Compliance Submittals:
    a. Submit as specified in DIVISION 1.
    b. Include, but not limited to, the following:
      (1) Specifications.
      (2) Installation instructions.

D. DELIVERY, STORAGE AND HANDLING:
  1. Deliver materials to project site in manufacturer's original unopened packaging with labels legible and intact.
  2. Do not overload the structure with the storage of materials or equipment on the deck or concentrated in one location.
  3. Store rigid insulation in a dry, well ventilated location to prevent moisture absorption or water penetration and to provide circulation of air under and around the stacked material.

E. JOB CONDITIONS:
1. Do not install insulation when temperature is 40 degrees F or below, during rain or wet weather, or when deck surfaces are wet.
2. Do not proceed with installation of roof insulation unless installation of roofing can follow immediately and will be installed over insulation on the same day.

7B-2 MATERIALS

A. BASIC MATERIALS: Conform to the following:
1. Vapor Barrier:
   a. Vinyl plastic sheets, Lexsuco Vapor Barrier as manufactured by Lexsuco, Inc.
2. Insulation Board: Insulation provided shall have a minimum "C" value of .36. Board size: 1-1/2 inches.
   a. Perlite FS-HH-I-529.
3. Mechanical Fasteners: Permafastener as manufactured by Grefco, Inc.

7B-3 PERFORMANCE

A. PREPARATION:
1. Clean roof deck free of all debris, dirt and dust, frost or after effects of freezing, grease or any other foreign materials. Surface shall be smooth and free of ragged condition at panel joints and opening edges.
2. Correct deck surfaces in poor alignment, loose welds, improper support, unrequired holes or projections, voids and low spots.
3. Realign curbs, nailers, projecting structural members, and other roof accessories where defective or not properly installed.
4. Do not proceed until conditions are satisfactory.

B. INSTALLATION-APPLICATION:
1. Application of Vapor Barrier on Metal Decks With Mechanical Fastening of Insulation:
   a. Lay vapor barrier dry, and install in the same direction as the ribs of the steel deck.
   b. Lap sides 2 inches and ends 6 inches. Seal laps with sufficient adhesive to ensure a tight seal.
   c. Smooth out all wrinkles and air pockets.
2. Application of Rigid Insulation:
   a. General:
      (1) Apply insulation on roof decks where indicated.
      (2 Cut and fit insulation neatly around all vertical surfaces to provide not over 1/2-inch clearance or as indicated.
      (3) Lay only amount of insulation that can be completely covered with roofing felts on the same day. Where work is stopped or at end of working day, protect all edges from water penetration or moisture with cutoff strips.
      (4) Provide 8-inch-wide cutoff strips of 15-pound felt.
      (5) Remove cutoff strips at beginning of next day's work.

b. Application on Metal Deck With Mechanical Fastening:

(1) Lay insulation boards in single layer.

(2) Place layer dry. Butt all edges tightly together, but do not force in place.

(3) Lay boards with long dimensions perpendicular to ribs of metal deck, in parallel courses and with transverse joints staggered with those of adjacent courses. All edges shall be supported and shall not occur over rib openings on metal deck with rib opening greater than 3/4-inch.

(4) Drive metal fasteners through all insulation boards into metal deck using fasteners per board as required by insulation manufacturer to meet FM requirements. Place fasteners maintaining an unbroken pattern. Do not drive fasteners into voids of metal deck. Length of fasteners and method of fastening shall be as recommended by manufacturer of insulation.

C. FIELD QUALITY CONTROL:

1. Protect insulation work from exposure to moisture, damage and deterioration, primarily by prompt installation of roofing system. Remove and replace insulation work which has become wet, damaged or deteriorated before proceeding with roofing systems.

D. CLEANUP: Remove all debris, tar, adhesives, and spillage from work area and adjacent areas and leave in a clean condition.

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7C - BUILT-UP COAL-TAR BITUMEN ROOFS - GRAVEL SURFACED

7C-1 GENERAL

A. DESCRIPTION:
  1. This Section includes built-up gravel surfaced roof system over rigid insulation.
  2. Related Work Specified Elsewhere:
    a. Wood Nailers: SECTION 6A.
    b. Roof Insulation: SECTION 7B.
    c. Flashings and Sheet Metal: SECTION 7D.

B. QUALITY ASSURANCE:
  1. Applicable Standards:
    a. American Society for Testing and Materials (ASTM):
      (1) D43 - Creosote for Priming Coat with Coal-Tar Pitch in Dampproofing and Waterproofing.
      (2) D227 - Coal-Tar Saturated Roofing Felt for Use in Waterproofing and in Constructing Built-Up Roofs.
      (3) D450 - Coal-Tar Pitch for Roofing, Dampproofing and Waterproofing.
      (4) D1863 - Mineral Aggregates for Use on Built-Up Roofs.
      (5) D2626 - Asphalt Base Sheet For Use in Construction of Built-Up Roofs.
      (6) D290 - Asphalt-Saturated Asbestos Felts for Use in Waterproofing and in Constructing Built-Up Roofs.
    b. Federal Specifications (FS):
      (1) SS-C-153 - Cement, Bituminous Plastic.
      (2) TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.
  2. Regulatory Agencies:
    a. Underwriters' Laboratories (UL).
    b. Factory Mutual (FM).
  3. Acceptable Manufacturers:
    a. Celotex Corporation.
    b. Koppers, Inc.
  4. Installer Qualifications: Roofing system installers shall be approved by materials manufacturer.

C. SUBMITTALS:
  1. Compliance Submittals:
    a. Submit as specified in DIVISION 1.
    b. Include, but not limited to, the following:
      (1) Specifications.
      (2) Installation Instructions.
  2. Manufacturer's Certificates:
    a. Submit as specified in DIVISION 1.
    b. Certify that bituminous materials, roofing fabrics, and other roofing materials comply with the requirements specified in this section.

D. DELIVERY, STORAGE AND HANDLING:
1. Deliver materials to the project site sealed in the manufacturer's original packaging with the labels legible and intact.
2. Handle all materials in a manner to prevent breakage of packaging or damage to the materials.
3. Storage:
   a. Store in a dry, well ventilated, weathertight place to prevent moisture absorption or water penetration, and to provide circulation of air under and around the materials.
   b. Stack bitumen and adhesive containers with lid-end up.
   c. Keep all labels intact and legible until containers are emptied.
   d. Do not overload the structure with the storage of material or equipment on the deck or concentrated in one location.

E. JOB CONDITIONS:
1. Do not apply roofing and fabric flashing materials while the following conditions exist:
   a. Temperature: Less than 45 degrees F unless special precautions are taken as recommended by roofing material manufacturer.
   b. Weather: During the presence of rain, ice or snow.
   c. Wind: During wind velocities exceeding 25 miles per hour.
2. Clean the interior surfaces of bitumen heating vats and transporting equipment and the working surfaces of tools of all foreign material and materials that would effect the proper installation of roofing materials.

F. ROOFING GUARANTEE:
1. Contractor shall guarantee the roof covering system against leaking as follows:
   a. Guarantee shall be for two years from the date of substantial completion as specified in General Conditions.
   b. Guarantee shall cover the following:
      (1) All built-up roof coverings and fabric base flashings.
      (2) Repair of the faulty areas of the roof covering system.

7C-2 MATERIALS

A. BASIC MATERIALS: All materials shall conform to the following:
1. Primer, Creosote - ASTM D43.
2. Bitumen, Coal-Tar - ASTM D450 Type III except for softening point or Koppers Bitumen.
3. Felts, Coal-Tar Pitch Saturated - ASTM D227.
4. Felts, Asbestos, Asphalt Saturated - ASTM D250.
5. Roofers Cement, - FS SS-C-153 Type I, Asphalt Base; Type II, Tar Base where specified.
6. Aggregates - ASTM D1863.

B. BITUMEN REQUIREMENTS:
1. Softening Point Temperature Range: Coal-Tar Bitumen - as per manufacturers' specifications.

2. Heating and Application Temperatures: Type A - Coal-Tar Pitch, heat to 400 degrees F, maintain at 300 to 375 degrees F.

C. CONSTRUCTION OF ROOF COVERINGS (per 100 square feet):
1. Felt: 4 plies of 15-pound tar saturated felt.
2. Bitumen: 25 pounds, Type A coal-tar pitch between each ply of felt.
3. Surface Coating: 75 pounds, Type A, coal-tar pitch flood coat.
4. Aggregates: Gravel - 400 pounds.

D. CONSTRUCTION OF MEMBRANE FLASHINGS: As specified in PART 7C-3.

7C-3 PERFORMANCE

A. PREPARATION:
1. Remove unrequired projections of concrete, mortar, nails, bolts, nailers, fins, etc.
2. Remove and replace with new material any insulation which has become wet, damaged, loose, or in poor alignment.
3. Prepare substrate to prevent hot bitumen from entering the building or drains.
4. Do not proceed with installation of roof covering until surfaces are satisfactory.

B. INSTALLATION OF ROOF COVERINGS:
1. Felts:
   a. When starting the application of roofing felts use appropriate width starting strips of felt to achieve the specification ply build-up at that point, so that successive plies laid single fashion will produce the ply requirement. Begin starter courses at low point of deck.
   b. Use felts from rolls that are 36 inches wide.
   c. Roll out felts transverse to the deck slope so that direction of water flow is over the laps and not into them.
   d. Over the insulation surface apply 4 plies of felt lapped 27-1/2 inches. Mop between each lap with hot coal-tar pitch. Install at flashings as specified under "Installation of Membrane Flashings."
   e. Overlap ends of all connecting plies not less than 10 inches. End stripping or taping of these laps will not be permitted.
2. Surface Coating: Uniformly coat the entire surface of the roofing membrane with hot coal-tar bitumen into which, while still hot, embed the aggregates.

C. INSTALLATION OF MEMBRANE FLASHINGS: Construct flashings to the details and specifications of the roof covering manufacturer and as follows:

1. Flashings at Gravel Stops and Scuppers:
   a. Extend bottom 2 plies of roof felts at least 6 inches beyond roof edge. After remaining felts and coal tar pitch of roofing membrane are applied, fold the extended bottom layers up and over the remaining layers and mop plies in place.
   b. Set scupper flange in a solid troweling of asphalt base roofers cement and secure to nailer.
   c. Set 2 plies of roof felts in roofers cement over scupper flange and 6" beyond.
   d. Set gravel stop flange in a solid troweling of asphalt base roofers cement and secure as recommended by manufacturer.
   e. Apply flood coat of coal-tar pitch and embed aggregates to gravel stop lip.

D. WORKMANSHIP:
1. Broom or press all layers of felts into bitumen. Take care to avoid wrinkles, buckles, kinks, tearing and other deformations that will result in formation of air pockets and blisters. In no case shall felts touch felts without an inner layer of required bitumen or roofers cement.
2. Roofing work shall be watertight for normal weather exposures, and not deteriorate in excess of normal weathering.

E. FIELD QUALITY CONTROL:
1. Cross Sectioning for Inspection:
   a. The roofing contractor may be required to cut the roofing at any point for a cross section to determine if proper quantities of material have been used.
   b. If membrane is found lacking in weight or number of plies, the Engineer-Architect may, at his discretion, require additional material be added to bring the roof up to specifications.
2. Repairs: Repair cross sectioned area as follows:
   a. Fill cutout areas with plies of roofing felt flush with surface of roofing.
   b. Install same number of felts as originally used, in hot pitch, lapping each ply 6 inches out on roofing, at ends and sides for each roofing ply.
3. Expense:
   a. If cross sections indicate roofing complies with specifications, the expense of the cross sectioning will be paid by Owner.
   b. If cross sectioning indicates roofing does not comply with specifications, expense of cross sectioning and additional material shall be paid by the Contractor.

F. CLEANUP:
1. Clean bitumen from all gravel stops, fascias, scuttles, roof drain dams and other roof items.
2. Remove excess aggregates from roof drain sumps.
3. Clean work area of all debris including areas surrounding the structure and beneath roof.

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7D - FLASHING AND SHEET METAL

7D-1 GENERAL

A. DESCRIPTION:

1. This Section includes the following items:
   a. Metal flashings.
   b. Metal gravel stops and fascia trim.
   c. Metal scuppers and downspouts.
   d. Laminated through-wall flashing.
2. Related work specified elsewhere:
   a. Built-up roofing: SECTION 7C.
   b. Sealants and caulking: SECTION 7E.

B. QUALITY ASSURANCE:

1. Applicable Standards:
   a. American Iron and Steel Institute (AISI).
   b. American Society for Testing and Materials (ASTM):
      (1) A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements.
      (2) A526 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.
      (3) B32 - Solder Metal.
      (4) B69 - Rolled Zinc.
      (5) B370 - Copper Sheet and Strip for Building Construction.
      (6) B209 - Aluminum-Alloy Sheet and Plate.
   c. Federal Specifications (FS):
      (1) QQ-L-201 - Lead Sheet.
      (2) SS-C-153 - Cement, Bituminous, Plastic.
      (3) TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.
   d. National Roofing Contractors Association (NRCA).
   e. Sheet metal and Air Conditioning Contractors' National Association (SMACNA).
2. Acceptable Manufacturers: As specified in PART 2, this Section.

C. SUBMITTALS:

1. Compliance Submittals:
   a. Submit as specified in DIVISION 1.
   b. Include, but not limited to, the following:
      (1) Specifications of materials and installation.
      (2) Catalog cuts.
      (3) Details of fabrication and installation.

D. DELIVERY. STORAGE AND HANDLING:

1. Store all materials or fabricated items in a manner to protect from warping, staining, or other damage.

7D-2 EQUIPMENT AND MATERIALS

A. BASIC MATERIALS:

1. Zinc Coated Steel Sheet:
   a. Commercial quality carbon steel sheet with minimum of 0.20 percent copper content conforming to ASTM A526; hot-dip galvanized conforming to ASTM A525, G90.
   b. Gauge as indicated.
   c. Use for the following items or locations:
      (1) Sheet metal indicated.
2. Copper Laminated Sheet Flashing:
   a. Copper sheet, bonded between 2 sheets of bituminous impregnated karft paper or bituminous saturated fabric.
   b. 5 ounces of copper per square foot at copings, 3 ounces of copper per square foot for all other flashings.
   c. Use for the following items or locations:
      (1) Through-wall flashing:
         (a) Heads of exterior doors, windows, louvers.
         (b) Sills of exterior windows, louvers.
         (c) Bottom of all exterior masonry walls.
   d. Manufacturer:
      (1) Sandell Manufacturing Company, Inc. - Copper Fabric.
      (2) St. Regis - Copper Semoured Sisalkraft.
      (3) Wasco Products, Inc. - Copper Fabric.
3. Aluminum:
   a. Conform to ASTM B209, alloy 3003, temper H14, mill finish.
   b. Use for the following items or locations:
      (1) Downspouts - .032" thickness.
      (2) Scuppers - .040" thickness.
   c. Use for the following items or locations:
      (1) Downspouts.

B. PREFORMED PRODUCTS:

1. Extruded Aluminum Roof Edge Fascia and Gravel Stop:
   a. Conform to ASTM B221, alloy 6063-T52, mill finish.
   b. 12B and S minimum gauge.
   c. Furnish complete with formed aluminum joint covers and flashing assembly, and with prefabricated, mitered and welded corner units.
   d. Use for the following items or locations:
      (1) Gravel stop and fascia.
2. Strainer Units:
   a. Fabricated of minimum 0.062-inch diameter, non-corrosive, compatible wire or wire mesh, with 1/2-inch maximum spacing of wires, bee-hive design.
   b. One required for each scupper outlet.

C. MISCELLANEOUS MATERIALS:

1. Solder and fasteners for metal work as recommended by sheet metal manufacturer and as required by installation.
2. Primers, adhesives, tapes and fasteners for nonmetallic work as recommended by flashing manufacturer and as required by installation.
3. Roofing cement to conform to FS SS-C-153, type I, asphaltic.

4. Bituminous coating to conform to FS TT-C-494, cold applied bituminous mastic, compounded for 15-mil dry film thickness.

7D-3 PERFORMANCE

A. GENERAL:
1. Fabricate all metal work required by this section conforming to profiles and details indicated, and the standard industry practices as shown by SMACNA in the Architectural Sheet Metal Manual and NRCA in the "Here's How to Make A Roof Drain."
2. Coordinate the work with other work for the correct sequencing of items which make up the weatherproofing system.
3. Install all exterior flashing and sheet metal to make the work watertight.

B. PREPARATION:
1. "Broom clean" roof surfaces and other areas receiving flashing or sheet metal work.
2. Tighten and realign loose wood nailers and blocking.
3. Straighten warped or bent metal sheets and preformed metal flashings.

C. FABRICATION AND INSTALLATION:
1. Through-wall Flashings:
   a. Start flashing 1/2-inch from exterior face of wall. Extend through wall stopping 1/2-inch from interior face of wall.
   b. Lap joints at least 4 inches. Splice multilayer material. Seal joints with asphalt mastic.
2. Roof Edge Fascia and Gravel Stop:
   a. Install at roof edge as indicated.

   c. Space joints 10'-0" oc and lap each length 4 inches. Secure together with concealed splice plate or slip joining member designed to allow for expansion and contraction.
   d. Set roof flange in plastic cement bed and secure to nailer as recommended by manufacturer.
   e. Install prefabricated units at corners.
3. Scrupper:
   a. Fabricate as indicated.
4. Downspouts:
   a. Fabricate in 10'-0" lengths, and telescope upper sections into lower sections 1-1/2 inches minimum.
   b. Provide elbows away from building at open downspout ends.
   c. Secure to wall with 1/16-inch x 1-inch straps of same material as downspout. Attach downspout to strap with sheet metal screws. Attach strap to masonry wall with expansion bolts.
   d. Locate straps at downspout top, bottom, horizontal joint, and at 10'-0" oc maximum.
5. Downspout Strainers: Fit tightly in each drain outlet.

D. REPAIRING AND CLEANING:

1. As work progresses, clean surfaces of all dirt, grease, oils, flux, adhesives, sealants, or other foreign substances.
2. Leave work clean and free of stains.
3. Repair or replace all damaged work.

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7E - SEALANTS AND CAULKING

7E-1 GENERAL

A. DESCRIPTION:
  1. This Section includes sealants and caulking for application in the following general locations:
    a. Joints around perimeter of door, window, and louver frames.
    b. Joints at penetration of walls, decks, and floors by piping and other services or equipment.
    c. General caulking.
  2. Related Work Specified Elsewhere:
    a. Joints in concrete: SECTION 3C.
    b. Joint Fillers: SECTION 7F.

B. QUALITY ASSURANCE:
  1. Applicable Standards:
    a. Federal Specifications (FS):
      (1) TT-S-00227 - Sealing Compound; Elastomeric Type, Multi-Component (For Caulking, Sealing And Glazings In Building and Other Structures).
  2. Acceptable Manufacturers:
    a. Sealants and Caulking:
      (1) Gibson-Homans Co..
      (2) Pecora Chemical Corporation.
      (3) Products Research and Chemical Corporation.
      (4) Sika Chemical Corp.
      (5) Sonneborn/Contech, Inc.
      (6) Tremco Manufacturing Company.
      (7) W. R. Grace & Company.
      (8) W. R. Meadows, Inc.
    b. Sealant Backer Rod:
      (1) Dow Corning Corporation.
      (2) Products Research & Chemical Corp.
      (3) Tremco Manufacturing Company.
      (4) Denver Foam.
  3. Manufacturer shall have a minimum of 5 years of successful experience in the production of types of sealants and caulking compounds required.
  4. Installation contractor shall have a minimum of two years' successful experience in the application of the types of materials required.

C. SUBMITTALS:
  1. Compliance Submittals:
    a. Submit as specified in DIVISION 1.
    b. Includes, but not limited to, the following for each type of sealant, caulking or associated material required.
      (1) Specifications.
      (2) Installation instructions.
      (3) Color charts.
      (4) Samples: Submit 3 samples of each color of each type of sealant or caulking compound exposed to view.

D. DELIVERY, STORAGE AND HANDLING:
1. Deliver all materials in original sealed containers with labels and inscriptions legible and intact.
2. Store all materials in areas suitable to prevent deterioration or shortened working life.

E. JOB CONDITIONS:
1. Do not proceed with application under adverse weather conditions, or when temperature is below 40 degrees F or above manufacturer's recommended limitations.
2. Proceed with application only when forecasted weather conditions are favorable for proper cure and development of bond strength.

F. WARRANTY:
1. Submit as specified in DIVISION 1.
2. Submit written warranty for elastomeric sealants, agreeing to repair or replace sealants which fail to perform as airtight or watertight joints; or fail in joint adhesion, weather resistance, stain resistance, or general durability.
3. Warranty to be signed by installation contractor and Contractor.
4. Warranty period is fifteen years.

7E-2 EQUIPMENT AND MATERIALS

A. GENERAL:
1. Before purchase of each specified sealant, investigate its compatibility with the joint surfaces, joint fillers, and other materials in the joint system.
2. Provide only materials (manufacturer's recommended variation of the specified materials) which are known to be compatible with the actual installation conditions, subject to approval of Engineer-Architect.

B. ELASTOMERIC SEALANTS:
1. Two-Component Polysulfide Sealant:
   a. Conform to FS TT-S-00227, Class A, Type II nonsag. (Use Type I self-leveling for horizontial floor joints.)
   b. Sealant shall bear the Thiokol Chemical Corporation seal of approval.
   c. Colors: No. 516 Off White.
   d. Pecora Chemical Corp. GC-5.
   e. Use in the following locations:
      (1) Exterior and interior joints around perimeter of door and louver frames.
      (2) Exterior and interior joints at penetration of walls, decks and floors by piping, conduit and other services or equipment.
      (3) Thresholds.
      (4) Interior general caulking and sealing.

C. MISCELLANEOUS MATERIALS:
1. Joint Cleaner: Type as recommended by the sealant or caulking compound manufacturer, for the joint surfaces to be cleaned.

2. Joint Primer/Sealer: Type as recommended by the sealant manufacturer, for the joint surfaces to be primed or sealed.
3. Bond Breaker Tape:
   a. Polyethylene tape or other plastic tape as recommended by the sealant manufacturer.
   b. To be applied to sealant-contact surfaces where bond to the substrate or joint filler must be avoided for proper performance of sealant.
   c. Self-adhesive tape wherever applicable.
4. Sealant Backer Rod:
   a. Compressible rod stock.
   b. Closed cell polyethylene foam, butyl rubber foam, neoprene foam, or other flexible, permanent, durable nonabsorptive material as recommended for compatibility with sealant by sealant manufacturer.
   c. Rod shall be of size and shape to control joint depth, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side and provide a highly compressible backer to minimize the possibility of sealant extrusion when joint is compressed.
   d. Dow Corning Corp. - Ethafoam SB.

7E-3 PERFORMANCE

A. JOINT SURFACE PREPARATION:

1. Clean joint surfaces immediately before application of sealant or caulking compound.
2. Remove dirt, oil, grease, insecure coatings, moisture, corrosion, loose aggregate, and other substances which would interfere with bond.
3. Etch concrete and masonry joint surfaces as follows:
   a. Remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with bond and performance.
   b. Etch with 5 percent solution of muriatic acid, neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.

B. APPLICATION:

1. Conform to manufacturer's printed instructions except where indicated otherwise.
2. Prime or seal joint surfaces as required.
3. Install sealant backer rod for sealants except where indicated to be omitted.
4. Install bond breaker tape as required to ensure that elastomeric sealants will perform properly. Use when applying polysulfide or other polymer-type sealants over asphalt impregnated joint fillers.
5. Use only proven application techniques which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surfaces equally on opposite sides.
6. Mix only amount of two-component sealants which can be applied within working life.

7. For polysulfide sealants, conform to standards issued by Thiokol Chemical Corporation except where more stringent requirements are indicated or specified otherwise, or have been issued by sealant manufacturer.
8. Install sealants to depths as indicated or, if not indicated as recommended by sealant manufacturer, within the following limitations:
   a. For normal moving joints sealed with elastomeric sealants, but not subject to traffic, fill joints to a depth equal to 50 percent of joint width, but neither more than 1/2-inch depth nor less than 1/4-inch depth.
   b. For joints sealed with non-elastomeric sealants and caulking compound, fill joint to a depth of 75 to 125 percent of joint width.
9. Unless indicated otherwise, tool joint sealant to a slightly concave surface, slightly below adjoining surfaces. Joint shall be weathertight.
10. Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces such as exposed aggregate panels and similar rough textures.
11. Remove excess and spillage of compound promptly as the work progresses. Clean the adjoining surfaces as required to eliminate evidence of spillage, without damage to adjoining surfaces or finishes.
12. Cure sealants and caulking compounds conforming to manufacturer's printed instructions to achieve strength and surface durability. Do not cure in a manner which would alter materials modulus of elasticity or other characteristics.

C. FIELD QUALITY CONTROL:

1. After nominal cure of exterior joint sealants which are exposed to weather, test for water leaks as follows:
   a. Flood joint exposure with water directed from a 3/4-inch garden hose and connected to water system with 30-psi minimum static water pressure.
   b. Hold hose perpendicular to wall face, 2'-0" from joint, and move stream of water along joint at approximate rate of 20 feet per minute.
   c. Test approximately 5 percent of total joint system, in locations which are typical of every joint condition, and which can be inspected easily for leakage on opposite face.
   d. Perform tests in presence of Engineer-Architect.
2. Repair sealant installation at leaks or, if leakage is excessive, replace sealant installation as required.

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7F - JOINT FILLERS

7F-1 GENERAL

A. DESCRIPTION:
1. This Section includes joint fillers in the following general locations:
   a. Expansion and control joints in masonry walls.
   b. Joints between tops of walls and structural members.
   c. Pipe and conduit penetrations through walls, floors and roofs.
   d. Other joints specified or indicated.
2. Related Work Specified Elsewhere:
   a. Joint Fillers in Concrete: SECTION 3C.
   b. Sealants and Caulking: SECTION 7E.

B. QUALITY ASSURANCE:
1. Applicable Standards:
   a. American Society for Testing and materials (ASTM):
      (1) D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
2. Acceptable Manufacturers:
   a. Sponge Rubber Joint Filler:
      (1) Williams Products, Inc.
      (2) A. C. Horn Co.
      (3) W. R. Meadows, Inc.
   b. Cork Joint Filler:
      (1) J&P Petroleum Products, Inc.
      (2) W. R. Meadows, Inc.
      (3) Sonneborn/Contech, Inc.
   c. Urethane Joint Filler - Aerosol Foam:
      (1) Insta-Foam Products, Inc.

C. SUBMITTALS:
1. Compliance Submittals:
   a. Submit as specified in DIVISION 1.
   b. Includes, but not limited to, the following:
      (1) Specifications.
      (2) Catalog cuts.
      (3) Installation details.
      (4) Samples: 3 samples of each joint filler.

D. DELIVERY, STORAGE AND HANDLING:
1. Store all joint filler materials in a manner to prevent absorption of moisture, warping, or other damage.

7F-2 EQUIPMENT AND MATERIALS

A. GENERAL:
1. Size and shape: As indicated, or if not indicated as recommended by the joint filler manufacturer for the joint size and condition.
2. Compressibility: Specified hardness and compressibilities are intended to establish requirements for normal or average conditions, whenever a

range of hardness or compressibility is available for a product, conform to manufacturer's recommendation for the specific condition or use.

3. Color: Manufacturer's standard color which has the best overall performance characteristic for application indicated.
4. Compatibility: Before purchase of each joint filler, confirm that it is compatible with the substrate, sealants, and other materials in the joint system.
5. Adhesives:
   a. Pressure sensitive adhesives compatible with each material in the joint system may be applied to one face of joint filler to facilitate installation and permanent anchorage.
   b. Do not allow adhesives to contaminate sealant bond surfaces in joint system.

B. CONTROL-EXPANSION JOINT FILLERS

1. Cork Joint Filler:
   a. Conform to ASTM D1752, Type II.
   b. Resilient, non-extruding type premolded cork, thickness as indicated.
   c. W. R. Meadows, Inc. - Cork.
   d. Use in the following locations:
      (1) Interior concrete masonry unit wall intersections.
2. Sponge Rubber Joint Filler:
   a. Resilient, non-extruding, open cell type premolded rubber.
   b. Conform to ASTM D1752, Type I.
   c. A. C. Horn Company - Cementone Sponge Rubber 3329.
   d. Use in the following locations:
      (1) Joints between top of concrete masonry unit walls and bottom of beam or ceiling.

C. MISCELLANEOUS FILLERS:

1. Urethane Joint Filler - Aerosol Foam:
   a. Rigid urethane foam formed from aerosol dispensing unit.
   b. Waterproof, fire retardant.
   c. Suitable for field application and purpose intended.
   d. Insta-Foam Products, Inc. - Froth Pak.
   e. Use in the following locations:
      (1) Pipe and conduit flashing through masonry walls as indicated.

7F-3 PERFORMANCE

A. INSTALLATION:

1. Conform to joint filler manufacturer's recommendations for each type of joint filler required unless more stringent requirements are specified or indicated.
2. Set units at proper depth or position in joint to coordinate with other work, including the installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between the ends of joint filler units.

7F - JOINT FILLERS: continued

3. Recess exposed edges or faces of exposed joint fillers slightly behind adjoining surfaces, so that compressed units will not protrude from the joint.

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7G - CHEMICAL-RESISTANT COATING - WALLS

7G-1 GENERAL

A. DESCRIPTION:

1. This Section includes chemical-resistant coating of concrete surfaces as indicated. The cast iron manhole steps, inside the face of sleeves and exposed faces of the steel plate embedded in concrete using type II cement shall also receive chemical resistant coating.

2. Related Work Specified Elsewhere:
   a. Concrete - SECTION 3C.
   b. Steel - SECTION 5A.
   c. Protective Coatings - SECTION 9A.

B. QUALITY ASSURANCE:
1. Applicable Standards:
   a. American Society For Testing and Materials (ASTM):
      (1) D450 - Coal-Tar Pitch For Roofing, Dampproofing and Waterproofing.
2. Acceptable Manufacturers: Specified in PART 7G-2.
3. All materials used in chemical-resistant coating system shall be suitable for the purpose intended.
4. Chemical-Resistant Coating Applicator must be familiar with the application of the system specified and approved by the manufacturer.

C. SUBMITTALS:
1. Compliance Submittals:
   a. Submit as specified in DIVISION 1.
   b. Includes, but not limited to, the following:
      (1) Specifications for materials.
      (2) Installation instructions.

D. DELIVERY, STORAGE AND HANDLING:
1. Deliver all materials in containers or cartons bearing the manufacturer's original labels.
2. Protect materials to keep clean, dry, and within manufacturer's temperature limitations.

7G-2 EQUIPMENT AND MATERIALS

A. COLD-APPLIED COAL-TAR EPOXY (Chemical-Resistant Coating):
1. Coal-tar epoxy coating (two-component).
2. Manufacturers:
   a. Carboline - CM 14.
   b. Cook - 920-B-221.
   c. Koppers Company, Inc. 300-M.
   d. Tnemec - Tnemec Tar 46-413.

7G-3 PERFORMANCE

A. SURFACE PREPARATION:

1. Examine surfaces to receive epoxy coating for conditions that will affect installation, permanence, or quality of work. Do not apply epoxy materials until conditions are satisfactory.
2. Repairing of cracks, holes, and voids is specified in SECTION 3C.
3. Protect other work from spillage of materials and prevent materials from penetrating and clogging drains.
4. Clean concrete substrate free of loose aggregate, protrusions, dirt, dust, oil, grease, asphalt, curing compound or other substances which would affect installation of coating.
5. Sandblast or etch concrete surfaces as required by coal-tar epoxy manufacturer.
6. Steel Surfaces Shop primed with inorganic zinc-rich primer (including grating support beam in ash pipe drain pit structure) shall be field touched-up with inorganic zinc-rich paint of the same type and by the same manufacturer as the shop coat. Surface preparation for surfaces to be touched-up shall be SSPC-SP6, Commercial Blast.
7. Unprimed steel surfaces, including embedded plates, shall be sandblasted to SSPC SP 5, white metal blast, immediately preceding application of coating.

B. INSTALLATION:

1. General:
   a. Prepare and apply materials conforming to manufacturer's printed instructions and as specified.
   b. Do not proceed with epoxy coating until vents, piping, conduit, and other projections through the substrate have been completed.
2. Cold-Applied Coal-Tar Epoxy:
   a. Apply as chemical-resistant coating on concrete and steel surfaces where indicated.
   b. Allow concrete to age a minimum of 7 days after normal cure before application of coating.
   c. Apply coal-tar epoxy as follows:
      (1) First Coat: Coal-tar epoxy with minimum 55 percent solids by volume (thin 1:1) applied at 2 mils dry to concrete surfaces only.
      (2) Second Coat: Coal-tar epoxy with minimum 55 percent solids by volume applied at 7 mils dry (8 mils dry to steel surfaces).
      (3) Third Coat: Same as second coat.
      (4) System Total: 16 mils minimum dry film.
   d. Pretreat first coat as required by manufacturer if second coat is not applied within manufacturer's specified time limit.
   e. Do not apply when atmospheric temperature is less than 50 degrees F.
   f. Allow coating to cure a minimum of 7 days before immersion.
   g. When applying over steel surfaces shop coated with inorganic zinc-rich primer, apply a wet mist coat and allow tiny bubbles to form. When bubbles disappear in 1 to 2 minutes, apply a full wet coat at specified mil thickness.
   h. Apply to steel surfaces only after erection.

7G - CHEMICAL-RESISTANT COATING - WALLS: continued

C. CLEANING AND REPAIRING:

1. Clean all work which is soiled and replace or restore work damaged by the installation of coal-tar epoxy coating.

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DIVISION 9 - FINISHES

9A - PROTECTIVE COATINGS

9A-1 GENERAL

A. DESCRIPTION:

1. Work included in this Section:
   a. Coating of interior and exterior surfaces as specified herein.
   b. Coating includes surface preparation, priming, finish coats, inspection, cleaning, and tough-up of surfaces and equipment in addition to shop priming and surface treatment specified elsewhere.
   c. Touch-up for all work included in this contract.
   d. Finish painting for areas specified.
2. Provide complete finish painting for the following:
   a. Ash Pond Electrical Equipment Building, interior and exterior surfaces.
   b. Contents of Ash Pond Electrical Equipment Building, including machinery, equipment and accessories furnished in this Contract.
   c. Bridge structures over Ash Pond and Sludge Pond.
   d. Finish paint all surfaces with appropriate coatings specified in ARTICLE 9A-2.B, COATING SYSTEMS.
3. Provide touch-up for all galvanized work included in this contract. (See COATING SYSTEMS, 9A-2.B.6)
4. Specific Surfaces to be Painted:
   a. All ungalvanized ferrous metal items in this contract shall receive one complete coat of prime paint, including shop or field applied coatings and touch-up, in addition to other coatings specified.
   b. Paint all non-ferrous pipe and conduit in finish painted areas, including aluminum, plastic, copper and galvanized.
5. Surfaces Not to be Painted:
   a. Concrete, except where specified or indicated.
   b. Glass, rubber, neoprene and finish plated items.
   c. Factory finished items, except where indicated.
   d. Nameplates, code stampings and other manufacturer's identification.
   e. Mechanical and electrical shafts, linkages or sensing devices.
   f. Galvanized items, except where specified or indicated.
6. Related Work Specified Elsewhere:
   a. Shop Painting and Coatings - All applicable divisions.
   b. Factory Prefinished Items - All applicable divisions.
   c. Chemical-Resistant Coating: SECTION 7G.
7. Colors:
   a. Color of paints and finishes shall match approved color samples.
   b. Colors shall be as follows:
      (1) Concrete Block, Interior Surfaces - Tnemec, No. 2049.
      (2) Structural and Miscellaneous Steel, Interior and Exterior - Tnemec, No. 2049.
      (3) Hollow Metal Doors and Frames - Tnemec, No. 2047.
      (4) Machinery and Equipment - Tnemec, No. 2047.
      (5) Electrical Cabinets and Panels, Factory Finished - Touch up as specified to match color of finish paint.

B. QUALITY ASSURANCE:
  1. Applicable Standards:
    a. American National Standards Institute (ANSI):
      (1) A 13.1 - Scheme for the Identification of Piping Systems.
      (2) Z 53.1 - Safety Color Code for Marking Physical Hazards.
    b. Steel Structures Painting Council (SSPC) Surface Preparation Specifications:
      (1) SP 1 - Solvent Cleaning. Removes oil grease, soil, etc., with other methods to remove rust, paint, and mill scale.
      (2) SP 2 - Hand Tool Cleaning. Removes loose mill scale, rust, paint. Not intended to remove all scale or rust.
      (3) SP 3 - Power Tool Cleaning. Removes loose material. Not intended to remove all scale or rust.
      (4) SP 4 - Flame Cleaning of New Steel. Acetylene flame and wire brush to remove all unbonded scale and rust.
      (5) SP 5 - White Metal Blast Cleaning. Removes all scale, rust, foreign matter. Leaves surface gray-white uniform metallic color.
      (6) SP 6 - Commercial Blast Cleaning. Two-thirds of each square inch free of all visible residues; remainder only light discoloration.
      (7) SP 7 - Brush-Off Blast Cleaning. Removes only loose material, remaining surface tight and abraded to give anchor pattern.
      (8) SP 8 - Pickling. After solvent cleaning remove all mill scale, rust, rust scale, and oxide by acid immersion and hot water rinse 140 degrees or more.
      (9) SP 10 - Near-White Blast Cleaning. At least 95 percent of each square inch shall be free of all visible residues.
  2. Acceptable Manufacturers: Proprietary names and codes are specified for material identification from these manufacturers.
    a. Carboline Company.
    b. Cook Paint and Varnish.
    c. Koppers Company, Inc.
    d. Mobil Chemical Company.
    e. Themec Company, Inc.
  3. Painter Qualifications:
    a. Painting shall be applied only by qualified and experienced personnel.
    b. Submit the name of the painting subcontractor to the Engineer-Architect for approval along with a list of his most recent jobs, including the names of owners and architects who can be contacted for reference.
  4. Include on label of container:
    a. Manufacturer's name and stock number.
    b. Type of paint and generic name.
    c. Color name and number.
    d. Instructions for reducing, if applicable.
    e. Mixing and application instructions.
    f. Drying or curing time.
    g. Storage and temperature limits.

5. Sampling of Materials:
   a. All materials to be used will be subject to testing for compliance with Specifications.
   b. Owner will provide testing.
6. Fungus Control: Organic coatings shall pass fungus growth test as specified in Federal Test Method Standard No. 141, Method 6271.1.

C. COMPLIANCE SUBMITTALS:
1. Submit as specified in DIVISION 1.
2. Includes, but not limited to, the following:
   a. Label analyses of all coating materials proposed for use if other than paint products listed in ARTICLE 9A-2.B, Coating Systems.
   b. General catalog including color charts, product description and application data materials to Engineer-Architect.
   c. Minimum of three (3) color samples of selected colors on 3-inch by 5-inch boards.
      (1) Colors to be exact match of existing colors, where required.
      (2) Each card to bear color identification and surfaces on which color will be used.
      (3) One approved color sample will be returned to the Contractor and will be kept at project site for reference.
      (4) No painting will be started until color samples are approved and available for reference.

D. SUBSTITUTIONS:
1. Request as specified in General Conditions.
2. Equivalent products of manufacturers listed in ARTICLE 9A-1.B, ACCEPTABLE MANUFACTURERS, may be substituted for paint listed in ARTICLE 9A-2.B, COATING SYSTEMS, provided such substitutions are approved by the Engineer-Architect.
3. Sufficient proof in the form of product data, samples, manufacturer's certification, etc., shall be submitted to determine that the proposed substitution is equivalent to the paint specified.
4. Submit a list of complete paint systems, surfaces to be painted and specified paint for which substitution is to be made. Follow format of ARTICLE 9A-2.B, COATING SYSTEMS.
5. Provide generic name and label analysis for all substitute materials.

E. DELIVERY, STORAGE AND HANDLING:
1. Delivery of Materials:
   a. Deliver in sealed containers with labels and inscriptions legible and intact.
   b. Allow sufficient time for testing if required.
2. Storage of Materials:
   a. Store only acceptable materials on project site.
   b. Provide separate area and suitable containers for storage of coatings, and related equipment.

9A-2 MATERIALS

A. GENERAL:

1. Materials furnished for each coating system shall be products of a single manufacturer and shall be compatible to the substrate. When shop-painted surfaces are to be coated, ascertain whether finish materials will be compatible with shop coating. If the specified paint is not compatible with the shop coat, one complete barrier type coating shall be applied as follows before applying the specified coatings: First Coat: Barrier type coating, 2 mils dry.
   a. Carboline - Rustbond 8HB
   b. Cook - Barrier Coat 391-Y-142.
   c. Mobil - Chromox Primer 13-R-50.
   d. Tnemec - Chem-Prime 37-77.
2. Start of work by applicator will signify acceptance of surface to be painted.

B. COATING SYSTEMS:

1. Metal:
   a. Surfaces:
      (1) Surfaces primed with inorganic zinc rich primers.
      (2) Structural and miscellaneous steel.
      (3) Bridge structures over Ash Pond and Sludge Pond.
   b. Surface Preparation: SSPC-SP1 and SP3. Use special care to remove all oil from bolts and plates at structural bolted connections.
   c. Touch-up paint to be by same manufacturer as prime paint.
   d. Color of touch-up paint to match color of prime paint.
   e. Field-spotting Coat: Organic zinc rich primer, 3 mils dry.
      (1) Carboline - 676.
      (2) Cook - 920-A-171.
      (3) Mobil - 13-G-14.
      (4) Tnemec - 90-93.
   f. Second Coat: High build epoxy, 5 mils dry.
      (1) Carboline - 191 HB.
      (2) Cook - 920-W-965.
      (3) Mobil - 89 Series.
      (4) Tnemec - Series 66 HB.
   g. Special Application Procedure: When applying high build epoxy over zinc primer, apply a wet mist coat first to allow tiny bubbles to form. When bubbles disappear in 1 to 2 minutes, apply full wet coat at specified mil thickness.
2. Metal:
   a. Surfaces:
      (1) Surfaces painted with conventional primers (other than inorganic zinc).
      (2) Unprimed surfaces.
      (3) Hollow metal doors and frames.
      (4) Bar joists.
      (5) Bare pipe, steel or cast iron.

b. Surfaces: Shop primed equipment and appurtenances, interior and exterior exposure, ambient temperature (150 degrees F and under).
c. Surface Preparation: SSPC-SP 1 and light sanding for primed surfaces, SSPC-SP3 for bare steel surfaces. Remove rust, clean, and dry.
d. First Coat: Primer or field-spotting coat, alkyd red primer, 2 mils dry; dry to recoat 2-4hours at 75 degrees F.
(1) Carboline - AD29.
(2) Cook - 391-N-083.
(3) Mobil - 13-R-31.
(4) Tnemec - 4-55.
e. Second Coat: Alkyd resin enamel, 2 mils dry.
(1) Carboline - AD-51.
(2) Cook - 800 Series.
(3) Mobil - Series 12.
(4) Tnemec - Series 2.
f. Third Coat: Alkyd resin enamel, 2 mils dry.

3. Galvanized Metal Surfaces:
a. Surfaces - interior exposure ambient temperature.
(1) Interior exposed metal decking.
(2) Trim, sleeves and closures in finish painted areas.
b. Surface Preparation: SSPC-SP1.
c. First Coat: Vinyl wash primer, 1/2-mil dry.
(1) Carboline - 1037 WP.
(2) Cook - 900-Y-002.
(3) Mobil - 13-Y-8.
(4) Tnemec - 32-1210.
d. Second Coat: Alkyd resin enamel, 2 mils dry.
(1) Carboline - AD-51.
(2) Cook - Series 800.
(3) Mobil - Series 12.
(4) Tnemec - Series 2.
e. Third Coat: Alkyd resin enamel, 2 mils dry.

4. Concrete Block:
a. Surfaces: Interior, normal exposure.
b. Surface Preparation: Remove form oil, laitance, dust and all surface deposits. Fill all cracks.
c. First Coat: Latex block filler.
(1) Carboline - 3329.
(2) Cook - 827-W-100.
(3) Mobil - 79-W-8.
(4) Tnemec - 54-560.
d. Second Coat: Acrylic latex or acrylic emulsion, 1-1/2 mils dry.
(1) Carboline - 3300.
(2) Cook - Akrylx SFR.
(3) Mobil - Series 42.
(4) Tnemec - Series 6.
e. Third Coat: Acrylic latex or acrylic emulsion or vinyl acrylic, 1-1/2 mils dry.

5. Uninsulated Piping and Conduit, Other than Steel:
   a. Surfaces:
      (1) Piping and conduit in finish painted areas.
      (2) Galvanized, copper, or aluminum piping and conduit.
   b. Surface Preparation: SSPC-SP1 remove dirt, grease, oil and all surface deposits.
   c. First Coat: Vinyl wash primer, 1/2-mil dry.
      (1) Carboline - 1037 WP.
      (2) Cook - 900-Y-002.
      (3) Mobil - 13-Y-8.
      (4) Tnemec - 32-1210.
   d. Second and Third Coat: Same paint as that on surface adjacent to pipe, or as follows:
      (1) Carboline - AD51.
      (2) Cook - Series 800.
      (3) Mobil - 12 Series.
      (4) Tnemec - Series 2.
6. Galvanized Metal Surfaces Touch-up:
   a. Surfaces:
      (1) Galvanized items which are not scheduled to be finish painted.
      (2) Exterior and interior where exposed galvanized surface has been damaged during erection.
   b. Surface Preparation: SSPC-SP3 to SSPC-SP6 quality. Remove grease and oil.
   c. Field Touch-up: Apply one coating organic zinc rich coating at 3 mils dry.
      (1) Carboline - 676.
      (2) Cook - 920-A-171.
      (3) Mobil - 13-G-14.
      (4) Tnemec - 90-93.
7. Machinery and Equipment:
   a. Surfaces: Factory-finished.
      (1) Unit heaters, panelboards, control panels, motor control centers, etc.
   b. Surface Preparation: SSPC-SP1.
   c. Spot Priming and Finish Touch-up:
      (1) Primer and finish coating to be compatible with coating system used on each item and suitable for service intended.
      (2) Spot prime and finish touch-up damaged areas. If machinery or equipment is damaged or scratched considerably, repaint entire item.
      (3) Finish coating color to match color of each item.
8. Plastic:
   a. Surfaces: Plastic or plastic coated piping and conduit where specified to receive paint.
   b. Surface Preparation: Clean and Dry. Remove grease and oil.
   c. First Coat: Water base latex paint or an oil base primer, after applying a test patch to determine compatibility with the plastic.
   d. Second and Third Coat: Same paint as that on surface adjacent to pipe, after testing compatibility with prime coat.

9. Concrete Block:
   a. Surfaces: Exterior, normal exposure.
   b. Surface Preparation: Clean, dry, free of all foreign materials. Fill all cracks.
   c. First Coat: 5 percent silicone resin in petroleum solvent at 100 square feet per gallon.
      (1) Cook - 331-C-020.
      (2) Koppers - Silicone penetrant.
      (3) Mobil - 46-V-6.
      (4) Tnemec - 50-60.
   d. Second Coat: Same as first coat after 48-hour dry at 75 degrees F.

9A-3 PERFORMANCE

A. SURFACE PREPARATION:
1. Prepare surfaces as specified for each coating system conforming to Steel Structures Painting Council Specifications outlined in PART 9A-1.
   a. If grease or oils are present, SP 1 - Solvent Cleaning must precede any other method specified.
   b. Surface irregularities such as weld spatter, burrs, sharp edges, or masonry voids, must be eliminated prior to specified surface preparation.
2. Approval of surface preparation quality by Engineer-Architect is required for all areas prior to application of coating system.
3. When blasting is required, depth of profile will be as specified for the system, but in no instance will it exceed 1/3 of the coating dry film.
4. Repainting on prepainted surfaces:
   a. Solvent Cleaning SP1 for any oil or grease.
   b. Remove all loose paint and use Power Tool Cleaning - SP 3 to develop anchor profile.
5. Prepare only those areas which will receive the first coat of the system on the same day.

B. APPLICATION:
1. Apply coatings in accordance with paint manufacturer's recommendations. Application will be subject to inspection by representatives of the Engineer and manufacturer.
2. After Engineer's approval of surface preparations, apply first coat of the system the same day. Use properly designed brushes, rollers and spray equipment for all application.
3. Painting shall remain 6 inches away from unprepared surface of any substrate. When steel is blasted, do not coat the last 6 inches of the blasted area until unprepared adjacent surface is prepared.
4. Paint Shall be Applied as Follows:
   a. Spray - High build paint, where recommended by the paint manufacturer, unless otherwise specified.
   b. Brush - All other surfaces.

c. Paint Glove - Glove-type applicators will be permitted for small piping, providing the specified dry film thickness is obtained.

5. Spray Application:
   a. Spray painting will not be permitted in areas where fire hazard or equipment damage would result therefrom, including air intakes, fans, energized equipment and other areas as directed by the Engineer.
   b. All equipment will be checked and in proper working condition before starting any application.
   c. A moisture trap shall be placed in line between air supply and pressure pot and gun. Trap shall be opened slightly to give continuous bleed.
   d. Regulators and gauges shall control air flow to both pressure pot and spray gun.
   e. Spray guns will be held perpendicular to the surface being painted to reduce dry overspray from angle application.
6. Environmental Conditions:
   a. Atmospheric temperature must be 50 degrees F or higher during application, unless approved by coating manufacturer. Stop painting when freezing temperature may occur within 6 hours.
   b. Exterior applications shall be made at wind velocities less than 20 mph.
   c. Relative humidity must be less than 85 percent and the surface to be painted must be at least 5 degrees F above the dew point.
   d. Erect temporary shelters to enclose areas if necessary to meet these requirements.
   e. Install exhaust blowers or fans to provide adequate ventilation in any confined area.
7. Protection:
   a. Cover or otherwise protect surfaces not being painted, areas not to be painted, and the work of other trades. Remove protective materials when appropriate.
   b. Provide signs to indicate fresh paint areas.
   c. Mask, remove, or otherwise protect finish hardware, machined surfaces, grilles, lighting fixtures, and prefinished units as necessary.
   d. Provide cover to prevent paints from entering orifices in electrical or mechanical equipment.
   e. Where paint spraying is permitted, the Contractor shall take special precautions to protect surrounding surfaces and equipment, and he shall be totally responsible for resulting damage.
   f. Provide daily cleanup of both storage and working areas and removal of all paint refuse, trash, etc.

C. INSPECTION:
1. Use wet film gauges to check each application about every 15 minutes in order to correct low or heavy film build immediately.
2. Use dry film gauge to check each coat when dry, and the total system when completed.

3. A sling psychrometer will be available from Engineer in the immediate area of the job for periodic checks on both relative humidity and temperature limits.
4. Check temperature of the substrate at regular intervals to be certain surface is 5 degrees above the dew point.

D. CLEANING:
1. Touch up and restore damaged finishes to original condition as required.
2. Remove spilled, dripped or splattered paint from all surfaces.

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DIVISION 16 - ELECTRICAL

16A - CONDUIT AND ACCESSORIES

16A-1 GENERAL

A. DESCRIPTION:
   1. This Section includes all conduit, fittings, and accessories and miscellaneous work.
   2. Conduit stubouts and sleeves are to be installed as shown on Drawing S231 and A86.

B. QUALITY ASSURANCE:
   1. Applicable Standards:
      a. American National Standards Institute (ANSI).
      b. American Society for Testing and Materials (ASTM).
      c. Federal Specifications (FS).
      d. National Electrical Code (NEC).
      e. National Electrical Manufacturer's Association (NEMA).
      f. Underwriters' Laboratories, Inc. (UL).
   2. Acceptable Manufacturers:
      a. Rigid Steel Conduit:
         (1) Robroy Industries, Pittsburgh Standard.
         (2) Triangle Conduit and Cable Company, Inc.
         (3) Republic Steel Corporation.
      b. Wall Entrance Seals: O. Z. Electrical Manufacturing Company, Type WSK.

C. SUBMITTALS:
   1. Compliance Submittals:
      a. Submit as specified in DIVISION 1.
      b. Includes, but not limited to, the following:
         (1) Catalog cuts.

D. JOB CONDITIONS: Consider all locations to be nonhazardous.

16A-2 EQUIPMENT AND MATERIALS

A. RIGID STEEL CONDUIT:
   1. Hot-dipped galvanized mild ductile steel, circular in cross section with uniform wall thickness sufficiently accurate to cut clean threads.
   2. Each length threaded on both ends and threads protected by same process as used on each length.
   3. All scale, grease, dirt, burrs and other foreign matter removed from inside and outside prior to application of coating material.
   4. Galvanized by the hot-dip process as follows:
      a. Interior and exterior surfaces coated with a solid, unbroken layer of 99 percent virgin zinc by dipping.
      b. Coating not to show fixed deposits of copper after four 1-minute immersions in a standard copper sulfate solution.

c. One coat of zinc chromate finish on inside and outside surfaces to prevent oxidation and white rust.

5. Couplings and elbows fabricated, coated and finished by the same process as conduit.

B. PVC JACKETED RIGID STEEL CONDUIT:

1. Conduit with PVC jacket shall be galvanized inside and outside by the hot-dip or electro-galvanizing process.
2. Conduits shall have interior and exterior protected with coating of zinc galvanizing and shall have galvanized or metalized zinc protected threads.
3. Galvanizing shall be protected with a permanently fused-on exterior sheet of polyvinyl chloride with thickness of 20 mils.
4. Furnish Pittsburg Standard Conduit Company "Plasti-Bond" or approved equal.
5. Conduit shall bear Underwriters' Laboratories label on each length.

16A-3 PERFORMANCE

A. INSTALLATION:

1. General Requirements:
   a. Location:
      (1) Install conduit as near as possible to the routing indicated.
      (2) Shift locations as required to avoid interference with other equipment and piping being installed.
   b. Cap all conduits after cleaning.
   c. Carefully ream ends of all conduit lengths after cutting to eliminate sharp burrs.
2. Cast-In-Concrete and Block-In-Wall Installation:
   a. Install where specified or indicated.
   b. Use long radius elbows except on risers where curved portion of elbow would extend above the finished floor or foundation.
   c. Make all joints watertight after installation by coating all finished joints with Koppers Bitumastic No. 50 waterproof paint.
   d. Tie securely in place to prevent movement when concrete is poured.
   e. Cap ends of all conduit before concrete is poured.
   f. Slope finished floor away from conduit risers.
   g. Clean out all conduits immediately after concrete work is finished.
3. Buried Installation:
   a. Install where specified or indicated.
   b. Bury conduits a minimum of 18 inches below finish grade unless otherwise indicated.
   c. Before burying or trenching check with Engineer as to existing grade conditions and the possibility of future coordination problems.
   d. Slope conduits away from conduit risers where possible.
   e. Use long radius bends at all risers unless otherwise indicated.
   f. Provide all entrance seals where conduit enters the building or subgrade walls/floors from exterior underground.
   g. Maintain 2-foot separation from underground piping.

h. Make all joints watertight after installation by coating all finished joints with a vinyl plastic compound as recommended by the manufacturer of PVC jacketed conduit.

i. Cap ends of all conduit before backfilling.

4. Rigid Steel Conduit: Permitted for exposed, concealed, cast-in-concrete applications, and concrete block wall sleeves.

5. PVC Jacketed Rigid Steel Conduits: Install for direct buried application and conduit stubouts out of buildings.

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17A - GENERAL REQUIREMENTS

17A-1 GENERAL

A. DESCRIPTION:

1. This Division includes furnishing all material, equipment, and labor for the complete installation and testing of all yard piping, valves, tanks, pumps, manholes and piping specials included in the following:

System	PDT
ASW - Ash Sluice Water	48,75,80
BW - Backwash	79
CA - Compressed Air	80
PDY - Plant Drain Yard	75,79,80,93
SW - Sludge Waste	79

B. QUALITY ASSURANCE:

1. Applicable Standards: As specified in each applicable SECTION.
2. Acceptable Manufacturers: As specified in each applicable SECTION.

17A-2 EQUIPMENT AND MATERIALS

A. YARD PIPING SYSTEM MATERIAL:

1. The piping design tables (PDT) tabulate the valve and piping material to be used for each line in a piping system. In some cases the piping design tables indicate a general type of material and a detailed specification for that type is included in this Division.
2. The line number and piping design table applicable for each line is indicated on the "U" and "UP" drawings. In a case where the applicable piping design table is changed within a piping system, the exact location of the change is indicated on the "U" and "UP" drawings.
3. The piping design tables are included in the drawings.

B. SMALL PIPING:

1. The small piping indicated shows the general layout of most pipelines 2 inches and smaller. The routing indicated is general and does not necessarily fix the exact location except where exact location dimensions are noted on the drawings.
   All small piping shall be buried at a minimum depth of 3'-0".
2. Fabricate and erect piping 2 inches and smaller in accordance with the following:
   a. Lines shall deviate from the arrangements shown as required in order to avoid interference with other work and to provide a neat installation. Piping shall be arranged so that it does not interfere with access to equipment for maintenance. Reroute and arrange as directed and approved by the Engineer with all labor and material furnished by this Contractor.
   b. The specific arrangements shown on the small piping shall not be varied.

c. Standard reducers shall be used for pipe size reductions. Bushings shall not be used for pipe size reductions.
d. Provide offsets, fittings, unions, drains, hangers and supports to make a complete installation.
e. Use tees for all branch connections, unless otherwise indicated.
f. Furnish and install all of the valves, strainers and special items indicated on the drawings.
g. Furnish and install unions in piping systems using screwed joints as follows:
   (a) Install so lines may be broken for maintenance, valves may be removed and equipment disconnected.
   (b) Install on lines which are erected without unions and which, in the opinion of the Engineer, cannot be properly maintained.
   (c) Install dielectric unions wherever copper pipe is joined to iron or steel pipe.

17A-3 PERFORMANCE

A. FIELD MEASUREMENTS:
1. Make all field measurements necessary to determine line and grade and ensure installation of all piping as indicated.
2. Perform all required field or shop cutting and fitting.

B. INSTALLATION: As specified in SECTION 17C.

C. CONNECTIONS: Install all valves, vents, ties, flanges, manholes, and other accessories as indicated and as specified.

* * * * *

17B - PIPING SYSTEM MATERIAL

17B-1 GENERAL

A. DESCRIPTION:

1. This Section covers specific requirements of piping material in addition to the general requirements as shown on the Piping Design Tables.
2. Related Work Specified Elsewhere:
   a. Site Preparation: DIVISION 2.
   b. Pipe Installation: SECTION 17C.
   c. Field Testing: SECTION 17D.

B. QUALITY ASSURANCE:

1. Applicable Standards:
   a. American National Standards Institute (ANSI):
      (1) B16.5 - Steel Pipe Flanges and Flanged Fittings.
   b. American Society for Testing and Materials (ASTM):
      (1) A48 - Gray Iron Castings.
      (2) A53 - Welded and Seamless Pipe.
      (3) A74 - Cast Iron Soil Pipe and Fittings.
      (4) A106 - Seamless Carbon Steel Pipe for High-Temperature Service.
      (5) A126 - Gray Iron Castings for Valves, Flanges and Pipe Fittings.
      (6) A307 - Low Carbon Steel Externally and Internally Threaded Standard Fasteners.
      (7) B61 - Standard Specification for Steam or Valve Bronze Castings.
      (8) C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
      (9) D2996 - Standard Specification for Centrifugally Cast Reinforced Thermosetting Resin Pipe.
   c. American Water Works Association (AWWA):
      (1) C110 - Gray Iron and Ductile Iron Fittings 3" through 48" for Water and other Liquids.
      (2) C111 - Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings.
      (3) C115 - Flanged Cast Iron and Ductile Iron Pipe with Threaded Flanges.
      (4) C151 - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds for Water or other Liquids.

C. SUBMITTALS:

1. Compliance Submittals:
   a. Submit as specified in DIVISION 1.
   b. Include, but not limited to, the following:
      (1) Manufacturer catalogue cuts on material being supplied.
      (2) Pipe Specification.
      (3) Bill of Material.
      (4) Complete details of fittings, specials and fabrication procedures.

17B-2 EQUIPMENT AND MATERIALS

A. FIBERGLASS PIPE:

1. Acceptable Manufacturers:
   a. A.O. Smith.
   b. Bondstrand.
   c. Fibercast.
2. Shall conform to the requirements of Piping Design Table No. 75 and as specified herein.
3. General:
   a. Fillers or bulking agents are allowed only to the extent required for viscosity control. They shall be restricted to a level not to exceed 5 percent by weight and shall not interfere with the operator's ability to visually inspect the pipe.
   b. The reinforcing glass fibers shall be commercial grade and have a finish compatible with the resin system.
   c. The interior liner of the pipe shall be a minimum of 20 mils in thickness. This surface shall not contain dyes or fillers which can hinder visual inspection.
   d. All fiberglass reinforcements shall be impregnated with resin.
   e. All exterior surfaces of the pipe above grade shall be protected against ultraviolet degradation. This may be accomplished by an inhibiter added to the resin or by painting with a paint compatible with the resin and glass.
   f. All structural capabilities of the pipe shall neglect any strength the liner might contribute.
   g. Any hole cut in the pipe exposing the reinforced wall shall be coated with resin as per manufacturer's recommendations to prevent exposure of the glass fibers.
   h. If the pipe has to be cut in the field, the work shall be performed in strict accordance with the manufacturer's recommendations.
   i. Pipe shall have a thermal coefficient of linear expansion no greater than 13×10^{-6} in/in/degrees F as determined by ASTM D696.
4. Fittings:
   a. Shall be furnished by the pipe manufacturer.
   b. The completed fitting shall be capable of withstanding all design criteria required of the pipe.
5. Joints:
   a. The completed joint shall be capable of withstanding all design criteria required of the pipe.
   b. Resin and pastes required shall be furnished by the pipe manufacturer.
   c. All joints on nongravity systems shall be heat cured until completely cured.
6. Design Criteria:
   a. Design with a factor of safety against ultimate failure of 2.0 as a result of the following:
      (1) External load.
      (2) Internal load.

(3) Combination of both.

b. Loads:
  (1) External loads: Depth of cover as indicated plus H20 live load.
  (2) Internal Loads:
    (a) Normal working pressure as follows: 65 psi maximum.
    (b) Test pressures as specified in SECTION 17D.
  (3) Soil Weight: 125 pounds per cubic foot.
  (4) Water table at grade.

c. Spanning Capabilities (for aboveground installation):
  (1) Neglect any strength liner might contribute.
  (2) Base on simple beam with less than 1/2-inch deflection.
  (3) Minimum spanning lengths at 125 degrees F: 10 feet.
  (4) Capable of maintaining spanning capability for 50 years.

d. Shall be capable of handling the following fluids:
  (1) Temperature Range: 40 to 120 degrees F.
  (2) pH: 2-11.
  (3) Solids: 0-10 percent.

7. Fiberglass installers shall be certified as specified in Section 17C.

B. DUCTILE IRON PIPE:

1. Acceptable Manufacturers:
  a. Clow.
  b. Mead Pipe Co.
  c. U.S. Pipe Co.
  d. Engineer-approved equal.
2. Shall conform to the requirements of Piping Design Table No. 79 and as specified herein.
3. All fittings on pressure lines shall be either thrust blocked or have the joints restrained. Size of blocks and number of restrained joints shall be as indicated. Restrained joints shall be used when thrust blocks cannot be poured against undisturbed earth without interfering with other piping systems. Concrete for thrust blocks shall be poured so fitting joints are not encased. Method of restraining joint must be approved by Engineer.
4. Special requirements for lines SW2 and SW3.
  a. Provide all fittings and pipe with flanged joints.
  b. Pipe shall have drain valves at intervals not to exceed 100 feet. Drain valves shall be ball valves and shall be installed as indicated.
  c. Locate all flanges a minimuim of 24 inches from the edge of a support unless otherwise indicated.

C. STEEL PIPE:

1. Pipe Joints:
  a. Screwed fittings 2-inch and smaller shall be as follows:
    (1) 300-pound malleable iron screwed fittings conforming to ANSI B16.3, or 2000-pound, 3000-pound or 6000-pound forged-steel threaded fittings conforming to ANSI B16.11.
    (2) Of the same material as the pipe to which they connect.
    (3) Galvanized when used with galvanized pipe.

b. Socket weld fittings 2-inch and smaller shall be as follows:
  (1) 3000-pound, 6000-pound or 9000-pound forged-steel socket-welded fittings conforming to ANSI B16.11.
  (2) Of the same material as the pipe to which they connect.

c. Malleable-iron unions 2-inch and smaller shall be as follows:
  (1) 300-pound malleable-iron unions with a ground joint of bronze to iron.
  (2) Galvanized when used with galvanized pipe.
  (3) Used only on piping systems which allow screwed piping joints.

d. Flanged steel unions 2-inch and smaller shall be as follows:
  (1) Forged-steel slip-on flanges with raised faces for use with spiral wound gaskets.
  (2) Have the same pressure and temperature ratings as the forged-steel valves in the system.
  (3) Of the same material as the pipe to which they connect.

e. Steel butt welding fittings shall be as follows:
  (1) Forged or wrought steel conforming to ANSI B16.9.
  (2) Of the same material and schedule as the pipe to which they connect.
  (3) Cast fittings are not acceptable.
  (4) Elbows shall be long radius unless otherwise indicated.

f. Backing rings for butt-welded joints shall be as follows:
  (1) Rectangular machined solid ring for pipe having a wall thickness greater than 1/2-inch.
  (2) Split ring with knock-off spacer nubs for pipe having a wall thickness of 1/2-inch or less.
  (3) Special machined if required for connection to equipment.

g. Steel pipe flanges shall be as follows:
  (1) Forged steel conforming to ANSI B16.5.
  (2) Slip-on or weld neck as indicated on the drawings for 150-pound class and weld neck type only for 300-pound class and higher.
  (3) Constructed of the same material as the pipe to which they connect.
  (4) Have surface finish in accordance with MSS SP-6.
  (5) Flat face when connected to 125-pound cast-iron valves or fittings and as otherwise specified or indicated.

h. Flange bolting materials shall be as follows:
  (1) Standard bolting materials for temperatures of 400 F to 750 F shall be as follows:
    (a) ASTM A193 Grade B7, alloy steel stud-bolts threaded the entire length.
    (b) ASTM A194 Grade 2H, carbon steel hexagon nuts.
  (2) Standard bolting materials for temperatures of 399 F and below shall be as follows:
    (a) ASTM A307 Grade B, carbon steel bolts.
    (b) ASTM A307 Grade B, carbon steel hexagon nuts.

2. Coating:

a. Coat all buried pipe and wrap to conform to AWWA C203.

b. At the Contractor's option, piping smaller than 4 inches may be coated with mill-applied polyethylene plastic coating, "X-Tru-Coat."

Coating thicknesses shall be as follows:

Pipe Diameter	Coating Thickness
0 - 1-1/2 inches	0.025-inch
1-5/8 - 4 inches	0.030-inch
4-1/2 - 12 inches	0.060-inch

Double half-lap wrap field joints with polyethylene tape, "X-Tru-Tape," per manufacturer's instructions.

c. Coat all interior and exposed exterior pipe with shop-applied primer, Koppers 622.

D. HIGH-DENSITY POLYETHYLENE PIPE:

1. High-density polyethylene plastic pipe shall conform to the requirements of Piping Design Table No. 48 and as specified herein.
2. The high-density polyethylene plastic pipe shall be Driscopipe 7600 Industrial Pipe as manufactured by Phillips Products Company, Inc., or Engineer-approved equal.
3. High-density polyethylene plastic pipe shall be used in the ash pond area as indicated.
4. Minimum wall thickness: 0.602 inches.
5. Design working pressure: 150 psi.
6. Flanged fittings having a design working pressure of 150 psi shall be used.
7. Fifteen (15) sections of pipe shall be supplied in 19-foot lengths.e

E. DRESSER COUPLINGS:

1. Dresser style 38 (or style 62 where indicated) steel couplings with pipe stops removed, complete with rubber gaskets and bolts.
2. Have middle ring thickness not less than the adjoining pipe wall thickness.
3. Have harness assembly as indicated on the drawings.
4. Coat buried couplings as specified in SECTION 17C.

F. GASKETS:

1. Spiral-wound gaskets shall be as follows:
   a. Spiral-wound type 304 stainless steel with asbestos filler and carbon-steel gauge rings.
   b. Have a nominal thickness of 0.175-inch with a 1/8-inch-thick gauge ring.
   c. Flexitallic Style CG or approved equal.
2. Oil-proof asbestos gaskets shall be as follows:
   a. Heavy-duty compressed asbestos with Buna-N binder.
   b. 1/16-inch-thick full-faced for flat-faced flanges, punched for bolts and pipe opening.
   c. 1/16-inch-thick ring for all raised faced flanges.
   d. Crane Packing Company Style 888 or approved equal.
3. Compressed asbestos gaskets shall be as follows:
   a. Heavy-duty compressed asbestos.
   b. 1/16-inch-thick full-faced for flat-faced flanges, punched for bolts and pipe opening.

c. 1/16-inch-thick ring for all raised faced flanges.
d. Crane Packing Company Style 333 or approved equal.

4. Buna-N gaskets shall be as follows:
   a. Heavy-duty Buna-N.
   b. 1/16-inch-thick full-faced for all pipe sizes 10 inches and smaller.
   c. 1/8-inch-thick full-faced for all pipe sizes 12 inches and larger.
   d. Punched for bolts and pipe opening.
   e. Crane Packing Company Style 900 or approved equal.
5. Teflon gaskets shall be as follows:
   a. 1/16-inch-thick teflon.
   b. Full-faced for flat-faced flanges, punched for bolts and pipe opening.
   c. Ring type for all raised-faced flanges.
   d. Crane Packing Company Style 68C or approved equal.
6. Red rubber gaskets shall be as follows:
   a. 1/8-inch-thick full-faced for flat-faced flanges unless otherwise noted in PDT, punched for bolts and pipe openings.
   b. O-ring for bell-and-spigot joints.
7. Flexicarb gaskets shall be as follows:
   a. Spiral-wound type 304 stainless steel with flexicarb filler and carbon-steel gauge rings.
   b. Have a nominal thickness of .175-inch with a 1/8-inch-thick gauge ring.
   c. Flexitallic Style GC or approved equal.

G. PIPING DESIGN TABLES:
1. The Piping Design Tables (PDT) tabulate the valve and piping materials to be used for each specific design.
2. The Piping Design Table to be used for each pipeline is indicated and scheduled on the contract drawings.

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17C - PIPE INSTALLATION

17C-1 GENERAL

A. DESCRIPTION:

1. This Section includes the installation of piping and accessories specified in this Division.
2. Supply all bolts, nuts, gaskets and other material necessary for complete installation of all yard piping systems as indicated. This includes materials necessary for connections to all interfaces with other contracts and Owner-supplied equipment.
3. Related Work Specified Elsewhere:
   a. Site Work: DIVISION 2.
   b. Piping System Materials: SECTION 17B.
   c. Field Testing: SECTION 17D.

B. QUALITY ASSURANCE:

1. Applicable Standards:
   a. American Water Works Association (AWWA):
      (1) C206 - Field Welding of Steel Water Pipe Joints.
      (2) C600 - Installation of Gray and Ductile Iron Water Mains and Appurtenances.
      (3) C601 - Disinfecting Water Mains.
      (4) M11 - Design and Installation of Steel Pipe.
   b. American Welding Society (AWS).
   c. American Society of Testing and Materials (ASTM).
      (1) D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
2. Qualification of Welders:
   a. Welding operators shall be qualified in accordance with AWS "Standard Qualification Procedure."
   b. Qualification tests shall be certified by the Contractor.
   c. All costs incident to qualification tests shall be paid by the Contractor.
3. Qualification of fiberglass pipe installers:
   a. All personnel installing fiberglass pipe must be certified by Peabody Testing through their established certification program.
   b. Certification shall consist of completion of a training course that is acknowledged by the manufacturer to cover all essential variables for handling, assembling, and adhesive bonding of the fiberglass product the candidate will be joining.
   c. The subjects covered by the training course shall include, but not necessarily be limited to, the following: preparation equipment, joint preparation, fitting, bonding, curing, repair/maintenance methods, systems testing, and general review.
   d. All certified personnel must be kept on file with the field engineer.
   e. All costs incident to certification shall be paid by the Contractor.
   f. Owner representatives shall be allowed to observe certification classes.
   g. Certification arrangements and information can be received from Mr. Ed Jain. Phone (415) 573-6000.

C. HANDLING:
  1. Handle pipe in a manner to ensure installation in sound, undamaged condition using proper equipment, tools, and methods as follows:
    a. Suitable slings or skids.
    b. Without hooks in contact with joint surfaces.
    c. Provisions for preventing contact with adjacent units during moving or storage.
    d. Protection for all pipe ends such as beveled ends, flanges, mechanical joints, plain ends, threads, etc., prior to shipping to jobsite.
    e. Do not drop or impact the pipe.
  2. Pipe damaged during transporting or handling which, in the opinion of the Engineer, cannot be satisfactorily repaired will be rejected.

17C-2 EQUIPMENT AND MATERIALS

A. EQUIPMENT AND MATERIALS: As specified in each applicable Section.

17C-3 PERFORMANCE

A. PIPE INSPECTION AND REPAIR:
  1. All pipe shall be subject to the approval of the Engineer.
  2. Repair all mortar coatings with an epoxy grout applied as recommended by the manufacturer. Prepare cracks in lining by routing or grooving an opening 7/8 of the lining thickness in depth and a minimum of 1/2-inch wide at the surface.
  3. Pipe sections damaged by handling which, in the opinion of the Engineer, cannot be satisfactorily repaired shall be rejected. This shall include, but is not limited to, broken bells and spigots, bent bell-and-spigot rings, and similar damage.

B. CLEANING:
  1. Thoroughly clean interior of all pipe, fittings, and joints before installation.
  2. Exclude foreign matter during discontinuances of installation as follows:
    a. Close ends with snug-fitting board containing several small holes near the center.
    b. Prevent water from filling trench.
    c. Remove all water, mud, sand, and other undesirable materials from trench prior to removal of end board.
  3. Do not place tools, clothing, or other materials at any time in pipe.
  4. Check air in pipe for gas after prolonged periods of enclosure, and replace with fresh air before resuming construction.
  5. Flush clean immediately prior to final fitting of system.

C. LAYING:
  1. Lay pipe according to the plans and laying schedule prepared by pipe manufacturer and as follows:
    a. Lay pipe such that fittings and other appurtenances are at the required locations.

b. Construct field connections true to line, facing, and position without undue strain on the pipe, fittings, and equipment.
c. Do not permit laying of pipe in water or on blocks except when encasement is to be provided.
d. Brace or anchor as required to prevent displacement of pipe during embedment or encasement operations.
e. Perform only when weather and trench conditions are suitable.
f. Install steel pipe conforming to AWWA M11.
g. Conform to lines, grades and elevations as indicated.
h. Maintain alignment and grade with batter boards at intervals as necessary but not to exceed 50 feet.

D. WELDING OF STEEL PIPE:
1. Field welding shall be in accordance with AWWA C206, and performed only by qualified welders.
2. Field welding procedures utilizing continuous feed self-shielded flux-cored electrode will be allowed as approved by the Engineer.

E. PROTECTIVE FIELD COATINGS:
1. Steel Pipe:
a. Coat welded joints of buried pipe with one coat of Kopper's Bitumatic "high Build" tar epoxy gel maintaining a minimum dry thickness of 30 mils or one wrapping (at 1/2-width lap) of hot-applied Tapecoat 20 with primer, conforming to manufacturer's printed instructions.
b. Coat buried Dresser Couplings, valves, harnesses, tie rods, flanged joints, and any other buried metal items with one coat of Kopper's Bitumastic "High Build" tar epoxy gel, conforming to manufacturer's printed instructions and maintaining a minimum dry thickness of 30 mils. The coating shall be sufficiently cured and approved by the Engineer prior to backfilling. The Contractor may accelerate the curing by heating the coating to 120 degrees F for 2 or 3 hours. All equipment and procedures used to heat the coating shall be subject to the approval of the engineer.
c. Check all coal tar enamel coated buried pipe with a holiday detector prior to backfilling operations to determine presence of voids or damage to coating. Repair all defects in coatings to satisfaction of Engineer prior to backfilling.
d. Touch up all damaged surfaces of coating of nonburied pipe after pipe is installed with one coat of Kopper's 622.

F. EXCAVATION, TRENCHING, BEDDING AND BACKFILLING: Conform to DIVISION 2 and as follows:
1. Excavate to provide alignment and depth as indicated.
2. Remove rock and other obstructions to provide clearance of trench width and depth as specified.
3. Overexcavate and backfill to foundation grade with approved compacted material as directed by the Engineer, if necessary to assure firm pipe foundation.
4. Adequately drain trenches during installation and maintain in dewatered condition throughout installation, bedding, and backfill operations.
5. Provide with bell holes where required for joints.

6. Backfill only with material approved by the Engineer. Backfill and compact by hand in 6-inch layers to a point one foot above the top of pipe.
7. Place remainder of backfill and compact as specified in DIVISION 2.
8. Utilize sheeting as required to ensure that trench width does not exceed maximum width specified for type of pipe being installed.

G. INSTALLATION OF OWNER-SUPPLIED PIPE:

1. Contractor shall install the following owner-supplied pipe:
   a. Abresist - ASW 15.
      (1) The Abresist pipe is furnished by M.H. Detrick under Contract 17B.
      (2) All pipe and material will be delivered by rail and truck for unloading and storage by Contract 29B.
      (3) Material furnished by Contract 17B for installation by this contract includes 800 feet of pipe and fittings as detailed on the drawings if a 6:1 ash pond sideslope is used, and 650 feet if a 3:1 sideslope is used.
      (4) Handling, storage and installation instructions are included herein.
      (5) Pipe is flanged and comes in 18-foot lengths.
2. Contractor shall take custody of pipe listed in this Section and install under this contract from points of storage in the Owner's storage yard at the jobsite.
3. Be responsible for the pipe from loss or damage received until the work is complete and accepted by the Owner.
4. Replace any pipe damaged or lost while in custody of the Contractor.
5. Handling, storage and installation of the piping shall be in accordance with the manufacturer's instructions and under the direction of the Engineer and the manufacturer's field service personnel. The manufacturer's field service personnel will not be available continuously. Services provided at no charge and the corresponding rates for additional services shall be as specified in DIVISION 1-8.

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HANDLING, STORAGE, INSTALLATION, OPERATION AND MAINTENANCE OF ABRESIST PIPE AND FITTINGS

A. Handling

ABRESIST Pipe has a ceramic lining of 7/8" thick fused cast basalt. This extremely hard material will give you years of trouble free service, but it is a ceramic material which requires care in handling and storage.

1. Under no circumstances should any lifting device, such as a fork lift, ever be used on the inside of ABRESIST Pipe to move it.

2. Care should be taken to avoid banging pipes into each other.

3. Pipe with fixed flanges may be lifted with hooks in the bolt holes only.

4. Pipe without fixed flanges should be lifted with a wire rope sling or comparable equipment.

5. ABRESIST Pipe normally is shipped in canvas topped containers, allowing crane unloading from above.

6. Normal care should be taken to avoid damage to flanges.

B. Storage

1. ABRESIST Pipe may be stored in the field with minimal protection. If it is going to be out for many months, you may want to cover it to protect the primer paint coat.

2. ABRESIST Pipe can be stacked six or seven layers high, but 4" x 4" wood spacers must be used.

3. We recommend that Elbows and other fittings be laid on the ground. Do not pile on each other.

C. Installation

1. Visually check pipes for damage that may have occurred after delivery.

2. Clean flange and pipe facings with a wire brush to assure good gasket fit.

3. Tighten bolts evenly to avoid leaks.

4. We recommend touching up primer paint where scratches and other loss of paint has occurred; then a good finished coat of paint.

D. Operation and Maintenance

1. Visually check the elbows and expansion pieces within one year after start up.

2. If no unusual wear is found, subsequent checks every two years should be enough.

3. Expansion pieces will wear more than other pieces and should be checked at least once a year.

4. Repaint the pipeline when necessary to maintain the steel casing.

17D - FIELD TESTING

17D-1 GENERAL

A. DESCRIPTION:
  1. This section includes requirements for hydrostatic testing of the systems.
  2. Related Work Specified Elsewhere:
    a. Piping System Material: SECTION 17B.
    b. Pipe Installation: SECTION 17C.

B. QUALITY ASSURANCE:
  1. Applicable Standards:
    a. American Water Works Association (AWWA):
      (1) M11 - Design and Installation of Steel Pipe.
      (2) C600 - Installation of Cast-Iron Water Mains.
      (3) C900 - Polyvinyl Chloride (PVC) Pressure Pipe 4-inch through 12-inch for water.

17D-2 EQUIPMENT AND MATERIALS

A. GENERAL:
  1. All equipment and materials used to perform the tests shall be subject to the approval of the Engineer.
  2. Furnish all required materials and equipment for the testing to include, but not limited to, the following:
    a. Necessary piping connections.
    b. Test pumping equipment.
    c. Water meter.
    d. Pressure gauge - calibrated by Owner.
    e. Bulkheads, supports, struts, strong backs, etc.
    f. All miscellaneous items required.
    g. Air compressor.

B. WATER: Water for performing the tests may be obtained from the Owner's existing Water System at a rate of 50 gpm. Provide all hose required to get water from source to pipe.

17D-3 PERFORMANCE

A. GENERAL:
  1. All test methods shall be subject to the approval of the Engineer.
  2. All tests shall be performed by the Contractor.
  3. Protect all plant equipment and material from damage resulting from leakage during the tests, and repair or replace if damaged.
  4. Do not proceed with test without approval of Engineer.

B. SPECIAL REQUIREMENTS:

1. Bulkhead and support piping during hydrostatic testing to prevent any damage to pipe or structures. Damage resulting from inadequate bulkhead or supports shall be repaired by the Contractor at his expense.
2. Fill pipeline, with adequate venting facilities installed and open, at a rate not exceeding the venting capacity.
3. Test steel pipe conforming to applicable sections of AWWA M11 and as specified herein.
4. Test cast iron and ductile iron pipe conforming to applicable sections of AWWA C600.

C. HYDROSTATIC TESTING:

1. Apply after the pipeline has been completely filled with water.
2. Apply in such a manner that the required pressure can be obtained and maintained for the duration of the tests.
3. Measure at the low point in the system with a tested, properly calibrated, and approved pressure gauge and in accordance with the following table:

System	Test Medium	Test Pressure (psig)	Duration of Test	Leakage
Ash Sluice Water (ASW).	Water	50	2 hours	0
ASW15................	Water	210	2 hours	0
Backwash (BW)..........	Water	50	2 hours	0
Compressed Air (CA)....	Air	150	2 hours	0
Plant Drain Yard (PDY).	Water	5	2 hours	0
PDY 17,18,27,72......	Water	50	2 hours	0
Sludge Waste (SW)......	Water	35	2 hours	0

D. AIR TESTS:

1. Systems being air tested shall be tested as follows:
   a. Equipment and methods used to perform the tests shall be subject to approval of the Engineer.
   b. Plug ends of pipe system and cap or plug all connections to withstand internal test pressures.
   c. Allow two minutes for air pressure to stabilize, and then introduce additional compressed air if needed to raise internal pressure to the specified test pressure.
   d. There shall be no decrease in the internal pressure of the line for the specified duration of the test.

E. REPAIRS: If the tests discloses leakage greater than that specified, the Contractor shall, at his expense:

1. Locate and repair the defective pipe, joint, or joints.
2. Repeat the above tests until the leakage is within the specified allowance.

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17E - VALVES AND ACCESSORIES

17E-1 GENERAL

A. DESCRIPTION:
  1. Provide all valves required to complete the piping systems as indicated on the drawings. All valves of a particular type shall be supplied by the same manufacturer.
  2. The valves required include, but are not limited to the following:
    a. Valves 2-1/2 inches and larger indicated on the valve lists. The valve list indicates which valves are furnished by others.
    b. Valves 2 inches and smaller indicated on the drawings.

B. QUALITY ASSURANCE:
  1. Applicable Codes and Standards:
    a. Design, fabricate, assemble and test equipment and materials in accordance with the following codes and standards:
      (1) ANSI B16.5 - Steel Pipe Flanges, and Flanged Fittings.
      (2) ANSI B16.25 - Butt Welding Ends.
      (3) ANSI B16.34 - Steel Butt-Welding End Valves.
      (4) ANSI B31.1 - Code for Pressure Piping, Power Piping Section, hereinafter referred to as the Power Piping Code.
      (5) ANSI B16.1 - Cast Flange Fittings.
      (6) ASTM 48 - Gray Iron Castings.
      (7) ASTM A105 - Forgings, Carbon Steel for Piping Components.
      (8) ASTM A126 - Gray Iron Castings for Valves, Flanges and Pipe Fittings.
      (9) ASTM A182 - Forged or Rolled Alloy Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High Temperature Service.
      (10) ASTM A216 - Carbon Steel Castings Suitable for Fusion Welding for High-Temperature Service.
      (11) ASTM A217 - Martensitic Stainless Steel and Alloy Steel Castings for Pressure Containing Parts Suitable for High Temperature Service.
      (12) ASTM A351 - Austenitic Steel Castings for High Temperature Service.
      (13) ASTM B26 - Aluminum Alloy Sand Castings.
      (14) ASTM B61 - Steam or Valve Bronze Castings.
  2. Acceptable Manufacturers:
    a. Bronze and cast-iron valves shall be manufactured by Crane, Lunkenheimer, Powell, Stockham, Walworth or approved equal.
    b. Steel valves 2-1/2-inch and larger shall be manufactured by the following:
      (1) 150- and 300-pound class - Crane, Lunkenheimer, Pacific, Powell, Rockwell-Edwards, Stockham, Walworth, Hopkinson or approved equal.
      (2) 600-, 900-, 1500- and 2500-pound class - Crane, Dewrance, Pacific, Hopkinson, Powell, Rockwell-Edwards, R.P.&C. or Walworth.
    c. Steel valves 2-inch and smaller shall be manufactured by the following:
      (1) 600-pound class - Crane, Hancock, Kerutest, Rockwell-Edwards, R.P.&C., Vogt, Smith, or Walworth.

(2) 1500-pound and 2500-pound class - Conval, Hancock, Kerutest, Rockwell-Edwards, or Yarway. Anderson Greenwood double block valves are acceptable for instrument root valves where double valves are required.

d. Butterfly valves shall be manufactured by Allis-Chalmers, B.I.F. Industries, Centerline, Crane, Dezurik, Dresser, Jamesbury, Keystone, Henry Pratt, TRW Mission or Rockwell.

3. Factory Tests:
   a. Conduct all standard factory tests and all tests required by the applicable codes and standards.
   b. Submit certificates of completion of factory tests as compliance submittals.

C. SUBMITTALS:
1. Submit as specified in Division 1.
2. Compliance Submittals required shall include the following:
   a. A valve list for all valves 2-1/2 inches and larger showing the following:
      (1) Tag Number.
      (2) Manufacturer.
      (3) Pressure and Temperature Ratings.
      (4) Body Material.
      (5) Trim Materials.
      (6) Manufacturer's model or figure number.
   b. A valve list for all valves 2 inches and smaller showing the following:
      (1) The type of valve to be used for each service.
      (2) Manufacturer, pressure and temperature rating, body material, trim material and manufacturer's model or figure number for each type of valve.
   c. A cross-section drawing for each different model or figure number valve indicating the following:
      (1) Details and features of construction.
      (2) Materials of construction.
      (3) Weld end preparation.
   d. Certificate of completion of factory tests.

D. DELIVERY, STORAGE, AND, HANDLING:
1. Ship valves 2-1/2-inch and larger to the project site tagged with the valve number shown on the drawings.
2. Ship all valves with suitable end covers to prevent entrance of foreign material into valve body.
3. Protect valve threads, stems and handwheels from damage.

17E-2 EQUIPMENT AND MATERIALS

A. Design and construct all valves to conform to the following valve specification tables.

B. Valve body materials shall be as specified on the piping design tables.

C. Valves not listed on the specification tables but required by the piping design tables are as follows:

1. Ball Valves:
   a. Valves 2-1/2-inch and larger shall be as follows:
      (1) Carbon steel body, ball, steam and plug.
      (2) Teflon seats.
      (3) Flanged ends.
      (4) Unit body construction.
      (5) Positive shutoff.
      (6) Pressure class in accordance with piping design table.
      (7) 3-inch valves shall be 8 inches long.
   b. Valves 2-inch and smaller shall be as follows:
      (1) Carbon steel body, ball, stem and plug.
      (2) Teflon seats.
      (3) Socket weld or flanged ends.
      (4) Pressure class in accordance with the piping design table.

* * * * *

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GATE VALVE SPECIFICATION TABLE

Pressure Class	Size	Type	Bonnet Joint	Disc Type	Stem Material	Disc and Seat Facing	Back Seat	End Connections	Notes
600 lb. 900 lb. 1500 lb. 2500 lb.	4" and Larger	Inside Screw	Pressure Seal	Flexible Wedge	11.5-14% Chrome	Stellited	Integral Stellited	Butt Welding	*1, 2, 3, 6, 8, 11*
	2½" and 3"	Inside Screw	Pressure Seal[7]	Flexible Wedge	11.5-14% Chrome	Stellited	Integral Stellited	Butt Welding	*6, 8*
1500 & 2500 lb.	2" and Smaller	Use Globe Valve Specification							
600 lb.		Inside Screw	Bolted or No-Bonnet	Solid Wedge	11.5-14% Chrome	Stellited Seat Facing	Fixed	Socket Welding	
150 lb. 300 lb. 400 lb.	2½" and Larger	Inside Screw Nonrising Stem	Bolted	Flexible Wedge	11.5-14% Chrome	As Recommended by Mfr.	Removable Cu-Ni or S.S.	See Valve List	*4, 5, 6, 9, 3*
125 lb. 250 lb.	2½" and Larger	Inside Screw Nonrising Stem	Bolted	Solid Wedge	Bronze	Bronze	Removable Bronze	See Valve List	
150 lb. 200 lb. 300 lb.	2" and Smaller	Rising Stem	Union	Solid Wedge	Bronze	Nickel Alloy	Integral	Screwed[12]	*9*

NOTES:

[1] *Provide factory-installed single-valve bypass.*

[2] *Provide totally enclosed bevel gear operator with handwheel.*

[3] *Bypass valves shall conform to the specifications for globe valves of the same pressure class.*

[4] *Provide factory-installed single-valve bypass on all valves 8" and larger when used for steam service.*

[5] *Flexible wedge not required on valves 4" and smaller in 150-pound class.*

[6] *Provide grease fitting on yoke bearing.*

[7] *A globe valve with a seal welded bonnet is also acceptable.*

[8] *Bonnet venting connections and piping shall be furnished when noted on valve list if required by valve design.*

[9] *Provide renewable seat rings.*

[11] *Provide air wrench adapter for valves 8 inches and larger.*

[12] *Provide solder ends when solder joints are specified on Piping Design Table.*

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CHECK VALVE SPECIFICATION TABLE

Pressure Class	Size	Type	Bonnet Joint	Hinge Pin & Bearing	Disc and Seat Facing	End Connections	Notes
900 lb. 1500 lb. 2500 lb.	4" and Larger	Piston Lift	Pressure Seal		Stellited	Butt Welding	1, 2
	2½" and 3"	Piston Lift	Pressure Seal or Welded		Stellited	Butt Welding	1, 2
1500 lb. 2500 lb.	2" and Smaller	Piston Lift	Welded		As recommended by manufacturer	Socket Welding	1
600 lb.		Piston Lift	Bolted or Welded		As recommended by manufacturer	Socket Welding	1
150 lb. 300 lb. 400 lb. 600 lb.	2½" and Larger	Swing	Bolted	As Recommended by Mfr.	As Recommended by Mfr.	See Valve List	
125 lb. 250 lb.	2½" and Larger	Swing	Bolted	Bronze	Bronze	See Valve List	3
150 lb. 200 lb. 300 lb.	2" and Smaller	Horizontal Lift	Union		Nickel Alloy	Screwed [4]	3

NOTES: [1]*Provide stellited or chrome-plated piston guides.*

[2]*Provide equalizer line or passage connecting area above piston to valve outlet to equalize pressure above piston.*

[3]*Provide renewable seats and disc.*

[4]*Provide solder ends when solder joints are specified on piping design table.*

ECCENTRIC PLUG VALVE SPECIFICATION TABLE

Pressure Class	Size	Body	Bonnet Joint	Gland	Packing	Bearings	Plug Facing	Operator	End Connection	Notes
150 lb.	5" and larger	soft rubber lined semi-steel	Bolted	Bolted	Buna	Alloy 20	Neoprene	Worm gear	Flanged	(1) Worm gear operators shall be totally enclosed with position indicator.
	3" to 4"	soft rubber lined semi-steel	Bolted	Bolted	Buna	Alloy 20	Neoprene	Wrench	Flanged	(2) Furnish wrench with each wrench operated valve.
	2½" and smaller	Alloy 20	Bolted	Bolted	Buna	Alloy 20	Neoprene	Wrench	Flanged	

BUTTERFLY VALVE SPECIFICATION TABLE

Pressure Class	Size	Disc	Seat	Shaft Type	Shaft Material	Shaft Bearings	Operator	End Connections	Notes
150-pound minimum working pressure	6" through 20"	Ni-Resist or Bronze	Buna-N or Rubber	Solid or Stub	Type 304 Stainless Steel	Bronze, Nylon or Reinforced Teflon	See Valve List	See Valve List	1,2
	2½" to 4"	Ni-Resist or Bronze	Buna-N or Rubber	Solid or Stub					1,3
150-pound minimum working pressure	2" & Smaller	Ni-Resist or Bronze	Buna-N or Rubber	Solid or Stub	Type 304 Stainless Steel		Latching Lever	Wafer	4

NOTES: [1] *Discs shall have polished seating edges.*
[2] *Worm Gear operators shall be totally enclosed with position indicator and shall be designed to hold valve in intermediate position without creep. Provide crank or handwheel.*
[3] *Valves for ethylene glycol service shall have B.P.T. (Nordel) seating material.*
[4] *Wafer type for valves 2½ inches and smaller.*

RUBBER LINED BUTTERFLY VALVE SPECIFICATION TABLE

Pressure Class	Size	Body	Disc	Seat	Shaft Type	Shaft Material	Shaft Bearings	Operator	Bolting Pattern	Notes
150 lb.	6" and larger	Wafer Type, Rubber lined iron or steel	Rubber Coated iron or steel	Integral with body liner	Solid	316L Stainless Steel 2.75% Moly.	Nylon or Reinforced Teflon	Worm gear	Standard ANSI 150 lb. drilling	(1) Worm gear operators shall be totally enclosed with position indicator, and shall be designed to hold valve in intermediate position without creep. Provide Crank or Handwheel.
	4" and smaller	Wafer Type, Rubber lined iron or steel	Rubber Coated iron or steel	Integral with body liner	Solid	316L Stainless Steel 2.75% Moly.	Nylon or Reinforced Teflon	Latching Lever	Standrad ANSI 150 lb. drilling	

17F - PIPING SPECIALS

17F-1 GENERAL

A. DESCRIPTION:

1. Provide all piping specials in accordance with the specifications and the following:
   a. Furnish, install and test all specials complete and ready for operation.
   b. Furnish complete with all necessary miscellaneous pipe, valves, unions, fittings, auxiliaries, and isolating valves whether indicated on the drawings or not, but required.
   c. Furnish accessories such as gauge glasses, pressure gauges, and other instruments of equal quality to those similar items which are specified hereinafter.
   d. Insulate and cover in accordance with the pipe system to which they attach.
   e. Include all necessary supports, foundations, and equipment pads including anchor bolts, grout, shims, dowels and concrete as required by the manufacturer, as specified, and as indicated on the drawings. All supports, foundations, and equipment pads are subject to the Engineer's approval.
2. Piping specials are designated by a number preceded by the letter; YS i.e., "YS-1.," etc.; these designations are used in the specifications and on the drawings.
3. Piping connected to specials which must vary from the drawings because of requirements peculiar to the particular equipment furnished, shall be furnished and installed as required to make a complete and workable installation without additional cost to the Owner; this requirement shall include changes required in the piping systems because of design changes made by the manufacturer between the time of design and the time of installation and because of equipment furnished of different manufacturer or type than that specified.

B. QUALITY ASSURANCE:

1. Applicable Codes and Standards:
   a. Design, fabricate, assemble, install and test equipment and materials in accordance with the following codes and standards:
      (1) ANSI B31.1 - Code for Pressure Piping, Power Piping Section, hereinafter referred to as the Power Piping Code.
2. Factory Tests:
   a. Conduct all standard factory tests and all tests required by the applicable codes and standards.
   b. Submit certificates of completion of factory tests as Compliance Submittals.

C. SUBMITTALS:
  1. Submit as specified in DIVISION 1.
  2. Compliance Submittals required shall include the following:
    a. A list of all piping specials by special number showing the manufacturer and the manufacturer's model or figure number as applicable.
    b. Detail drawings and manufacturer's descriptions for each piping special as follows:
      (1) Drawings showing general arrangement detail dimensions and all clearances required for installation, operation and maintenance.
      (2) Details of all external connections which must be made.
      (3) Electrical connection drawings for all equipment requiring electrical connections complete with schematic diagrams of internal wiring.
      (4) Static and dynamic loadings.
      (5) Certificates of completion of factory tests.
      (6) Operation and maintenance data.
      (7) Instruction books.

D. DELIVERY, STORAGE AND HANDLING:
  1. Suitably protect all equipment and material for storage at the jobsite. Seal all openings and do not remove until equipment is ready for connection.
  2. Tag all piping specials, including all components shipped loose, with the special number.
  3. Where spare, replacement, or additional parts are required for the piping specials, these items shall be delivered to the Owner immediately upon receipt at the jobsite. Parts shall be packaged and sealed for long-term storage and be securely and visibly labeled as to part, function, and name of equipment to which they apply.

17F-2 LIST AND DESCRIPTION OF PIPING SPECIALS

YS-19 INSULATED UNION

A. Insulated unions 2-inch and smaller shall be as follows:
  1. Have nylon or micarta bushings and Buna-N gaskets.
  2. Used wherever copper pipe is joined to iron or steel pipe or equipment and where indicated.
  3. Shall be installed as indicated.

YS-20 AIR RELEASE ISOLATION VALVE

A. Shall be butterfly valve as specified.

B. End connections shall be flanged.

C. Size: 3 inches.

D. Shall be installed as indicated.

YS-30 COMBINATION AIR RELEASE VALVES

A. Shall be as manufactured by Valve and Primer Corp.

B. Design Criteria:
  1. Capable of exhausting large amounts of air when line is being filled.
  2. Capable of allowing air to reenter line immediately if vacuum should occur.
  3. Capable of exhausting small pockets of air which collect when line is operating under pressure.

C. Construction:
  1. Valve inlet: 125 lb flange.
  2. Material:
    a. Body, Cover, Lever Frame - Cast Iron
    b. Float - Stainless Steel
    c. Seat - Buna-N
    d. All other Internal Parts - Stainless Steel

D. Inlet size: 3 inches.

E. Shall be installed as indicated.

YS-31 AIR HOSE BIBS

A. Air hose bibs shall be 3/4-inch DeZurik Fig. No. 120S eccentric valves or Engineer approved equal.

B. Air hose bibs shall have bronze body, resilient plug, stainless steel bearings and screwed end connections.

C. Provide with Chicago Pneumatic No. 36841Y hose coupling. Couplings shall be of malleable iron construction with resilient gaskets.

D. Install air hose bibs in lines as indicated.

YS-34 PRESSURE GAUGES

A. General:
  1. Accuracy: 1/2 of 1 percent of scale range.
  2. Case: Aluminum or high-impact polypropylene reinforced with glass fiber. Provide solid front face and blowout back.
  3. Dial: White laminated plastic with black markings.
  4. Accessories: Provide pulsation dampeners pressure gauges which have a "P" under Accessories in the table below. Provide diaphragm seals for pressure gauges which have a "D" under Accessories in the table below.

B. Line Mounted Pressure Gauges: (Spec Type A2)
 1. Manufacturer: McDaniel.
 2. Size: 6-inch diameter face.

C. Differential Pressure Gauges: (Spec Type B2)
 1. Manufacturer: Mid-West Instruments, Catalog Model No. 120.
 2. Sensing Element: Free-Floating Piston Magnet.
 3. Case: Pressure housing of aluminum; safe working pressure of 5000 psi.
 4. Size: 2-1/2-inch dial.
 5. Connections: Bottom pressure connection.

D. Provide pressure gauges as follows:

Tag Number	Spec Type	Line Number	Scale Range	Accessories
PDY/P-11	A2	PDY 27	0-100 psi	P,D
PDY/P-12	A2	PDY 27	0-100 psi	P,D
PDY/P-13	A2	PDY 72	0-100 psi	P,D
PDY/P-14	A2	PDY 72	0-100 psi	P,D
PDY/P-15	A2	PDY 72	0-100 psi	P,D
ASW/P-12	A2	ASW27	0-100 psi	P,D
ASW/P-13	A2	ASW27	0-100 psi	P,D
ASW/P-14	A2	ASW27	0-100 psi	P,D
ASW/P-15	A2	ASW25	0-100 psi	P,D
ASW/P-16	A2	ASW25	0-100 psi	P,D
ASW/P-17	A2	ASW25	0-100 psi	P,D

E. Instrument Root Valves:
 1. Furnish and install root valves for all pressure gauges.
 2. Root valves shall be gate valves conforming to the piping design table of the line to which they are connected except for the CWT lines which shall be YS-27.
 3. Root valves shall be 1/2-inch size, except as otherwise indicated on the drawings.
 4. Instrument root valves are not indicated on the drawings.

YS-40 Y-TYPE STRAINERS

A. Y-Type strainers shall be as follows:
 1. Body shall be same material and body rating as valves in the Piping Design Tables on which the strainer is installed.
 2. Baskets shall be stainless steel as follows:
  a. YS-40A - 20 mesh for water.
 3. Armstrong, Leslie, Crane or Engineer approved equal. Dimensions are based on Leslie.

B. Y-Type strainers shall be installed as indicated.

YS-41 WATER HOSE BIBS

A. Water hose bibs shall be Crane Bronze Hose Valve No. 58 with 3/4-inch threaded garden hose connections.

17F - PIPING SPECIALS: continued

B. Water hose bibs shall have bronze body and stem, brass base and disc holder and composition disc.

C. Install water hose bibs in lines as indicated.

YS-43 MOTOR-OPERATED VALVE

A. Motor-operated valve shall be a 150-pound butterfly as specified in PDT 75.

B. All valves shall be furnished complete with motor operators as follows:
  1. Philadelphia Gear Corporation - Limitorque type SMB/HBC or Engineer approved equal.
  2. Motor voltage shall be 460-volt, 3-phase, 60-hertz.
  3. Control voltage shall be 120-volt, single-phase, 60-hertz.
  4. Provide opening and closing torque switches.
  5. Provide 4 train-geared limit switches.
  6. Provide 120-volt, ac, single-phase, 60-hertz, space heater in limit switch compartment and motor. Space heater leads shall terminate in limit switch compartment at main terminal strip.
  7. Equip with a permanently mounted handwheel that is disengaged under all conditions of motor operation.
  8. Reversing motor starter and wiring will be furnished by others.
  9. Closing time shall be 60 seconds.

YS-48 SIGHT FLOW INDICATORS

A. Sight flow indicators shall be Johnson Porthole Series Flapper type, Schutte and Koerting or approved equal.

B. Sight flow indicators shall be as follows:
  1. Suitable for pressures to 75 psig.
  2. Suitable for temperatures to 150 degrees F.
  3. Have cast-iron bodies with tempered glass windows.
  4. Have screwed ends.

C. Indicators shall be furnished and installed as indicated.

YS-54 FLOW SWITCHES

A. Flow switches shall be McDonnell series FS4-3T or Engineer approved equal.

B. Flow switches shall be brass with monel trim. End connections shall be threaded.

C. Switch elements shall be as follows:
  1. Interrupting rating: 120 volts ac, 4 amps or 125 volts dc, 0.5 amps.
  2. Enclosure: NEMA 1 with threaded conduit connection.
  3. Type of switch: snap action contact (mercury switch contacts not acceptable).

17F - PIPING SPECIALS: continued

D. Tag each flow switch with a permanently attached solid brass or aluminum tag with tag numbers as shown below stamped clearly into the metal.

E. Provide flow switches as follows:
1. Flow switches shall be assigned tag numbers FPY/FS-15 through FPY/FS-27.
2. All are on line number FPY-15.
3. All have a maximum flow of 15 gpm.
4. All are 3/4" size.
5. All are model number FS4-3T3.

YS-60 RUBBER FLAPPER SWING CHECK VALVE

A. Series 100R as manufactured by Valve and Primer Corporation.

B. Disc and body shall be lined with Buna-N synthetic rubber.

C. Coat buried valve as specified in SECTION 17C.

3 D. Provide and tag valves as follows:

Tag Number	Line Number	Operating Pressure	Operating Temperature	Size
YS-60A	PDY 17	45 psi	100°F	10"
YS-60B	PDY 18	35 psi	100°F	18"
YS-60C	PDY 27	50 psi	100°F	12"
YS-60D	BW 3	35 psi	100°F	16"
YS-60E	PDY 72	35 psi	100° F	6"

f. The annulus between the well screen and casing and the wall of the hole shall be backfilled with loose surface sand to the ground surface.
g. The wells shall be capable of producing at a rate equal to the capacity of the pumps when pumped continuously.
h. Subsurface information is available as specified in DIVISION 1.

Table 1

Well	Location	Approximate Plant Coordinations
SW-1	SW corner of coal-pile runoff pond.............	N 12390 E 9665
SW-2A	Ash ponds................	N 12575 E 8985
SW-2B	Ash ponds................	N 12585 E 8985
SW-3A	Ash Landfill.............	N 13150 E 7890
SW-3B	Secure Landfill..........	N 13415 E 8050

B. Seal Water Pumps

1. Pump shall be submersible type capable of being installed and operating in a 4-inch inside diameter well casing, as manufactured by Jacuzzi Brothers, Inc.
2. Materials:
   a. Discharge head - bronze.
   b. Impeller - Lexan.
   c. Pump casing - stainless steel.
   d. Screen - plastic.
   e. Motor - stainless steel.
   f. Accessories: Pump shall be furnished with manufacturer's standard control box, standard accessories, and lightning arrester.
3. Install in locations shown on drawings complete with any piping and fittings required. Test and place into proper operation.
4. Motors shall be as follows:
   a. 1/2 hp and smaller: 115 volt, single phase, 60 hertz, ac.
   b. 3/4 hp and larger: 460 volt, three phase, 60 hertz, ac.
   c. 1.0 Service Factor
5. Provide seal water pumps as follows:

Service	Tag Number	Number Required	Capacity (gpm)	Head (ft)
Recycle	YS-61-A	2	18	110
Coal Pile Runoff	YS-61-B	1	6	65
Ash Landfill	YS-61-C	1	6	65
Secure Landfill	YS-61-D	1	9	65

YS-62 FLOATING BAFFLE

17F - PIPING SPECIALS: continued

A. All materials shall be of fiberglass construction, including 1/2-inch fiberglass plate, 9x11x1/2 fiberglass rectangular sections, 3x3x3/8 fiberglass angles, and 1/2-inch-diameter fiberglass bolts.

B. Baffle shall float level with 50 percent above water surface and 50 percent below water surface.

C. The ends of all rectangular sections shall be sealed with 1/2-inch plate so as to be airtight.

D. 1/2-inch wear plates shall be attached to the rectangular sections that scrape against the stop-log structure.

E. Rectangular sections, wear plates, and end plates shall be firmly held in place by an adhesive bond which conforms to the fiberglass manufacturer's recommendations.

F. If fiberglass is cut at any time exposing glass fibers, a resin coating shall be applied to protect the fibers.

G. Baffle shall be constructed as shown on drawing S224.

YS-63 TIE-DOWN ROPE

A. Manufacturer: American Manufacturing Company, Inc., or Engineer approved equal.

B. Quantity Required: 2 Sections, each 200 feet long.

C. Description: Rope shall be 3/4 inch diameter with a minimum allowable working load of 1,420 pounds.

D. Material: Nylon

E. Ropes shall be used to anchor the free end of the floating polyethylene pipe in ash pond.

YS-64 SOLENOID VALVES:

A. Solenoid valves shall be 120 V/480 V, ½" ASCO #DF8211C94.

B. Tag each solenoid valve with a permanently attached solid brass or aluminum tag with tag numbers as shown below stamped clearly into the metal.

C. Solenoid valves shall be assigned tag numbers FPY/SV-15 through FPY/SV-27.

D. Install complete with all required fittings.

* * * * *

17G PUMP INSTALLATION

17G-1 GENERAL

A. DESCRIPTION·

1. Install equipment and materials in PART 17G-2 to include all expert and common labor, rigging, blocking, scaffolding, tools, construction materials and services to remove from on-site storage and install as specified.
2. Assume full responsibility for all equipment and materials upon taking over equipment and materials in storage, until installation as specified is complete and accepted by the Owner.

B. DELIVERY, STORAGE AND HANDLING·

1. Take custody of equipment and material listed in PART 17G-2 and installed under this contract from points of storage in the Owner's plant or other storage yard at the jobsite.
2. Be responsible for the safety and protection from loss or damage of all equipment and material received until the work is complete and accepted by the Owner.
3. Protect all equipment and material during installation against corrosion, moisture deterioration, mechanical injury, and accumulation of dirt or other foreign matter to include the following:
   a. Keep all pipe and equipment connections closed until ready for connection.
   b. Replace or restore to original condition any equipment or material damaged or lost while in custody of the Contractor.
   c. Spot paint all equipment and material where the shop coat of paint has been damaged.

17G-2 EQUIPMENT AND MATERIALS

A. PUMPS:

1. Pumps are furnished by Worthington under Contract 9.
2. All equipment shall be delivered, unloaded, and stored by this Contract.
3. Items furnished under Contract 9 for installation by this contract are as follows:

Qty	Description	Dimension	Weight
3	Ash Recycle	204"x52"x30"	2800 lb
3	Ash Pond Blowdown	216"x36"x24"	2800 lb
2	Landfill Runoff	144"x36"x24"	2800 lb
2	Secure Landfill Runoff	210"x36"x24"	2800 lb
1	Secure Landfill Drain	264"x36"x24"	2800 lb

17G-3 PERFORMANCE

A. Install equipment and materials in strict accordance with the manufacturer's instructions.

B. All tolerances in alignment and leveling, and the quality of all workmanship shall be in accordance with the manufacturer's instructions.

C. All tolerances in alignment and leveling, and the quality of all workmanship shall be in accordance with the manufacturer's published standards.

D. Copies of all required drawings and manufacturer's instruction books will be made available to the contractor prior to the start of any work.

E. Installation of the pumps shall include the following items of work:
1. Level, align, and grout pit covers.
2. Mount pump on pit covers and align with mating flanges on suction and discharge piping.
3. Install all accessories furnished under Contract 9.
4. Install all piping and tubing complete as shown on Worthington Drawing ready for external piping. Drawing will be made available to successful bidder.
5. Complete makeup of discharge connections.
6. Start pumps and insure pumps are operating satisfactorily.

* * * * *

17H - MANHOLES

17H-1 GENERAL REQUIREMENTS

A. DESCRIPTION:
  1. This Section includes manholes for the Plant Drain Yard (PDY) system.
  2. Related work specified elsewhere:
    a. Concrete: DIVISION 3.

B. QUALITY ASSURANCE:
  1. Applicable Standards:
    a. American Society for Testing and Materials (ASTM).
      (1) C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
      (2) C478 - Precast Reinforced Concrete Manhole Sections.

17H-2 EQUIPMENT AND MATERIALS

A. PRECAST CONCRETE MANHOLES: Precast units shall meet the following requirements:
  1. Equal or exceed provisions of ASTM C478. Manhole design and construction shall be approved in writing by the Engineer.
  2. Include risers, cone, cover and frame, and steps. Base shall be cast-in-place concrete in conformance with DIVISION 3 - CONCRETE.
  3. Rubber gaskets shall be of the O-ring type.
  4. Join manhole sections with rubber and concrete joints conforming with ASTM C443, paragraph 18.
  5. Install manhole steps at 12 inches on center vertical.
  6. Apply two coats of Kopper's Bitumastic No. 50 to the exterior surface.

B. MANHOLE COVERS AND FRAMES: As indicated on the drawings.

C. MANHOLE STEPS: No. 3232 as manufactured by Clay & Bailey or approved equal.

17H-3 PERFORMANCE

A. INSTALLATION: As indicated on the drawings and specified in DIVISION 3.

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DIVISION 18 - ROADS, DRIVES, AND WALKS

18A - LIMEROCK SURFACE COURSE

18A-1 GENERAL

A. DESCRIPTION:
  1. This Section includes limerock surface course and method of depositing.
  2. Related Work Specified Elsewhere:
     a. Site Preparation and Earthwork: SECTION 2A.

B. QUALITY ASSURANCE:
  1. Applicable Standards:
     a. American Association of State Highway and Transportation Officials (AASHTO):
        (1) T99 - Test for the Moisture Density Relations of Soils Using a 5.5-Pound Rammer and a 12-Inch Drop.
     b. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction (Exclusive of Sections on Method of Measurement and Basis of Payment).
        (1) Section 200 - Limerock Base.
        (2) Section 911 - Limerock Material for Limerock Base and Stabilized Base.

C. COMPLIANCE SUBMITTALS:
  1. Submit as specified in DIVISION 1.
  2. Includes, but not limited to, certification that material conforms to specifications.
     a. Certificates shall be prepared by a recognized testing laboratory.
     b. Contractor shall furnish Engineer certified copies of test reports.

18A-2 EQUIPMENT AND MATERIALS

A. EQUIPMENT:
  1. Maintain all equipment, tools, and machines used in the performance of the work required by this Section in a satisfactory working condition at all times.
  2. Equipment shall be industry standard equipment designed to accomplish the work for which it is used and shall conform to FDOT Section 200-3.
  3. Equipment shall be subject to the approval of the Engineer.

B. MATERIALS:
  1. General: Limerock surface course shall consist of aggregate specified and shall be subject to final approval of the Engineer.
  2. Aggregate shall be limerock material and shall conform to FDOT Section 911 as follows:
     a. Material shall be classified either as Ocala Formation or as Miami Oolite Formation. Limerock material which is mined above the 28th degree parallel in the State of Florida will be considered and tested only as Ocala Limerock and material mined below such parallel only as

Miami Limerock. Material of only one formation may be used on this contract.

b. The minimum percentage of carbonates (of calcium and magnesium) in the limerock material shall be in accordance with the following:
   (1) Ocala Limerock: 95
   (2) Miami Limerock: 70
   (3) For any one day's shipment, up to 15 percent of all material may be deficient in the carbonates by up to one percent less than minimum.

c. The organic matter contained in limerock material shall not exceed one-half of one percent of the material.

d. Limerock material which shows a significant tendency to air slake, or to undergo chemical change under exposure to the weather will not be acceptable.

e. For Ocala limerock material the liquid limit shall not exceed 35 and all limerock materials shall be nonplastic.

f. Limerock material shall not contain flinty or other hard pieces, in sufficient quantity to prevent proper bonding or the obtaining of a smooth surface, free from excessive pits and pockets.

g. Gradation and size requirements shall be as follows:
   (1) At least 97 percent by weight of the material shall pass a 3-1/2-inch sieve and the material shall be graded uniformly down to dust.
   (2) The fine material shall consist entirely of dust of fracture.
   (3) All crushing or breaking-up which might be necessary in order to meet such size requirements shall be done before the material is placed on the road.

18A-3 PERFORMANCE

A. GENERAL REQUIREMENTS:

1. Stockpiles:
   a. Clear and level storage sites prior to stockpiling.
   b. Place in the manner and at locations designated by Engineer, providing separate stockpiles for materials from separate sources.
2. Cold-Weather Limitations:
   a. Surface course construction shall be prohibited when atmospheric temperature is below 35 degrees F.
   b. Do not place surface course on frozen subgrade.
   c. Protect surface course and subgrade in freezing weather and repair areas damaged by freezing by reshaping and recompacting.
3. Preparation of Subgrade:
   a. Clean of all foreign substances.
   b. Correct any ruts or soft yielding spots or any areas with inadequate compaction.
   c. Engineer will inspect for adequate compaction and surface tolerances.
4. Grade Control: Establish and maintain by means of grade stakes placed in lanes parallel to the centerline of the area to be surfaced and spaced so string lines may be stretched between stakes.

B. MIXING AND PLACING OF MATERIALS:
   1. Methods for mixing, placing, and compacting limerock surface course shall conform to FDOT Section 200.
   2. Surface testing shall conform to FDOT Section 200-7.

C. MAINTENANCE: Maintain finished surface course in a condition satisfactory to the Engineer until completion of the contract.

D. WAYBILLS AND DELIVERY TICKETS: Submit for each load of surfacing material daily to the Engineer during progress of work.

* * * * *

18B - BITUMINOUS PRIME AND TACK COAT

18B-1 GENERAL

A. DESCRIPTION:
  1. This Section shall consist of the application of liquid bituminous material, having penetrating properties, to a prepared subgrade and to a mixed-in-place bituminous base in the ash, sludge and pump back cells, and to a limerock surface course on roads.
  2. Related Work Specified Elsewhere:
    a. Limerock Surface Course: SECTION 18A.
    b. Site Preparation and Earthwork: SECTION 2A.

B. QUALITY ASSURANCE:
  1. Applicable Standards:
    a. American Society for Testing and Materials (ASTM):
      (1) D140 - Sampling Bituminous Materials.
      (2) D977 - Emulsified Asphalt.
    b. Federal Specifications (FS):
      (1) SS-A-706d - Asphalt, Petroleum: Road and Pavement Construction (Asphalt Cement).
    c. Florida Department of Transportation Standard Specifications for Road and Bridge Construction.
      (1) Section 300 - Prime and Tack Coats for Base Courses.
  2. Samples and Testing:
    a. Tests to determine conformance with all requirements for material quality and properties specified herein will be performed by an independent laboratory approved by the Engineer and compensated by the Contractor.
    b. Obtain representative samples of material in accordance with ASTM D140 for testing. Furnish Engineer sufficient material for testing from each sample at the time obtained.
    c. Furnish specific schedule for sampling to provide Engineer the opportunity to observe sampling.
    d. Quality control testing will be performed during construction by a testing laboratory retained by the Owner.

C. COMPLIANCE SUBMITTALS:
  1. Submit as specified in DIVISION 1.
  2. Includes, but not limited to, the following:
    a. Test result reports from testing laboratory indicating conformance with the specifications.
    b. Certification of conformance with the specifications.

18B-2 EQUIPMENT AND MATERIALS

A. EQUIPMENT:
  1. General Requirements:
    a. Furnish and maintain all equipment, tools and machines used in performance of the Work required by this Section in satisfactory working condition at all times.

b. All equipment designated for use in this Work shall be subject to approval by the Engineer.

2. Bitumen Distributor:
   a. Distributor shall be of the pressure type with insulated tanks.
   b. The use of gravity distributors will not be permitted.
   c. The distributor shall be designed and equipped with the necessary accessories and instruments to provide for the uniform application of bituminous material on various widths of surface at readily determined and controlled rate of 0.05 to 4.0 gallons per square yard.
   d. The maximum allowable variation from any specified rate of application shall not exceed 10 percent.
   e. Distributor and booster tanks shall be so maintained at all times that no dripping of bituminous material will occur from any part of the equipment.
   f. The minimum equipment for an approved distributor truck shall be as follows:
      (1) A positive displacement-type bitumen pump powered so that uniform distribution of the bituminous material at the rate specified will be obtained. No bypassing of the material to the tank during distribution operations will be permitted. The speed of the pump shall be controlled either by the driver or by the operator on the rear of the truck. A metering device shall be provided to furnish accurate information as to the amount of material being pumped in order to ensure accurate control of the spread.
      (2) A heating device, as an integral part of the truck, which will heat the material to, and maintain it at, the required temperature. The device shall be of a low-pressure type with separate low pressure blower and high-pressure spray nozzle to provide fast and adequate heating before and during the spreading operations.
      (3) A pump or other device for circulating and agitating the bituminous material during the heating process.
      (4) Devices and charts to provide for accurate and rapid predetermination and control of the amount of bituminous material being applied, including a tachometer of the auxiliary wheel type, reading speed in feet per minute, and a suitable instrument for recording, in feet, the total distance traveled.
      (5) A dial indicator, mounted in full view of the operator, that will show accurately the quantity of bituminous material in the tank.
      (6) An accurate thermometer, mounted on the tank and capable of being read from the ground, that will show the temperature of the bituminous material in the tank.
      (7) A full circulating swinging spray bar capable of spraying various widths of from 6 inches to at least 12 feet. When extensions are used, they shall also be of the full circulating type. The spray bar shall have a minimum lateral movement to each side of 6 inches and shall have adjustments to permit the surface to be treated from various heights.
      (8) A pressure gauge, pump tachometer or other approved device for controlling the amount of bituminous material being pumped through the spray bar.

18B - BITUMINOUS PRIME AND TACK COAT: continued

(9) A hand hose and nozzle attachment to be used for spotting skipped areas, and areas inaccessible to the distributor.

(10) Spray-bar nozzle valves which are operated by levers so that all valves may be quickly opened or closed in one operation by the operator at the rear of the distributor.

(11) Dual pneumatic tires. Dual axles will not be permitted unless they are equipped with dual tires.

3. Heating Equipment (Storage Tanks):
   a. Steam coils and equipment for producing steam, or approved type retort heater manufactured for heating asphaltic products, at Contractor's option so designed that steam will not be introduced into the material.
   b. An armored thermometer with a range from 100 to 400 degrees F, fixed to tank in a manner such that it can be easily read from the ground and will continuously indicate temperature of bituminous material.

B. MATERIALS:
1. Bituminous prime coat may be either RC 250 or RC 70, conforming to the requirements of FDOT Section 300.
2. Bituminous tack coat may be either RS-2, SS-1, or SS-1 H, conforming to the requirements of FDOT Section 300.

18B-3 PERFORMANCE

A. PREPARATION OF SURFACE:
1. Remove all loose and objectionable material from surface.
2. Surface shall be approved by Engineer prior to application of prime coat.
3. Correct any ruts, soft-yielding spots or any other areas deemed unsuitable by the Engineer as follows:
   a. For subgrade repair as specified for "SUBGRADE PREPARATION," SECTION 2A.
   b. For limerock surface course repair as specified for "LIMEROCK SURFACE COURSE," SECTION 18A.
4. Sprinkle surface with water immediately in advance of application of prime coat, if surface is excessively dry.

B. APPLICATION OF BITUMINOUS PRIME AND TACK COAT:
1. Apply by means of an approved bituminous distributor.
2. Apply bituminous prime and tack coats only when atmospheric temperature in the shade is above 40 degrees F, and the atmospheric and surface conditions are such as will permit satisfactory penetration and adhesion of prime or tack coat.
3. The approximate quantity of bituminous prime to be used shall be as follows:
   a. For limerock surface course on roads, not less than 0.10 gallon per square yard.
   b. For subgrade beneath hot-mix asphaltic concrete liner on side slopes in ash, sludge, and pump back ponds, 4.0 gallons per square yard.

4. The approximate quantity of bituminous tack to be used on the mixed-in-place bituminous base on the pond bottoms and ramps shall be between 0.02 and 0.08 gallons per square yard.
5. The bituminous prime and tack coats shall be uniformly applied at the rate so designated and in one application.
6. Any spots that are missed in the initial application or any areas which develop that do not have a uniform spread or penetration shall be hand sprayed as directed by Engineer.
7. If directed by Engineer, areas deemed to have excess bituminous prime shall be blotted with approved material.
8. The primed limerock surfacing shall be covered by an application of cover material as specified in FDOT Section 300-6.5.
9. Allow primed surface to cure for not less than 48 hours without being disturbed.
10. Allow tack coated surface to cure as directed by the Engineer.
11. Traffic shall be kept off the bituminous material until it has cured.
12. Maintain prime coated and tack coated surface until the succeeding layer of pavement has been placed.
13. In the event traffic has caused holes or breaks in the prime coated or tack coated surface, such holes or breaks shall be repaired, as directed by the Engineer, at no additional expense to the Owner.

* * * * *

SOUTHERN CULVERT
AN OPERATION OF ST REGIS
P.O. Box 460 • Pinellas Park, Florida 33565 Phone: (813) 544-8811

Telegram from Western Union 4-7-80

ECI shall fully guarantee all material and workmanship to meet a permeability of 1 x 10^{-7} centimeters per second for a period of not less than 10 years.

Jeff Shallard
ECI Inc.

Reference: Deerhaven 29C
yard structures

James R. Gregg
James R. Gregg
Vice-President
Square G. Const Inc

* INTERFACE WITH CONTRACT NO. [illegible], CONTRACTOR NEED NOT FILL IN SCHEDULE FOR THIS ITEM AT THIS TIME.
** CONTRACTOR MUST FILL IN EQUIP. & MANPOWER ITEMS.

PROPOSED SCHEDULE

CONTRACTOR Square G Construction Company, Inc.

PHASE OF WORK | WEEKS | 0 NOTICE TO COMMENCE WORK AT SITE | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70

PIPING
[illegible] WATER PIPING
8 ASH [illegible]
A) EXC./EMBANKMENT
B) LINER INSTALLATION
C) PLANT YARD DRAINS PIPING
D) PUMP STRUCT.
E) FINAL GRADING
9 SECURE LANDFILL POND
A) EXC./EMBANKMENT
B) [illegible] WALLS
C) LINER INSTALLATION
D) PLANT [illegible]
E) PUMP [illegible]
F) FINAL GRADING
10 [illegible]
11 ROADS
A) GRADING
B) LIMEROCK SURFACING
12 FINAL GRADING, [illegible]
SOIL, SEEDING
MULCHING, ETC.

MAJOR EQUIP. **
SCRAPERS 7, 8, 12 ... 8 ... 2, 1
FRONT END LOADERS 0, 1, 2, 3 ... 3 ... 2 ... 1
BACKHOE 0, 2, 3 ... 2 ... 1 ... 0
DOZERS 2, 5, 8 ... 6 ... 4 ... 2
PUMP TRUCKS 1, 2, 3 ... 5 ... 8 ... 10 ... 7 ... 5 ... 3 ... 1
COMPACTORS 1, 2, 2, 3 ... 2, 1
OTHER 3, 6, 10 ... 14 ... 11 ... 7 ... 4, 3

MANPOWER [illegible] 7, 18, 22, 26 ... 32 ... 34 ... 30 ... 36 ... 30 ... 26 ... 20, 18, 15, 14, [illegible]
MAN [illegible] 7, 13, 22, 27 ... 28 ... 35 ... 14 ... 14 ... 15 ... 13 ... 11, 25, 16, 8, 3
TOTAL [illegible]

PROCUREMENT & DESIGN
CONSTRUCTION
SOLID VERTICAL LINE INDICATES COMPLETION OF ALL WORK

CONTRACT COMPLETE

DATE 5-5-86
DESIGNED
DETAILED [illegible]
CHECKED

GAINESVILLE FLORIDA & RUB
DEERHAVEN UNIT 2
Burns & McDonnell

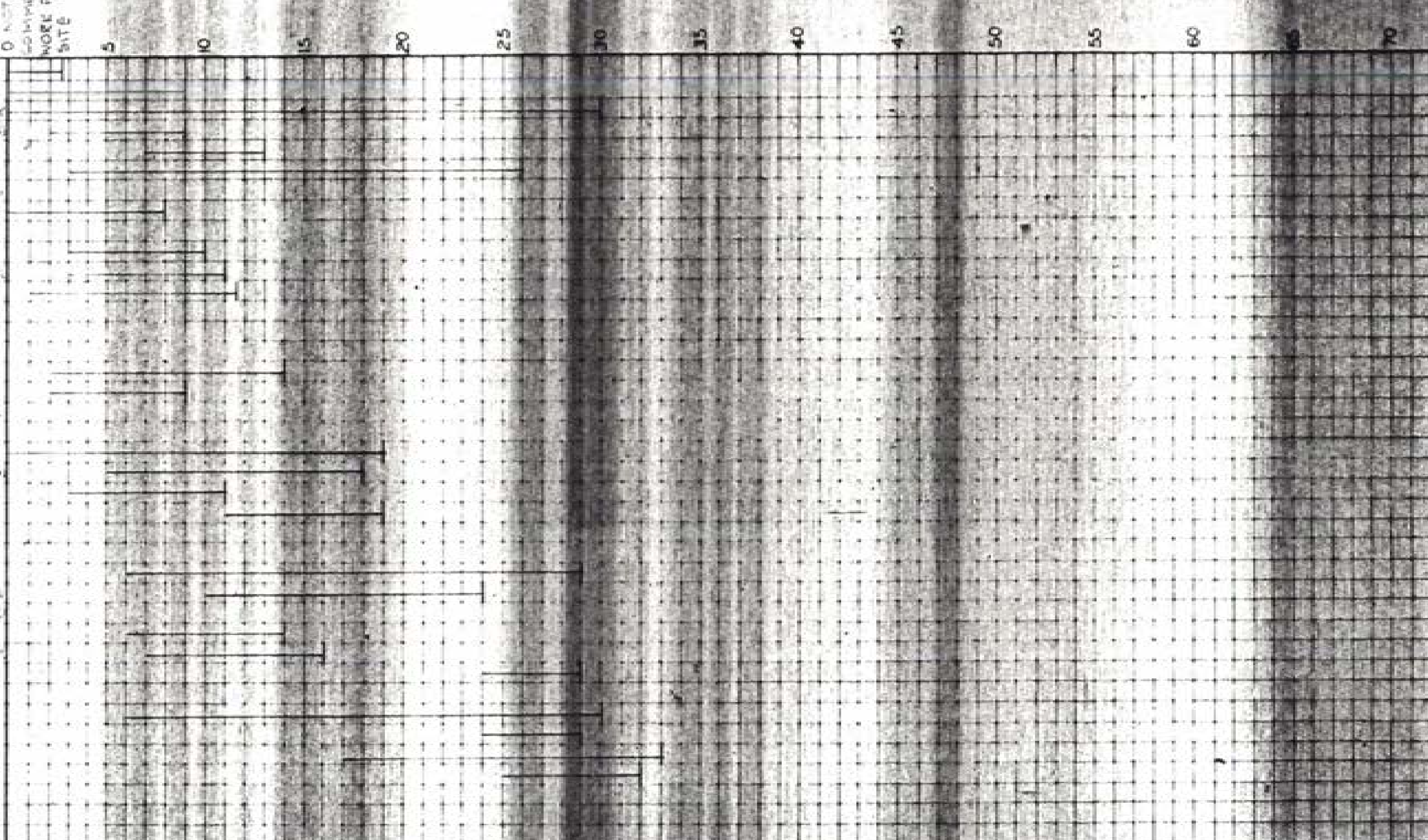
CONTRACT NO. 29C
PROJECT NO. 76-077-1
DRAWING NO. | REV.

NOTE:
COMPLETION OF STRUCT. MEANS
COMPLETE INCLUDING EQUIP. SET IN
PLACE, MATERIALS INSTALLED & READY
FOR ELECTRICAL CONNECTIONS

PROPOSED SCHEDULE

CONTRACTOR Squner G Construction
COMPANY, INC.

PHASE OF WORK	WEEKS
1 MOVE-IN & SET-UP	
2 ORDER EQUIP. & MTL.	
3 EQUIP. & MTL. DELIVERY	
A) BENTONITE (IF USED)	
B) PUMPS	
C) PIPE	
4 CLEARING & GRUBBING	
A) TEMP. ... TO ...	
OFF RET. POND NO. 1	
B) ASH PONDS	
C) ASH & SLUDGE ...	
D) CLAY BORROW	
PIT (IF USED)	
5 TEMP. CONSTR. ...	
RET. POND NO. 1	
A) EXCAVATION	
B) OUTLET STRUCT.	
6 COAL YARD ...	
RUNOFF RET. POND	
A) EXC./EMBANKMENT	
B) LINER INSTALLATION	
C) POND PUMP STRUCT.	
D) FINAL GRADING	
7 ASH, SLUDGE	
PUMPBACK PONDS	
A) EXC./EMBANKMENT	
B) LINER INSTALLATION	
C) ASH & SLUDGE POND	
STOPLOG STRUCT.	
D) RECYCLE PUMP STRUCT.	
E) ASH POND ELEC.	
EQUIP. BLDG.	
F) PIPE ... STRUCT.	
G) ASH PIPE DRAIN PIT	
H) FINAL GRADING	
I) ASH SLUICE WATER	
MANPOWER PRIME CONTR.	
MANPOWER SUBS	
TOTAL JOB MANPOWER	



— — — — — PROCUREMENT & DESIGN
———————— CONSTRUCTION
| SOLID VERTICAL LINE INDICATES COMPLETION OF ALL WORK

CONTR. TO COMPLETE

DATE	5-5-80
DESIGNED	C.F. Taylor
DETAILED	
CHECKED	

GAINESVILLE FLORIDA & RUB
DEERHAVEN UNIT 2

Burns & McDonnell

CONTRACT NO.	28C
PROJECT NO.	78-077-1
DRAWING NO.	[illegible]

Contract 29C Yard Structures III

DWGNO	DWGTITLE
A86	ASH POND ELECTRICAL BLDG PLAN & DETAILS
A87	ASH POND ELECTRICAL BLDG DETAILS
L-114	FLOOR PLANS STRUCTURAL STEEL DESIGN LAYOUT
M35	HVAC & PLUMBING ASH POND ELEC EQUIPMENT BUILDIN
S001	STANDARD DETAILS
S002	STANDARD DETAILS
S003	STANDARD DETAILS
S004	STANDARD DETAILS
S005	STANDARD DETAILS
S222	RECYCLE PUMP STRUCTURE
S223	ASH POND ELEC EQUIPMENT BUILDING RETAINING WALL
S224	ASH POND STOP LOG STRUCUTRE NO.1 & 2
S225	SLUDGE POND STOPLOG STRUCUTRE NO.1 & 2
S226	HEADWALLS & BRIDGE ABUTMENTS
S227	STOPLOG STRUCUTRE BRIDGES
S228	CROSSING STRUCTURE NO.6
S229	CROSSING STRUCTURE NO.7
S230	CROSSING STRUCTURE NO.8 & SLURRY WALL CROSSIN
S231	ASH PIPE DRAIN PIT STRUCTURE ASH POND ELECTR EQ
S232	PIPE SUPPORTS
S233	UNASSIGNED
S234	CONCR SLAB ON STOCKOUT TOWER & STAIR TOWER GU
S235	C.P.R. POND PUMP STRUCTURE & HEADWALL TEMP CON
S236	SECURE LANDFILL RUNOFF RETENTION POND PUMP ST
S237	ASH LANDFILL PUMP STRUCUTURE
S238	UNASSIGNED
S239	UNASSIGNED
S240	UNASSIGNED

DWGNO	*DWGTITLE*
U07	DRAWING REFERENCE & LEGEND
U08	YARD UTILITIES ASH & SLUDGE PONDS
U09	YARD UTILITIES ASH & SLUDGE PONDS
U10	YARD UTILITIES SECURE LANDFILL
U11	YARD UTILITIES ASH LANDFILL I
U12	YARD UTILITIES ASH LANDFILL II
U13	UNASSIGNED
UP43	ISOMETRIC DETAILS I
UP44	ISOMETRIC DETAILS II
UP45	UNASSIGNED
UP46	MISCELL PIPING DETAILS I
UP47	MISCELL PIPING DETAILS II
UP48	MISCELL PIPING DETAILS III
UP49	UNASSIGNED
UP50	YARD ENLARGEMENT DETAILS I
UP51	YARD ENLARGEMENT DETAILS II
UP52	YARD ENLARGEMENT DETAILS III
UP53	YARD ENLARGEMENT DETAILS IV
UP54	VALVE LIST & CONNECTION SCHEDULE
UP55	PIPING DESIGN TABLES
UP56	PIPING SUPPORT SCHEDULES
Y000	GENERAL SITE PLAN
Y062	SITE PLAN
Y063	CLEARING & GRUBBING LIMITS
Y064	GRADING PLAN 1
Y065	GRADING PLAN 2
Y066	GRADING PLAN 3
Y067	GRADING PLAN 4
Y068	GRADING PLAN 5
Y069	GRADING PLAN 6

DWGNO	*DWGTITLE*
Y070	GRADING PLAN 7
Y071	GRADING PLAN 8
Y072	GRADING PLAN 9
Y073	GRADING PLAN 10
Y074	GRADING PLAN 11
Y075	ALTERNATIVE GRADING PLAN
Y076	ROAD PROFILES 1
Y077	ROAD PROFILES 2
Y078	RAMP PROFILES
Y079	UNASSIGNED
Y080	GRADING SECTIONS 1
Y081	GRADING SECTIONS 2
Y082	GRADING SECTIONS 3
Y083	GRADING SECTIONS 4
Y084	UNASSIGNED
Y085	GRADING DETAILS 1
Y086	GRADING DETAILS 2
Y087	GRADING DETAILS 3
Y088	GRADING DETAILS 4
Y089	GRADING DETAILS 5
Y090	UNASSIGNED
Y091	STORM DRAINAGE DETAILS 1
Y092	STORM DRAINAGE DETAILS 2
Y093	STORM DRAINAGE DETAILS 3
Y094	UNASSIGNED
Y095	UNASSIGNED

Book No. __

Gainesville Regional Utilities

Deerhaven Generating Station Emergency Response Action Plan (Facility Response Plan 1.1)

10001 NW 13th Street
U. S. Highway 441 North
Gainesville, Florida 32653

ACRONYMS

This section contains a listing of acronyms which are used in the Facility Response Plan or which may be useful for the user of this manual in response subject related discussions.

CFR:	Code of Federal Regulations
CWA:	Clean Water Act
DOT:	Department of Transportation
EPA:	Environmental Protection Agency
FDEP:	Florida Department of Environmental Protection
FEMA:	Federal Emergency Management Agency
FRP:	Facility Response Plan
GPM:	Gallons Per Minute
GRU:	Gainesville Regional Utilities
HAZMAT:	Hazardous Materials
LEPC:	Local Emergency Planning Committee
MSDS:	Material Safety Data Sheet
NRC:	National Response Center
OPA:	Oil Pollution Act of 1990
PCB:	Polychlorinated Biphenyl
PREP:	National Preparedness for Response Exercise Program
SCBA:	Self Contained Breathing Apparatus
SDWA:	Safe Drinking Water Act of 1986
SERC:	State Emergency Response Commission
SIC:	Standard Industrial Classification
SPCC:	Spill Prevention, Control, and Countermeasures
USGS:	United States Geological Survey

TABLE OF CONTENTS

1.0 FACILITY RESPONSE PLAN

The Deerhaven Generating Station is an electric power generating facility located on 3,463.59 acres, approximately seven miles north of downtown Gainesville on U.S. Highway 441, near Hague, Florida. The facility is owned by the City of Gainesville and operated by Gainesville Regional Utilities (GRU). The facility began operations in 1972. The facility operates around the clock in two 12-hour shifts, seven days a week.

Two steam electric generating units and three combustion turbines comprise the power generating capabilities of the Deerhaven Generating Station. Unit 1 is an 81 megawatt (MW) natural gas or oil-fired (Number 2 or Number 6 fuel oil) unit. Unit 2 is a 235 MW coal-fired unit, ignited either by natural gas or Number 2 fuel oil. The three combustion turbines, two at 20 MW and 74 MW nominal capacities, are fired on natural gas or Number 2 fuel oil. A site plan with locations of storage tanks is provided in the Site Plan Diagram, Section 1.1.9.

The Deerhaven Generating Station is a "zero discharge" facility. Process wastewater onsite is collected, treated, and reused. This is made possible by a water treatment system which utilizes a brine concentrator as the primary component. Process wastewater is collected in clay lined process ponds and pumped to the brine concentrator after solids separation. A Front End Water Treatment System, which provides lime softening of pumped groundwater, augments the brine concentrator condensate for process makeup water.

The purpose of a Facility Response Plan is to provide a facility which handles significant quantities of oil with structured guidance for addressing a spill event. Discussions range from measures for spill prevention to appropriate response actions and resources available in the event of a spill.

The Environmental Protection Agency (EPA) has provided a specific format in Appendix F of 40 CFR 112 after which this Facility Response Plan has been modeled for ease in assuring compliance.

The first section of this plan, 1.1 *Emergency Response Action Plan (ERAP)*, is a compilation of information found in subsequent sections of the plan for immediate access in the event of spill. A copy of the ERAP is distributed to GRU response personnel for reference in case of an oil spill. The remaining sections 1.2 through 1.9 comprise the complete *Facility Response Plan (FRP)*.

1.1 EMERGENCY RESPONSE ACTION PLAN

The Emergency Response Action Plan, Section 1.1, provides a condensed compilation of selected portions of the full Facility Response Plan (Sections 1.2 through 1.9) for quick reference in an oil spill emergency situation. Included components are listed below with the respective source sections of the full plan:

Emergency Response Plan Section Number	Subject	Facility Response Plan Reference Section
1.1.1	Response Personnel Duties and Responsibilities	1.2
1.1.2	Emergency Notification Phone List	1.3.1
1.1.3	Spill Response Notification Form	1.3.1
1.1.4	Response Equipment List and Location	1.3.2
1.1.5	Response Equipment Testing and Deployment	1.3.3
1.1.6	Facility Response Team	1.3.4
1.1.7	Evacuation Plan	1.3.5
1.1.8	Immediate Actions	1.7.1
1.1.9	Facility Diagram	1.9

In some cases, only a portion of the referenced FRP section is utilized in the ERAP. For more detailed and complete information, refer to the appropriate reference section as listed in the above table.

1.1.1 RESPONSE PERSONNEL DUTIES AND RESPONSIBILITIES

1.1.1.1 Qualified Individual Duties and Responsibilities

As specified in Section 1.2 of this Facility Response Plan, the Plant Manager is the Qualified Individual for the Deerhaven Generating Station. The Maintenance Manager is the Alternate Qualified. This section defines the duties specific to these roles as set forth in 40 CFR 112.20(h)(3)(ix). All of the duties specified for the Qualified Individual in this and other sections of this FRP apply to the Alternate Qualified Individual identified in Section 1.2.

Facility Awareness

The Qualified Individual is responsible for activating internal alarms and hazard communication systems to notify all facility personnel. This includes notifying facility response personnel if appropriate.

Spill Characterization

As detailed in Section 1.3.1 of this plan, event specific information is required for the notification process. The Qualified Individual must be able to identify the character, exact source, amount, and extent of the release, as well as the other items needed for notification.

Notification

The Qualified Individual must be able to notify and provide necessary information to the appropriate federal, state, and local authorities with designated response roles, including the National Response Center, State Emergency Response Commission, and Local Emergency Planning Committee.

Situation Assessment

Assessment of the spill event is essential to determining the order and extent of necessary response actions. The Qualified Individual must have the ability to perform each of the following duties:

- Assess the interaction of the spilled substance with water and/or other substances stored at the facility and notify response personnel at the scene of that assessment.
- Assess the possible hazards to human health and the environment due to the release. This assessment must consider both the direct and indirect effects of the release (*i.e.*, the effects of any toxic, irritating, or asphyxiating gases that may be generated or the effects of any hazardous surface water run-offs from water or chemical agents used to control fire and heat-induced explosion).

- Assess and implement prompt actions to contain and remove the substance released.

Coordination of Activities

The Qualified Individual is expected to coordinate rescue and response actions as previously arranged with all response personnel. This includes directing cleanup activities until properly relieved of this responsibility.

Authority

The Qualified Individual has authority to immediately access funding to initiate cleanup activities.

1.1.1.2 Spill Coordinator's Duties and Responsibilities

The Spill Coordinator will be responsible for performing the following duties.

- Notify all facility personnel potentially impacted by the emergency.
- Immediately identify the material, source, amount, and the extent of any released materials through observation, review of facility records, or chemical analysis.
- If necessary, initiate evacuation of the affected areas.
- Assess possible hazards to human health or the environment including impacts to surface water bodies and fire/explosion potential. The assessment will consider both the direct and indirect effects of the release such as: fire, generation and/or release of any toxic, irritating or asphyxiating gases, or the run off resulting from water or chemical agents used to control the emergency. Incompatibilities with other materials must be assessed by consulting Material Safety Data Sheets, Chemtrec (9-1-800-424-9300), or the Gainesville Fire Rescue Hazardous Materials (HazMat) Team (9-911). Chemtrec can be contacted to provide hazard information and guidance when given the identification number, name of the product, and nature of the problem.
- Request assistance from the fire department or police, as appropriate.

- Stabilize the situation and implement control measures. Initiate, coordinate, and supervise countermeasure activities which will stop or prevent the progression of the release.

- Notify GRU Environmental Personnel.

- If Environmental Personnel are not available, make all required notifications. Otherwise, the Environmental Personnel will make the appropriate notifications.

- Begin cleanup operations.

- Take all reasonable measures necessary to insure that releases, fires, and explosions do not occur, reoccur, or spread to other portions of the facility. These measures will include, where applicable, stopping processes and operations, collecting and containing spilled material, and removing and/or isolating containers.

- In the event facility operation is shut down, monitor the entire facility for leaks, pressure buildup, gas generation, *etc.* in tanks, pipes, or other equipment as appropriate.

- Provide for the safe storage of recovered spilled material, contaminated soil, contaminated water, or any other material that results from a release, fire, or explosion at the facility. GRU Environmental Personnel will provide guidance on appropriate storage and disposal methods, in accordance with local, state, and federal laws.

- After the spill event, ensure that all emergency equipment is cleaned and operational for future use.

The shift supervisor on duty will act as a Spill Coordinator until another one of the designated Spill Coordinators in Table 1.1-2 has been notified and has assumed responsibilities.

1.1.2 EMERGENCY NOTIFICATION PHONE LIST

This section provides the person making the spill notification with the necessary telephone numbers for an emergency response event. Responsibilities of Spill Coordinators and Environmental Personnel are defined and appropriate individuals designated.

Figure 1.1-1 provides an important flowchart sequence of initial notification protocol. This flowchart prompts the caller to make the required notifications and provides guidance for:

- Fire/Rescue (911)
- Spill Coordinators (referenced to Table 1.1-2)
- Deerhaven Radiation Safety Officer
- Environmental Staff
- City of Gainesville Risk Management
- City of Gainesville Corporate Communications
- GRU Gas.

A more complete list of internal and external numbers to possibly use during an emergency is provided in Tables 1.1-1 through 1.1-3. The order in which notifications and contacts are made largely depends on the severity of the spill and other mitigating factors. Judgment must be used in making this decision. Depending on available personnel, the acting Spill Coordinator may assign different notification responsibilities to several people, thereby providing simultaneous notifications. Certainly, if employee and/or public safety are endangered, the Fire/Rescue and Police Departments must be contacted and obviously should be the first notifications made.

Contact of a designated Spill Coordinator (Table 1.1-2) should follow a spill. If the situation warrants, the Emergency Response Contractor should be the next notification in order to mobilize the response effort. Environmental Personnel (Table 1.1-3) would next be contacted and Environmental Notifications initiated immediately thereafter.

Figure 1.1-1, Table 1.1-2, and Table 1.1-3 should be posted at locations in the plant where it is anticipated that notifications may be initiated, including the Control Room, Laboratory, Coal/Ash Facility, and Process Plant. This provides immediate access to the notification telephone numbers.

Fire/Rescue (Hazmat Team) and Police

If fire or other immediate employee and/or public danger exists then the caller should immediately dial 9-911 to contact the Gainesville Fire/Rescue and Police Departments.

The caller must provide very *specific* information about the location and nature of the emergency. The caller should then proceed to notify designated Spill Coordinators and Environmental Personnel.

In the event a spill migrates off-site, it will be necessary to involve the Fire/Rescue and Police Departments which have the authority to access private property without prior permission.

Environmental Personnel

Environmental Personnel are responsible for making all required environmental notifications. Attempt contact in the order listed in Table 1.1-3. If neither environmental engineer can be reached, the Spill Coordinator must make the required environmental notifications (Figure 1.1-1).

Emergency Response Contractors

A variety of response capabilities are referenced in the Figure 1.1-1 flowchart. The spill category, as assessed by the Spill Coordinator, will determine the proper selection of response resources. Spill emergencies are broken out into two main categories—minor and major spills:

- Minor Spills — Spills that can be controlled at the time of release in the immediate release area with booms/sorbent pads and do not require specialized response personnel or equipment.
- Major Spills — Spills that cannot be contained at the time of release in the immediate release area or that require specialized response personnel, or equipment.

The primary contractor to be used in the event of major spills is listed on Table 1.1-3.

Available resources for minor spills are listed and will be selected to provide assistance at the discretion of the Spill Coordinator. Additionally, the primary response contractor for major spills can also be contacted to provide specific cleanup equipment (vacuum trucks, *etc.*) and technicians for minor spill events.

Environmental Notifications

As previously stated, Environmental Personnel are primarily responsible for making required environmental notifications. However, if Environmental Personnel are unavailable, the Spill Coordinator will be responsible for these notifications.

Reportable spills might involve notification to the National Response Center, State Division of Emergency Management, and/or the Alachua County Environmental Protection Department. If materials with a polychlorinated biphenyl (PCB) concentration in excess of 50 parts-per-million (ppm) enter a surface water body, drinking water resource, grazing lands, or a human consumption agricultural area, EPA Region IV Office of Pesticides and Toxic Substances must also be notified.

City of Gainesville Risk Management

The Spill Coordinator should contact the City of Gainesville Risk Management Department in the event of fire, fatalities, injuries, evacuation, or damage to property as indicated in Figure 1.1-1 and apprise the appropriate representative (Risk Manager) of the situation.

1.1.3 SPILL RESPONSE NOTIFICATION FORM

During an emergency response event, pieces of information required by various agencies may not necessarily be available to the person making the immediate notification calls. Due to the potentially critical nature of the situation, this could result in confusion and the impediment of the notification process.

The *Spill Response Notification Form*, Figure 1.1-2, has been prepared to provide structured guidance for information gathering. Facility specific information such as address, longitude, latitude, *etc.* has been included for the reporter's reference. Underlined blanks indicate information to be provided specific to the response event.

Note that one of the items on this form questions whether the facility is meeting environmental obligations to report. In the event environmental personnel cannot be reached, the answer to this question can be found in Figure 1.1-3, *Oil Release Notification Form*. Figure 1.1-3 provides a step by step procedure to determine if a petroleum spill is reportable.

Notification will be accomplished immediately upon discovery of a spill. Although the Spill Response Notification Form is a checklist of information to be provided when making notifications, *the notification process should not be delayed in order to obtain all of the listed information.* However, the pursuit of this information should continue beyond notification until the form is completed.

1.1.4 RESPONSE EQUIPMENT LIST AND LOCATION

Table 1.1-4, 1.1-5 and 1.1-6 provide a compilation of response equipment available at the Deerhaven Generating Station or through the GRU Water and Wastewater Department.

The tables contain information specific to equipment stored at the generating plant. Equipment description, quantity, and location as well as inspector assignment and inspection frequency are listed. Contents of the listed Spill Containment Kits are detailed and quantified in Table 1.1-5.

Deerhaven frequently utilizes heavy earth moving equipment as listed in Table 1.1-6. In the event of a response situation, this equipment could be made available to response personnel. The Water and Wastewater Department can provide additional resources, so their phone number is included in Table 1.1-3. Still more equipment if needed may be available through the City's Public Works Department.

Deerhaven equipment is intended for use principally in minor spill incidents. Minor spills are those that can be controlled at the time of release in the immediate release area with booms/sorbent pads and do not require specialized response personnel or equipment. As further described in Section 1.3.4, emergency contractors have been identified for services in the event a spill exceeds the capacity of the plant's resources.

1.1.5 RESPONSE EQUIPMENT TESTING AND DEPLOYMENT

Equipment Testing

Table 1.1-4 contains inspection assignments and frequencies for Emergency Response Equipment at the Deerhaven Generating Station. Inspection logs are utilized for documentation and include the following information:

- Date of Inspection
- Name of the Inspector (where applicable)
- Inspection Activities (where applicable)
- Quantities (where applicable)
- Comments/Observations

Deficiencies are noted by the Inspector and corrective actions initiated.

Deployment

Petrotech Southeast, Inc. currently provides Gainesville Regional Utilities with emergency response services for the Deerhaven Generating Station. Petrotech Southeast, Inc. is located in Ocoee, Florida and has a three hour response time for the Gainesville area. Appendix A contains information pertaining to the services provided by Petrotech Southeast, Inc.

Appropriate internal drills involving emergency response notification are detailed in Section 1.8.2 of this plan.

1.1.6 FACILITY RESPONSE TEAM

Table 1.1-7 identifies members of the Deerhaven Facility Response Team. The Facility Response Team is a subset of the Emergency Response Personnel listing provided in Table 1.1.2.

In a spill situation which requires an emergency response effort, Qualified Individuals and Spill Coordinators will assume the essential role of organizing the response effort. The Emergency Response Contractor will be contacted and provided an analysis specific to the situation at hand. This will enable the contractor to determine specific equipment and manpower needs.

Depending on the situation, involvement of Fire/Rescue and Police may be requested. Decisions necessary to ensure the safety of on-site plant personnel will be made.

Attempts will be made to notify Environmental Personnel who are responsible for making all required environmental agency notifications. If none are available, the Spill Coordinator will make the notifications. Throughout the response, the Qualified Individual and Spill Coordinator will utilize their knowledge of the plant site and materials stored therein to advise and assist in the effort.

1.1.7 EVACUATION PLAN

Evacuation initiation is to be at the discretion of the Spill Coordinator. The potential for spilled materials to jeopardize life or threaten serious injury is the primary factor in the decision to evacuate. The following procedure is to be followed in the event of an evacuation:

1. Selection of evacuation route to assembly area
2. Announce evacuation message over intercom system
3. Evacuate to assembly area
4. Perform post evacuation evaluation

If (and only if) time allows, active equipment should be placed in emergency shutdown mode prior to evacuation.

Selection of Evacuation Routes to Assembly Area

Figure 1.1-4 illustrates the main evacuation routes and assembly areas. The assembly areas, which are located at the flagpole and the guard station, have been established to provide accountancy for each employee. Depending on the emergency condition, the guard station assembly area can be reached from more than one direction, should the situation require alternate routes. When selecting the proper assembly area and route, the Spill Coordinator should consider the following event specific factors:

- Location of stored fuels, chemicals, and combustible materials near spill
- Type of hazard related to spilled material (explosion, toxicity, etc.)
- Spill flow direction
- Prevailing wind direction and speed
- Arrival route of emergency response personnel and response equipment
- Potential evacuation routes
- Transportation of injured personnel to nearest emergency medical facility.

Depending on the location of the hazard and the location of various personnel on the site, it may be necessary to designate more than one evacuation route to provide safe access for all personnel.

Announcement of Evacuation

To facilitate organized removal of personnel from the site, the Spill Coordinator will make an announcement of the evacuation over the intercom. This message will inform plant personnel of the following information:

- Area(s) to be evacuated
- Hazard necessitating the evacuation
- Location of the hazard
- Blocked exits
- Proper evacuation route
- Location of the assembly area.

If possible, this message should be repeated several times during the evacuation.

Post Evacuation Evaluation

Upon reaching the assembly area, each supervisor will begin a head count of each individual under his/her supervision. The final count as well as any injuries will be provided to the Spill Coordinator. Depending on the situation, emergency personnel may choose to coordinate a search effort to locate any missing individuals.

Entry back into the evacuated facility areas will only be permitted after inspection by fire and safety officials and with the authorization of the Spill Coordinator.

Evacuations of Surrounding Communities

Any necessary evacuations of the public will be the responsibility of local authorities such as police department, fire department, and Local Emergency Planning Commission. The Spill Coordinator will assist the authorities in providing appropriate information concerning the spill event and associated hazards.

1.1.8 IMMEDIATE ACTIONS

Spills that cannot be contained at the time of release in the immediate release area or that require specialized personnel, materials, and/or equipment will be referred to the Primary Emergency Response Contractor. In the interim, immediate actions can be taken upon discovery of a spill to position for a successful response effort. In a generalized form, the following actions are included:

- Stop the product flow: Act quickly to secure pumps, close valves, *etc.*
- Warn personnel: Enforce safety and security measures.
- Shut off ignition sources: Motors, electrical circuits, open flames, etc.
- Initiate containment: Around the tank, around drainage structures, and/or in the water with oil boom.
- Start required notifications: As provided in the *Oil Release Notification Form.*

Section 1.5 of this plan identifies three spill magnitudes for planning purposes. The Worst Case Discharge, calculated to be 2,350,000 gallons, assumes: 1) complete loss of volume from the largest aboveground petroleum tank (No. 6 fuel oil) and 2) release of oil without taking into account the secondary containment structure. A medium discharge was determined to be 36,000 gallons and a small discharge, 2,100 gallons.

The Worst Case Discharge Scenario would require immediate contact and subsequent involvement of the Primary Emergency Response Contractor. In the interim, the Qualified Individual and/or Spill Coordinator would assume the notification and coordination responsibilities detailed above in Section 1.1.1 of this plan.

Several immediate actions can be taken to abate the progression of the spill. Flow paths and destinations of spills from each source identify potential locations for the placement of booms, construction of dams, or excavation of collection pits. See Figure 1.1-6 for a graphical display of flow pathways.

Boom Placement

Booms should be placed at the entrance and exit of Ponds #3 and #4. If on-site water drainage through culverts is sufficient to act as a carrier medium for the petroleum product, booms could potentially be an effective means of skimming and absorbing product from the water surface.

See Figure 1.4-3 in Section 1.4 of this plan for culvert locations. Booms may be placed at the entrance and exit of the two sets of 24-inch culverts located on the southwest portion of the site, under the railroad and under the plant entrance road. Another strategic set of culverts is the 48-inch culverts located on the southwest edge of the property which conveys drainage off-site.

Construction of Dams

Earthen dams may be constructed at numerous points along the estimated flow path illustrated in Figure 1.4-4 of Section 1.4 of this plan.

When constructing dams, the effects of rerouting the drainage must be considered to prevent averting the flow to a less manageable flow path. If considerable on-site water drainage is occurring, such as during a stormwater event, underflow dams may be constructed. This is accomplished by placing a pipe at the bottom of the dam during construction.

Since diesel, gasoline, and lubricating oils have a specific gravity less than water the underflow pipe will allow relief of water buildup while maintaining the petroleum behind the dam. The specific gravity of Number 6 fuel oil is close to that of water (0.99 compared to 1 for water) so discretion is required in deciding whether to provide an underflow pipe for Number 6 fuel oil spills. Observation will be required to verify if Number 6 fuel oil is indeed floating on the surface to prevent constructing an underflow device that would actually aid the progression of the petroleum.

A key location for a dam would be at the discharge point at the south edge of Pond #4. By raising the elevation of this point to slightly below the pond perimeter, full utilization of pond freeboard may be realized. Note that the gate on the west side of the pond should be raised to the highest elevation possible to ensure full benefit of this action. In a similar manner, increasing the elevation of the overflow weir gate of Pond #3 would have the effect of increasing storage capacity.

If little on-site drainage is encountered and the effectiveness of booms at the entrance and discharge of key culverts is reduced, construction of a dam to prevent flow through the culverts might be necessary to avoid off-site discharge.

Note that the construction of earthen dams can be accomplished concurrently with the excavation of collection pits. The low point of the dam could be located to discharge to a collection pit in the event of overtopping.

Excavation of Pits

Excavation pits may be utilized to provide temporary storage of petroleum product until equipment such as a vacuum truck can be employed to remove the product.

The relatively high groundwater table on-site will aid in retaining petroleum products that are lighter than water (diesel, lube oil, and gasoline). These products will float on the surface and the water will act to help prevent downward migration through the bottom into the underlying soil. However, loss will still occur laterally through the sides of the soil pit. In the case of Number 6 fuel oil, which might be denser than water, migration will be hindered somewhat by the viscosity of the fluid.

Before excavating a pit, care must be taken to avoid underground pipes. For example, excavating areas close to the combustion turbine are to be avoided due to the gas lines in the vicinity.

Excavation pits can be very useful when used in conjunction with earthen dams. Therefore, the locations described for constructing dams should also be evaluated for locating excavation pits.

Response to medium and small spills will depend on the situation. If the spill is not contained, the response may be executed as described for the worst case discharge scenario, but on a smaller scale. Conversely, a contained spill allows more flexibility in deciding the appropriate level of response.

Plant procedures are in place to address spills that can be controlled at the time of release in the immediate release area with booms/sorbent pads and do not require specialized response personnel or equipment. Procedures for the cleanup of Number 2 oil, Number 6 oil, lubricating oil, and non-PCB contaminated transformer oil are provided in Section 1.7.1 of the Facility Response Plan.

1.1.9 FACILITY DIAGRAMS

In order to facilitate the response effort, it is important to provide location information pertaining to materials and structures which have an impact on how the situation is approached. Figures 1.1-4, 1.1-5, and 1.1-6 serve to alert and orient the employee or responder to these considerations.

Site Evacuation Plan Diagram

Reference Section 1.1.7, for information related to evacuation procedures. As provided in this section, Figure 1.1-4 locates the main evacuation route and assembly area.

Site Plan Diagram

Aside from providing general site orientation, the following information is provided in Figure 1.1-5:

- Facility building identification and location
- Aboveground bulk oil storage tank content, location, and capacity
- Secondary containment location and capacity
- Identification of chemical storage areas
- Location of oil unloading station
- Location of switchyard (contains transformers)

A full size drawing of the Site Plan Diagram is found as Figure 1.9-1 in Section 1.9. This larger version of the Site Plan Diagram will be kept at the Guard House and made available to emergency personnel, should the need ever arise.

Site Drainage Information

Figure 1.1-6 provides the plant area drainage directions and adjacent surface water bodies. Section 1.4.2 of the Facility Response Plan provides a discussion of drainage directions from petroleum storage areas.

ATTACHMENT TO SECTION 1.1: ERAP TABLES

TABLE I.D.	NAME
Table 1.1-1	DEERHAVEN GENERATING STATION QUALIFIED INDIVIDUAL
Table 1.1-2	GRU SPILL COORDINATORS
Table 1.1-3	GRU ENVIRONMENTAL PERSONNEL AND OUTSIDE ASSISTANCE
Table 1.1-4	DEERHAVEN GENERATING STATION RESPONSE EQUIPMENT
Table 1.1-5	DEERHAVEN GENERATING STATION SPILL CONTAINMENT KITS
Table 1.1-6	HEAVY EARTH MOVING EQUIPMENT
Table 1.1-7	FACILITY RESPONSE TEAM

TABLE 1.1-1

DEERHAVEN QUALIFIED INDIVIDUALS

NAME[1]	PHONE[2]	RESPONSE TIME	ASSIGNMENTS DURING RESPONSE[3, 4]	RESPONSE TRAINING TYPE/DATE
Dan Moffett	Work: 393-6240 Home: 505-0257 Cell: 562-1724	1 hour	Qualified Individual and Spill Coordinator	Position Related Work Experience; Facility Response Plan Training
Dino DeLeo	Work: 393-6244 Home: 418-0386	1 hour	Alternate Qualified Individual and Spill Coordinator	Position Related Work Experience; Facility Response Plan Training

TABLE 1.1-2

EMERGENCY PHONE LIST
DEERHAVEN SPILL COORDINATORS

NAME[1]	PHONE[2]	RESPONSE TIME	ASSIGNMENTS DURING RESPONSE[3, 4]	RESPONSE TRAINING TYPE/DATE
Dan Moffett	Work: 393-6240 Home: 505-0257 Cell: 562-1724	1 hour	Qualified Individual and Spill Coordinator	Position Related Work Experience; Facility Response Plan Training
Dino DeLeo	Work: 393-6244 Home: 418-0386	1 hour	Alternate Qualified Individual and Spill Coordinator	Position Related Work Experience; Facility Response Plan Training
Jeff Lightsey	Work: 393-6123 Home: 418-0386 Cell: 317-5762	1 hour	Spill Coordinator	Position Related Work Experience; Facility Response Plan Training
Mark Procopio	Work: 393-6345 Home: 335-7635	1 hour	Spill Coordinator	Position Related Work Experience; Facility Response Plan Training
Dan Ominski	Work: 393-6336 Cell: 222-2075	1 hour	Spill Coordinator	Position Related Work Experience; Facility Response Plan Training
Tony Waters	Work: 393-6101 Home: 473-7123	1 hour	Spill Coordinator	Position Related Work Experience; Facility Response Plan Training
Abe Chandler	Work: 393-6101 Home: 377-8779	1 hour	Spill Coordinator	Position Related Work Experience; Facility Response Plan Training
Paul Wright	Work: 393-3101 Home: (386) 454-3071	1 hour	Spill Coordinator	Position Related Work Experience; Facility Response Plan Training
Bill Wheeler	Work: 393-6101 Home: (386) 454-3072	1 hour	Spill Coordinator	Position Related Work Experience; Facility Response Plan Training
Syed Hassan	Work: 393-3201 Home: 331-6791 Cell: 222-5996	1 hour	Spill Coordinator	Position Related Work Experience; Facility Response Plan Training

See Next table for Spill Contractors.

TABLE 1.1-3

GRU ENVIRONMENTAL STAFF AND OUTSIDE RESOURCES

Name	Position	Work Telephone	Home Telephone
ENVIRONMENTAL PERSONNEL			
Regina Embry	Utility Engineer	393-1299 538-7143 (cell)	377-2789
Robert Klemans	Utility Engineer	393-1283	(386) 454-7575
ELECTRIC UTILITY SAFETY STAFF			
Rick Lavery	Safety Training	393-6245	371-1801
EMERGENCY/OIL SPILL RESPONSE CONTRACTORS			
Petrotech Southeast (Primary)		1-800-293-1743 (24-hour)	
Environmental Remediation Services (Secondary)		1-904-791-9992	
Gainesville Fire/Rescue		9-911	
Potash Corporation Regional Response Team		1-386-397-8101	
GRU WATER/WASTEWATER ASSISTANCE			
GRU Dispatch		334-2892/2893	
GRU Water/Wastewater		334-3400 x1616	
GRU Gas		334-2550 (24 hour)	
CITY OF GAINESVILLE PUBLIC WORKS			
Public Works		334-5801	
ENVIRONMENTAL NOTIFICATIONS (See Oil Release Notification Form)			
National Response Center		1-800-424-8802	
Florida State Warning Point		1-800-320-0519	
FDEP NE District		1-904-807-3300	
Alachua County Warning Point		264-6800	

TABLE 1.1-4
DEERHAVEN GENERATING STATION
EMERGENCY RESPONSE EQUIPMENT

EQUIPMENT TYPE	QTY	LOCATION	INSPECT BY	FREQUENCY
Chemical Burn First Aid Station	1	Process Plant, Laboratory Sink	Process Plant	Monthly
Eyewash/Shower Station	1	Unit 1/Aux Tower Chem Tanks	Lab	Monthly
Eyewash/Shower Station	1	Unit 2 Tower Chem Tanks	Lab	Monthly
Eyewash/Shower Station	1	Unit 2 Chemical Feed Tanks	Lab	Monthly
Eyewash/Shower Station	1	Lab	Lab	Monthly
Eyewash/Shower Station	1	Unit 2 10th Floor - planned	Lab	Monthly
Eyewash/Shower Station	1	Demineralizer Room	Lab	Monthly
Eyewash/Shower Station	1	Process Plant, Brine Concentrator	Process Plant	Monthly
Eyewash	1	Process Plant, Ferric Hoppers	Process Plant	Monthly
Eyewash/Shower Station	1	Process Plant, Lime Feeders	Process Plant	Monthly
Eyewash/Shower Station	1	Process Plant, Acid Tank	Process Plant	Monthly
Eyewash/Shower Station	1	Process Plant, Lab	Process Plant	Monthly
Fire Axe	2	Process Plant	Process Plant	Monthly
Fire Extinguisher		Throughout the Facility	All Depts.	*2, Monthly
Fire Hose Station		Throughout the Facility	Maintenance	*3, Monthly
First Aid Kit	1	Administrative Office	Contracted	Monthly
First Aid Kit	1	Coal Area	Contracted	Monthly
First Aid Kit	1	Coal/Ash Building	Contracted	Monthly
First Aid Kit	1	Control Room, #1 & #2	Contracted	Monthly
First Aid Kit	1	Lab	Contracted	Monthly
First Aid Kit	1	Process Plant, Control Room	Contracted	Monthly
First Aid Kit	1	Maintenance Shop	Contracted	Monthly
SCBA	2	Process Plant	Warehouse	*1
SCBA	1	Process Plant, Control Room	Warehouse	*1
SCBA	2	Unit 1, Condenser, 1st Floor	Warehouse	*1
Shovels	12	Throughout Plant	n/a	Prior to Use

*1 Tanks hydrostatically tested every five (5) years. Mask and hoses must be visually inspected monthly.
*2 Extinguishers are inspected annually and hydrostatically tested every five (5) years by an outside contractor.
*3 Hoses are inspected annually by an outside contractor.

TABLE 1.1-5
DEERHAVEN GENERATING STATION
SPILL CONTAINMENT KITS

EQUIPMENT TYPE	QTY	LOCATION	INSPECT BY	FREQUENCY
Spill Kit (HazMat)	1	Process Plant	Lab	Monthly
Spill Kit (HazMat)	1	Navco Building - large	Lab	Monthly
Spill Kit (HazMat)	1	Demineralizer Room	Lab	Monthly
Spill Kit-oil Petrochem	1	Demineralizer Room	Lab	Monthly
Spill Kit-oil Petrochem	1	Unit 2 WAS	Lab	Monthly
Spill Kit-oil Petrochem	1	Navco - large	Lab	Monthly
Spill Kit-oil Petrochem	1	Process Plant	Lab	Monthly
Spill Kit-oil Petrochem	1	Vehicle Maintenance - small	Lab	Monthly
Spill Kit-oil Petrochem	1	Warehouse - small	Lab	Monthly
Spill Kit (Mercury)	1	Instrumentation Shop	Instr. Shop	Monthly
Spill Kit (Skimmer)	1	Navco Building - large	Lab	Monthly
Spill Kit (Skimmer)	1	North fuel unloading station - bulk	Lab	Monthly
Spill Kit (Skimmer)	1	Coal Pile Diesel Tank	Lab	Monthly
Spill Kit (Skimmer)	1	South fuel unloading station - bulk	Lab	Monthly
Portable Kit	1	Lab	Lab	Monthly
Drum Leak Repair Kit	1	Demineralizer Room	Lab	Monthly
Bulk Spill Material Storage	1	Pump House	Lab	Monthly
Telephones	215	Throughout Plant	n/a	n/a
Walkie Talkies	5	Coal Ash Facility	n/a	n/a
Walkie Talkies	5	Control Room	n/a	n/a
Walkie Talkies	4	Process Plant	n/a	n/a

TABLE 1.1-6

DEERHAVEN GENERATING STATION
ONSITE HEAVY EQUIPMENT AVAILABLE

EQUIPMENT TYPE	QTY	LOCATION
Bat Wing Mower	1	Coal Ash Facility
Bobcat	1	Coal Ash Facility
Carry Deck	1	Maintenance Shop
Coal Dozer	2	Coal Ash Facility
Ford Tractor	1	Coal Ash Facility
Forklift	2	Warehouse
7210 John Deere tractor U1247	1	Coal Ash Facility
Payloader	2	Coal Ash Facility
Pump, 1" Air Driven	1	Process Plant
Pump, 6" Diesel High volume	2	Coal Ash Facility
Pump, 3" Mug Hog	2	Coal Ash Facility
Pump, ½" Air Driven	1	Lab
Truck, 4-Wheel Drive	2	Coal Ash Facility
Truck, Pickup	1	Operations
Truck, Pickup/4-Wheel Drive	1	Process Plant
Truck, Pickup	1	Coal Ash Facility

TABLE 1.1-6 (continued)

**DEERHAVEN GENERATING STATION
EMERGENCY RESPONSE EQUIPMENT
HEAVY EARTH MOVING EQUIPMENT
(AVAILABLE FROM WATER/WASTEWATER SYSTEMS)**

EQUIPMENT TYPE	QTY
Front End Loaders	2
Backhoes	1

Contact Water/Wastewater Systems at (352) 334-3400 x1616 (24 hours a day) or Dispatch at 334-2892 or 334-2893.

TABLE 1.1-7

DEERHAVEN FACILITY RESPONSE TEAM

NAME[1]	PHONE[2]	RESPONSE TIME	ASSIGNMENTS DURING RESPONSE[3, 4]	RESPONSE TRAINING TYPE/DATE
Dan Moffett	Work: 393-6240 Home: 505-0257 Cell: 562-1724	1 hour	Qualified Individual and Spill Coordinator	Position Related Work Experience; Facility Response Plan Training
Dino DeLeo	Work: 393-6244 Home: 418-0386	1 hour	Alternate Qualified Individual and Spill Coordinator	Position Related Work Experience; Facility Response Plan Training
Tony Waters	Work: 393-6101 Home: 473-7123	1 hour	Spill Coordinator/ Shift Supervisor	Position Related Work Experience; Facility Response Plan Training
Abe Chandler	Work: 393-6101 Home: 377-8779	1 hour	Spill Coordinator/ Shift Supervisor	Position Related Work Experience; Facility Response Plan Training
Paul Wright	Work: 393-3101 Home: (386) 454-3071	1 hour	Spill Coordinator/ Shift Supervisor	Position Related Work Experience; Facility Response Plan Training
Bill Wheeler	Work: 393-6101 Home: (386) 454-3072	1 hour	Spill Coordinator/ Shift Supervisor	Position Related Work Experience; Facility Response Plan Training
Syed Hassan	Work: 393-3201 Home: 331-6791 Cell: 222-5996	1 hour	Spill Coordinator/ Shift Supervisor	Position Related Work Experience; Facility Response Plan Training

ATTACHMENT TO SECTION 1.1: ERAP FIGURES

Figure 1.1-1	EMERGENCY RESPONSE FLOWCHART

FIGURE 1.1-1. EMERGENCY RESPONSE FLOWCHART

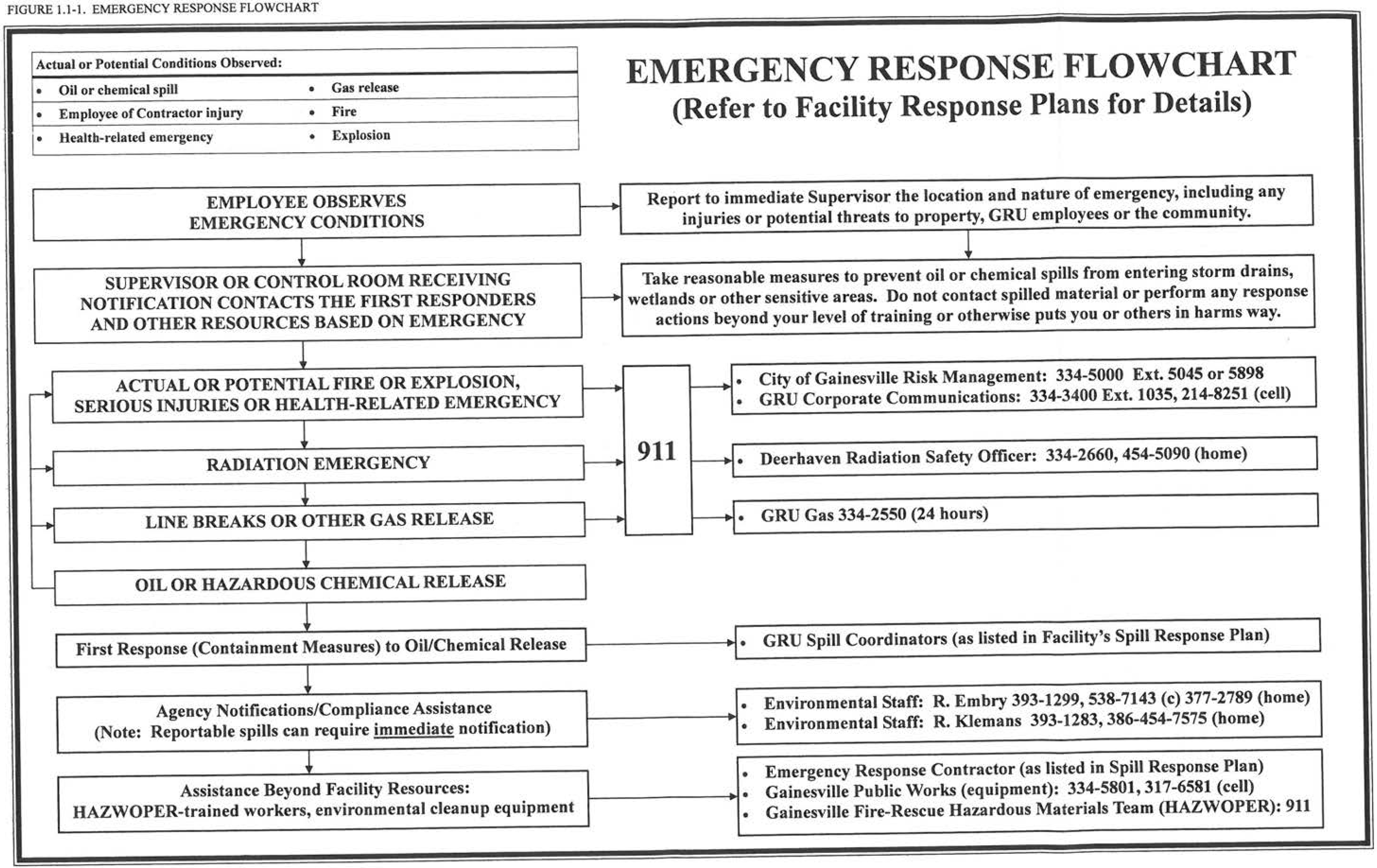


Figure 1.1-2	SPILL RESPONSE NOTIFICATION FORM

SPILL RESPONSE NOTIFICATION FORM (FIGURE 1.1-2)

Reporter's Last Name: ________________________ **First:** ______________ **M.I.:**
Position:
Phone Number: (352) 334-2666
Company: Gainesville Regional Utilities
Organization Type: Municipal Power Generating Station
Address: Deerhaven Generating Station, 10001 NW 13th Street (Highway 441 North)
Gainesville, Florida **Zip:** 32653
Were Materials Discharged? ____ (Y/N)
Meeting Environmental Obligations to Report? ____ (Y/N) As determined by FIGURE 1.3-3 Oil Release Form
Are you a spill coordinator? _____ (Y/N) **Did a spill coordinator direct you to make this call?** (Y/N)
Date Called: __________ **Time Called:**
Incident Description
Source and/or Cause of Incident:

Date of Incident: ___________ **Time of Incident:** __________ AM/PM
Incident Address/Location:

____

Container Type: ________ **Tank Storage Capacity:** ________ **Units of Measure:**
Nearest City: Gainesville **State:** Florida **County:** Alachua **Zip:** 32653
Distance from City: 8 Miles **Direction from City:** Northwest of Downtown
Section: 26 **Township:** 8S **Range:** 19E
Facility Latitude: N 29 Degrees 45 Minutes 30 Seconds
Facility Longitude: W 82 Degrees 23 Minutes 15 Seconds

Material

Spilled Material	Discharged Quantity	Unit of Measure	Material Discharged in Water (Y/N)	Quantity

Response Action

Actions Taken to Correct, Control or Mitigate Incident:

Impact

Number of Injuries: _______ **Number of Deaths:** _______ **Were There Evacuations?** _______(Y/N)
Was There Any Damage? _________ (Y/N) **Damage in Dollars (approximate):**

Medium Affected: (i.e., surface water, ground surface/water, etc.)
Description:
More Information About Medium:

Additional Information

Any information about the incident not recorded elsewhere in the report:

Caller Notifications

EPA? ________ (Y/N) **State?** ________ (Y/N) **Other?**
(Y/N)

Figure 1.1-3	OIL RELEASE NOTIFICATION FORM

FIGURE 1.1-3
OIL* RELEASE NOTIFICATION FORM

Date:

1. Plant: ____________________________ 2. Location:

3. Date of Release: ______________________ 4. Time of Release:

5. Type of Oil: _________________________ 6. Amount Released:

7. Duration of Release:

8. Cause of Release:

9. Action taken to contain the release:

10. Did the released material contain PCBs ≥50 ppm?
    Yes ____ Stop and complete Form 4 (Hazardous Substance Release Notification Form)
    No ____ Continue

11. Did the release enter into a waterbody?
    Yes ____ Specify waterbody: ____________________________ Go to 12
    No ____ Go to 13

12. Did the release cause a visible sheen?
    Yes ____ Notify agencies below
    No ____ Go to 13

Agency	Date	Time (AM/PM)	Contact Person	Caller's Name	Comments
GRU Environmental Department (Ext. 1299, 1283), 538-7143 (cell)					
National Response Center (1-800-424-8802)					
State Division of Emergency Management (850-413-9911 or 800-320-0519)					

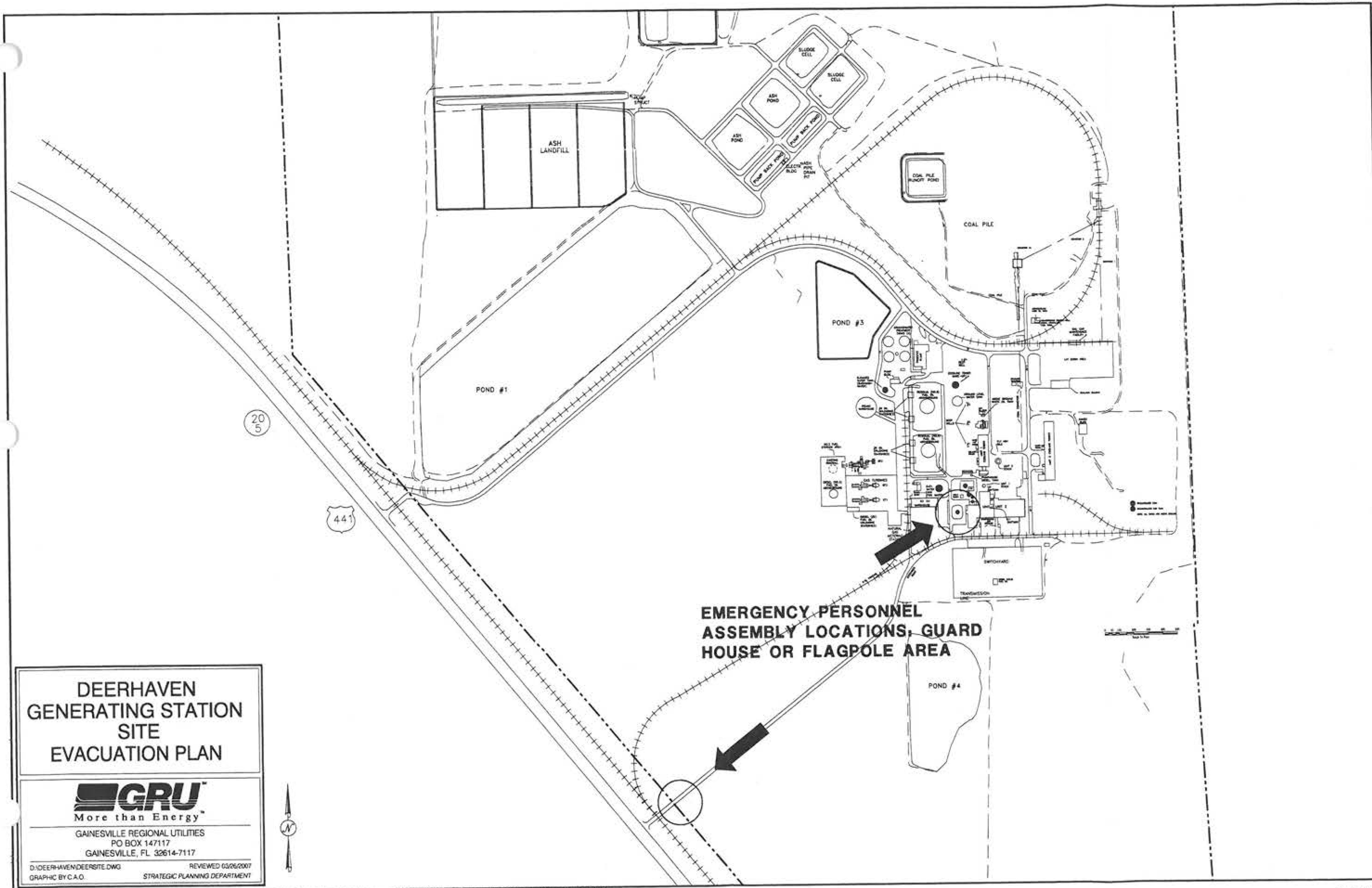
13. Did the amount released exceed 10 pounds and enter the soil, groundwater, or surface water?
    Yes ____ Notify Alachua County Environmental Protection Department (352-264-6800). Go to 15
    No ____ Go to 14

14. The release does not have to be reported to the regulatory agencies. Notify Environmental Personnel immediately. Continue to 15

15. Did the release involve fire, fatalities, injuries, or evacuation?
    Yes ____ Notify City of Gainesville Risk Management at 334-5000 x5045 or 334-5000 x5891 or Utility Dispatch (on weekends, holidays) at 334-2892 or 334-2893.
    No
    STOP

* Including petroleum, fuel oil, oil refuse and oil mixed with wastes other than dredged spoil.

Figure 1.1-4	DEERHAVEN GENERATING STATION SITE EVACUATION PLAN



DEERHAVEN GENERATING STATION SITE EVACUATION PLAN

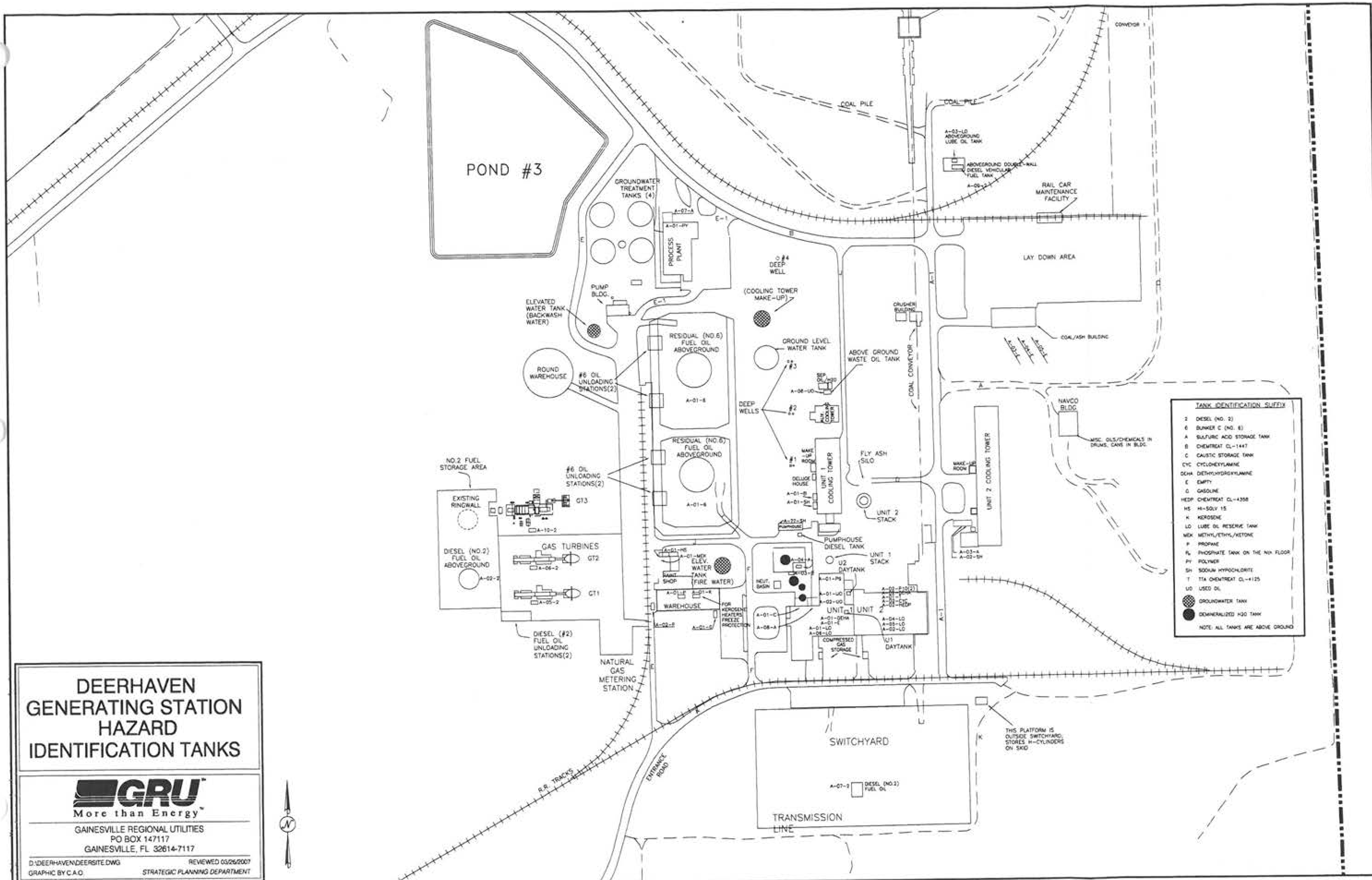
GRU
More than Energy

GAINESVILLE REGIONAL UTILITIES
PO BOX 147117
GAINESVILLE, FL 32614-7117

D:\DEERHAVEN\DEERSITE.DWG REVIEWED 03/26/2007
GRAPHIC BY C.A.O. STRATEGIC PLANNING DEPARTMENT

D:\Deerhaven\DEERSITE.dwg PLOTTED: 03\26\07 3:49pm By C.A.O. XREFS: RTEXT DHSITE XREF Layout tab: HP 8500c 3rd FL ENERGY SUPPLY 17x11 landscape

Figure 1.1-5	DEERHAVEN GENERATING STATION SITE PLAN DIAGRAM



DEERHAVEN GENERATING STATION HAZARD IDENTIFICATION TANKS

GRU More than Energy

GAINESVILLE REGIONAL UTILITIES
PO BOX 147117
GAINESVILLE, FL 32614-7117

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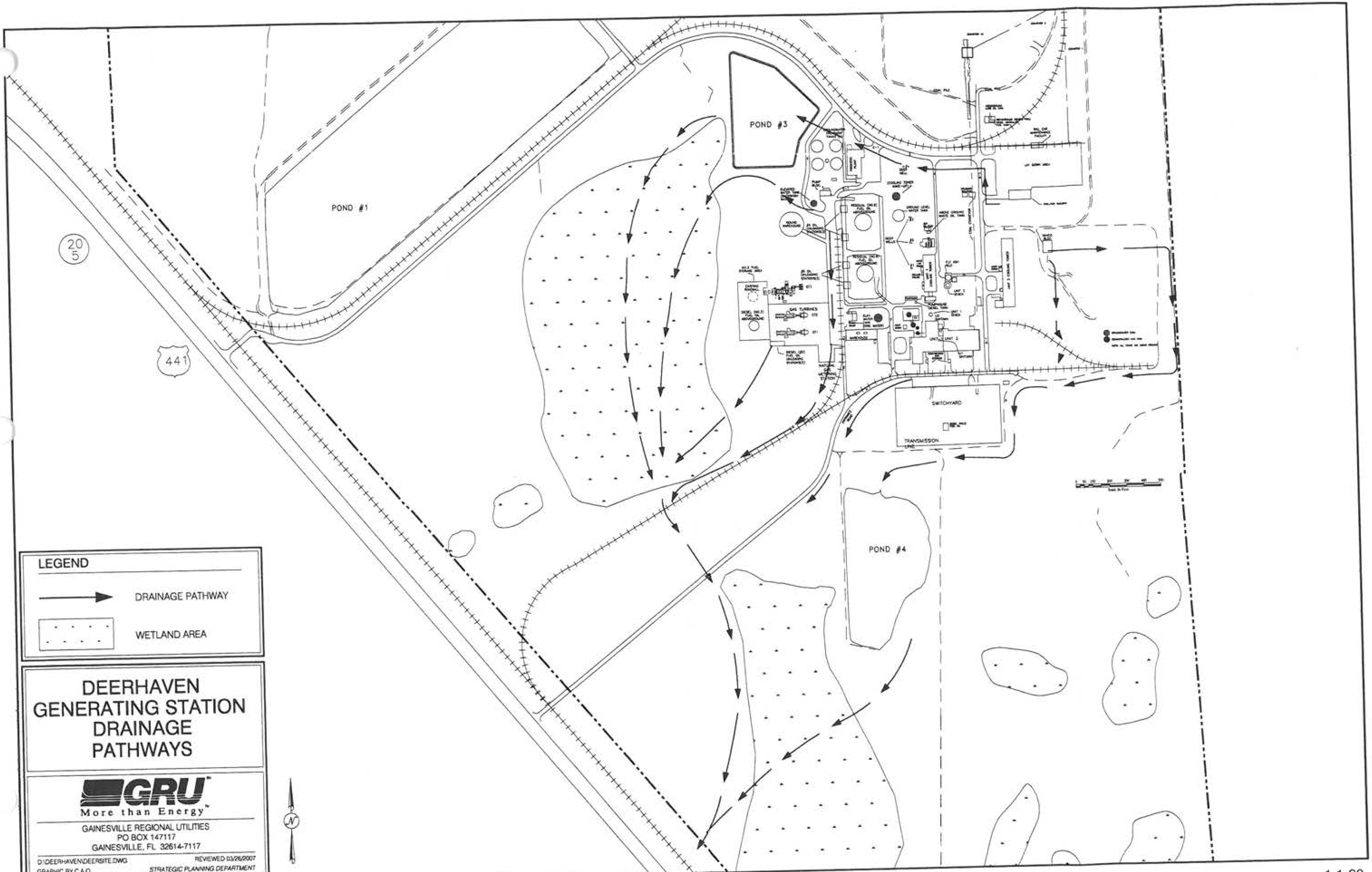
Figure 1.1-6	DEERHAVEN GENERATING STATION DRAINAGE PATHWAYS



DEERHAVEN GENERATING STATION DRAINAGE PATHWAYS

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GAINESVILLE REGIONAL UTILITIES
PO BOX 147117
GAINESVILLE, FL 32614-7117

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GRAPHIC BY C.A.O. STRATEGIC PLANNING DEPARTMENT

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Gainesville Regional Utilities
Deerhaven Generating Station

Standard Operating Procedure:

Pond Best Practices

Prepared By:	Dan Ominski, Deerhaven Environmental Compliance Group		
Signature:		Date:	
Reviewed By:	Chris Brew, Environmental Compliance Manager		
Signature:		Date:	
Approved By:	Melissa Jones, Deerhaven Production Manager		
Signature:		Date:	

Periodic Review:

Signature	Title	Date

Contents

1. SCOPE AND APPLICATION

1.1. This SOP is intended as guidance for Process Plant operators in maintaining the Deerhaven Power Plant ash pond system, runoff ponds and construction ponds.

2. SYSTEM SUMMARY

2.1. The Deerhaven Generating Station is operated as a "zero liquid discharge" plant. The plant staff is responsible for preventing the discharge of industrial waste water and runoff water that comes in contact with plant processes from being discharged to either waters of the United States or subsurface waters. To facilitate this operation waste water impoundments (ash, sludge ponds and pump back ponds) have been constructed on site. These ponds store the total cooling tower blowdown, boiler blowdown, demineralizer regeneration products, process plant products, seal trough water, bottom ash product and carrier water generated from these plant processes. This waste water is processed and reused in three ways: 1) Process Plant Brine Concentrator and Spray Dryer system for demineralizer makeup, 2) Deerhaven Air Quality Control System dry scrubber attemperator water and as 3) offset water in the groundwater Front End Treatment cold lime softening system for cooling tower makeup.

2.2. Runoff water from the coal pile, ash landfill and brine (secure) landfill is sequestered in (respectively) the coal pile runoff pond, landfill runoff pond, and secure landfill runoff pond. The ultimate fate of coal pile runoff and landfill runoff is impoundment in the ash ponds for future processing and reuse or processing directly through the FET system. The ultimate fate of the secure landfill runoff is processing offsite through the Kanapaha waste water facility via the sewer system or impoundment for processing in the ash ponds. Secure landfill runoff is primarily processed offsite due to the adverse affect the solids in this water have on the Brine Concentrator system. This is not considered a discharge as the secure landfill runoff is contained throughout the system and is treated appropriately at the Kanapaha treatment facility.

2.3. Rainfall runoff from undeveloped areas of the plant is collected in the three construction ponds on the site. These ponds are equipped with overflow weirs/pipes and natural flow from these ponds is not considered a reportable discharge.

2.4. No sewage is treated on the Deerhaven site. All sewage from the buildings is treated via the sewer system in the Kanapaha treatment facility.

3. DEFINITIONS

3.1. **Conveyances**-in this usage a means of transferring water from one area to another. Conveyances may be streams or man made trenches. Typically, conveyances on the Deerhaven site (with the exception of the wetlands areas) are considered to be man made and are maintained by the Facilities staff.

3.2. Impoundments-in this usage natural or man made ponds or canals for the storage of water. All impoundments on the Deerhaven site are man made and maintained by the Facilities staff.

3.3. Blowdown-in this usage any waste water stream from a plant process (cooling towers, clarifiers, backwash waste, etc.).

3.4. Ash Ponds-in this usage impoundments where principally cooling tower blowdown and ash slurry are deposited.

3.5. Sludge Ponds-in this usage impoundments where principally clarifier waste water slurry is deposited.

3.6. Runoff-in this usage any water stream that has as its watershed any area of the plant. Runoff water at the Deerhaven plant is produced by rainfall only. Typically runoff water from the plant structures is conveyed and impounded in the Ash Pond System. Runoff water from the parking lots and grass is conveyed to the Construction Ponds. Runoff water from the landfills or coal pile area is conveyed and impounded in either the landfill runoff ponds or the Coal Pile Runoff Pond.

3.7. Construction Ponds-in this usage impoundments where rainfall runoff is stored. Typically this water is not contaminated by plant processes. Construction Ponds are numbered 1 through 4. Construction Pond #2 was filled in at the completion of Unit #2 in 1980.

4. ASH POND OPERATION

4.1. The ash ponds are typically filled from the plant drain sump, the LP ash sump, the backwash waste tank at the process plant and the process plant building sump. These flows (with the exception of the LP ash sump) discharge out of the south crooknecks (PDY 32-1 and PDY 32-2) on each pond.

4.2. Subsequent flows from the landfill runoff pond, coal pile runoff pond and secure landfill runoff pond enter only Ash Pond #1 via the north crookneck. These flows do not enter Ash Pond #2 as this crookneck has been blanked off to facilitate pumping the secure landfill runoff pond to Kanapaha via the sewer system at the Deerhaven plant. (PDY 31-1 and 31-2)

4.3. The LP ash sump discharges midway between both ponds via a floating line in the ponds. The flow is directed to only one pond at a time.

4.4. Ash ponds and sludge cells both flow to a common wetwell via the pump back ponds and located adjacent to pump back pond #1.

4.5. Pumping of water from the pumpback wetwell to the process plant and main plant is facilitated by three submersible ash recycle pumps (Flygt # CP 3152; nominal output 1200 gpm) and two ash pond blowdown pumps (Flygt # CP 3127; nominal output 300 gpm).

4.6. Water flows from ash ponds to the pump back ponds via a 12” butterfly valve located in the stop log structures in the ponds through a 12” ductile iron line to the outfall in the pump back pond. The elevation of the 12" butterfly valve is 178' AMSL and the outfall elevation is 176' AMSL. Each ash pond flows to its respective pump back pond (ash pond #1 flows to pump back pond #1, etc.).

4.7. Plant flows may be directed to either ash pond. It is advantageous to isolate the bottom ash flow to one ash pond to collect the bottom ash solids and utilize the other as a heavy solids free water pond. Both ash ponds have a stop log structure to prevent the flow of settled ash into the pond valve and pipe discharge.

4.8. The dewatering elevation of a pump back pond to dewater an ash pond is 179' AMSL.

4.9. NORMAL ASH POND OPERATING PARAMETERS:

1) Ash Pond level(s) not to exceed 193' AMSL.
2) One Ash Pond designated to be bottom ash impoundment only.
3) One Ash Pond designated to be destination of plant drains, blowdown, filter backwash waste, process plant building sump, and landfill runoff and coal pile runoff.
4) Ash pond discharge valves to be kept in good working order.
5) Ash pond discharge valves to be exercised on a (min.) weekly basis.
6) Ash pond influent valves (crooknecks and bottom ash line) to be kept in good working order.
7) Ash pond levels to be checked, recorded and initialed at least once a shift (12 hour shifts). ***If high level or,if high rainfall, radical valve changes or high blowdown conditions, several times (beginning of shift, middle of shift, end of shift) a shift.***
8) Stop logs to be checked yearly for rotting or misalignment.
9) ***Any notice of color change, foaming, or obvious fuming to be reported to the shift supervisor immediately.***
10) Overflows, high level conditions, or out of the ordinary (bottom ash line running all shift, constant flow of crooknecks, etc.) flows to be reported immediately to shift supervisor for investigation.
11) One south crookneck must always be in the open position to accommodate blowdowns from the steam plant and process plant. Closing both crooknecks will cause backflow and flooding initially starting at the Process Plant.

5.0 SLUDGE POND OPERATION

5.1. The Sludge Ponds are filled from the Sludge Holding Tank at the Process Plant. This flow is facilitated by two 300 gpm Sludge Waste Pumps at the Process Plant Sludge Pump Station.

5.2. The source waters and slurries for the Sludge Holding Tank are clarifier blowdown (primarily $CaCO_3$ and $Mg(OH)_2$ slurry), demineralizer regeneration waste, Process Waste Treatment Plate Separator blowdown (via the Sludge Pump Station Sump), the FET electrical bank sump and the Sludge Pump Station Sump.

5.3. Flow to the Sludge Ponds is exclusively from the Sludge Waste Pumps. The Sludge Waste Pumps pump through one of two Sludge Waste Lines. Presently the East Sludge Waste Line (a 4" HDPE line) is used exclusively with the West Sludge Waste Line (4" DIP) in last run status due to the inclusion of temporary flexible rubber hose in the line.

5.4. The influent valve structure at the east end of the sludge ponds allows both sludge ponds to be filled by either sludge waste line. These are 4" stainless steel knife gate carbon steel body type valves with wheel actuators.

5.5. The sludge slurry flows into the sludge ponds through a floating line which is used to control the deposition of the sludge in each pond.

5.6. Water flows from the sludge cells through 6" butterfly valves located in the stop log structures in these ponds. The stoplog structure as in the ash ponds prevents the fouling of the discharge valve and subsequent contamination of the Pump Back Pond water with solids. The elevation of these valves is 178' AMSL. These valves discharge to a common pipe which has an outfall on the NE corner of Pump Back Pond #2 at an elevation of 176' AMSL.

5.7. The dewatering level for the Pump Back Pond to drain the sludge ponds is 179' AMSL.

5.8. NORMAL SLUDGE POND OPERATING PARAMETERS

1) Sludge Pond level(s) not to exceed 187' AMSL.
2) One Sludge Pond designated to be sludge impoundment.
3) One Sludge Pond designated to be out of service and in reserve.
4) Sludge pond discharge valves to be kept in good working order.
5) Sludge pond discharge valves to be exercised on a (min.) weekly basis.
6) Sludge pond influent valves to be kept in good working order.
7) Sludge pond levels to be checked, recorded and initialed at least once a shift (12 hour shifts). ***If high level or, if high rainfall, radical valve changes or high blowdown conditions, several times (beginning of shift, middle of shift, end of shift) a shift.***
8) Stop logs to be checked yearly for rotting or misalignment.
9) ***Any notice of color change, foaming, or obvious fuming to be reported to the shift supervisor immediately.***
10) Overflows, high level conditions, or out of the ordinary flows (i.e. continuous sludge flow or clear water flow) to be reported immediately to shift supervisor for investigation.

6. PUMPBACK POND OPERATION

6.1. The Pump Back Ponds are filled from their associated Ash Ponds via the 12" butterfly valve and pipe to the outfall. In addition Pump Back Pond #2 is filled from the 6" line from the common sludge cell discharge pipe via the outfall in the NE corner.

6.2. The Pump Back Ponds are emptied via the pump well adjacent to Pump Back Pond #1. Both Pump Back Ponds have their outfalls in this pump well.

6.3. The pump well at Pump Back Pond #1 is equipped with 5 Flygt pumps (see **Section 4.5.**). The pump well depth is 19.4 ft.

6.4. The Center and West Ash Recycle pumps provide makeup water for the bottom ash system via ASW 25 and the bottom ash makeup valve ASW 25-7. ASW 25 is also the source for the AQCS attemperator water.

6.5. The East Ash Recycle pump is designated for the Process Plant. When in service it supplies water to the Gainesville Pipeline (FET offset water) and the Process Plant Brine Concentrator.

6.6. The Ash Pond Blowdown pumps supply water to the Brine Concentrator and can be used to supply the Gainesville Pipeline at low flows. Typically the Ash Pond Blowdown pumps are in a standby status.

6.7. The Pump Back Pond level is impacted by makeup from the Ash Ponds and Sludge Ponds and the demand on the pond by the Ash Recycle and Ash Pond Blowdown pumps.

6.8. At high high level a designated Ash Recycle Pump is energized along with valve ASW26-1 which allows Pump Back Pond water to recirculate back to the Ash Ponds via ASW 26 and the south crooknecks. This is a fail safe feature which is designed to prevent the Pump Back Ponds from overflowing.

6.9. The dewatering level for the Pump Back Ponds is 174' AMSL or "14 steps" (by Process Plant operator reckoning); this can only be achieved by closing all influent from Ash and Sludge Ponds and either "hotwiring" out the low level trips on the Ash Recycle or Ash Pond Blowdown Pumps or using a portable pump. Total dewatering is only achieved by using a portable pump; to facilitate this the bottom ash system and AQCS must use service water makeup. Care must be taken at low level that the Ash Recycle and Ash Pond Blowdown pumps stay continuously submerged. To uncover the outfalls of the ash cells and the sludge cells in the pump back pond the level must me 12 "steps" in operator reckoning or 7.0 ft indication on the Miltronics depth indicator in the pond MCC room.

6.10. NORMAL PUMP BACK POND OPERATING PARAMETERS

1) Maintain pond level at 3 steps (185 ft AMSL).
2) Always have ASW 26-1 and at least one Ash Recycle Pump available (in auto) for auto recycling to the Ash Ponds for high level conditions.
3) Pump Back Pond levels to be checked, recorded and initialed at least once a shift (12 hour shifts); ***if high level or, if high rainfall, radical valve changes or high blowdown conditions, check pond levels several times (beginning of shift, middle of shift, end of shift) a shift.***
4) Pump Back Pond level not to exceed 187' AMSL ("one step").
5) Pump Back Pond overflow is an immediate danger of contamination to Construction Pond #1. If the Pump Back Pond is overflowing immediately close all Ash and Sludge Pond valves. Contact the shift supervisor for containment of pond water without contamination of Construction Pond #1.
6) Pump Back Pond overflows are almost always due to failure of the pumps at the Pump Back Pumping Structure. During outages which cause the failure of MCC 18 (which is the source of electrical power to the Pump Back Pond Pumping Structure) the Pump Back Pond is at risk of overflow. Close all Ash Pond and Sludge Pond effluent valves to stabilize the level in the pond.
7) Any work on the bottom ash PLC at the precipitator house should be a red flag for the Process Plant operators and operations in general. Communication failures from the bottom ash PLC will result in a pump failure at the pump back pond structure. The immediate remedy for this is to place the Ash Pond Blowdown pumps or the East Ash Recycle pump in hand out at the ponds. Please note that while this will keep the pumps running the Process Plant will not have remote capability for start/stop of these pumps.

7. COAL PILE, LANDFILL AND SECURE LANDFILL RUNOFF POND OPERATION

COAL PILE RUNOFF POND

7.1. The Coal Pile Runoff Pond is filled from runoff ditches which are fed from rain runoff from the coal pile, runoff from the covered roof area of the coal pile and the coal tunnel pumps.

7.2. Water from the Coal Pile Runoff Pond is discharged one of two ways: via a Flygt Pump (Flygt # CP 3127; nominal 300 gpm) to the #1 Ash Pond or through an HDPE line to the FET untreated wetwell.

7.3. ***The Coal Pile Runoff Pond is extremely susceptible to overflow during intense rainfall events due to an increase in runoff from the covered area of the coal pile.***

7.4. NORMAL COAL PILE RUNOFF POND OPERATING PARAMETERS:

1) Pond level not to exceed three feet below top of pump structure (181 ft AMSL).
2) Pond discharge valves to be in good working order.
3) Pond discharge pump to be replaced immediately upon failure.
4) Pond to be pumped weekly to Ash Pond #1.
5) In case of high Ash Pond levels the Coal Pile Runoff Pond may be pumped to the FET untreated wetwell via the HEDP pipe and valve system.

LANDFILL RUNOFF POND (FLYASH CANAL)

7.5. The Landfill Runoff Pond is filled solely from the under drain system of the Fly Ash and AQCS Product Landfill.

7.6. Water from the Landfill Runoff Pond is discharged one of two ways: via the Flygt Pump (Flygt # CP 3152; nominal 1200 gpm) to the #1 Ash Pond or via the Coal Pile/Secure Landfill cross connect station to the FET untreated wetwell.

7.7. The Landfill Runoff Pond level should be kept low to facilitate draining of the landfill via the under drain system. The Landfill Runoff Pond should be pumped weekly to maintain a low level.

7.8. NORMAL LANDFILL RUNOFF POND OPERATING PARAMETERS

1) Pond level not to exceed three feet below the top of the pump structure (180 ft AMSL).
2) Pond discharge valves to be kept in good working order.
3) Pond discharge pump to be repaired or replaced in timely fashion.
4) Pond to be pumped weekly to Ash Cell #1.
5) In case of high levels in Ash Cells; pump the Landfill Runoff Pond to the FET untreated wetwell via the Coal Pile/Secure Landfill cross connect station.

SECURE LANDFILL RUNOFF POND

7.9. The Secure Landfill Runoff Pond is filled from runoff from the Secure Landfill and pumping from the French Drain system under the Secure Landfill. Typically, water from the Secure Landfill Runoff Pond is the most contaminated water on the Deerhaven site.

7.10. Water from the Secure Landfill Runoff Pond is discharged via the the Flygt pumps in the pump structure to either Ash Pond #1 or the Kanapaha treatment POTW via the lift station system discharge line system at the Deerhaven plant.

7.11. The Secure Landfill Runoff Pond pumps (Flygt # CP 3085; nominal flow is 15 gpm due to the tremendous head the pump has to overcome) are to be pumped every day from just after midnight to approximately 0700.

7.12. The HDPE piping from the Secure Landfill Runoff Pond (the piping enters the lift station system just downstream of the Process Plant lift station; however this piping bypasses the Process Plant lift station and the main plan lift station and directly enters the discharge main) must be checked periodically for leaks. Typically water from the Secure Landfill Runoff Pond is the most contaminated water on the Deerhaven site, therefore, leakage or overflow from the Secure Landfill Runoff Pond is a reportable event.

7.13. The Secure Landfill Runoff Pond must be checked daily to ensure no runoff is escaping the conveyances around landfill; all Secure Landfill runoff is to be impounded in the Secure Landfill Runoff Pond.

7.14. NORMAL SECURE LANDFILL RUNOFF POND OPERATING PARAMETERS

1) The pond level is not to exceed 2 feet below the top of the pumping structure (180 ft AMSL).
2) Pond discharge valves to be kept in good working order.
3) Pond discharge pump(s) to be replaced in a timely fashion; one pump needs to be ready for service at all times.
4) Pond is to be pumped daily from 0001 to 0700 to Kanapaha via the sewer system. Totalizer reading before and after pumping, time pump on and time pump off, and total gallons pumped to be recorded in a consistent and legible fashion on the Secure Landfill Pumping log. Log is to be initialed daily and filled out daily whether the pump is in service or not.
5) Conveyances around the pond to be inspected daily for overflow; if signs of overflow report immediately to the shift supervisor. (This is particularly important during periods of heavy rainfall).
6) In emergencies the pond may be discharged to Ash Cell #1 through the North crookneck; the limit on conductivity on Ash Cell #1 for this procedure is 3000 umhos. Higher than 3000 umhos

compromises the BC and our ability to pump Ash Pond water to the FET.

7) Pond discharge pipe (metal and HDPE) to be inspected regularly to ensure no leaks.

8. CONSTRUCTION POND OPERATION

8.1. The Construction Ponds are solely natural source/ rainwater runoff impoundments. The outfalls of these ponds are constructed with weir gates (Construction Ponds #1 and #4) or stoplog structures (Construction Pond #3). Each pond has an overflow weir or pipe which allows the pond to discharge naturally during high rainfall events. Typically Construction Pond #4 discharges continuously through an overflow pipe while Construction Ponds #1 and #3 discharge during high rainfall events.

8.2. If for any reason Deerhaven staff decide that the Construction Pond levels need to lowered Regina Embry (x1299) must be consulted.

8.3. The outfalls of the Construction Ponds are to be sampled in accordance with the "Site Runoff SOP (W:\U0330\Process Plant\PP environmental records\SWPPP\site runoff sop v.2.)".

8.4. Any change in color, fish kills or obvious drops in levels in these ponds are to be reported to the shift supervisor at once.

8.5. The construction ponds should be checked weekly to look for berm leaks or damage to the outfall structures.

Appendix A

Normal Ash Pond Operating Parameters

1) Ash Pond level(s) not to exceed 193' AMSL.

2) One Ash Pond designated to be bottom ash impoundment only.

3) One Ash Pond designated to be destination of plant drains, blowdown, filter backwash waste, process plant building sump, and landfill runoff and coal pile runoff.

4) Ash pond discharge valves to be kept in good working order.

5) Ash pond discharge valves to be exercised on a (min.) weekly basis.

6) Ash pond influent valves (crooknecks and bottom ash line) to be kept in good working order.

7) Ash pond levels to be checked, recorded and initialed at least once a shift (12 hour shifts). ***If high level or, if high rainfall, radical valve changes or high blowdown conditions, several times (beginning of shift, middle of shift, end of shift) a shift.***

8) Stop logs to be checked yearly for rotting or misalignment.

9) Any notice of color change, foaming, or obvious fuming to be reported to the shift supervisor immediately.

10) Overflows, high level conditions, or out of the ordinary (bottom ash line running all shift, constant flow of crooknecks, etc.) flows to be reported immediately to shift supervisor for investigation.

11) One south crookneck must always be in the open position to accommodate blowdowns from the steam plant and process plant. Closing both crooknecks will cause backflow and flooding initially starting at the Process Plant.

Appendix B

Normal Sludge Pond Operating Parameters

1) Sludge Pond level(s) not to exceed 187' AMSL.

2) One Sludge Pond designated to be sludge impoundment.

3) One Sludge Pond designated to be out of service and in reserve.

4) Sludge pond discharge valves to be kept in good working order.

5) Sludge pond discharge valves to be exercised on a (min.) weekly basis.

6) Sludge pond influent valves to be kept in good working order.

7) Sludge pond levels to be checked, recorded and initialed at least once a shift (12 hour shifts). ***If high level or, if high rainfall, radical valve changes or high blowdown conditions, several times (beginning of shift, middle of shift, end of shift) a shift.***

8) Stop logs to be checked yearly for rotting or misalignment.

9) Any notice of color change, foaming, or obvious fuming to be reported to the shift supervisor immediately.

11) Overflows, high level conditions, or out of the ordinary flows (i.e. continuous sludge flow or clear water flow) to be reported immediately to shift supervisor for investigation.

Appendix C

Normal Pump Back Pond Operating Parameters

1) Maintain pond level at 3 steps (185 ft AMSL).

2) Always have ASW 26-1 and at least one Ash Recycle Pump available (in auto) for auto recycling to the Ash Ponds for high level conditions.

3) Pump Back Pond levels to be checked, recorded and initialed at least once a shift (12 hour shifts); ***if high level or, if high rainfall, radical valve changes or high blowdown conditions, check pond levels several times (beginning of shift, middle of shift, end of shift) a shift.***

4) Pump Back Pond level not to exceed 187' AMSL ("one step").

5) Pump Back Pond overflow is an immediate danger of contamination to Construction Pond #1. ***If the Pump Back Pond is overflowing immediately close all Ash and Sludge Pond valves***. Contact the shift supervisor for containment of pond water without contamination of Construction Pond #1.

6) Pump Back Pond overflows are almost always due to failure of the pumps at the Pump Back Pumping Structure. ***During outages which cause the failure of MCC 18 or Power Center #4 (which is the source of electrical power to the Pump Back Pond Pumping Structure) the Pump Back Pond is at risk of overflow***. Close all Ash Pond and Sludge Pond effluent valves to stabilize the level in the Pump Back Pond.

7) Outages which cause the failure of the Bottom Ash PLC (in the Precipitator House) or the loss of MCC 16, MCC 18 or Power Center #4 will cause loss of communication between the Process Plant and the Pump Back Pond Pump PLC controller. Pumps may be returned to service in manual until the communications problem is troubleshot (if MCC 18 or Power Center #4 is out then see **6)** above for countermeasures).

Appendix D

Normal Runoff Pond Operating Parameters

NORMAL COAL PILE RUNOFF POND OPERATING PARAMETERS

1) Pond level not to exceed three feet below top of pump structure (181 ft AMSL).
2) Pond discharge valves to be in good working order.
3) Pond discharge pump to be replaced immediately upon failure.
4) Pond to be pumped weekly to Ash Pond #1.
5) In case of high Ash Pond levels the Coal Pile Runoff Pond may be pumped to the FET untreated wetwell via the HDPE pipe and valve system.

NORMAL LANDFILL RUNOFF POND OPERATING PARAMETERS

1) Pond level not to exceed three feet below the top of the pump structure (180 ft AMSL).
2) Pond discharge valves to be kept in good working order.
3) Pond discharge pump to be repaired or replaced in timely fashion.
4) Pond to be pumped weekly to Ash Cell #1.
5) In case of high levels in Ash Cells; pump the Landfill Runoff Pond to the FET untreated wetwell via the Coal Pile/Secure Landfill cross connect station.

NORMAL SECURE LANDFILL RUNOFF POND OPERATING PARAMETERS

1) The pond level is not to exceed 2 feet below the top of the pumping structure (180 ft AMSL).
2) Pond discharge valves to be kept in good working order.

3) Pond discharge pump(s) to be replaced in a timely fashion; one pump needs to be ready for service at all times.

4) Pond is to be pumped daily from 0001 to 0700 to Kanapaha via the sewer system. Totalizer reading before and after pumping, time pump on and time pump off, and total gallons pumped to be recorded in a consistent and legible fashion on the Secure Landfill Pumping log. Log is to be initialed daily and filled out daily whether the pump is in service or not.

5) Conveyances around the pond to be inspected daily for overflow; if signs of overflow report immediately to the shift supervisor. (This is particularly important during periods of heavy rainfall).

6) In emergencies the pond may be discharged to Ash Cell #1 through the North crookneck; the limit on conductivity on Ash Cell #1 for this procedure is 3000 umhos. Higher than 3000 umhos compromises the BC and our ability to pump Ash Pond water to the FET.

7) Pond discharge pipe (metal and HDPE) to be inspected regularly to ensure no leaks.

Appendix E

Construction Pond Operation

1) Any change in color, fish kills or obvious drops in levels in these ponds are to be reported to the shift supervisor at once.

2) The construction ponds should be checked weekly to look for berm leaks or damage to the outfall structures.

3) Level management of the construction ponds due to weather or plant needs is to be done with the consultation of the Environmental Engineering staff.

Appendix F

Pond Strategies and Tribal Knowledge

Keep one ash pond for bottom ash and one for the plant drains. This allows the segregation of waters when we have strong thunderstorms or tropical storm activity. If we reduce or eliminate the blowdown during these high rainfall times it may be possible to have one pond with all the excess rainwater which will allow us to process it through the FET at a very high rate.

Utilize pond source and chemistry if the suspended solids in the BC get low (<10000 ppm). Select the ponds for processing through the BC that have the highest Ca fraction. Have the lions share of the pump back ponds having the high Ca ponds as the source water.

Use a slipstream of $Ca(OH)_2$ from the process plant drain to mitigate any large low pH or high transition metal flows to the ash ponds. This helps in two ways, 1) it adds to the Ca fraction in the ponds and 2) pH's of 11+ actively precipitate out metals with high charge densities. This strategy may also be employed if the pond water suspended solids become a problem.

Urea has proven to be a lingering issue for BC product water impacting the demineralizers and Cooling tower alkalinities if dumped in large quantities (1000 gallons or greater) to the pond system. In the event of a large urea dump segregate the urea in the ash pond with the least impact on the pump back cells (usually the bottom ash pond) so it may be introduced at a small flow to the system. Any hydrolyzer flushing or cleaning must be treated as a large urea dump.

If the ponds are low level and we are in danger of losing bottom ash makeup or AQCS attemperator water makeup begin selectively deleting the following process streams: 1) gradually lower the "Gainesville Pipeline" flow rate, 2) begin to lower the BC processing rate. As the BC has a poor turndown (we don't want to go below 150 gpm on makeup) we can also employ lowering the Soda Ash feed to the secondary clarifiers on the FET; this will increase cooling tower blow down (with a higher Ca fraction) that will replenish the pond supply. Work closely with the lab as this may be hazardous with poor alkalinity control in Unit #1 tower.

Landfill runoff and coal pile runoff may be processed through the FET by use of the secure landfill coal pile runoff cross connect station.

Try to have one sludge pond empty to accommodate unusual pond flows.

Leave the construction ponds alone unless there is a danger to the plant roads or railways. Natural outflow from these ponds is not an issue however fish and wildlife kills due to low levels may be if these are caused by poor water management.

Replace valves and pumps when they break down.

Monitor the piping to and from the ponds by walking them down not riding in the truck. Its difficult to spot leaks from the truck.

Keep the level in the Coal Pile Runoff Pond to a minimum by constantly pumping. This pond is easily susceptible to overflow due to inclement weather.

Keep the level in the Landfill Runoff Pond to a minimum as this will keep the ash landfill dry.

Keep pumping the level in the Secure Landfill at a constant rate. Make sure to fill out the landfill pumping records whether the pumps are in service or not.

When a pond gets full of sediment make arrangements to have it dredged as quickly as possible.

Get pond valves back in service as soon as possible. This saves on having to use pumps to move pond water.

Make sure to always have a high volume pump available during times of high rainfall.

Back pumping from the landfill runoff ponds or coal pile runoff pond to the ash ponds is not a viable strategy unless the use of overland flex hoses is employed. The backflow preventors on the lines from the landfill runoffs and the coal pile runoff to the ash ponds are still viable.

Bottom ash PLC failures and or maintenance is a red flag for the Process Plant; the shift supervisor needs to notify the PP in the event of a failure of this system. If a failure happens the Ash Pond Blowdown or the East Ash Recycle pump needs to be started in hand locally. This will enable the pump to keep running however the Process Plant will lose remote start/stop capability.

To expose the outfalls of the ash cells and sludge cells in the pump back cell jumper out the low level trip for the ash recycle pumps and ash pond blowdown pumps and allow the pond level to drop to 12 “steps” or 7.0 ft on the Miltronics indicator in the pump back pond MCC house. This will be 176’ AMSL.

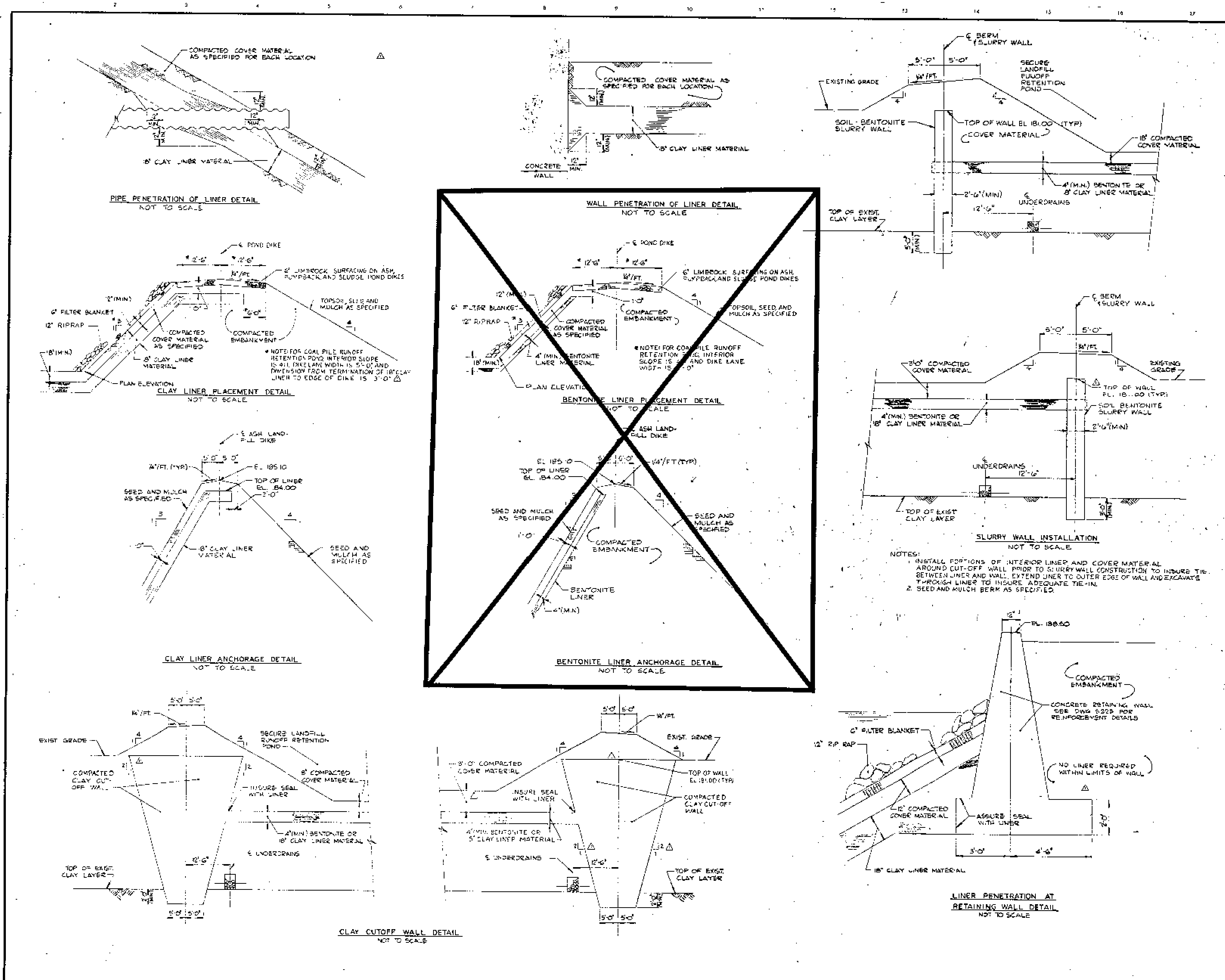
JUNE 6-9-13

DEERHAVEN GENERATING STATION

4690 ...

PROCESS PLANT PONDS LEVEL LOG

Date/Time	Pump Back Wet Well	Ash Cell #1	Ash Cell #2	Sludge #1	Sludge #2	Remarks	Operator Initials
1600 6-9-13	2.7	B/A 192.8	R 189.4	185	186		[illegible]
6/10 1000	2.5	192'6" 4 CL	189'	185'	186'	AC1 closed BROKEN PIPE	[illegible]
6/11 0830	2.6	192.6 4	R 189.3	185	186		[illegible]
6/11 1400	3.5	192'5"4	190'4	185'	186'		[illegible]
6/12 0010	3.7	192.5	R 189.5	185	186		[illegible]
6/12 0700	4.0	192.5 5 Turns	190.6 R	185	186	AC1 5 turns	[illegible]
6/13 0040	4.0	192 5T	190.3 C	185	185		[illegible]
6/13 0700	3.5	191.5 5T	190.5 R	185	185		[illegible]
6/13 1840	4.0	191 5T	190.9 C	185	186.9		[illegible]
6/14 0700	3.5	192	191	185	186		[illegible]
6/14 1830	4.0	191 6T	191 R	185	186.8	opened AC1 1 Turn	[illegible]
6/15 07..	3.7	190.8	191.3	185	186		[illegible]
6/15 1840	3	190 6T	191.2	185	186.9		[illegible]
6/16 1840	3	190 6T	190.9	185	186.9		[illegible]
6/17 1630	3.	190 6T	191	185	187.0		[illegible]
6/17 1900	2.5	190	190.5	185	186.7		[illegible]
	2.9	191.4 6T	190	185	186		[illegible]
6/18	2.7	191	190	185	186		[illegible]
6/18	2.6	191 closed	R 190	185	186		[illegible]
6/19	4.0	191.8	R 189	185	186		[illegible]
	4.4	192	189.5	185	186		



NO.	DATE	BY	REVISION
△	5-12-80	TOW	ADDED & REVISED NOTES FOR CLARIFICATION. REVISED CLAY CUTOFF WALL DETAIL. REVISED LINER PENETRATION AT RETAINING WALL DETAIL.
	3-21-80	DMZ	ISSUED WITH ADDENDUM NO. 3
	4-22-80	DMZ	ISSUED AS BID
	2-1-81	DJB	CONFORMING TO CONSTRUCTION RECORDS

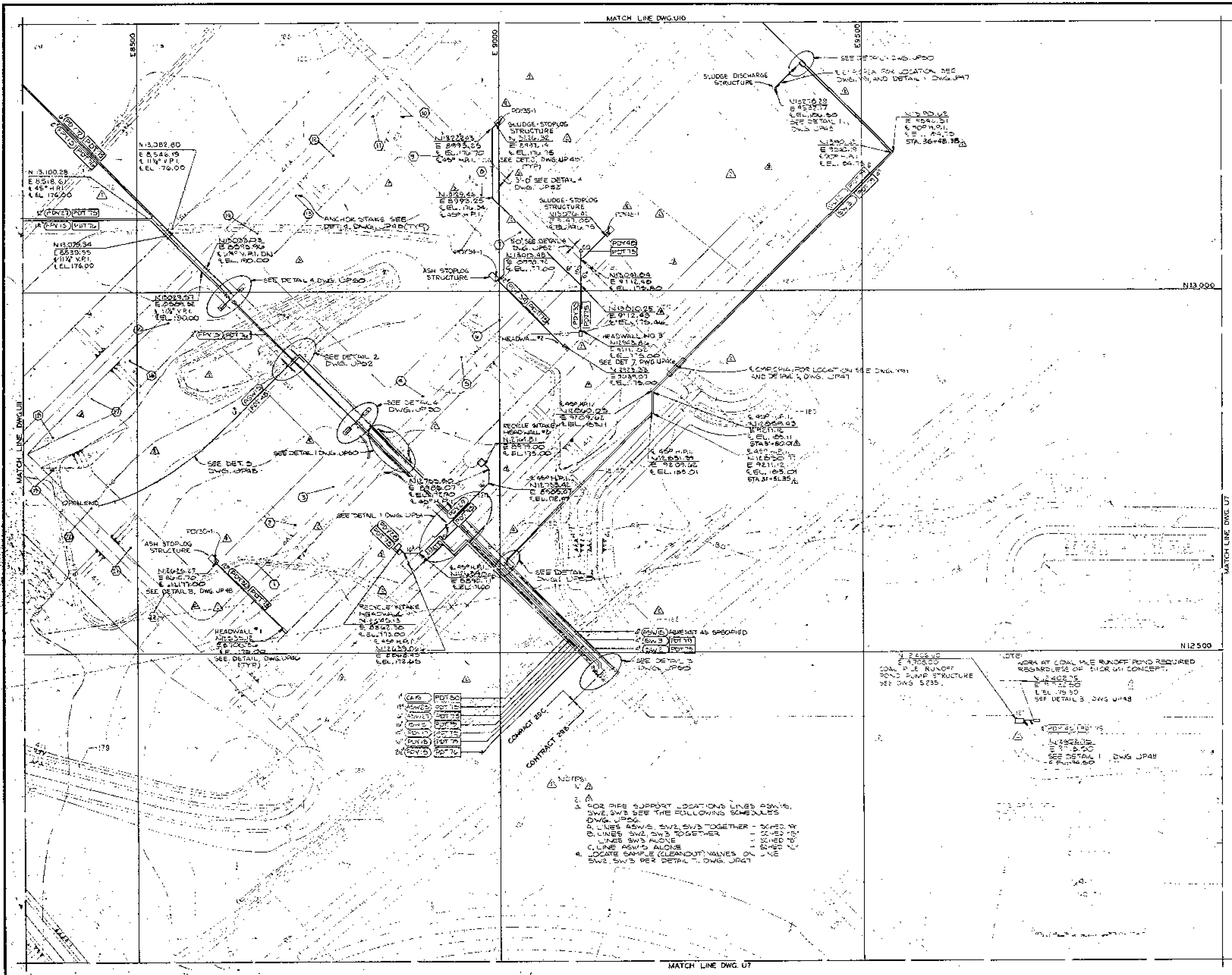
CONTRACT NO. 29C
YARD STRUCTURES III

DEERHAVEN GENERATING STATION
UNIT 2
CITY OF GAINESVILLE/
GAINESVILLE-ALACHUA COUNTY
REGIONAL UTILITIES BOARD
FLORIDA

GRADING DETAILS 3

Burns & McDonnell
Engineers-Architects-Consultants
KANSAS CITY, MISSOURI

DATE FEB. 8, 1980 | DRAWING NO. Y87 | REV. 1
DESIGNED HITCHCOCK
DETAILED LANGHAMMER | PROJECT 76-077-1
CHECKED DMZ | SHEET OF SHEETS



NO.	DATE	BY	REVISION
1	3-4-80	CLA	REVISED & REISSUED PER ADDENDUM NO. 1
			ISSUED
2			REVISED & REISSUED PER ADDENDUM NO. 2
			ISSUED
			ISSUED AS B.D.
3		REC	DELETE NOTES 1 & 2, LINES PDY52 THRU 63. MOVED LINE PDY 35 & ADD 6" SIZE
			ISSUED
4			CONFORMING TO CONSTRUCTION RECORDS

CONTRACT 29C
YARD STRUCTURES III

DEERHAVEN GENERATING STATION
UNIT 2

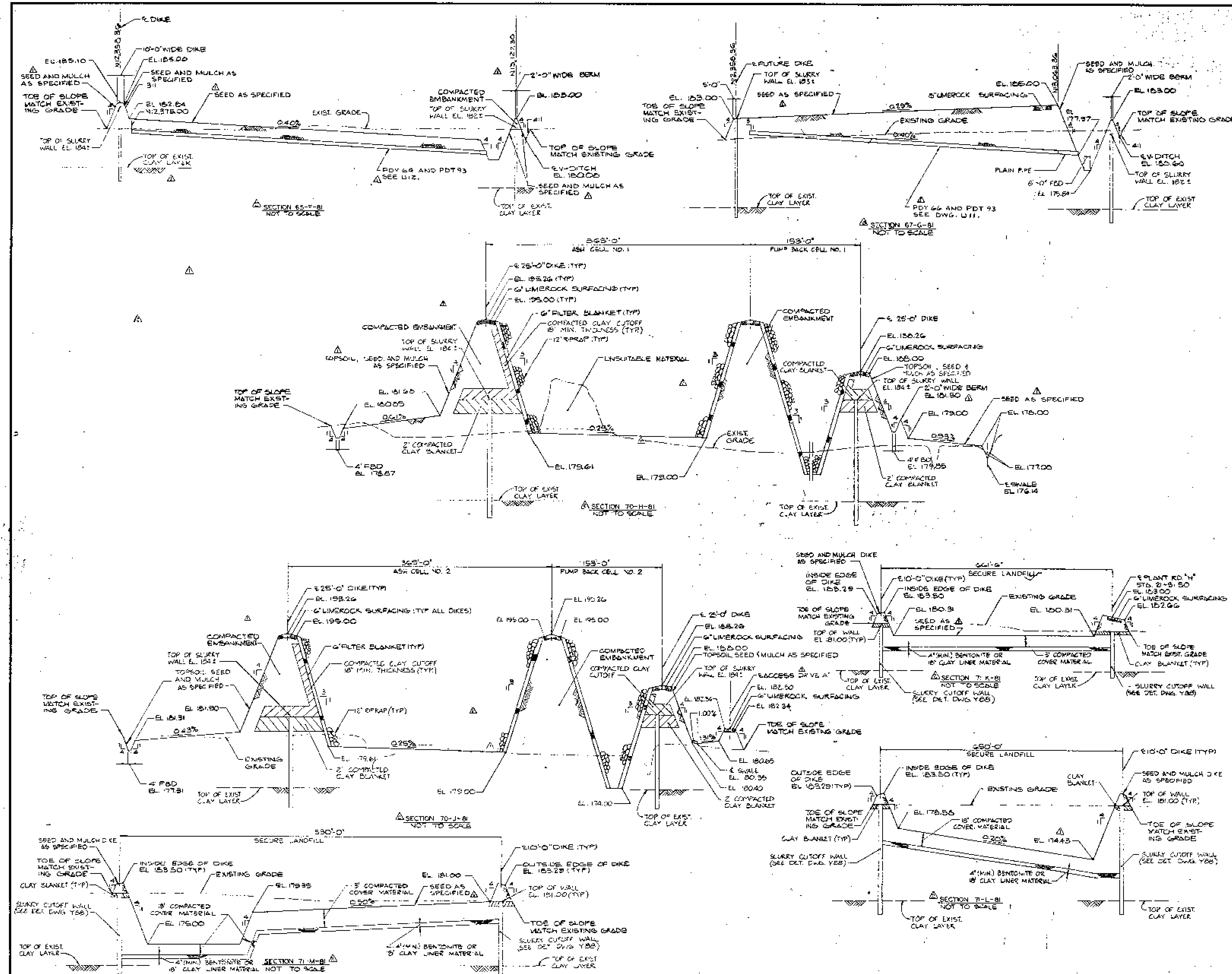
CITY OF GAINESVILLE/
GAINESVILLE-ALACHUA COUNTY
REGIONAL UTILITIES BOARD

FLORIDA

YARD UTILITIES – ASH & SLUDGE PONDS (3:1)

Burns & McDonnell
Engineers – Architects – Consultants
KANSAS CITY, MISSOURI

DATE FEB. 6 1980	DRAWING NO. U9 — REV. 4
DESIGNED DOMBROSKI	
DETAILED C. ALLEN	PROJECT 75-077-1
CHECKED	SHEET OF SHEETS



NO.	DATE	BY	REVISION
1	5-8-80	DJB	REVISED & ADDED NOTES FOR CLARIFICATION.
	3-4-82	TDW	F-9, J-61 REVISED TIMBER POLE LINER PROTECTION
	3-21-80	DMZ	ISSUED WITH ADDENDUM NO. 3
	4-22-80	DMZ	ISSUED AS BID
4	6-13-80	GWB	REVISED PER ALTERNATE BIDS NO. 3 & NO. 4
	6-24-80	DMZ	ISSUED
	7-1-84	DJB	CONFORMING TO CONSTRUCTION RECORDS

CONTRACT NO. 29C
YARD STRUCTURES (I)

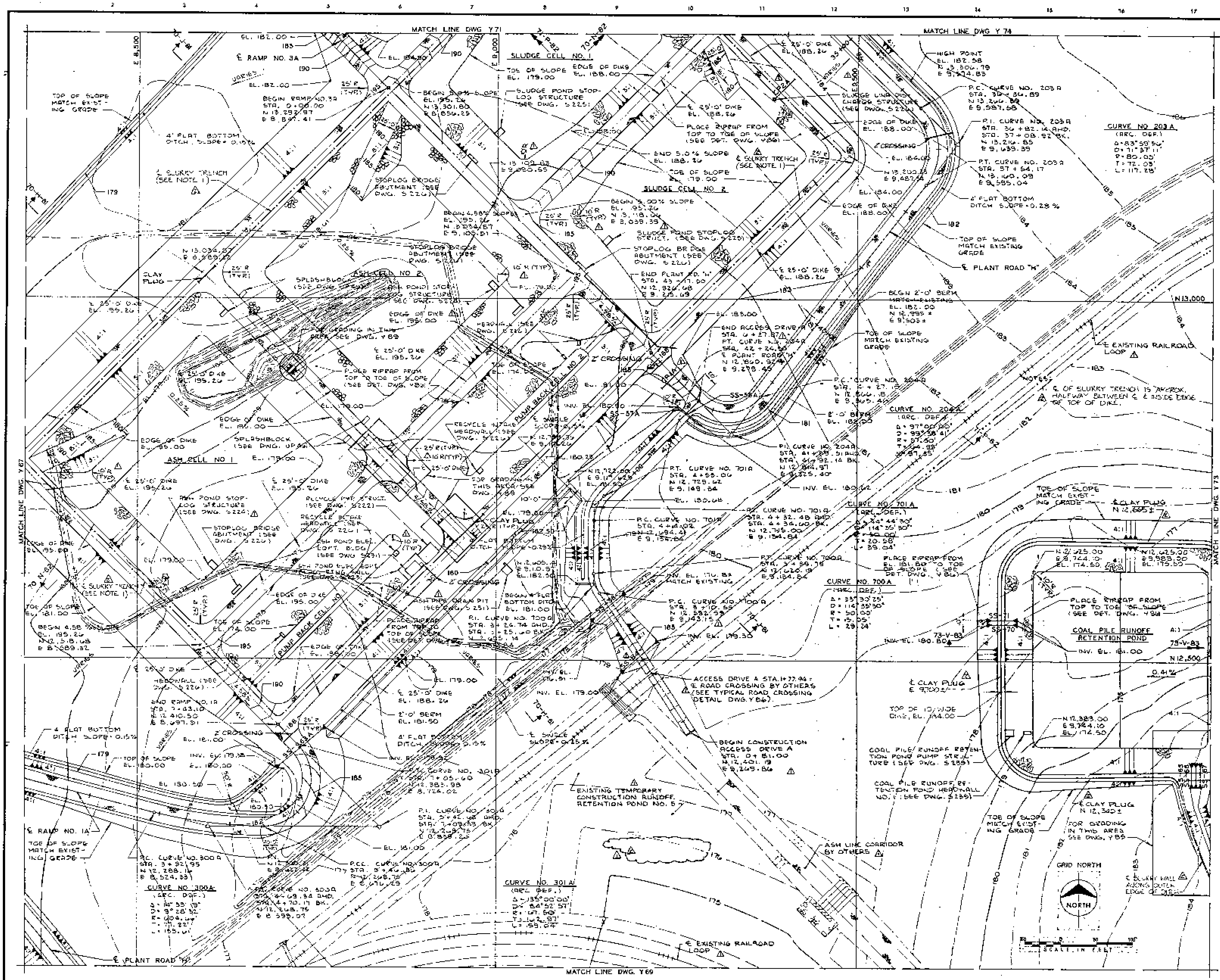
DEERHAVEN GENERATING STATION
UNIT 2

CITY OF GAINESVILLE/
GAINESVILLE-ALACHUA COUNTY
REGIONAL UTILITIES BOARD
FLORIDA

GRADING SECTIONS 2

Burns & McDonnell
Engineers-Architects-Consultants
KANSAS CITY, MISSOURI

DATE FEB. 18, 1980 | DRAWING NO. Y81 | REV. 2
DESIGNED HUTCHESON
DETAILED MADDOCK | PROJECT 76-077-1
CHECKED DMZ | SHEET OF SHEETS



NO.	DATE	BY	REVISION
1	3-11-80	DJB	REVISED PER ADDENDUM NO. 2
	4-3-80	MBB	ADDED NOTE PER ADDENDUM NO 3
	4-7-80	MBB	REVISED NOTE FOR CLARIFICATION
	4-22-80	DMZ	ISSUED AS BID
2	5-21-80	GWB	ADDED SLURRY WALL & SLURRY TRENCH. (E-16) REVISED NOTE 1 (L-10) DELETED NOTE
	5-30-80	DMZ	ISSUED
3	6-30-81	DJB	CONFORMING TO CONSTRUCTION RECORDS

CONTRACT NO. 29C
YARD STRUCTURES III

DEERHAVEN GENERATING STATION
UNIT 2

CITY OF GAINESVILLE/
GAINESVILLE–ALACHUA COUNTY
REGIONAL UTILITIES BOARD

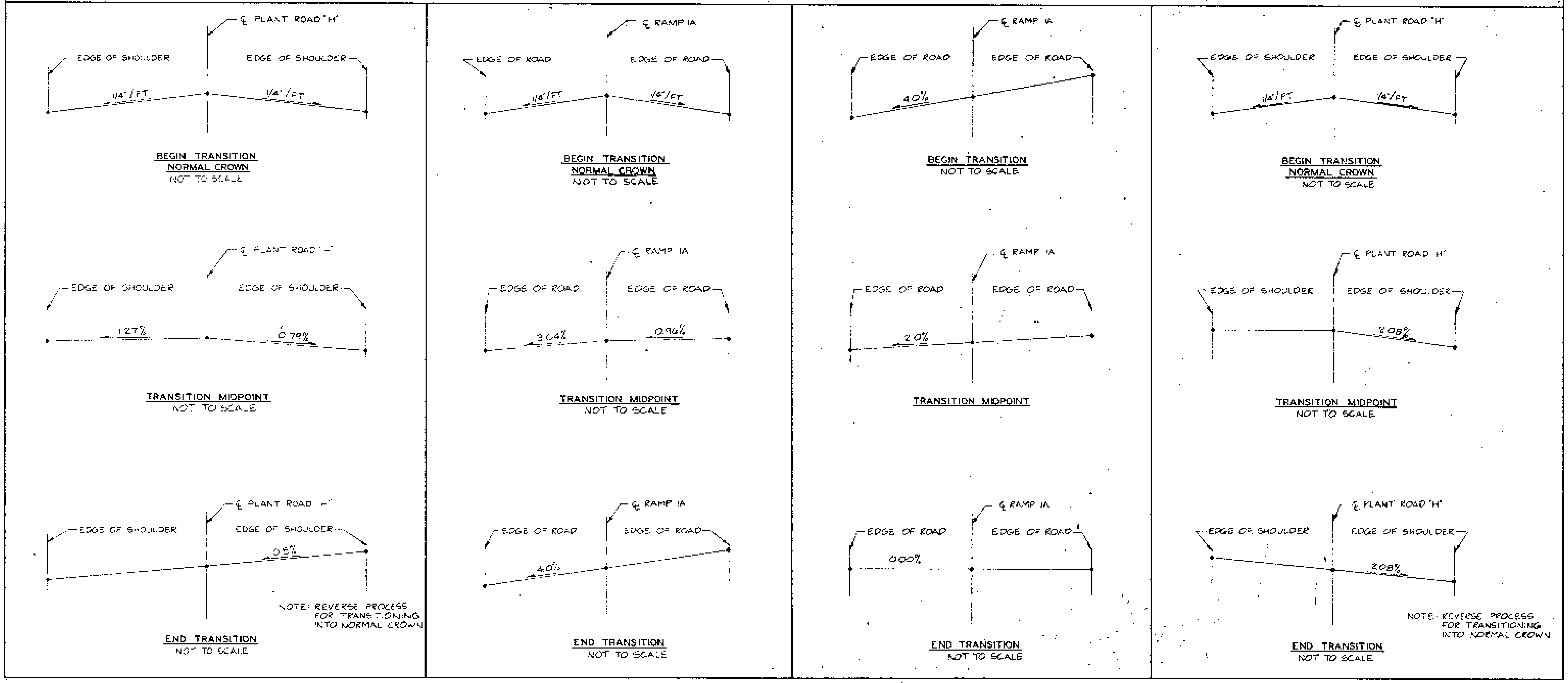
FLORIDA

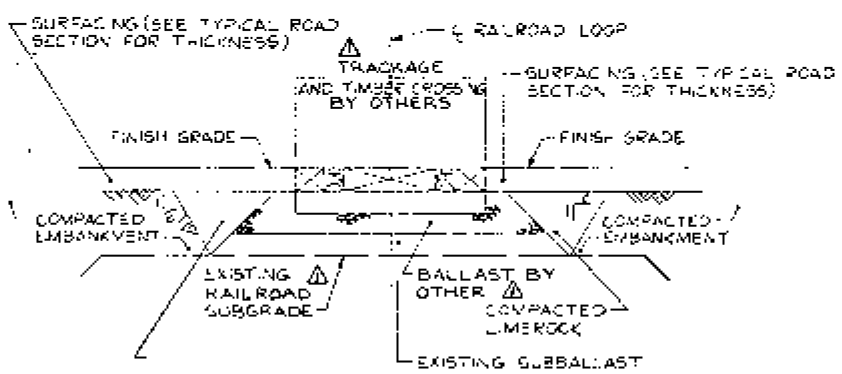
GRADING PLAN 7

Burns & McDonnell
Engineers – Architects – Consultants
KANSAS CITY, MISSOURI

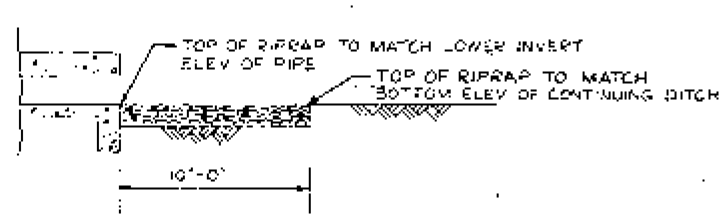
DATE FEB. 18, 1980	DRAWING NO. Y 70 — REV. 3
DESIGNED HUTCHESON	
DETAILED WISEMAN	PROJECT 76-077-1
CHECKED DMZ	SHEET OF SHEETS

SUPERELEVATION TRANSITIONS

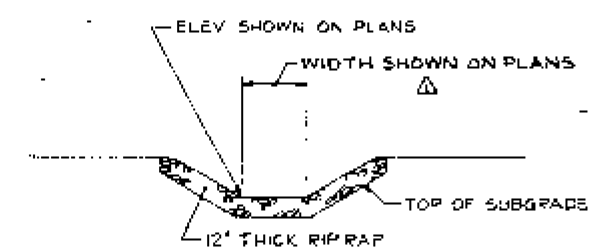




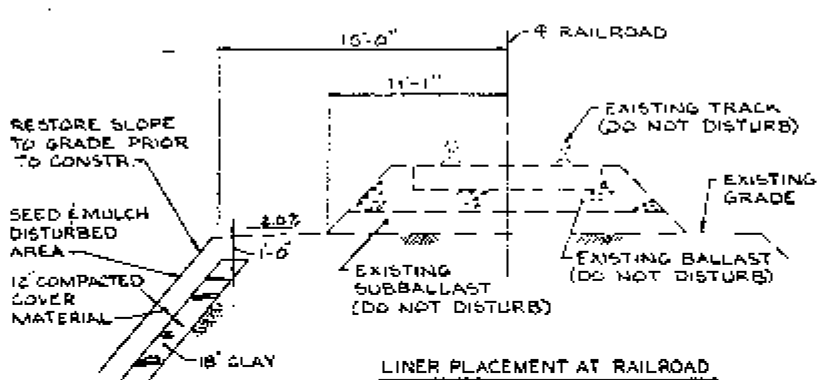
TYPICAL ROAD CROSSING DETAIL
NOT TO SCALE



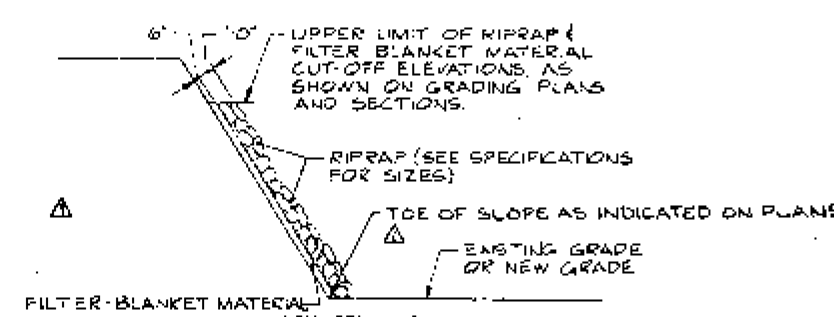
TRANSITION FROM RIPRAPPED TO NON RIPRAPPED DITCH
NOT TO SCALE



TYPICAL SECTION
RIP RAPPED FLAT BOTTOM DITCH
NOT TO SCALE



LINER PLACEMENT AT RAILROAD EMBANKMENT DETAIL
NOT TO SCALE



ASH CELL NO.1 & NO.2
SLUDGE CELL NO.1 & NO.2
PUMP BACK CELL NO.1 & NO.2
COAL PILE RUNOFF RETENTION POND
TYPICAL RIPRAP PLACEMENT DETAIL
NOT TO SCALE

NO.	DATE	BY	REVISION
△	8-12-80	DJB	(I-3)(I-15)(L-16) ADDED NOTES FOR CLARIFICATION. (L-14) DELETED NOTE. (M-3) ADDED DETAIL.
	5-21-80	DMZ	ISSUED WITH ADDENDUM NO.3
	4-7-80	DMZ	ISSUED AS BID
	7-1-81	DJD	CONFORMING TO CONSTRUCTION RECORDS

CONTRACT NO. 29C
YARD STRUCTURES III

DEERHAVEN GENERATING STATION
UNIT 2

CITY OF GAINESVILLE/
GAINESVILLE-ALACHUA COUNTY
REGIONAL UTILITIES BOARD
FLORIDA

GRADING DETAILS 2

Burns & McDonnell
Engineers-Architects-Consultants
KANSAS CITY, MISSOURI

DATE FEB. 18, 1980	DRAWING NO. Y86 REV. 1
DESIGNED MEYERS	
DETAILED BAKER	PROJECT 76-077-1
CHECKED DMZ	SHEET OF SHEETS

CITY OF GAINESVILLE, FLORIDA
GAINESVILLE—ALACHUA COUNTY
REGIONAL UTILITIES BOARD

DEERHAVEN GENERATING STATION - UNIT 2

CONTRACT 29C - YARD STRUCTURES III

1980

YARD

Y61	GENERAL SITE PLAN
Y62	SITE PLAN
Y63	CLEARING & GRUBBING LIMITS
Y64	GRADING PLAN 1
Y65	GRADING PLAN 2
Y66	GRADING PLAN 3
Y67	GRADING PLAN 4
Y68	GRADING PLAN 5
Y69	GRADING PLAN 6
Y70	GRADING PLAN 7
Y71	GRADING PLAN 8
Y72	GRADING PLAN 9
Y73	GRADING PLAN 10
Y74	GRADING PLAN 11
Y75	DELETED FROM CONTRACT - NOT APPLICABLE
Y76	ROAD PROFILES 1
Y77	ROAD PROFILES 2
Y78	RAMP PROFILES
Y79	UNASSIGNED
Y80	GRADING SECTIONS 1
Y81	GRADING SECTIONS 2
Y82	GRADING SECTIONS 3
Y83	GRADING SECTIONS 4
Y84	UNASSIGNED
Y85	GRADING DETAILS 1
Y86	GRADING DETAILS 2
Y87	GRADING DETAILS 3
Y88	GRADING DETAILS 4
Y89	GRADING DETAILS 5
Y90	UNASSIGNED
Y91	STORM DRAINAGE DETAILS 1
Y92	STORM DRAINAGE DETAILS 2
Y93	STORM DRAINAGE DETAILS 3
Y94	UNASSIGNED
Y95	UNASSIGNED

ARCHITECTURAL

A86	ASH POND ELECTRICAL BUILDING PLAN AND DETAILS
A87	ASH POND ELECTRICAL BUILDING DETAILS

STRUCTURAL

S1	STANDARD DETAILS
S2	STANDARD DETAILS
S3	STANDARD DETAILS
S4	STANDARD DETAILS
S5	STANDARD DETAILS
S222	RECYCLE PUMP STRUCTURE
S223	ASH POND ELEC EQUIP. BLDG RETAINING WALL
S224	ASH POND STOPLOG STRUCTURE NO. 1 & 2
S225	SLUDGE POND STOPLOG STRUCTURE NO. 1 & 2
S226	HEADWALLS & BRIDGE ABUTMENTS
S227	STOPLOG STRUCTURE BRIDGES
S228	CROSSING STRUCTURE NO. 6
S229	CROSSING STRUCTURE NO. 7
S230	CROSSING STRUCTURE NO. 8 & SLURRY WALL CROSSINGS NO. 1 & 2
S231	ASH PIPE DRAIN PIT STRUCTURE & ASH POND ELECTRICAL EQUIPMENT BUILDING
S232	PIPE SUPPORTS
S233	UNASSIGNED
S234	CONC SLAB ON STOCKOUT TOWER & STAIR TOWER GUARD POSTS
S235	C.P.R. POND PUMP STRUCTURE & HEADWALL TEMP CONSTR RUNOFF POND NO. 1 OUTLET
S236	SECURE LANDFILL RUNOFF RETENTION POND PUMP STRUCTURE & INTAKE STRUCTURE
S237	ASH LANDFILL PUMP STRUCTURE
S238	UNASSIGNED
S239	UNASSIGNED
S240	UNASSIGNED

MECHANICAL

M35	HVAC & PLUMBING ASH POND ELECTRICAL EQUIPMENT BUILDING

MECHANICAL - YARD PIPING

U7	DRAWING REFERENCE & LEGEND
U8	DELETED FROM CONTRACT - NOT APPLICABLE
U9	YARD UTILITIES - ASH & SLUDGE PONDS (3-3)
U10	YARD UTILITIES - SECURE LANDFILL
U11	ASH LANDFILL
U12	ASH LANDFILL II
U13	UNASSIGNED
UP43	ISOMETRIC DETAILS I
UP44	ISOMETRIC DETAILS II
UP45	UNASSIGNED
UP46	MISCELLANEOUS PIPING DETAILS I
UP47	MISCELLANEOUS PIPING DETAILS II
UP48	MISCELLANEOUS PIPING DETAILS III
UP49	UNASSIGNED
UP50	YARD ENLARGEMENT DETAILS I
UP51	YARD ENLARGEMENT DETAILS II
UP52	YARD ENLARGEMENT DETAILS III
UP53	YARD ENLARGEMENT DETAILS IV
UP54	VALVE LIST AND CONNECTIONS SCHEDULE
UP55	PIPING DESIGN TABLES
UP56	PIPE SUPPORT SCHEDULES

REFERENCE DRAWING

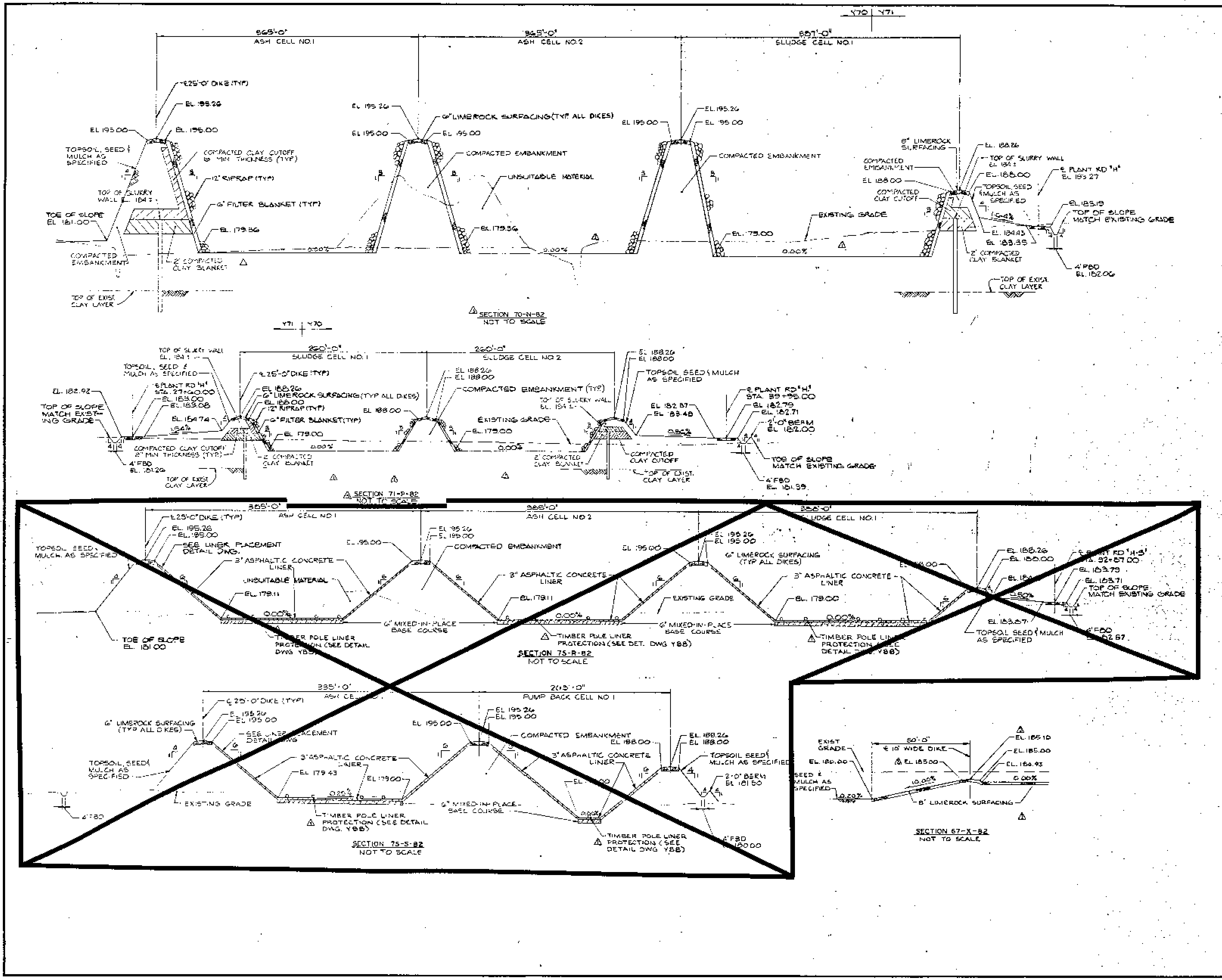
L-114	FLOOR PLANS STRUCTURAL STEEL DESIGN LAYOUT

CERTIFICATE No. 25065 STATE OF FLORIDA REGISTERED ENGINEER

CONFORMING TO CONSTRUCTION RECORDS

Burns & McDonnell
Engineers-Architects-Consultants
Kansas City, Missouri

76-077-1



NO.	DATE	BY	REVISION
1	3-11-80	DJB	ADDED TIMBER POLE LINER PROTECTION & NOTE TO SECTIONS 70-N-82, 70-P-82, 75-R-82, & 75-S-82. (K-14) ADDED SECTION 67-X-82
	3-21-80	DMZ	ISSUED WITH ADDENDUM NO.3
2	4-7-80	MBS	REVISED EL FOR CLARIFICATION
	4-22-80	DMZ	ISSUED AS BID
3	6-12-80	GWB	REVISED PER ALTERNATE BIDS NO 3 & NO.4
	6-24-80	DMZ	ISSUED
	7-1-81	DJB	CONFORMING TO CONSTRUCTION RECORDS

CONTRACT NO. 29C
YARD-STRUCTURES (C)

DEERHAVEN GENERATING STATION
UNIT 2

CITY OF GAINESVILLE/
GAINESVILLE-ALACHUA COUNTY
REGIONAL UTILITIES BOARD

FLORIDA

GRADING SECTIONS 3

Burns & McDonnell
Engineers–Architects–Consultants
KANSAS CITY, MISSOURI

DATE FEB. 8, 1980
DESIGNED HUTCHESON
DETAILED MADDOCK
CHECKED DMZ
DRAWING NO. Y82 REV. 3
PROJECT 76-077-1
SHEET OF SHEETS

GRU
More than Energy

GAINESVILLE REGIONAL UTILITIES

STRATEGIC PLANNING

April 2, 2012

Mr. Robert L. Martin, P.G.
Florida Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, FL 32256-7590

Re: Gainesville Regional Utilities Deerhaven Generating Station
Quarterly Groundwater Monitoring Results
Quarter 1, 2012

Dear Mr. Martin,

Enclosed is the Deerhaven Generating Station groundwater monitoring report for Quarter 1 of 2012 monitoring period.

If you have any questions or require further information, please do not hesitate to contact me at (352) 393-1304.

Sincerely,

Boi Hoang
Utility Engineer

Enclosures

cc: file: WDH2.2

Electronically: K. Klemans
C. Brew
R. Embry
C. Lewis
S. Phillips

P.O. Box 147117, Station A136, Gainesville, Florida 32614-7117, Telephone: (352) 334-3400 ext. 1260 Fax: (352) 334-3151

State of Florida
Department of Environmental Protection

GROUNDWATER MONITORING REPORT

Facility Name: **GRU-Deerhaven Generating Station** County: Alachua
Address: Post Office Box 147117 Station A136
City: Gainesville State: Florida ZIP: 32614-7117
Telephone No: (352) 334-3400 (ext 1741)
Facility ID (DEP Permit No): FLA017161 (PA 74-04)
Authorized Representative: Christopher C. Brew Title: Manager, Regulatory Compliance and Lab Services
Address: Same
City: Same State: ZIP:
Telephone No: Same
Type of Discharge: Industrial Wastewater
Method of Discharge: Ponds/Basins

CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein; and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Signature of Owner or Authorized Representative

3/27/2012
Date

GRU Deerhaven DOH Certification # E52876
GRU Kannapaha Laboratory DOH Certification # E52099 3901 SW 63 Blvd. Gainesville, FL 32608 (352) 375-8143
KNL Laboratory Services DOH Certification # E84025 2742 N Florida Ave. P.O. Box 1833 Tampa, FL 33601 (813) 229-2879
Pace Analytical Services, Inc. DOH Certification # E83079 8 East Tower Circle Ormond Beach, FL 32174 (386) 672-5668

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/20/2012
Report Date: Wednesday, March 28, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27662
Testsite Name: MWD-1-6 (R1T6)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	11.2		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	7.7	I	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	12.2		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	51.0		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	13.9		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	3.0	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	12	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1.3	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	1.8		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.4		pCi/L	1.8
Iron	01045	No	Nitric Acid	EPA 200.7	4000		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	28.2		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	140		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	2.9	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.049	I	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	6.64		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.47		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	12.2		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	485		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	42.1		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	2.5	U	mg/L	2.5
Temperature	00010	No	none	FDEP	21.3		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	286		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	5.7		mg/L	0.50

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/20/2012
Report Date: Wednesday, March 28, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27662
Testsite Name: MWD-1-6 (R1T6)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	3.6	I	mg/L	1.0
Turbidity	82079	No	None	SM2130B	1.39		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	178.38		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1.3	I	ug/L	1
Redox	00090	No	None	FDEP	-34.3	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/18/2012
Report Date: Wednesday, March 28, 2012

Well Type: Background
WAFR Testsite ID: 27663
Testsite Name: MWB-2-1 (R2T1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	255		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	1.7		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	10.7		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	4.2	I	mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	2.5	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	10	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	2.2	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	7.2		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	1.3		pCi/L	1.7
Iron	01045	No	Nitric Acid	EPA 200.7	190		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	0.72		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	4.9		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1.4	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.049	I	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	6.89		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.02	I	mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	2.88		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	72.5		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	23.8		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	2.5	U	mg/L	2.5
Temperature	00010	No	none	FDEP	18.2		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	45		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	9.0		mg/L	0.50

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/18/2012
Report Date: Wednesday, March 28, 2012

Well Type: Background
WAFR Testsite ID: 27663
Testsite Name: MWB-2-1 (R2T1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	6.00		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	3.0	I	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	176.04		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1.3	I	ug/L	1
Redox	00090	No	None	FDEP	126.7	D	mv	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/17/2012
Report Date: Wednesday, March 28, 2012

Well Type: Intermediate
WAFR Testsite ID: 27664
Testsite Name: MWI-3-7 (R3T7)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	16.2		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	0.8		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	29.0		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	22.0		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1.5	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	25		PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1.8	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	2.4		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.1		pCi/L	1.9
Iron	01045	No	Nitric Acid	EPA 200.7	3540		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	6.17		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	51.0		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	5.6		ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	4.6		ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.010	U	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	6.19		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	1.18		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	70.5		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	484		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	96.9		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	91.4		mg/L	5.0
Temperature	00010	No	none	FDEP	20.3		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	320		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	3.4		mg/L	0.50

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/17/2012
Report Date: Wednesday, March 28, 2012

Well Type: Intermediate
WAFR Testsite ID: 27664
Testsite Name: MWI-3-7 (R3T7)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	I	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.82		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	12.1		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	177.27		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	2.2	I	ug/L	1
Redox	00090	No	None	FDEP	4.9	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/19/2012
Report Date: Wednesday, March 28, 2012

Well Type: Intermediate
WAFR Testsite ID: 27665
Testsite Name: MWI-4-5 (R4T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	125		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	5.1	I	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	15.6		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	4.3		ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	110		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	4.1	I	mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	275		PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	2.0	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.3		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	4.4		pCi/L	2.1
Iron	01045	No	Nitric Acid	EPA 200.7	38700		ug/L	100
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	37.8		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	186		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1.6	I	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.10	U,D3	mg/L	0.10
pH(field)	00406	No	None	SM4500H+B	6.16		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.82		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	16.6		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	867		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	107		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	5.8		mg/L	2.5
Temperature	00010	No	none	FDEP	21.0		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	554		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	36.3		mg/L	0.50

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/19/2012
Report Date: Wednesday, March 28, 2012

Well Type: Intermediate
WAFR Testsite ID: 27665
Testsite Name: MWI-4-5 (R4T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	5.9		mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.34	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	177.69		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	3.1	I	ug/L	1
Redox	00090	No	None	FDEP	-62.8	D	mV	1

GROUND WATER MONITORING REPORT   Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/18/2012
Report Date: Wednesday, March 28, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27671
Testsite Name: MWD-6-1 (R6T1B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	266		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	10.4		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	4.17		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	34.0	J(M1)	mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1.6	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.7		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	0.9		pCi/L	1.6
Iron	01045	No	Nitric Acid	EPA 200.7	272		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	2.56		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	2.8	I	ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.010	U	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	4.94		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.36		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	15.9		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	141.8		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	10.1		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	5.8		mg/L	2.5
Temperature	00010	No	none	FDEP	20.1		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	80		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	2.0		mg/L	0.50

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/18/2012
Report Date: Wednesday, March 28, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27671
Testsite Name: MWD-6-1 (R6T1B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.13	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	175.39		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox	00090	No	None	FDEP	212.1	D	mv	1

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/18/2012
Report Date: Wednesday, March 28, 2012

Well Type: Intermediate
WAFR Testsite ID: 27672
Testsite Name: MWI-6-4 (R6T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	2390		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	20.3		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.8	I	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	44.4		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	124		mg/L	5.0
Chromium	01034	No	Nitric Acid	EPA 200.7	3.2	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	2.2	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	8	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1.2	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.3		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	9.7		pCi/L	4.4
Iron	01045	No	Nitric Acid	EPA 200.7	7480		ug/L	2
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	21.8		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	61.3		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	29.5		ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.020	U,D3	mg/L	0.020
pH(field)	00406	No	None	SM4500H+B	4.90		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	4.11		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	272		mg/L	0.02
Specific Conductance(field)	00094	No	None	SM2510B	1536		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	121		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	675		mg/L	50.0
Temperature	00010	No	none	FDEP	18.1		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	1240		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	11.8		mg/L	0.50

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/18/2012
Report Date: Wednesday, March 28, 2012

Well Type: Intermediate
WAFR Testsite ID: 27672
Testsite Name: MWI-6-4 (R6T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	2.00		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	42.6		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	176.57		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	2.5	I	ug/L	1
Redox	00090	No	None	FDEP	43.6	D	mv	1

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/19/2012
Report Date: Wednesday, March 28, 2012

Well Type: Intermediate
WAFR Testsite ID: 27673
Testsite Name: MWI-6-8 (R6T8B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	30.7		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	13.1		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	57.0		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	8.9		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	6	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1.7	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	2.7		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.5		pCi/L	1.9
Iron	01045	No	Nitric Acid	EPA 200.7	71.9		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	34.6		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	19.4		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.030	I	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	6.69		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.16		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	9.6		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	538		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	90.1		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	3.2	I	mg/L	2.5
Temperature	00010	No	none	FDEP	18.2		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	304		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	2.3		mg/L	0.50

GROUND WATER MONITORING REPORT   Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/19/2012
Report Date: Wednesday, March 28, 2012

Well Type: Intermediate
WAFR Testsite ID: 27673
Testsite Name: MWI-6-8 (R6T8B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	1.05		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	173.27		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	3.0	I	ug/L	1
Redox	00090	No	None	FDEP	191.7	D	mv	1

GROUNDWATER MONITORING REPORT | Facility name: GRU-Deerhaven Generating Station

Facility ID: FLA017161	Well Type: Site Boundary	Was Well Purged Before Sample Collection: N/A
Report Date: **1Q12**	WAFR Testsite ID: 27674	Groundwater Classification: GII
Sample Data: N/A		
Report Date: March 28, 2012	Testsite Name: R6T12	Sample Method: Peristaltic Pump

Dry Well

NELAC Lab Cert# FL00251

GROUND WATER MONITORING REPORT Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/20/2012
Report Date: Wednesday, March 28, 2012

Well Type: Compliance
WAFR Testsite ID: 27676
Testsite Name: MWC-8-10 (R8T10)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	1410		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	23.1		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	43.7		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	163		mg/L	12.5
Chromium	01034	No	Nitric Acid	EPA 200.7	6.8		ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	2.6	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	12	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	3.4	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	5.6		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	6.4		pCi/L	2.3
Iron	01045	No	Nitric Acid	EPA 200.7	216		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	14.0		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	15.2		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	6.0		ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.065		mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	4.90		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.18		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	88.3		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	847		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	42.6		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	127		mg/L	12.5
Temperature	00010	No	none	FDEP	22.8		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	496		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	12.7		mg/L	0.50

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/20/2012
Report Date: Wednesday, March 28, 2012

Well Type: Compliance
WAFR Testsite ID: 27676
Testsite Name: MWC-8-10 (R8T10)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	2.0	I	mg/L	1.0
Turbidity	82079	No	None	SM2130B	1.55		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	49.1		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	168.55		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	4.4		ug/L	1
Redox	00090	No	None	FDEP	360.2	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/19/2012
Report Date: Wednesday, March 28, 2012

Well Type: Intermediate
WAFR Testsite ID: 27677
Testsite Name: MWI-9-5 (R9T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	1420		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	6.6		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	3.74		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	7.7		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	2.9	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	8	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	3.1	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	1.7		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	3.3		pCi/L	1.6
Iron	01045	No	Nitric Acid	EPA 200.7	439		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	1.62		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	12.0		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1.0	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.029	I	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	5.17		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.93		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	7.68		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	90.5		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	13.1		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	7.4		mg/L	2.5
Temperature	00010	No	none	FDEP	14.2		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	45		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	2.2		mg/L	0.50

GROUND WATER MONITORING REPORT   Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/19/2012
Report Date: Wednesday, March 28, 2012

Well Type: Intermediate
WAFR Testsite ID: 27677
Testsite Name: MWI-9-5 (R9T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	6.7		mg/L	1.0
Turbidity	82079	No	None	SM2130B	7.95		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1.7	I	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	173.86		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	3.0	I	ug/L	1
Redox	00090	No	None	FDEP	157.1	D	mv	1

GROUND WATER MONITORING REPORT Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/19/2012
Report Date: Wednesday, March 28, 2012

Well Type: Compliance
WAFR Testsite ID: 27678
Testsite Name: MWC-10-8 (R10T8)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	33.8		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	2.8		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	9.25		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	2.5	U	mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1.6	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	1.5		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.6		pCi/L	1.7
Iron	01045	No	Nitric Acid	EPA 200.7	15.0		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	2.42		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	8.5		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.010	U	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	5.39		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.16		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	2.18		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	91.9		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	11.2		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	16.5		mg/L	2.5
Temperature	00010	No	none	FDEP	17.9		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	53		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	1.4		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/19/2012
Report Date: Wednesday, March 28, 2012

Well Type: Compliance
WAFR Testsite ID: 27678
Testsite Name: MWC-10-8 (R10T8)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.10	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	15.3		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	173.57		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1.5	I	ug/L	1
Redox	00090	No	None	FDEP	226.5	D	mv	1

GROUND WATER MONITORING REPORT   Facility Name: GRU Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/18/2012
Report Date: Wednesday, March 28, 2012

Well Type: Compliance
WAFR Testsite ID: 27679
Testsite Name: MWC-11-4 (R11T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	117		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	4.4		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	8.98		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	37.4		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	3.3	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	14	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1.7	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.8		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	11.2		pCi/L	2.0
Iron	01045	No	Nitric Acid	EPA 200.7	514		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	4.45		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	15.8		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1.1	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.010	U	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	5.30		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.30		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	57.4		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	350.6		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	6.46		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	99.4		mg/L	2.5
Temperature	00010	No	none	FDEP	18.7		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	256		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	17.8		mg/L	0.50

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/18/2012
Report Date: Wednesday, March 28, 2012

Well Type: Compliance
WAFR Testsite ID: 27679
Testsite Name: MWC-11-4 (R11T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.39	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	2.9	I	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	170.73		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1.1	I	ug/L	1
Redox	00090	No	None	FDEP	2.8	D	mv	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/20/2012
Report Date: Wednesday, March 28, 2012

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	12.4		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	60.0		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	8.7		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1.4	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.2		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	7.4		pCi/L	1.9
Iron	01045	No	Nitric Acid	EPA 200.7	11.1		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	21.2		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	7.9		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.010	U	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	7.39		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.80		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	8.38		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	452.6		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	1110		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	40.6		mg/L	2.5
Temperature	00010	No	none	FDEP	21.9		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	301		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	1.4		mg/L	0.50

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/20/2012
Report Date: Wednesday, March 28, 2012

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.18	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox	00090	No	None	FDEP	-152.1	D	mV	1

Facility ID: FLA017161
Report Period: **1Q12**
Sample Date: 1/20/2012
Report Date: Wednesday, March 28, 2012

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL

I certify that all of the analytical results comply with NELAC Standards and/or were generated by NELAC laboratories certified by the Florida Department of Health

Report Date: **3/28/2012--2:17 PM**

Quality Assurance Officer: Jack McDonald

Technical Director: C. G. Luis

Remarks

D3 - Sample was diluted due to the presence of high levels of non-target analytes or other matrix interferences. This is not an FDEP qualifier; however, it was used by the Contract Lab.

GRU
More than Energy™

GAINESVILLE REGIONAL UTILITIES

STRATEGIC PLANNING

July 16, 2012

Mr. Robert L. Martin, P.G.
Florida Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, FL 32256-7590

Re: Gainesville Regional Utilities Deerhaven Generating Station
Quarterly Groundwater Monitoring Results
Quarter 2, 2012

Dear Mr. Martin,

Enclosed is the Deerhaven Generating Station groundwater monitoring report for Quarter 2 of 2012 monitoring period.

If you have any questions or require further information, please do not hesitate to contact me at (352) 393-1304.

Sincerely,

Boi Hoang
Utility Engineer

Enclosures

cc: file: WDH2.2

Electronically: K. Klemans
C. Brew
R. Embry
C. Lewis
S. Phillips

State of Florida
Department of Environmental Protection

GROUNDWATER MONITORING REPORT

Facility Name: **GRU-Deerhaven Generating Station** County: Alachua
Address: Post Office Box 147117 Station A136
City: Gainesville State: Florida ZIP: 32614-7117
Telephone No: (352) 334-3400 (ext 1741)
Facility ID (DEP Permit No): FLA017161 (PA 74-04)
Authorized Representative: Christopher C. Brew Title: Manager, Regulatory Compliance and Lab Services
Address: Same
City: Same State: ZIP:
Telephone No: Same
Type of Discharge: Industrial Wastewater
Method of Discharge: Ponds/Basins

CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein; and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Signature of Owner or Authorized Representative

6/29/12
Date

GRU Deerhaven DOH Certification # E52876
GRU Kannapaha Laboratory DOH Certification # E52099 — 3901 SW 63 Blvd. Gainesville, FL 32608 (352) 375-8143
KNL Laboratory Services DOH Certification # E84025 — 2742 N Florida Ave. P.O. Box 1833 Tampa, FL 33601 (813) 229-2879
Pace Analytical Services, Inc. DOH Certification # E83079 — 8 East Tower Circle Ormond Beach, FL 32174 (386) 672-5668

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/13/2012
Report Date: Wednesday, June 27, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27662
Testsite Name: MWD-1-6 (R1T6)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	13.4		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	12.2		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	48.8		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	14.3		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	2.8	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	13	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.3		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.7		pCi/L	1.0
Iron	01045	No	Nitric Acid	EPA 200.7	5200		ug/L	2
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	27.3		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	134		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1.0	I	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.010	U	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	6.60		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.45		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	11.7		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	484.3		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	39.4		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	2.5	U	mg/L	2.5
Temperature	00010	No	none	FDEP	22.0		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	290		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	5.4		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/13/2012
Report Date: Wednesday, June 27, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27662
Testsite Name: MWD-1-6 (R1T6)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	4.9		mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.25	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	177.89		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox	00090	No	None	FDEP	-35.9	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/17/2012
Report Date: Wednesday, June 27, 2012

Well Type: Background
WAFR Testsite ID: 27663
Testsite Name: MWB-2-1 (R2T1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	105		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	0.6		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	6.75		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	4.3	I	mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1.5	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	8	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	5.0		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	1.1		pCi/L	0.9
Iron	01045	No	Nitric Acid	EPA 200.7	482		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	0.88		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	27.6		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.031	I	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	6.19		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.04	I	mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	3.65		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	62.8		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	19.1		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	2.5	U	mg/L	2.5
Temperature	00010	No	none	FDEP	21.6		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	48		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	1.6		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/17/2012
Report Date: Wednesday, June 27, 2012

Well Type: Background
WAFR Testsite ID: 27663
Testsite Name: MWB-2-1 (R2T1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	3.19		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	175.42		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox	00090	No	None	FDEP	221.4	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/11/2012
Report Date: Wednesday, June 27, 2012

Well Type: Intermediate
WAFR Testsite ID: 27664
Testsite Name: MWI-3-7 (R3T7)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	8.1		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	0.59		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	33.2		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	14.5		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.4		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.3		pCi/L	1.2
Iron	01045	No	Nitric Acid	EPA 200.7	2640		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	7.51		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	35.2		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	8.8		ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1.0	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.014	I	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	6.17		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	1.33		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	55.7		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	489.1		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	136		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	92.1		mg/L	2.5
Temperature	00010	No	none	FDEP	23.6		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	295		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	2.9		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/11/2012
Report Date: Wednesday, June 27, 2012

Well Type: Intermediate
WAFR Testsite ID: 27664
Testsite Name: MWI-3-7 (R3T7)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	2.0	I	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.19	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	5.6		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	178.21		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox	00090	No	None	FDEP	14.5	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/11/2012
Report Date: Wednesday, June 27, 2012

Well Type: Intermediate
WAFR Testsite ID: 27665
Testsite Name: MWI-4-5 (R4T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	138		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	15.8		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	4.0		ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	98.0		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	5.8		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1.2	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	550		PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.2		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.1		pCi/L	2.2
Iron	01045	No	Nitric Acid	EPA 200.7	39000		ug/L	20
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	33.8		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	173		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.027	I	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	6.16		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.67		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	15.4		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	842		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	94.6		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	14.9		mg/L	2.5
Temperature	00010	No	none	FDEP	24.5		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	523		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	34.4		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/11/2012
Report Date: Wednesday, June 27, 2012

Well Type: Intermediate
WAFR Testsite ID: 27665
Testsite Name: MWI-4-5 (R4T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	2.2	I	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.45		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	177.77		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1.8	I	ug/L	1
Redox	00090	No	None	FDEP	-93.0	D	mV	1

GROUND WATER MONITORING REPORT   Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/12/2012
Report Date: Wednesday, June 27, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27671
Testsite Name: MWD-6-1 (R6T1B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	247		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	7.6		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	4.26		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	31.6		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.2		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	0.0		pCi/L	0.8
Iron	01045	No	Nitric Acid	EPA 200.7	364		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	1.38		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	2.5	I	ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.010	U	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	5.05		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.08		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	15.4		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	143.3		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	8.5		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	4.7	I	mg/L	2.5
Temperature	00010	No	none	FDEP	19.9		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	85		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	0.86	I	mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/12/2012
Report Date: Wednesday, June 27, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27671
Testsite Name: MWD-6-1 (R6T1B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.81		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	175.54		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox	00090	No	None	FDEP	232.2	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/11/2012
Report Date: Wednesday, June 27, 2012

Well Type: Intermediate
WAFR Testsite ID: 27672
Testsite Name: MWI-6-4 (R6T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	2750		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	18.8		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.9	I	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	51.5		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	122		mg/L	12.5
Chromium	01034	No	Nitric Acid	EPA 200.7	3.7	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	2.9	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.2		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	0.0		pCi/L	7.2
Iron	01045	No	Nitric Acid	EPA 200.7	8960		ug/L	2
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	24.9		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	77.4		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	41.0		ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.015	I	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	4.95		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	3.04		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	260		mg/L	0.02
Specific Conductance(field)	00094	No	None	SM2510B	1782		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	112		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	714		mg/L	25.0
Temperature	00010	No	none	FDEP	21.3		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	1240		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	12.7		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/11/2012
Report Date: Wednesday, June 27, 2012

Well Type: Intermediate
WAFR Testsite ID: 27672
Testsite Name: MWI-6-4 (R6T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	2.1	I	mg/L	1.0
Turbidity	82079	No	None	SM2130B	5.00		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	61.2		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	177.42		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox	00090	No	None	FDEP	-63.2	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/12/2012
Report Date: Wednesday, June 27, 2012

Well Type: Intermediate
WAFR Testsite ID: 27673
Testsite Name: MWI-6-8 (R6T8B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	11200		ug/L	5
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	27.2		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	1.1	I	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	55.4		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	8.9		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	5.8		ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	150		PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	1.2		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	7.8		pCi/L	1.7
Iron	01045	No	Nitric Acid	EPA 200.7	11800		ug/L	5
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	34.7		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	71.1		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.11		mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	6.76		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.58		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	9.8		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	513		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	102		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	5.6		mg/L	2.5
Temperature	00010	No	none	FDEP	22.0		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	352		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	2.9		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/12/2012
Report Date: Wednesday, June 27, 2012

Well Type: Intermediate
WAFR Testsite ID: 27673
Testsite Name: MWI-6-8 (R6T8B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	73		mg/L	1.0
Turbidity	82079	No	None	SM2130B	189		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	12.4		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	173.82		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	8.3		ug/L	1
Redox	00090	No	None	FDEP	215.6	D	mV	1

GROUNDWATER MONITORING REPORT   Facility name: GRU-Deerhaven Generating Station

Facility ID: FLA017161	Well Type: Site Boundary	Was Well Purged Before Sample Collection: N/A
Report Date: **2Q12**	WAFR Testsite ID: 27674	Groundwater Classification: GII
Sample Data: N/A		
Report Date: June 27, 2012	Testsite Name: R6T12	Sample Method: Peristaltic Pump

Dry Well

NELAC Lab Cert# FL00251

GROUND WATER MONITORING REPORT   Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/13/2012
Report Date: Wednesday, June 27, 2012

Well Type: Compliance
WAFR Testsite ID: 27676
Testsite Name: MWC-8-10 (R8T10)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	1020		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	21.7		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	31.4		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	109		mg/L	5.0
Chromium	01034	No	Nitric Acid	EPA 200.7	72.6		ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	2.0	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	12	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1.4	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	5.8		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	3.4		pCi/L	2.3
Iron	01045	No	Nitric Acid	EPA 200.7	383		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	7.85		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	14.6		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1.6	I	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	38.9		ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.038	I	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	4.79		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.08		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	76.9		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	708		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	37.8		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	146		mg/L	5.0
Temperature	00010	No	none	FDEP	22.2		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	410		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	15.5		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/13/2012
Report Date: Wednesday, June 27, 2012

Well Type: Compliance
WAFR Testsite ID: 27676
Testsite Name: MWC-8-10 (R8T10)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.88		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	35.4		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	170.08		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox	00090	No	None	FDEP	310.0	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/13/2012
Report Date: Wednesday, June 27, 2012

Well Type: Intermediate
WAFR Testsite ID: 27677
Testsite Name: MWI-9-5 (R9T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	327		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	3.0		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	3.37		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	7.5		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	5.8		ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	1.4		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	1.8		pCi/L	0.9
Iron	01045	No	Nitric Acid	EPA 200.7	224		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	1.50		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	10.6		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	3.4	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.031	I	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	5.19		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.86		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	7.0		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	94.0		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	6.9		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	7.6		mg/L	2.5
Temperature	00010	No	none	FDEP	22.8		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	53		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	2.4		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/13/2012
Report Date: Wednesday, June 27, 2012

Well Type: Intermediate
WAFR Testsite ID: 27677
Testsite Name: MWI-9-5 (R9T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	2.4	I	mg/L	1.0
Turbidity	82079	No	None	SM2130B	4.05		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1.6	I	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	173.64		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	9.0		ug/L	1
Redox	00090	No	None	FDEP	148.5	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/12/2012
Report Date: Wednesday, June 27, 2012

Well Type: Compliance
WAFR Testsite ID: 27678
Testsite Name: MWC-10-8 (R10T8)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	33.6		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	2.0		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	8.08		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	2.5	U	mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.3		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	1.9		pCi/L	0.9
Iron	01045	No	Nitric Acid	EPA 200.7	68.1		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	2.33		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	7.5		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.010	U	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	5.43		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.16		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	1.77		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	87.5		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	9.3		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	16.3		mg/L	2.5
Temperature	00010	No	none	FDEP	20.8		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	51		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	1.3		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/12/2012
Report Date: Wednesday, June 27, 2012

Well Type: Compliance
WAFR Testsite ID: 27678
Testsite Name: MWC-10-8 (R10T8)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.24	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	9.8		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	174.09		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox	00090	No	None	FDEP	175.0	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/12/2012
Report Date: Wednesday, June 27, 2012

Well Type: Compliance
WAFR Testsite ID: 27679
Testsite Name: MWC-11-4 (R11T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	114		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	4.9		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	7.86		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	40.9		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	2.9	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	7	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.5		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	8.1		pCi/L	1.1
Iron	01045	No	Nitric Acid	EPA 200.7	1150		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	3.90		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	13.9		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.013	I	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	5.41		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.32		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	60.6		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	415.0		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	6.2		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	98.0		mg/L	5.0
Temperature	00010	No	none	FDEP	19.6		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	263		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	17.2		mg/L	0.50

GROUND WATER MONITORING REPORT
Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/12/2012
Report Date: Wednesday, June 27, 2012

Well Type: Compliance
WAFR Testsite ID: 27679
Testsite Name: MWC-11-4 (R11T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.21	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	3.1	I	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	170.7		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox	00090	No	None	FDEP	-127.4	D	mv	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/16/2012
Report Date: Wednesday, June 27, 2012

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	11.7		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	58.3		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	8.3		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	3.6	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.2		mg/L	0.1
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.7		pCi/L	1.4
Iron	01045	No	Nitric Acid	EPA 200.7	40.6		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	21.3		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	8.8		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1.7	I	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.010	U	mg/L	0.010
pH(field)	00406	No	None	SM4500H+B	7.51		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.79		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	7.86		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	466.6		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	1080		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	41.3		mg/L	2.5
Temperature	00010	No	none	FDEP	23.2		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	282		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	1.1		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/16/2012
Report Date: Wednesday, June 27, 2012

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	1.61		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox	00090	No	None	FDEP	-112.9	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **2Q12**
Sample Date: 4/16/2012
Report Date: Wednesday, June 27, 2012

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL

I certify that all of the analytical results comply with NELAC Standards and/or were generated by NELAC laboratories certified by the Florida Department of Health

Report Date: **6/27/2012--1:16 PM**

Quality Assurance Officer: (JACLYN M DLHOS) 06/27/2012

Technical Director: Catherine A. [illegible] 6/29/12

Remarks

GRU
More than Energy

GAINESVILLE REGIONAL UTILITIES

STRATEGIC PLANNING

October 16, 2012

Mr. Robert L. Martin, P.G.
Florida Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, FL 32256-7590

Re: Gainesville Regional Utilities Deerhaven Generating Station
Quarterly Groundwater Monitoring Results
Quarter 3, 2012

Dear Mr. Martin,

Enclosed is the Deerhaven Generating Station groundwater monitoring report for Quarter 3 of 2012 monitoring period.

If you have any questions or require further information, please do not hesitate to contact me at (352) 393-1304.

Sincerely,

Boi Hoang
Utility Engineer

Enclosures

cc: file: WDH2.2

Electronically: K. Klemans
J. Shaw
J. Dlhos
C. Lewis
S. Phillips

P.O. Box 147117, Station A136, Gainesville, Florida 32614-7117, Telephone: (352) 334-3400 ext. 1260 Fax: (352) 334-3151

State of Florida

Department of Environmental Protection

GROUNDWATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station County: Alachua

Address: Post Office Box 147117 Station D38

City: Gainesville State: Florida ZIP: 32614-7117

Telephone No: (352) 393-6240

Facility ID (DEP Permit No): FLA017161 (PA 74-04)

Authorized Representative: Joe W. Shaw Title: Production Manager

Address: Same

City: Same State: Same ZIP: Same

Telephone No: Same

Type of Discharge: Industrial Wastewater

Method of Discharge: Ponds/Basins

CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein; and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Joe W Shaw

Signature of Owner or Authorized Representative

10/9/12

Date

GRU Deerhaven DOH Certification # E52876

GRU Kannapaha Laboratory DOH Certification # E52099 3901 SW 63rd Blvd. Gainesville, FL 32608 (352) 393-6777

KNL Laboratory Services DOH Certification # E84025 2742 N Florida Ave. P.O. Box 1833 Tampa, FL 33601 (813) 229-2879

Pace Analytical Services, Inc. DOH Certification # E83079 8 East Tower Circle Ormond Beach, FL 32174 (386) 672-5668

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/23/2012
Report Date: Monday, October 08, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27662
Testsite Name: MWD-1-6 (R1T6)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	21.2		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	14.0		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	I	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	48.9		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	13.9		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	3.7	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	20		PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.22		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	3.9		pCi/L	2.1
Iron	01045	No	Nitric Acid	EPA 200.7	6240		ug/L	10
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	27.0		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	140		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	2.0	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid - Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	6.49		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.50		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	1.1	I	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	11.8		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	507		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	40.0		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	2.5	U	mg/L	2.5
Temperature	00010	No	none	FDEP	26.7		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	284		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	5.2		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/23/2012
Report Date: Monday, October 08, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27662
Testsite Name: MWD-1-6 (R1T6)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	7.2		mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.26	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	183.76		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1.2	I	ug/L	1
Redox Potential	00090	No	None	FDEP	-51.2	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/26/2012
Report Date: Monday, October 08, 2012

Well Type: Background
WAFR Testsite ID: 27663
Testsite Name: MWB-2-1 (R2T1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	391		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	3.4		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	15.4		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	7.4		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	2.1	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	1.95		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.3		pCi/L	1.8
Iron	01045	No	Nitric Acid	EPA 200.7	34.7		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	0.60		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	6.5		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1.1	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid - Chill	EPA 353.2	6.9		mg/L	0.050
pH(field)	00406	No	None	SM4500H+B	5.42		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.29		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.6	I	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	5.9		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	138.4		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	71.2		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	9.4		mg/L	2.5
Temperature	00010	No	none	FDEP	28.7		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	108		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	2.7		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/26/2012
Report Date: Monday, October 08, 2012

Well Type: Background
WAFR Testsite ID: 27663
Testsite Name: MWB-2-1 (R2T1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	2.71		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	7.1		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	181.8		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	4.4		ug/L	1
Redox Potential	00090	No	None	FDEP	139.3	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/25/2012
Report Date: Monday, October 08, 2012

Well Type: Intermediate
WAFR Testsite ID: 27664
Testsite Name: MWI-3-7 (R3T7)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	76.2		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	1.9		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	25.4		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	12.6		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	12	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.40		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	3.8		pCi/L	2.0
Iron	01045	No	Nitric Acid	EPA 200.7	936		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	5.71		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	21.5		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	9.1		ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	2.6	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid - Chill	EPA 353.2	0.13		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	6.13		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	1.69		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	54.8		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	435		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	116		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	82.8		mg/L	2.5
Temperature	00010	No	none	FDEP	28.8		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	262		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	3.3		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/25/2012
Report Date: Monday, October 08, 2012

Well Type: Intermediate
WAFR Testsite ID: 27664
Testsite Name: MWI-3-7 (R3T7)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.80		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	6.7		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	179.46		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	4.4		ug/L	1
Redox Potential	00090	No	None	FDEP	12.1	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/23/2012
Report Date: Monday, October 08, 2012

Well Type: Intermediate
WAFR Testsite ID: 27665
Testsite Name: MWI-4-5 (R4T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	153		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	17.6		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	2.8		ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	104		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	4.3	I	mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	2.0	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	275		PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.24		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	1.1		pCi/L	2.0
Iron	01045	No	Nitric Acid	EPA 200.7	28400		ug/L	10
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	33.4		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	156		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1.7	I	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid - Chill	EPA 353.2	0.026	I	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	6.06		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.93		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	15.3		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	839		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	103		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	2.5	U	mg/L	2.5
Temperature	00010	No	none	FDEP	29.2		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	541		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	36.5		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/23/2012
Report Date: Monday, October 08, 2012

Well Type: Intermediate
WAFR Testsite ID: 27665
Testsite Name: MWI-4-5 (R4T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	2.5	I	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.36	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1.2	I	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	178.87		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	2.3	I	ug/L	1
Redox Potential	00090	No	None	FDEP	-51.8	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/25/2012
Report Date: Monday, October 08, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27671
Testsite Name: MWD-6-1 (R6T1B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	187		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	7.1		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	2.88		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	26.4		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.25		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	0.0		pCi/L	1.7
Iron	01045	No	Nitric Acid	EPA 200.7	244		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	1.41		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	1.8	I	ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid - Chill	EPA 353.2	0.040	I	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.03		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.09		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.6	I	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	13.8		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	118.8		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	6.1		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	2.5	U	mg/L	2.5
Temperature	00010	No	none	FDEP	26.8		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	61		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	0.55	I	mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/25/2012
Report Date: Monday, October 08, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27671
Testsite Name: MWD-6-1 (R6T1B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.1	U	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	180.83		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	137.5	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/24/2012
Report Date: Monday, October 08, 2012

Well Type: Intermediate
WAFR Testsite ID: 27672
Testsite Name: MWI-6-4 (R6T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	491		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	37.4		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.6	I	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	63.9		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	95.7		mg/L	12.5
Chromium	01034	No	Nitric Acid	EPA 200.7	3.4	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	2.6	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.30		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	6.4		pCi/L	3.4
Iron	01045	No	Nitric Acid	EPA 200.7	6710		ug/L	2
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	22.2		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	70.7		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	32.1		ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid - Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.67		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	4.11		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	232		mg/L	0.02
Specific Conductance(field)	00094	No	None	SM2510B	1674		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	200		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	615	J(M1)	mg/L	25.0
Temperature	00010	No	none	FDEP	26.4		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	1100		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	13.4		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/24/2012
Report Date: Monday, October 08, 2012

Well Type: Intermediate
WAFR Testsite ID: 27672
Testsite Name: MWI-6-4 (R6T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.33	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	57.9		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	180.85		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	2.0	I	ug/L	1
Redox Potential	00090	No	None	FDEP	24.4	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/25/2012
Report Date: Monday, October 08, 2012

Well Type: Intermediate
WAFR Testsite ID: 27673
Testsite Name: MWI-6-8 (R6T8B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	2510		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	19.8		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	32.4		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	8.7		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1.2	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	40		PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	2.62		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	3.7		pCi/L	1.8
Iron	01045	No	Nitric Acid	EPA 200.7	1210		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	15.6		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	19.7		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1.2	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid – Chill	EPA 353.2	0.36		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	6.30		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	6.08		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.6	I	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	12.8		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	355		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	63.4		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	33.0		mg/L	2.5
Temperature	00010	No	none	FDEP	28.3		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	239		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	7.7		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/25/2012
Report Date: Monday, October 08, 2012

Well Type: Intermediate
WAFR Testsite ID: 27673
Testsite Name: MWI-6-8 (R6T8B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.4	I	mg/L	1.0
Turbidity	82079	No	None	SM2130B	10.7		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1.9	I	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	175.5		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	6.0		ug/L	1
Redox Potential	00090	No	None	FDEP	170.6	D	mV	1

GROUND WATER MONITORING REPORT Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/24/2012
Report Date: Monday, October 08, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27674
Testsite Name: MWD-6-12 (R6T12)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	1160		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	10.0		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.4	I	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	16.9		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	8.1		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	2.7	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1.5	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	120		PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	86.4		ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	3.26		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	5.7		pCi/L	1.6
Iron	01045	No	Nitric Acid	EPA 200.7	324		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	1.78		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	14.8		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	3.4	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid - Chill	EPA 353.2	4.3		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.79		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	1.02		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.5	I	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	9.25		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	173.2		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	89.2		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	15.2		mg/L	2.5
Temperature	00010	No	none	FDEP	26.5		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	192		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	22.7		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/24/2012
Report Date: Monday, October 08, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27674
Testsite Name: MWD-6-12 (R6T12)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	5.36		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	20.0		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	171.32		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	9.8		ug/L	1
Redox Potential	00090	No	None	FDEP	233.6	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/24/2012
Report Date: Monday, October 08, 2012

Well Type: Compliance
WAFR Testsite ID: 27676
Testsite Name: MWC-8-10 (R8T10)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	855		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	12.2		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	23.9		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	69.1		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	5.6		ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1.8	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	100		PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.67		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	16.4		pCi/L	1.9
Iron	01045	No	Nitric Acid	EPA 200.7	4290		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	4.93		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	6.1		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	2.1	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid - Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.24		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.07		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	56.2		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	490		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	28.2		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	92.9		mg/L	2.5
Temperature	00010	No	none	FDEP	27.3		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	358		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	32.0		mg/L	0.50

GROUND WATER MONITORING REPORT
Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/24/2012
Report Date: Monday, October 08, 2012

Well Type: Compliance
WAFR Testsite ID: 27676
Testsite Name: MWC-8-10 (R8T10)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	1.44		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	46.0		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	173.93		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1.9	I	ug/L	1
Redox Potential	00090	No	None	FDEP	82.1	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/24/2012
Report Date: Monday, October 08, 2012

Well Type: Intermediate
WAFR Testsite ID: 27677
Testsite Name: MWI-9-5 (R9T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	22.0		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	11.0		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	9.65		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	4.2	I	mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.99		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.8		pCi/L	1.5
Iron	01045	No	Nitric Acid	EPA 200.7	34.0		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	1.87		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	33.8		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid - Chill	EPA 353.2	0.51		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.47		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	1.82		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	5.11		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	104.3		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	55.4		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	5.6		mg/L	2.5
Temperature	00010	No	none	FDEP	27.3		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	67		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	2.2		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/24/2012
Report Date: Monday, October 08, 2012

Well Type: Intermediate
WAFR Testsite ID: 27677
Testsite Name: MWI-9-5 (R9T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.38	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	5.3		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	180.27		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1.3	I	ug/L	1
Redox Potential	00090	No	None	FDEP	211.5	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/26/2012
Report Date: Monday, October 08, 2012

Well Type: Compliance
WAFR Testsite ID: 27678
Testsite Name: MWC-10-8 (R10T8)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	44.4		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	3.3		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	9.90		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	3.5	I	mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.35		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	0.8		pCi/L	1.6
Iron	01045	No	Nitric Acid	EPA 200.7	4.4		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	2.40		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	9.0		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid - Chill	EPA 353.2	0.084		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.32		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.22		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	3.0		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	100.1		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	11.8		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	16.1		mg/L	2.5
Temperature	00010	No	none	FDEP	28.0		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	57		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	1.5		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/26/2012
Report Date: Monday, October 08, 2012

Well Type: Compliance
WAFR Testsite ID: 27678
Testsite Name: MWC-10-8 (R10T8)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.20	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	20.3		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	176.3		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	88.0	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/26/2012
Report Date: Monday, October 08, 2012

Well Type: Compliance
WAFR Testsite ID: 27679
Testsite Name: MWC-11-4 (R11T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	104		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	4.1		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	7.32		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	43.7		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	3.2	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	8	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.21		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	0.9		pCi/L	1.7
Iron	01045	No	Nitric Acid	EPA 200.7	664		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	3.36		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	13.0		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid - Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.32		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.34		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	53.2		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	369		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	5.1		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	76.3		mg/L	2.5
Temperature	00010	No	none	FDEP	26.6		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	230		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	15.0		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/26/2012
Report Date: Monday, October 08, 2012

Well Type: Compliance
WAFR Testsite ID: 27679
Testsite Name: MWC-11-4 (R11T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.22	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1.6	I	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	175.73		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1.2	I	ug/L	1
Redox Potential	00090	No	None	FDEP	-172.3	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/26/2012
Report Date: Monday, October 08, 2012

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	1.8	I	ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	12.2		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	60.8		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	9.1		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.08		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	0.0		pCi/L	1.9
Iron	01045	No	Nitric Acid	EPA 200.7	18.4		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	20.4		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	7.2		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1.1	I	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid - Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	7.41		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.82		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	8.80		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	487		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	1040		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	39.9		mg/L	2.5
Temperature	00010	No	none	FDEP	23.9		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	300		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	1.2		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/26/2012
Report Date: Monday, October 08, 2012

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.1	U	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-234.7	D	mV	1

Facility ID: FLA017161
Report Period: **3Q12**
Sample Date: 7/26/2012
Report Date: Monday, October 08, 2012

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL

I certify that all of the analytical results comply with NELAC Standards and/or were generated by NELAC laboratories certified by the Florida Department of Health

Report Date: **10/8/2012--10:46 AM**

Quality Assurance Officer: Catherine A. Lewis

Technical Director: Jack M Dobbs 10/09/2012

Remarks

J(M1) Qualifier Explanation: Estimated value. Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

GRU
More than Energy

GAINESVILLE REGIONAL UTILITIES

STRATEGIC PLANNING

January 9, 2013

Mr. Robert L. Martin, P.G.
Florida Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, FL 32256-7590

Re: Gainesville Regional Utilities Deerhaven Generating Station
Quarterly Groundwater Monitoring Results
Quarter 4, 2012

Dear Mr. Martin,

Enclosed is the Deerhaven Generating Station groundwater monitoring report for Quarter 4 of 2012 monitoring period.

If you have any questions or require further information, please do not hesitate to contact me at (352) 393-1304.

Sincerely,

Boi Hoang
Utility Engineer

Enclosures

cc: file: WDH2.2

Electronically: K. Klemans
J. Shaw
J. Dlhos
C. Lewis
S. Phillips

State of Florida
Department of Environmental Protection

GROUNDWATER MONITORING REPORT

Facility Name: **GRU-Deerhaven Generating Station** County: Alachua
Address: Post Office Box 147117 Station D38
City: Gainesville State: Florida ZIP: 32614-7117
Telephone No: (352) 393-6240
Facility ID (DEP Permit No): FLA017161 (PA 74-04)
Authorized Representative: Joe W. Shaw Title: Production Manager
Address: Same
City: Same State: Same ZIP: Same
Telephone No: Same
Type of Discharge: Industrial Wastewater
Method of Discharge: Ponds/Basins

CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein; and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Joe Shaw 12/18/12

Signature of Owner or Authorized Representative Date

GRU Deerhaven DOH Certification # E52876
GRU Kannapaha Laboratory DOH Certification # E52099 3901 SW 63rd Blvd. Gainesville, FL 32608 (352) 393-6777
KNL Laboratory Services DOH Certification # E84025 2742 N Florida Ave. P.O. Box 1833 Tampa, FL 33601 (813) 229-2879
Pace Analytical Services, Inc. DOH Certification # E83079 8 East Tower Circle Ormond Beach, FL 32174 (386) 672-5668

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/9/2012
Report Date: Tuesday, December 18, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27662
Testsite Name: MWD-1-6 (R1T6)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	21.7		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	15.1		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.7	I	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	50.6		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	14.8		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	3.0	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	180		PCU	20
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.19		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.9		pCi/L	1
Iron	01045	No	Nitric Acid	EPA 200.7	5900		ug/L	2
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	27.6		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	146		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1.7	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	6.28		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.50		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	11.9		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	499.8		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	44.3		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	2.5	U	mg/L	2.5
Temperature	00010	No	none	FDEP	23.5		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	282		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	5.8		mg/L	0.50

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/9/2012
Report Date: Tuesday, December 18, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27662
Testsite Name: MWD-1-6 (R1T6)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET' CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	12		mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.86		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	184.8		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-92.4	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/9/2012
Report Date: Tuesday, December 18, 2012

Well Type: Background
WAFR Testsite ID: 27663
Testsite Name: MWB-2-1 (R2T1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	249		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	3.5		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	15.3		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	11.4		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	7	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	1.10		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.0		pCi/L	0.9
Iron	01045	No	Nitric Acid	EPA 200.7	19.7		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	0.74		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	8.2		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	6.4		mg/L	0.050
pH(field)	00406	No	None	SM4500H+B	5.52		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.23		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	6.01		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	141.4		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	68.2		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	7.6		mg/L	2.5
Temperature	00010	No	none	FDEP	24.8		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	103		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	2.8		mg/L	0.50

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/9/2012
Report Date: Tuesday, December 18, 2012

Well Type: Background
WAFR Testsite ID: 27663
Testsite Name: MWB-2-1 (R2T1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET [1] CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.98		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	6.6		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	182.92		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	2.8	I	ug/L	1
Redox Potential	00090	No	None	FDEP	51.2	D	mV	1

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/10/2012
Report Date: Tuesday, December 18, 2012

Well Type: Intermediate
WAFR Testsite ID: 27664
Testsite Name: MWI-3-7 (R3T7)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	23.4		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	1.8		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	27.1		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	12.2		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	22		PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1.1	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	1.59		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	5.4		pCi/L	1.1
Iron	01045	No	Nitric Acid	EPA 200.7	1100		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	5.21		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	18.4		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	5.4		ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	2.2	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.16		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	6.34		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	1.74		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	47.4		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	402.1		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	113		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	60.6		mg/L	2.5
Temperature	00010	No	none	FDEP	26.6		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	245		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	3.8		mg/L	0.50

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/10/2012
Report Date: Tuesday, December 18, 2012

Well Type: Intermediate
WAFR Testsite ID: 27664
Testsite Name: MWI-3-7 (R3T7)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET [1] CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	5.05		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	5.2		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	181.02		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1.7	I	ug/L	1
Redox Potential	00090	No	None	FDEP	-76.5	D	mV	1

GROUND WATER MO[illegible] REPORT   Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/10/2012
Report Date: Tuesday, December 18, 2012

Well Type: Intermediate
WAFR Testsite ID: 27665
Testsite Name: MWI-4-5 (R4T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	170		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	17.1		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	3.4		ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	101		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	6.3		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	2.0	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	600		PCU	50
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.38		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	0.7		pCi/L	0.9
Iron	01045	No	Nitric Acid	EPA 200.7	33600		ug/L	10
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	32.6		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	154		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	6.12		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.94		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	16.6		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	839		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	99.9		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	2.5	U	mg/L	2.5
Temperature	00010	No	none	FDEP	24.8		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	548		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	45.8		mg/L	0.50

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/10/2012
Report Date: Tuesday, December 18, 2012

Well Type: Intermediate
WAFR Testsite ID: 27665
Testsite Name: MWI-4-5 (R4T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET ' CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.42		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	178.93		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	2.6	I	ug/L	1
Redox Potential	00090	No	None	FDEP	-98.5	D	mV	1

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/8/2012
Report Date: Tuesday, December 18, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27671
Testsite Name: MWD-6-1 (R6T1B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	189		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	10.6		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	3.06		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	37.5		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.30		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.7		pCi/L	1.2
Iron	01045	No	Nitric Acid	EPA 200.7	325		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	1.75		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	1.9	I	ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	4.99		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.10		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	18.7		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	156.6		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	9.5		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	3.8	I	mg/L	2.5
Temperature	00010	No	none	FDEP	26.0		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	83		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	1.1		mg/L	0.50

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/8/2012
Report Date: Tuesday, December 18, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27671
Testsite Name: MWD-6-1 (R6T1B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET ' CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.11	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	182.09		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-82.2	D	mV	1

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/10/2012
Report Date: Tuesday, December 18, 2012

Well Type: Intermediate
WAFR Testsite ID: 27672
Testsite Name: MWI-6-4 (R6T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	78.8		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	33.3		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.6	I	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	65.7		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	52.5		mg/L	5.0
Chromium	01034	No	Nitric Acid	EPA 200.7	2.0	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1.2	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	25		PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.19		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	4.4		pCi/L	2.4
Iron	01045	No	Nitric Acid	EPA 200.7	2490		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	13.0		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	50.8		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1.0	I	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	14.6		ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	6.20		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	2.85		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	139		mg/L	0.02
Specific Conductance(field)	00094	No	None	SM2510B	1106		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	223		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	316		mg/L	25.0
Temperature	00010	No	none	FDEP	24.6		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	729		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	12.8		mg/L	0.50

GROUND WATER MONITORING REPORT   Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/10/2012
Report Date: Tuesday, December 18, 2012

Well Type: Intermediate
WAFR Testsite ID: 27672
Testsite Name: MWI-6-4 (R6T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET ' CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.33	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	36.9		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	180.85		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-116.3	D	mV	1

GROUND WATER MO[illegible] REPORT Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/8/2012
Report Date: Tuesday, December 18, 2012

Well Type: Intermediate
WAFR Testsite ID: 27673
Testsite Name: MWI-6-8 (R6T8B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	2450		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	16.7		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	28.7		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	9.8		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1.2	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	42		PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.92		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	5.0		pCi/L	1.0
Iron	01045	No	Nitric Acid	EPA 200.7	1820		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	14.2		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	96.7		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1.4	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	6.12		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	4.05		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	10.9		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	339.9		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	49.0		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	38.4		mg/L	2.5
Temperature	00010	No	none	FDEP	26.3		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	232		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	8.3		mg/L	0.50

GROUND WATER MONITORING REPORT   Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/8/2012
Report Date: Tuesday, December 18, 2012

Well Type: Intermediate
WAFR Testsite ID: 27673
Testsite Name: MWI-6-8 (R6T8B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET ' CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	2.1	I	mg/L	1.0
Turbidity	82079	No	None	SM2130B	10.4		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1.4	I	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	176.3		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	2.4	I	ug/L	1
Redox Potential	00090	No	None	FDEP	68.6	D	mV	1

GROUND WATER MONITORING REPORT   Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/10/2012
Report Date: Tuesday, December 18, 2012

Well Type: Site Boundary
WAFR Testsite ID: 27674
Testsite Name: MWD-6-12 (R6T12)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	1250		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	13.1		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.6	I	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	16.2		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	4.9	I	mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	4.1		ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	220		PCU	25
Copper	01042	No	Nitric Acid	EPA 200.7	85.0		ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	2.81		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	3.2		pCi/L	0.9
Iron	01045	No	Nitric Acid	EPA 200.7	1010		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	1.12		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	13.0		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	4.0	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.45		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.77		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.97		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	4.42		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	106.2		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	84.4		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	7.0		mg/L	2.5
Temperature	00010	No	none	FDEP	25.6		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	135		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	31.1		mg/L	0.50

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161

Report Period: **4Q12**

Sample Date: 10/10/2012

Report Date: Tuesday, December 18, 2012

Well Type: Site Boundary

WAFR Testsite ID: 27674

Testsite Name: MWD-6-12 (R6T12)

Was Well Purged Before sample collection: YES

Ground Water Classification: GII

Sample Method: Peristaltic Pump

Parameter	STORET ' CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	7.77		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	15.0		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	172.31		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	6.8		ug/L	1
Redox Potential	00090	No	None	FDEP	54.6	D	mV	1

GROUND WATER MONITORING REPORT Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/9/2012
Report Date: Tuesday, December 18, 2012

Well Type: Compliance
WAFR Testsite ID: 27676
Testsite Name: MWC-8-10 (R8T10)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	828		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	13.1		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	1.0	I	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	28.1		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	91.7		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	8.1		ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1.8	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	160		PCU	25
Copper	01042	No	Nitric Acid	EPA 200.7	1.4	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.30		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	23		pCi/L	1.4
Iron	01045	No	Nitric Acid	EPA 200.7	9550		ug/L	2
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	5.70		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	6.6		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	2.2	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.01		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.08		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	65.2		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	561		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	31.0		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	80.9		mg/L	2.5
Temperature	00010	No	none	FDEP	24.4		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	406		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	40.1		mg/L	0.50

GROUND WATER MONITORING REPORT Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161

Report Period: **4Q12**

Sample Date: 10/9/2012

Report Date: Tuesday, December 18, 2012

Well Type: Compliance

WAFR Testsite ID: 27676

Testsite Name: MWC-8-10 (R8T10)

Was Well Purged Before sample collection: YES

Ground Water Classification: GII

Sample Method: Peristaltic Pump

Parameter	STORET ¹ CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	1.07		NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	38.6		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	174.33		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	2.7	I	ug/L	1
Redox Potential	00090	No	None	FDEP	-76.4	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/10/2012
Report Date: Tuesday, December 18, 2012

Well Type: Intermediate
WAFR Testsite ID: 27677
Testsite Name: MWI-9-5 (R9T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	13.0		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	14.0		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	14.8		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	5.8		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1.6	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.29		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	3.9		pCi/L	0.9
Iron	01045	No	Nitric Acid	EPA 200.7	11.0		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	2.49		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	37.3		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	2.4		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.62		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	2.21		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	3.73		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	135.9		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	110		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	7.4		mg/L	2.5
Temperature	00010	No	none	FDEP	23.8		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	75		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	3.3		mg/L	0.50

GROUND WATER MONITORING REPORT   Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/10/2012
Report Date: Tuesday, December 18, 2012

Well Type: Intermediate
WAFR Testsite ID: 27677
Testsite Name: MWI-9-5 (R9T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET [1] CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.26	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	6.0		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	180.6		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1.2	I	ug/L	1
Redox Potential	00090	No	None	FDEP	129.2	D	mV	1

GROUND WATER MONITORING REPORT   Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161   Well Type: Compliance   Was Well Purged Before sample collection: YES

Report Period: **4Q12**   WAFR Testsite ID: 27678   Ground Water Classification: GII

Sample Date: 10/8/2012   Testsite Name: MWC-10-8 (R10T8)   Sample Method: Peristaltic Pump

Report Date: Tuesday, December 18, 2012

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	36.8		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	3.75		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	12.7		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	6.5		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.22		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	6.0		pCi/L	0.9
Iron	01045	No	Nitric Acid	EPA 200.7	296		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	2.46		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	14.0		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.29		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.18		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	2.93		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	114.6		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	14.7		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	19.5		mg/L	2.5
Temperature	00010	No	none	FDEP	25.3		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	66		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	2.5		mg/L	0.50

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/8/2012
Report Date: Tuesday, December 18, 2012

Well Type: Compliance
WAFR Testsite ID: 27678
Testsite Name: MWC-10-8 (R10T8)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET [1] CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.20	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	177.97		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-193.1	D	mV	1

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/8/2012
Report Date: Tuesday, December 18, 2012

Well Type: Compliance
WAFR Testsite ID: 27679
Testsite Name: MWC-11-4 (R11T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	97.5		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	4.5		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	7.25		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	35.0		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	3.3	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	12	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.16		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.7		pCi/L	1.1
Iron	01045	No	Nitric Acid	EPA 200.7	640		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	3.57		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	12.8		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.35		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.36		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	54.6		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	372.7		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	5.1		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	84.7		mg/L	2.5
Temperature	00010	No	none	FDEP	25.6		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	239		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	16.9		mg/L	0.50

GROUND WATER MONITORING REPORT Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/8/2012
Report Date: Tuesday, December 18, 2012

Well Type: Compliance
WAFR Testsite ID: 27679
Testsite Name: MWC-11-4 (R11T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET ' CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.25	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	2.2	I	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	176.8		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-172.4	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/8/2012
Report Date: Tuesday, December 18, 2012

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	11.5		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	58.5		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	9.1		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.21		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.5		pCi/L	1.2
Iron	01045	No	Nitric Acid	EPA 200.7	13.8		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	20.4		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	8.8		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	7.50		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.79		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	7.72		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	461.5		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	1070		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	38.7		mg/L	2.5
Temperature	00010	No	none	FDEP	23.5		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	288		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	1.7		mg/L	0.50

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/8/2012
Report Date: Tuesday, December 18, 2012

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET ' CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.37	I	NTU	.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-209.1	D	mV	1

Facility ID: FLA017161
Report Period: **4Q12**
Sample Date: 10/8/2012
Report Date: Tuesday, December 18, 2012

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL

I certify that all of the analytical results comply with NELAC Standards and/or were generated by NELAC laboratories certified by the Florida Department of Health

Report Date: **12/18/2012--9:37 AM**

Quality Assurance Officer: Shelley Phillips

Technical Director: Jody M DeLuca 12/20/2012

Remarks

GAINESVILLE REGIONAL UTILITIES

STRATEGIC PLANNING

April 18, 2013

Mr. Robert L. Martin, P.G.
Florida Department of Environmental Protection
8800 Baymeadows Way, Suite 100
Jacksonville, FL 32256-7590

Re: Gainesville Regional Utilities Deerhaven Generating Station
Quarterly Groundwater Monitoring Results
Quarter 1, 2013

Dear Mr. Martin,

Enclosed is the Deerhaven Generating Station groundwater monitoring report for Quarter 1 of 2013 monitoring period.

If you have any questions or require further information, please do not hesitate to contact me at (352) 393-1304.

Sincerely,

Boi Hoang
Utility Engineer

Enclosures

cc: file: WDH2.2

Electronically: K. Klemans
J. Shaw
C. Lewis
S. Phillips

State of Florida

Department of Environmental Protection

GROUNDWATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station County: Alachua

Address: Post Office Box 147117 Station D38

City: Gainesville State: Florida ZIP: 32614-7117

Telephone No: (352) 393-6240

Facility ID (DEP Permit No): FLA017161 (PA 74-04)

Authorized Representative: Joe W. Shaw Title: Production Manager

Address: Same

City: Same State: Same ZIP: Same

Telephone No: Same

Type of Discharge: Industrial Wastewater

Method of Discharge: Ponds/Basins

CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein; and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Signature of Owner or Authorized Representative

4/16/13

Date

GRU Deerhaven DOH Certification # E52876

GRU Kannapaha Laboratory DOH Certification # E52099 — 3901 SW 63rd Blvd. Gainesville, FL 32608 (352) 393-6777

KNL Laboratory Services DOH Certification # E84025 — 2742 N Florida Ave. P.O. Box 1833 Tampa, FL 33601 (813) 229-2879

Pace Analytical Services, Inc. DOH Certification # E83079 — 8 East Tower Circle Ormond Beach, FL 32174 (386) 672-5668

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/7/2013 2
Report Date: Tuesday, April 16, 2013

Well Type: Site Boundary
WAFR Testsite ID: 27662
Testsite Name: MWD-1-6 (R1T6)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	3.8	I	ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	14.6		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.7	I	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	49.8		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	14.5		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	4.6		ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	170		PCU	20
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.52		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	4.2		pCi/L	1.2
Iron	01045	No	Nitric Acid	EPA 200.7	4930		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	28.6		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	196		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	3.3	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.032	I	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	6.48		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.48		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	11.9		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	509		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	44.9		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	2.5	U	mg/L	2.5
Temperature	00010	No	none	FDEP	19.7		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	265		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	5.2		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/7/2013 2
Report Date: Tuesday, April 16, 2013

Well Type: Site Boundary
WAFR Testsite ID: 27662
Testsite Name: MWD-1-6 (R1T6)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	7.4		mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.54		NTU	0.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	183.2		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-97.7	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/8/2013 4
Report Date: Tuesday, April 16, 2013

Well Type: Background
WAFR Testsite ID: 27663
Testsite Name: MWB-2-1 (R2T1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	186		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	2.0		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	11.1		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	9.6		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	7	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	3.02		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	1.9		pCi/L	0.9
Iron	01045	No	Nitric Acid	EPA 200.7	21.0		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	0.59		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	4.6		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	2.4		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.70		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.25		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	4.1		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	102.9		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	47.6		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	3.9	I	mg/L	2.5
Temperature	00010	No	none	FDEP	19.8		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	55		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	2.2		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/8/2013 4
Report Date: Tuesday, April 16, 2013

Well Type: Background
WAFR Testsite ID: 27663
Testsite Name: MWB-2-1 (R2T1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.73		NTU	0.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	5.3		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	181.84		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1.3	I	ug/L	1
Redox Potential	00090	No	None	FDEP	-21.7	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/10/2013
Report Date: Tuesday, April 16, 2013

Well Type: Intermediate
WAFR Testsite ID: 27664
Testsite Name: MWI-3-7 (R3T7)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	24.7		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	1.3		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	24.6		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	14.2		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	2.4	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	8	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1.7	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	1.66		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	0.6		pCi/L	1.2
Iron	01045	No	Nitric Acid	EPA 200.7	975		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	5.50		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	18.7		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	5.6		ug/L	1
Nickel	01067	No	Nitric Acid	EPA:200.7	3.9	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.10		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	6.26		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	1.09		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	57.3		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	440.6		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	97.3		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	80.3		mg/L	2.5
Temperature	00010	No	none	FDEP	19.4		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	220		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	3.0		mg/L	0.50

GROUND WATER MONITORING REPORT Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/10/2013
Report Date: Tuesday, April 16, 2013

Well Type: Intermediate
WAFR Testsite ID: 27664
Testsite Name: MWI-3-7 (R3T7)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	1.24		NTU	0.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	5.7		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	179.63		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-70.8	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/7/2013 4
Report Date: Tuesday, April 16, 2013

Well Type: Intermediate
WAFR Testsite ID: 27665
Testsite Name: MWI-4-5 (R4T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	101		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	14.0		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	3.3		ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	121		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	5.8		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	900		PCU	100
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.33		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.5		pCi/L	1.3
Iron	01045	No	Nitric Acid	EPA 200.7	30,700		ug/L	10
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	40.0		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	167		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1.5	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.052		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	6.20		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.70		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	13.8		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	906		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	108		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	12.1		mg/L	2.5
Temperature	00010	No	none	FDEP	20.0		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	475		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	23.2		mg/L	0.50

GROUND WATER MONITORING REPORT Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/7/2013 4
Report Date: Tuesday, April 16, 2013

Well Type: Intermediate
WAFR Testsite ID: 27665
Testsite Name: MWI-4-5 (R4T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	50		mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.26	I	NTU	0.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	178.77		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1.7	I	ug/L	1
Redox Potential	00090	No	None	FDEP	-216.5	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/9/2013 3
Report Date: Tuesday, April 16, 2013

Well Type: Site Boundary
WAFR Testsite ID: 27671
Testsite Name: MWD-6-1 (R6T1B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	219		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	7.8		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	3.42		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	46.0		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	2.8	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.51		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.6		pCi/L	0.9
Iron	01045	No	Nitric Acid	EPA 200.7	221		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	1.78		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	3.0	I	ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA:200.7	2.8	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.02		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.10		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	22.3		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	175.1		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	6.5		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	2.5	U	mg/L	2.5
Temperature	00010	No	none	FDEP	21.3		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	74		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	1.3		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/9/2013 3
Report Date: Tuesday, April 16, 2013

Well Type: Site Boundary
WAFR Testsite ID: 27671
Testsite Name: MWD-6-1 (R6T1B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.23	I	NTU	0.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	180.52		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-163.3	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/10/2013
Report Date: Tuesday, April 16, 2013

Well Type: Intermediate
WAFR Testsite ID: 27672
Testsite Name: MWI-6-4 (R6T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	1190		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	29.6		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	1.0	I	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	64.8		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	114		mg/L	12.5
Chromium	01034	No	Nitric Acid	EPA 200.7	2.4	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	3.0	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	13	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.29		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	8.5		pCi/L	4.0
Iron	01045	No	Nitric Acid	EPA 200.7	7,700		ug/L	2
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	23.8		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	77.9		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	21.8		ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.031	I	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.64		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	4.66		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	313		mg/L	0.05
Specific Conductance(field)	00094	No	None	SM2510B	1858		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	190		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	697		mg/L	25.0
Temperature	00010	No	none	FDEP	20.0		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	1290		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	12.8		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/10/2013
Report Date: Tuesday, April 16, 2013

Well Type: Intermediate
WAFR Testsite ID: 27672
Testsite Name: MWI-6-4 (R6T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	3.6	I	mg/L	1.0
Turbidity	82079	No	None	SM2130B	1.16		NTU	0.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	64.5		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	180.89		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	10.2		ug/L	1
Redox Potential	00090	NO	None	FDEP	-255.0	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/8/2013 1
Report Date: Tuesday, April 16, 2013

Well Type: Intermediate
WAFR Testsite ID: 27673
Testsite Name: MWI-6-8 (R6T8B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	1530		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	11.4		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	28.8		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	7.3		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1.1	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	50		PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1.6	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	1.97		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	3.9		pCi/L	1.0
Iron	01045	No	Nitric Acid	EPA 200.7	866		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	16.3		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	9.1		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.18		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	6.37		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	5.36		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	10.4		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	316.2		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	48.1		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	12.7		mg/L	2.5
Temperature	00010	No	none	FDEP	17.5		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	171		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	12.6		mg/L	0.50

GROUND WATER MONITORING REPORT   Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/8/2013 1
Report Date: Tuesday, April 16, 2013

Well Type: Intermediate
WAFR Testsite ID: 27673
Testsite Name: MWI-6-8 (R6T8B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	4.2		mg/L	1.0
Turbidity	82079	No	None	SM2130B	7.54		NTU	0.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	2.4	I	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	174.94		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-111.9	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/9/2013 1
Report Date: Tuesday, April 16, 2013

Well Type: Site Boundary
WAFR Testsite ID: 27674
Testsite Name: MWD-6-12 (R6T12)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	1580		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	9.5		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.7	I	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	13.1		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	5.3		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	4.6		ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	140		PCU	20
Copper	01042	No	Nitric Acid	EPA 200.7	106		ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	7.63		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	4.8		pCi/L	0.8
Iron	01045	No	Nitric Acid	EPA 200.7	693		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	1.62		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	8.8		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	4.9		ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.41		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	6.40		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.50		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	7.28		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	117.4		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	46.8		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	10.0		mg/L	2.5
Temperature	00010	No	none	FDEP	21.2		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	66		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	19.9		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/9/2013 1
Report Date: Tuesday, April 16, 2013

Well Type: Site Boundary
WAFR Testsite ID: 27674
Testsite Name: MWD-6-12 (R6T12)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	10.5		NTU	0.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	17.5		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	170.57		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	4.6		ug/L	1
Redox Potential	00090	No	None	FDEP	-29.7	D	mV	1

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/9/2013 1
Report Date: Tuesday, April 16, 2013

Well Type: Compliance
WAFR Testsite ID: 27676
Testsite Name: MWC-8-10 (R8T10)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	897		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	9.4		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.9		ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	25.7		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	108		mg/L	5.0
Chromium	01034	No	Nitric Acid	EPA 200.7	15.1		ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	2.0	I	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	90		PCU	10
Copper	01042	No	Nitric Acid	EPA 200.7	1.6	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.98		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	12.2		pCi/L	1.3
Iron	01045	No	Nitric Acid	EPA 200.7	8010		ug/L	2
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	7.04		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	8.3		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	9.4		ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.11		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.12		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.06		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	62.5		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	599		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	26.0		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	69.0		mg/L	2.5
Temperature	00010	No	none	FDEP	20.5		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	377		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	38.3		mg/L	0.50

GROUND WATER MONITORING REPORT Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/9/2013 1
Report Date: Tuesday, April 16, 2013

Well Type: Compliance
WAFR Testsite ID: 27676
Testsite Name: MWC-8-10 (R8T10)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	1.89		NTU	0.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	34.4		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	173.57		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	2.5	I	ug/L	1
Redox Potential	00090	No	None	FDEP	-115.8	D	mV	1

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/10/2013
Report Date: Tuesday, April 16, 2013

Well Type: Intermediate
WAFR Testsite ID: 27677
Testsite Name: MWI-9-5 (R9T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	8.3		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	12.2		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	15.1		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	4.9	I	mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1.1	I	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	2.7	I	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	1.03		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	2.4		pCi/L	0.8
Iron	01045	No	Nitric Acid	EPA 200.7	6.9		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	2.34		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	32.2		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1.5	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	1.3		mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.68		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	1.89		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	3.85		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	127.8		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	93.0		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	6.0		mg/L	2.5
Temperature	00010	No	none	FDEP	20.2		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	10	U	mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	2.9		mg/L	0.50

GROUND WATER MONITORING REPORT Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/10/2013
Report Date: Tuesday, April 16, 2013

Well Type: Intermediate
WAFR Testsite ID: 27677
Testsite Name: MWI-9-5 (R9T5B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.13	I	NTU	0.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	5.8		ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	180.01		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-101.3	D	mV	1

GROUND WATER MONITORING REPORT   Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/10/2013
Report Date: Tuesday, April 16, 2013

Well Type: Compliance
WAFR Testsite ID: 27678
Testsite Name: MWC-10-8 (R10T8)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	31.7		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	3.0		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	11.8		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	4.3	I	mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.41		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	0.7		pCi/L	0.9
Iron	01045	No	Nitric Acid	EPA 200.7	315		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	2.45		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	12.8		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1.6	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.36		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.14		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	2.25		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	104.7		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	13.2		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	17.3		mg/L	2.5
Temperature	00010	No	none	FDEP	22.0		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	10	U	mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	2.3		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/10/2013
Report Date: Tuesday, April 16, 2013

Well Type: Compliance
WAFR Testsite ID: 27678
Testsite Name: MWC-10-8 (R10T8)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.37	I	NTU	0.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	176.88		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-267.5	D	mV	1

GROUND WATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/9/2013 5
Report Date: Tuesday, April 16, 2013

Well Type: Compliance
WAFR Testsite ID: 27679
Testsite Name: MWC-11-4 (R11T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	96.2		ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	4.0		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	6.75		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	40.2		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	4.1		ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	I	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.38		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	10.4		pCi/L	1.0
Iron	01045	No	Nitric Acid	EPA 200.7	426		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	3.48		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	12.4		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	3.4	I	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	5.38		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.32		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	60.4		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	393.0		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	4.9		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	91.9		mg/L	2.5
Temperature	00010	No	none	FDEP	19.8		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	228		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	16.8		mg/L	0.50

GROUND WATER MONITORING REPORT

Facility Name: GRU Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/9/2013 5
Report Date: Tuesday, April 16, 2013

Well Type: Compliance
WAFR Testsite ID: 27679
Testsite Name: MWC-11-4 (R11T4B)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: Peristaltic Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.56		NTU	0.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	3.0	I	ug/L	1
Water Level(NGVD)	82545	No	None	FDEP	175.82		Ft	.01
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-244.8	D	mV	1

GROUND WATER MONITORING REPORT
Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/10/2013
Report Date: Tuesday, April 16, 2013

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Aluminum	01105	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Arsenic	01002	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Barium	01007	No	Nitric Acid	EPA 200.7	11.5		ug/L	0.1
Beryllium	01012	No	Nitric Acid	EPA 200.7	0.06	U	ug/L	0.06
Cadmium	01027	No	Nitric Acid	EPA 200.7	0.3	U	ug/L	0.3
Calcium	00916	No	Nitric Acid	EPA 200.7	59.6		mg/L	0.01
Chloride	00940	No	Chill 4 deg C	EPA 300	9.4		mg/L	2.5
Chromium	01034	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Cobalt	01037	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Color	00080	No	Chill 4 deg C	SM 2120B	5	U	PCU	5
Copper	01042	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Dissolved Oxygen	00300	No	None	FDEP	0.25		mg/L	0.01
Gross Alpha	80045	No	Nitric Acid	EPA 900.0	0.8		pCi/L	1.1
Iron	01045	No	Nitric Acid	EPA 200.7	12.3		ug/L	1
Lead	01051	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Magnesium	00927	No	Nitric Acid	EPA 200.7	20.8		mg/L	0.01
Manganese	01055	No	Nitric Acid	EPA 200.7	9.6		ug/L	1
Mercury	71900	No	Nitric Acid	EPA 245.1	0.1	U	ug/L	0.1
Molybdenum	01062	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nickel	01067	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Nitrite+Nitrate(N)	00630	No	Sulfuric Acid-Chill	EPA 353.2	0.025	U	mg/L	0.025
pH(field)	00406	No	None	SM4500H+B	7.42		SU	0.01
Potassium	00937	No	Nitric Acid	EPA 200.7	0.84		mg/L	0.01
Selenium	01147	No	Nitric Acid	EPA 200.7	4	U	ug/L	4
Silver	01077	No	Nitric Acid	EPA 200.7	0.4	U	ug/L	0.4
Sodium	00929	No	Nitric Acid	EPA 200.7	8.67		mg/L	0.01
Specific Conductance(field)	00094	No	None	SM2510B	477.3		uS/cm	1
Strontium	01082	No	Nitric Acid	EPA 200.7	1050		ug/L	0.1
Sulfate	00945	No	Chill 4 deg C	EPA 300	39.6		mg/L	2.5
Temperature	00010	No	none	FDEP	23.3		deg C	0.1
Total Dissolved Solids	70304	No	Chill 4 deg C	SM2540C	259		mg/L	10
Total Organic Carbon	00680	No	Sulfuric Acid-Chill	SM 5310B	2.0		mg/L	0.50

GROUND WATER MONITORING REPORT — Facility Name: GRU-Deerhaven Generating Station

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/10/2013
Report Date: Tuesday, April 16, 2013

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL
Total Suspended Solids	00530	No	Chill 4 deg C	SM2540D	1.0	U	mg/L	1.0
Turbidity	82079	No	None	SM2130B	0.1	U	NTU	0.1
Vanadium	01087	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Zinc	01092	No	Nitric Acid	EPA 200.7	1	U	ug/L	1
Redox Potential	00090	No	None	FDEP	-327.1	D	mV	1

Facility ID: FLA017161
Report Period: **1Q13**
Sample Date: 1/10/2013
Report Date: Tuesday, April 16, 2013

Well Type: Compliance
WAFR Testsite ID: 27681
Testsite Name: MWC-DEEP (DEEP-1)

Was Well Purged Before sample collection: YES
Ground Water Classification: GII
Sample Method: In Situ Pump

Parameter	STORET CODE	Samples Filtered?	Preservative added?	Analysis Method	Analytical Results	Qualifier	Units	MDL

I certify that all of the analytical results comply with NELAC Standards and/or were generated by NELAC laboratories certified by the Florida Department of Health

Report Date: 4/16/2013--10:14 AM

Quality Assurance Officer: Shelley Phillips

Technical Director: C. A. [illegible]

Remarks

GAINESVILLE REGIONAL UTILITIES

STRATEGIC PLANNING

July 24, 2013

Mr. Robert L. Martin, P.G.
Florida Department of Environmental Protection
8800 Baymeadows Way West, Suite 100
Jacksonville, FL 32256-7590

Re: Gainesville Regional Utilities Deerhaven Generating Station
Quarterly Groundwater Monitoring Results
Quarter 2, 2013

Dear Mr. Martin,

Enclosed is the Deerhaven Generating Station groundwater monitoring report for Quarter 2 of 2013 monitoring period.

If you have any questions or require further information, please do not hesitate to contact me at (352) 393-1304.

Sincerely,

Boi Hoang
Utility Engineer

Enclosures

cc: file: WDH2.2

Electronically: K. Klemans
J. Shaw
C. Lewis
S. Phillips

State of Florida
Department of Environmental Protection

GROUNDWATER MONITORING REPORT

Facility Name: **GRU-Deerhaven Generating Station** County: Alachua

Address: Post Office Box 147117 Station D38

City: Gainesville State: Florida ZIP: 32614-7117

Telephone No: (352) 393-6240

Facility ID (DEP Permit No): FLA017161 (PA 74-04)

Authorized Representative: Joe W. Shaw Title: Production Manager

Address: Same

City: Same State: Same ZIP: Same

Telephone No: Same

Type of Discharge: Industrial Wastewater

Method of Discharge: Ponds/Basins

CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein; and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Signature of Owner or Authorized Representative

7/12/13
Date

GRU Deerhaven DOH Certification # E52876 3901 SW 63rd Blvd. Gainesville, FL 32608 (352) 393-6777

GRU Kannapaha Laboratory DOH Certification # E52099

KNL Laboratory Services DOH Certification # E84025 2742 N Florida Ave. P.O. Box 1833 Tampa, FL 33601 (813) 229-2879

Pace Analytical Services, Inc. DOH Certification # E83079 8 East Tower Circle Ormond Beach, FL 32174 (386) 672-5668

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWD-1-6 (R1T6)
Well Type: Site Boundry
Description: Due east of Coal Pile Storage Area, along eastern property line.

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/11/2013
Time Sample Obtained 17:25

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	10.4		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	14.3		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.4	I	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	52.9		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	13.6		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	4.1		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	140		Report	PCU	Grab	Quarterly	20	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.22		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	3.2		Report	pCi/L	Grab	Quarterly	1.3	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	4940		Report	ug/L	Grab	Quarterly	2	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	28.8		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	197		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	3.9	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.044	I	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	6.64		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.45		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-222.8	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWD-1-6 (R1T6)
Well Type: Site Boundry
Description: Due east of Coal Pile Storage Area, along eastern property line.

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/11/2013
Time Sample Obtained 17:25

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	10.7		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	511		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	46.1		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	2.5	U	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	21.3		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	303		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	6.1		Report	mg/L	Grab	Quarterly	0.5	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1	U	Report	mg/L	Grab	Quarterly	1	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.42		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	181.8		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	07/12/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWB-2-1 (R2T1)
Well Type: Background
Description: North of Coal Pile Storage Area, along northern property line, and near NE property corner

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**
Date Sample Obtained: 4/11/2013
Time Sample Obtained 12:55

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	172		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	1.7		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	7.14		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	8.1		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	3.4	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	U	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	2.22		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	1.3		Report	pCi/L	Grab	Quarterly	0.8	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	27.3		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	0.54		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	4.3		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	3.1	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.42		Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.66		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.07		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-71.6	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWB-2-1 (R2T1)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Background
County:	Alachua	Description:	North of Coal Pile Storage Area, along northern property line, and near NE property corner

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/11/2013
Time Sample Obtained 12:55

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	2.94		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	69.1		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	31.4		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	2.5	U	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	22.5		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	41		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	1.9		Report	mg/L	Grab	Quarterly	0.5	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1	U	Report	mg/L	Grab	Quarterly	1	SM 2540D	Peristaltic Pump	N
Turbidity	00070	1.49		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	7.3		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	180.69		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1.8	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	07/12/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWI-3-7 (R3T7)
Well Type: Intermediate
Description: SW side of Coal Pile Storage Area, about 250' NE of Pond #3.

Monitoring Period 2Q13 From: 04/01/13 To: 06/30/13

Date Sample Obtained: 4/10/2013
Time Sample Obtained 16:17

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	11.3		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	1.4		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	29.8		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	18.8		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1.7	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	18	I	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.59		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	1.6		Report	pCi/L	Grab	Quarterly	1.2	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	1730		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	7.76		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	27.2		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	4.6		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	3.1	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	6.22		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	1.12		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-211.1	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWI-3-7 (R3T7)
Well Type: Intermediate
Description: SW side of Coal Pile Storage Area, about 250′ NE of Pond #3.

Monitoring Period 2Q13 From: 04/01/13 To: 06/30/13

Date Sample Obtained: 4/10/2013
Time Sample Obtained 16:17

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	55.1		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	482		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	118		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	86.9		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	21.7		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	299		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	3.5		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	1.02		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	3.6	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	179.36		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	3.5	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	07/12/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWI-4-5 (R4T5B)
Well Type: Intermediate
Description: SE side of Ash Ponds

Monitoring Period 2Q13 From: 04/01/13 To: 06/30/13

Date Sample Obtained: 4/12/2013
Time Sample Obtained 9:01

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	123		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	13.6		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	3.0		Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	110		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	5.4	Q	Report	mg/L	Grab	Quarterly	0.25	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	2.0	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	240		Report	PCU	Grab	Quarterly	40	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.36		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	2.1		Report	pCi/L	Grab	Quarterly	1.6	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	29,800		Report	ug/L	Grab	Quarterly	10	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	36.5		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	166		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1.4	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U,Q	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	6.18		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.61		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-186.0	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWI-4-5 (R4T5B)
Well Type: Intermediate
Description: SE side of Ash Ponds

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/12/2013
Time Sample Obtained 9:01

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	13.5		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	853		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	100		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	16.5	Q	Report	mg/L	Grab	Quarterly	0.25	EPA 300	Peristaltic Pump	N
Temperature	00010	22.1		Report	^0C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	549		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	32.3	Q	Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.28	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	178.62		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	12.1		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

Q - Based on trend analysis, we suspected that samples or data from R6T4 and R4 T5 were switched at the contract lab, therefore we asked the contract lab to reanalyze a second set of samples taken from our remaining physical samples; these samples were out of holding time for the analyses. The re-analysis confirmed the mix up.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	07/12/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWD-6-1 (R6T1B)
Well Type: Site Boundry
Description: NW of Secure Landfill, along northern property line.

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/12/2013
Time Sample Obtained 10:07

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	141		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	3.6		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	2.55		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	32.8		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	U	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.20		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	0.7		Report	pCi/L	Grab	Quarterly	1.0	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	331		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	1.16		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	2.3	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.25		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.09		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-219.8	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWD-6-1 (R6T1B)
Well Type: Site Boundry
Description: NW of Secure Landfill, along northern property line.

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/12/2013
Time Sample Obtained 10:07

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	25.8		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	188.7		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	2.7		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	18.7		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	21.3		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	98		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	2.0		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.31	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	179.73		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	07/12/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWI-6-4 (R6T4B)
Well Type: Intermediate
Description: South side of the Secure Landfill

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/9/2013
Time Sample Obtained 16:26

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	1340		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	27.4		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.9	I	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	51.8		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	131	Q	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	2.8	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	3.6	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	12	I	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.22		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	7.5		Report	pCi/L	Grab	Quarterly	0.4	EPA 00-02	Peristaltic Pump	N
Iron, Total Recoverable	00980	9750		Report	ug/L	Grab	Quarterly	5	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	25.1		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	75.3		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	20.4		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U,Q	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.33		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	6.67		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	11.92	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWI-6-4 (R6T4B)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Intermediate
County:	Alachua	Description:	South side of the Secure Landfill

Monitoring Period 2Q13 From: 04/01/13 To: 06/30/13 Date Sample Obtained: 4/9/2013

Time Sample Obtained 16:26

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	340		Report	mg/L	Grab	Quarterly	0.05	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	2047		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	159		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	808	Q	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	20.0		Report	^0C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	1440		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	11.1	Q	Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	1.25		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	64.7		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	180.29		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	2.4	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

Q - Based on trend analysis, we suspected that samples or data from R6T4 and R4 T5 were switched at the contract lab, therefore we asked the contract lab to reanalyze a second set of samples taken from our remaining physical samples; these samples were out of holding time for the analyses. The re-analysis confirmed the mix up.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	07/12/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWI-6-8 (R6T8B)
Well Type: Intermediate
Description: About 350' east of Pond #1 and SW of Coal Pile Storage Area.

Monitoring Period 2Q13 From: 04/01/13 To: 06/30/13

Date Sample Obtained: 4/10/2013
Time Sample Obtained 13:40

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	2860		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	11.5		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	34.6		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	7.3		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1.8	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	35		Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	1.10		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	3.4		Report	pCi/L	Grab	Quarterly	1.0	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	1740		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	19.4		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	54.2		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	2.1	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	6.47		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.61		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	54.7	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWI-6-8 (R6T8B)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Intermediate
County:	Alachua	Description:	About 350′ east of Pond #1 and SW of Coal Pile Storage Area.

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13** Date Sample Obtained: 4/10/2013
Time Sample Obtained 13:40

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	6.6		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	359		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	56.0		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	10.8		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	22.1		Report	^{0}C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	211		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	10.0		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	4.3		Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	10.9		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	2.4	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	174.98		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	2.2	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	07/12/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWD-6-12 (R6T12)
Well Type: Site Boundry
Description: Due west of Pond #4 and SW of Coal Pile Storage Area.

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/9/2013
Time Sample Obtained 9:02

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	604		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	4.8		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	13.2		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	7.1		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	3.5	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1.1	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	60		Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	71.1		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	7.95		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	4.0		Report	pCi/L	Grab	Quarterly	0.9	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	599		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	2.04		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	10.9		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	4.3		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.17		Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	6.39		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.23		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	6.03	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWD-6-12 (R6T12)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Site Boundry
County:	Alachua	Description:	Due west of Pond #4 and SW of Coal Pile Storage Area.

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13** Date Sample Obtained: 4/9/2013

Time Sample Obtained 9:02

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	8.8		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	132.7		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	32.0		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	12.8		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	19.4		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	117		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	16.9		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	5.14		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	12.6		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	170.07		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	5.8		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	07/12/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWD-8-10 (R8T10)
Well Type: Compliance
Description: SW of Coal Pile Storage Area, alond SR441

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13** Date Sample Obtained: 4/9/2013
Time Sample Obtained 13:08

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	849		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	6.9		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.8	I	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	20.5		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	70.9		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	9.8		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	2.0	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	80		Report	PCU	Grab	Quarterly	20	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.48		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	24		Report	pCi/L	Grab	Quarterly	1.1	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	7010		Report	ug/L	Grab	Quarterly	2	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	5.10		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	6.4		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	6.7		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.050	I	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.31		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.05		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	9.80	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWD-8-10 (R8T10)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Compliance
County:	Alachua	Description:	SW of Coal Pile Storage Area, alond SR441

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13** Date Sample Obtained: 4/9/2013

Time Sample Obtained 13:08

Was the well purged before sampling? _X_ Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	48.5		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	438		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	19.4		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	47.3		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	22.2		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	314		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	37.2		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	2.43		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	31.5		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	173.67		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	2.7	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	07/12/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWI-9-5 (R9T5B)
Well Type: Intermediate
Description: NW corner of Ash Landfill

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/8/2013
Time Sample Obtained 14:36

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	17.8		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	11.4		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	13.1		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	4.6	I	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	U	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.98		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	1.7		Report	pCi/L	Grab	Quarterly	0.8	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	7.1		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	2.07		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	32.7		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1.9	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.35		Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.67		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	1.73		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	9.28	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWI-9-5 (R9T5B)
Well Type: Intermediate
Description: NW corner of Ash Landfill

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/8/2013
Time Sample Obtained 14:36

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	3.51		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	113.4		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	64.3		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	5.1		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	20.5		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	75		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	3.1		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.38	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	5.8		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	179.45		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1.0	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	07/12/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-10-8 (R10T8)
Well Type: Compliance
Description: SW of Pond #1, SSW of Ash Landfill, along SR441

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/9/2013
Time Sample Obtained 15:11

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	36.8		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	3.0		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	12.9		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	5.3		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	U	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.37		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	1.0		Report	pCi/L	Grab	Quarterly	0.8	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	275		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	2.37		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	11.1		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.42		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.13		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	11.64	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-10-8 (R10T8)
Well Type: Compliance
Description: SW of Pond #1, SSW of Ash Landfill, along SR441

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/9/2013
Time Sample Obtained 15:11

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	2.50		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	110		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	13.8		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	16.7		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	21.0		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	73		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	2.3		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	1.16		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	176.19		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	07/12/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-11-4 (R11T4B)
Well Type: Compliance
Description: West of Ash Landfill, along western property line.

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/8/2013
Time Sample Obtained 12:28

Was the well purged before sampling? _X_ Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	96.4		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	4.6		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	7.11		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	50.2		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	3.5	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	I	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1.0	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.39		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	5.9		Report	pCi/L	Grab	Quarterly	1.1	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	1160		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	3.62		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	12.6		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	2.8	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.47		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.36		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-257.3	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-11-4 (R11T4B)
Well Type: Compliance
Description: West of Ash Landfill, along western property line.

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/8/2013
Time Sample Obtained 12:28

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	65.8		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	440.2		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	5.0		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	92.4		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	20.6		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	276		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	17.5		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	2.67		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	3.8	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	175.3		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	07/12/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-DEEP (DEEP-1)
Well Type: Compliance
Description: Plant Suply Well

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/11/2013
Time Sample Obtained 8:02

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	12.1		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	60		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	8		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	U	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.26		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	3.5		Report	pCi/L	Grab	Quarterly	1.1	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	18.2		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	20.5		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	7.8		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	7.46		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.8		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-284.0	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-DEEP (DEEP-1)
Well Type: Compliance
Description: Plant Suply Well

Monitoring Period **2Q13** From: **04/01/13** To: **06/30/13**

Date Sample Obtained: 4/11/2013
Time Sample Obtained 8:02

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	7.36		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	468.3		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	1120		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	38.4		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	22.7		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	287		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	1.8		Report	mg/L	Grab	Quarterly	0.5	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1	U	Report	mg/L	Grab	Quarterly	1	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.21	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	FDEP	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	07/12/2013

GRU More than Energy

GAINESVILLE REGIONAL UTILITIES

STRATEGIC PLANNING

October 18, 2013

Mr. Robert L. Martin, P.G.
Florida Department of Environmental Protection
8800 Baymeadows Way West, Suite 100
Jacksonville, FL 32256-7590

Re: Gainesville Regional Utilities Deerhaven Generating Station
Quarterly Groundwater Monitoring Results
Quarter 3, 2013

Dear Mr. Martin,

Enclosed is the Deerhaven Generating Station groundwater monitoring report for Quarter 3 of 2013 monitoring period.

If you have any questions or require further information, please do not hesitate to contact me at (352) 393-1304.

Sincerely,

Boi Hoang
Utility Engineer

Enclosures

cc: file: WDH2.2

Electronically: K. Klemans
J. Shaw
C. Lewis
S. Phillips

State of Florida

Department of Environmental Protection

GROUNDWATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station   County: Alachua

Address: Post Office Box 147117 Station D38

City: Gainesville   State: Florida   ZIP: 32614-7117

Telephone No: (352) 393-6240

Facility ID (DEP Permit No): FLA017161 (PA 74-04)

Authorized Representative: Joe W. Shaw   Title: Production Manager

Address: Same

City: Same   State: Same   ZIP: Same

Telephone No: Same

Type of Discharge: Industrial Wastewater

Method of Discharge: Ponds/Basins

CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein; and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Joe W Shaw

Signature of Owner or Authorized Representative

9/30/13

Date

GRU Deerhaven DOH Certification # E52876

GRU Kannapaha Laboratory DOH Certification # E52099   3901 SW 63rd Blvd. Gainesville, FL 32608 (352) 393-6777

KNL Laboratory Services DOH Certification # E84025   2742 N Florida Ave. P.O. Box 1833 Tampa, FL 33601 (813) 229-2879

Pace Analytical Services, Inc. DOH Certification # E83079   8 East Tower Circle Ormond Beach, FL 32174 (386) 672-5668

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWD-1-6 (R1T6)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Site Boundry
County:	Alachua	Description:	Due east of Coal Pile Storage Area, along eastern property line.

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13

Date Sample Obtained: 7/15/2013

Time Sample Obtained 15:23

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	30.9		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	14.4		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.8	I	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	52.4		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	14.1		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	2.8	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	50		Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.32		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	2.4		Report	pCi/L	Grab	Quarterly	0.9	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	6580		Report	ug/L	Grab	Quarterly	2	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	28.7		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	147		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	2.8	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	6.56		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.51		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-166.2	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWD-1-6 (R1T6)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Site Boundry
County:	Alachua	Description:	Due east of Coal Pile Storage Area, along eastern property line.

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13 Date Sample Obtained: 7/15/2013

Time Sample Obtained 15:23

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	11.7		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	511		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	44.8		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	2.5	U	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	22.9		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	284		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	6.0		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	8.3	J	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.76		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	184.3		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1.6	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

J - The QCS for TSS failed low, therefore the sample result may be greater than reported.

Note: In addition, a PT for TSS was run with the batch and passed.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	09/30/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWB-2-1 (R2T1)
Well Type: Background
Description: North of Coal Pile Storage Area, along northern property line, and near NE property corner

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13

Date Sample Obtained: 7/19/2013
Time Sample Obtained 13:36

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	180		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	1.9		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	6.34		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	7.0		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	2.1	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	U	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	1.70		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	1.6		Report	pCi/L	Grab	Quarterly	0.7	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	77.3		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	0.44		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	5.1		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1.6	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.31		Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.53		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.18		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	94.9	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWB-2-1 (R2T1)
Well Type: Background
Description: North of Coal Pile Storage Area, along northern property line, and near NE property corner

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13
Date Sample Obtained: 7/19/2013
Time Sample Obtained 13:36

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	3.31		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	64.4		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	30.1		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	2.5	U	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	26.2		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	36	I	Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	2.3		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	UJ	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.77		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1.7	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	182.14		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	2.1	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

J - The QCS for TSS failed low, therefore the sample result may be greater than reported.
Note: In addition, a PT for TSS was run with the batch and passed.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	09/30/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWI-3-7 (R3T7)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Intermediate
County:	Alachua	Description:	SW side of Coal Pile Storage Area, about 250' NE of Pond #3.

Monitoring Period **3Q13** From: **07/01/13** To: **09/30/13**

Date Sample Obtained: 7/18/2013

Time Sample Obtained 14:53

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	16.4		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	2.0		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	34.6		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	14.1		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	I	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.23		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	3.7		Report	pCi/L	Grab	Quarterly	1.1	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	2390		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	8.04		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	42.6		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	6.5		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	2.8	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	6.25		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	1.54		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-237.4	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWI-3-7 (R3T7)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Intermediate
County:	Alachua	Description:	SW side of Coal Pile Storage Area, about 250' NE of Pond #3.

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13 Date Sample Obtained: 7/18/2013

Time Sample Obtained 14:53

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	49.7		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	457.0		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	140		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	70.8		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	28.1		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	270		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	3.7		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	2.8	IJ	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.52		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	3.7	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	180.11		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1.6	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

J - The QCS for TSS failed low, therefore the sample result may be greater than reported.

Note: In addition, a PT for TSS was run with the batch and passed.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	09/30/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWI-4-5 (R4T5B)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Intermediate
County:	Alachua	Description:	SE side of Ash Ponds

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13 Date Sample Obtained: 7/17/2013

Time Sample Obtained 14:45

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	178		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	16.6		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	2.7		Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	105		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	4.4	I	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1.8	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	225		Report	PCU	Grab	Quarterly	25	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.34		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	2.2		Report	pCi/L	Grab	Quarterly	1.3	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	25600		Report	ug/L	Grab	Quarterly	10	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	32.3		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	146		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.027	I	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	6.09		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.82		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-213.5	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWI-4-5 (R4T5B)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Intermediate
County:	Alachua	Description:	SE side of Ash Ponds

Monitoring Period **3Q13** From: **07/01/13** To: **09/30/13** Date Sample Obtained: 7/17/2013

Time Sample Obtained 14:45

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	14.9		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	810		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	102		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	2.8	I	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	26.7		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	513		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	40.2		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	UJ	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.70		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1.4	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	178.97		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	2.2	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

J - The QCS for TSS failed low, therefore the sample result may be greater than reported.

Note: In addition, a PT for TSS was run with the batch and passed.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	09/30/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWD-6-1 (R6T1B)
Well Type: Site Boundry
Description: NW of Secure Landfill, along northern property line.

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13
Date Sample Obtained: 7/18/2013
Time Sample Obtained 16:26

Was the well purged before sampling? _X_ Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	182		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	5.3		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	3.59		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	20.9		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	U	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.19		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	1.2		Report	pCi/L	Grab	Quarterly	0.7	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	659		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	1.94		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	3.4	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.09		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.12		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-254.8	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWD-6-1 (R6T1B)
Well Type: Site Boundry
Description: NW of Secure Landfill, along northern property line.

Monitoring Period **3Q13** From: **07/01/13** To: **09/30/13**

Date Sample Obtained: 7/18/2013
Time Sample Obtained 16:26

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	28.0		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	199.3		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	3.3		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	39.4		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	25.9		Report	^0C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	108		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	1.7		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	UJ	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.59		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	181.24		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1.1	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

J - The QCS for TSS failed low, therefore the sample result may be greater than reported.

Note: In addition, a PT for TSS was run with the batch and passed.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	09/30/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWI-6-4 (R6T4B)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Intermediate
County:	Alachua	Description:	South side of the Secure Landfill

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13 Date Sample Obtained: 7/17/2013

Time Sample Obtained 13:59

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	440		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	40.5		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	1.0	I	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	64.1		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	95.5		Report	mg/L	Grab	Quarterly	12.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1.8	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	2.0	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	10	I	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.15		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	4.9		Report	pCi/L	Grab	Quarterly	0.4	EPA 00-02	Peristaltic Pump	N
Iron, Total Recoverable	00980	7990		Report	ug/L	Grab	Quarterly	2	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	19.6		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	64.1		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	15.8		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.80		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	5.62		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-285.5	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWI-6-4 (R6T4B)
Well Type: Intermediate
Description: South side of the Secure Landfill

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13 Date Sample Obtained: 7/17/2013
Time Sample Obtained 13:59

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	240		Report	mg/L	Grab	Quarterly	0.02	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	1624		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	235		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	571		Report	mg/L	Grab	Quarterly	25.0	EPA 300	Peristaltic Pump	N
Temperature	00010	24.7		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	1100		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	10.9		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	UJ	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.39	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	45.1		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	181.02		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	2.2	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

J - The QCS for TSS failed low, therefore the sample result may be greater than reported.

Note: In addition, a PT for TSS was run with the batch and passed.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	09/30/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant

Permit Number: FLA017161 (PA74-04)

County: Alachua

Monitoring Well ID: MWI-6-8 (R6T8B)

Well Type: Intermediate

Description: About 350' east of Pond #1 and SW of Coal Pile Storage Area.

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13

Date Sample Obtained: 7/16/2013

Time Sample Obtained 10:30

Was the well purged before sampling? _X_ Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	227		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	13.8		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	31.7		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	8.9		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	30		Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.69		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	3.3		Report	pCi/L	Grab	Quarterly	0.9	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	333		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	16.0		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	47.9		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	6.23		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	5.72		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-190.2	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWI-6-8 (R6T8B)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Intermediate
County:	Alachua	Description:	About 350' east of Pond #1 and SW of Coal Pile Storage Area.

Monitoring Period **3Q13** From: **07/01/13** To: **09/30/13** Date Sample Obtained: 7/16/2013

Time Sample Obtained 10:30

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	9.53		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	345.2		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	56.1		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	12.1		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	26.8		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	209		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	13.8		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.1	IJ	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	1.44		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	2.0	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	176.37		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1.3	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

J - The QCS for TSS failed low, therefore the sample result may be greater than reported.

Note: In addition, a PT for TSS was run with the batch and passed.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	09/30/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWD-6-12 (R6T12)
Well Type: Site Boundry
Description: Due west of Pond #4 and SW of Coal Pile Storage Area.

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13

Date Sample Obtained: 7/15/2013
Time Sample Obtained 16:33

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	1230		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	8.2		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	1.8		Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	17.8		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	14.0		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	4.1		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	2.3	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	100		Report	PCU	Grab	Quarterly	25	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	53.6		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.44		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	13.7		Report	pCi/L	Grab	Quarterly	0.4	EPA 00-02	Peristaltic Pump	N
Iron, Total Recoverable	00980	8160		Report	ug/L	Grab	Quarterly	2	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	3.30		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	19.2		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	5.6		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.57		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.17		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-23.6	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWD-6-12 (R6T12)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Site Boundry
County:	Alachua	Description:	Due west of Pond #4 and SW of Coal Pile Storage Area.

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13 Date Sample Obtained: 7/15/2013

Time Sample Obtained 16:33

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	14.6		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	212.6		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	24.7		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	13.5		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	26.0		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	165		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	16.4		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	5.1	J	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	9.18		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	5.1		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	171.62		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	11.5		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

J - The QCS for TSS failed low, therefore the sample result may be greater than reported.

Note: In addition, a PT for TSS was run with the batch and passed.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe S	352-393-6240	09/30/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-8-10 (R8T10)
Well Type: Compliance
Description: SW of Coal Pile Storage Area, alond SR441

Monitoring Period **3Q13** From: 07/01/13 To: 09/30/13

Date Sample Obtained: 7/18/2013
Time Sample Obtained 12:31

Was the well purged before sampling? _X_ Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	798		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	7.6		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	1.1	I	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	19.6		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	77.6		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	39.0		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	2.1	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	100		Report	PCU	Grab	Quarterly	25	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.25		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	7.5		Report	pCi/L	Grab	Quarterly	0.4	EPA 00-02	Peristaltic Pump	N
Iron, Total Recoverable	00980	8570		Report	ug/L	Grab	Quarterly	2	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	4.62		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	8.5		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	19.3		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.27		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.07		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-239.1	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-8-10 (R8T10)
Well Type: Compliance
Description: SW of Coal Pile Storage Area, alond SR441

Monitoring Period **3Q13** From: **07/01/13** To: **09/30/13**

Date Sample Obtained: 7/18/2013
Time Sample Obtained 12:31

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	51.2		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	422.6		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	19.6		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	33.5		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	25.9		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	314		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	44.4		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	UJ	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	2.19		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	41.7		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	173.99		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	2.6	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

J - The QCS for TSS failed low, therefore the sample result may be greater than reported.

Note: In addition, a PT for TSS was run with the batch and passed.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe S	352-393-6240	09/30/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWI-9-5 (R9T5B)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Intermediate
County:	Alachua	Description:	NW corner of Ash Landfill

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13 Date Sample Obtained: 7/16/2013

Time Sample Obtained 11:41

Was the well purged before sampling? _X_ Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	14.6		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	13.5		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	18.8		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	5.6		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	8	I	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.26		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	2.8		Report	pCi/L	Grab	Quarterly	0.8	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	89.1		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	2.24		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	35.4		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.050	I	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.72		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	2.10		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-133.9	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWI-9-5 (R9T5B)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Intermediate
County:	Alachua	Description:	NW corner of Ash Landfill

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13 Date Sample Obtained: 7/16/2013

Time Sample Obtained 11:41

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	3.64		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	141.3		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	94.0		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	7.6		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	25.8		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	82		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	3.8		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U,J	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.32	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	6.9		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	180.43		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1.0	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

J - The QCS for TSS failed low, therefore the sample result may be greater than reported.

Note: In addition, a PT for TSS was run with the batch and passed.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	09/30/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-10-8 (R10T8)
Well Type: Compliance
Description: SW of Pond #1, SSW of Ash Landfill, along SR441

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13 Date Sample Obtained: 7/18/2013
Time Sample Obtained 9:39

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	36.4		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	2.8		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	10.7		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	4.9	I	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1.6	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	U	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.30		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	0.2		Report	pCi/L	Grab	Quarterly	0.8	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	195		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	2.03		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	8.0		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.28		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.14		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-252.2	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWC-10-8 (R10T8)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Compliance
County:	Alachua	Description:	SW of Pond #1, SSW of Ash Landfill, along SR441

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13 Date Sample Obtained: 7/18/2013

Time Sample Obtained 9:39

Was the well purged before sampling? _X_ Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	2.56		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	99.6		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	11.5		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	16.6		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	24.2		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	50		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	2.2		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U,J	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.17	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	177.05		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

J - The QCS for TSS failed low, therefore the sample result may be greater than reported.

Note: In addition, a PT for TSS was run with the batch and passed.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	09/30/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-11-4 (R11T4B)
Well Type: Compliance
Description: West of Ash Landfill, along western property line.

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13

Date Sample Obtained: 7/16/2013
Time Sample Obtained 12:37

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	108		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	4.4		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	6.61		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	34.9		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	3.2	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	10	I	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.26		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	2.6		Report	pCi/L	Grab	Quarterly	1.1	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	619		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	3.32		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	11.5		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1.3	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.24		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.43		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-266.3	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWC-11-4 (R11T4B)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Compliance
County:	Alachua	Description:	West of Ash Landfill, along western property line.

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13 Date Sample Obtained: 7/16/2013

Time Sample Obtained 12:37

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	65.1		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	401.4		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	4.5		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	99.2		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	25.7		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	257		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	19.2		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U,J	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.36	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	3.0	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	176.33		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

J - The QCS for TSS failed low, therefore the sample result may be greater than reported.

Note: In addition, a PT for TSS was run with the batch and passed.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	09/30/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-DEEP (DEEP-1)
Well Type: Compliance
Description: Plant Suply Well

Monitoring Period 3Q13 From: 07/01/13 To: 09/30/13

Date Sample Obtained: 7/17/2013
Time Sample Obtained 15:44

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	12.0		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	57.5		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	9.1		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	U	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.14		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	2.2		Report	pCi/L	Grab	Quarterly	1.3	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	10.4		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	20.5		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	8.4		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	7.25		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.88		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-311.4	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWC-DEEP (DEEP-1)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Compliance
County:	Alachua	Description:	Plant Suply Well

Monitoring Period **3Q13** From: **07/01/13** To: **09/30/13** Date Sample Obtained: 7/17/2013

Time Sample Obtained 15:44

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	8.06		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	462.1		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	1110		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	41.5		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	24.7		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	301		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	1.1		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	UJ	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.1	U	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	FDEP	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

J - The QCS for TSS failed low, therefore the sample result may be greater than reported.

Note: In addition, a PT for TSS was run with the batch and passed.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Sh	352-393-6240	09/30/2013

GRU
More than Energy

GAINESVILLE REGIONAL UTILITIES

STRATEGIC PLANNING

December 17, 2013

Mr. Robert L. Martin, P.G.
Florida Department of Environmental Protection
8800 Baymeadows Way West, Suite 100
Jacksonville, FL 32256-7590

Re: Gainesville Regional Utilities Deerhaven Generating Station
Quarterly Groundwater Monitoring Results
Quarter 4, 2013

Dear Mr. Martin,

Enclosed is the Deerhaven Generating Station groundwater monitoring report for Quarter 4 of 2013 monitoring period.

If you have any questions or require further information, please do not hesitate to contact me at (352) 393-1304.

Sincerely,

Boi Hoang
Utility Engineer

Enclosures

cc: file: WDH2.2

Electronically: K. Klemans
J. Shaw
C. Lewis
S. Phillips

State of Florida
Department of Environmental Protection

GROUNDWATER MONITORING REPORT

Facility Name: GRU-Deerhaven Generating Station County: Alachua
Address: Post Office Box 147117 Station D38
City: Gainesville State: Florida ZIP: 32614-7117
Telephone No: (352) 393-6240
Facility ID (DEP Permit No): FLA017161 (PA 74-04)
Authorized Representative: Joe W. Shaw Title: Production Manager
Address: Same
City: Same State: Same ZIP: Same
Telephone No: Same
Type of Discharge: Industrial Wastewater
Method of Discharge: Ponds/Basins

CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein; and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Joe Shaw
Signature of Owner or Authorized Representative

12/11/13
Date

GRU Deerhaven DOH Certification # E52876
GRU Kannapaha Laboratory DOH Certification # E52099 3901 SW 63rd Blvd. Gainesville, FL 32608 (352) 393-6777
KNL Laboratory Services DOH Certification # E84025 2742 N Florida Ave. P.O. Box 1833 Tampa, FL 33601 (813) 229-2879
Pace Analytical Services, Inc. DOH Certification # E83079 8 East Tower Circle Ormond Beach, FL 32174 (386) 672-5668

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWD-1-6 (R1T6)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Site Boundry
County:	Alachua	Description:	Due east of Coal Pile Storage Area, along eastern property line.

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13 Date Sample Obtained: 10/2/2013

Time Sample Obtained 9:58

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	16.6		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	16.4		Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	14.6		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.59	I	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	51.5		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	14.1		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1.5	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	2.5	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	15	I	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.13		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	3.2		Report	pCi/L	Grab	Quarterly	0.9	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	7020		Report	ug/L	Grab	Quarterly	2	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	28.3		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	142		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	2.1	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	6.59		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.48		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-241.3	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU - Deerhaven Power Plant	Monitoring Well ID:	MWD-1-6 (R1T6)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Site Boundry
County:	Alachua	Description:	Due east of Coal Pile Storage Area, along eastern property line.

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13 Date Sample Obtained: 10/2/2013

Time Sample Obtained 9:58

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	11.7		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	513		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	43.0		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	2.5	U	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	23.2		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	277		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	5.4		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	6.5		Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.28	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	183.79		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO.	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	12/11/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWB-2-1 (R2T1)
Well Type: Background
Description: North of Coal Pile Storage Area, along northern property line, and near NE property corner

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/1/2013
Time Sample Obtained 13:58

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	134		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	1.6		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	5.05		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	7.7		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	6.6		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	U	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	4.56		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	0.3		Report	pCi/L	Grab	Quarterly	0.7	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	164		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	0.55		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	6.9		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	4.6		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.055		Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.70		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.05		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	31.5	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant

Permit Number: FLA017161 (PA74-04)

County: Alachua

Monitoring Well ID: MWB-2-1 (R2T1)

Well Type: Background

Description: North of Coal Pile Storage Area, along northern property line, and near NE property corner

Monitoring Period: 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/1/2013

Time Sample Obtained: 13:58

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	3.52		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	58.6		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	22.0		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	2.5	U	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	26.4		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	21	I	Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	1.1		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.71		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	180.04		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

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o

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	12/11/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU - Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWI-3-7 (R3T7)
Well Type: Intermediate
Description: SW side of Coal Pile Storage Area, about 250' NE of Pond #3.

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/4/2013
Time Sample Obtained 9:34

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	9.9		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	1.0		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.4	I	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	31.2		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	14.5		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	4.8		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	40		Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.35		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	2.4		Report	pCi/L	Grab	Quarterly	1.1	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	4770		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	6.52		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	32.8		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	3.3	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	5.2		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	6.13		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	1.05		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-223.2	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWI-3-7 (R3T7)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Intermediate
County:	Alachua	Description:	SW side of Coal Pile Storage Area, about 250' NE of Pond #3.

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13 Date Sample Obtained: 10/4/2013

Time Sample Obtained 9:34

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/T/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	62.1		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	499		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	93.4		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	80.8		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	26.8		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	293		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	4		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.35	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	4.3		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	177.25		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO.	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	12/11/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU - Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWI-4-5 (R4T5B)
Well Type: Intermediate
Description: SE side of Ash Ponds

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/2/2013
Time Sample Obtained 13:52

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	210		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	15.8		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	4		Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	85.5		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	5.4		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	3.1	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	300		Report	PCU	Grab	Quarterly	25	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.48		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	1.7		Report	pCi/L	Grab	Quarterly	1.2	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	45600		Report	ug/L	Grab	Quarterly	20	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	27.8		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	146		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1.1	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	6.14		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.83		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-219.2	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MW1-4-5 (R4T5B)
Well Type: Intermediate
Description: SE side of Ash Ponds

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/2/2013
Time Sample Obtained 13:52

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	17.8		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	777		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	82.4		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	2.5	U	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	27.9		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	505		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	52.4		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	7.3		Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.35	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1.2	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	177.42		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	2.7	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO.	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	12/11/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWD-6-1 (R6T1B)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Site Boundry
County:	Alachua	Description:	NW of Secure Landfill, along northern property line.

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13 Date Sample Obtained: 10/3/2013

Time Sample Obtained 13:35

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	176		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	4.2		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	3.56		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	15.6		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	U	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.3		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	0.2		Report	pCi/L	Grab	Quarterly	0.7	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	349		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	3.00		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	3.0	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.27		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.12		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-230.5	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWD-6-1 (R6T1B)
Well Type: Site Boundry
Description: NW of Secure Landfill, along northern property line.

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/3/2013
Time Sample Obtained 13:35

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	16.1		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	148.8		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	4.3		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	24.2		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	26.6		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	73		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	1.5		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.1	U	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	180.16		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO.	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	12/11/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWI-6-4 (R6T4B)
Well Type: Intermediate
Description: South side of the Secure Landfill

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/1/2013
Time Sample Obtained 15:48

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L F/N)
Aluminum, Total Recoverable	01104	739		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	24.4		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	1.1	I	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	49.1		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	103		Report	mg/L	Grab	Quarterly	12.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	2.3	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	2.7	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	12	I	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.18		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	5.3		Report	pCi/L	Grab	Quarterly	0.4	EPA 00-02	Peristaltic Pump	N
Iron, Total Recoverable	00980	11260		Report	ug/L	Grab	Quarterly	5	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	24.4		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	77.8		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	17.2		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.31		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	5.93		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-251.8	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU - Deerhaven Power Plant

Permit Number: FLA017161 (PA74-04)

County: Alachua

Monitoring Well ID: MW1-6-4 (R6T4B)

Well Type: Intermediate

Description: South side of the Secure Landfill

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/1/2013

Time Sample Obtained 15:48

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	247		Report	mg/L	Grab	Quarterly	0.05	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	1579		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	138		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	546		Report	mg/L	Grab	Quarterly	25.0	EPA 300	Peristaltic Pump	N
Temperature	00010	25.9		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	1080		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	8.9		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.32	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	55.8		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	180.30		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1.1	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO.	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	12/11/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU - Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MW1-6-8 (R6TSB)
Well Type: Intermediate
Description: About 350' east of Pond #1 and SW of Coal Pile Storage Area.

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/2/2013
Time Sample Obtained 15:38

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	643		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	14.6		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	56.8		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	8.2		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1.0	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	17	I	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.35		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	4.2		Report	pCi/L	Grab	Quarterly	1.1	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	661		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	33.6		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	128		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	2.0	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	6.73		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.20		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-235.9	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU - Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWI-6-8 (R6TSB)
Well Type: Intermediate
Description: About 350' east of Pond #1 and SW of Coal Pile Storage Area

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/2/2013
Time Sample Obtained 15:38

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	9.37		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	571		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	87.3		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	2.5	U	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	27.4		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	297		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	4.3		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	7.3		Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	5.24		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1.3	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	173.17		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO.	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	12/11/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWD-6-12 (R6T12)
Well Type: Site Boundry
Description: Due west of Pond #4 and SW of Coal Pile Storage Area.

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/1/2013
Time Sample Obtained 8:43

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	337		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	3.4		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.7	I	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	15.9		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	10.0		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	3.8	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1.1	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	110		Report	PCU	Grab	Quarterly	10	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	94.8		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	4.31		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	3.6		Report	pCi/L	Grab	Quarterly	0.5	EPA 00-02	Peristaltic Pump	N
Iron, Total Recoverable	00980	4840		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	2.48		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	12.1		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	6.7		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.086		Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	6.13		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.16		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	17.0	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWD-6-12 (R6T12)
Well Type: Site Boundry
Description: Due west of Pond #4 and SW of Coal Pile Storage Area.

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/1/2013
Time Sample Obtained 8:43

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	10.6		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	156.0		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	21.4		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	8.1		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	24.4		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	131		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	21.3		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.1	I	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	5.98		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	13.7		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	170.21		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	3.6	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO.	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	12/11/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWC-8-10 (RST10)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Compliance
County:	Alachua	Description:	SW of Coal Pile Storage Area, alond SR441

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13 Date Sample Obtained: 10/2/2013

Time Sample Obtained 12:22

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	878		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	15.9		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	1.4		Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	32.0		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	135		Report	mg/L	Grab	Quarterly	12.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	17.1		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	3.6	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	47		Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.43		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	6.2		Report	pCi/L	Grab	Quarterly	1.1	EPA 00-02	Peristaltic Pump	N
Iron, Total Recoverable	00980	15150		Report	ug/L	Grab	Quarterly	5	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	8.42		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	10.6		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	8.1		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	4.97		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.11		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-217.1	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-8-10 (R8T10)
Well Type: Compliance
Description: SW of Coal Pile Storage Area, alond SR441

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/2/2013
Time Sample Obtained 12:22

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	83.3		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	762		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	32.9		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	73.5		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	25.3		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	431		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	31.6		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	2.36		Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	36.0		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	171.32		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	2.8	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO.	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	12/11/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MW1-9-5 (R9T5B)
Well Type: Intermediate
Description: NW corner of Ash Landfill

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/3/2013
Time Sample Obtained 9:56

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	15.0		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	13.4		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	15.2		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	4.5	I	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	U	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.24		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	3.3		Report	pCi/L	Grab	Quarterly	0.8	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	397		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	2.28		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	36.5		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.58		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	2.07		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-155.1	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU - Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MW1-9-5 (R9T5B)
Well Type: Intermediate
Description: NW corner of Ash Landfill

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/3/2013
Time Sample Obtained 9:56

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	3.86		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	124.5		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	76.6		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	5.5		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	25.6		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	67		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	3.2		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.23	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	2.4	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	178.84		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO.	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	12/11/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-10-8 (R101S)
Well Type: Compliance
Description: SW of Pond #1, SSW of Ash Landfill, along SR441

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/3/2013
Time Sample Obtained 11:14

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	35.5		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	2.5		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	10.7		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	2.5	U	Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	U	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.30		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	0.3		Report	pCi/L	Grab	Quarterly	0.7	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	192		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	1.93		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	7.2		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.40		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.14		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-230.6	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU - Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-10-8 (R10T8)
Well Type: Compliance
Description: SW of Pond #1, SSW of Ash Landfill, along SR441

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/3/2013
Time Sample Obtained 11:14

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	2.47		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	94.2		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	11.3		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	15.2		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	25.2		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	47		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	1.7		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.19	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	174.00		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO.	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	12/11/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-11-4 (R11T4B)
Well Type: Compliance
Description: West of Ash Landfill, along western property line.

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13 Date Sample Obtained: 10/3/2013
Time Sample Obtained 12:29

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	108		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	4		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	7.52		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	31.0		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	3.4	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	I	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.26		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	4.2		Report	pCi/L	Grab	Quarterly	0.9	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	676		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	3.87		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	12.8		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1.3	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	5.36		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.36		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-259.5	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name:	GRU – Deerhaven Power Plant	Monitoring Well ID:	MWC-11-4 (R11T4B)
Permit Number:	FLA017161 (PA74-04)	Well Type:	Compliance
County:	Alachua	Description:	West of Ash Landfill, along western property line.

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13 Date Sample Obtained: 10/3/2013

Time Sample Obtained 12:29

Was the well purged before sampling? X Yes ___ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	59.1		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	387		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	5.1		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	96.9		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	27.7		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	239		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	17.3		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.38	I	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	3.0	I	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Water Level (NGVD)	82545	174.52		Report	Feet	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED A	TELEPHONE NO.	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	12/11/2013

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU – Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-DEEP (DEEP-1)
Well Type: Compliance
Description: Plant Suply Well

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13

Date Sample Obtained: 10/3/2013
Time Sample Obtained 16:03

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Aluminum, Total Recoverable	01104	6.0		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Arsenic, Total Recoverable	00978	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Barium, Total Recoverable	01009	11.5		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Beryllium, Total Recoverable	00998	0.06	U	Report	ug/L	Grab	Quarterly	0.06	EPA 200.7	Peristaltic Pump	N
Cadmium, Total Recoverable	01113	0.3	U	Report	ug/L	Grab	Quarterly	0.3	EPA 200.7	Peristaltic Pump	N
Calcium, Total Recoverable	00918	62.4		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Chloride	00940	8.9		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Chromium, Total Recoverable	01118	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Cobalt, Total Recoverable	00979	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Color	00080	5	U	Report	PCU	Grab	Quarterly	5	SM 2120B	Peristaltic Pump	N
Copper, Total Recoverable	01119	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Dissovled Oxygen	00300	0.20		Report	mg/L	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Gross Alpha	80045	1.9		Report	pCi/L	Grab	Quarterly	0.9	EPA 900.0	Peristaltic Pump	N
Iron, Total Recoverable	00980	6.0		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Lead, Total Recoverable	01114	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N
Magnesium, Total Recoverable	00921	20.5		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Manganese, Total Recoverable	11123	7.2		Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Mercury, Total Recoverable	71901	0.1	U	Report	ug/L	Grab	Quarterly	0.1	EPA 245.1	Peristaltic Pump	N
Molybdenum, Total Recoverable	01129	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nickel, Total Recoverable	01074	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Nitrite+Nitrate (as N)	00630	0.025	U	Report	mg/L	Grab	Quarterly	0.025	EPA 353.2	Peristaltic Pump	N
pH (field)	00400	7.42		Report	SU	In-situ	Quarterly	0.01	FDEP	Peristaltic Pump	N
Potassium, Total Recoverable	00939	0.83		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Redox Potential (ORP)	00090	-288.5	D	Report	mV	Grab	Quarterly		FDEP	Peristaltic Pump	N
Selenium, Total Recoverable	00981	4	U	Report	ug/L	Grab	Quarterly	4	EPA 200.7	Peristaltic Pump	N

GROUND WATER MONITORING WELL REPORT - PART D

Quarterly

Facility Name: GRU - Deerhaven Power Plant
Permit Number: FLA017161 (PA74-04)
County: Alachua

Monitoring Well ID: MWC-DEEP (DEEP-1)
Well Type: Compliance
Description: Plant Suply Well

Monitoring Period 4Q13 From: 10/01/13 To: 12/31/13 Date Sample Obtained: 10/3/2013
Time Sample Obtained 16:03

Was the well purged before sampling? X Yes __ No

Parameter	PARM Code	Sample Measurement	Qualifier	Permit Requirement	Unit	Sample Type	Monitoring Frequency	Detection Limits	Analysis Method	Sampling Equipment Used	Filtered (L/F/N)
Silver, Total Recoverable	01079	0.4	U	Report	ug/L	Grab	Quarterly	0.4	EPA 200.7	Peristaltic Pump	N
Sodium	00923	8.80		Report	mg/L	Grab	Quarterly	0.01	EPA 200.7	Peristaltic Pump	N
Specific Conductance (field)	00095	481		Report	umhos/cm	In-situ	Quarterly	1	FDEP	Peristaltic Pump	N
Strontium, Total Recoverable	01084	1090		Report	ug/L	Grab	Quarterly	0.1	EPA 200.7	Peristaltic Pump	N
Sulfate	00945	42.2		Report	mg/L	Grab	Quarterly	2.5	EPA 300	Peristaltic Pump	N
Temperature	00010	25.3		Report	°C	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Total Dissolved Solids	70295	292		Report	mg/L	Grab	Quarterly	10	SM 2540C	Peristaltic Pump	N
Total Organic Carbon	00680	1.5		Report	mg/L	Grab	Quarterly	0.50	SM 5310B	Peristaltic Pump	N
Total Suspended Solids	00530	1.0	U	Report	mg/L	Grab	Quarterly	1.0	SM 2540D	Peristaltic Pump	N
Turbidity	00070	0.1	U	Report	NTU	In-situ	Quarterly	0.1	FDEP	Peristaltic Pump	N
Vanadium, Total Recoverable	01128	1	U	Report	ug/L	Grab	Quarterly	1	EPA 200.7	Peristaltic Pump	N
Zinc, Total Recoverable	01094	1	U	Report	ug/L	Grab	Quarterly	1	FDEP	Peristaltic Pump	N

COMMENTS AND EXPLANATION (Reference all attachments here):

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO.	DATE (mm/dd/yyyy)
Joe Shaw/Plant Manager	Joe Shaw	352-393-6240	12/11/2013

LIST OF TABLES

CHAPTER 7 - ECONOMIC AND SOCIAL EFFECTS OF CONSTRUCTION AND OPERATION

LIST OF FIGURES

Table A2-1 Cultural Resources Survey Data Sources

Maps	Description
1850	Township 8 South, Range 19 East, Section Survey by A.M. Randolph. On file, Florida Bureau of State Lands, Tallahassee.
1966	Gainesville East, Florida. USGS Quadrangle sheet, 7½' Series, 1:24,000.
1966	Gainesville West, Florida. USGS Quadrangle sheet, 7½' Series, 1:24,000.
1966	Monteocha, Florida. USGS Quadrangle sheet, 7½' Series, 1:24,000.
1966	Alachua, Florida. USGS Quadrangle sheet, 7½' Series, 1:24,000.
Aerial Photographs	
1938	USDA IT 10136, 1" = 2640", index prints on file at Florida Department of Transportation, Tallahassee.
1949	USDA IT 442-49, 1" - 5280", contact prints on file at Florida Department of Transportation, Tallahassee.
1961	USDA IT C55-3-61-OC, 1:20,000, contact prints on file at Florida Department of Transportation, Tallahassee.
1974	A20-12001, 1:20,000, contact prints available from Florida Department of Revenue, Tallahassee.
1974	A20-12001, 1:4800, blue line prints available at Alachua County courthouse.

Interviews: Mr. R.W. Cellon, Hague
Mr. S.L. Rogers, Sr., Alachua
Mr. J.F. Parrish, Alachua
Mr. Dolphus Harrell, Hague
Mr. J.F. Griffis, Hague
Mr. Jerald Evans, Florida State Museum
Mr. Gerald T. Milanich, Florida State Museum
Dr. Charles H. Fairbanks, University of Florida, Department of Anthropology
Mr. George W. Percy, Florida Division of Archives, History and Records
Mr. J. Rodney Little, Florida Division of Archives, History and Records

Table A2-1 Cultural Resources Survey Data Sources

Documents	Alachua County
No Date	Alachua County Deed Book, No. 74, p. 408.
1899	Alachua County Tax Rolls, 1899.
1905	Alachua County Tax Rolls, 1905.
1909	Alachua County Tax Rolls, 1909.
1911	Alachua County Tax Rolls, 1911.
1925	Alachua County Tax Rolls, 1925.
1940	Alachua County Tax Rolls, 1940.
1945	Alachua County Tax Rolls, 1945.
	State of Florida
No Date	Tract Book, Vol. 16, Records of the Internal Improvement Fund, Bureau of State Lands, Tallahassee.
No Date	Deed Book E, p. 769, Records of the Internal Improvement Fund, Bureau of State Lands, Tallahassee.
No. Date	Records of Railroads Deeds, Records of the Internal Improvement Fund, Tallahassee.
1850	Surveyor's Field Notes, Township 8 South, Range 19 East, Records of the Internal Improvement Fund, Tallahassee.

Publications

Johnson, Dudley Sady - 1965 "The Railroads of Florida, 1865-1900," Dissertation on file, R.M. Strozier Library, Florida State University, Tallahassee.

Mueller, James W. - 1974 "The Use of Sampling in Archaeology," Memoirs of the Society for American Archaeology, No. 28. American Antiquity, Vol. 39, No. 2, Pt. 2.

Soil Conservation Service - 1954 Soil Survey, Alachua County, Florida, Series 1940, No. 10, Issued February, 1954. U.S. Department of Agriculture.

Table A2-2 Metals concentrations (mg/l) in Turkey, Cellon and Rocky Creek waters.

STATION	DATE	AL	AS	CD	CN	CR	CRHEX	CU
RC-4	082776	0.90	0.030	0.000	0.02	0.00	.	0.003
RC-5	082776	0.95	0.004	0.000	0.02	0.00	.	0.003
RC-6	082776	0.95	0.004	0.000	0.02	0.00	.	0.003
RC-7	083076	1.03	0.008	0.000	0.02	0.00	.	0.004
RC-8	083076	0.52	0.015	0.000	0.02	0.00	.	0.002
RC-15	083176	0.87	0.001	0.001	0.02	0.01	.	0.003
RC-16	083176	0.00	0.000	0.000	0.02	0.00	.	0.003
*****		.	.	.	.	.	.	.
CP-3	082576	1.60	0.065	0.001	0.00	0.00	0	0.007
CP-4	082676	0.14	0.058	0.001	0.00	0.00	0	0.005
CP-5	082576	0.61	0.118	0.024	0.00	0.01	0	0.014
CP-8	082576	0.58	0.057	0.015	0.00	0.01	0	0.004
CP-13	082676	1.94	0.119	0.011	0.00	0.01	0	0.004
*****		.	.	.	.	.	.	.
DH-1	082576	0.45	0.153	0.001	0.00	0.01	0	0.018
DH-1	090976	7.50	0.046	0.012	0.00	0.68	.	2.200
DH-6	090976	0.16	0.036	0.001	0.00	0.00	.	0.003
DH-7	090976	0.24	0.000	0.001	0.00	0.00	.	0.003
DH-8	090976	0.36	0.014	0.000	0.00	0.00	.	0.003
DH-9	090976	0.34	0.014	0.000	0.00	0.00	.	0.003

STATION	FE	PB	MN	HG	MO	NI	ZN
RC-4	1.01	0.02	0.01	0.00020	0.0	0.00	0.079
RC-5	1.02	0.06	0.02	0.00048	0.0	0.00	0.265
RC-6	1.02	0.06	0.02	0.00048	0.0	0.00	0.265
RC-7	1.24	0.01	0.12	0.00024	0.0	0.00	0.085
RC-8	0.65	0.02	0.17	0.00080	0.0	0.00	0.272
RC-15	4.49	0.02	0.03	0.00060	0.1	0.01	0.310
RC-16	0.29	0.02	0.01	0.00072	0.0	0.00	0.332
*****	.	.	.	.	.	.	.
CP-3	0.51	0.01	0.08	0.00044	0.0	0.00	0.041
CP-4	0.73	0.01	0.13	0.00070	0.0	0.00	0.277
CP-5	0.19	0.05	0.03	0.00060	0.0	0.03	0.031
CP-8	0.59	0.02	0.01	0.00050	0.0	0.02	0.023
CP-13	0.98	0.03	0.04	0.00056	0.0	0.02	0.119
*****	.	.	.	.	.	.	.
DH-1	2.17	0.05	0.11	0.00040	0.0	0.01	0.042
DH-1	1030.00	0.31	4.01	0.00090	0.0	54.80	1.440
DH-6	0.50	0.03	0.02	0.00080	0.0	0.01	0.110
DH-7	0.78	0.13	0.02	0.00088	0.0	0.01	0.170
DH-8	0.10	0.01	0.03	0.00084	0.0	0.01	0.057
DH-9	0.10	0.01	0.02	0.00080	0.0	0.01	0.036

Table A2-2 (continued) Metals concentrations (mg/l) in Mulatto Pen Branch waters.

STATION	DATE	AL	CD	CR	CRHEX	CU	FE	PB
RC-20	010577	0.59	< 0.001	< 0.01	< 0.01	0.003	0.38	< 0.01
RC-21	010577	0.63	< 0.001	< 0.01	< 0.01	0.003	0.40	< 0.01
RC-23	010577	1.12	< 0.001	< 0.01	< 0.01	0.003	0.46	< 0.01
RC-24	010577	1.09	< 0.001	< 0.01	< 0.01	0.003	0.32	< 0.01

STATION	DATE	MN	HG	MO	NI	ZN
RC-20	010577	0.01	0.00027	< 0.01	< 0.01	0.338
RC-21	010577	0.02	0.00034	< 0.01	< 0.01	0.790
RC-23	010577	0.10	0.00024	< 0.01	< 0.01	0.215
RC-24	010577	0.01	0.00020	< 0.01	< 0.01	0.174

Table A2-3. Nutrient, sulfate, sulfide, free mineral acidity and total organic carbon (mg/l) in Turkey, Cellon and Rocky Creek waters.

STATION	DATE	AMMONIA	KJNITRO	NITRATE	TOTPHOS	ORTOPHOS
RC-4	082776	0.00	1.240	0.00	0.09	0.06
RC-5	082776	0.00	1.030	0.01	0.12	0.10
RC-6	082776	0.05	1.180	0.00	0.19	0.15
RL-7	083076	0.08	1.260	0.00	0.19	0.13
RC-8	083076	0.05	2.590	0.16	0.38	0.25
RC-15	083176	0.38	1.120	0.12	0.69	0.49
RC-16	083176	0.00	0.750	0.22	0.43	0.25
.....		.	.	.	.	.
CP-3	082576	0.40	2.770	0.00	1.22	0.52
CP-4	082676	0.45	4.560	3.95	3.94	0.28
CP-5	082576	0.10	3.290	10.52	1.50	0.68
CP-6	082576	0.05	2.380	12.82	0.84	0.59
CP-13	082676	0.10	2.830	16.16	1.28	0.78
.....		.	.	.	.	.
DH-1	082576	0.02	0.674	0.25	0.35	0.32
DH-1	090976	0.00	0.240	0.03	0.79	0.58
DH-6	090976	0.00	0.660	0.01	0.05	0.02
DH-7	090976	0.00	0.660	0.00	0.05	0.02
DH-8	090576	0.03	0.560	0.09	0.09	0.05
DH-9	090976	0.00	0.600	0.09	0.24	0.20

STATION	SO4	SULFIDE	FMA	TOC
RC-4	24.00	0	0	58
RC-5	26.40	0	0	50
RC-6	31.20	.	0	51
RL-7	38.40	0	0	80
RC-8	45.60	0	0	47
RC-15	16.80	0	0	28
RC-16	28.80	0	0	14
.....	.	.	.	.
CP-3	37.80	0	0	46
CP-4	9.24	0	0	35
CP-5	306.00	0	0	12
CP-6	357.00	0	0	10
CP-13	481.00	0	0	9
.....	.	.	.	.
DH-1	460.00	0	0	5
DH-1	3941.00	0	1643	94
DH-6	208.93	0	0	14
DH-7	192.12	0	0	16
DH-6	198.60	0	0	25
DH-9	120.30	0	0	27

Note: Hydrogen sulfide reported elsewhere for extended collections downstream of Deerhaven on-site swamp.

Table A2-3 (continued) Nutrient, sulfate, sulfide, free mineral acidity and total organic carbon (mg/l) in Mulatto Pen Branch waters.

STATION	DATE	AMMONIA	KJNITRO	NITRATE	TOTPHOS	ORTOPHOS	SO4
RC-20	010577	0.61	2.250	0.03	0.43	0.29	14.00
RC-21	010577	0.27	2.370	0.12	0.35	0.29	22.00
RC-23	010577	0.46	6.660	0.02	0.83	0.63	16.00
RC-24	010577	0.13	2.040	< 0.01	0.08	0.08	8.00

STATION	DATE	SULFIDE	FMA	TOC
RC-20	010577	< 0.01	0	25
RC-21	010577	< 0.01	0	12
RC-23	010577	< 0.01	0	44
RC-24	010577	< 0.01	0	38

Table A2-4 Other physical and chemical parameter concentrations in Turkey, Cellon and Rocky Creek waters (concentrations in mg/l except where noted).

STATION	DATE	MG	CA	ALKAL (mg/l $CaCO_3$)	HARDNESS (EDTA)	TDS	COLOR (pt-cb)	TURBITY (NTU)	CHLORIDE	FLUORIDE
RC-4	082776	2.59	6.25	0.0	26.3	151	40	0.71	12.0	0.045
RC-5	082776	2.71	7.81	5.0	34.8	137	36	1.00	12.0	0.060
RC-6	082776	2.71	7.81	6.0	30.7	154	28	1.30	12.0	0.078
RC-7	083076	2.67	10.94	6.0	38.3	164	40	2.90	11.0	0.072
RC-8	083076	3.84	12.50	21.5	48.0	127	24	1.00	12.0	0.260
RC-15	083176	3.57	12.45	20.0	46.0	.	32	13.00	16.5	0.170
RC-16	083176	3.07	14.06	16.0	50.4	.	10	10.00	11.0	0.170
.....		.	.	.	.	.	.	.	.	.
CP-3	082576	0.67	10.00	0.0	28.6	163	16	17.00	23.0	0.240
CP-4	082676	7.00	43.75	123.0	138.0	298	7	25.00	30.0	0.230
CP-5	082576	4.30	26.56	196.0	84.0	883	8	15.00	37.0	0.290
CP-8	082576	9.42	45.31	249.0	152.0	1006	2	2.80	39.0	0.350
CP-13	082676	5.52	40.03	278.0	124.0	1305	6	2.10	52.0	0.340
.....		.	.	.	.	.	.	.	.	.
DH-1	082576	73.50	117.20	23.0	480.0	902	0	24.00	27.0	0.830
DH-1	090976	303.00	143.20	0.0	1693.0	.	75	1800.00	13.8	0.450
DH-6	090976	21.50	64.50	37.5	250.0	.	32	0.70	18.5	0.490
DH-7	090976	21.72	62.50	42.0	240.0	.	28	0.75	27.5	0.470
DH-8	090976	18.92	50.69	47.5	232.0	.	64	1.00	4.5	0.460
DH-9	090976	12.47	41.77	37.5	152.0	.	64	2.30	15.0	0.350

STATION	NA.	K	CONDUCT (µmhos/cm)	PH	TOD	BOD5	COD
RC-4	5.10	0.23	63	4.40	7.95	.	111
RC-5	4.90	0.34	70	5.20	8.10	.	294
RC-6	5.10	0.34	72	5.20	8.30	.	188
RC-7	5.31	0.69	81	5.00	5.30	.	171
RC-8	4.90	0.57	99	5.60	7.15	.	129
RC-15	6.60	4.49	72	5.50	5.60	.	67
RC-16	5.29	1.83	80	5.80	6.50	.	6
.....	.	.	.	.	.	.	.
CP-3	5.88	6.17	180	5.00	9.10	4	129
CP-4	8.82	21.72	369	6.90	8.35	10	110
CP-5	225.00	16.00	1100	7.30	8.65	6	59
CP-8	241.00	14.86	1500	7.80	9.10	5	39
CP-13	334.00	26.29	1590	7.30	9.20	6	37
.....	.	.	.	.	.	.	.
DH-1	12.90	25.15	800	7.10	8.90	2	61
DH-1	157.00	41.25	4700	2.80	7.05	.	246
DH-6	18.76	1.38	500	6.10	3.50	.	59
DH-7	18.05	1.72	495	6.15	3.50	.	55
DH-8	18.43	1.10	500	6.40	6.70	.	65
DH-9	12.73	1.79	342	6.70	7.45	.	87

Table A2-4 (Continued) Other physical and chemical parameter concentrations in Mulatto Pen Branch (m/l except where otherwise noted).

STATION	DATE	MG	CA	ALKAL (mg/l $CaCO_3$)	HARDNESS (EDTA)	TDS	COLOR (Pt. - Cb)
RC-20	010577	3.87	10.23	3.5	42.4	90	500+
RC-21	010577	4.16	11.36	7.5	46.4	94	500+
RC-23	010577	3.78	7.95	0.0	32.7	108	500+
RC-24	010577	2.66	2.76	0.0	21.8	66	500+

STATION	DATE	TURBIDITY (NTU)	CHLORIDE	FLUORIDE	AS	NA	K	CN
RC-20	010577	2.40	24.0	0.135	0.0006	8.70	4.95	< 0.001
RC-21	010577	2.90	25.0	0.151	0.0005	8.35	5.01	< 0.001
RC-23	010577	1.50	28.0	0.331	0.0003	11.30	3.72	< 0.001
RC-24	010577	3.20	16.0	0.081	0.0003	6.26	0.28	< 0.001

STATION	DATE	CONDUCT (μmhos/cm)	PH	TOD (@ 20°C)	BOD5	COD
RC-20	010577	123	5.40	8.86	8	65
RC-21	010577	132	5.80	6.90	4	37
RC-23	010577	140	3.90	6.85	8	133
RC-24	010577	93	3.90	9.00	5	90

Table A2-5 Oil and grease, phenols and detergent concentrations (mg/l) in Turkey, Cellon and Rocky Creek waters.

STATION	DATE	OILGRES	PHENOLS	DETRGNT
RC-4	082776	2.8	0.000	0.076
RC-5	082776	1.2	0.000	0.068
RC-6	082776	.	0.000	0.084
RC-7	083076	0.4	0.000	0.062
RC-8	083076	0.8	0.000	0.057
RC-15	083176	1.2	0.000	0.057
RC-16	083176	0.9	0.000	0.030
.....		.	.	.
CP-3	082576	0.1	0.000	0.005
CP-4	082676	0.7	0.000	0.016
CP-5	082576	0.4	0.000	0.073
CP-8	082576	1.0	0.000	0.065
CP-13	082676	4.6	0.003	0.014
.....		.	.	.
DH-1	082576	0.3	0.001	0.019
DH-1	090976	3.4	0.000	0.006
DH-6	090976	3.4	0.002	0.006
DH-7	090976	3.8	0.009	0.006
DH-8	090976	1.6	0.004	0.078
DH-9	090976	2.4	0.002	0.065

Table A2-5 Oil and grease, phenols and detergent concentrations (mg/l) in Mulatto Pen Branch waters.

STATION	DATE	OILGRES	PHENOLS	DETRGNT
RC-20	010577	2.8	0.010	0.002
RC-21	010577	1.8	0.010	0.002
RC-23	010577	0.8	0.010	0.005
RC-24	010577	0.6	0.010	0.002

Table A2-6 Sediment metals, sulfate and sulfide concentrations in Turkey, Cellon and Rocky Creeks. (mg/l)

STATION	DATE	SULFATE	SULFIDE	NICKEL	CADMIUM	LEAD	MOIST
CP-3	82576	63.40	2.89	1.49	0.070	6.97	12.5
CP-5	82576	38.10	10.63	8.16	4.420	4.45	13.4
CP-5	100176	68.10	6.00	3.51	1.730	3.28	12.9
CP-8	82576	847.70	1.64	0.73	0.250	1.09	9.4
CP-11	90976	684.60	6.00	26.13	7.190	4.33	37.7
CP-11	92476	57.30	36.60	3.45	1.130	3.45	.
CP-13	82676	26.30	0.00	10.26	6.250	4.40	11.8
CP-20	92376	161.80	48.60	5.59	5.490	3.35	.
.....	.	.	.	.	.	.	.
RC-4	82776	80.80	0.00	0.42	0.062	0.64	9.2
RC-5	82776	7.20	0.00	0.45	0.065	0.67	19.6
RC-5	82776	41.10	2.00	0.44	0.064	0.66	15.5
RC-5	100176	7.40	0.00	1.81	0.076	4.51	31.8
RC-6	83076	7.00	0.00	0.42	0.061	5.27	57.9
RC-6	100176	14.70	12.00	0.91	0.078	2.31	22.6
RC-7	83076	13.20	2.90	0.41	0.062	0.63	76.4
RC-7	93076	7.80	10.00	3.52	0.248	6.57	70.0
RC-8	100176	12.60	4.00	0.55	0.078	2.29	21.3
RC-8	83076	38.10	2.00	0.42	0.061	0.62	11.7
RC-12	83076	63.80	4.00	0.46	0.067	0.70	13.8
RC-15	83176	185.90	4.00	1.22	0.112	0.03	21.2
RC-16	83176	103.40	0.00	1.11	0.111	0.08	25.3

Table A2-6 (Continued)

DH-2	90976	443.30	.	62.22	0.109	2.18	9.9
DH-2	93076	13.90	0.00	45.35	0.077	4.52	15.6
DH-3	90976	1325.80	.	239.56	0.118	14.18	71.2
DH-3	93076	126.60	10.00	438.70	0.252	18.97	66.8
DH-4	90976	557.80	.	22.60	0.115	4.58	70.7
DH-4	93076	92.30	17.00	20.12	0.128	6.84	75.6
DH-5	90976	304.10	.	24.10	0.113	4.50	78.6
DH-5	93076	223.60	135.00	30.23	0.118	4.19	83.0
DH-5A	90976	595.60	.	26.41	0.115	4.59	77.0
DH-5A	93076	30.84	64.00	3.63	0.077	4.07	82.8
DH-5B	90976	250.40	.	34.49	0.108	4.34	83.1
DH-5B	93076	50.60	68.00	4.49	0.126	4.47	71.9
DH-5C	90976	620.60	.	36.66	0.113	4.54	80.2
DH-5C	93076	15.40	52.00	7.31	0.129	4.55	80.8
DH-17	93076	7.40	37.00	1.75	0.074	4.37	81.3
DH-6	93076	40.30	231.00	1.82	0.077	2.27	27.0
DH-7	93076	14.90	191.00	3.65	0.077	3.41	37.6
DH-8	90976	21.30	87.00	2.49	0.273	3.41	13.0
DH-8	93076	32.60	8.00	1.71	0.120	4.27	17.5
DH-9	90976	94.50	2.00	0.60	0.109	2.19	12.3
DH-9	93076	23.60	2.00	0.90	0.076	2.25	16.1
SF-A1	80176	248.00	8.44	.	.	.	.
SF-A2	80176	139.00	2.08	.	.	.	.
SF-B	80176	127.00	5.05	.	.	.	.
SF-C	80176	172.00	3.17	.	.	.	.
SF-D	80176	154.00	2.01	.	.	.	.
SF-E	80176	264.00	3.16	.	.	.	.
SF-F	80176	472.00	5.74	.	.	.	.
SF-G	80176	319.00	4.81	.	.	.	.
SF-H	80176	185.00	4.81	.	.	.	.
SFCOR	81076	202.00	15.53	.	.	.	.

Table A2-7 Sulfide concentrations (mg/l) immediately downstream of the Deerhaven on-site swamp and in Cellon and Rocky Creeks.

STATION	DATE	SULFIDE	PH	CONDUCT
RC-4	082776	0.0	4.40	63
RC-5	082776	0.0	5.20	70
RC-6	082776	.	5.20	72
RC-7	092176	0.0	.	.
RC-7	083076	0.0	5.00	81
RC-8	083076	0.0	5.60	99
RC-15	083176	0.0	5.50	72
RC-16	083176	0.0	5.80	80
.....		.	.	.
CP-3	082576	0.0	5.00	180
CP-4	082676	0.0	6.90	369
CP-5	082576	0.0	7.30	1100
CP-8	082576	0.0	7.80	1500
CP-13	082676	0.0	7.30	1590
.....		.	.	.
DH-1	082576	0.0	7.10	800
DH-1	090976	0.0	2.80	4700
DH-1	091576	0.0	.	.
DH-1	091876	0.0	.	.
DH-2	093076	0.0	.	.
DH-3	093076	0.0	.	.
DH-4	093076	0.0	.	.
DH-5	093076	0.3	.	.
DH-5A	093076	0.0	.	.
DH-5B	093076	0.1	.	.
DH-5C	093076	0.3	.	.
DH-17	091576	6.3	.	.
DH-17	091876	8.0	.	.
DH-17	092276	2.4	.	.
DH-17	100176	9.5	.	.
DH-17	100476	9.5	.	.
DH-17	100676	9.5	.	.
DH-17	100876	11.0	.	.
DH-17	101176	7.5	.	.
DH-17	101376	6.5	.	.
DH-17	101876	0.8	.	.
DH-6	090976	0.0	6.10	500
DH-6	091576	2.4	.	.
DH-6	091876	2.7	.	.
DH-6	092276	0.4	.	.
DH-6	100176	3.0	.	.
DH-6	100476	2.0	.	.
DH-6	100676	1.4	.	.
DH-6	100876	1.7	.	.
DH-6	101176	2.4	.	.
DH-6	101376	1.0	.	.
DH-6	101876	0.2	.	.
DH-7	090976	0.0	6.15	495
DH-7	091576	0.3	.	.
DH-7	091876	0.4	.	.
DH-7	092276	0.0	.	.
DH-7	100176	0.6	.	.
DH-7	100476	0.1	.	.
DH-7	100676	0.1	.	.
DH-7	100876	0.0	.	.
DH-7	101176	0.1	.	.
DH-7	101376	0	.	.
DH-7	101876	0	.	.
DH-8	090976	0	6.4	500
DH-8	091576	0	.	.
DH-8	091876	0	.	.
DH-8	100176	0	.	.
DH-8	100476	0	.	.
DH-8	100676	0	.	.
DH-8	100876	0	.	.
DH-8	101176	0	.	.
DH-8	101376	0	.	.
DH-8	101876	0	.	.
DH-9	090976	0	6.7	342
DH-9	090976	0	.	.
DH-9	091576	0	.	.
DH-9	091876	0	.	.
DH-9	100176	0	.	.
DH-9	100476	0	.	.
DH-9	100676	0	.	.

Table A2-8 Pesticide and herbicide concentrations in Turkey, Cellon and Rocky Creeks.

Compound	Concentrations (mg/l) *
Aldrin	<0.01
Chlordane	<0.03
DDT	<0.05
DDE	<0.05
Dieldrin	<0.01
Endrin	<0.002
Heptachlor	<0.001
Heptachlor Epoxide	<0.001
Lindane	<0.04
Toxaphene	<0.05
2,4 D (Acid)	<0.1
2,4,5 TP (Silvex)	<0.1
Chloroform	<0.1
Other Chlorinated Hydrocarbons	ND **

* All Stations
** Not Detected

Table A2-9 Sediment pesticide and herbicide concentrations in Turkey, Cellon and Rocky Creeks

Parameter	Concentration (ppm) *
Aldrin	<0.01
Chlordane	<0.03
DDT	<0.05
DDE	<0.05
Dieldrin	<0.01
Endrin	<0.002
Heptachlor	<0.001
Heptachlor Epoxide	<0.001
Lindane	<0.04
Toxaphene	<0.05
2,4 D (Acid)	<0.1
2,4,5 TP (Silvex)	<0.1
Chloroform	<0.1
Other Chlorinated Hydrocarbons	ND **

* All Stations
** Not Detected

PERTINANT DATA FOR TABLES A2-10 THRU A2-47

WATER QUALITY

DUNCAN'S NEW MULTIPLE RANGE TEST

Station Grouping Used for Duncan's Multiple Range Test

Group	Stream Segment Description	Included Stations
D	Cellon Creek upstream of battery plant.	CP-3 and CP-4
E	Cellon Creek downstream of battery plant.	CP-5, CP-8 and CP-13
F	Upper half of Rocky Creek basin.	RC-4, RC-5, RC-6 and RC-7
G	Lower half of Rocky Creek basin.	RC-8, RC-15 and RC-16
J	Deerhaven outfall to site main entrance road.	DH-1, DH-6 and DH-7
K	Deerhaven site boundary to Turkey Creek connection.	DH-8 and DH-9

<u>Contents</u>

Note: The following parameters were not significantly different for any of the station groupings (Tables A2-10 through A2-17).

Table A2-35 Duncan's new multiple range test for nitrates.

Table A2-36 Duncan's new multiple range test for hardness.

Table A2-37 Duncan's new multiple range test for magnesium.

Table A2-38 Duncan's new multiple range test for calcium.

Note: The following parameters were not significantly greater for stream segments not receiving industrial discharge (Tables A2-31 and A2-38).

Table A2-39 Duncan's new multiple range test for ammonia.

Table A2-40 Duncan's new multiple range test for total Kjeldahl nitrogen.

Table A2-41 Duncan's new multiple range test for iron.

Table A2-42 Duncan's new multiple range test for manganese.

Table A2-43 Duncan's new multiple range test for molybdenum.

Table A2-44 Duncan's new multiple range test for zinc.

Table A2-45 Duncan's new multiple range test for chemical oxygen demand (COD).

Table A2-46 Duncan's new multiple range test for detergents.

Others:

Table A2-47 Duncan's new multiple range test for total dissolved oxygen.

Table A2-10 Duncan's new multiple range test for aluminum.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=0.27

GROUPING	MEAN	N	GRP	Included Stations
A	1.043333	3	E	CP-5, CP-8, CP-13
A	0.970000	2	D	CP-3, CP-4
A	0.957500	4	F	RC-4, RC-5, RC-6, RC-7
A	0.463333	3	G	RC-8, RC-15, RC-16
A	0.360000	2	K	DH-8, DH-9
A	0.283333	3	J	DH-1, DH-6, DH-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-11 Duncan's new multiple range test for copper.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=28000E-8

GROUPING	MEAN	N	GRP	Included Stations
A	0.008000	3	J	DH-1, DH-6, DH-7
A				
A	0.007333	3	E	CP-5, CP-8, CP-13
A				
A	0.006000	2	D	CP-3, CP-4
A				
A	0.003250	4	F	RC-4, RC-5, RC-6, RC-7
A				
A	0.003000	2	K	DH-8, DH-9
A				
A	0.002667	3	G	RC-8, RC-15, RC-16

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-12 Duncan's new multiple range test for mercury.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=0.0028

GROUPING	MEAN	N	GRP	Included Stations
A	0.000820	2	K	DH-8, DH-9
A	0.000707	3	G	RC-8, RC-15, RC-16
A	0.000693	3	J	DH-1, DH-6, DH-7
A	0.000570	2	D	CP-3, CP-4
A	0.000553	3	E	CP-5, CP-8, CP-13
A	0.000350	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-13 Duncan's new multiple range test for lead.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=1.16

GROUPING	MEAN	N	GRP	Included Stations
A	0.070000	3	J	DH-1, DH-6, DH-7
A	0.037500	4	F	RC-4, RC-5, RC-6, RC-7
A	0.033333	3	E	CP-5, CP-8, CP-13
A	0.020000	3	G	RC-8, RC-15, RC-16
A	0.010000	2	D	CP-3, CP-4
A	0.010000	2	K	DH-8, DH-9

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-14 Duncan's new multiple range test for nickel.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=61000E-8

GROUPING	MEAN	N	GRP	Included Stations
A	0.023333	3	E	CP-5, CP-8, CP-13
A	0.010000	3	J	DH-1, DH-6, DH-7
A	0.010000	2	K	DH-8, DH-9
A	0.003333	3	G	RC-8, RC-15, RC-16
A	0.000000	4	F	RC-4, RC-5, RC-6, RC-7
A	0.000000	2	D	CP-3, CP-4

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-15 Duncan's new multiple range test for potassium.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=633.76

GROUPING	MEAN	N	GRP	Included Stations
A	19.050000	3	E	CP-5, CP-8, CP-13
A				
A	13.945000	2	O	CP-3, CP-4
A				
A	9.416667	3	J	DH-1, DH-6, DH-7
A				
A	2.296667	3	G	RC-8, RC-15, RC-16
A				
A	1.445000	2	K	DH-8, DH-9
A				
A	0.400000	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-14 Duncan's new multiple range test for nickel.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=61000E-8

GROUPING	MEAN	N	GRP	Included Stations
A	0.023333	3	E	CP-5, CP-8, CP-13
A	0.010000	3	J	DH-1, DH-6, DH-7
A	0.010000	2	K	DH-8, DH-9
A	0.003333	3	G	RC-8, RC-15, RC-16
A	0.000000	4	F	RC-4, RC-5, RC-6, RC-7
A	0.000000	2	D	CP-3, CP-4

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-15 Duncan's new multiple range test for potassium.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=633.76

GROUPING	MEAN	N	GRP	Included Stations
A	19.050000	3	E	CP-5, CP-8, CP-13
A	13.945000	2	O	CP-3, CP-4
A	9.416667	3	J	DH-1, DH-6, DH-7
A	2.296667	3	G	RC-8, RC-15, RC-16
A	1.445000	2	K	DH-8, DH-9
A	0.400000	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-16 Duncan's new multiple range test for total phosphorus.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=2.18

GROUPING	MEAN	N	GRP	Included Stations
A	2.580000	2	D	CP-3, CP-4
A	1.206667	3	E	CP-5, CP-8, CP-13
A	0.500000	3	G	RC-8, RC-15, RC-16
A	0.165000	2	K	DH-8, DH-9
A	0.150000	3	J	DH-1, DH-6, DH-7
A	0.147500	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-17 Duncan's new multiple range test for ortho-phosphorus.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=0.37

GROUPING	MEAN	N	GRP	Included Station
A	0.683333	3	E	CP-5, CP-8, CP-13
A	0.400000	2	D	CP-3, CP-4
A	0.330000	3	G	RC-8, RC-15, RC-16
A	0.125000	2	K	DH-8, DH-9
A	0.120000	3	J	DH-1, DH-6, DH-7
A	0.110000	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-18 Duncan's new multiple range test for fluoride.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=25.58

GROUPING	MEAN	N	GRP	Included Stations
A	0.596667	3	J	DH-1, DH-6, DH-7
A	0.405000	2	K	DH-8, DH-9
A	0.326667	3	E	CP-5, CP-8, CP-13
A	0.235000	2	D	CP-3, CP-4
A	0.200000	3	G	RC-8, RC-15, RC-16
A	0.063750	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-19 Duncan's new multiple range test for total organic carbon.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=5930.87

GROUPING	MEAN	N	GRP	Included Stations
A	59.750000	4	F	RC-4, RC-5, RC-6, RC-7
A				
A	40.500000	2	D	CP-3, CP-4
A				
A	29.666667	3	G	RC-8, RC-15, RC-16
A				
A	26.000000	2	K	DH-8, DH-9
A				
A	11.666667	3	J	DH-1, DH-6, DH-7
A				
A	10.333333	3	E	CP-5, CP-8, CP-13

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-20 Duncan's new multiple range test for color.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=4407.01

GROUPING	MEAN	N	GRP	Included Stations
A	64.000000	2	K	DH-8, DH-9
A	36.000000	4	F	RC-4, RC-5, RC-6, RC-7
A	22.000000	3	G	RC-8, RC-15, RC-16
A	20.000000	3	J	DH-1, DH-6, DH-7
A	11.500000	2	D	CP-3, CP-4
A	5.333333	3	E	CP-5, CP-8, CP-13

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-21 Duncan's new multiple range test for turbidity.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=91.92

GROUPING	MEAN	N	GRP	Included Stations
A	21.000000	2	D	CP-3, CP-4
A				
A	8.483333	3	J	DH-1, DH-6, DH-7
A				
A	8.000000	3	G	RC-8, RC-15, RC-16
A				
A	6.633333	3	E	CP-5, CP-8, CP-13
A				
A	1.650000	2	K	DH-8, DH-9
A				
A	1.477500	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-22 Duncan's new multiple range test for pH.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=20725

GROUPING	MEAN	N	GRP	Included Stations
A	7.466667	3	E	CP-5, CP-8, CP-13
A	6.550000	2	K	DH-8, DH-9
A	6.450000	3	J	DH-1, DH-6, DH-7
A	5.950000	2	D	CP-3, CP-4
A	5.633333	3	G	RC-8, RC-15, RC-16
A	4.950000	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-23 Duncan's new multiple range test for phenols.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=2362.71

GROUPING	MEAN	N	GRP	Included Stations
A	0.004000	3	J	DH-1, DH-6, DH-7
A				
A	0.003000	2	K	DH-8, DH-9
A				
A	0.001000	3	E	CP-5, CP-8, CP-13
A				
A	0.000000	4	F	RC-4, RC-5, RC-6, RC-7
A				
A	0.000000	3	G	RC-8, RC-15, RC-16
A				
A	0.000000	2	D	CP-3, CP-4

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-24 Duncan's new multiple range test for oil and grease.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=3 MS=6.22

GROUPING	MEAN	N	GRP	Included Stations
A	2.500000	3	J	DH-1, DH-6, DH-7
A	2.000000	3	E	CP-5, CP-8, CP-13
A	2.000000	2	K	DH-8, DH-9
A	1.466667	3	F	RC-4, RC-5, RC-6, RC-7
A	0.966667	3	G	RC-8, RC-15, RC-16
A	0.400000	2	D	CP-3, CP-4

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-25 Duncan's new multiple range test for Biological Oxygen Demand (BOD).

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=6 MS=17281.7

GROUPING	MEAN	N	GRP	Included Stations
A	7.000000	2	D	CP-3, CP-4
A				
A	5.666667	3	E	CP-5, CP-8, CP-13
A				
A	2.000000	1	J	DH-1, DH-6, DH-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-26 Duncan's new multiple range test for conductivity.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=52.72

GROUPING	MEAN	N	GRP	Included Stations
A	1396.666667	3	E	CP-5, CP-8, CP-13
B	598.333333	3	J	DH-1, DH-6, DH-7
C	421.000000	2	K	DH-8, DH-9
D	274.500000	2	D	CP-3, CP-4
E	83.666667	3	G	RC-8, RC-15, RC-16
E E	71.500000	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-27 Duncan's new multiple range test for total dissolved solids.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=10 MS=2.12

GROUPING	MEAN	N	GRP	Included Stations
A	1064.666667	3	E	CP-5, CP-8, CP-13
B	902.000000	1	J	DH-1, DH-6, DH-7
C	230.500000	2	D	CP-3, CP-4
D	151.500000	4	F	RC-4, RC-5, RC-6, RC-7
E	127.000000	1	G	RC-8, RC-15, RC-16

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-28 Duncan's new multiple range test for sulfates.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=0.015

GROUPING	MEAN	N	GRP	Included Stations
A	381.333333	3	E	CP-5, CP-8, CP-13
B	287.016667	3	J	DH-1, DH-6, DH-7
C	159.450000	2	K	DH-8, DH-9
D	30.400000	3	G	RC-8, RC-15, RC-16
E	30.000000	4	F	RC-4, RC-5, RC-6, RC-7
F	23.520000	2	D	CP-3, CP-4

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-29 Duncan's new multiple range test for alkalinity.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=255.37

GROUPING		MEAN	N	GRP	Included Stations
	A	241.000000	3	E	CP-5, CP-8, CP-13
	B	61.500000	2	D	CP-3, CP-4
	B				
C	B	42.500000	2	K	DH-8, DH-9
C	B				
C	B	34.166667	3	J	DH-1, DH-6, DH-7
C					
C	D	19.166667	3	G	RC-8, RC-15, RC-16
	D				
	D	4.750000	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-30 Duncan's new multiple range test for arsenic.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=0.0015

GROUPING		MEAN	N	GRP	Included Stations
	A	0.098000	3	E	CP-5, CP-8, CP-13
B	A	0.063000	3	J	DH-1, DH-6, DH-7
B	A	0.061500	2	D	CP-3, CP-4
B		0.014000	2	K	DH-8, DH-9
B		0.013500	4	F	RC-4, RC-5, RC-6, RC-7
B		0.005333	3	G	RC-8, RC-15, RC-16

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-31 Duncan's new multiple range test for cadmium.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=8100E-9

GROUPING	MEAN	N	GRP	Included Stations
A	0.016667	3	E	CP-5, CP-8, CP-13
B	0.001000	3	J	DH-1, DH-6, DH-7
B	0.001000	2	D	CP-3, CP-4
B	0.000333	3	G	RC-8, RC-15, RC-16
B	0.000000	4	F	RC-4, RC-5, RC-6, RC-7
B	0.000000	2	K	DH-8, DH-9

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-32 Duncan's new multiple range test for chromium.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=12000E-9

GROUPING	MEAN	N	GRP	Included Stations
A	0.010000	3	E	CP-5, CP-8, CP-13
B	0.003333	3	G	RC-8, RC-15, RC-16
B				
B	0.003333	3	J	DH-1, DH-6, DH-7
B				
B	0.000000	2	D	CP-3, CP-4
B				
B	0.000000	4	F	RC-4, RC-5, RC-6, RC-7
B				
B	0.000000	2	K	DH-8, DH-9

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-33 Duncan's new multiple range test for chloride.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=52.74

GROUPING	MEAN	N	GRP	Included Stations
A	42.666667	3	E	CP-5, CP-8, CP-13
B	26.500000	2	D	CP-3, CP-4
B	24.333333	3	J	DH-1, DH-6, DH-7
B	13.166667	3	G	RC-8, RC-15, RC-16
B	11.750000	4	F	RC-4, RC-5, RC-6, RC-7
B	9.750000	2	K	DH-8, DH-9

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-34 Duncan's new multiple range test for sodium.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=0.0087

GROUPING	MEAN	N	GRP	Included Stations
A	266.666667	3	E	CP-5, CP-8, CP-13
B	16.570000	3	J	DH-1, DH-6, DH-7
C	15.580000	2	K	DH-8, DH-9
D	7.350000	2	D	CP-3, CP-4
F	5.596667	3	G	RC-8, RC-15, RC-16
F	5.102500	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-35 Duncan's new multiple range test for nitrates.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05   DF=11   MS=0.36

GROUPING	MEAN	N	GRP	Included Stations
A	13.166667	3	E	CP-5, CP-8, CP-13
B	1.975000	2	D	CP-3, CP-4
C	0.166667	3	G	RC-8, RC-15, RC-16
C	0.090000	2	K	DH-8, DH-9
C	0.086667	3	J	DH-1, DH-6, DH-7
C	0.002500	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-36 Duncan's new multiple range test for hardness.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=1029.14

GROUPING		MEAN	N	GRP	Included Stations
	A	323.333333	3	J	DH-1, DH-6, DH-7
	B	192.000000	2	K	DH-8, DH-9
	C	120.000000	3	E	CP-5, CP-8, CP-13
D	C	83.300000	2	D	CP-3, CP-4
D		48.133333	3	G	RC-8, RC-15, RC-16
D		32.525000	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-37 Duncan's new multiple range test for magnesium.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=115.39

GROUPING	MEAN	N	GRP	Included Stations
A	38.906667	3	J	DH-1, DH-6, DH-7
B	15.695000	2	K	DH-8, DH-9
B	6.413333	3	E	CP-5, CP-8, CP-13
B	3.935000	2	D	CP-3, CP-4
B	3.693333	3	G	RC-8, RC-15, RC-16
B	2.670000	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-38 Duncan's new multiple range test for calcium.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=168.09

GROUPING	MEAN	N	GRP	Included Stations
A	81.400000	3	J	DH-1, DH-6, DH-7
B	49.230000	2	K	DH-8, DH-9
B	37.500000	3	E	CP-5, CP-8, CP-13
C B	26.875000	2	D	CP-3, CP-4
C	13.003333	3	G	RC-8, RC-15, RC-16
C	8.202500	4	F	RC-4, RC-5, RC-6, RC-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-39 Duncan's new multiple range test for ammonia.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=0.007

GROUPING	MEAN	N	GRP	Included Stations
A	0.425000	2	D	CP-3, CP-4
B	0.143333	3	G	RC-8, RC-15, RC-16
B	0.083333	3	E	CP-5, CP-8, CP-13
B	0.032500	4	F	RC-4, RC-5, RC-6, RC-7
B	0.015000	2	K	DH-8, DH-9
B	0.006667	3	J	DH-1, DH-6, DH-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-40 Duncan's new multiple range test for total Kjeldahl nitrogen.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=0.0085

GROUPING	MEAN	N	GRP	Included Stations
A	3.665000	2	D	CP-3, CP-4
B	2.833333	3	E	CP-5, CP-8, CP-13
C	1.486667	3	G	RC-8, RC-15, RC-16
D	1.177500	4	F	RC-4, RC-5, RC-6, RC-7
E	0.664667	3	J	DH-1, DH-6, DH-7
E	0.580000	2	K	DH-8, DH-9

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-41 Duncan's new multiple range test for iron.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 OF=11 MS=20000E-9

GROUPING	MEAN	N	GRP	Included Stations
A	1.810000	3	G	RC-8, RC-15, RC-16
B	1.150000	3	J	DH-1, DH-6, DH-7
C	1.072500	4	F	RC-4, RC-5, RC-6, RC-7
D	0.620000	2	D	CP-3, CP-4
E	0.586667	3	E	CP-5, CP-8, CP-13
F	0.100000	2	K	DH-8, DH-9

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-42 Duncan's new multiple range test for manganese.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=74000E-8

GROUPING		MEAN	N	GRP	Included Stations
	A	0.105000	2	D	CP-8, CP-4
B	A	0.070000	3	G	RC-8, RC-15, RC-16
B	A	0.050000	3	J	DH-1, DH-6, DH-7
B		0.042500	4	F	RC-4, RC-5, RC-6, RC-7
B		0.026667	3	E	CP-5, CP-8, CP-13
B		0.025000	2	K	DH-8, DH-9

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-43 Duncan's new multiple range test for molybdenum.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=2000E-11

GROUPING	MEAN	N	GRP	Included Stations
A	0.033333	3	G	RC-8, RC-15, RC-16
B	0.000000	4	F	RC-4, RC-5, RC-6, RC-7
B	0.000000	2	D	CP-3, CP-4
B	0.000000	3	E	CP-5, CP-8, CP-13
B	0.000000	3	J	DH-1, DH-6, DH-7
B	0.000000	2	K	DH-8, DH-9

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-44 Duncan's new multiple range test for zinc.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=12000E-9

GROUPING	MEAN	N	GRP	Included Stations
A	0.304667	3	G	RC-8, RC-15, RC-16
B	0.173500	4	F	RC-4, RC-5, RC-6, RC-7
C	0.159000	2	D	CP-3, CP-4
D	0.107333	3	J	DH-1, DH-6, DH-7
E	0.057667	3	E	CP-5, CP-8, CP-13
F	0.046500	2	K	DH-8, DH-9

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-45 Duncan's new multiple range test for Chemical Oxygen Demand (COD).

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=2.49

GROUPING	MEAN	N	GRP	Included Stations
A	191.000000	4	F	RC-4, RC-5, RC-6, RC-7
B	119.500000	2	D	CP-3, CP-4
C	81.000000	2	K	DH-8, DH-9
D	67.333333	3	G	RC-8, RC-15, RC-16
E	58.333333	3	J	DH-1, DH-6, DH-7
F	45.000000	3	E	CP-5, CP-8, CP-13

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-46 Duncan's new multiple range test for detergents.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=4200E-9

GROUPING	MEAN	N	GRP	Included Stations
A	0.072500	4	F	RC-4, RC-5, RC-6, RC-7
A	0.071500	2	K	DH-8, DH-9
B	0.050667	3	E	CP-5, CP-8, CP-13
B	0.048000	3	G	RC-8, RC-15, RC-16
C	0.010500	2	D	CP-3, CP-4
C	0.010333	3	J	DH-1, DH-6, DH-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-47 Duncan's new multiple range test for total oxygen demand.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

ALPHA LEVEL=.05 DF=11 MS=0.28

GROUPING	MEAN	N	GRP	Included Stations
A	8.983333	3	E	CP-5, CP-8, CP-13
A	8.725000	2	D	CP-3, CP-4
B	7.412500	4	F	RC-4, RC-5, RC-6, RC-7
C B	7.075000	2	K	DH-8, DH-9
C	6.416667	3	G	RC-8, RC-15, RC-16
D	5.300000	3	J	DH-1, DH-6, DH-7

Note: See pages A-14 through A-16 for description of station grouping and other information.

Table A2-48 Benthic macroinvertebrates collected by Ekman grab from Turkey Creek.

Taxa	Beck's Biotic Index	Station Number No./m² DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
Nematoda	II			131		NONE COLLECTED	NONE COLLECTED			NONE COLLECTED
Oligochaeta	III		203	1103	6			83	6	
Hirudinea										
Helobdella sp.	III									
Placobdella sp.	II									
Amphipoda										
Hyalella azteca	II									
Isopoda										
Asellus sp.	I									
Decapoda										
Palaemonetes paludosus	II									
Procambarus sp.	II									
Ephemeroptera										
Caenis diminuta	III									
Stenonema sp.	I									
Odonata										
Aeschna sp.	V									
Agria sp.	I									
Agrion sp.	II									
Boyeria sp.	V							3		
Calopteryx sp.	II									
Chromagrion sp.	V									
Cordulegaster sp.	V									
Enallagma sp.	II								3	
Gomphus sp.	II									

Table A2-48 (Continued)

Turkey Creek - Ekman

Taxa	Beck's Biotic Index	Station Number No./m^2								
		DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
Odonata (Continued)						NONE COLLECTED	NONE COLLECTED			NONE COLLECTED
Hyponeura sp.	V									
Macromia sp.	I									
Pachydiplax longipennis	II									
Progomphus obscurus	I				14			14	19	
Somatochlora sp.	---									
Tauriphila sp.	V									
Tetragoneuria sp.	V									
Hemiptera										
Belostoma sp.	IV									
Gerris sp.	IV									
Notonecta sp.	IV									
Pelocoris sp.	IV									
Ranatra sp.	IV									
Trichocorixa sp.	IV									
Veliidae sp.	IV									
Plecoptera										
Acroneuria sp.	I									
Trichoptera										
Cheumatopsyche sp.	II							33		
Limnephilus sp.	V									
Oecetis sp.	II									
Phylocentropus sp.	V									
Megaloptera										
Corydalus cornutus	I									
Sialis sp.	V									

Table A2-48 (Continued) Turkey Creek - Ekman

Taxa	Beck's Biotic Index	Station Number No./m2								
		DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
Coleoptera						NONE COLLECTED	NONE COLLECTED			NONE COLLECTED
<u>Dineutus</u> sp.	IV									
<u>Dubiraphia</u> sp.	II							22		
<u>Hydaticus</u> sp.	IV									
<u>Microcylloepus</u> sp.	II									
<u>Peltodytes</u> sp.	IV			3						
<u>Stenelmis</u> sp.	II				8			56		
<u>Tropisternus</u> sp.	IV									
Acarina	I									
Diptera										
<u>Ablabesmyia aspera</u>	I									
<u>Ablabesmyia peleensis</u>	II									
<u>Bezzia</u> sp.	III	3	3					8		
<u>Bezzia</u> - group sp.	III									
<u>Bezzia/Probezzia</u> sp.	---									
<u>Chironomus attenuatus</u>	III		58	2472						
<u>Chironomus decorus</u>	III									
<u>Chironomus fulvipilus</u>	III			792						
<u>Chironomus stigamterus</u>	III									
<u>Chrysops</u> sp.	IV									
<u>Cladotanytarsus</u> sp.	II									
<u>Clinotanypus</u> sp.	II									
<u>Cricotopus bicinctus</u>	I									
<u>Cryptochironomus fulvus</u>	III									
<u>Dicrotendipes</u> sp.	II									
<u>Dicrotendipes nervosus</u>	II									
<u>Glyptotendipes</u> sp.	III									
<u>Hexatoma</u> sp.	IV									

Table A2-48 (Continued) Turkey Creek - Ekman

Taxa	Beck's Biotic Index	DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
		Station Number No./m^2								
Diptera (Continued)						NONE COLLECTED	NONE COLLECTED			NONE COLLECTED
Lauterborniella sp.	V									
Odonotomyia sp.	II									
Palpomyia tibialis	III									
Parachironomus sp.	II									
Paratendipes sp.	V									
Polypedilum halterale	I				19			3		
Polypedilum illinoense	II									
Polypedilum scalaenum	III									
Polypedilum tritum	II				6					
Procladius sp.	II									
Psychodidae sp.	V									
Rheotanytarsus sp.	II									
Stenochironomus hilaris	I									
Stictochironomus sp.	I									
Tanytarsus sp.	II									
Tipulidae sp.	IV									
Tribelos sp.	I									

Table A2-48 (Continued)

Turkey Creek - Ekman

Taxa	Beck's Biotic Index	Station Number No./m^2 DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
Lepidoptera										
Pyralididae sp.	I									
Mollusca										
Campeloma sp.	V									
Corbicula manilensis	V									
Elliptio sp.	V									
Helisoma sp.	IV									
Helisoma duryi	IV									
Lampsilis sp.	II							3		

Table A2-48 (Continued)

Turkey Creek - Ekman

Taxa	Beck's Biotic Index	DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
		Station Number No./m^2								
Mollusca (Continued)						NONE COLLECTED	NONE COLLECTED			NONE COLLECTED
Lithasia sp.	---									
Physa sp.	III									
Pisidium sp.	III									
Pseudosuccinea sp.	II									
Sphaerium sp.	III							111		
No. organisms/m^2/station		3	264	4501	53			336	28	
No. taxa		1	3	5	5			10	3	

Table A2-49 Macroinvertebrates collected by sweep net from Turkey Creek.

Taxa	Beck's Biotic Index	DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
		Station Number								
		Number Collected								
Nematoda	II			1						
Oligochaeta	III			3		1	2		4	1
Hirudinea										
Helobdella sp.	III									
Placobdella sp.	II									
Amphipoda										
Hyalella azteca	II									2
Isopoda										
Asellus sp.	I									1
Decapoda										
Palaemonetes paludosus	II						4	1		
Procambarus sp.	II									
Ephemeroptera										
Caenis diminuta	III								2	
Stenonema sp.	I									
Odonata								2		
Aeschna sp.	V			1					1	
Agria sp.	I									
Agrion sp.	II						1		2	
Boyeria sp.	V						2			
Calopteryx sp.	II							2		
Chromagrion sp.	V								2	
Cordulegaster sp.	V									
Enallagma sp.	II						3		10	1
Gomphus sp.	II			1						

Table A2-49 (Continued)

Turkey Creek - Sweep Net

Taxa	Beck's Biotic Index	DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
		Station Number								
		Number Collected								
Odonata (Continued)										
<u>Hyponeura</u> sp.	V									
<u>Macromia</u> sp.	I							4	8	
<u>Pachydiplax longipennis</u>	II									
<u>Progomphus</u> <u>obscurus</u>	I						16	10	4	6
<u>Somatochlora</u> sp.	---									
<u>Tauriphila</u> sp.	V									
<u>Tetragoneuria</u> sp.	V						3			
Hemiptera										
<u>Belostoma</u> sp.	IV						1		1	
<u>Gerris</u> sp.	IV									
<u>Notonecta</u> sp.	IV									
<u>Pelocoris</u> sp.	IV									
<u>Ranatra</u> sp.	IV									
<u>Trichocorixa</u> sp.	IV									
<u>Veliidae</u> sp.	IV									
Plecoptera										
<u>Acroneuria</u> sp.	I									
Trichoptera										
<u>Cheumatopsyche</u> sp.	II						3	8		
<u>Limnephilus</u> sp.	V									
<u>Oecetis</u> sp.	II									1
<u>Phylocentropus</u> sp.	V									
Megaloptera										
<u>Corydalus</u> <u>cornutus</u>	I				4	2	3	3	3	1
<u>Sialis</u> sp.	V									

Table A2-49 (Continued)

Turkey Creek - Sweep Net

Taxa	Beck's Biotic Index	DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
		Station Number								
		Number Collected								
Coleoptera										
<u>Dineutus</u> sp.	IV			1			11		4	
<u>Dubiraphia</u> sp.	II						1	4	2	
<u>Hydaticus</u> sp.	IV									
<u>Microcylloepus</u> sp.	II								1	
<u>Peltodytes</u> sp.	IV									
<u>Stenelmis</u> sp.	II				14	7	2	9		
<u>Tropisternus</u> sp.	IV									
Acarina	I									
Diptera										
<u>Ablabesmyia</u> <u>aspera</u>	I									
<u>Ablabesmyia</u> <u>peleensis</u>	II									
<u>Bezzia</u> sp.	III									
<u>Bezzia</u> - group sp.	III									
<u>Bezzia/Probezzia</u> sp.	---									
<u>Chironomus</u> <u>attenuatus</u>	III			2						
<u>Chironomus</u> <u>decorus</u>	III									
<u>Chironomus</u> <u>fulvipilus</u>	III									
<u>Chironomus</u> <u>stigamterus</u>	III									
<u>Chrysops</u> sp.	IV									
<u>Cladotanytarsus</u> sp.	II									
<u>Clinotanypus</u> sp.	II									
<u>Cricotopus</u> <u>bicinctus</u>	I							1		
<u>Cryptochironomus</u> <u>fulvus</u>	III									
<u>Dicrotendipes</u> sp.	II							1		
<u>Dicrotendipes</u> <u>nervosus</u>	II									
<u>Glyptotendipes</u> sp.	III									
<u>Hexatoma</u> sp.	IV									

Table A2-49 (Continued) Turkey Creek - Sweep Net

Taxa	Beck's Biotic Index	DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
		Station Number								
		Number Collected								
Diptera (Continued)										
Lauterborniella sp.	V									
Odonotomyia sp.	II									
Palpomyia tibialis	III									
Parachironomus sp.	II									
Paratendipes sp.	V									
Polypedilum halterale	I									
Polypedilum illinoense	II									1
Polypedilum scalaenum	III									
Polypedilum tritum	II									
Procladius sp.	II									
Psychodidae sp.	V									
Rheotanytarsus sp.	II									
Stenochironomus hilaris	I									
Stictochironomus sp.	I									
Tanytarsus sp.	II									
Tipulidae sp.	IV									
Tribelos sp.	I									
Lepidoptera										
Pyralididae sp.	I									
Mollusca										
Campeloma sp.	V							2		
Corbicula manilensis	V									
Elliptio sp.	V									
Helisoma sp.	IV									
Helisoma duryi	IV									
Lampsilis sp.	II									

Table A2-49 (Continued) Turkey Creek - Sweep Net

Taxa	Beck's Biotic Index	Station Number / Number Collected								
		DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
Mollusca (Continued)										
<u>Lithasia</u> sp.	---				6	2				2
<u>Physa</u> sp.	III									2
<u>Pisidium</u> sp.	III									
<u>Pseudosuccinea</u> sp.	II									
<u>Sphaerium</u> sp.	III							3		
No. collected				9	24	12	52	50	44	18
No. taxa				6	3	4	13	13	13	10

Table A2-50 Macroinvertebrates collected by block net seine from Turkey Creek.

Taxa	Beck's Biotic Index	Station Number No./m^2 (Number Collected) DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
Nematoda	II									
Oligochaeta	III									
Hirudinea										
Helobdella sp.	III									
Placobdella sp.	II									
Amphipoda										
Hyalella azteca	II									
Isopoda										
Asellus sp.	I									
Decapoda										
Palaemonetes paludosus	II									
Procambarus sp.	II							0.033 (4)	0.029 (5)	
Ephemeroptera										
Caenis diminuta	III									
Stenonema sp.	I								0.006 (1)	
Odonata										
Aeschna sp.	V									
Agria sp.	I							0.008 (1)	0.023 (4)	
Agrion sp.	II							0.024 (3)		
Boyeria sp.	V						0.034 (1)			
Calopteryx sp.	II								0.029 (5)	
Chromagrion sp.	V									
Cordulegaster sp.	V								0.011 (2)	
Enallagma sp.	II							0.024 (3)		
Gomphus sp.	II						0.103 (3)		0.011 (2)	

Table A2-50 (Continued) Turkey Creek - Block Net Seine

Taxa	Beck's Biotic Index	Station Number No./m^2 (Number Collected) DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
Odonata (Continued)										
<u>Hyponeura</u> sp.	V							0.024 (3)		
<u>Macromia</u> sp.	I						0.069 (2)	0.154 (18)	0.097 (17)	
<u>Pachydiplax longipennis</u>	II									
<u>Progomphus obscurus</u>	I						0.517 (15)	0.211 (26)	0.303 (53)	
<u>Somatochlora</u> sp.	---									
<u>Tauriphila</u> sp.	V									
<u>Tetragoneuria</u> sp.	V						0.034 (1)	0.016 (2)		
Hemiptera										
<u>Belostoma</u> sp.	IV						0.034 (1)	0.008 (1)		
<u>Gerris</u> sp.	IV									
<u>Notonecta</u> sp.	IV									
<u>Pelocoris</u> sp.	IV									
<u>Ranatra</u> sp.	IV								0.011 (2)	
<u>Trichocorixa</u> sp.	IV							0.032 (4)		
<u>Veliidae</u> sp.	IV								0.063 (11)	
Plecoptera										
<u>Acroneuria</u> sp.	I									
Trichoptera										
<u>Cheumatopsyche</u> sp.	II						0.103 (3)	0.122 (15)	0.006 (1)	
<u>Limnephilus</u> sp.	V									
<u>Oecetis</u> sp.	II									
<u>Phylocentropus</u> sp.	V									
Megaloptera										
<u>Corydalus cornutus</u>	I						0.034 (1)	0.106 (13)	0.017 (3)	
<u>Sialis</u> sp.	V									

Table A2-50 (Continued)

Taxa	Beck's Biotic Index	DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
		Station Number No./m^2 (Number Collected)								
Coleoptera										
Dineutus sp.	IV						0.103 (3)	0.366 (45)	0.006 (1)	
Dubiraphia sp.	II						0.034 (1)	0.008 (1)		
Hydaticus sp.	IV									
Microcylloepus sp.	II									
Peltodytes sp.	IV							0.008 (1)		
Stenelmis sp.	II									
Tropisternus sp.	IV									
Acarina	I									
Diptera										
Ablabesmyia aspera	I									
Ablabesmyia peleensis	II									
Bezzia sp.	III									
Bezzia - group sp.	III									
Bezzia/Probezzia sp.	---									
Chironomus attenuatus	III									
Chironomus decorus	III									
Chironomus fulvipilus	III									
Chironomus stigamterus	III									
Chrysops sp.	IV									
Cladotanytarsus sp.	II									
Clinotanypus sp.	II									
Cricotopus bicinctus	I									
Cryptochironomus fulvus	III									
Dicrotendipes sp.	II									
Dicrotendipes nervosus	II									
Glyptotendipes sp.	III									
Hexatoma sp.	IV									

Table A2-50 (Continued)

Turkey Creek - Block Net Seine

Taxa	Beck's Biotic Index	Station Number No./m2 (Number Collected) DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
Diptera (Continued)										
Lauterborniella sp.	V									
Odonotomyia sp.	II									
Palpomyia tibialis	III									
Parachironomus sp.	II									
Paratendipes sp.	V									
Polypedilum halterale	I									
Polypedilum illinoense	II									
Polypedilum scalaenum	III									
Polypedilum tritum	II									
Procladius sp.	II									
Psychodidae sp.	V									
Rheotanytarsus sp.	II									
Stenochironomus hilaris	I									
Stictochironomus sp.	I									
Tanytarsus sp.	II									
Tipulidae sp.	IV							0.008 (1)		
Tribelos sp.	I									
Lepidoptera										
Pyralididae sp.	I							0.008 (1)		
Mollusca										
Campeloma sp.	V									
Corbicula manilensis	V									
Elliptio sp.	V									
Helisoma sp.	IV									
Helisoma duryi	IV									
Lampsilis sp.	II									

Table A2-50 (Continued)

Turkey Creek - Block Net Seine

Taxa	Beck's Biotic Index	Station Number No./m^2 (Number Collected) DH-1	DH-6	DH-7	DH-8	DH-8A	DH-8B	DH-9	DH-10	HS-1
Mollusca (Continued)										
Lithasia sp.	---									
Physa sp.	III							0.063 (8)		
Pisidium sp.	III									
Pseudosuccinea sp.	II									
Sphaerium sp.	III									
Total Collected							31	150	107	
Total Species							10	18	13	

Station No.	Collection Area (m^2)
DH-8B	29
DH-9	126
DH-10	175

Table A2-51 Benthic macroinvertebrates collected by Ekman grab from Cellon Creek.

Taxa	Beck's Biotic Index	Station Number No./m² CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
Nematoda	II		3	NONE COLLECTED					NONE COLLECTED
Oligochaeta	III	89	159		125	2123	839		
Hirudinea									
Helobdella sp.	III							3	
Placobdella sp.	II								
Amphipoda									
Hyalella azteca	II	47	3			17			
Isopoda									
Asellus sp.	I								
Decapoda									
Palaemonetes paludosus	II								
Procambarus sp.	II	3	3						
Ephemeroptera									
Caenis diminuta	III								
Stenonema sp.	I								
Odonata									
Aeschna sp.	V								
Agria sp.	I	3				3		8	
Agrion sp.	II								
Boyeria sp.	V								
Calopteryx sp.	II								
Chromagrion sp.	V								
Cordulegaster sp.	V								
Enallagma sp.	II								
Gomphus sp.	II	3						3	

Table A2-51 (Continued)

Cellon Creek - Ekman

Taxa	Beck's Biotic Index	CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
		Station Number No./m^2							
Odonata (Continued)				NONE COLLECTED					NONE COLLECTED
Hyponeura sp.	V								
Macromia sp.	I								
Pachydiplax longipennis	II	3						3	
Progomphus obscurus	I				11		3		
Somatochlora sp.	---								
Tauriphila sp.	V								
Tetragoneuria sp.	V								
Hemiptera									
Belostoma sp.	IV								
Gerris sp.	IV								
Notonecta sp.	IV								
Pelocoris sp.	IV								
Ranatra sp.	IV								
Trichocorixa sp.	IV								
Veliidae sp.	IV								
Plecoptera									
Acroneuria sp.	I								
Trichoptera									
Cheumatopsyche sp.	II							300	
Limnephilus sp.	V								
Oecetis sp.	II								
Phylocentropus sp.	V								
Megaloptera									
Corydalus cornutus	I								
Sialis sp.	V								

Table A2-51 (Continued)

Cellon Creek - Ekman

Taxa	Beck's Biotic Index	CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
		Station Number No./m2							
Coleoptera									
Dineutus sp.	IV								
Dubiraphia sp.	II								
Hydaticus sp.	IV								
Microcylloepus sp.	II								
Peltodytes sp.	IV								
Stenelmis sp.	II		3						
Tropisternus sp.	IV					3			
Acarina	I			NONE COLLECTED					NONE COLLECTED
Diptera									
Ablabesmyia aspera	I								
Ablabesmyia peleensis	II							3	
Bezzia sp.	III	6	3			11	3		
Bezzia - group sp.	III								
Bezzia/Probezzia sp.	---					25			
Chironomus attenuatus	III								
Chironomus decorus	III					6			
Chironomus fulvipilus	III								
Chironomus stigamterus	III					33			
Chrysops sp.	IV					25			
Cladotanytarsus sp.	II						3		
Clinotanypus sp.	II		3			14	6		
Cricotopus bicinctus	I								
Cryptochironomus fulvus	III	17	3				8		
Dicrotendipes sp.	II								
Dicrotendipes nervosus	II	6						3	
Glyptotendipes sp.	III								
Hexatoma sp.	IV								

Table A2-51 (Continued) Cellon Creek - Ekman

Taxa	Beck's Biotic Index	Station Number No./m^2 CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
Diptera (Continued)									
Lauterborniella sp.	V								
Odonotomyia sp.	II					3			
Palpomyia tibialis	III		3	3					
Parachironomus sp.	II								
Paratendipes sp.	V					3			
Polypedilum halterale	I	31	9	NONE COLLECTED	3				NONE COLLECTED
Polypedilum illinoense	II					3		39	
Polypedilum scalaenum	III	3							
Polypedilum tritum	II								
Procladius sp.	II					25			
Psychodidae sp.	V								
Rheotanytarsus sp.	II	6							
Stenochironomus hilaris	I								
Stictochironomus sp.	I								
Tanytarsus sp.	II	3				8			
Tipulidae sp.	IV					3			
Tribelos sp.	I								
Lepidoptera									
Pyralididae sp.	I								
Mollusca									
Campeloma sp.	V								
Corbicula manilensis	V								
Elliptio sp.	V								
Helisoma sp.	IV								
Helisoma duryi	IV							6	
Lampsilis sp.	II								

Cellon Creek - Ekman

Table A2-51(Continued)

Taxa	Beck's Biotic Index	CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
		Station Number No./m^2							
Mollusca (Continued)									
Lithasia sp.	---			NONE COLLECTED		14	3	.6	NONE COLLECTED
Physa sp.	III								
Pisidium sp.	III	6							
Pseudosuccinea sp.	II								
Sphaerium sp.	III	3							
No. organisms/m^2/station		229	192		139	2319	865	374	
No. taxa		15	10		3	17	7	10	

Table A2-52 Macroinvertebrates collected by sweep net from Cellon Creek.

Taxa	Beck's Biotic Index	CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
		Station Number Number Collected							
Nematoda	II								
Oligochaeta	III					11			
Hirudinea									
Helobdella sp.	III								
Placobdella sp.	II								
Amphipoda									
Hyalella azteca	II					3			
Isopoda									
Asellus sp.	I								
Decapoda									
Palaemonetes paludosus	II								
Procambarus sp.	II								
Ephemeroptera									
Caenis diminuta	III								
Stenonema sp.	I								
Odonata									
Aeschna sp.	V								
Agria sp.	I								
Agrion sp.	II								
Boyeria sp.	V								
Calopteryx sp.	II								
Chromagrion sp.	V								
Cordulegaster sp.	V								
Enallagma sp.	II								
Gomphus sp.	II								

Table A2-52 (Continued)

Cellon Creek - Sweep Net

Taxa	Beck's Biotic Index	CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
		Station Number							
		Number Collected							
Odonata (Continued)									
Hyponeura sp.	V								
Macromia sp.	I								
Pachydiplax longipennis	II					3			
Progomphus obscurus	I								1
Somatochlora sp.	---								
Tauriphila sp.	V								
Tetragoneuria sp.	V								
Hemiptera									
Belostoma sp.	IV					2			
Gerris sp.	IV								
Notonecta sp.	IV								
Pelocoris sp.	IV								
Ranatra sp.	IV								
Trichocorixa sp.	IV								
Veliidae sp.	IV								
Plecoptera									
Acroneuria sp.	I								
Trichoptera									
Cheumatopsyche sp.	II					2			1
Limnephilus sp.	V								
Oecetis sp.	II								
Phylocentropus sp.	V								
Megaloptera									
Corydalus cornutus	I								
Sialis sp.	V								

Table A2-52 (Continued)

Taxa	Beck's Biotic Index	CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
		Station Number							
		Number Collected							
Coleoptera									
Dineutus sp.	IV								
Dubiraphia sp.	II								
Hydaticus sp.	IV								
Microcylloepus sp.	II								
Peltodytes sp.	IV								
Stenelmis sp.	II								
Tropisternus sp.	IV								
Acarina	I								
Diptera									
Ablabesmyia aspera	I								
Ablabesmyia peleensis	II								
Bezzia sp.	III								
Bezzia - group sp.	III								
Bezzia/Probezzia sp.	---								
Chironomus attenuatus	III								
Chironomus decorus	III								
Chironomus fulvipilus	III								
Chironomus stigamterus	III								
Chrysops sp.	IV					2			
Cladotanytarsus sp.	II								
Clinotanypus sp.	II					6			
Cricotopus bicinctus	I								1
Cryptochironomus fulvus	III								
Dicrotendipes sp.	II								
Dicrotendipes nervosus	II								
Glyptotendipes sp.	III								
Hexatoma sp.	IV								

Table A2-52 (Continued)

Cellon Creek - Sweep Net

Taxa	Beck's Biotic Index	CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
		Station Number							
		Number Collected							
Diptera (Continued)									
Lauterborniella sp.	V								
Odonotomyia sp.	II					6			
Palpomyia tibialis	III								
Parachironomus sp.	II								
Paratendipes sp.	V								
Polypedilum halterale	I								
Polypedilum illinoense	II								
Polypedilum scalaenum	III								
Polypedilum tritum	II								
Procladius sp.	II					1			
Psychodidae sp.	V								
Rheotanytarsus sp.	II								
Stenochironomus hilaris	I								
Stictochironomus sp.	I								
Tanytarsus sp.	II								
Tipulidae sp.	IV								
Tribelos sp.	I								
Lepidoptera									
Pyralididae sp.	I								
Mollusca									
Campeloma sp.	V								
Corbicula manilensis	V								
Elliptio sp.	V								
Helisoma sp.	IV								4
Helisoma duryi	IV								
Lampsilis sp.	II								

Table A2-52 (Continued)

Cellon Creek - Sweep Net

Taxa	Beck's Biotic Index	CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
		Station Number Number Collected							
Mollusca (Continued)									
Lithasia sp.	---					7			
Physa sp.	III					3			
Pisidium sp.	III								
Pseudosuccinea sp.	II								
Sphaerium sp.	III								
No. collected						46			7
No. taxa						11			4

Table A2-53 . Macroinvertebrates collected by block net seine from Cellon Creek.

Taxa	Beck's Biotic Index	Station Number No./m² (Number Collected) CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
Nematoda	II								
Oligochaeta	III			0.004 (1)					
Hirudinea									
Helobdella sp.	III								
Placobdella sp.	II								
Amphipoda									
Hyalella azteca	II							0.061 (9)	0.177(11)
Isopoda									
Asellus sp.	I								
Decapoda									
Palaemonetes paludosus	II								
Procambarus sp.	II								
Ephemeroptera									
Caenis diminuta	III								
Stenonema sp.	I								
Odonata									
Aeschna sp.	V								
Agria sp.	I							0.018 (1)	0.097 (6)
Agrion sp.	II								
Boyeria sp.	V								
Calopteryx sp.	II		0.01 (1)						
Chromagrion sp.	V								
Cordulegaster sp.	V								
Enallagma sp.	II								0.016 (1)
Gomphus sp.	II							0.196 (11)	

Table A2-53 (Continued)

Cellon Creek - Block Net Seine

Taxa	Beck's Biotic Index	CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
		Station Number No./m2 (Number Collected)							
Odonata (Continued)									
Hyponeura sp.	V								
Macromia sp.	I							0.036 (2)	
Pachydiplax longipennis	II		0.01 (1)					0.036 (2)	
Progomphus obscurus	I		0.01 (1)	0.012 (3)				0.911 (51)	
Somatochlora sp.	---								
Tauriphila sp.	V								
Tetragoneuria sp.	V								
Hemiptera									
Belostoma sp.	IV								
Gerris sp.	IV		0.01 (1)						
Notonecta sp.	IV								
Pelocoris sp.	IV								
Ranatra sp.	IV								
Trichocorixa sp.	IV								
Veliidae sp.	IV								
Plecoptera									
Acroneuria sp.	I			0.004 (1)					
Trichoptera									
Cheumatopsyche sp.	II							0.875 (49)	0.355 (22)
Limnephilus sp.	V								
Oecetis sp.	II								
Phylocentropus sp.	V								
Megaloptera									
Corydalus cornutus	I		0.01 (1)	0.004 (1)				0.268 (15)	
Sialis sp.	V								

Table A2-53 (Continued)

Cellon Creek - Block Net Seine

Taxa	Beck's Biotic Index	Station Number No./m^2 (Number Collected) CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
Coleoptera									
Dineutus sp.	IV			0.004 (1)				0.018 (1)	
Dubiraphia sp.	II								
Hydaticus sp.	IV								
Microcylloepus sp.	II							0.036 (2)	
Peltodytes sp.	IV								
Stenelmis sp.	II							0.018 (1)	
Tropisternus sp.	IV							0.036 (2)	
Acarina	I								
Diptera									
Ablabesmyia aspera	I								
Ablabesmyia peleensis	II								
Bezzia sp.	III								
Bezzia - group sp.	III								
Bezzia/Probezzia sp.	---								
Chironomus attenuatus	III								
Chironomus decorus	III								
Chironomus fulvipilus	III								
Chironomus stigamterus	III								
Chrysops sp.	IV								
Cladotanytarsus sp.	II								
Clinotanypus sp.	II							0.089 (5)	
Cricotopus bicinctus	I								
Cryptochironomus fulvus	III								
Dicrotendipes sp.	II								
Dicrotendipes nervosus	II								
Glyptotendipes sp.	III								
Hexatoma sp.	IV								

Table A2-53 (Continued) Cellon Creek - Block Net Seine

Taxa	Beck's Biotic Index	CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
		Station Number No./m^2 (Number Collected)							
Diptera (Continued)									
Lauterborniella sp.	V								
Odonotomyia sp.	II								0.048 (3)
Palpomyia tibialis	III								
Parachironomus sp.	II								
Paratendipes sp.	V								
Polypedilum halterale	I								
Polypedilum illinoense	II								
Polypedilum scalaenum	III								
Polypedilum tritum	II								
Procladius sp.	II								
Psychodidae sp.	V								
Rheotanytarsus sp.	II								
Stenochironomus hilaris	I								
Stictochironomus sp.	I								
Tanytarsus sp.	II								
Tipulidae sp.	IV								
Tribelos sp.	I								
Lepidoptera									
Pyralididae sp.	I								
Mollusca									
Campeloma sp.	V								
Corbicula manilensis	V								
Elliptio sp.	V								
Helisoma sp.	IV								
Helisoma duryi	IV								
Lampsilis sp.	II								

Table A2-53 (Continued)

Cellon Creek - Block Net Seine

Taxa	Beck's Biotic Index	Station Number No./m^2 (Number Collected)							
		CP-4	CP-5	CP-6	CP-8	CP-11	CP-13A	CP-13B	CP-20
Mollusca (Continued)									
Lithasia sp.	---								
Physa sp.	III			0.004 (1)				0.036 (2)	0.016 (1)
Pisidium sp.	III								
Pseudosuccinea sp.	II								
Sphaerium sp.	III								
No. Organisms			5	8				153	44
No. Species			5	6				14	6

Station No.	Collection Area (m^2)
CP-5	97
CP-6	257
CP-14	56
CP-20	62

Table A2-54 Benthic macroinvertebrates collected by Ekman grab from Rocky Creek.

Taxa	Beck's Biotic Index	RC-4	RC-5	RC-6	RC-7A	RC-7B	RC-7C	RC-9	RC-15
		Station Number No./m²							
Nematoda	II		3			NONE COLLECTED	NONE COLLECTED		3
Oligochaeta	III	331	250	139	247			111	109
Hirudinea									
<u>Helobdella</u> sp.	III		3	6					3
<u>Placobdella</u> sp.	II		3						
Amphipoda									
<u>Hyalella</u> <u>azteca</u>	II			3				8	
Isopoda									
<u>Asellus</u> sp.	I				14				
Decapoda									
<u>Palaemonetes</u> <u>paludosus</u>	II								
<u>Procambarus</u> sp.	II							3	
Ephemeroptera									
<u>Caenis</u> <u>diminuta</u>	III			6				6	
<u>Stenonema</u> sp.	I								
Odonata									
<u>Aeschna</u> sp.	V								
<u>Agria</u> sp.	I							3	
<u>Agrion</u> sp.	II								
<u>Boyeria</u> sp.	V								
<u>Calopteryx</u> sp.	II							3	
<u>Chromagrion</u> sp.	V								
<u>Cordulegaster</u> sp.	V							3	
<u>Enallagma</u> sp.	II								
<u>Gomphus</u> sp.	II			3				14	

Table A2-54 (Continued)

Rocky Creek - Ekman

Taxa	Beck's Biotic Index	Station Number No./m² RC-4	RC-5	RC-6	RC-7A	RC-7B	RC-7C	RC-9	RC-15
Odonata (Continued)						NONE COLLECTED	NONE COLLECTED		
Hyponeura sp.	V								
Macromia sp.	I								
Pachydiplax longipennis	II								
Progomphus obscurus	I								
Somatochlora sp.	---								
Tauriphila sp.	V								
Tetragoneuria sp.	V								
Hemiptera									
Belostoma sp.	IV								
Gerris sp.	IV								
Notonecta sp.	IV								
Pelocoris sp.	IV								
Ranatra sp.	IV								
Trichocorixa sp.	IV								
Veliidae sp.	IV								
Plecoptera									
Acroneuria sp.	I								
Trichoptera									
Cheumatopsyche sp.	II	11							3
Limnephilus sp.	V	8							
Oecetis sp.	II								
Phylocentropus sp.	V	3		6				6	
Megaloptera									
Corydalus cornutus	I							3	
Sialis sp.	V								

Table A2-54 (Continued)

Rocky Creek - Ekman

Taxa	Beck's Biotic Index	RC-4	RC-5	RC-6	RC-7A	RC-7B	RC-7C	RC-9	RC-15
		Station Number No./m^2							
Coleoptera						NONE COLLECTED	NONE COLLECTED		
Dineutus sp.	IV								
Dubiraphia sp.	II	3		64				47	3
Hydaticus sp.	IV				14				
Microcylloepus sp.	II	3		14				8	
Peltodytes sp.	IV								
Stenelmis sp.	II	20	14					19	8
Tropisternus sp.	IV								
Acarina	I			25				33	6
Diptera									
Ablabesmyia aspera	I								
Ablabesmyia peleensis	II							3	
Bezzia sp.	III	8	9	28	3			11	6
Bezzia - group sp.	III	169		8				95	6
Bezzia/Probezzia sp.	---								
Chironomus attenuatus	III		6						
Chironomus decorus	III								
Chironomus fulvipilus	III								
Chironomus stigamterus	III								
Chrysops sp.	IV	11			11			6	
Cladotanytarsus sp.	II	8						14	
Clinotanypus sp.	II	3		3				17	
Cricotopus bicinctus	I								
Cryptochironomus fulvus	III								
Dicrotendipes sp.	II	3							
Dicrotendipes nervosus	II								
Glyptotendipes sp.	III								
Hexatoma sp.	IV	3							

Table A2-54 (Continued)

Rocky Creek - Ekman

Taxa	Beck's Biotic Index	Station Number No./m^2 RC-4	RC-5	RC-6	RC-7A	RC-7B	RC-7C	RC-9	RC-15
Diptera (Continued)									
Lauterborniella sp.	V				3	NONE COLLECTED	NONE COLLECTED		
Odonotomyia sp.	II								
Palpomyia tibialis	III		3						
Parachironomus sp.	II			14					
Paratendipes sp.	V				31				
Polypedilum halterale	I	25		8				22	
Polypedilum illinoense	II	8						6	
Polypedilum scalaenum	III		20						
Polypedilum tritum	II	8	6	3					
Procladius sp.	II		14	3	11				
Psychodidae sp.	V				3				
Rheotanytarsus sp.	II	11							
Stenochironomus hilaris	I								
Stictochironomus sp.	I			3					8
Tanytarsus sp.	II								
Tipulidae sp.	IV								
Tribelos sp.	I	3		6				133	
Lepidoptera									
Pyralididae sp.	I								
Mollusca									
Campeloma sp.	V								
Corbicula manilensis	V								11
Elliptio sp.	V							11	6
Helisoma sp.	IV								
Helisoma duryi	IV								
Lampsilis sp.	II	3						8	3

Table A2-54 (Continued)

Rocky Creek - Ekman

Taxa	Beck's Biotic Index	Station Number No./m^2 RC-4	RC-5	RC-6	RC-7A	RC-7B	RC-7C	RC-9	RC-15
Mollusca (Continued)									
Lithasia sp.	---					NONE COLLECTED	NONE COLLECTED	3	
Physa sp.	III			11					
Pisidium sp.	III								
Pseudosuccinea sp.	II								
Sphaerium sp.	III	14	3	14					25
No. organisms/m^2/station		656	334	367	337			596	200
No. taxa		21	12	20	9			26	14

Table A2-55 Macroinvertebrates collected by sweep net from Rocky Creek. *

Taxa	Beck's Biotic Index	Station Number / Number Collected: RC-4	RC-5	RC-6	RC-7A	RC-7B	RC-7C	RC-9	RC-15
Nematoda	II								
Oligochaeta	III								
Hirudinea									
Helobdella sp.	III								
Placobdella sp.	II								
Amphipoda									
Hyalella azteca	II								
Isopoda									
Asellus sp.	I								
Decapoda									
Palaemonetes paludosus	II								
Procambarus sp.	II								
Ephemeroptera									
Caenis diminuta	III								
Stenonema sp.	I								
Odonata									
Aeschna sp.	V								
Agria sp.	I								
Agrion sp.	II								
Boyeria sp.	V							1	
Calopteryx sp.	II								
Chromagrion sp.	V								
Cordulegaster sp.	V								
Enallagma sp.	II								
Gomphus sp.	II								

* Note: Only one specimen (*Boyeria* sp.) was collected by sweep net from Rocky Creek.

Table A2-56 Macroinvertebrates collected by block net seine from Rocky Creek.

Taxa	Beck's Biotic Index	Station Number No./m^2 (Number Collected) RC-4A	RC-4B	RC-5	RC-6 (9/20)	RC-6 (9/21)	RC-7A
Nematoda	II				0.008 (1)		
Oligochaeta	III						
Hirudinea							
Helobdella sp.	III						
Placobdella sp.	II						
Amphipoda							
Hyalella azteca	II						
Isopoda							
Asellus sp.	I						
Decapoda							
Palaemonetes paludosus	II				0.136 (18)		0.170 (53)
Procambarus sp.	II	0.014 (1)			0.045 (6)	0.076 (10)	0.013 (4)
Ephemeroptera							
Caenis diminuta	III						
Stenonema sp.	I						
Odonata							
Aeschna sp.	V				0.015 (2)		
Agria sp.	I						
Agrion sp.	II				0.015 (2)		
Boyeria sp.	V					0.008 (1)	0.010 (3)
Calopteryx sp.	II	0.043 (3)				0.008 (1)	
Chromagrion sp.	V						
Cordulegaster sp.	V						
Enallagma sp.	II						
Gomphus sp.	II	0.043 (3)	0.014 (1)			0.023 (3)	

Taxa	Beck's Biotic Index	RC-7B	RC-7C	RC-8A	RC-8B	RC-15A	RC-15B
		Station Number No./m^2 (Number Collected)					
Nematoda	I						
Oligochaeta	III						
Hirudinea							
Helobdella sp.	III						
Placobdella sp.	II						
Amphipoda							
Hyalella azteca	II						
Isopoda							
Asellus sp.	I						
Decapoda							
Palaemonetes paludosus	II		12.727 (140)	0.217 (13)	0.170 (9)	0.037 (5)	0.012 (2)
Procambarus sp.	II	0.011 (1)	0.636 (7)			0.007 (1)	
Ephemeroptera							
Caenis diminuta	III						
Stenonema sp.	I						
Odonata							
Aeschna sp.	V						
Agria sp.	I						
Agrion sp.	II						
Boyeria sp.	V						
Calopteryx sp.	II						
Chromagrion sp.	V						
Cordulegaster sp.	V						
Enallagma sp.	II						
Gomphus sp.	II						

Table A2-56 (Continued)

Rocky Creek (Stations RC-4A - RC-7A) - Block Net Seine

Taxa	Beck's Biotic Index	RC-4A	RC-4B	RC-5	RC-6 (9/20)	RC-6 (9/21)	RC-7A
		Station Number No./m² (Number Collected)					
Odonata (Continued)							
Hyponeura sp.	V						
Macromia sp.	I						
Pachydiplax longipennis	II				0.030 (4)		
Progomphus obscurus	I	0.072 (5)				0.076 (10)	
Somatochlora sp.	---					0.008 (1)	
Tauriphila sp.	V		0.014 (1)				
Tetragoneuria sp.	V					0.008 (1)	0.006 (2)
Hemiptera							
Belostoma sp.	IV	0.014 (1)					
Gerris sp.	IV	0.072 (5)	0.042 (3)		0.023 (3)	0.008 (1)	
Notonecta sp.	IV						0.003 (1)
Pelocoris sp.	IV						0.003 (1)
Ranatra sp.	IV						
Trichocorixa sp.	IV				0.008 (1)		
Veliidae sp.	IV						
Plecoptera							
Acroneuria sp.	I						
Trichoptera							
Cheumatopsyche sp.	II						
Limnephilus sp.	V						
Oecetis sp.	II						
Phylocentropus sp.	V		0.014 (1)				
Megaloptera							
Corydalus cornutus	I						
Sialis sp.	V		0.014 (1)				

Table A2-56 (Continued)

Rocky Creek (Stations RC-7B - RC-15B) - Block Net Seine

Taxa	Beck's Biotic Index	Station Number No./m² (Number Collected) RC-7B	RC-7C	RC-8A	RC-8B	RC-15A	RC-15B
Odonata (Continued)							
Hyponeura sp.	V						
Macromia sp.	I						0.006 (1)
Pachydiplax longipennis	II		0.273 (3)				
Progomphus obscurus	I						
Somatochlora sp.	---						
Tauriphila sp.	V						
Tetragoneuria sp.	V						
Hemiptera							
Belostoma sp.	IV						
Gerris sp.	IV		0.091 (1)				
Notonecta sp.	IV		0.091 (1)				
Pelocoris sp.	IV						
Ranatra sp.	IV						
Trichocorixa sp.	IV	0.111 (1)	0.091 (1)				
Veliidae sp.	IV						
Plecoptera							
Acroneuria sp.	I						
Trichoptera							
Cheumatopsyche sp.	II			0.017 (1)			
Limnephilus sp.	V						
Oecetis sp.	II						
Phylocentropus sp.	V						
Megaloptera							
Corydalus cornutus	I		0.091 (1)				
Sialis sp.	V						

Table A2-56 (Continued) Rocky Creek (Stations RC-4A - RC-7A) - Block Net Seine

Taxa	Beck's Biotic Index	Station Number No./m^2 (Number Collected) RC-4A	RC-4B	RC-5	RC-6 (9/20)	RC-6 (9/21)	RC-7A
Coleoptera							
Dineutus sp.	IV	0.565 (39)	0.042 (3)			0.008 (1)	0.003 (1)
Dubiraphia sp.	II				0.008 (1)		
Hydaticus sp.	IV						
Microcylloepus sp.	II						
Peltodytes sp.	IV						
Stenelmis sp.	II						
Tropisternus sp.	IV						
Acarina	I						
Diptera							
Ablabesmyia aspera	I		0.014 (1)				
Ablabesmyia peleensis	II						
Bezzia sp.	III						
Bezzia - group sp.	III						
Bezzia/Probezzia sp.	---						
Chironomus attenuatus	III						
Chironomus decorus	III						
Chironomus fulvipilus	III						
Chironomus stigamterus	III						
Chrysops sp.	IV				0.008 (1)	0.008 (1)	
Cladotanytarsus sp.	II						
Clinotanypus sp.	II						
Cricotopus bicinctus	I						
Cryptochironomus fulvus	III						
Dicrotendipes sp.	II						
Dicrotendipes nervosus	II						
Glyptotendipes sp.	III						
Hexatoma sp.	IV						

Table A2-56 (Continued) Rocky Creek (Stations RC-7B - RC-15B) - Block Net Seine

Taxa	Beck's Biotic Index	Station Number No./m² (Number Collected) RC-7B	RC-7C	RC-8A	RC-8B	RC-15A	RC-15B
Coleoptera							
Dineutus sp.	IV						
Dubiraphia sp.	II						
Hydaticus sp.	IV						
Microcylloepus sp.	II						
Peltodytes sp.	IV		0.091 (1)				
Stenelmis sp.	II				0.091 (1)		
Tropisternus sp.	IV						
Acarina	I						
Diptera							
Ablabesmyia aspera	I						
Ablabesmyia peleensis	II						
Bezzia sp.	III						
Bezzia - group sp.	III						
Bezzia/Probezzia sp.	---						
Chironomus attenuatus	III						
Chironomus decorus	III						
Chironomus fulvipilus	III						
Chironomus stigamterus	III						
Chrysops sp.	IV		0.091 (1)				
Cladotanytarsus sp.	II						
Clinotanypus sp.	II						
Cricotopus bicinctus	I						
Cryptochironomus fulvus	III						
Dicrotendipes sp.	II						
Dicrotendipes nervosus	II						
Glyptotendipes sp.	III						
Hexatoma sp.	IV						

Taxa	Beck's Biotic Index	RC-4A	RC-4B	RC-5	RC-6 (9/20)	RC-6 (9/21)	RC-7A
		Station Number No./m^2 (Number Collected					
Diptera (Continued)							
Lauterborniella sp.	V						
Odonotomyia sp.	II						
Palpomyia tibialis	III						
Parachironomus sp.	II						
Paratendipes sp.	V						
Polypedilum halterale	I						
Polypedilum illinoense	II						
Polypedilum scalaenum	III						
Polypedilum tritum	II						
Procladius sp.	II				0.008 (1)		
Psychodidae sp.	V						
Rheotanytarsus sp.	II						
Stenochironomus hilaris	I		0.014 (1)				
Stictochironomus sp.	I						
Tanytarsus sp.	II						
Tipulidae sp.	IV						0.006 (2)
Tribelos sp.	I		0.127 (9)				
Lepidoptera							
Pyralididae sp.	I						
Mollusca							
Campeloma sp.	V						
Corbicula manilensis	V						
Elliptio sp.	V						
Helisoma sp.	IV						
Helisoma duryi	IV						
Lampsilis sp.	II						

Table A2-56 (Continued) Rocky Creek (Stations RC-7B - RC-15B) - Block Net Seine

Taxa	Beck's Biotic Index	RC-7B	RC-7C	RC-8A	RC-8B	RC-15A	RC-15B
		Station Number No./m^2 (Number Collected)					
Diptera (Continued)							
Lauterborniella sp.	V						
Odonotomyia sp.	II						
Palpomyia tibialis	III						
Parachironomus sp.	II						
Paratendipes sp.	V						
Polypedilum halterale	I						
Polypedilum illinoense	II						
Polypedilum scalaenum	III						
Polypedilum tritum	II						
Procladius sp.	II						
Psychodidae sp.	V						
Rheotanytarsus sp.	II						
Stenochironomus hilaris	I						
Stictochironomus sp.	I						
Tanytarsus sp.	II						
Tipulidae sp.	IV						
Tribelos sp.	I						
Lepidoptera							
Pyralididae sp.	I						
Mollusca							
Campeloma sp.	V						
Corbicula manilensis	V						
Elliptio sp.	V						
Helisoma sp.	IV						
Helisoma duryi	IV						
Lampsilis sp.	II						

Table A2-56 (Continued)

Rocky Creek (Stations RC-4A - RC-7A) - Block Net Seine

Taxa	Beck's Biotic Index	Station Number No./m² (Number Collected) RC-4A	RC-4B	RC-5	RC-6 (9/20)	RC-6 (9/21)	RC-7A
Mollusca (Continued)							
Lithasia sp.	---						
Physa sp.	III						
Pisidium sp.	III						
Pseudosuccinea sp.	II						
Sphaerium sp.	III						0.010 (3)
Total Collected		57	21		40	30	70
Total Species		7	9		11	10	9

Station Number	Collection Area (m^2)
RC-4A	69
RC-4B	71
RC-6	132
RC-7A	311

Table A2-56 (Continued) Rocky Creek (Stations RC-7B - RC-15B) - Block Seine

Taxa	Beck's Biotic Index	Station Number No./m² (Number Collected) RC-7B	RC-7C	RC-8A	RC-8B	RC-15A	RC-15B
Mollusca (Continued)							
Lithasia sp.	---						
Physa sp.	III						
Pisidium sp.	III						
Pseudosuccinea sp.	II						
Sphaerium sp.	III						
Total Collected		2	156	14	10	6	3
Total Species		2	9	2	2	2	2

Station Number	Collection Area (m^2)
RC-7B	9
RC-7C	11
RC-8A	60
RC-8B	53
RC-15A	136
RC-15B	162

Table A2-57 Benthic macroinvertebrates collected by Ekman grab from Mulatto Pen Branch - Ekman

Taxa	Beck's Biotic Index	Station Number No./m^2 RC-19	RC-20	RC-26
Oligochaeta	III	39	287	592
Hirudinea				
Helobdella sp.	III	3		
Amphipoda				
Hyalella azteca	II		3	
Decapoda				
Procambarus sp.	II			3
Ephemeroptera				
Caenis diminuta	III		108	
Leptophlebia sp.	---	3		
Odonata				
Agrion sp.	II		22	
Gomphus sp.	II		8	
Pachydiplax longipennis	II	3	14	
Progomphus obscurus	I	17	3	
Coleoptera				
Agabus johannis	IV	3		
Dubiraphia sp.	II		14	
Dytiscidae sp.	IV	17		3
Stenelmis sp.	II		3	
Acarina				
Hydracarina sp.	---		3	

Table A2-57 (Continued)

Taxa	Beck's Biotic Index	Station Number No./m² RC-19	RC-20	RC-26
Diptera				
Ablabesmyia philosphanos	---	3	36	11
Bezzia sp.	III	25	11	
Chaoborus sp.	---			
Chironomus crassicaudatus	III	8	8	
Chrysops sp.	IV	11	3	
Cladotanytarsus sp.	II		6	
Clinotanypus pinguis	II	3	3	
Cricotopus bicintus	I			
Cryptochironomus fulvus	III	3	42	
Dicrotendipes sp.	II			
Endochironomus sp.	II	11	36	
Harnischia nr. boydi	---		20	6
Hexatoma sp.	IV			6
Holorusia sp.	IV	8	3	
Microtendipes sp.	---			3
Palpomyia tibialis	III	3	25	3
Polypedilum halterale	I	8		
Polypedilum			28	
illinoense	II		8	3
Polypedilum tritum	II		33	
Procladius sp.	II			
Rheotanytarsus exiguus	I	17	28	
Rheotantarsus sp.	II	3	3	
Tanytarsus guerla	---	17	28	6
Tanytarsus sp.	II	3		

Table A2-57 (Continued)

Mulatto Pen Branch - Ekman

Taxa	Beck's Biotic Index	Station Number No./m^2 RC-19	RC-20	RC-26
Mollusca				
Elliptio sp.	V		8	
Physa sp.	III	3	17	
Sphaerium sp.	III		6	
No. organisms/m^2/station		211	817	636
No. Taxa		22	30	10

Table A2-58 Fish collection data for Rocky, Cellon and Turkey Creeks.

SPECIES Scientific Name	SPECIES Common Name	Station	Collection Date - 1976	Method of Collection	No. Specimens Collected	Weight (g)
Amia calva	Bowfin	RC-7	10/1	Trot Line*(4)	2	450.00 1400.00
		RC-7	10/4	Trot Line (3)	2	230.00 260.00
		RC-7	10/4	Trot Line (4)	2	180.00 300.00
		RC-7	10/5	Trot Line (1)	1	240.00
Esox americanus: americanus x vermiculatus	Redfin Pickerel	RC-6	10/14	Trot Line (4)	1	4.80
Ictalurus nebulosus	Brown Bullhead	RC-7	10/1	Trot Line (2)	1	110.00
		RC-7	10/1	Trot Line (3)	1	Head Only
		RC-7	10/4	Trot Line (3)	1	110.00
		RC-7	10/4	Trot Line (4)	1	140.00
		RC-7	10/6	Trot Line (3)	1	57.00
Ictalurus natalis	Yellow Bullhead	RC-6	9/20	Block Seine	1	0.71
		RC-6	10/12	Trot Line (1)	1	28.00
		RC-6	10/12	Trot Line (3)	1	57.00
		RC-6	10/12	Trot Line (4)	2	71.00 170.00
		RC-6	10/12	Trot Line (4)	5	64.00 71.00 (2) 85.00 99.00
		RC-6	10/13	Trot Line (3)	1	92.00
		RC-6	10/13	Trot Line (4)	9	28.00 (3) 43.00 (3) 57.00 85.00 160.00

Table A2-58 (Continued)

Species: Scientific Name	Species: Common Name	Station	Collection Date - 1976	Method of Collection	No. Specimens Collected	Weight (g)
Ictalurus natalis (Continued)	Yellow Bullhead	RC-6	10/14	Trot Line (4)	4	71.00
						85.00
						110.00 (2)
		RC-6	10/15	Trot Line (4)	2	43.00
						71.00
		RC-7	10/1	Trot Line (2)	1	110.00
		RC-7	10/1	Trot Line (3)	2	57.00
						230.00
		RC-7	10/1	Trot Line (4)	1	230.00
		RC-7	10/5	Trot Line (2)	1	85.00
		RC-7	10/5	Trot Line (3)	3	85.00
						260.00 (2)
		RC-7	10/6	Trot Line (1)	1	85.00
		RC-7	10/6	Trot Line (2)	3	71.00
						99.00
						110.00
		RC-7	10/6	Trot Line (3)	2	130.00
						180.00
		RC-7	10/6	Trot Line (4)	2	99.00
						110.00
		RC-7	10/7	Trot Line (3)	2	71.00
						110.00
Notemigonus crysoleucas	Golden Shiner	DH-9	9/20	Block Seine	1	3.90
		RC-15A	9/22	Block Seine-30 M	1	0.09
Notropis hypselopterus	Sailfin Shiner	RC-8B	9/22	Block Seine-16 M	3	1.10
Notropis petersoni	Coastal Shiner	RC-15B	9/22	Block Seine-50 M	1	1.10
Notropis chalybaeus	Ironcolor Shiner	RC-8B	9/22	Block Seine-16 M	2	0.60
		RC-15B	9/22	Block Seine-50 M	1	0.46

Table A2-58 (Continued)

SPECIES Scientific Name	Common Name	Station	Collection Date - 1976	Method of Collection	No. Specimens Collected	Weight (g)
Fundulus chrysotus	Golden Topminnow	RC-15B	9/22	Block Seine-50 M	1	0.87
Gambusia affinis	Mosquitofish	DH-7	9/9	Sweep Net	2	0.47
		DH-7	9/9	B-sweep	7	1.20
		DH-8B	9/20	Block Seine	25	4.60
		DH-9	9/20	Block Seine	253	27.00
		RC-4	9/20	Block Seine	1	0.16
		RC-4B	9/20	Block Seine	3	0.38
		RC-6	9/20	Block Seine	3	0.48
		RC-6	9/20	Block Seine	21	2.10
		RC-7A	9/21	Block Seine	4	0.25
		RC-7B	9/21	Block Seine	29	5.40
		RC-7C	9/21	Block Seine	91	11.00
		RC-8B	9/22	Block Seine-16 M	1	0.08
		RC-15A	9/22	Block Seine-20 M	1	0.05
		RC-15B	9/22	Block Seine-50 M	6	1.30
		CP-5	9/23	Block Seine	1	0.01
		CP-14	9/23	Block Seine-30 M	40	10.00
		CP-20	9/23	Block Seine	15	6.80
		CP-20	9/23	B-sweep	1	1.40
		CP-11	9/24	Sweep Net	38	3.80
		HS-1	9/24	B-sweep	6	4.10
		DH-10	10/28	Block Seine	31	6.90
		DH-10	10/28	B-sweep	5	0.22
Heterandria formosa	Least Killifish	DH-9	9/20	B-sweep	1	0.02
		DH-9	9/20	Block Seine	10	0.69
		RC-6	9/20	Block Seine	3	0.08
		RC-6	9/20	Block Seine	1	0.02
		RC-7B	9/21	Block Seine	6	0.36
		RC-7C	9/21	Block Seine	78	2.20
		CP-14	9/23	Block Seine-30 M	8	0.31
		CP-20	9/23	Block Seine	6	0.78
		CP-11	9/24	Sweep Net	105	3.20

Table A2-58 (Continued)

SPECIES						
Scientific Name	Common Name	Station	Collection Date - 1976	Method of Collection	No. Specimens Collected	Weight (g)
Aphredoderus sayanus	Pirateperch	RC-4	9/20	Block Seine	1	1.30
		RC-6	9/20	Block Seine	1	1.10
		RC-7A	9/21	Block Seine	2	3.00
		RC-7C	9/21	Block Seine	1	0.56
Micropterus salmoides	Largemouth Bass	RC-7C	9/21	Block Seine	2	1.90
Lepomis punctatus	Spotted Sunfish	DH-9	9/20	Block Seine	4	0.13
Lepomis auritus	Redbreast Sunfish	RC-4	9/20	Block Seine	1	3.80
		RC-6	9/20	Block Seine	1	3.10
		RC-8A	9/22	Block Seine	1	4.50
		RC-15B	9/22	Block Seine-50 M	7	13.00
Lepomis macrochirus	Bluegill	CP-20	9/23	Block Seine	5	19.00
Lepomis gulosus	Warmouth	RC-7C	9/21	Block Seine	1	1.90
Enneacanthus gloriosus	Bluespotted Sunfish	RC-7C	9/21	Block Seine	1	0.50
Elassoma okefenokee	Okefenokee Pygmy Sunfish	RC-6	9/20	Block Seine	1	0.03
Etheostoma edwini	Brown Darter	RC-15A	9/22	Block Seine-30 M	1	0.14
Etheostoma fusiforme	Swamp Darter	RC-7A	9/21	Block Seine	2	0.61
Labidesthes sicculus	Brook Silverside	RC-6	9/20	Block Seine	11	2.00
		RC-8B	9/22	Block Seine-16 M	1	0.33

* Note: Number following trot line under Method of Collection refers to the line number.

Table A2-59 Fish mass per unit area collected by block seining from Rocky, Cellon and Turkey Creeks

Creek/ Subsystem	Station	Species	kg	lbs	Acres	Hectares	kg/Hectare	lbs/Acre
Cellon Creek: Fast Flowing High Scour Subsystem	CP-5	Gambusia affinis	.001	.002	.024	.010	.001	.001
	CP-6	None Collected						
Cellon Creek: Deep - weedy stream subsystem	CP-14	Gambusia affinis	.010	.022	.014	.006	1.802	1.623
		Heterandria formosa	.0003	.0007	.014	.006	.055	.050
	CP-20	Gambusia affinis	.007	.015	.015	.006	1.097	.974
		Heterandria formosa	.0008	.002	.015	.006	.126	.112
		Lepomis macrochirus	.019	.042	.015	.006	3.092	2.744
Rocky Creek: Shaded Flowing Stream Subsystem	RC-4 (A & B)	Gambusia affinis	.0005	.001	.033	.013	.041	.037
		Aphredoderus sayanus	.001	.003	.033	.013	.096	.085
		Lepomis auritus	.004	.008	.033	.013	.286	.255
	RC-6	Ictalurus natalis	.0001	.0002	.033	.013	.005	.005
		Gambusia affinis	.003	.006	.033	.013	.196	.175
		Heterandria formosa	.0001	.0002	.033	.013	.008	.007
		Aphredoderus sayanus	.001	.002	.033	.013	.083	.074
		Lepomis auritus	.003	.007	.033	.013	.237	.212
		Elassoma okefenokee	.00003	.00007	.033	.013	.002	.002
		Labidesthes sicculus	.002	.004	.033	.013	.149	.133

Table A2-59 (Continued)

Creek/ Subsystem	Station	Species	kg	lbs	Acres	Hectares	kg/Hectare	lbs/Acre
	RC-7A	*Gambusia affinis*	.0003	.0006	.077	.031	.008	.007
		Aphredoderus sayanus	.003	.007	.077	.031	.095	.085
		Etheostoma fusiforme	.0006	.0013	.077	.031	.020	.017
	RC-7B	*Gambusia affinis*	.005	.012	.002	.0009	6.044	5.213
		Heterandria formosa	.0004	.0008	.002	.0009	.400	.344
	RC-7C	*Gambusia affinis*	.011	.024	.003	.001	9.718	8.414
		Heterandria formosa	.002	.005	.003	.001	1.991	1.725
		Aphredoderus sayanus	.0006	.001	.003	.001	.509	.439
		Micropterus salmoides	.002	.004	.003	.001	1.764	1.527
		Lepomis gulosus	.002	.005	.003	.001	1.719	1.489
		Enneacanthus gloriosus	.0005	.001	.003	.001	.455	.393
	RC-8 A & B	*Lepomis auritus*	.004	.010	.028	.011	.396	.354
		Notropis hypselopterus	.001	.002	.028	.011	.100	.090
		Notropis chalybaeus	.0006	.001	.028	.011	.053	.048
		Gambusia affinis	.0001	.0002	.028	.011	.007	.007
		Labidesthes sicculus	.0003	.0007	.028	.011	.029	.026
	RC-15A	*Notemigonus crysoleucas*	.0009	.0019	.034	.014	.053	.056
		Gambusia affinis	.0005	.0012	.034	.014	.039	.035
		Etheostoma edwini	.0001	.0003	.034	.014	.010	.009

Table A2-59 (Continued)

Creek/ Subsystem	Station	Species	kg	lbs	Acres	Hectares	kg/Hectare	lbs/Acre
	RC-15B	*Notropis petersoni*	.001	.002	.040	.016	.069	.062
		Notropis chalybaeus	.0005	.001	.040	.016	.028	.025
		Fundulus chrysotus	.0009	.002	.040	.016	.054	.048
		Gambusia affinis	.001	.003	.040	.016	.079	.071
		Lepomis auritus	.013	.028	.040	.016	.793	.708
Turkey Creek: Flowing Stream Subsystem	DH-8B	*Gambusia affinis*	.005	.010	.007	.003	1.579	1.443
	DH-9	*Notemigonus crysoleucas*	.004	.009	.031	.013	.309	.276
		Gambusia affinis	.027	.061	.031	.013	2.181	1.948
		Heterandria formosa	.0007	.0015	.031	.013	.055	.049
		Lepomis punctatus	.0001	.0003	.031	.013	.010	.009
	DH-10	*Gambusia affinis*	.007	.015	.043	.018	.396	.355

Note: Surface area obtained from stream area and volume data.
1 Acre = 43.560 sq. ft.
1 Hectare = 10,000 sq. meters

Table A2-60 Habitat preference summary of fish species found in Rocky, Cellon and Turkey Creeks.

Scientific Name	Common Name	Habitat Preference
Amia calva	Bowfin	Found in weedy, slow moving or non-moving waters.
Esox americanus: americanus x vermiculatus	Redfin Pickerel	Found in shallow flowing brown-water streams and pools.
Ictalurus nebulosus	Brown Bullhead	Found in slow moving or non moving water with vegetation.
Ictalurus natalis	Yellow Bullhead	Prefers slow moving water with vegetation but may be found in faster moving situations.
Notemigonus crysoleucas	Golden Shiner	Found in all situations; tolerant of poor temperature and quality.
Notropis hypselopterus	Sailfin Shiner	Found in the whole gamut of streams but not in lakes or pools; needs moving water.
Notropis petersoni	Coastal Shiner	Found in the whole gamut of streams but not in lakes or pools; needs moving water.
Notropis chalybaeus	Ironcolor Shiner	Found in the whole gamut of streams but not in lakes or pools; needs moving water.
Fundulus chrysotus	Golden Topminnow	Found near the surface in slower moving water.
Gambusia affinis	Mosquitofish	Found in almost all situations. Especially slower moving water such as pools and stream edges. Able to gasp air and thus tolerate lower oxygen levels.
Heterandria formosa	Least Killifish	Found generally among floating vegetation in slower moving situations.
Aphredoderus sayanus	Pirateperch	Prefers slow or non-moving water such as ditches, pools, etc. with heavy mud or silt bottom. Found sitting on or embedded in this layer.
Micropterus salmoides	Largemouth Bass	Found in any water situation where quality is tolerable.
Lepomis punctatus	Spotted Sunfish	Found in association with vegetation and slow or non-moving water, generally in a stream environment.

Table A2-60 (Continued)

Creek/ Subsystem	Station	Species	kg	lbs	Acres	Hectares	kg/Hectare	lbs/Acre
	RC-15B	*Notropis petersoni*	.001	.002	.040	.016	.069	.062
		Notropis chalybaeus	.0005	.001	.040	.016	.028	.025
		Fundulus chrysotus	.0009	.002	.040	.016	.054	.048
		Gambusia affinis	.001	.003	.040	.016	.079	.071
		Lepomis auritus	.013	.028	.040	.016	.793	.708
Turkey Creek: Flowing Stream Subsystem	OH-0B	*Gambusia affinis*	.005	.010	.007	.003	1.579	1.443
	OH-9	*Notemigonus crysoleucas*	.004	.009	.031	.013	.309	.276
		Gambusia affinis	.027	.061	.031	.013	2.181	1.948
		Heterandria formosa	.0007	.0015	.031	.013	.055	.049
		Lepomis punctatus	.0001	.0003	.031	.013	.010	.009
	DH-10	*Gambusia affinis*	.007	.015	.043	.018	.396	.355

Note: Surface area obtained from stream area and volume data.
1 Acre = 43.560 sq. ft.
1 Hectare = 10,000 sq. meters

Table A2-61 Vertebrates Expected to Occur in the Area of Concern.

I. Mammals

Opposum	Didelphis virginiana
Southeastern Shrew	Sorex longirostis longirostis
Short-tailed Shrew	Blarina lirevidauda
Least Shrew	Cryptotis parva
Eastern Mole	Scolopus aquaticus
Southeastern Myotis	Myotis austroriparius
Gray Myotis	Myotis grisescens
Eastern Pipistrelle	Pipistrellus subflavus
Big Brown Bat	Eptesicus fuscus
Red Bat	Lasiurus borealis
Hoary Bat	Lasiurus cinereus
Florida Yellow Bat	Lasiurus intermedius
Seminole Bat	Lasiurus seminolus
Evening Bat	Nysticeius fumeralus
Big-eared Bat	Plecotus rafinesquii
Brasilian Free-tailed Bat	Todarida brasiliensis
Nine-banded Armadillo	Dasypus novemcinctis
Eastern Cottontail	Sylvilogue floridanus
Marsh Rabbit	Sylvilogue polustris
Gray Squirrel	Sciurus carolinensis
Fox Squirrel	Sciurus niger
Southern Flying Squirrel	Glaucomys volans
Southeastern Pocket Gopher	Geomys pinetis
Marsh Rice Rat	Oryzomys polustris
Eastern Harvest Mouse	Reithrodontomys humulis
Florida Mouse	Peromyscus floridanus
Cotton Mouse	Peromyscus gossypinus
Golden Mouse	Peromyscus nuttalli
Oldfield Mouse	Peromyscus polionotus
Hispid Cotton Rat	Sigmodon hispidus
Eastern Wood Rat	Neotoma floridana
Pine Vole	Microtus pinetorum
Round-tailed Muskrat	Neofiber alleni
Norway Rat	Rattus norvegicus
Black Rat	Rattus rattus
House Mouse	Mus musculus
Gray Fox	Urocyon cinereourgenteus
Florida Black Bear	Ursus americanus floridanus
Raccoon	Procyon lotor
Long-tailed Weasel	Mustela frenata olivacea
Mink	Mustela vison

Table A2-61 (Continued)

Spotted Skunk	Spilogale putorius
Striped Skunk	Mephitis mephitis
River Otter	Lutra canadensis
Bobcat	Lynx rufus
Wild Hog	Sus scrofa
White-tailed Deer	Odocoileus virginiana

II. Birds

Pied-billed Grebe	Podilymbus podiceps
Double-crested Cormorant	Phalacrocorax auritus
Anhinga	Anhinga anhinga
Great Blue Heron	Ardea herodias
Green Heron	Butorides virescens
Little Blue Heron	Florida caerulea
Cattle Egret	Bubulcus ibis
Common Egret	Casmerodius albus
Snowy Egret	Leucophoyx thula
Louisiana Heron	Hydranassa tricolor
Black-crowned Night Heron	Nycticorax nycticorax
Yellow-crowned Night Heron	Nyctanassa violacea
Least Bittern	Ixobrychus exilis
American Bittern	Botaurus lentiginosus
Wood Stork	Mycteria americana
Glossy Ibis	Plegadis falcinellus
White Ibis	Eudocimus albus
Mallard	Anas platyrhynchos
Black Duck	Anas rubripes
Mottled Duck	Anas fulvigula
Pintail	Anas acuta
Gadwall	Anas strepera
Baldpate	Anas americana
Shoveler	Anas clypeata
Blue-winged Teal	Anas discors
Green-winged Teal	Anas carolinensis
Wood Duck	Aix sponsa
Ring-necked Duck	Aythya collaris
Lesser Scaup	Aythya affinis
Ruddy Duck	Oxyura jamaicensis
Hooded Merganser	Mergus cucullatus
Turkey Vulture	Cathartes aura
Black Vulture	Coragyps atratus

Table A2-61 (Continued)

Swallow-tailed Kite	Elanoides forficatus
Mississippi Kite	Ictinia mississippiensis
Sharp-shinned Hawk	Accipiter striatus
Cooper's Hawk	Accipiter cooperii
Red-tailed Hawk	Buteo jamaicensis
Red-shouldered Hawk	Buteo lineatus
Broad-winged Hawk	Buteo platypterus
Marsh Hawk	Circus cyaneus
Osprey	Pandion haliaetus
Merlin	Falco columbarius
Kestrel	Falco sparuerius
Bobwhite	Colinus virginianus
Turkey	Meleagris gallopauo
Sandhill Crane	Grus canadensis
Limpkin	Aramus guarauna
King Rail	Rallus elegans
Virginia Rail	Rallus limicola
Sora Rail	Porzana carolina
Purple Gallinule	Porphyrula martinica
Common Gallinule	Gallinula chloropus
American Coot	Fulica americana
Killdeer	Charadrius vociferus
Woodcock	Philohela minor
Common Snipe	Capello gallinago
Spotted Sandpiper	Actitis macularia
Solitary Sandpiper	Tringa solitaria
Greater Yellowlegs	Totanus melanoleucus
Lesser Yellowlegs	Totanus flavipes
Least Sandpiper	Erolia minutilla
Pigeon	Columba livia
Mourning Dove	Zenaidura macroura
Ground Dove	Columbigallina passerina
Yellow-billed Cuckoo	Coccyzus americanus
Barn Owl	Tyto alba
Screech Owl	Otus asio
Great Horned Owl	Bubo virginianus
Barred Owl	Strix varia
Chuck-will's Widow	Caprimulgus carolinensis
Nighthawk	Chordeiles minor
Chimney Swift	Chaetura pelagica
Ruby-throated Hummingbird	Archilochus colubris
Belted Kingfisher	Megaceryle alcyon
Flicker	Colaptes auratus
Pileated Woodpecker	Dryocopus pileatus
Red-bellied Woodpecker	Centurus carolinus
Red-headed Woodpecker	Melanerpes erythrocephalus

Table A2-61 (Continued)

Yellow-bellied Sapsucker	Sphyrapicus varius
Downy Woodpecker	Dendrocopos pubescens
Red-cockaded Woodpecker	Dendrocopos borealis
Eastern Kingbird	Tyrannus tyrannus
Crested Flycatcher	Myiarchus crinitus
Pheobe	Sayornis phoebe
Acadian Flycatcher	Empidonax virescens
Eastern Wood Pewee	Contopus virens
Tree Swallow	Iridoprocne bicolor
Rough-winged Swallow	Stelgidopteryx ruficollis
Barn Swallow	Hirundo rustica
Purple Martin	Progne subis
Blue Jay	Cyarocitta cristata
Common Crow	Corvus brachyrhynchos
Fish Crow	Corvus ossifragus
Carolina Chickadee	Parus carolinensis
Tufted Titmouse	Parus bicolor
Brown-headed Nuthatch	Sitta pusilla
White-breasted Nuthatch	Sitta carolinensis
Brown Creeper	Certhia familiaris
House Wren	Troglodytes aedon
Winter Wren	Troglodytes troglodytes
Carolina Wren	Thryothorus ludovicianus
Long-billed Marsh Wren	Telmatodytes palustris
Short-billed Marsh Wren	Cistothorus platensis
Mockingbird	Mimus polyglottos
Catbird	Dumetella carolinensis
Brown Thrasher	Toxostoma rufum
Robin	Turdus migratorius
Wood Thrush	Hylocichla mustelina
Hermit Thrush	Hylocichla guttata
Swainson's Thrush	Hylocichla ustulata
Gray-cheeked Thrush	Hylocichla minima
Veery	Hylocichla fuscescens
Bluebird	Sialia sialis
Blue-gray Gnatcatcher	Polioptila caerulea
Golden-crowned Kinglet	Regulus satrapa
Ruby-crowned Kinglet	Regulus calendula
Water Pipit	Anthus spinoletta
Cedar Waxwing	Bombycilla cedrorum
Loggerhead Shrike	Lanius ludovicianus
Starling	Sturnus vulgaris
White-eyed Vireo	Vireo griseus
Yellow-throated Vireo	Vireo flavifrons
Solitary Vireo	Vireo solitarius
Red-eyed Vireo	Vireo olivaceus

Table A2-61 (Continued)

Black-and-white Warbler	*Mniotitta varia*
Prothonotary Warbler	*Protonotaria citrea*
Worm-eating Warbler	*Helmitheros vermivorus*
Tennessee Warbler	*Vermivora peregrina*
Orange-crowned Warbler	*Vermivora celata*
Parula Warbler	*Parula americana*
Yellow Warbler	*Dendroica petechia*
Magnolia Warbler	*Dendroica magnolia*
Cape May Warbler	*Dendroica tigrina*
Black-throated Blue Warbler	*Dendroica caerulescens*
Myrtle Warbler	*Dendroica coronata*
Yellow-throated Warbler	*Dendroica dominica*
Black-poll Warbler	*Dendroica striata*
Pine Warbler	*Dendroica pinus*
Prairie Warbler	*Dendroica discolor*
Palm Warbler	*Dendroica palmarum*
Ovenbird	*Seiurus aurocapillus*
Northern Waterthrush	*Seiurus noveboracensis*
Louisiana Waterthrush	*Seiurus motacilla*
Yellowthroat	*Geothlypis trichas*
Hooded Warbler	*Wilsonia citrina*
Redstart	*Setophaga ruticilla*
House Sparrow	*Passer domesticus*
Bobolink	*Dolichonyx oryzivorus*
Meadowlark	*Sturnella magna*
Red-winged Blackbird	*Agelaius phoeniceus*
Orchard Oriole	*Icterus spurius*
Baltimore Oriole	*Icterus galbula*
Rusty Blackbird	*Euphagus carolinus*
Brewer's Blackbird	*Euphagus cyanocephalus*
Boat-tailed Grackle	*Cassidix mexicanus*
Common Grackle	*Quiscalus quiscula*
Brown-headed Cowbird	*Molothrus ater*
Scarlet Tanager	*Piranga olivacea*
Summer Tanager	*Piranga rubra*
Cardinal	*Richmondena cardinalis*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Blue Grosbeak	*Guiraca caerulea*
Indigo Bunting	*Passerina cyanea*
Painted Bunting	*Passerina ciris*
Dickcissel	*Spiza americana*
Purple Finch	*Carpodacus purpureus*
Goldfinch	*Spinus tristis*
Rufous-sided Towhee	*Pipilo erythrophthalmus*
Savannah Sparrow	*Passerculus sandwichensis*
Grasshopper Sparrow	*Ammodramus savannarum*

Table A2-61 (Continued)

Henslow's Sparrow	Passerherbulus henslowii
Vesper Sparrow	Pooecetes gramineus
Bachman's Sparrow	Aimophila aestivalis
Slate-colored Junco	Junco hyemalis
Chipping Sparrow	Spizella passerina
Field Sparrow	Spizella pusilla
White-crowned Sparrow	Zonotrichia leucophrys
White-throated Sparrow	Zonotrichia albicollis
Swamp Sparrow	Melospiza georgiana
Song Sparrow	Melospiza melodia

III. Reptiles

American Alligator	Alligator mississippiensis
Florida Snapping Turtle	Chelydra serpentina osceola
Common Snapping Turtle	Chelydra serpentina serpentina
Stinkpot	Sternothaerus odoratus
Loggerhead Musk Turtle	Sternothaerus minor minor
Striped Mud Turtle	Kinosternon bauri
Florida Mud Turtle	Kinosternon subrubrum steindachneri
Florida Box Turtle	Terrapene carolina bauri
Pensinsula Cooter	Pseudemys floridana peninsularis
Yellow-bellied Turtle	Pseudemys scripta scripta
Florida Red-bellied Turtle	Pseudemys nelsoni
Florida Chicken Turtle	Deirochelys reticularia
Gopher Tortoise	Gopherus polyphemus
Florida Softshell	Trionyx ferox
Green Anole	Anolis carolinensis carolinensis
Southern Fence Lizard	Sceloporus undulatus undulatus
Ground Skink	Lygosoma laterale
Southern Five-lined Skink	Eumeces inexpectatus
Broad-headed Skink	Eumeces laticeps
Brown Red-tailed Skink	Eumeces egregius onocrepis
Six-lined Racerunner	Cnemidophorus sexlineatus
Eastern Glass Lizard	Ophisaurus ventralis
Eastern Slender Glass Lizard	Ophisaurus attenuatus longicaudus
Island Glass Lizard	Ophisaurus compressus
Worm Lizard	Rhineura floridana
Florida Green Water Snake	Natrix cyclopion floridana
Brown Water Snake	Natrix taxispilota
Red-bellied Water Snake	Natrix erythrogaster erythrogaster

Table A2-61 (Continued)

North Florida Swamp Snake	Seminatrix pygaea
Florida Brown Snake	Storeria dekayi victa
Banded Water Snake	Natrix sipedon fasciata
Eastern Garter Snake	Thamnophis sirtalis sirtalis
Striped Swamp Snake	Liodytes alleni
Southern Ribbon Snake	Thamnophis sauritus sackeni
Rainbow Snake	Abastor erythrogrammus
Yellow-lipped Snake	Rhadinaea flavilata
Eastern Mud Snake	Farancia abacura
Eastern Hognose Snake	Heterodon platyrhinos
Southern Hognose Snake	Heterodon simus
Southern Ringneck Snake	Diadophis punctatus punctatus
Southern Black Racer	Coluber constrictor priapus
Eastern Coachwhip	Masticophis flagellum
Eastern Indigo Snake	Drymarchon corais
Rough Green Snake	Opheodrys aestivus
Yellow Rat Snake	Elaphe obsoleta quadrivittata
Florida Pine Snake	Pitouphis melanoleucas mugitus
Corn Snake	Elaphe guttata guttata
Short-tailed Snake	Stilosoma extenuatum
Scarlet Snake	Cemophora coccinea
Scarlet Kingsnake	Lampropeltis doliata doliata
Mole Snake	Lampropeltis calligastor
Eastern Kingsnake	Lampropeltis getulus
Florida Crowned Snake	Tantilla coronata wagneri
Eastern Coral Snake	Micrurus fulvius
Eastern Cottonmouth	Agkistrodon piscivorus piscivorus
Dusky Pigmy Rattlesnake	Sistrurus miliarius barbouri
Eastern Diamondback Rattlesnake	Crotalus adamanteus

IV. Amphibians

Amphiuma	Amphiuma means
Eastern Lesser Siren	Siren intermedia
Greater Siren	Siren lacertina
Narrow-striped Dwarf Siren	Pseudobranchus striatus axanthus
Mole Salamander	Ambystoma talpoideum
Marbled Salamander	Ambystoma opacum
Eastern Tiger Salamander	Ambystoma tigrinum tigrinum
Peninsula Newt	Diemictylus viridescens piaropicola
Central Newt	Notrophthalmus viridescens

Table A2-61 (Continued)

Striped Newt	*Diemictylus perstriatus*
Slimy Salamander	*Plethodon glutinosus glutinosus*
Eastern Mud Salamander	*Pseudotriton montanus montanus*
Dwarf Salamander	*Manculus quadridigitatus*
Eastern Spade Foot	*Scaphiopus holbrooki*
Southern Toad	*Bufo terristris*
Oak Toad	*Bufo quercicus*
Eastern Narrow-mouth Toad	*Gastrophryne carolinensis*
Greenhouse Frog	*Eleutherodactylus ricordi planirostris*
Spring Peeper	*Hyla crucifer*
Green Tree Frog	*Hyla cinerea*
Pine Woods Tree Frog	*Hyla femoralis*
Eastern Gray Tree Frog	*Hyla versicolor versicolor*
Squirrel Tree Frog	*Hyla squirella*
Little Grass Frog	*Hyla ocularis*
Barking Tree Frog	*Hyla gratiosa*
Florida Cricket Frog	*Acris gryllus dorsalis*
Florida Chorus Frog	*Pseudacris nigrita verrucosa*
Ornate Chorus Frog	*Pseudacris ornata*
Bullfrog	*Rana catesbeiana*
River Frog	*Rana heckscheri*
Pig Frog	*Rana grylio*
Bronze Frog	*Rana clamitans clamitans*
Southern Leopard Frog	*Rana pipiens sphenocephala*
Florida Gopher Frog	*Rana areolata aesopus*

V. Fishes

Bowfin	*Amia calva*
Mud Minnow	*Umbra pygmaea*
Redfin Pickerel	*Esox americanus*
Chain Pickerel	*Esox niger*
Southeastern Golden shiner	*Notemigonus crysoleucas bosci*
Iron-colored Shiner	*Notropis chalybaeus*
Lowland Shiner	*Notropis cummingsae cummingsae*
Pugnose Minnow	*Notropis emiliae*
Sailfin Shiner	*Notropis hypselopterus*
Red Minnow, Taillight Shiner	*Notropis maculatus*
Peterson's Shiner	*Notropis petersoni*
Spring Redeye Chub	*Hybopsis harperi*
Yellow Bullhead	*Ictalurus natalis*
Southern Brown Bullhead	*Ictalurus nebulosus marmoratus*

Table A7-1 Total Employment By Occupation - Gainesville

Occupational Title	1970	1974	Estimated 1977	Estimated 1978	Projected 1985
Crafts and Kindred Workers	3742	5780	6710	7040	9180
Construction Crafts Workers	1665	2690	3120	3260	4310
Carpenters and Apprentices	444	690	820	870	1180
Brick and Stonemasons and Apprentices	120	160	190	200	2700
Bulldozer Operators	59	120	130	130	160
Cement and Concrete Finishers	111	200	230	240	330
Electricians and Apprentices	255	460	520	540	690
Excavating, Grading, Machine Operators	103	170	190	190	220
Floor Layers, Exc. Tile Setters	0	*	*	*	*
Painters and Apprentices	200	280	340	360	500
Paperhangers	0	*	*	*	*
Plasterers and Apprentices	37	30	40	50	80
Plumbers, Pipefitters and Apprentices	200	310	350	370	480
Roofer and Slaters	78	170	190	190	240
Structural Metal Craft Workers	20	40	40	40	50
Tilesetters	38	60	80	80	110
Blue Collar Worker Supvr., Mec.	316	440	520	540	710
Metalworking Craft Workers Exc. Mec.	117	140	180	180	250
Blacksmiths	0	*	*	*	*
Boilermakers	0	*	*	*	*
Heat Treaters, Annealers, Etc.	0	*	*	*	*
Forge and Hammer Operators	0	*	*	*	*
Job and Die Setters, Metal	0	*	*	*	*
Machinists and Apprentices	46	60	80	80	110
Millwrights	4	*	10	10	10
Molders, Metal and Apprentices	9	*	*	*	*
Jewelers and Watchmakers	11	10	10	10	20
Millers, Grain, Flour, Feed	0	*	*	*	*
Motion Picture Projectionists	4	*	*	*	10
Opticians, Lens Grinder, Polisher	15	40	40	40	40
Piano, Organ Tuners, Repairers	0	*	*	*	*
Shipfitters	0	*	*	*	*
Shoe Repairers	6	*	*	*	10
Sign Painters and Letterers	0	*	*	*	*
Stationary Engineers	43	80	90	90	110
Stone Cutters, Stone Carvers	0	*	*	*	*
Tailors	5	*	10	10	10
Upholsterers	6	10	10	10	20
Crafts, Kindred Workers, Nec.	26	60	60	60	80

Table A7-1 Total Employment By Occupation - Gainesville (continued)

Occupational Title	1970	1974	Estimated 1977	Estimated 1978	Projected 1985
Operatives	2897	3540	4200	4410	5960
Operatives, Exc. Transport	1822	2120	2500	2630	3530
Semiskilled Metalworking	91	160	180	190	240
Drill Press Operatives	0	*	*	*	*
Furnace Tendrs, Smeltrs, Pourers	0	*	*	*	*
Grinding Machine Operatives	4	*	*	*	10
Heaters, Metal	0	*	*	*	*
Lathe, Millin Mach. Operatives	5	10	10	10	10
Metal Platers	10	20	20	20	30
Other Precision Mach. Operators	0	*	*	*	*
Punch Stamping Press Operative	0	*	*	*	*
Solderers	0	*	*	*	*
Welders and Flame Cutters	72	130	150	160	190
Semiskilled Textile	0	*	*	*	*
Carding, Lapping, Combing Oprs.	0	*	*	*	*
Knitters, Loopers, and Toppers	0	*	*	*	*
Spinners, Twisters, Winders	0	*	*	*	*
Weavers	0	*	*	*	*
Other Textile Operatives	0	*	*	*	*
Semiskilled Packing, Inspecting	276	310	360	380	520
Checkers, Examiners, Etc., Mfg.	88	130	150	160	210
Graders, and Sorters, Mfg.	13	10	10	10	20
Meat Wrappers, Retail Trade	24	40	50	50	60
Packer, Wrapper, Ex. Meat, Produce	127	90	110	120	180
Prod. Ordr, Packer, Exc. Fact, Farm	24	40	40	40	50
Other Operatives, Exc. Transport	1455	1650	1960	2060	2770
Asbestos, Insulation Workers	6	10	10	10	10
Assemblers	179	350	410	420	550
Blasters	0	*	*	*	*
Bottling, Canning Operatives	17	20	20	20	30
Surveyor Helpers	15	20	30	30	40
Clothing Ironers and Pressers	46	20	30	30	50
Pattern and Model Makers	0	*	*	*	*
Rollers and Finishers, Metal	0	*	*	*	*
Sheetmetal Workers and Appr.	43	60	70	70	100
Tool and Diemakers and Appr.	15	20	20	20	30
Mechanics, Repairers, Installers	893	1360	1550	1620	2070
Air Cond., Heating, Refrig Mech.	73	150	170	170	200
Aircraft Mechanics	0	*	*	*	*
Auto Accessories Installers	0	*	*	*	*
Auto Body Repairers	85	80	110	110	170
Auto Mechanics and Appr.	347	450	520	550	720
Data Processing Machine Repairers	9	30	30	30	30

Table A7-1 Total Employment By Occupation - Gainesville (continued)

Occupational Title	1970	1974	Estimated 1977	Estimated 1978	Projected 1985
Farm Implement Mechanics	11	30	30	30	30
Heavy Equip. Mech, Includes Diesel	142	240	270	280	250
Household Appliance Mechanics	57	80	90	100	120
Loom Fixers	0	*	*	*	*
Office Machine Repairers	16	40	40	40	40
Radio, Television Repairers	74	90	100	100	130
Railroad, Car Shop Repairers	14	40	50	60	80
Other Mechanics and Appr.	65	130	140	150	180
Printing Trade Crafts Workers	68	80	90	100	130
Bookbinders	8	10	10	10	10
Compositors and Typesetters	26	30	30	40	50
Electrotypers, Stereotypers	0	*	*	*	*
Engravers Exc. Photoengravers	0	*	*	*	*
Photoengravers, Lithographers	5	10	10	10	10
Printing Press Opers. & Apprentices	29	40	40	40	60
Transportation, Public Utility Craft	322	560	650	670	880
Elec. Power Line Installer, Reprs.	72	110	130	130	170
Locomotive Engineers	29	140	160	170	210
Locomotive Engineer Helpers	0	*	*	*	*
Power Station Operators	9	20	20	20	30
Telephone Installers, Repairers	157	240	280	290	380
Telephone Line Instalr, Splicer	55	50	60	60	90
Other Crafts, Kindred Workers	361	510	600	620	830
Bakers	78	70	90	90	130
Cabinetmakers	61	80	90	100	140
Carpet Installers	22	40	50	50	70
Crane, Derrick, and Hoist Operator	5	10	10	10	10
Decorators, Window Dressers	22	30	30	40	50
Dental Laboratory Tech.	9	10	10	10	10
Furniture and Wood Finishers	6	10	10	10	10
Furriers	0	*	*	*	*
Glaziers	15	30	40	40	50
Inspectors, Log and Lumber	7	*	10	10	10
Inspectors, Other	20	30	40	40	50
Cutting Operatives, Nec.	30	20	30	30	50
Dressmakers, Exc. Factory	64	80	90	100	140
Drillers, Earth	5	10	10	10	10
Dry Wall Installers, Lathes	43	90	100	120	150
Dyers	0	*	*	*	*
Filer, Polisher, Sander, Buffer	7	10	10	10	20
Garge Workers, Gas Station Attendant	258	220	260	270	360
Laundry, Dry Cleaning Oprs, Nec.	107	70	90	90	130
Meat Cutters, Butchers, Exc. Mfg.	127	150	190	200	220
Meat Cutters, Butchers	55	20	30	30	50
Milleners	0	*	*	*	*
Mine Operatives, Nec.	0	*	*	*	*

Table A7-1 Total Employment By Occupation - Gainesville (continued)

Occupational Title	1970	1974	Estimated 1977	Estimated 1978	Projected 1985
Mixing Operatives	26	30	30	40	50
Oilers, Greasers, Exc. Auto	6	10	10	10	10
Painters, Mfg. Articles	23	40	40	40	50
Photographic Process Workers	39	80	90	90	100
Riveters and Fasteners	0	*	*	*	*
Sailors and Deckhands	0	*	*	*	*
Sawyers	14	10	20	20	30
Sewers and Stitchers	74	20	20	30	30
Shoemaking Machine Operatives	0	*	*	*	*
Furnace Tender, Stoker Exc. Metal	33	30	40	40	60
Winding Operatives, Nec.	14	40	40	40	50
Misc. Mach. Operatives	112	150	180	190	240
Operatives, Nec.	155	150	180	190	260
Transport Equipment Operatives	1075	1420	1700	1780	2430
Boat Operators	0	*	*	*	*
Bus Drivers	116	210	230	240	310
Conductors and Opr. Urban Rail	0	*	*	*	*
Delivery and Route Workers	461	500	600	630	850
Fork Lift Tow Motor Operatives	17	20	20	30	40
Rail Vehicle Operators Nec.	6	*	10	10	10
Parking Attendants	9	10	10	10	20
Railroad Brake Operators	0	*	*	*	*
Railroad Switch Operators	26	80	100	100	140
Taxicab Drivers, Chauffeurs	23	20	30	30	50
Truck Drivers	417	580	700	740	1010

* = Data not available.

Source: Office of Research and Statistics, Florida Department of Commerce (unpublished report).

Table A7-2 1975 Existing Educational Facilities

Facility	Grade Levels	1975-76 Enrollment	Capacity*
Elementary Schools			
Alachua	K - 4	643	670
Archer	K - 6	398	490
Duval	K - 5	449	515
J.J. Finley	K - 5	571	610
Stephen Foster	K - 5	687	650
Glen Springs	K - 5	695	655
High Springs	K - 4	383	270
Idlywild	K - 5	484	690
Kirby-Smith	K - 5	423	475
Lake Forest	K - 5	510	625
Sidney Lanier	K - 5	114	415
Littlewood	K - 5	629	640
Metcalfe	K - 5	479	625
Newberry	K - 6	426	475
Prairie View	K - 5	501	655
M.K. Rawlings	K - 5	554	655
Shell	K - 6	552	620
Terwilliger	K - 5	753	640
Waldo	K - 6	232	240
Williams	K - 5	556	710
		10,039	11,325
Middle Schools			
Howard Bishop	6 - 8	976	1,075
Fort Clarke	6 - 8	1,094	913
Lincoln	6 - 8	996	1,230
A.L. Mebane	5 - 8	576	1,083
Spring Hill	5 - 8	342	333
Westwood	6 - 8	991	1,139
		4,975	5,773
Secondary Schools			
Buchholtz	9 - 12	1,622	1,876
Eastside	9 - 12	1,122	1,316
Gainesville	9 - 12	1,998	1,885
Hawthorne	7 - 12	666	1,007
Newberry	7 - 12	746	909
Santa Fe	9 - 12	872	1,056
		7,026	8,049
TOTAL:		22,040	25,147

*Does not include portable classrooms.

Source: North Central Florida Regional Planning Council, 1976a.

Table A7-3 Regional Utilities Projected Electric Revenue Requirements
-Based on Load Growth of 8 Percent Through 1980 and 7 Percent Thereafter
(Dollars in Thousands)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1) Minimum Net Revenue Requirements											
Low-Sulfur Oil	$15,535	$18,962	$21,013	$19,213	$21,147	$21,445	$21,439	$21,393	$21,734	$22,319	$22,907
Low-Sulfur Coal	15,020	17,822	20,445	22,578	23,864	24,600	24,603	24,596	24,603	24,977	25,631
2) Total System Operating & Maintenance Expense											
Low-Sulfur Oil	5,633	6,308	7,065	7,901	8,740	9,668	10,691	11,831	13,075	14,458	15,990
Low-Sulfur Coal	5,633	6,308	7,065	7,901	9,336	10,351	11,392	12,659	14,007	15,314	17,098
3) System Fuel Cost											
Low-Sulfur Oil	15,858	17,682	20,639	24,819	26,471	30,367	34,369	39,247	44,871	51,197	58,237
Low-Sulfur Coal (Contract)	15,858	17,682	20,639	24,819	20,741	23,244	26,051	29,671	33,657	38,204	43,663
Low-Sulfur Coal (Lease)	15,858	17,682	20,639	24,819	16,888	18,844	21,014	24,174	27,563	31,433	35,863
4) Florida Power Corporation Sales											
Low-Sulfur Oil					(1,631)	(1,698)	(1,849)				
Low-Sulfur Coal (Contract)					(3,648)	(3,954)	(4,359)				
Low-Sulfur Coal (Lease)					(4,637)	(4,810)	(4,826)				
Total Revenue Requirements (Sum of Items 1,2,3, & 4)											
Low-Sulfur Oil	37,026	42,952	48,717	51,933	54,727	59,782	64,650	72,471	79,680	87,974	97,134
Low-Sulfur Coal (Contract)	36,511	41,812	48,149	55,298	50,293	54,241	57,687	66,926	72,267	78,495	86,392
Low-Sulfur Coal (Lease)	36,511	41,812	48,149	55,298	45,451	48,985	52,183	61,429	66,173	71,823	78,592

	Levelized 1977-1987	Average Revenues in Mills Per kWh										
		1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Low-Sulfur Oil	61.52	53.74	57.73	60.52	59.69	58.78	59.96	60.59	63.40	65.10	67.16	69.33
Low-Sulfur Coal (Contract)	57.69	52.99	56.20	59.81	63.56	54.02	54.40	54.06	58.55	59.04	60.00	61.66
Low-Sulfur Coal (Lease)	54.37	52.99	56.20	59.81	63.56	48.82	49.13	48.91	53.74	54.06	54.83	56.10

Table A7-4 Regional Utilities Projected Electric Revenue Requirements
-Based on 5 Percent Load Growth
(Dollars in Thousands)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1) Required Net Operating Revenue											
Low-Sulfur Oil	$15,535	$18,962	$21,013	$19,213	$21,147	$21,445	$21,439	$21,393	$21,734	$22,319	$22,907
Low-Sulfur Coal	15,020	17,822	20,445	22,578	23,864	24,600	24,630	24,596	24,603	24,977	25,631
2) System Production Operating & Maintenance Expense											
Low-Sulfur Oil	5,546	6,210	6,956	7,779	8,605	9,618	10,525	11,648	12,872	14,234	15,742
Low-Sulfur Coal	5,546	6,210	6,956	7,779	9,171	10,167	11,191	12,434	13,708	15,142	16,795
3) System Fuel Cost											
Low-Sulfur Oil	14,402	15,254	17,376	19,531	21,245	23,914	26,508	29,679	33,346	37,180	41,527
Low-Sulfur Coal (Contract)	14,402	15,254	17,376	19,531	16,746	18,631	19,844	22,638	25,201	27,674	30,513
Low-Sulfur Coal (Lease)	14,402	15,254	17,376	19,531	13,605	15,201	16,968	18,419	20,547	22,462	24,763
4) Florida Power Corporation Sales											
Low-Sulfur Oil					(1,631)	(1,698)	(1,849)				
Low-Sulfur Coal (Contract)					(3,648)	(3,954)	(4,359)				
Low-Sulfur Coal (Lease)					(4,637)	(4,810)	(4,826)				
Total Revenue Requirements (Sum of Items 1,2,3, & 4)											
Low-Sulfur Oil	35,483	40,426	45,345	46,343	49,366	53,179	56,523	62,720	67,952	73,733	80,176
Low-Sulfur Coal (Contract)	34,968	39,286	44,777	49,888	46,133	49,444	51,279	59,668	63,512	67,793	72,939
Low-Sulfur Coal (Lease)	45,968	39,286	44,777	49,888	42,003	45,158	47,936	55,449	58,858	62,581	67,189

	Levelized 1977-1987	Average Revenue in Mills Per kWh										
		1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Low-Sulfur Oil	63.08	52.96	57.50	61.36	59.80	60.65	62.20	63.05	66.51	68.64	70.97	73.49
Low-Sulfur Coal (Contract)	60.20	52.19	55.88	60.59	64.37	56.67	57.83	57.10	63.27	64.15	65.25	66.86
Low-Sulfur Coal (Lease)	57.27	52.19	55.88	60.59	64.37	51.60	52.82	53.38	58.80	59.45	60.23	61.58

Table A7-5 Regional Utilities Economic Comparison of Project Cancellation
-Based on Load Growth of 8 Percent Through 1980 and 7 Percent Thereafter
(Dollars in Thousands)

	Levelized 1977-1987	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Minimum Net Revenue Requirements												
Includes Defeasement of 1976 Issue		$12,464	$22,400	$22,601	$22,794	$23,078	$22,863	$21,832	$22,585	$22,917	$23,423	$23,986
Without Defeasement of 1976 Issue		12,089	17,149	17,386	17,661	17,990	18,069	18,236	18,597	18,937	19,451	19,435
Without Defeasement of 1976 Issue and Without Maintaining Transfers		12,089	14,985	16,024	17,085	17,856	18,069	18,236	18,597	18,937	19,451	19,935
Total System Operating & Maintenance Expense		5,633	6,308	7,065	8,102	8,531	9,441	10,255	11,386	12,549	13,309	14,703
System Fuel Cost		15,858	17,862	20,639	24,819	19,545	22,549	19,344	23,320	25,587	8,176	10,799
Purchase or Participation Expenses												
Demand Charges						1,239	1,323	3,465	3,714	3,964	12,262	12,275
Delivered Energy Cost (Fuel Cost)						7,480	8,290	17,400	18,100	22,000	34,000	37,200
Transmission and O&M Expense						878	973	3,252	3,393	4,121	7,810	8,659
Subtotal:						9,596	10,586	24,117	25,207	30,085	54,072	58,134
Total Revenue Requirements												
Includes Defeasement of 1976 Issue		33,955	46,570	50,305	55,715	60,750	65,439	75,548	82,498	91,138	98,980	107,622
Without Defeasement of 1976 Issue		33,580	41,319	45,090	50,582	55,662	60,645	71,952	78,510	87,158	95,008	103,571
Without Defeasement of 1976 Issue and Without Maintaining Transfers		33,580	39,155	43,728	50,006	55,528	60,645	71,952	78,510	87,158	95,008	103,571
		Average Revenue in Mills Per kWh										
Includes Defeasement of 1976 Issue	67.30	49.28	62.59	62.49	64.04	65.25	65.64	70.80	72.18	74.46	75.56	76.82
Without Defeasement of 1976 Issue	63.11	48.74	55.54	56.01	58.14	59.79	60.83	67.43	68.69	71.21	72.53	73.93
Without Defeasement of 1976 Issue and Without Maintaining Transfers	62.63	48.74	52.63	54.32	57.48	59.64	60.83	67.43	68.69	71.21	72.53	73.93

Table A7-6 Deerhaven Unit 2 Construction Cost Estimates

	Oil-Fired	Coal-Fired	
	Low Sulfur	Low Sulfur	High Sulfur
Existing Contracts	$ 365,400	$ 365,400	$ 365,400
Oil Storage Tanks	8,505,964	8,505,964	8,505,964
Turbine Generator	30,068,474	10,800,000[a]	10,800,000[a]
Steam Generator (Oil-Fired)	1,569,904	1,569,904	1,569,904
Transformers	154,752	154,752	154,752
Start Transformer	360,000	360,000	360,000
Site Improvement	2,217,010	2,217,010	2,217,010
Condenser and Heaters	161,429	161,429	161,429
Deareating Heater	1,528,390	1,528,390	1,528,390
Feedwater Pumps	937,635	937,635	937,635
Circulating Pumps	416,667	416,667	416,667
Turbine & Condenser Installation	1,649,172	1,649,172	1,649,172
Electrical Equipment	1,019,691	1,019,691	1,019,691
Subtotal:	48,954,488	29,686,014	29,686,014
Existing Contract Modifications			
Additional Transformer Capacity		250,000	320,000
Steam Generator (Coal-Fired)		35,200,000	35,200,000
Additional Site Improvements		365,000	365,000
Additional Electrical Equipment		381,000	471,000
Subtotal:	--	36,196,000	36,356,000
Items Not Under Contract			
Foundations and Buildings	3,400,000	4,500,000	4,700,000
Piping and Equipment	9,200,000	9,530,000	9,530,000
Wiring and Equipment	3,350,000	3,450,000	3,500,000
Cooling Towers	2,400,000	2,600,000	2,600,000
Chimney	750,000	845,000	845,000
Railroads		300,000	300,000
Ash Storage Ponds		235,000	235,000
Ash Handling Equipment		210,000	210,000
Coal Handling Equipment		7,800,000	7,800,000
Wastewater Treatment		500,000	500,000
Electrostatic Precipitator		10,750,000	8,750,000
Limestone Slurry Scrubber			20,000,000
Contingency	1,359,279	5,000,000	6,000,000
Subtotal	20,459,272	45,720,000	64,970,000
Total	60,413,767	111,602,014	131,012,014
Engineering and Project Management	3,043,446	4,893,200	5,744,200
Total Construction Cost:[b]	$72,457,213 or $308/kW	$116,495,214 or $496/kW	$136,756,214 or $582/kW

NOTES: [a]Estimated cancellation charge is based on a re-order for a coal-fired boiler.
[b]Excludes fuel inventory, interest during construction and other financial costs, sales taxes are included.

Table A7-7 Regional Utilities Deerhaven Unit 2 Estimated Capital Budget
(Dollars in Thousands)

	Construction Years					Total
	7/76-6/77	7/77-6/78	7/78-6/79	7/79-6/80	7/80-12/80	Expenditures
Capital Construction Requirements						
Generation Construction Alternatives						
Low-Sulfur Oil[1]	$18,764	$33,439	$14,232	$ 6,022	$ --	$72,457
Low-Sulfur Coal[1]	18,764	30,436	36,781	25,431	5,083	116,495
High-Sulfur Coal[1]	18,764	37,440	43,672	30,260	6,620	136,756
Related Facilities						
Oil Inventory Requirement[1]	--	--	--	1,000	--	1,000
Coal Inventory Requirement[1]	--	--	--	2,000	2,000	4,000
Unit Coal Train[1]	--	--	--	2,500	--	2,500
Total Construction						
Low-Sulfur Oil	18,764	33,439	14,232	7,022	--	73,457
Low-Sulfur Coal	18,764	30,436	36,781	29,931	7,083	122,995
High-Sulfur Coal	18,764	37,440	43,672	34,760	8,620	143,256
Financing Costs, Interest, and Fund Requirements						
Net Interest During Construction[2]						
Low-Sulfur Oil	2,905	2,803	4,848	5,840	--	16,396
Low-Sulfur Coal	2,905	2,499	4,811	7,173	4,302	21,690
High-Sulfur Coal	2,905	2,674	5,378	8,142	4,907	24,006
Bond Reserves, Contingency Fund Requirements, and Financing Fees[3]						
Low-Sulfur Oil	2,625	4,880	2,513	1,074	--	11,092
Low-Sulfur Coal	2,475	3,565	4,313	3,738	1,139	15,230
High-Sulfur Coal	2,475	4,163	5,049	4,370	1,326	17,383
Total Capital Requirements						
Low-Sulfur Oil	24,294	41,122	21,593	13,936	--	100,945
Low-Sulfur Coal	24,144	36,500	45,905	40,842	12,524	159,915
High-Sulfur Coal	24,144	44,277	54,099	47,272	14,853	184,645

Table A7-7 Regional Utilities Deerhaven Unit 2 Estimated Capital Budget (continued)
(Dollars in Thousands)

	Construction Years					Total
	7/76-6/77	7/77-6/78	7/78-6/79	7/79-6/80	7/80-12/80	Expenditures
Capital Sources						
Bond Financing						
Low-Sulfur Oil[1] [4]	$21,520	$40,000	$20,600	$ 8,800	$ --	$90,920
Low-Sulfur Coal[1]	21,520	31,000	37,500	32,500	9,900	132,420
High-Sulfur Coal[1]	21,520	36,200	43,900	38,000	11,530	151,150
Internal Capital Required						
Low-Sulfur Oil	2,774	1,122	993	5,136	--	10,025
Low-Sulfur Coal	2,624	5,500	8,405	8,342	2,624	27,495
High-Sulfur Coal	2,624	8,077	10,199	9,272	3,323	33,495
Total Capital Sources						
Low-Sulfur Oil	24,294	41,122	21,593	13,936	--	100,945
Low-Sulfur Coal	24,144	36,500	45,905	40,842	12,524	159,915
High Sulfur Coal	24,144	44,277	54,099	47,272	14,853	184,645

NOTES: [1]Amounts obtained from RUB's Status Report, Deerhaven Unit 2, November 1976.
[2]Amounts calculated assuming interest expense rate of 6 3/4 percent. Interest expense assumed to be offset in year of issue by investment earnings at 6 3/4 percent.
[3]Amounts estimated at 12.2 percent of bond issues for oil alternative and 11.5 percent for coal based on financing fees of 3 percent, contingency fund requirements of 0.5 percent, and bond reserve fund requirements assumed to equal level debt service, reflecting interest expense of 6 3/4 percent (oil for 23 retirements and coal for 28 retirements).
[4]Projected oil financing issues include interest during construction for one year and bond reserve and contingency fund requirements. Projected coal issues do not assume capitalization of these items.

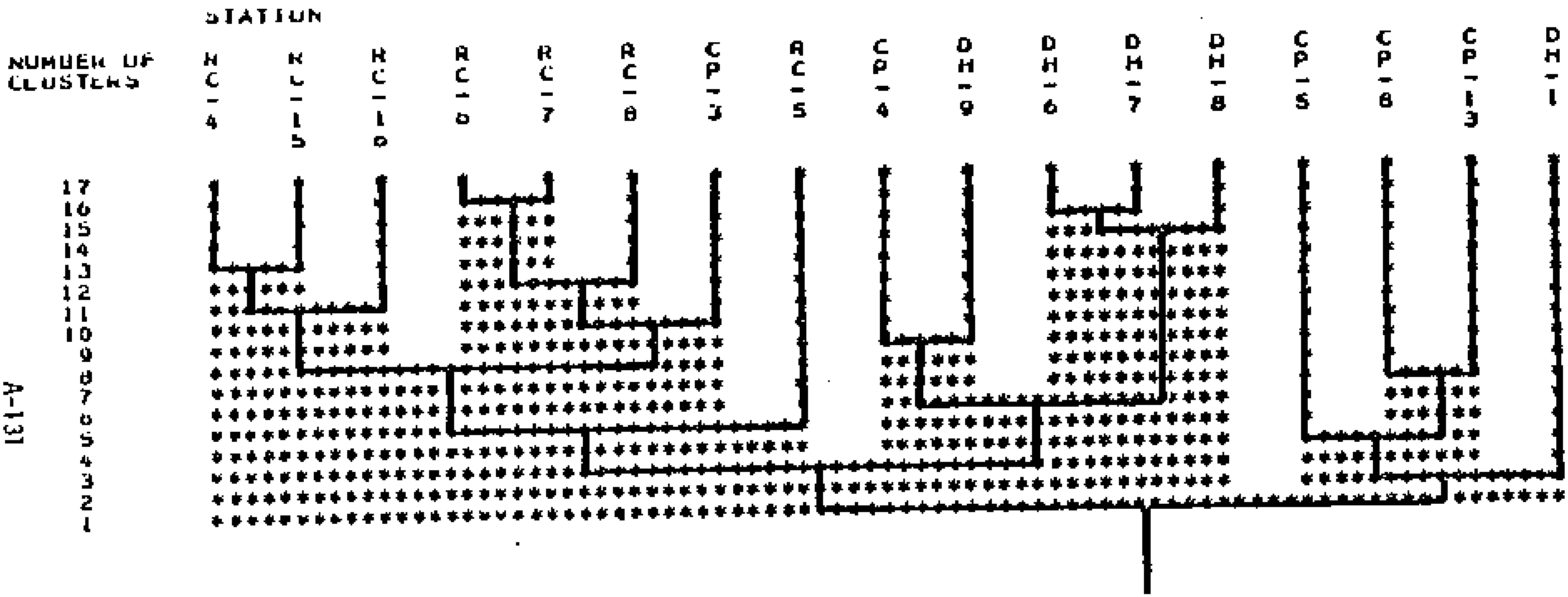

Figure A2-1 Cluster analysis map using all parameters found significantly different by Duncan's new multiple range test.

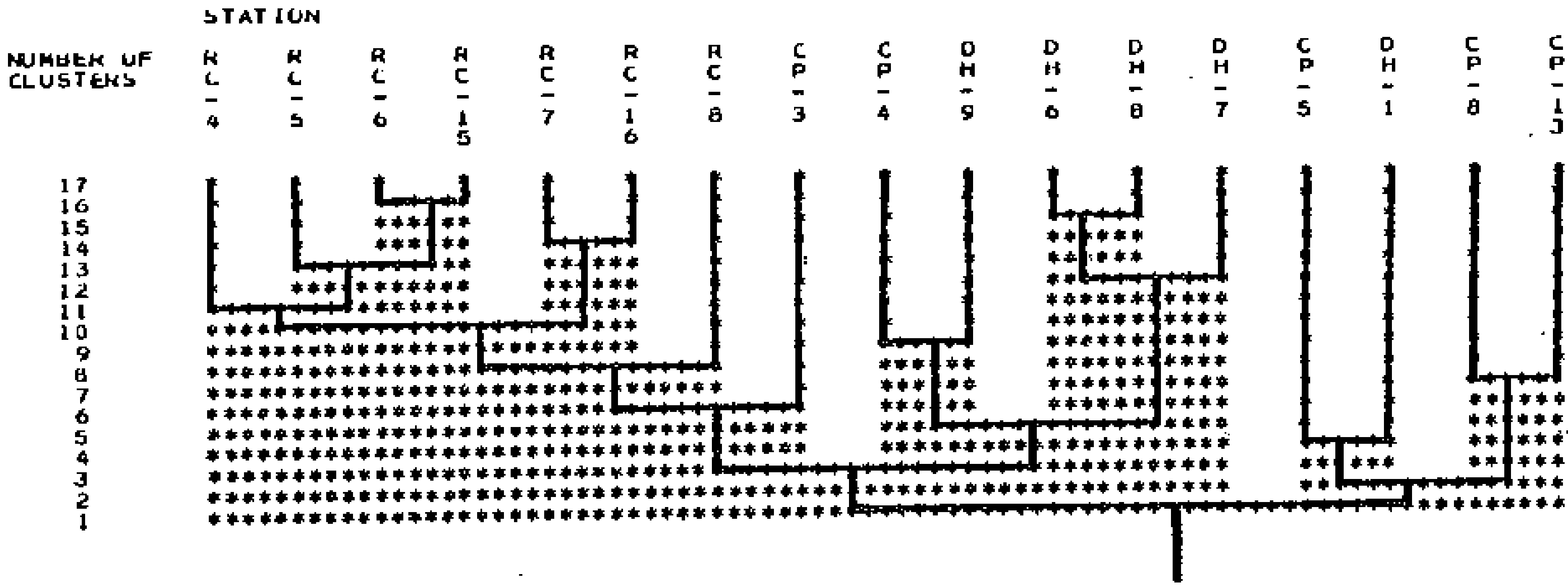

Figure A2-2 Cluster analysis map for conductivity.

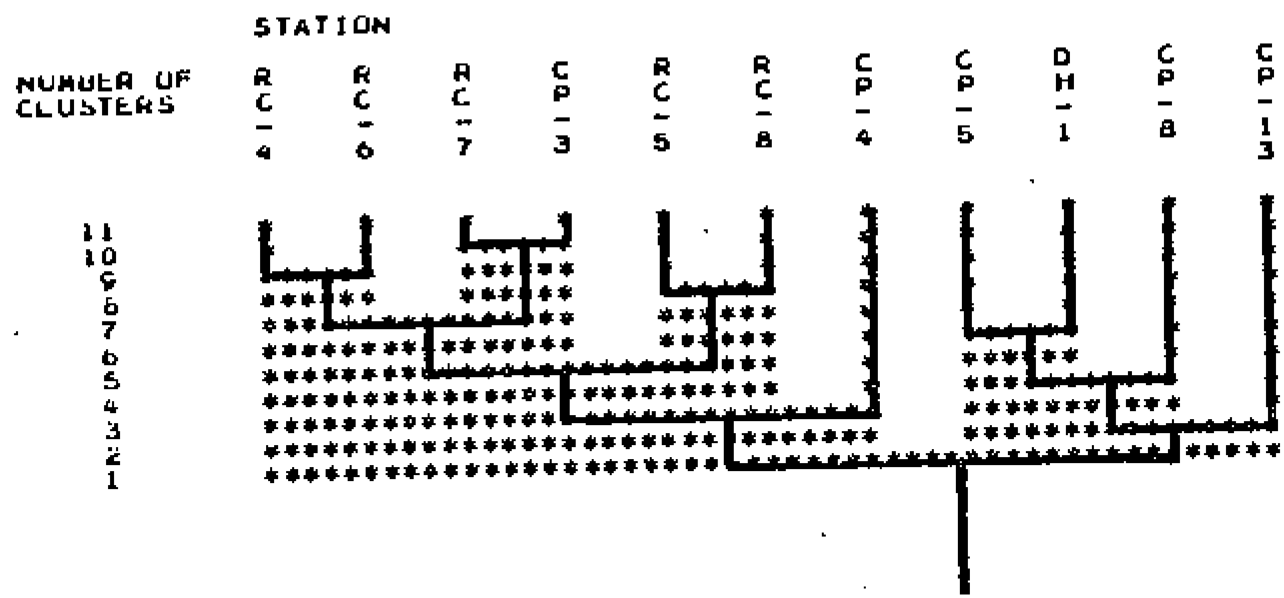

Figure A2-3 Cluster analysis map for total dissolved solids.

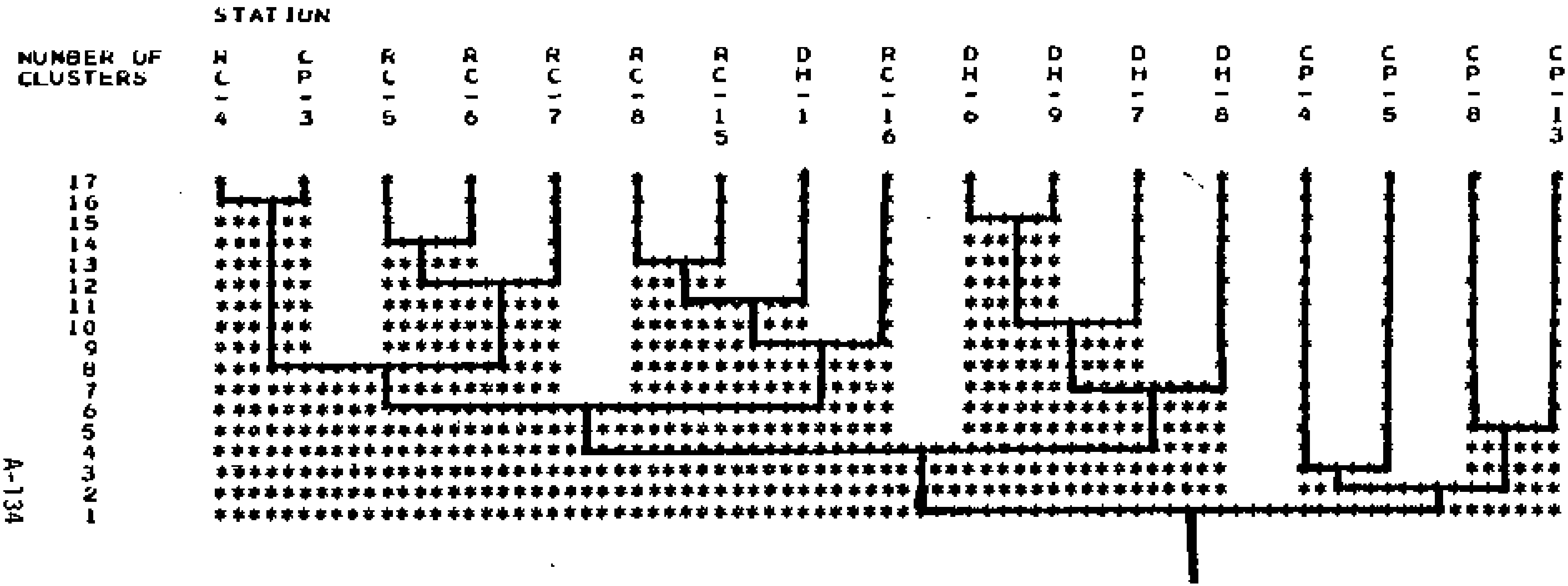

Figure A2-4 Cluster analysis map for alkalinity.

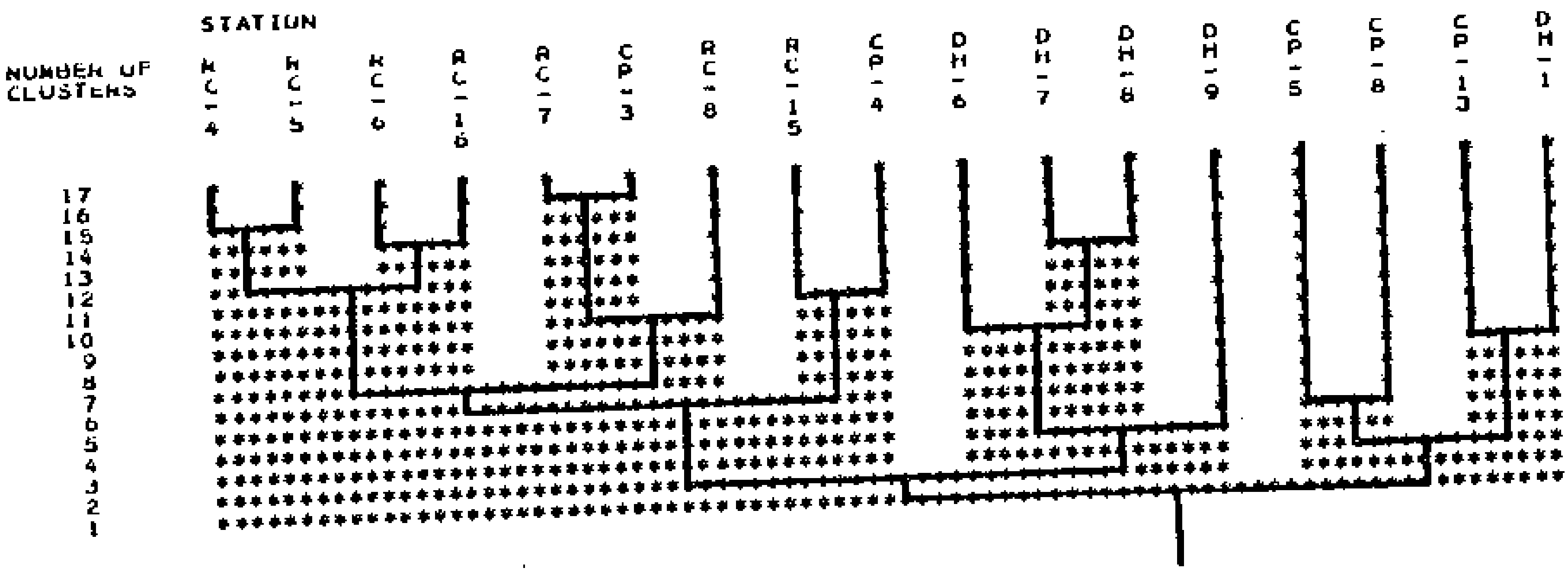

Figure A2-5 Cluster analysis map for sulfates.

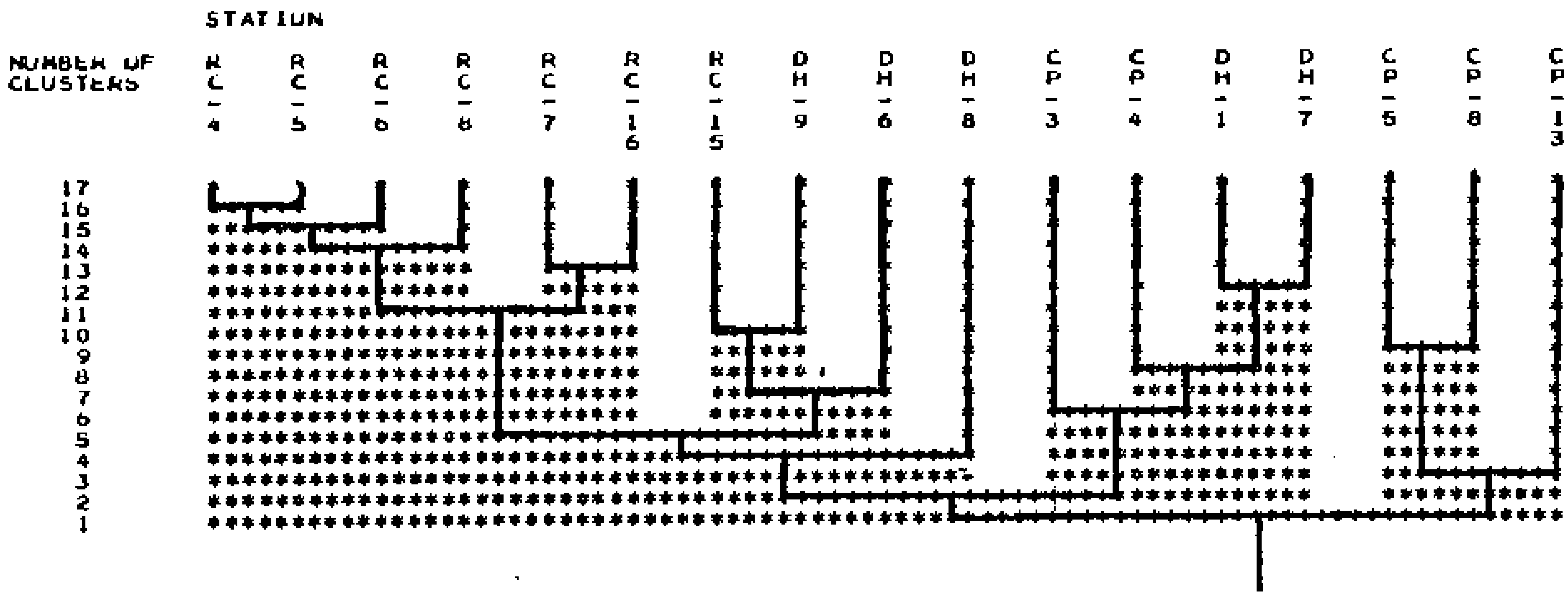

Figure A2-6 Cluster analysis map for chloride.

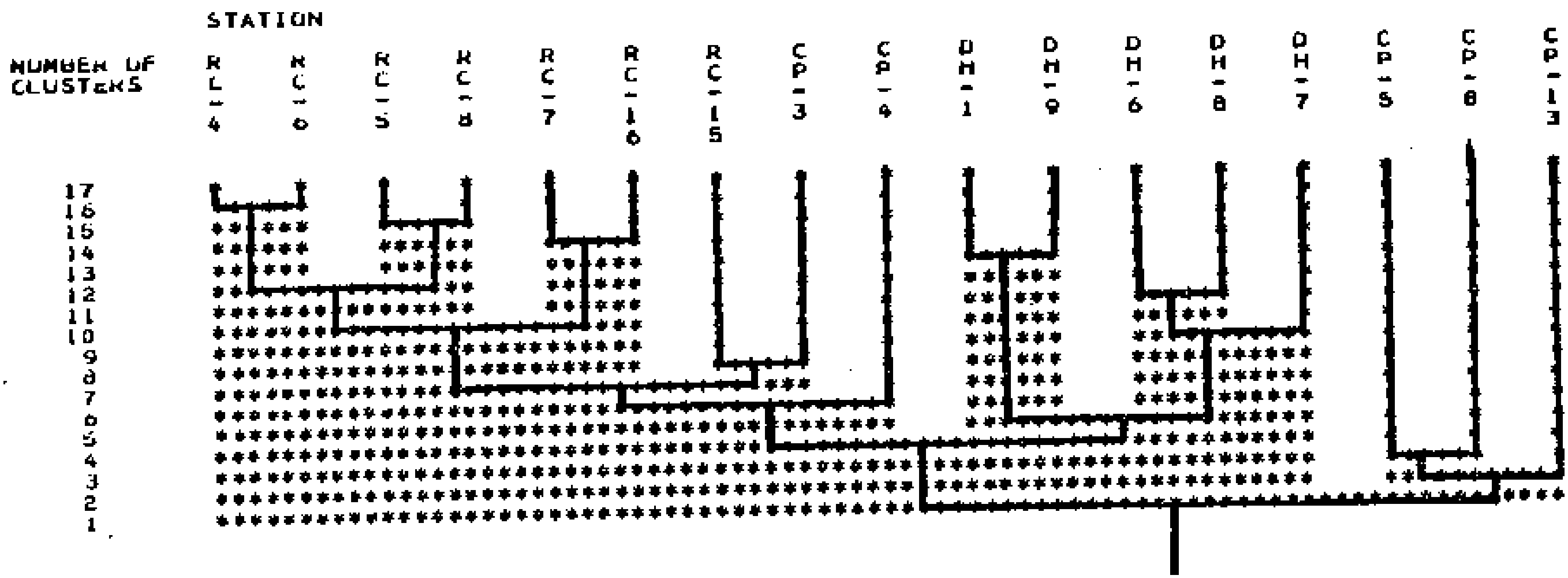

Figure A2-7 Cluster analysis map for sodium.

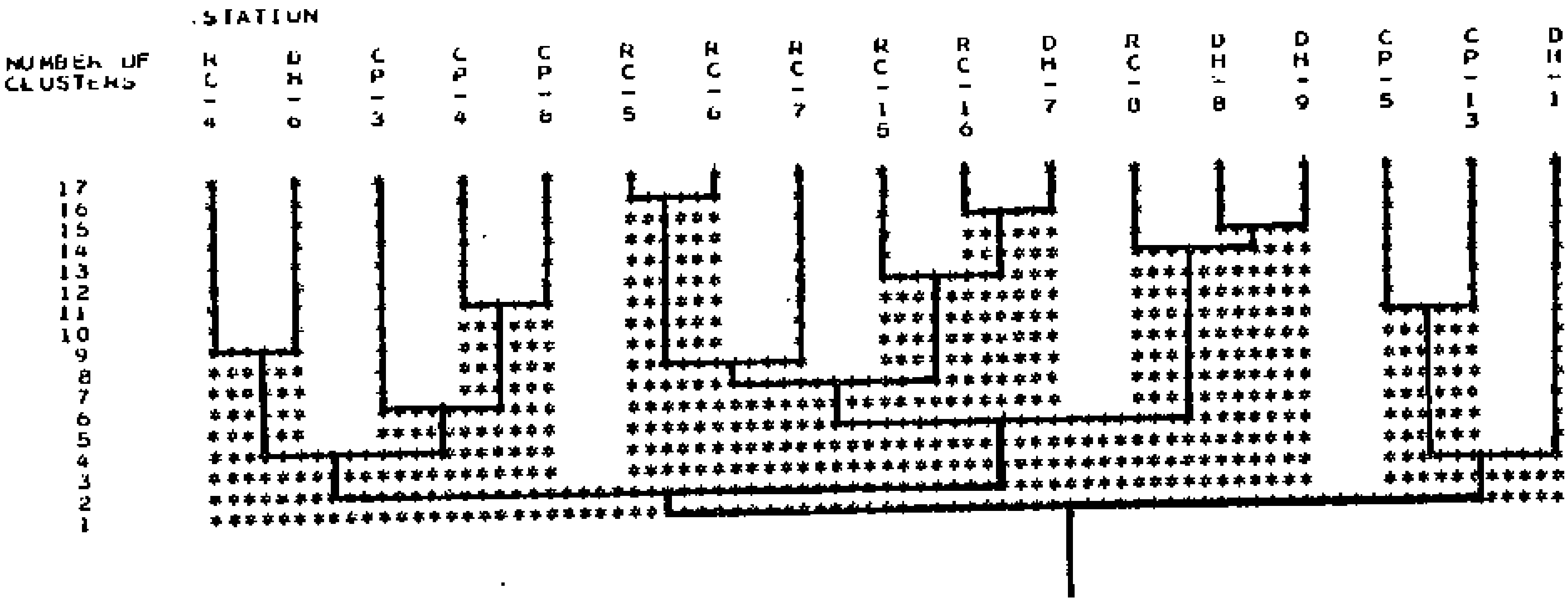

Figure A2-8 Cluster analysis map for arsenic.

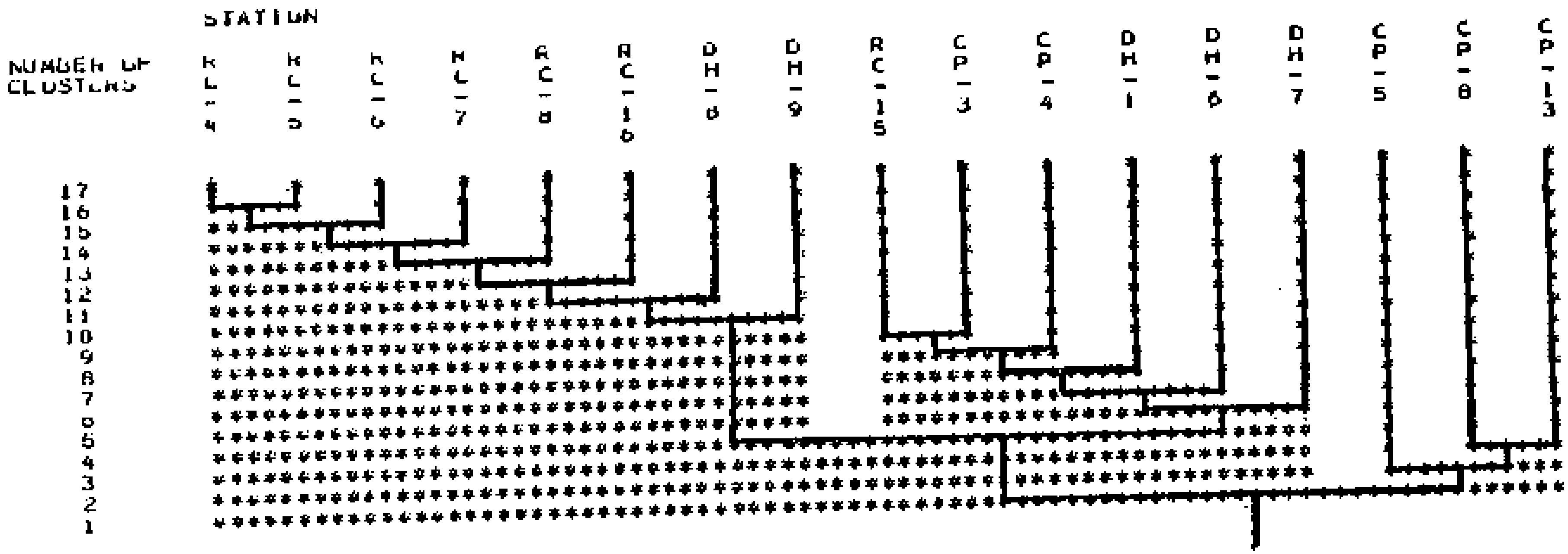

Figure A2-9 Cluster analysis map for cadmium.

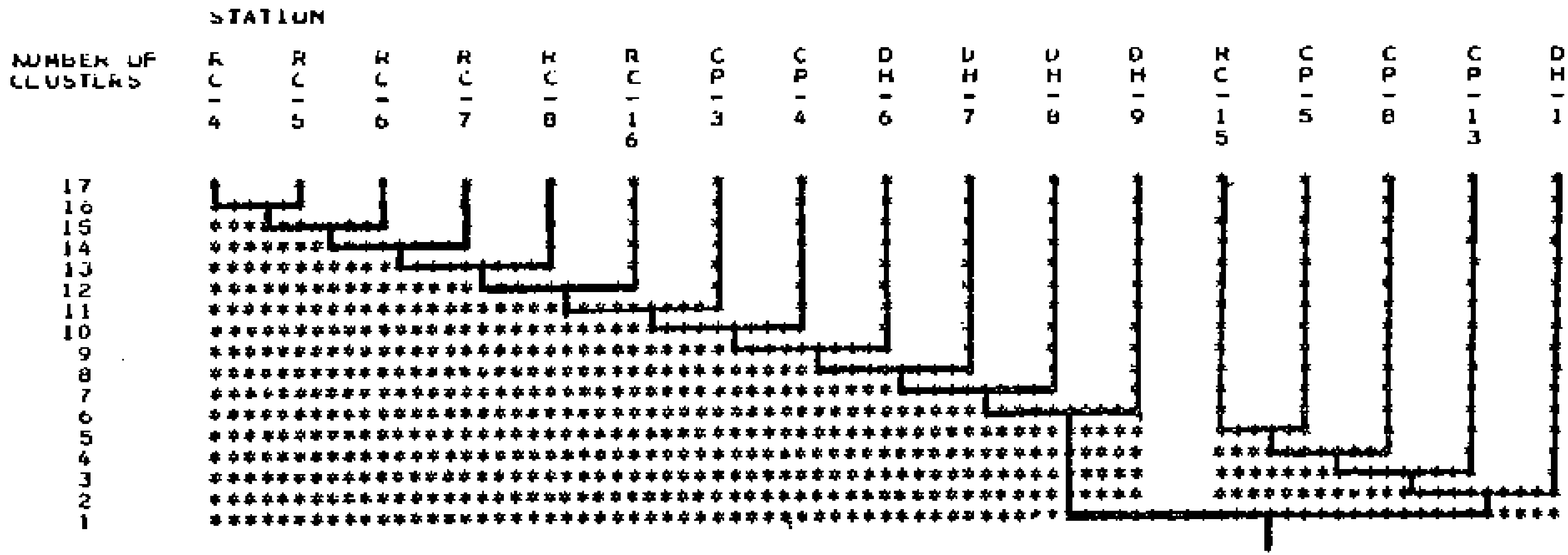

Figure A2-10 Cluster analysis map for chromium.

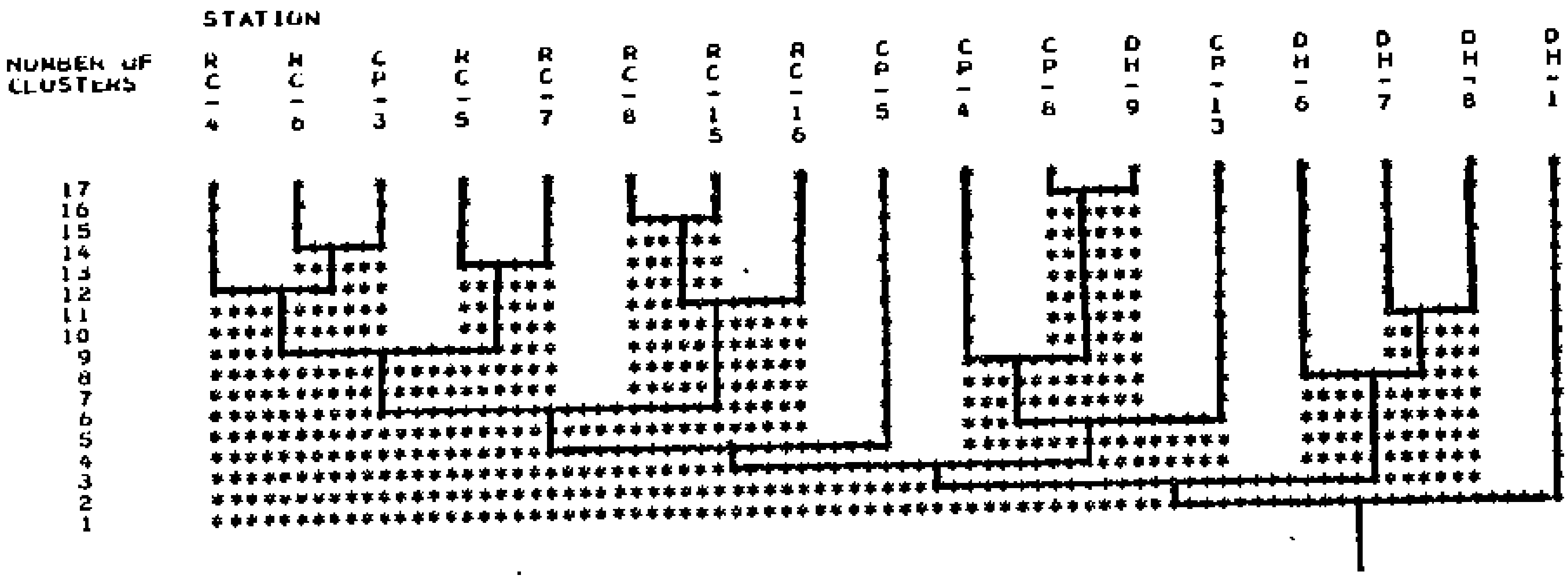

Figure A2-11 Cluster analysis map for hardness.

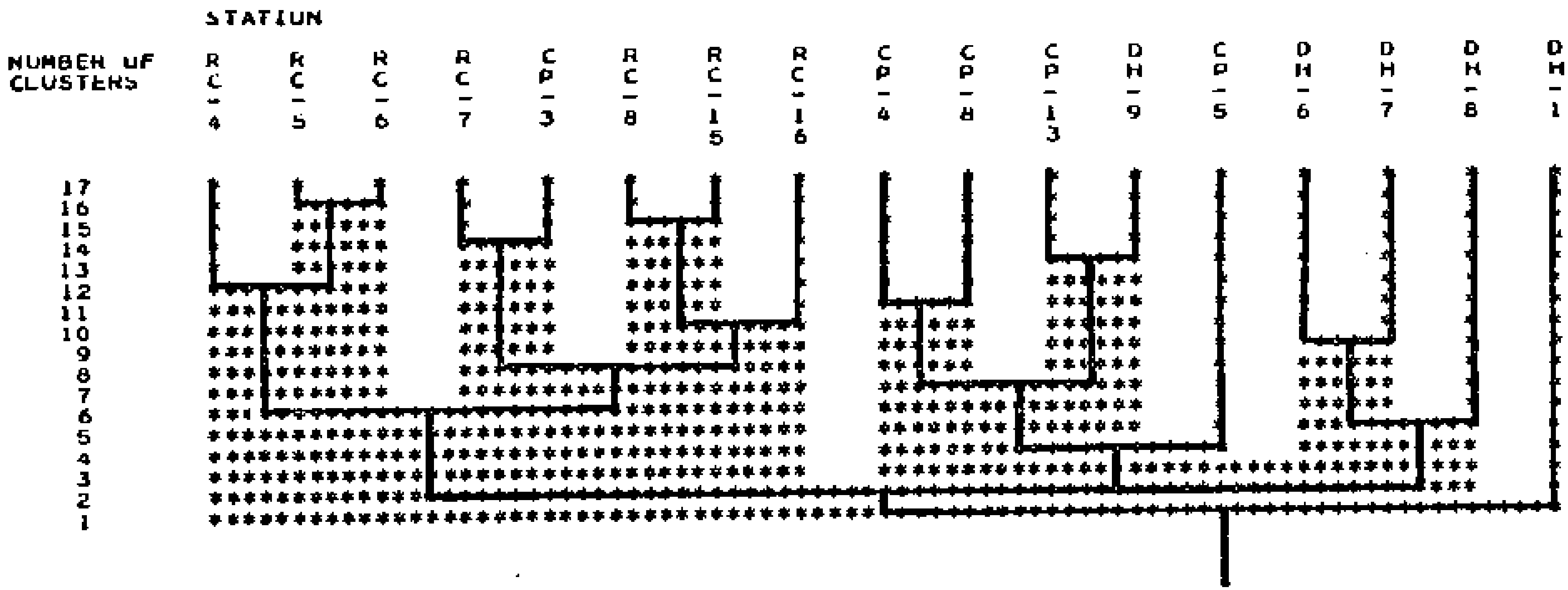

Figure A2-12 Cluster analysis map for calcium.

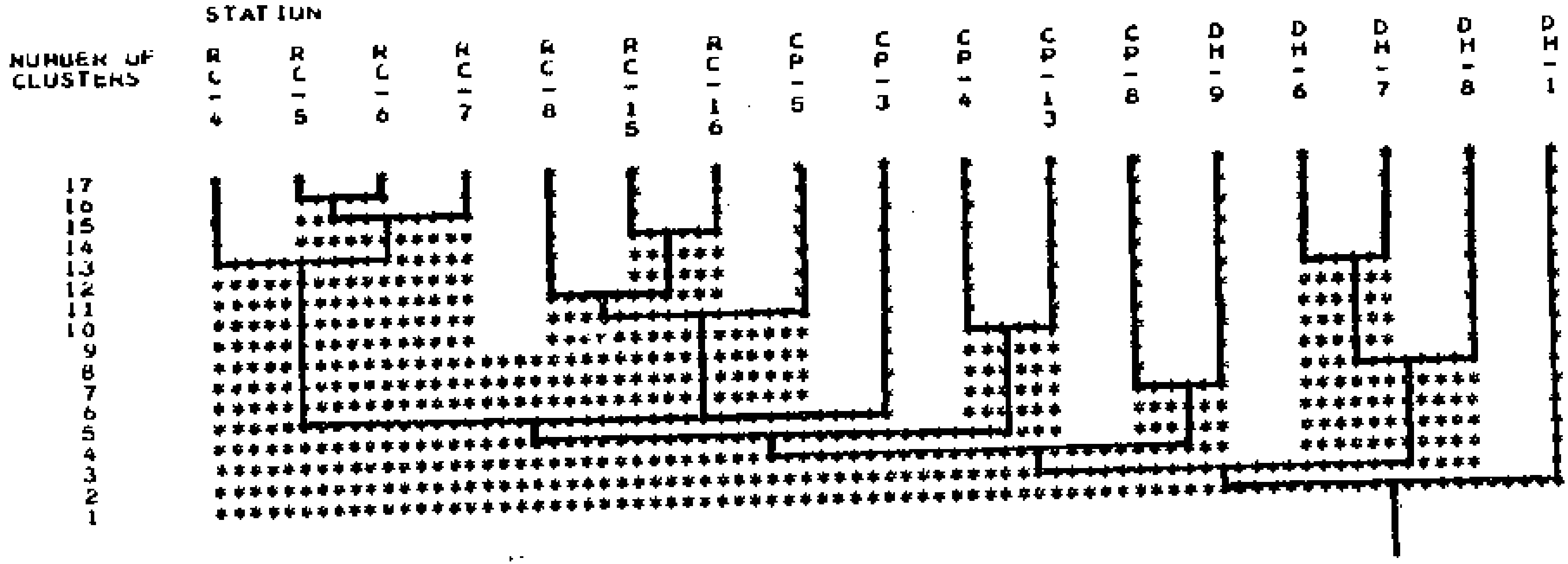

Figure A2-13 Cluster analysis map for magnesium.

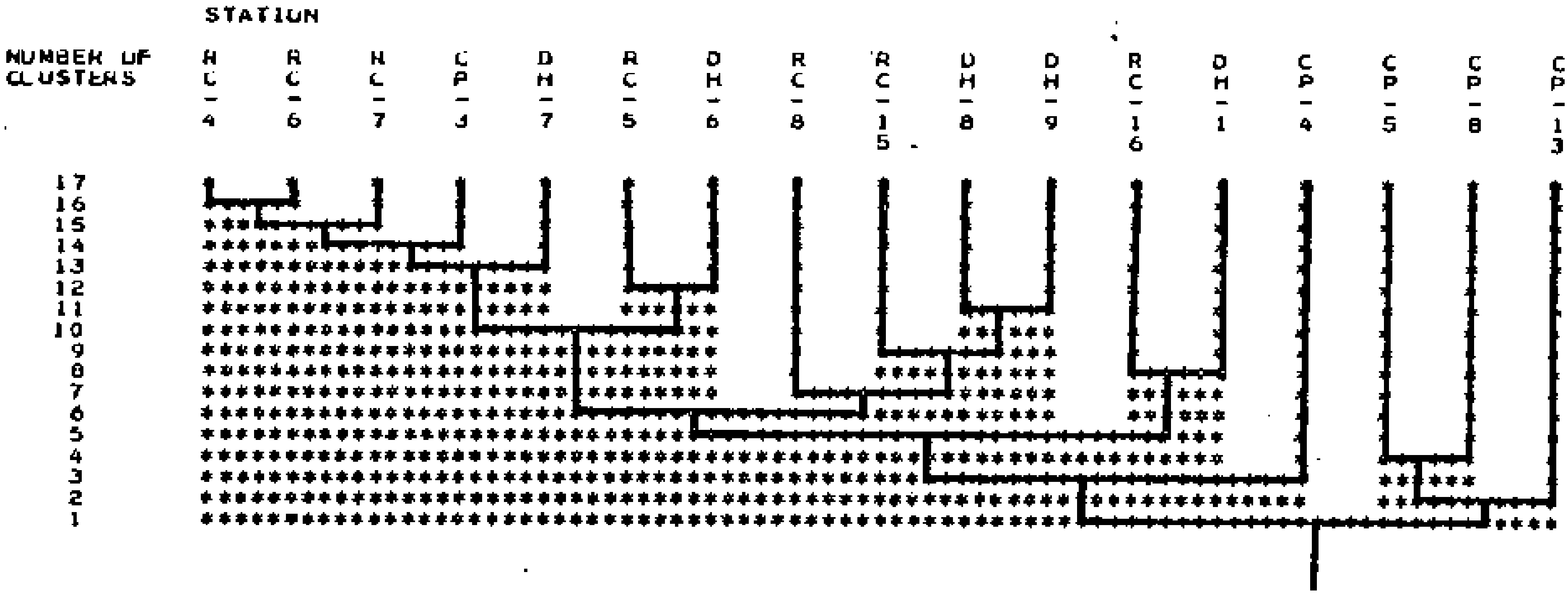

Figure A2-14 Cluster analysis map for nitrates.

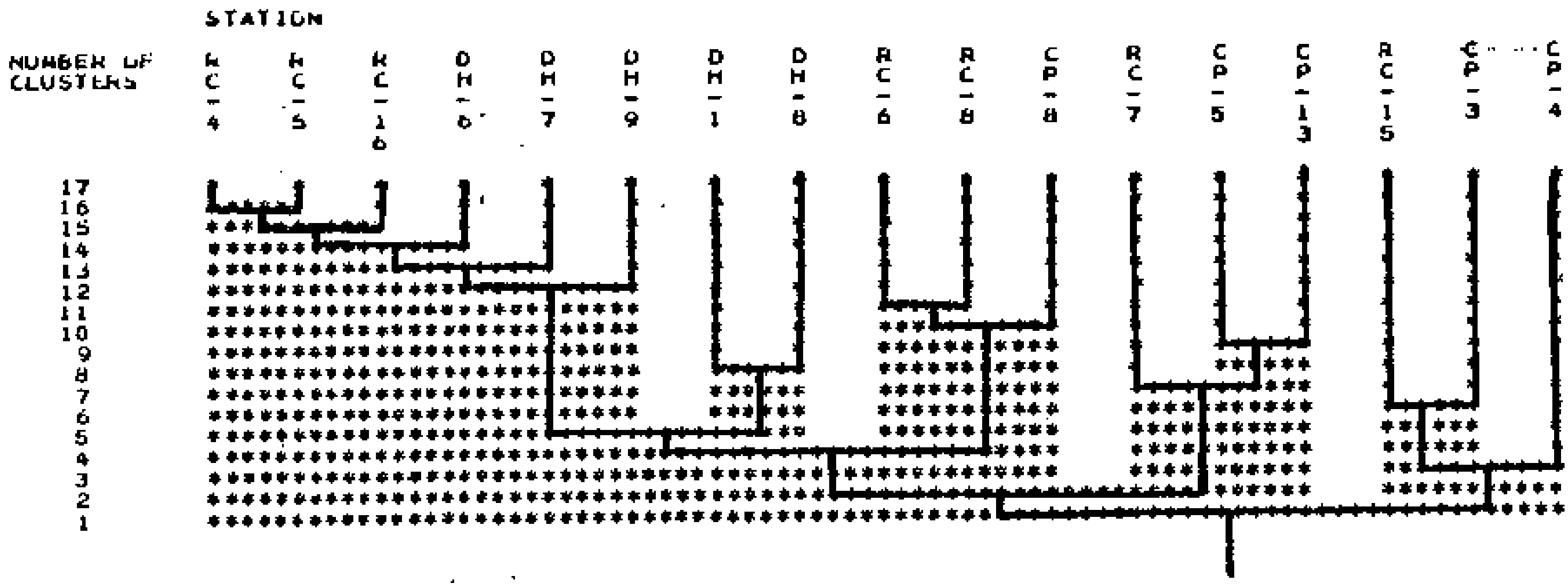

Figure A2-15 Cluster analysis map for ammonia.

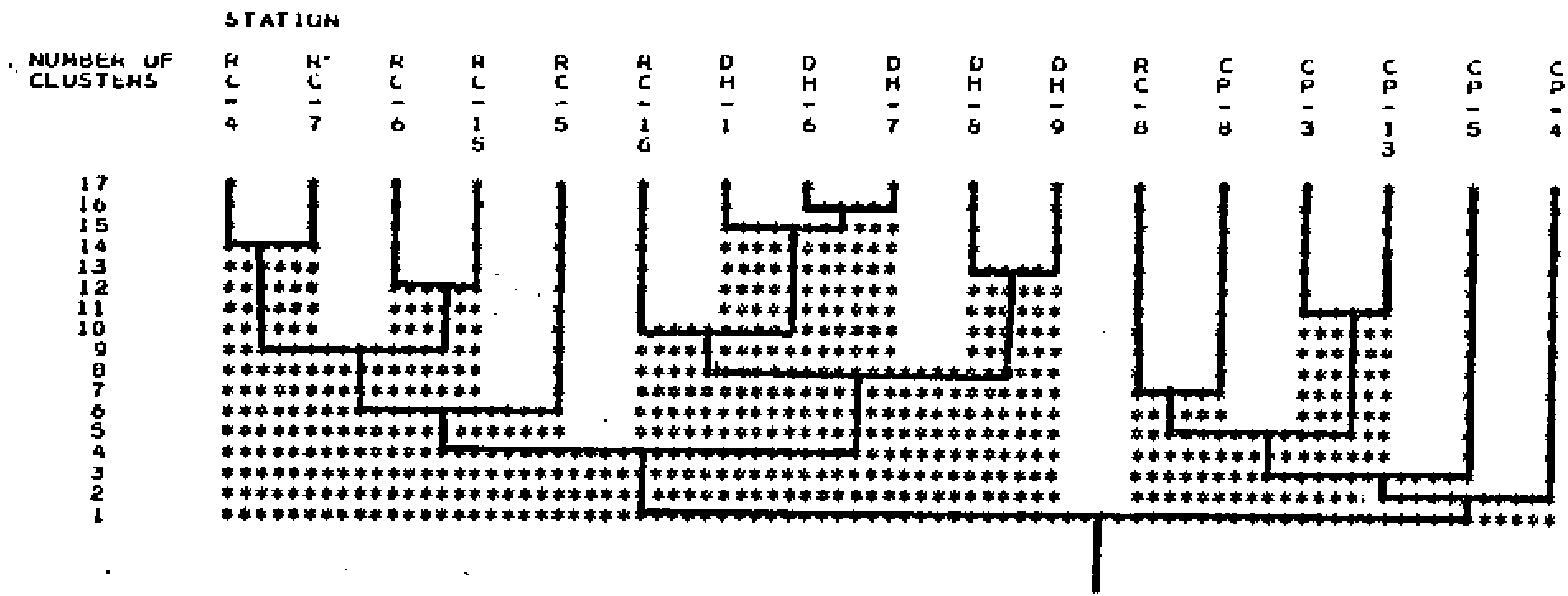

Figure A2-16 Cluster analysis map for total Kjeldahl nitrogen.

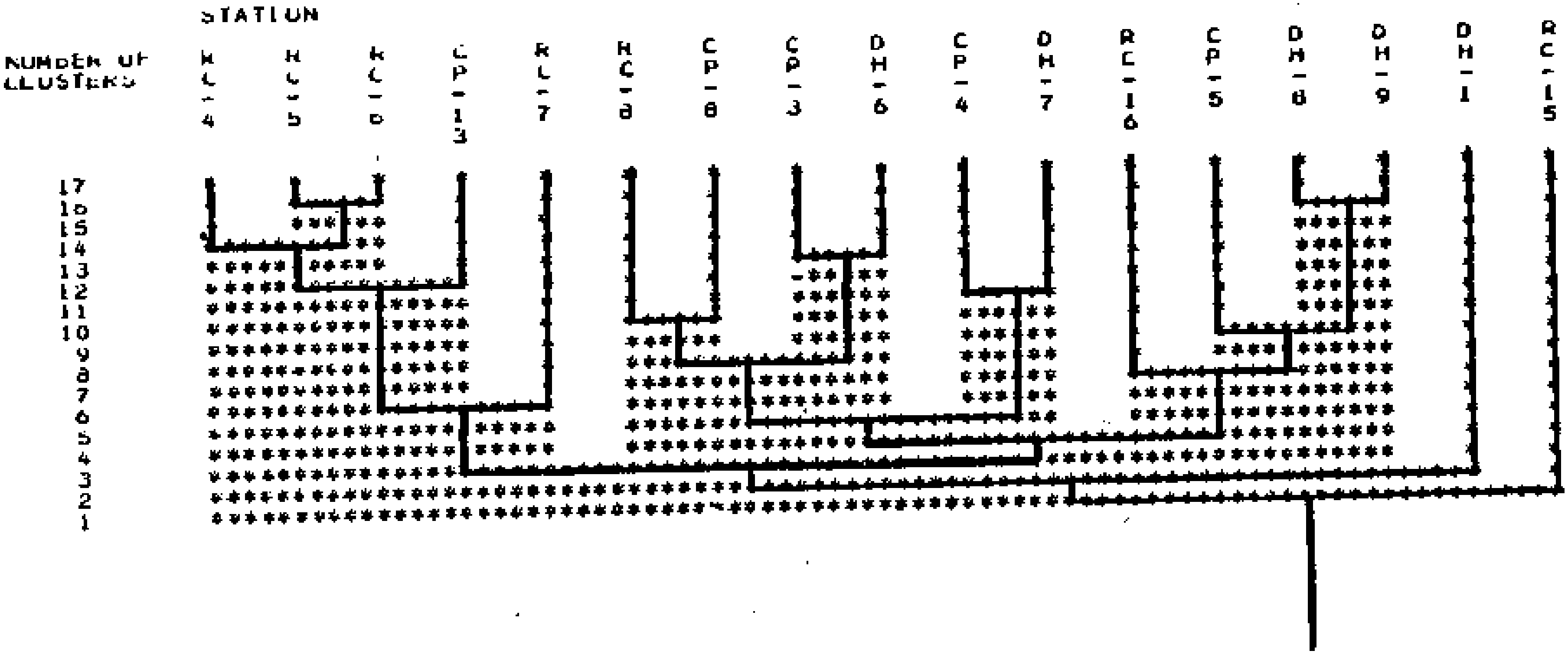

Figure A2-17 Cluster analysis map for iron.

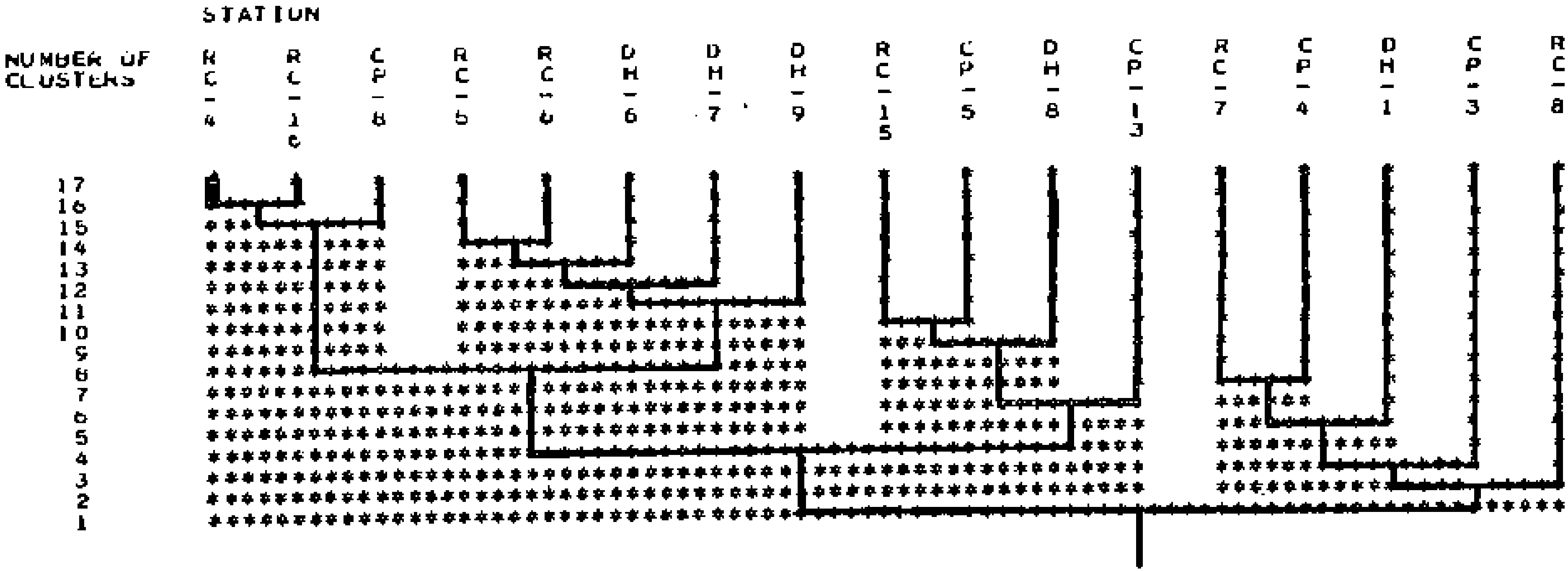

Figure A2-18 Cluster analysis map for manganese.

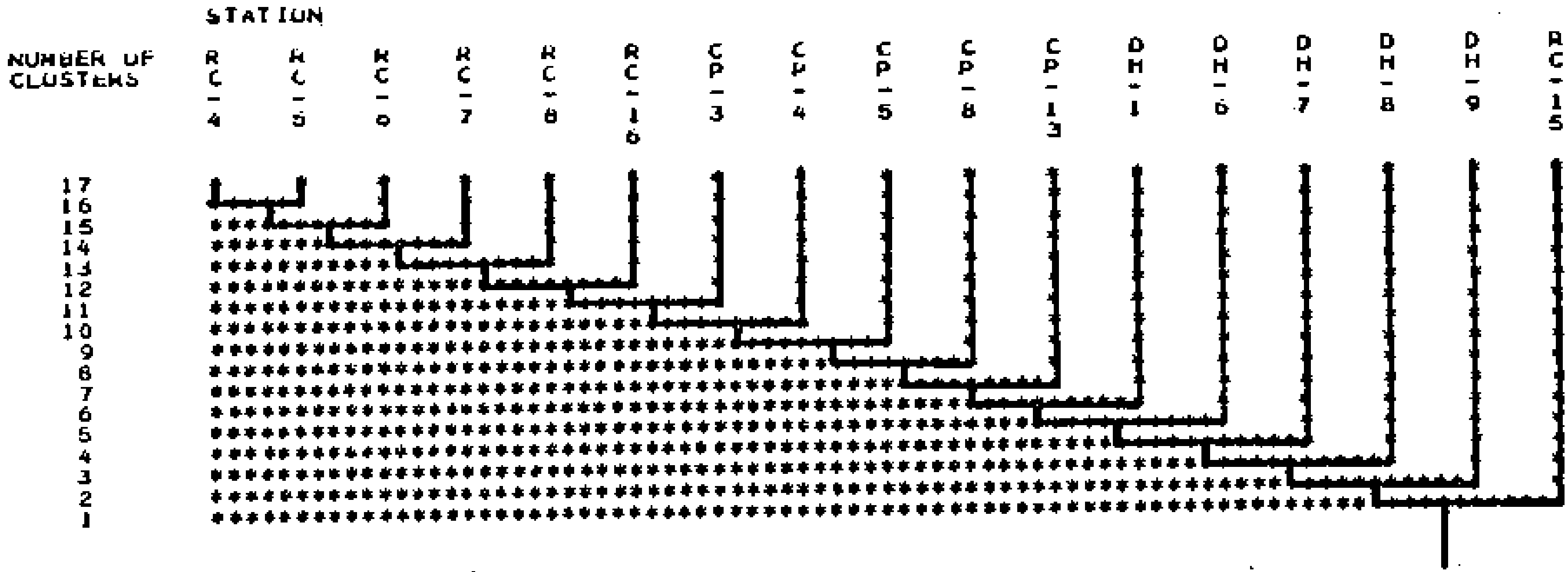

Figure A2-19 Cluster analysis map for molybdenum.

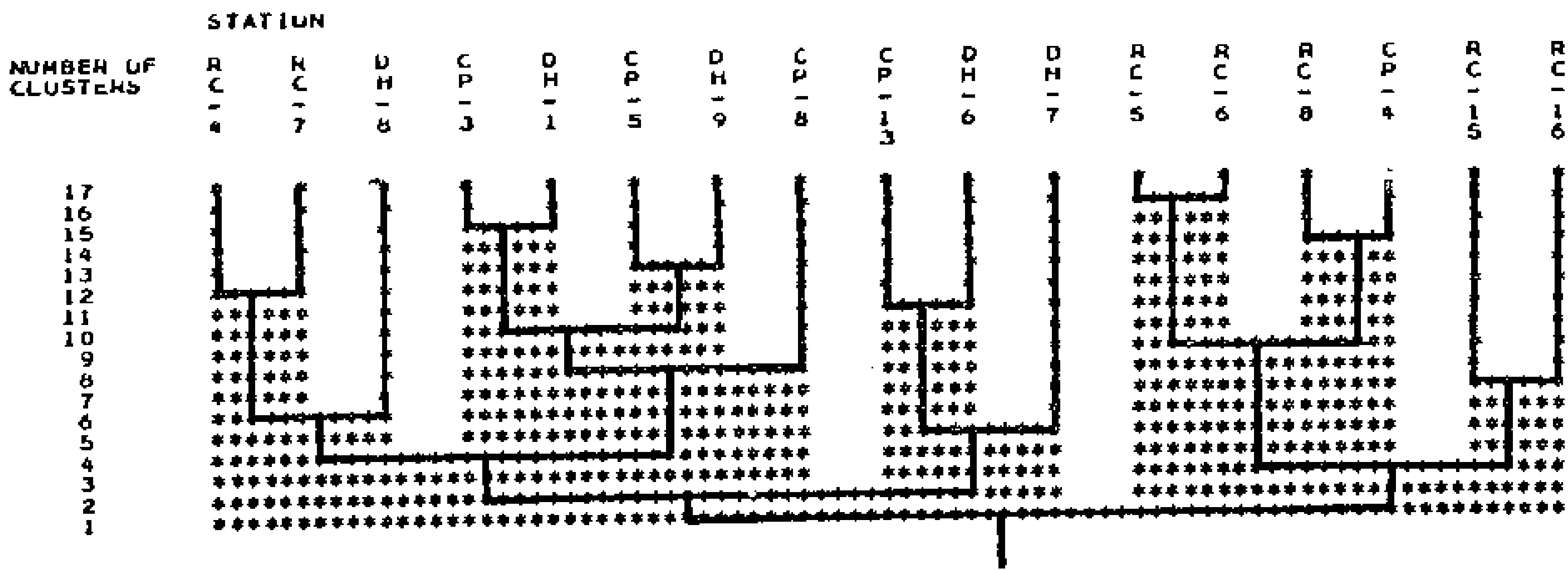

Figure A2-20 Cluster analysis map for zinc.

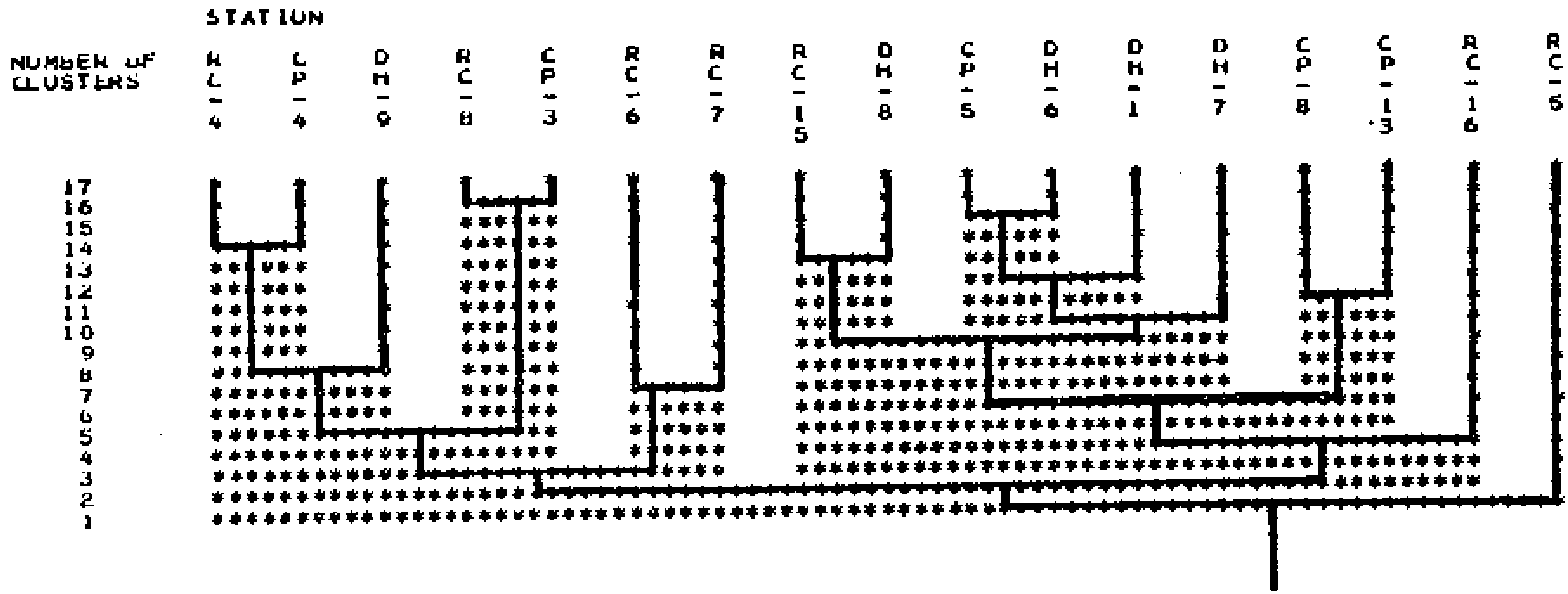

Figure A2-21 Cluster analysis map for Chemical Oxygen Demand (COD).

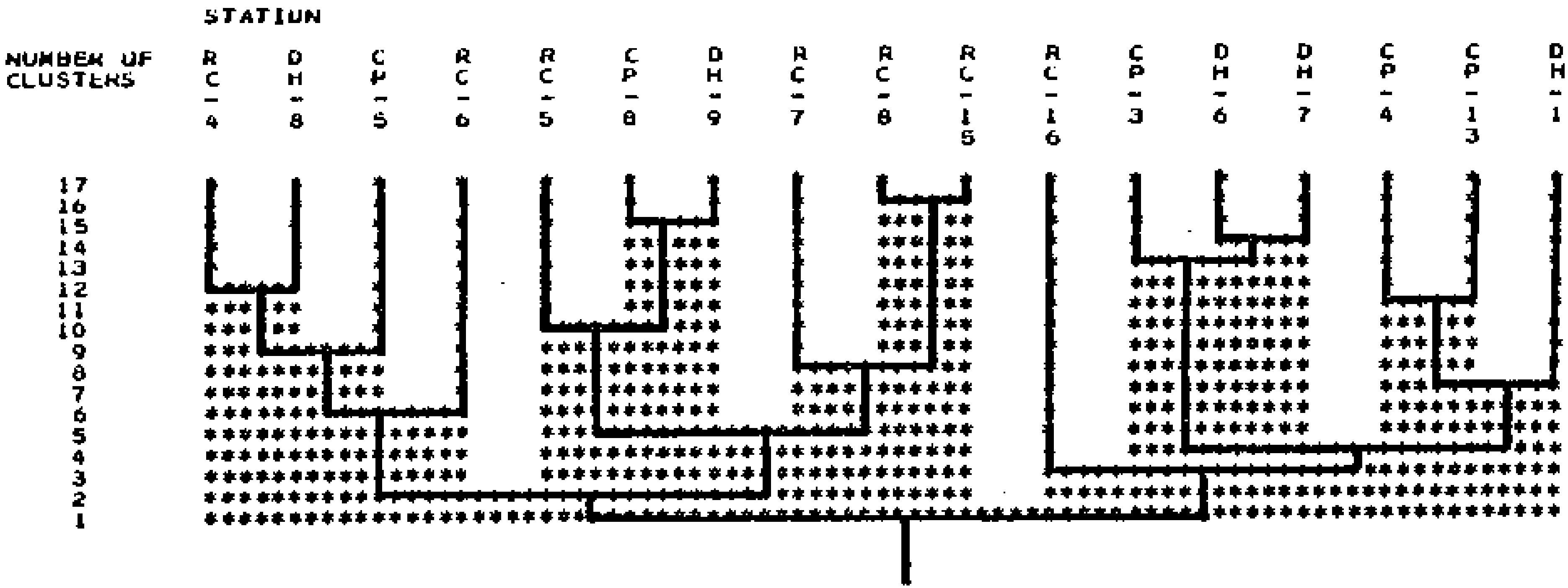

Figure A2-22 Cluster analysis map for detergents.

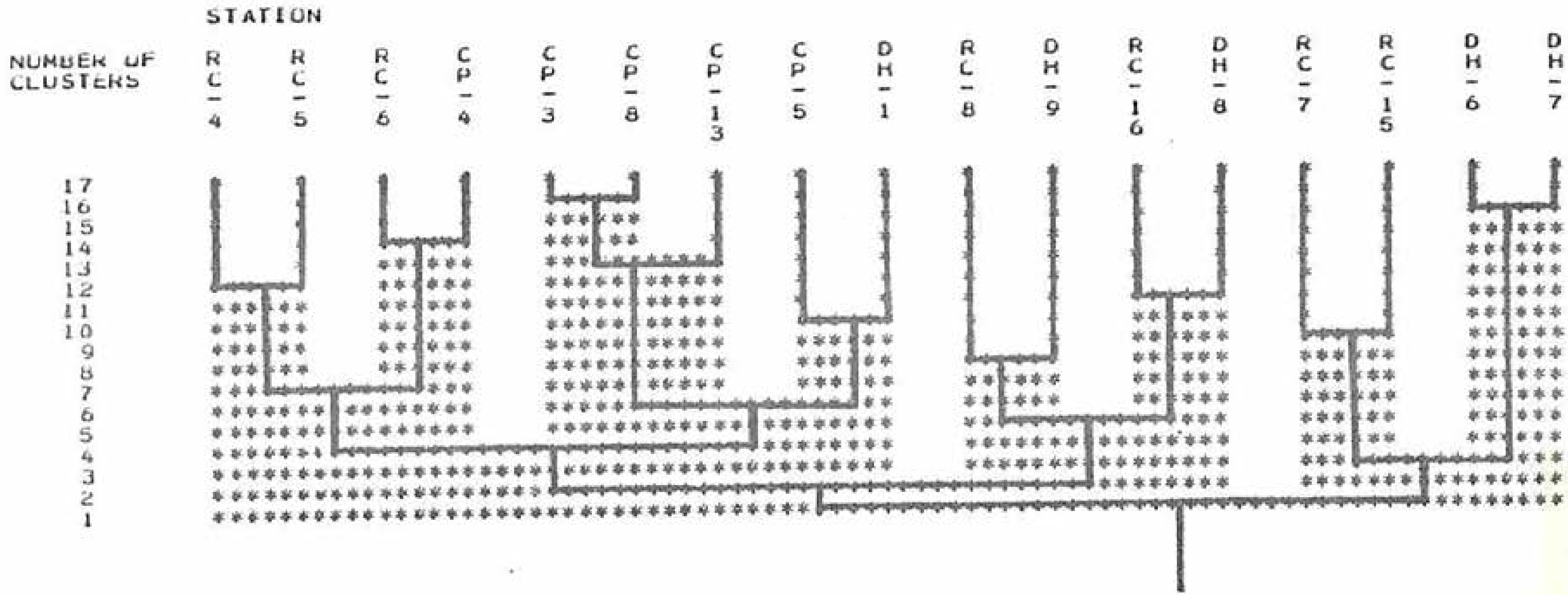

Figure A2-23 Cluster analysis map for total oxygen demand.

BIBLIOGRAPHY

CHAPTER 1

Bureau of Economic and Business Research, College of Business Administration, University of Florida, 1976. Florida Statistical Abstract 1976.

Florida Electric Power Coordinating Group, Inc., 1974. State of Florida 1974 Ten Year Site Plan.

Florida Electric Power Coordinating Group, Inc., 1975. State of Florida 1975 Ten Year Site Plan.

Florida Electric Power Coordinating Group, Inc., 1976. State of Florida 1976 Ten Year Site Plan.

Florida Electric Power Coordinating Group, Inc., 1977. State of Florida 1977 Ten Year Site Plan.

North Florida Regional Planning Council, 1975. Rev. 1976. Alachua County Comprehensive Plan 1975-1995.

Regional Utilities Board. 1974 Ten Year Site Plan.

Regional Utilities Board. 1975 Ten Year Site Plan.

Regional Utilities Board. 1976 Ten Year Site Plan.

Regional Utilities Board. 1977 Ten Year Site Plan.

Regional Utilities Board. 1977 Load and Energy Forecast.

R.W. Beck and Associates, 1977. Load Management Analysis.

U.S. Department of Commerce, Bureau of Census 1950, 1960, 1970.

U.S. Department of Commerce, Bureau of Census, 1976. Statistical Abstract of the United States, 1976. Washington, D.C., p. 43.

CHAPTER 2

Alachua Audubon Society, 1973. Proposal to the State of Florida to Purchase San Felasco Hammock by the Authority of the Land Conservation Act of 1972.

Alvarez, K.C., 1973. Report on the August 1973, On-site Inspection of San Felasco Hammock. Florida Department of Natural Resources.

Andrews, A.T., 1977. Crop Production Statistics for Alachua County. Alachua County Agricultural Agent. Gainesville, Florida.

Beck, W.M., 1955. Suggested Method for Reporting Biotic Data. Sewage and Industrial Wastes. (27:10) 1193-1197.

Beck, W.M., 1965. The Streams of Florida. Bulletin Florida State Museum. Biological Science 10(3):91-126.

Berger, E.R. and G.E. Eichler, 1975. Thermal Discharge Model for Deerhaven Generating Station. Environmental Science & Engineering, Inc. 74-095-003.

Breedlove, B.W., 1975a. Some Effects of Deerhaven Station Operations on the Aquatic System Receiving Cooling Tower Blowdown. Environmental Science & Engineering, Inc. 75-032-001.

Breedlove, B.W., 1975b. A Field Reconnaissance of the Sanchez Prairie Area Receiving Deerhaven Station Cooling Tower Blowdown. Environmental Science & Engineering, Inc. 75-032-002.

Breedlove, B.W., 1976a. An Evaluation of a Cypress Dome as a Mixing Zone for the Deerhaven Power Plant. Breedlove and Associates. 109-76-04.

Breedlove, B.W., 1976b. A Comparison of Turkey Creek with Other Streams. Breedlove and Associates. 109-76-03.

Breedlove and Associates, Inc. & Jones, Edmunds and Associates, Inc., 1977. An Evaluation of Alternatives to the Present Releasing of Deerhaven Generating Station Blowdown into Turkey Creek. 109-76-08.

Burch, W.M. Letter from W.M. Burch, Chief, Air Strategy Development Section, EPA, Region IV (Atlanta, Georgia) to Gene McNeil, EIS Branch, EPA Region IV, July 26, 1977.

Clark, William E. et. al., 1964. Water Resources of Alachua, Bradford, Clay, and Union Counties, Florida. U.S. Geological Survey in Cooperation with the Florida Geological Survey. Report of Investigations No. 35.

Conant, Roger, 1958. A Field Guide to Reptiles and Amphibians. Houghton Mifflin Co. 366 pp.

Crider, E.D., 1976. Letter Providing General Ecological Description of the Deerhaven Site. Florida Game and Fresh Water Fish Commission. Gainesville, Florida.

Department of Environmental Regulation, Florida. Florida Administrative Code, Chapter 17-3: Pollution of Waters.

Dohrenwend, R.E., "The Climate of Alachua County", The Alachua County Charette, Inc., May 1974.

Dunn, G.E. and B.I. Miller. Atlantic Hurricanes, 1969.

Flora, S.D., Hailstorms of the United States, 1956.

Florida Audubon Society, 1974. Florida Committee on Rare and Endangered Plants and Animals, Final Report. Mailtand, Florida.

Florida Game and Fresh Water Fish Commission, 1975. Endangered and Threatened Species Included in the Wildlife Code, Effective 1975. Tallahassee, Florida.

Florida Geological Survey, 1964. Report of Investigations. No.35. (July 1957 - September 1960). Daily and Semiannual Data.

Forked River Nuclear Station Unit 1 Natural Draft Salt Water Cooling Tower, GPU Report, January 1972.

Gilbert, C., 1976. Information on Endangered Vertebrate Species. Florida State Museum. Gainesville, Florida.

Holzworth, G.C.: "Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States", U.S. Environmental Protection Agency AP-101, K.

Hosler, C.R., "Low-Level Inversion Frequency in the Contiguous United States", Monthly Weather Review, Vol. 89, September 1961, pp 319-339.

Huss, P.O., "Relationship Between Gusts and Average Wind Speed", Report 140, Guggenheim Airship Institute, Ohio, 1946.

Interdisciplinary Center for Astronomy and Atmospheric Sciences, 1975. Review of Regional Utilities Board Application for Site Certification of Deerhaven Unit 2. University of Florida, Gainesville, Florida.

McKee and Wolf, 1964. "Water Quality Criteria", Second Ed. The Resources Agency of California, State Water Resources Control Board. Pub. No. 3-A.

McKee, J.E. and H.W. Wolf, 1971. Water Quality Criteria. State of California. The Resources Agency of California. Water Resources Control Board. 2nd Ed. Pub. No. 3-A.

Monk, C.D., 1965. Southern Mixed Hardwood Forest of North Central Florida. Ecological Monographs 35(4):335-354.

Monk, C.D., 1966. An Ecological Study of Hardwood Swamps in North Central Florida. Ecology 47(4):649-654.

Monk, C.D., 1967. Tree Species Diversity in the Eastern Deciduous Forest with Particular Reference to North Central Florida. American Naturalist 101 (918):173-187.

Monk, C.D., 1968. Successional and Environmental Relationships of the Forest Vegetation of North Central Florida. American Midland Naturalist 79(2):441-457.

Nesbitt, Stephen A., 1977. Letter Concerning Ecologically Sensitive Features in the Area of Concern. U.S. Fish and Wildlife Service. Gainesville, Florida.

Owens, Rick, 1977. Letter Concerning Ecologically Sensitive Features in the Area of Concern. Florida Game and Fresh Water Fish Commission. Wildlife Research Project. Gainesville, Florida.

Penfound, W.T., 1952. Southern Swamps and Marshes. Botanical Review 18: 413-446.

Quarterman, E. and C. Keever, 1962. Southern Mixed Hardwood Forest: Climax in the Southeastern Coastal Plain, U.S.A. Ecological Monographs 32(2):167-185.

Thom, H.C.S., Tornado Probabilities, Monthly Weather Review, Vol. 91, 1963, pp 730-736.

Thom, H.C.S., "New Distribution of Extreme Winds in the United States", ASCE, Environmental Engineering Conference, Dallas, Texas, February 6, 1967.

Turner, D.B., JACPA Vol. II, No. 10, pp 483-489, October, 1961.

U.S. Department of Agriculture, Rainfall Frequency Atlas, Alabama, Florida, Georgia, and South Carolina, U.S. Department of Agriculturo, Soil Conservation Service, Gainesville, Florida. 1973.

U.S. Department of Interior, 1975. Proceedings of the National Wetland Classification and Inventory Workshop. U.S.Department of Interior, Fish and Wildlife Service. 110 pp.

U.S. Department of Interior, 1976. Endangered and Threatened Wildlife and Plants. Federal Register 41(208):47181-47201.

U.S. Environmental Protection Agency, 1973. Biological Field and Laboratory Methods for Measuring the Quality of Surface Waters and Effluents. Office of Research and Development, Cincinnati, Ohio, EPA-67014-73-001.

U.S. Environmental Protection Agency, 1976. Quality Criteria for Water. U.S. Environmental Protection Agency, Washington, D.C. EPA-440/9-76-023.

U.S. Geological Survey, 1971. Selected Flow Characteristics of Florida Streams and Canals. Information Circular No. 69. State of Florida. Department of Natural Resources, Tallahassee, Florida. 595 pp.

U.S. Geological Survey/DER Letter, 1975. (May 14) From Mathew I. Kaufman (for the District Chief), sent to: Hamilton S. Oven, Jr., of the Florida Department of Environmental Regulation (then known as the Florida Department of Pollution Control).

U.S. Geological Survey, 1975. Water Resources Data for Florida. Vol. 1 Northern Florida Water Data Report FL-75-1 (October 1971 - April 1975).

Ward, D., 1977. Information on Endangered Plant Species. Herbarium of the University of Florida, Agricultural Experiment Station, Gainesville, Florida.

Wilson, A.L. Air Quality Impact Evaluation of the Gainesville-Alachua County Regional Electric, Water and Sewer Utilities Deerhaven Unit 2, Environmental Science & Engineering, Inc. Gainesville, Florida.

CHAPTER 3

Chu, T.J., P.A. Krenkel, and R.J. Ruane. Reuse of Ash Cluising Water in Coal-Fired Power Plants, presented at the Third National Conference on Complete Water Reuse, Cincinnati, Ohio, June 27-30, 1976.

CHAPTER 4

Burns and McDonnell, 1977. Preliminary Site Plant for Deerhaven Unit 2, (Drawing YIA).

Crider, E. Dale, 1973. Letter Providing General Ecological Descriptions of the Deerhaven Site. Florida State Game and Fresh Water Fish Commission, Gainesville, Florida.

Federal Register, Vol. 40, No. 103, 1975.

Noise Control Engineering, Vol. 4, No. 1, 1975.

Post, D.M. Personal Communication, University of Florida Department of Forestry, Gainesville, Florida. August 1975.

U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 2nd Ed. U.S. Environmental Protection Agency AP-42, February 1976.

CHAPTER 5

Anderson, William C. and Mark P. Youngstrom, December 1976. Coal Pile Leachate Quantity and Quality Characteristics. Proc. ASCE, pp 1239-1253.

Bierman, G.F., G.A. Kunder, J.F. Sebald, R.F. Visbisky, 1971. Characteristics, Classification and Incidence of Plumes from Large Natural Draft Cooling Towers. 33rd Annual American Power Conference, April 22, 1971.

Boyce, S.G., 1954. The Salt Spray Community. Ecol. Monagr. 24(1):29-67.

Cairns, J. Jr., J.S. Crossman and K.L. Dickson, 1970. The Biological Recovery of the Clinch River Following a Fly Ash Pond Spill. 25th Purdue Industrial Waste Conference, May 5-7, 1970 at Purdue University.

Cherry, D.S. and R.K. Guthrie, 1975. The Significance of Ash Discharged into Aquatic Drainage System. Aware, Jo. 56, pp 12-14.

Cherry, D.S., R.K. Guthrie, J.H. Rodgers, Jr., J. Cairns, Jr. and K.L. Dickson, 1976. Responses of Mosquito fish (Gambusia affinis) to Ash Effluent and Thermal Stress. Trans. Am. Fish Soc., 1976, No. 6 pp 686-694.

Curtis, C.R., H.G. Gauch, R. Sik, 1975. Sodium and Chloride Concentrations in Native Vegetation near Chalk Point, Maryland. IN: Cooling Tower Environment-1974 etc....pp 370-378.

DeVine, J.C. Jr, 1975. The Forked River Program: A Case Study in Saltwater Cooling. IN: Cooling Tower Environment-1974 etc....pp 509-557.

Doudoroff P. and M. Kutz, 1953. Critical Review of the Literature on the Toxicity of Industrial Wastes and Their Components to Fish II. The Metals, as Salts. Sewage and Industrial Wastes. 25:802.

Edmonds, P.R., H.K. Roffman, and R.C. Maxwell, 1975. Some Terrestrial Considerations Associated with Cooling-Tower Systems for Electric Power Generation. IN: Cooling Tower Environment-1974. Technical Information Center/Office of Public Affairs, Energy Research and Development Administration. pp 393-407.

European Inland Fisheries Advisory Commission, 1965. Water Quality Criteria for European Fresh Water Fish, Report on Finely Divided Solids and Inland Fisheries. Int. Jour. Air Water Poll. 9:151.

Florida Department of Environmental Regulation. Florida Administrative Code, Chapter 17-3: Pollution of Waters.

Forked River Nuclear Station Unit 1 Natural Draft Salt Water Cooling Tower, FPA Report, January 1972.

Gammon, J.R., 1970. The Effect of Inorganic Sediment on Stream Biota. Environmental Protection Agency Water Poll. Cont. Res. Series 18050 DWC 12170 USGPO Washington, D.C.

Gualke, A.E. and G.L. Crawford, 1976. The Effects of Big Sandy Plant Fly-Ash Pond Effluent on Fish and Benthos. Environmental Engineering Division, American Electric Power Service Corp.

Guthrie, R.K. and D.S. Cherry, 1976. Pollutant Removal From Coal-Ash Basin Effluent. Water Resources Bulletin, American Water Resources Association: Vol. 12 No. 5 pp 889-902.

Guthrie, R.K., D.S. Cherry, and J.R. Rodgers, 1974. The Impact of Ash Basin Effluent on Biota in the Drainage System. Proc. 7th Mid-Atlantic Industrial Waste Conference, Drexel University, Philadelphia.

Hosler, C.L., J. Pena, and R. Pena, 1972. Determination of Salt Deposition Rates from Drift from Evaporative Cooling Towers. Department of Meterology, Penn. St. Univ. 46pp.

Hones, J.R.E., 1938. The Relative Toxicity of Salts of Lead, Zinc, and Copper to the Stidleback. J. Exp. Biol. 15:394.

Linson, S.N., 1973. Sulphur Dioxide in Quality Standards for Vegetation. Preprint, 66th Annual Meeting, Air Pollution Control Association Chicago, U.S.A.

McKee, J.E. and H.W. Wolf, 1963. Water Quality Criteria. The Resources Agency of California, State Water Resources Control Board, Publ. No. 3-A.

Mukammal, E.F., 1976. Review of Present Knowledge of Plant Injury by Air Pollution. World Meterological Organization, Technical Note no. 147. 27 pp.

Mulchi, C.L. and J.A. Armbruster, 1975. Effects of Salt Sprays on the Field and Nutrient Balance of Corn and Soybeans. IN: Cooling Tower Environment-1974 etc....pp 379-392.

National Technical Advisory Committee to the Secretary of the Interior, 1968. Water Quality Criteria. U.S. Government Printing Office, Washintong, D.C.

Noise Control Engineering, Vol. 6, Nos. 1 and 2, 1976.

Pendleton, R.C., 1958. Absorption of Cs^{137} by an Aquatic Community. Hanford Biology Research Annual Report for 1957. p. 35, HW-53500, Office of Technical Services, U.S. Department of Commerse, Washington, D.C. 228 pp.

Rawson, D.S. and J.E. Moore, 1944. The Saline Lakes of Saskatchewan. Canadian Jour. of Res. 22:141.

Rothstein, A., 1953. Toxicology of the Minor Metals. University of Rochester AEC Project UR-262.

Stewart, R.E., 1968. Atmospheric Diffusion of Particulate Matter Released from an Elevated Continuous Source. J. of Applied Meterology. 7:425-432.

Tebo, L.R. Jr., 1955. Effects of Oiltation from Improper Logging on the Bottom Fauna of a Small Trout Stream in the Southern Appalachians. The Progressive Fish-Culturist, 17:64.

U.S. Atomic Energy Commission, 1973. Toxicity of Power Plant Chemicals to Aquatic Life. Washginton-1249, UC-11.

U.S. Environmental Protection Agency, 1973. Reviewing Environmental Impact Statements. Power Plant Cooling System, Engineering Aspects. National En. Res. Center Off. of Res. & Dev. U.S. EPA. Corvallis, Or. 93 pp.

U.S. Environmental Protection Agency, 1973. 39-Federal Register, 36207.

U.S. Environmental Protection Agency, 1974. Development Document for Effluent-Limitation Guidelines and New-Source Performance Standards for the Steam Electric Power Generating Point-Source Category, EPA 440/1-74 029a, Group 1 1974.

U.S. Environmental Protection Agency, 1976. Quality Criteria for Water. EPA-440/9-76-023.

U.S. Environmental Protection Agency, Compilation of Air Pollutant Emission Factors, 2nd ed. USEPA AP-42, February, 1976.

CHAPTER 6

Altig, R., 1970. A Key to the Tadpoles of the Continental United States and Canada. Herpetologia 26(2):180-207.

American Public Health Association, 1975. Standard Methods for the Examination of Water and Wastewater. 14th Ed. APHA, Washington, D.C.

Atomic Industrial Forum, Inc., 1974. Environmental Impact Monitoring of Nuclear Power Plants. Source Book of Monitoring Methods. Batelle Laboratories, Washington, D.C.

Beck, W.M., 1955. Suggested Method for Reporting Biotic Data. Sewage and Industrial Wastes. 27(10):1193-1197.

Blair, W.F., et. al., 1968. Vertebrates of the United States. 2nd Ed. McGraw-Hill.

Breedlove and Associates and Jones, Edmunds and Associetes, Inc., 1977. An Evaluation of Alternatives to the Present Releasing of Deerhaven Generating Station Blowdown to Turkey Creek. 2 Vol., 430 pp.

Carr, A.F., Jr., 1937. A Key to Fresh Water Fishes of Florida. Proc. FIA Academic Science (1936):72-86.

Carr, A. and C.J. Goin, 1955. Guide to the Reptiles, Amphibians, and Fresh Water Fishes of Florida. Gainesville, University of Florida Press. 341 pp.

Conant, R., 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Boston: Houghton Mifflin Co., 429 p.

DuBoys, M.P., 1970. "Etûdes du Régine du Rhône et l'action exercée par les eaux sur un lit à fond de graviers indéfiniment affouillable". Annales des Pont et Chaussees, Ser. 5, Vol. 18, pp 141-195.

Eddy, Samuel, 1969. How to Know the Fresh Water Fishes. 2nd Edition. W.G. Brown Company.

Einstein, H.A., 1950. "The Bid-Load Function for Sediment Transportation in Open Channel Flow." USDA Technical Bulletin No. 1026.

Florida Department of Environmental Regulation. Floride Administrative Code. Chapter 17-3: Pollution of Waters.

Gifford, F.A., Jr., 1961: "Use of Routine Meteorological Observations for Estimating Atmospheric Dispersion. Nuclear Safety."

Hanna, S.R., 1974. Fog and Drift Deposition from Evaporative Cooling Towers. Nuclear Safety, 15(2):190-195.

Knudsen, J.W., 1972. Collecting and Preserving Plants and Animals. Harper and Row Publishers, New York, 320 pp.

Kurz, H. and R.K. Godfrey, 1962. Trees of Northern Florida. University of Florida Press, Gainesville, Florida.

MacArthur, R.H., 1957. On the Relative Abundance of Bird Species. Proceedings National Academy of Sciences, 43:293-295, Washington, D.C.

McVehil, G.E. and K.E. Heikes, 1975. Cooling Tower Plume Modeling and Drift Measurement: A Review of the State-of-the Art. Ball Brothers Research Corp., Contract G-131-1. 177 pp.

Mueller, James W., 1974. The Use of Sampling in Archaeology. Memoirs of the Society for American Archaeology, No. 28. American Antiquity, Vol. 39, No. 2, Pt. 2.

Pasquill, F., 1961: "The Estimation of the Dispersion of Windborne Material". Meteorol Magazine, 90, 1063, pp 33-49.

Radford, A.E., H.E. Ahles and C.R. Bell, 1968. Manual of the Vascular Flora of the Carolinas. University of North Carolina Press, Chapel Hill, North Carolina.

Ricker, W.E. (Editor), 1971. Methods for Assessment of Fish Production in Fresh Waters. 2nd Ed. IBP Handbook No. 3.

Southwood, T.R.E., 1975. Ecological Methods with Particular Reference to the Study of Insect Populations. Chapman and Hall.

Straub, L.G., 1935. Silt Investigation on the Missouri River Basin, H.D. 238, 73rd Congress, 2nd Session, Appendix XV, pp 1125-1140.

Turner, D.B., February, 1964: "A Diffusion Model of an Urban Area." Journal of Applied Meteorology, 3, pp 83-91.

U.S. Environmental Protection Agency, 1973. Biological Field and Laboratory Methods for Measuring the Quality of Surface Waters and Effluents. EPA-670/4-73-001, Office of Research and Development, Cincinnati, Ohio..

U.S. Environmental Protection Agency, 1973. Reference Method for Determination of Nitrogen Dioxide in the Atmosphere. Federal Register 38(110):15174-15176.

U.S. Environmental Protection Agency, 1976. Quality Criteria for Water. EPA 440/9-76-023. Washington, D.C.

Ward, H.B. and G.C. Whipple, 1959. Fresh Water Biology. John Wiley and Sons, 1248 pp.

CHAPTER 7

Bureau of Economic and Business Research, College of Business Administration, University of Florida, 1976. Florida Statistical Abstract 1976.

Capehart, Barney, Sierra Club, to Joe Little, Regional Utilities Board, letter, April 20, 1977.

City of Gainesville, 1972. Ordinance 1427.

City of Gainesville, Department of Community Development, 1976. Housing Market Analysis, 1975-1985.

Environmental Research and Technology, 1977. SHERCO Units 3 and 4 Electrical Generating Facility EIS, Technical Working Paper No. 10, "Socio-Economics", Concord, Massachusetts.

Federal Bureau of Investigation, 1975. 1974 Uniform Crime Report, Washington, D.C.

Gainesville SMSA Labor Market Trends, Letter No. 8, April 1977. (Published by State of Florida, Department of Commerce, Division of Employment Security).

Harmon, D., Florida State Employment Service, to J.S. Miller, R.W. Beck and Associates, August 1977.

Hood, Helen, Florida Defenders of the Environment, to John E. Hagan, III, U.S. Environmental Protection Agency, letter, April 18, 1977.

Regional Utilities Board personnel to J.S. Miller, R.W. Beck and Associates, personal communication, August 23, 1977.

North Central Florida Regional Planning Council, Alachua County Department of Planning and Development. 1976a. Alachua County Comprehensive Plan 1975-1995, 2 vols.

North Central Florida Regional Planning Council, 1976b. Housing.

North Central Florida Regional Planning Council, 1976c. 1976 Population and Economic Study.

Smith, S.K., 1977. Projections of Florida Population by County, 1978-2000. Gainesville: University of Florida.

State of Florida, Department of Commerce, Bureau of Economic Analysis. No date.

State of Florida, Department of Commerce, Office of Management and Budget, 1976. "Employment Considerations in Florida's Comprehensive Economic Development Planning". Tallahassee.

State of Florida. Employment Service. No date. Annual Planning Report, Gainesville SMSA (unpublished).

Tennessee Valley Authority, 1976. Hartsville Nuclear Plants: Socio-Economic Monitoring and Mitigation Report.

U.S. Bureau of the Census, 1976. Statistical Abstract of the United States. Washington, D.C.

U.S. Bureau of Census, Office of Research and Statistics, 1977. Personal communication regarding information contained in Census Publications RC1-C11 and PC1-D11.

U.S. Postal Service, 1977. United States Postal Vacancy Survey, Gainesville, Florida. SMSA.

University of Florida, College of Business Administration, Bureau of Economic and Business Research, 1976a. Florida Estimates of Population. Gainesville, Florida.

Woodward-Clyde Consultants, 1975. Socio-Economic Study: Washington Public Power Supply System Nuclear Projects 1 and 4. San Francisco.

CHAPTER 8

Atomic Industrial Forum, Inc. Background Information. Washington, D.C.

Bradley, W.J. "Designing and Siting Solar Power Plants". Consulting Engineer, March 1977.

City of Gainesville, Department of Community Development, 1976. Housing Market Analysis, 1975-1985.

Code of Federal Regulations, Title 10, Chapter II, Part 215.3.

Committee on Power Plant Siting, National Academy of Engineering, 1972. Engineering for Resolution of the Energy-Environment Delemma. National Academy of Science Printing and Publishing Office, Washington, D.C.

County Sanitation District of Los Angeles, California, 1976. Report of Resources from Solid Waste.

Energy Supply and Environmental Coordination Act of 1974.

Federal Register, Vol. 40, No. 114, Thursday, June 12, 1975, pp 25090-25093.

Geraghty, J.J., D.W. Miller, F. Van Der Leeden, and F.L. Troise, 1973. Water Atlas of the United States.

Gainesville-Alachua County Regional Utilities Board, 1977. Ten-Year Electric Utility Expansion Plan. (Submitted to Division of State Planning, April 1977).

Kruger, P., 1975. Aware.

Plant Siting Task Force, 1970. Major Electric Power Facilities and the Environment. Committee on the Environment, New York, NY.

White, D.F., and D.L. Williams, 1975. Assessment of Geothermal Resources of the United States, U.S. Geological Survey Circular.

U.S. Atomic Energy Commission, 1973. General Environmental Siting Guides for Nuclear Power Plants - Topics and Basis (Draft report).

U.S. Federal Energy Administration, 1976. National Energy Outlook, Washington, D.C.

U.S. Federal Energy Administration. Order to Abandon Oil-Fired Unit Plans.

U.S. Federal Power Commission, 1976. Hydroelectric Power Resources of the United States, Developed and Underdeveloped, January 1976.

U.S. 92nd Congress 2nd Session, 1972. Background Report on Power Plant Siting. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

U.S. Office of Science and Technology, Energy Policy Staff, 1970. Electric Power and the Environment. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

U.S. Office of Science and Technology, Energy Policy Staff, 1968. Considerations Affecting Steam Power Plant Site Selection. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

U.S. Office of Science and Technology, Energy Policy Staff, Washington, D.C., 1968. Considerations Affecting Power Plant Site Selection. U.S. Government Printing Office, Washington, D.C.

CHAPTER 9

Breedlove and Associates and Jones, Edmunds and Associates, Inc., 1977. An Evaluation of Alternatives to the Present Releasing of Deerhaven Generating Station Blowdown to Turkey Creek. 2 Vol, 430 pp.

Hanna, S.R., 1974. Fog and Drift Deposition from Evaporative Cooling Towers. Nuclear Safety, 15(2):190-195.

McVehil, G.E. and K.E. Heikes, 1975. Cooling Tower Plume Modeling and Drift Measurement: A Review of the State-of-the-Art. Ball Brothers Research Corporation, Contract G-131-1. 177 pp.

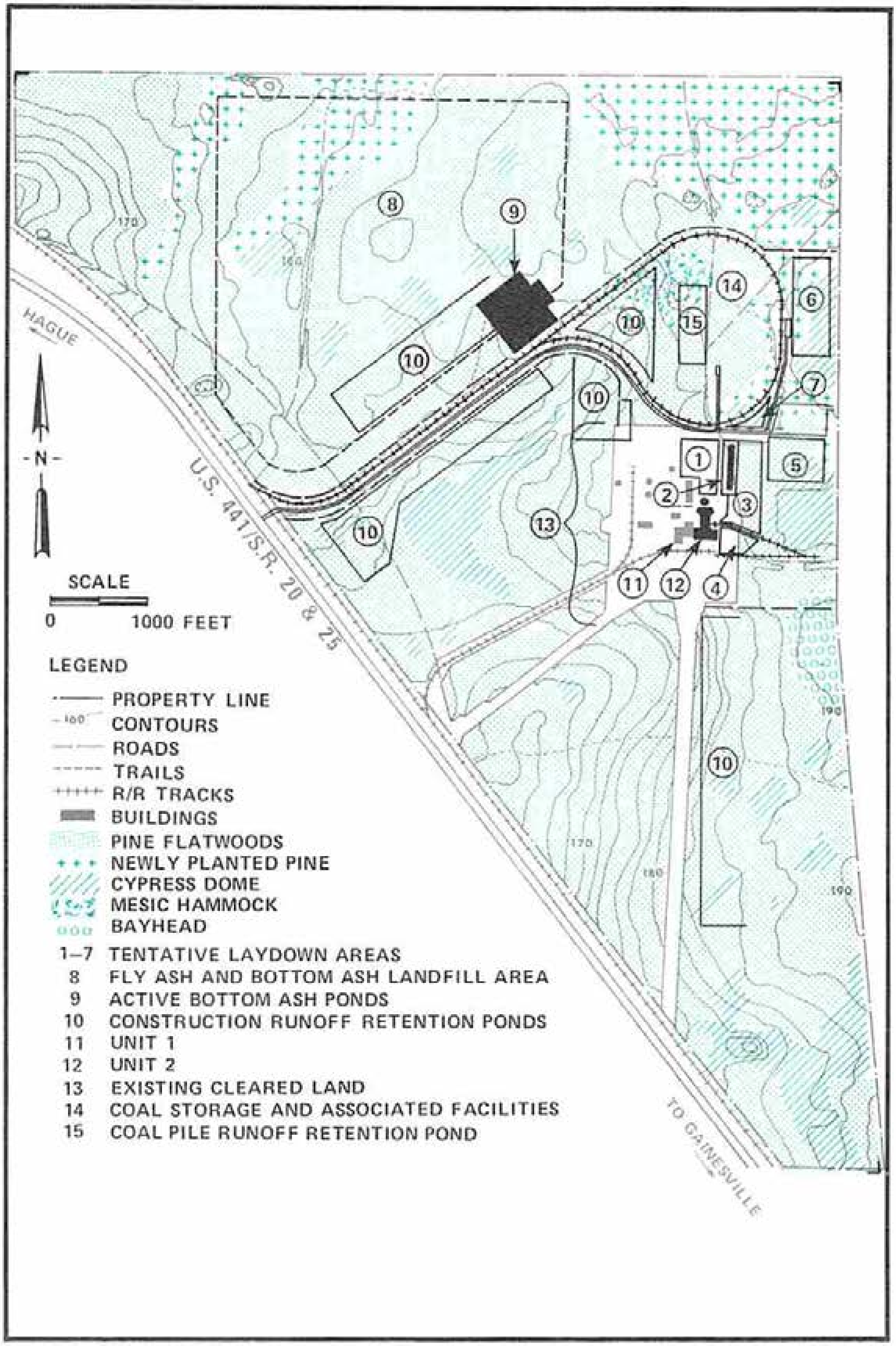

FIGURE 4.1-1 VEGETATION MAP AND PROPOSED SITE PLAN OF THE DEERHAVE SITE.

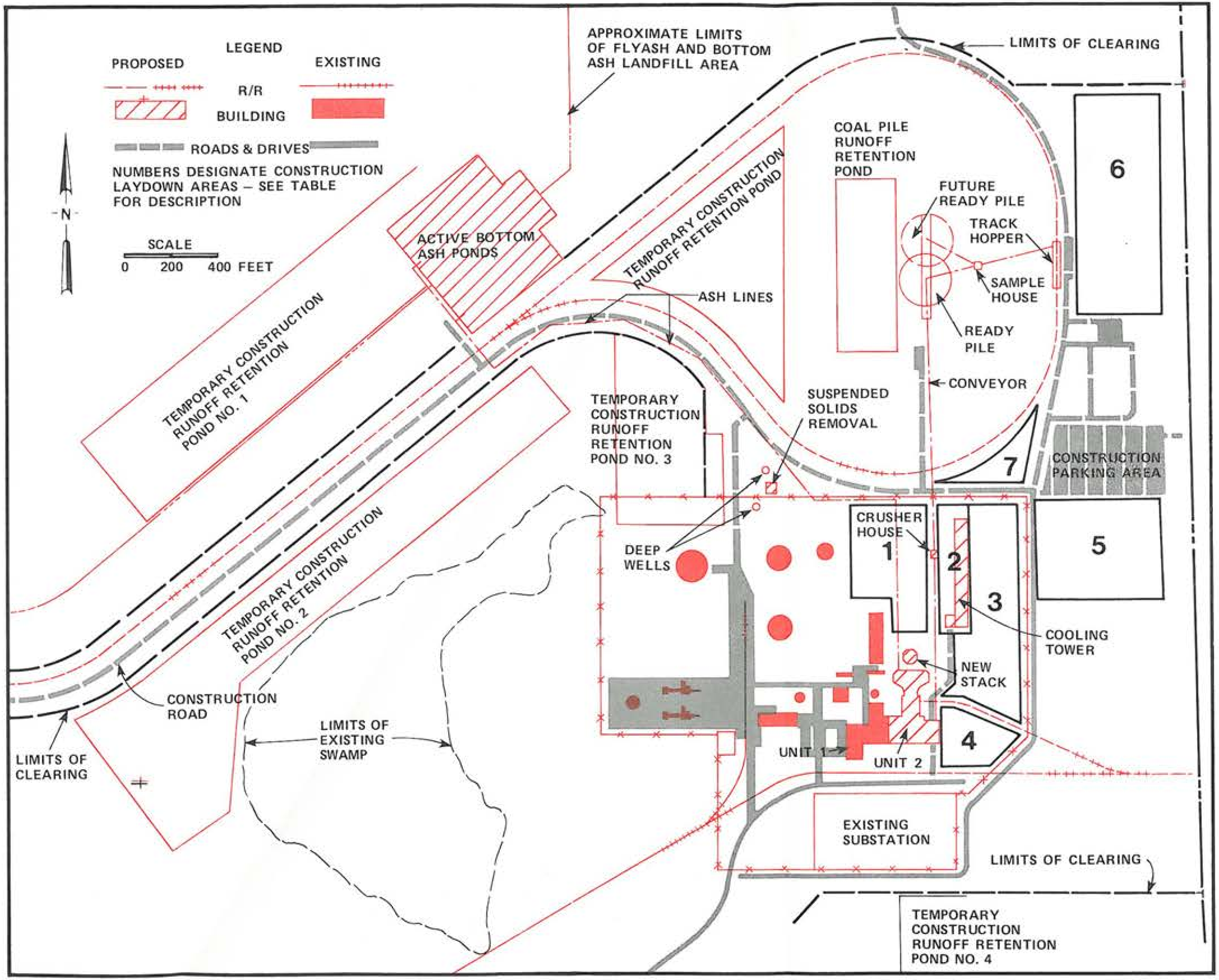

FIGURE 4.1-2 PROPOSED SITE IMPROVEMENTS AND LAYDOWN AREAS.

CHAPTER 4

ENVIRONMENTAL EFFECTS OF SITE PREPARATION, PLANT AND ASSOCIATED FACILITIES CONSTRUCTION

Presented in this chapter are the expected physical impacts of site preparation and plant construction on the environment and resources discussed in Chapter 2. Such impacts are evaluated in terms of their relative and long-term impacts. The measures for mitigating the adverse impacts are also discussed. Socio-economic impacts of construction are discussed in Chapter 7.

Also presented are those effects which represent a commitment of resources, both those irretrievably committed and those only impacted for a short-term. An estimated listing of non-recyclable building materials is presented.

4.1 Site Preparation and Plant Construction

4.1.1 Laydown Areas

The portions of the Deerhaven site which have been set aside for use as building material laydown areas during construction of the new facilities are shown in Figures 4.1-1 and 4.1-2 and summarized in Table 4.1-1. Based on preliminary site plant approximately 27 acres of land have been committed for storage of construction materials and equipment. Approximately 6 acres occur on the existing improved site and 21 acres will be cleared. Most of the latter is pine flatwoods, with approximately 3 acres in two small cypress domes. In addition, 3 acres will be cleared and used for construction parking (Figure 4.1-2).

Table 4.1-1 Deerhaven Site Laydown Areas

Area No.	Size (acres)	Location	To Be Used By
1	3.5	North of new unit	Boiler Contractor-short term use
2	1.8	Northeast of new unit	Cooling Tower Contractor-short term use
3	5.8	Northeast of new unit	Cooling Tower, Boiler, and Other Contractors-long term use
4	1.5	East of new unit	Power House Contractor-short term use
5	7.4	Southeast of new unit	Substation Contractor
6	5.6	Northeast of new unit	All Contractors-long term use
7	1.6	Southeast of railroad loop	Coal Handling and Railroad Contractors-short term use

Laydown areas 1 and 2 are within the cleared area surrounding the present Deerhaven Unit 1 facilities. Area number 4, to the east of the proposed Unit 2, presently consists of approximately one-half cleared and grassed land with the other half consisting of planted pine flatwoods with understory vegetation. The remaining areas, numbers 3, 5, 6 and 7, consist of primarily pine flatwoods.

The above mentioned areas will remain cleared after use as laydown areas, and will become part of the permanently grassed area. It is not anticipated that any transient environmental effects during construction will result from the use of these land areas as building material laydown areas other than the removal of vegetation. A possible transient effect could have been soil erosion by stormwater runoff; however, parking and temporary roads within the laydown areas will be covered with crushed rock. Following construction, the crushed rock will be removed and all areas grassed. Erosion control during construction is discussed in a subsequent section.

4.1.2 Land Impacts

Impact Areas

Construction of access corridors, laydown areas, and new facilities for Unit 2 will require the clearing of 141 acres, or 14% of the unimproved land on the Deerhaven property (Figure 4.1-1). One hundred twenty acres are currently occupied by flatwoods, 14 acres by small cypress heads, and 7 by developing, or early successional, mesic hardwoods. These acreages represent 14% of the pine flatwoods and 11% of the cypress heads on the Deerhaven property; assigning a percentage value to the area of developing mesic vegetation would be relatively meaningless, since it is immature and all flatwoods on the property would succeed to mesic hardwood forest or hammocks in the absence of fires for a few decades. Pine flatwoods and plantations with interspersed cypress heads are the dominant vegetation communities in the project area (Figure 2.2-1). Loss of these acreages will have negligible impact on the ecology and land use practices of the region.

With the utilization of deep injection, wells will be drilled on the existing improved plant site, requiring no additional committment of land or vegetation communities.

The fly ash and bottom ash landfill area will be cleared a portion at a time, as required, for ash disposal. With this exception, construction will require total clearing of the land areas described above.

Other areas of land impact, as shown in Figures 4.1-1 and 4.1-2 are the construction runoff retention pond, active bottom ash ponds, truck roads, and the railroad loop.

The construction runoff retention pond located within the coal storage area will be a shallow excavated earthen lagoon of total volume equal to the stormwater runoff expected from a ten year, twenty-four hour rainfall.

All other construction runoff retention areas will not be cleared but will be formed with low earthen dikes in an effort to preserve as much vegetation as possible.

The active bottom ash settling ponds will also be of excavated earthen lagoon type construction. Each lagoon will be approximately 300 feet wide, 400 feet long, and about 18 feet deep. The necessity for interior lining of these ponds will be determined from the results of a leachate travel investigation.

Cross sections of the single track railroad and adjacent roadway are shown in Figure 4.1-3. This construction will require land clearing and vegetation disposal. As with all on-site construction, cut and fill earthwork, will, if possible, be balanced to eliminate excess material or the necessity for excavating borrow pits.

Major on-site excavation will probably be confined to the areas of the coal unloading facility and the active bottom ash ponds (Figure 4.1-1). Excavated material will be used as fill for the on-site railroad embankment and other on-site fill areas and as cover material on the on-site ash landfill.

Construction Solid Waste

During construction, solid waste will be produced which will include vegetation removed during land clearing and grubbing, and trash and

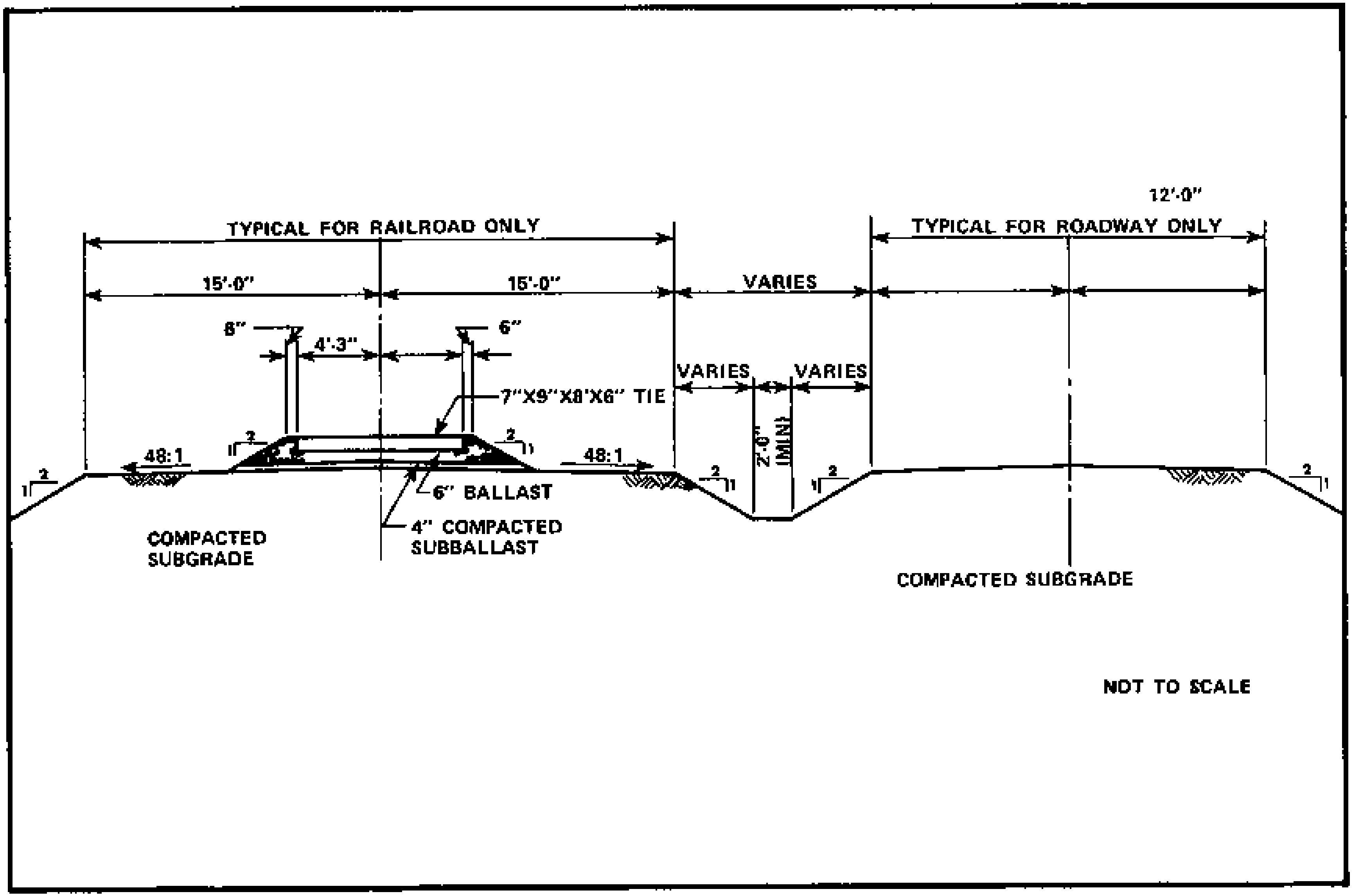

FIGURE 4.1-3 TYPICAL SECTION FOR SINGLE TRACK RAILROAD AND ROADWAY.

debris (scrap metal, scrap lumber, masonry, cardboard, paper, etc.) typical of building construction operations. It is anticipated that the combustible portion of these wastes will be burned on-site with such burning being subject to state and local laws. The contractor will be responsible for obtaining daily burning permits from the local office of the State Division of Forestry. The residue from this burning will be disposed of by the contractor either by burial on-site or by removal to the nearest landfill. The portions of the solid wastes which are not combustible will be removed from the site by the contractor for disposal at either the nearest landfill or an on-site landfill if permitted. General rubbish such as paper trash and small packing and crating materials will be incinerated in the existing on-site incinerator. This facility is permitted by the DER and can be utilized as long as its use is limited to the conditions of the permit.

It is not anticipated that hazardous chemical wastes will result from construction operations.

Construction Explosives

Present knowledge of subsurface site conditions indicates no need for the use of explosives during site earthwork or construction. In addition, the presence of the existing generating unit would discourage the use of explosives, even if such use were desirable.

Archaeological Sites

Of the 11 archaeological loci identified on the Deerhaven property, only two were assigned "site" status (Section 2.3). One of these, 8AL368, is toward the southwestern boundary of the property, well away from proposed construction, and its accessibility will not be affected by construction of Deerhaven Unit 2. The other, 8AL369, which is considered important enough to be included in the National Register, lies within the proposed construction area. However, because the Deerhaven property is entirely fenced and closed to the public, the site will remain inaccessible to unauthorized persons nor is its exact location included in the published sections of this site certification application.

Mitigating Measures

Erosion Control - As discussed in Chapter 2, the majority of the Deerhaven site is drained by channels and ditches which are tributaries to Turkey Creek. During construction of Unit 2, clearing and grubbing of the site construction area will remove protective vegetation and earthwork and construction operations will tend to loosen the ground surface. Should erosion control techniques not be implemented, such site development could result in significant transport of eroded material into Turkey Creek and possible siltation of water courses, local flooding, burying of stream biota, and increased stream turbidity.

At the present time, no specific sediment control standards exist in Florida. However, some portions of Chapter 17-3, Florida Administrative

Code, might be considered as applying to stormwater runoff containing eroded sediments. In particular, these regulations limit turbidity to 50 Jackson Turbidity Units (JTU). Table 4.1-2 presents maximum values for other water quality parameters which could be affected by eroded materials in stormwater runoffs.

Figures 4.1-1 and 4.1-2 present the portions of the existing site which will be cleared and developed during proposed construction. The construction runoff and earthwork activities in these areas will be directed, via dikes and ditches, into retention ponds at various locations on the site. These ponds will be constructed to contain the anticipated volume of runoff to be expected from a ten year, twenty-four hour storm plus a minimum two foot freeboard. This stormwater volume will be retained in the ponds until acceptable levels of suspended solids content and turbidity are reached. It is anticipated that stop logs will be used so that, upon their removal, low turbidity surface water will be first released from the retention ponds. In addition, the use of hay bales as filters and scum baffles is presently anticipated.

It is anticipated that the erosion-control techniques described above will be sufficient to prevent significant on-site erosion during construction and to contain eroded materials on-site. If needed, additional measures will be taken as necessary during the construction program.

Table 4.1-2 Water Quality Standards for Class III Waters (recreation and propagation; and management of fish and wildlife).

Item	Maximum Permissible Value
Dissolved Oxygen	5 mg/l (min 24-hr average) 4 mg/l (min value)
Turbidity	50 JTU
Total Dissolved Solids	500 mg/l (monthly average) 1,000 mg/l (max value)
Specific Conductance	not more than 100% above background level 500 µmhos/cm (max value)
Oil & Grease	no visible oil or iridescence 15 mg/l (max value)
pH	not more than 1.0 unit above or below background pH 6.0 (min value) 8.5 (max value)
Sewage, industrial wastes or other wastes	must receive approved treatment
Deleterious substances	must be free of materials attributable to municipal, industrial, agricultural or other discharges producing color, odor or other conditions in such degree as to create a nuisance

Dust Control - Figure 4.1-2 presents the proposed locations of construction access roads and parking lots. These facilities will be graveled during construction of Unit 2 both to prevent dust generation and for erosion control. Otherwise, dust generation during construction is not anticipated to be a significant problem. Should excessive dust generation occur during construction, a wetting program will be implemented. It should be noted that, because of the buffer of trees and vegetation which will remain around much of the site perimeter, the impact of dust generation upon off-site areas is not expected to be significant.

Archaeological - Disturbance of the archaeological site 8AL369 will be mitigated by professional excavation; RUB entered into a contract with the University of Florida, Department of Anthropology for test and salvage excavations. This work has been completed and a report of the findings is presently under preparation and will be submitted as soon as possible. Preliminary indications are that no material of significance was found and no further salvage work is necessary.

4.1.3 Impact on Water Bodies and Uses

Surface Streams

During the initial construction stage, runoff from the construction site will follow existing drainage patterns, percolate into the sandy soil, and enter Turkey Creek. The sandy soil, flat topography, swale areas, and vegetation should minimize any short-term impacts on Turkey Creek due to turbidity.

During the initial construction stage, 4 runoff retention areas totaling 78 acres will be constructed with the capacity to contain the runoff from a ten year, twenty-four hour storm event (Figure 4.1-1) (Burns & McDonnell, 1977). Six acres of the potentially ponded area are occupied by parts of small cypress heads and the remainder by a pine flatwoods association.

The runoff retention areas will consist of low earthen dams constructed of soil taken from the construction site. Vegetation will not be disturbed, except to allow earth-moving equipment to operate and soil to be amassed. A runoff retention capacity of four to five days is planned to reduce or eliminate turbidity prior to discharging the water to Turkey Creek.

The planned relatively short duration runoff retention periods and subsequent complete drainage of the areas should minimize vegetation stress due to flooding. Where retention areas coincide with depressions which may not drain completely and/or soils which are poorly drained, vegetation stress may occur.

The ponds will exist only for the duration of construction, after which the dams will be removed, the area seeded to reestablish a ground cover, and natural succession allowed to revegetate stressed or disturbed areas.

Figure 4.1-4 presents a typical construction runoff pond control structure. After a period of quiescent settling in the retention ponds, stop logs will be removed so that low turbidity surface water can be gradually

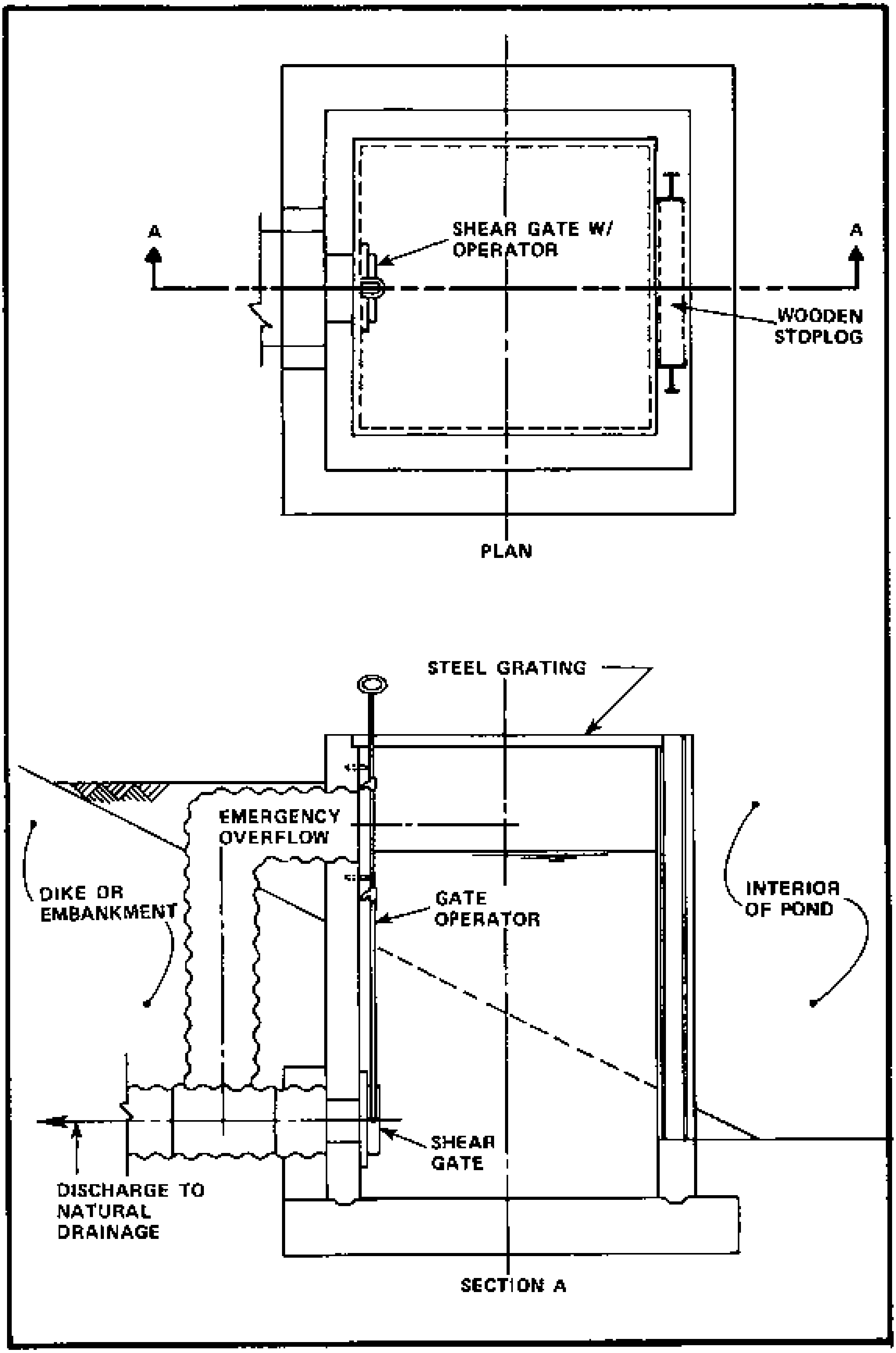

FIGURE 4.1-4 CONSTRUCTION RUNOFF POND OUTFALL STRUCTURE.

released. In addition, the use of hay bales as filters and surface scum baffles is anticipated. In addition to reducing storm water runoff turbidity, these retention ponds will prevent short duration-high rate water runoff flows from producing erosion of existing stream channels and should more than compensate for the increase in rainfall runoff rates and total runoff volume due to site development.

In addition to construction of the improvements described above, construction management of the Deerhaven site will include consideration of the following factors so as to reduce hydrological impacts:

1. Scheduling and sequencing of operations, including the scheduling of potentially harmful construction activities during periods of reduced rainfall.

2. The locating and maintaining of runoff retention ponds near potentially harmful activity areas.

3. Supervising the use and maintenance of storm water runoff retention facilities.

4. Instituting pollution abatement programs such as watering for dust control, grassing open areas during out-of-use periods, surface treating temporary roads, maintaining waste disposal areas, isolating runoff from fuel dumps and equipment service areas, etc.

5. Revegetating of construction areas upon completion of site development.

Since there are no natural open bodies of water on the Deerhaven site, there will be no constructional impacts on lakes or ponds of the project area.

Groundwater

As described in Chapter 2, it has been observed that during the rainy season the Deerhaven site groundwater approaches the ground surface at many locations, totally saturating surface soils. It is therefore anticipated that some drainage and dewatering of the site will be necessary during construction. The amount of dewatering required will depend upon construction scheduling, since the Gainesville area has seasonal rainfall variations.

At present, detailed dewatering and construction drainage plans have not been performed. However, it is possible to describe construction areas likely to require dewatering and to infer the impact of such dewatering on the site groundwater table.

The major structure likely to require dewatering will be the coal unloading facility. This facility will be constructed at the east side of the railroad loop shown in Figure 4.1-1. Excavation dimensions for this facility are estimated to be 120 feet long, 20 feet wide, and 40 feet deep. During construction, this excavation will require dewatering.

The dewatering will be terminated upon completion of the foundation system. Discharge from the construction dewatering system will go to the runoff retention pond to be constructed within the new railroad loop and, if necessary, to other nearby retention ponds.

Active bottom ash settling ponds are presently anticipated to be constructed north of the proposed railroad loop as shown in Figure 4.1-1. At present, two ash ponds, each about 400 feet long, 300 feet wide, and 18 feet deep are contemplated with a smaller pumping pond 200 feet long, by 100 feet wide, by 18 feet deep located nearby. Dewatering of this area will be required during construction but is not anticipated to be necessary following construction completion.

The major excavations described above may result in temporary lowering of the site groundwater table by approximately 40 feet. It should be noted that such dewatering would influence only the local (perched) groundwater table and would not affect the potentiometric surface in the Floridan Aquifer. Rather than removing seepage discharges from the surface drainage system, however, such dewatering will provide continuous high quality discharge from the dewatering equipment into nearby streams. Insufficient information is available to determine the rate of such discharge from dewatering equipment but is not anticipated to produce a significant impact on streams and channels. Since the total construction time for which dewatering will be necessary is not known, it is difficult to assess the effect on site groundwater hydrology of this dewatering program. It is expected that some limited impact may result from such depressing of the shallow groundwater table.

4.1.4 Air Quality

The effects of site preparation and plant construction on air quality will be short-term reversible impacts.

As indicated earlier site preparation will involve the clearing of approximately 141 acres for the construction of Unit 2 and the additional support facilities. In addition, approximately 220 acres will be cleared at a staged rate for use as an ash disposal area.

It has been estimated that after salvage, the trash remaining on cleared land will be about 12 tons/acre, wet (Post, 1975). The estimated weight of this material after drying naturally will be 7.5 tons/acre. For the initial clearing operation, i.e., 141 acres, a total of approximately 1,058 tons of trash will be generated and probably disposed of by open burning under controlled conditions. This will generate approximately 9 tons of airborne particulate matter, 76 tons of CO and 13 tons of hydrocarbons. The clearing of the 220 acre ash disposal site will result in 14 tons of airborne particulate matter, 119 tons of CO and 20 tons of hydrocarbons (U.S. EPA, 1976). However, since the clearing for the ash landfill will be staged, the above emissions will occur intermittently over a twenty-five year period.

By limiting the burning of this refuse to 40 to 80 tons per day (material from 5 to 10 acres) the ambient concentrations of the various pollutants at the Deerhaven site boundary, under extreme conditions, can be maintained well below Florida air quality standards. For example, the twenty-four hour TSP levels will be maintained below 80 $\mu g/m^3$ (standard-150 $\mu g/m^3$); eight hour CO levels below 2 milligrams/m^3 (standard-10 milligrams/m^3); three hour hydrocarbon levels below 115 $\mu g/m^3$ (standard-160 $\mu g/m^3$).

A second source of airborne particulate matter resulting from construction activities is fugitive dust resulting from the operation of construction equipment and wind erosion of particulate matter from barren land. Estimates indicate that fugitive dust emissions from the Deerhaven site will be in the range of 3 tons per day (U.S. EPA, 1976). This number can be reduced by approximately 50% by an effective watering program conducted twice daily during the dry season. The effect of these emissions will be mitigated by the fact that most construction activities will occur more than one kilometer from the site boundary and substantial quantities of the dust will be deposited on trees and other vegetation before reaching the boundary.

4.1.5 Ambient Noise

Existing ambient noise levels are typical of rural environments except in the immediate vicinity of the operating Deerhaven Unit 1 and along the southwest boundary of the site which parallels U.S. 441. A noise survey of the site with eighteen sampling locations (Section 6.1.8) indicated that over most of the site the average A-weighted sound level (L_{50}) is in range of 40 to 45 dBA. Readily identified sound sources were birds and wind effects from trees and shrubs. Along the perimeter adjacent to the highway, average levels are 45 to 50 dBA with motor vehicle traffic as the major noise source. Noise levels near plant operating equipment (Section 5.6.2) ranged from 60 to 75 dBA from a variety of sources.

Candidate noise sources during site preparation and construction of Deerhaven are identified as (Federal Register, Volume 40, Number 103, 1975):

* Air Compressors
* Backhoes
* Chain Saws
* Concrete Vibrators
* Cranes, Derrick and Mobile
* Dozers, Track and Wheel
* Engine Driven Industrial Equipment
* Generators
* Graders
* Loaders, Track and Wheel
* Mixers
* Pavers
* Pile Drivers
* Pneumatic and Hydraulic Tools

* Power Saws
* Pumps
* Scrapers
* Shovels

In addition, activities associated with equipment delivery by heavy truck and rail transports will impact existing ambient noise levels.

The frequency spectra of these possible noise sources will generally be broad band with acoustic energy emissions higher in the lower frequency range. The exception occurs with operation of saws which tend to emit higher frequency noise with audible tonal components. Noise emission will be partially masked by highway traffic noise during activities near the southwest boundary of the site. Similarly, for the major portion of construction adjacent to the existing station, operating noise levels will tend to mask construction noise.

Estimates of the magnitude of noise level impact on the site during construction are based on studies of construction noise for a similar an electric generating station facility (Noise Control Engineering, 1975). Construction noise levels are most appropriately represented as an A-weighted level exceeded a specific fraction of the time. For example, L_{90} represents a level exceeded 90% of the time, L_{50}, a level exceeded 50% of the time. The impact is presented as the increase in these temporal levels over existing ambient levels. The incremental increases in noise levels are estimated as an area average for "on-site" and "off-site" receptors. Off-site receptors are defined for this study as those being approximately a one mile distance from the center of the site. The estimates are presented as follows:

CONSTRUCTION NOISE LEVEL IMPACT (dBA)

DEERHAVEN SITE, GAINESVILLE, FLORIDA

Noise Level	On-Site	Off-Site
ΔL_{90}	5	2
ΔL_{50}	10	3
ΔL_{10}	20	5

Noise level impact on humans will be almost entirely associated with construction contractor personnel. This impact will largely be mitigated by short duration of high-level exposure and by use of personal hearing protectors when appropriate. There are two permanent residences (closest proximity) located approximately one mile from the center of the site. Attenuation of noise levels with distance (noise levels will nominally decrease 6 dB for each increment of doubling the distance from the source) will result in small temporary noise level impact on permanent residents.

No definitive studies have been reported which establish the extent to which wildlife might be effected by construction noise. It is generally accepted that permanent physiological damage to wildlife will not occur from the levels of noise typical of construction activities.

4.1.6 Construction Traffic Control

As shown in Figure 4.1-2, construction access to the site will be by means of a construction traffic access road. It will enter the site from U.S. 441 approximately one-half mile northwest of the existing main entrance. Since earthwork operations will not require removal of excess material from the site or hauling in of fill material from off-site borrow pits, truck traffic will be primarily limited to delivering of construction materials and equipment, and removing construction solid waste from the site. The volume of such truck traffic is not anticipated to produce a major impact on U.S. 441. Deceleration lanes, will be provided in order to obtain a Florida Department of Transportation permit for connecting the access road to U.S. 441, which will help to minimize any hazard to through-traffic.

Representatives of the Seaboard Coastline Railroad have indicated in preliminary discussions that existing off-site railroad lines will be adequate to transport coal to the Deerhaven site and that no new lines will be necessary.

4.2 Resources Committed

4.2.1 Hydrological

As discussed in previous sections, dewatering of major on-site excavations will be performed only during construction operations and will terminate upon construction of those facilities. Thus, no long-term major depression of the shallow groundwater tables should occur.

Since the ash landfill cells are anticipated to be constructed above existing grades, the only other facility which could require long-term dewatering would be the proposed coal pile runoff retention pond. However, it is anticipated that this pond will be fairly shallow, perhaps 1.5 to 2.0 feet deep. During high groundwater periods, dewatering of the coal pile runoff retention pond by means of a sump pump will probably be necessary to keep the pond empty and ready to receive coal pile runoff flows. Therefore, the shallow groundwater table could be depressed by 1 1/2 to 2 feet in the area of the site occupied by the coal pile runoff retention pond. This seepage will be pumped to the active bottom ash ponds. It is anticipated that such minor depression of the shallow groundwater table will not have harmful effects on the ecology of hydrology of the area. In fact, such depression of the shallow groundwater table will reverse the local piezometric gradient and may help to reduce possible leachate contamination of the shallow groundwater system.

Hydrological impacts on the Floridan Aquifer are discussed in Section 5.0 of this document.

4.2.2 Archaeological

The archaeological site 8AL369 will be severely and permanently impacted by construction activities. However, as reported in Section 4.1.2 it has been excavated systematically and its artifacts will be catalogued and preserved.

4.2.3 Ecological

Total land committed for construction will be 141 acres, most of which is in pine plantation interspersed with small cypress domes. These represent a permanent and unavoidable loss of wildlife habitat.

Pine plantation is the most prevalent vegetative community in the project area; therefore, its loss on the Deerhaven property is not regarded as of serious consequence to the region. The cypress domes affected are important primarily as they provide habitat diversity for adjacent pine-lands. The developing mesic community lies with the proposed railway loop and coal storage area and becuase of its size and successional status (Section 4.1.2) is not considered important enough to warrant relocation of these features.

Construction noise, smoke, and dust may cause some animals to migrate away from sources of disturbance: smaller mobile forms will enter new areas on or off the Deerhaven property; larger ones such as white-tailed deer will be confined to the site by the perimeter fence. The resulting competition stress will be minimal and temporary and primarily confined to the property except, perhaps, near the eastern boundary, where construction activities and clearing will proceed to the perimeter fence.

As these lands are cleared, resident wildlife will move to nearby similar vegetation communities, causing temporary stress on the wildlife populations in the newly occupied areas as migrating individuals compete with those already present. After a period of adjustment, populations will return to former levels, showing a net loss of wildlife roughly equivalent to that originally displaced when the land was cleared.

The site offers only marginal habitat for any rare or endangered species and no present utilization by an endangered species is known (Section 2.7.1) (Crider, 1973). Loss of habitat associated with plant construction will not significantly decrease the endangered species support potential of the region nor should construction cause the loss of any individuals.

4.2.4 Non-recyclable Building Material

Non-recyclable materials associated with the project are estimated to consist of the following:

Metals	Approximate Quantities	
Aluminum	50	Tons
Copper (300 miles)	300	Tons
Steel		
Structural shapes	1,700	Tons
Formed Plate	3,000	Tons
Rebar	800	Tons
Pipe	800	Tons
Tubing	1,200	Tons
Casting and forgings	600	Tons
Bituminous concrete	5,000	Tons
Cement concrete	30,000	Cu. yards
Crushed rock	30,000	Tons
Sand	2,000	Tons
Wood	350,000	Board ft.
Insulation	300	Tons

CHAPTER 5

ENVIRONMENTAL EFFECTS OF PLANT OPERATION

This chapter presents the details describing the interaction of the operation of the new unit and the surrounding environment, as described in Chapter 2. Both beneficial and detrimental effects or impacts arising from this interaction are identified, evaluated and described by analyzing each project operation and required resources. The evaluation and description of impacts includes a specification of their magnitude, significance and other characteristics. Impacts are distinguished in terms of their impacts on surface water bodies, groundwater, air, land, and ecology.

5.1 Effects of Heat Dissipation System

As described in Chapter 3, the new unit, as does the existing unit, will utilize a multi-cell, mechanical draft wet cooling tower for heat removal from the recirculating condenser cooling water. Cooling tower blowdown from both the existing and new units will be disposed of through deep well injection, with exception of small quantities used for fly ash wetting for dust suppression during landfilling and quench water for boiler blowdown. These small volumes will be collected in the ash landfill.

Effects on Aquatic Life

There will be no surface water utilization as part of the heat dissipation system. Consequently, impacts to aquatic life associated with thermal discharge, impingement, entrapment, diversion and modified circulation will be non-existent.

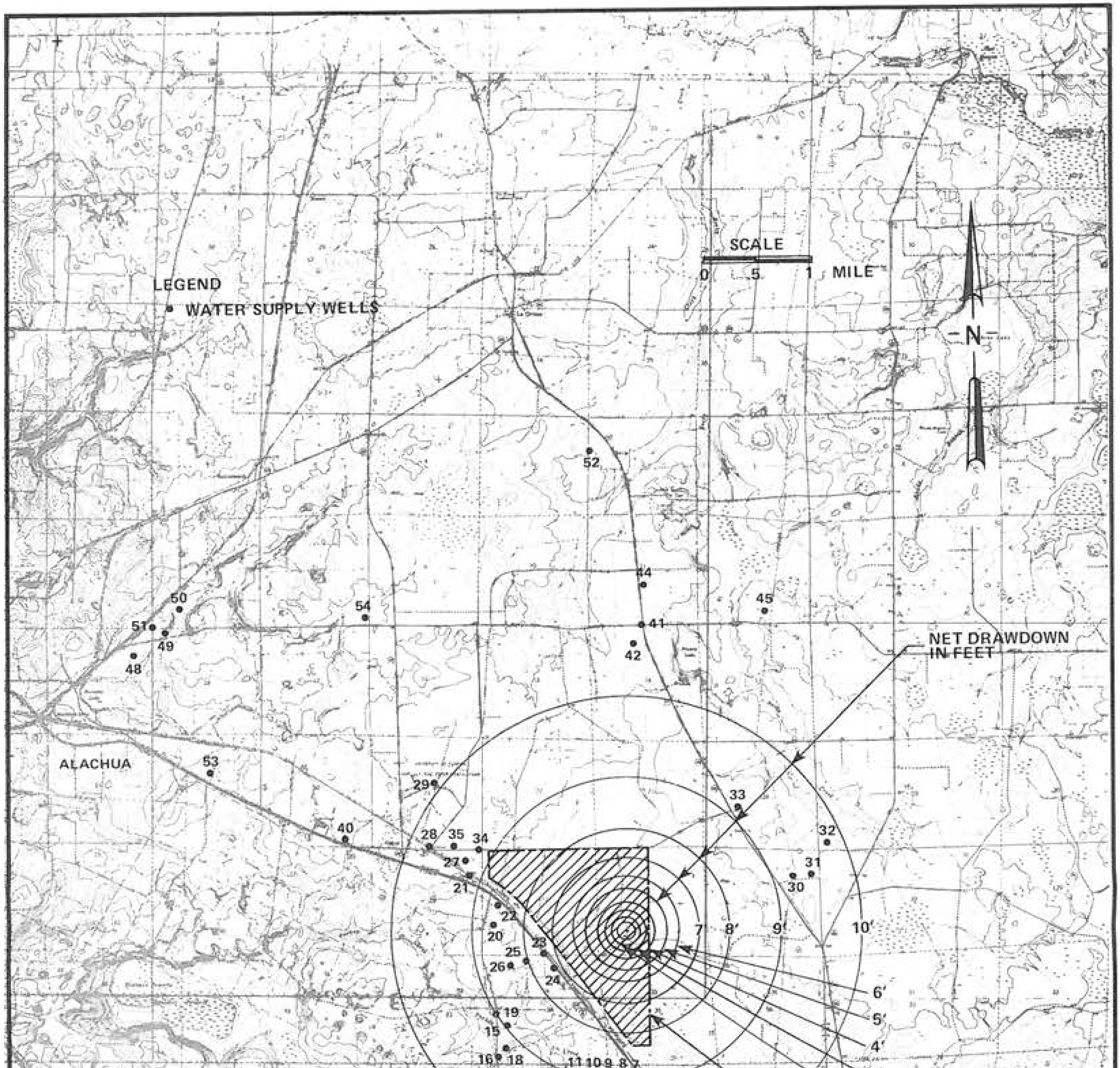

FIGURE 5.1-2 NET DRAWDOWN AFTER 5 YEARS WITHDRAWAL AT DEERHAVEN WATER SUPPLY WELLS ASSUMING WATER TABLE CONDITIONS IN FLORIDIAN AQUIFER.

Water Supply Well Withdrawal

As discussed in Chapter 2, all well pumping tests in the area, for which information is available, have been conducted in wells which apparently penetrate the Floridan Aquifer under artesian conditions. Tests performed originally at the Deerhaven water supply wells did not provide an estimate of the aquifer storage coefficient so that groundwater withdrawal effects could be reliably predicted. As discussed in Chapter 2 and shown in Figure 2.5-7, some authors have proposed that the Floridan Aquifer in the Deerhaven vicinity experiences groundwater table conditions. Such suggestions are based on the assumption that the Ocala group, which constitutes the top of the Floridan Aquifer in this area, performs as a hydrologic unit throughout its depth and that, since the aquifer's potentiometric surface lies below the top of the Ocala group, the aquifer therefore experiences water table (i.e. unconfined aquifer) conditions. However, field experience indicates that this formation and others which comprise the Floridan Aquifer may contain zones of both low and high permeability. The implication of this observation for the Deerhaven site is that, even though the potentiometric surface in the Floridan Aquifer is known to be 28 feet below the top of the Ocala group (in September, 1977), this is not necessarily positive proof that the Floridan Aquifer beneath the site is under water table conditions. Furthermore, if the assumption that the aquifer is under water table conditions is correct, the only data which have been available for drawdown prediction have been obtained from wells under artesian conditions, and their application to the Deerhaven water supply wells may provide invalid results.

In order to obtain site-specific data, a test of one of the existing water supply wells was performed from September 9, 1977, to September 13, 1977. As Figure 5.1-1 indicates, three water supply wells presently exist to meet the present needs of the station. These wells are aligned approximately on a north-south axis and are 150 feet apart. The three supply wells range in depth from 360 to 440 feet. An observation well, 281 feet deep, lies 485 feet south of the central water supply well.

During the week preceding the aquifer test, the central water supply well was the only well pumped for the station's needs. This well was pumped continuously to establish quasi-equilibrium in the groundwater system at a rate equal to the average withdrawal rate for the preceding months. This continuous pumping terminated at 5:00 a.m. September 9, 1977. Pre-test water levels were measured in the south water supply well and in the observation well. These were used as monitoring wells during the aquifer test and the central water supply well was used as the pumping well. It was not possible to insert water level measuring devices in the north and central water supply wells due to the small annular clearance in the well casing. Pre-test water level observations indicated that the aquifer had not fully recovered from the previous pumping; however, only a limited shut-down time could be tolerated due to water supply needs at the station. Therefore, the aquifer test was begun at 3:02 p.m. September 9, 1977, and proceeded for 94 hours, 16 minutes until 1:19 p.m. September 13, 1977. During this test period the central water supply well was pumped at a rate of 881 gallons per minute.

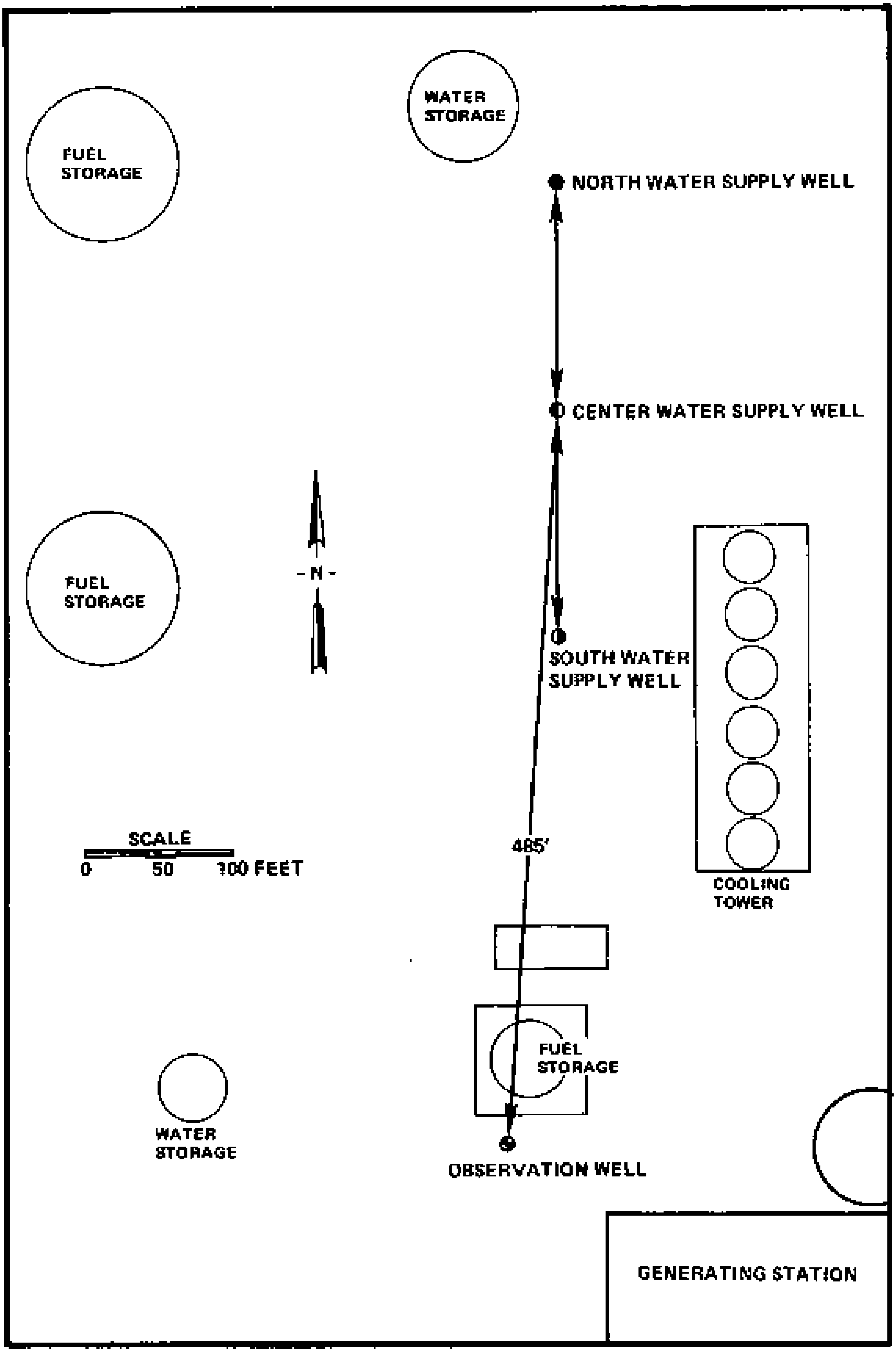

FIGURE 5.1-1 LOCATION OF EXISTING DEERHAVEN STATION WATER SUPPLY WELLS AND OBSERVATION WELL.

The collected data were analyzed using two models to determine transmissivity and storage coefficient values. These were the Hantush-Jacob model, a non-steady state, leaky artesian aquifer model which assumes fully penetrating wells, no release of water from storage in the aquitard and constant discharge conditions; and Boulton's delayed drainage model for a water table aquifer with fully penetrating wells and constant discharge conditions.

Time-drawdown response during the first few hundred minutes of the test indicated that the aquifer system may be responding as a water table aquifer. Using Boulton's technique, time-drawdown data for both monitoring wells was plotted on log-log paper and the plots were matched to the Boulton model type curves. A match for early and late times was obtained for the south water supply well and only a match for early time was obtained for the observation well. A summary of the results of this analysis is shown in Table 5.1-1.

The log-log plots of the time-drawdown data for both monitoring wells were also matched for the Hantush-Jacob leaky artesian model type curves. A summary of the results of this analysis is presented in Table 5.1-2.

As indicated, values of transmissivity determined from both methods of analysis range from a high of 300,000 gpd/ft. to a low of 250,000 gpd/ft. The values of storage coefficients range from 1.8×10^{-4} to 5.2×10^{-5}

Table 5.1-1 Aquifer Parameters Obtained Using the Delayed Drainage Model

Well	Transmissivity (gpd/ft) Early	Transmissivity (gpd/ft) Late	Storage Coefficient (dimensionless) Early	Storage Coefficient (dimensionless) Late
South	250,000	250,000	1.6×10^{-4}	0.15
Observation	300,000		5.2×10^{-5}	

Table 5.1-2 Aquifer Parameters Obtained Using the Leaky Artesian Model

Well	Transmissivity (gpd/ft)	Storage Coefficient (dimensionless)
South	280,000	1.8×10^{-4}
Observation	290,000	5.2×10^{-5}

for the artesian aquifer analysis. A specific yield of 0.15 was calculated from the late-type curve match using the Boulton delayed drainage model and test data monitored at the south water supply well.

There is still a degree of uncertainty regarding the nature of the aquifer system beneath the Deerhaven site. As mentioned above, the time-drawdown response for the first few hundred minutes of the test indicated a water table system; however, the geologic condition of the site (that is, the sequence of shallow water table aquifer, clay and siltstone, and deeper limestone aquifer), could indicate a leaky artesian system, provided the confining beds are saturated. Since the purpose of the test program was to provide data to project regional water table impacts due to proposed groundwater withdrawal at the Deerhaven site, it was determined that impacts should be predicted using both models. This, it was felt, would provide both an optimistic and pessimistic prediction of such impacts. Using each aquifer model the net drawdown of the Floridan Aquifer's potentiometric surface was predicted based on an average withdrawal rato of 3,289 gpm (4.7 mgd) from on-site wells.

For the modeling assumption of a leaky artesian type system, an equilibrium type mathematical model was used. This model assumed that the Floridan Aquifer is recharged by the leakage of water through the confining layer, or aquitard, (i.e. the Hawthorn formation) from the shallow water table, and that equilibrium (i.e. no further drawdown) occurs when the cone of depression from Deerhaven water supply wells intercepts enough leakage to offset the water supply well withdrawal. For the leaky artesian aquifer assumption, the following parameters were used: transmissivity = 290,000 gpd./ft.; storage coefficient = 5.0 x 10^{-5}; leakage = 0.197 gpd./ft.^{3}. Table 5.1-3 presents the predicted net drawdown upon reaching equilibrium. As indicated, this model predicts that detectable net drawdown will be confined almost entirely to the Deerhaven site and that no measurable offsite impacts to the shallow water table, shallow wells, lakes, or marshes would result.

For the modeling assumption of a water table type system, net drawdown was computed for several withdrawal periods. The net cone of depression predicted by Boulton's delayed drainage model for each withdrawal period was superimposed on a theoretical potentiometric surface.

It was assumed that equilibrium would be established, and no further drawdown would occur, when the annual volume of vertical infiltration into the Floridan Aquifer (i.e., recharge) intercepted by the resulting net cone of depression equaled the annual Deerhaven water supply well withdrawal. Clark et al (1964) developed an estimated value, which they described as conservative, of 1.8 inches of recharge per year for a 525 square mile area whose center is approximately 20 miles east of the site in similar terrain. Using this value, it was determined that equilibrium would be established after a cone of depression with a radius of approximately 22,000 feet had developed.

Table 5.1-3 Net Equilibrium Drawdown at 3,289 Gallons/Minute Withdrawal Assuming a Leaky Artesian Aquifer

Radius from Deerhaven Wells (ft)	Drawdown (ft)
500	2.93
1,000	1.43
2,000	0.46
3,000	0.16
5,000	0.02

The following parameters were used: transmissivity = 250,000 gpd/ft.; specific yield = 0.15; delay index = 1.11 days. This analysis predicted that equilibrium drawdown would be reached after approximately one year of withdrawal. Table 5.1-4 presents the predicted net drawdown at the end of the one-year period and Figure 5.1-2 shows net drawdown contours within 5 miles of the Deerhaven wells at the end of the one-year period as predicted by the water table aquifer model. As seen, the total drawdown due to all Deerhaven water supply well withdrawal declines from 3.1 feet one mile away from the wells to 0.2 feet four miles away from the wells. Table 2.5-9 presents the known wells within five miles of the Deerhaven site. Wells which are deep enough to penetrate into the Floridan Aquifer would be expected to be influenced by this drawdown. Because this model assumes no influence on the shallow water table by the drawdown in the Floridan Aquifer, there would be no impacts to the shallow water table or to lakes, marshes, or shallow wells.

Effects of Offstream Cooling - Fogging Potential

Offstream cooling can increase the occurrence of fog in limited areas around the plant site. It has been reported that the potential for artificially created fog occurs when moisture is discharged into air that has a deficit between the actual and saturation moisture content of less than 0.1 gram per cubic meter (GPA Report, 1972). This deficit is related to air temperature and relative humidity in Table 2.6-4.

Table 5.1-4 Net Drawdown at Equilibrium (after five years withdrawal) at 3,289 Gallons/Minute Assuming a Water Table Aquifer

Radius from Deerhaven Wells (ft)	(miles)	Drawdown (ft)
1,000	0.2	6.8
2,000	0.4	5.3
4,000	0.8	3.8
6,000	1.1	2.7
10,000	1.9	1.2
14,000	2.7	0.53
18,000	3.4	0.38
20,000	3.8	0.24
22,000	4.2	0.12

A review of joint temperature and humidity conditions occuring in Gainesville in 1975 showed a deficit of 0.1 grams moisture per cubic meter of air to exist during 422 hours. Of this total, the deficit was zero (100% relative humidity) in 155 cases. Thus, the potential for fog to develop was increased by 267 hours. Several of these hours would be in conjunction with hours during which fog already occurred resulting in an extension of the period of fog.

Fog normally occurs 30 to 40 days per year in the Gainesville area, usually at night or in the early morning during the late fall and winter months and is generally dissipated by mid-morning.

The extent of the fog created by the cooling towers is expected to be limited. Of the 267 hours when artificially induced fog may occur 5% of the hours have a moisture deficit of 0.1 grams per cubic meter; 8% a deficit of ≈ 0.07 grams per cubic meter; 25% a deficit of ≈ 0.04 grams per cubic meter; and 62% a deficit approaching zero.

Since fog is normally expected to occur in the late fall and winter months and the predominant wind direction during this period is from the northwest, it is expected that the artificially created fog will generally drift southeasterly.

5.2 Effects of Chemical and Biocide Discharges

5.2.1 Effects of Surface Discharge of Industrial Type Wastes

All operational effluents from the combined Unit 1 and Unit 2 facilities will be injected into the deep well disposal system. Therefore, in this regard, no impacts on the water quality or biota of local surface streams is anticipated.

5.2.2 Cooling Tower Blowdown and Drift

Ecological Effects of Cooling Tower Blowdown

Cooling tower blowdown from both Unit 1 and the proposed Unit 2 will be injected into the deep well disposal system. Therefore, there will be no surface water quality or ecological impacts associated with this effluent.

Ecological Effects of Cooling Tower Drift

Vegetation in the area affected by cooling tower drift could potentially be impacted by increased levels of environmental salt. Injury could result either from foliar absorption of deposited salt or uptake of salt from the soils. Other potential impacts of lesser concern include possible physiological effects on animals and salt contamination of nearby surface waters.

In nature, the highest salt fallout concentrations are found in coastal areas where values normally reach 25-300 lb./acre-year, and may reach levels as high as 4,000 lb./acre-year on exposed shorelines. Natural precipitation is usually sufficient to retard salt buildup on vegetation and in the surface soils of these areas (Bierman, et al, 1971; Edmunds, et al, 1975). In inland areas, salt deposition results primarily from rainfall with amounts ranging from about 3-25 lb./acre-year (Bierman, et al, 1971).

Information on the toxic effects of various salt concentrations on individual plant species is limited and generally qualitative in nature. From studies along salted highways, deposition rates of 1,000 lb./acre-year appear critical to roadside vegetation, even in areas of appreciable rainfall (Bierman, et al, 1971). Curtis et al (1975) report that broad leaved trees absorb greater amounts of salt than do pines, probably due to leaf shape and greater surface to volume ratio. DeVine (1975) found that deciduous trees begin to exhibit adverse effects after a few hours of exposure to salt concentrations of 100 micrograms/m^3. While no obvious injury was observed with long-term exposure to 40 micrograms/m^3, long-term exposure to concentrations of about 10 micrograms/m^3 may result in a loss of vigor for some plants and can alter the vegetational distribution pattern of affected areas (DeVine, 1975). Edmunds et al (1975) report that chloride deposition from saltwater cooling towers may produce injury in sensitive ornamental and crop vegetation. Ornamentals such as flowering dogwood, golden rain tree, red maple, trumpet creeper, Virginia creeper and black cherry, and crops such as lettuce, stone fruits and tobacco are among the more common species associated with saline toxicity. Mulchi and Armbruster (1975) produced leaf damage and reduced yields of corn and soybeans with salt spray applications of 7.28 and 14.56 kg/ha-wk (169 and 339 lb./acre-year). A listing of plants showing varying degrees of susceptibility to saline toxicity is provided in Table 5.2.1.

No direct physiological effects of salt drift on terrestrial animals have been observed. It is thought that increased salt concentrations in soils and vegetation might attract some animals to an area resulting in competition stress, but this is at most a minor concern (Edmunds et al, 1975; DeVine, 1975). Potential contamination of surface waters is also a minor concern as illustrated by the fact that freshwater surface streams in coastal areas are not significantly higher in dissolved solids than streams further inland.

With regard to drift deposition from cooling towers per se, the major environmental problems occur when sea water is used as makeup, or when substances such as chromium are used as biocides or rust inhibitors (Hanna, 1974). Deposition and associated effects from fresh water towers are much less pronounced (Edmunds, et al, 1975). Since both the existing and planned mechanical draft towers at the Deerhaven site will use fresh water as makeup and will not depend on metallic scale or corrosion inhibitors, there is no precedent for assuming that significant environmental damage could occur.

A quantitative characterization of potential, site-specific deposition rates and resulting environmental impacts would best be made through the

Table 5.2-1 Plants Susceptible to Saline Toxicity

Alfalfa	Dogwood	Rose	Camphor weed
Oats	Red maple	Bermuda grass	Poison ivy
Clover	Blackjack oak	Trumpet creeper	Cinnamon fern
Corn	Black cherry	Geranium	Highbush blueberry
Wheat	Black gum	Virginia creeper	St. John's wort
Indian rice grass	Scrub oak		Smilax
Lettuce	Cypress		
Stone fruits	Golden rain tree		
Tobacco			
Soybeans			

Sources: Edmunds, et al, 1975
Mulchi and Armbruster, 1975

use of predictive dispersion models. However, a review of present state-of-the-art in drift modeling indicated that although a number of models presently exist (Hanna, 1974), no individual model should be accepted as providing accurate predictions of drift residue and concentration or deposition rate as validation data are unavailable (McVehil and Heikes, 1975).

In lieu of reliable predictive model for salt drift deposition, a simplistic procedure, based on empirical, literature-derived data and site-specific drift estimated, was used to provide a rough prediction of local deposition rates (Chapter 6). Stewart (1968) and Hosler, et al (1972), as quoted by EPA (1973) indicate that the majority of drift particles will fall out within 2,000 feet of the cooling tower under normal conditions. Utilizing this information, a circular deposition area within a 2,000 foot radius, was assumed. The deposition rate for total dissolved solids (TDS) is 110 tons/year. Therefore, TDS deposition within this area is calculated to be about 761 lbs./acre-year (Figure 5.2-1).

It should be emphasized that the constituent of greatest concern is chloride, which makes up approximately 2% of the calculated TDS deposition. This translates into about 13 lbs./acre-year of chloride, which assuming an addition of normal background levels, is far below levels reported to be toxic to vegetation. Sulfate salts, which represent 55% of the TDS constituents are less toxic than chlorides (Boyce, 1954).

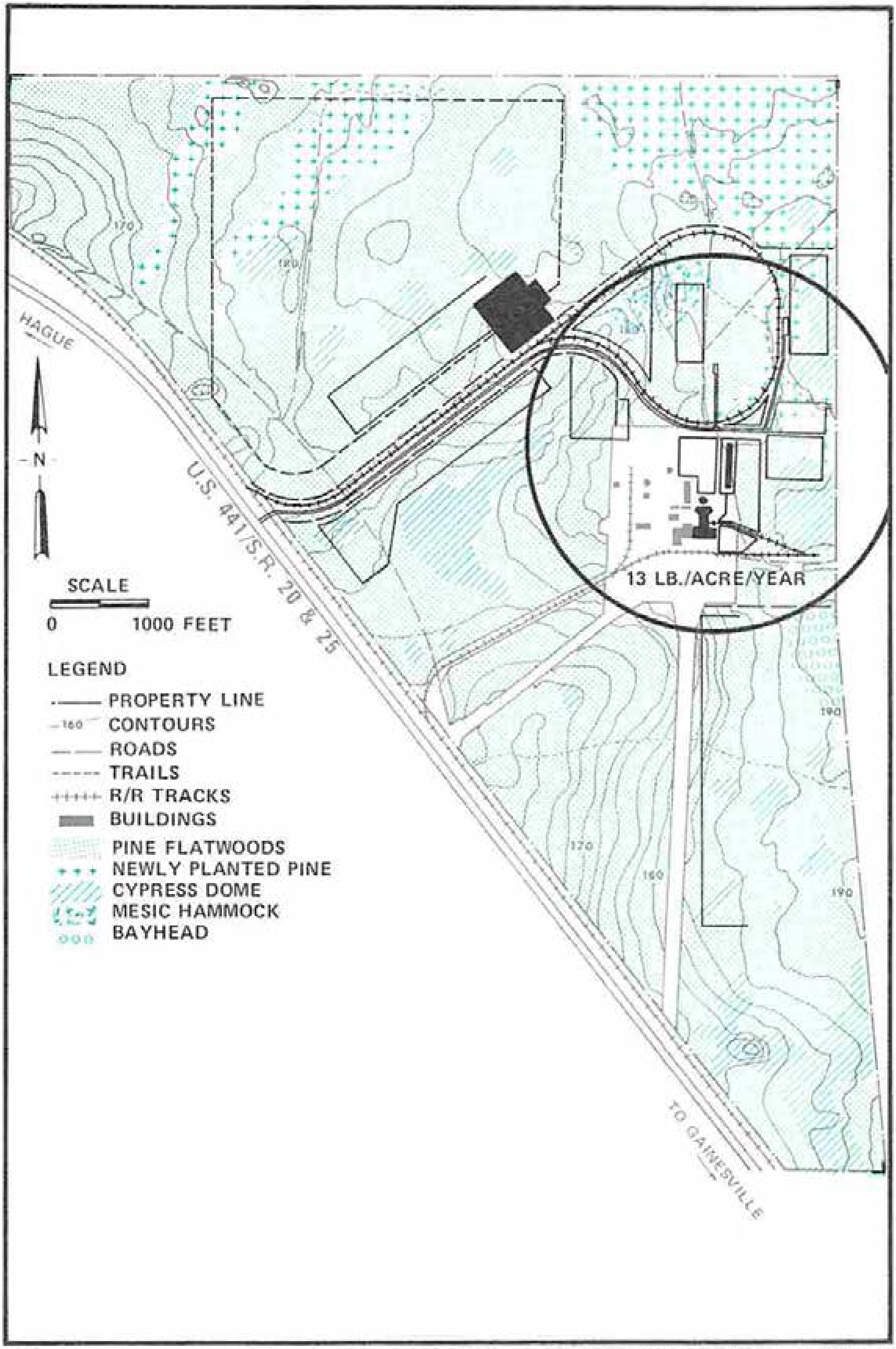

FIGURE 5.2-1 PROJECTED SALT DEPOSITION FROM COOLING TOWER DRIFT USING DEEP WELL INJECTION.

Based on this assessment and the limited existing data, no adverse impacts from cooling tower drift deposition are expected.

5.3 Sanitary Wastes

Deerhaven operating personnel report that the existing septic tank system for sanitary wastes has been operating satisfactorily since installation. This system was designed initially for a total work force of 40 people, and will be expanded to accomodate the anticipated increase to a total work force of 60 to 70 people. This expansion will be in accordance with applicable Alachua County Health Department rules for septic tank facilities.

5.4 Coal and Ash Handling Systems

Construction of Deerhaven Unit 2 will result in runoff being generated from several handling and storage systems, each with distinct chemical characteristics. The most notable of such flows are coal-pile runoff, runoff from the ash landfill, and site stormwater runoff. This section characterizes and describes the effects of runoff from these site areas.

Current U.S. Environmental Protection Agency regulations (39-Federal Register 36207, 1974) specify that runoff from coal piles and other material storage areas must have a pH between 6 and 9 and must have a maximum total suspended solid (TSS) concentration less than 50 mg/l. Recognizing that it is not economically feasible to design for all natural events, the EPA stetes that runoff flows exceeding those from the ten year, twenty-four hour rainfall need not be treated. Table 5.4-1 presents estimates of the twenty-four hour total rainfall for the Gainesville area for selected recurrence intervals.

Table 5.4-2 summarizes certain portions of Chapter 17-3 of the Florida Administrative Code which might be considered applicable to runoff from the Deerhaven site.

According to Dr. G. J. Thabaraj, Department of Environmental Regulation (DER) Administrator, stormwater systems are subject to the following agency policies:

1. Storm runoff discharge requirements will be strictly based on the potential impact of the discharge in relation to the designated use of the receiving waters and the practical consideration of the cost-effectiveness of the proposed abatement measure.

2. Cost-effective solutions must consider integrative approaches utilizing pre-storm action to reduce the impact of storm flows, moderation of flow rate and possibly treatment of stormwater.

3. Detention basins should be considered as essential in residential, business, industrial and highway development. Interim drainage systems including storage should be required during all construction activity.

Table 5.4-1 Estimates of 24-hour Total Rainfall at Gainesville, Florida for Selected Recurrence Intervals

Recurrence Interval (years)	Total Rainfall (inches)
1	3.7
2	4.3
5	5.7
10	6.9
25	7.8
50	8.7
100	9.6

Source: USDA SCS Rainfall Frequency Atlas of Alabama, Florida,...

NOTE: A storm with a recurrence interval of five years occurs on the average of once every five years. There is a 20 percent chance it will occur in any year, a 4 percent chance it will occur two years in a row, etc.

Table 5.4-2 Florida Administrative Code, Chapter 17-3, Water Quality Standards for Class III Waters (recreation-propagation and management of fish and wildlife)

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1. Ninety percent organic and inorganic removal factor is required for industrial wastes.
2. The presence of any of the following constituents may be suspected of degrading water quality:
   - Sulfates
   - Sulfides
   - Nickel
   - Aluminum
   - Free mineral acids
   - Nitrates
   - Phosphates
   - Potassium
3. Chlorides should not exceed 250 mg/l in freshwater streams.
4. Turbidity should not exceed 50 JTU.
5. Dissolved solids should not exceed 500 mg/l monthly average or 1,000 mg/l at any time.
6. Specific conductance shall not exceed 100 percent above background levels or a maximum of 500 μmhos/cm.
7. Radioactive substances-gross beta activity (in the known absence of strontium-90 and alpha emitters) shall not exceed 1,000 micromicrocuries at any time.
8. There shall be no detectable cyanide or cyanates.
9. Copper shall not exceed 0.5 g/l.
10. Zinc shall not exceed 1.0 mg/l.

Table 5.4-2 Florida Administrative Code, Chapter 17-3, Water Quality Standards for Class III Waters (recreation-propagation and management of fish and wildlife) (continued)

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11. Chromium shall not exceed 0.50 mg/l hexavalent or 1.0 mg/l total chromium in effluent discharge, and should not exceed 0.05 mg/l after reasonable mixing in receiving streams.
12. Phenolic compounds shall not exceed 0.01 mg/l as phenol.
13. Lead shall not exceed 0.05 mg/l.
14. Iron shall not exceed 0.30 mg/l.
15. Arsenic shall not exceed 0.05 mg/l.
16. Oils and greases shall not produce iridescence, cause taste and odors, interfere with other beneficial uses, or exceed 15 mg/l.
17. pH of receiving waters shall not be caused to vary more than 1.0 unit above or below normal pH, the lower value shall not be less than 6.0 and the upper value shall be not above 8.5.
18. There shall be no detectable mercury.
19. Total dissolved oxygen shall not average less than 5 mg/l in a 24-hour period or 4 mg/l at any time.
20. Receiving waters shall be kept free from substances attributable to municipal, industrial, agricultural or other discharges or concentrations or combinations which are toxic or harmful to humans, animals, or aquatic life.
21. Receiving waters shall be kept free from materials attributable to municipal, industrial, agricultural or other discharges producing color, odor, or other conditions in such a degree as to create a nuisance.

The DER currently regulates stormwater discharges from stormwater management systems. Those systems discharging water that does not meet applicable water quality standards are cited by the DER and required to be brought into compliance.

The Suwannee River Water Management District is expected to assume an expanding role in regulating and permitting drainage works as a result of the Water Resources Act of 1972. A statewide water use plan is an objective of the act and is presently being prepared, principally by the Regional Water Management Districts. Stormwater systems in the site area are subject to review by the Suwannee Water Management District.

5.4.1 Leachate Movement

As part of an investigation previously performed to evaluate the potential for cooling tower blowdown disposal on-site by means of percolation ponds or spray irrigation systems, limited groundwater and soils data were obtained from on-site auger borings. This information is presented in Chapter 2 of this document. Based on this information mathematical and computer models indicated that the lateral groundwater seepage rate on-site is too low to permit cooling tower blowdown disposal through groundwater seepage. These conclusions indicate that leachate movement from unlined or partially lined on-site waste storage and disposal facilities may be sufficiently low such that full lining of all such facilities will not be required.

An investigation is currently underway to evaluate potential leachate movement from unlined on-site solid waste storage and disposal facilities. Should this investigation predict that leachate contamination to groundwaters may occur, additional evaluations will be performed to determine the locations for and types of permeable barriers to help prevent such contamination.

No long-term data exist to show the behavior of the perched on-site groundwater table. Water levels were recorded on auger borings performed during September, 1976. These boring logs are presented in Chapter 2. Selected cross-sections, showing assumed soil stratification and groundwater elevations, are also presented in Chapter 2. It should be noted that all groundwater table observations were made following three successive rain-free days. The greatest depth to water table was found to be approximately 2 to 3 feet, and, in the southern part of the site, only 1 foot below ground surface. Permeability tests performed on various sands within the upper 5 feet indicated an average permeability of 0.43 ft./day. Order-of-magnitude mathematical and computer models performed using inferred stratification, results of permeability testing, and simplifying assumptions as to slope and groundwater depth indicated little possibility for reliable on-site cooling tower blowdown disposal by percolation. Such models also infer low lateral groundwater velocity. These conclusions correlate well with the observations of plant operating personnel that surficial soils are completely saturated during some parts of the year and that most rainfall leaves the site through surface runoff during those periods.

Groundwater information will be obtained during the study to evaluate potential leachate movement from unlined on-site storage and disposal facilities. During this program a network of on-site and off-site soil borings will be obtained; the potentiometric surface will be monitored in a network of observation wells; groundwater observations will be continuously recorded at key observation wells; permeability testing will be performed on undisturbed soil samples and by means of pumping tests of surficial sands; and, if possible, modeling will be performed to predict the potential for leachate movement.

5.4.2 Coal Pile Runoff and Leachate

A substantial on-site supply of coal will be necessary to fuel the boiler in Unit 2. This coal will be stored in an open pile exposed to the weather as shown in Figure 4.1-2.

Chemical reactions between rainwater and minerals in coal typically form a solution called coal pile leachate (CPL) which can have characteristics such as high acidity, high dissolved mineral content, and heavy metals content. CPL is generated by variable rainfall flushing through the coal pile. Exposed slopes of finely crushed coal can be a significant source of sediment. Unless otherwise retained, this sediment may be deposited in natural stream channels, thus affecting channel stability and harming aquatic life. Such loss of coal is also an unnecessary fuel loss.

Coal pile leachate which leaves the pile by surface runoff is termed coal-pile runoff (CPR). Although CPR is usually acidic, some alkaline values have been reported. Anderson and Youngstrom (1976) in a single set of observations, observed that CPR pH does not seem to decrease with storm duration as do many other characteristics of the runoff, thus inferring that detention and treatment may be necessary to meet applicable pH standards for some coals. The EPA (1974) reported total suspended solids values for selected coal-pile runoff effluents varying from 22 mg/l to 3,302 mg/l, with an average value of 828 mg/l. This implies that applicable total suspended solids regulations can be met without treatment for some coal, but usually must be met by utilizing retention and/or clarification.

Rainfall runoff from the coal storage and handling area (approximately 11.3 acres) will be captured and drained to a retention pond (approximately 3.4 acres) which will contain runoff from storm events up to and including a ten year, twenty-four hour rainfall. Thus, in this area, 15 acres of land area will be removed from contributing to the runoff/infiltration hydrological systems. Figure 5.4-1 presents schematically the coal-pile runoff retention system and presents hypothetical hydrographs at various points for the system. The cross-hatched portions of the hydrographs represent excess discharges to be overflowed to Turkey Creek. No coal-pile runoff will enter the surface waters unless the design storm is exceeded. Any amount of runoff in excess of that produced by the design rainfall will be allowed to overflow to the

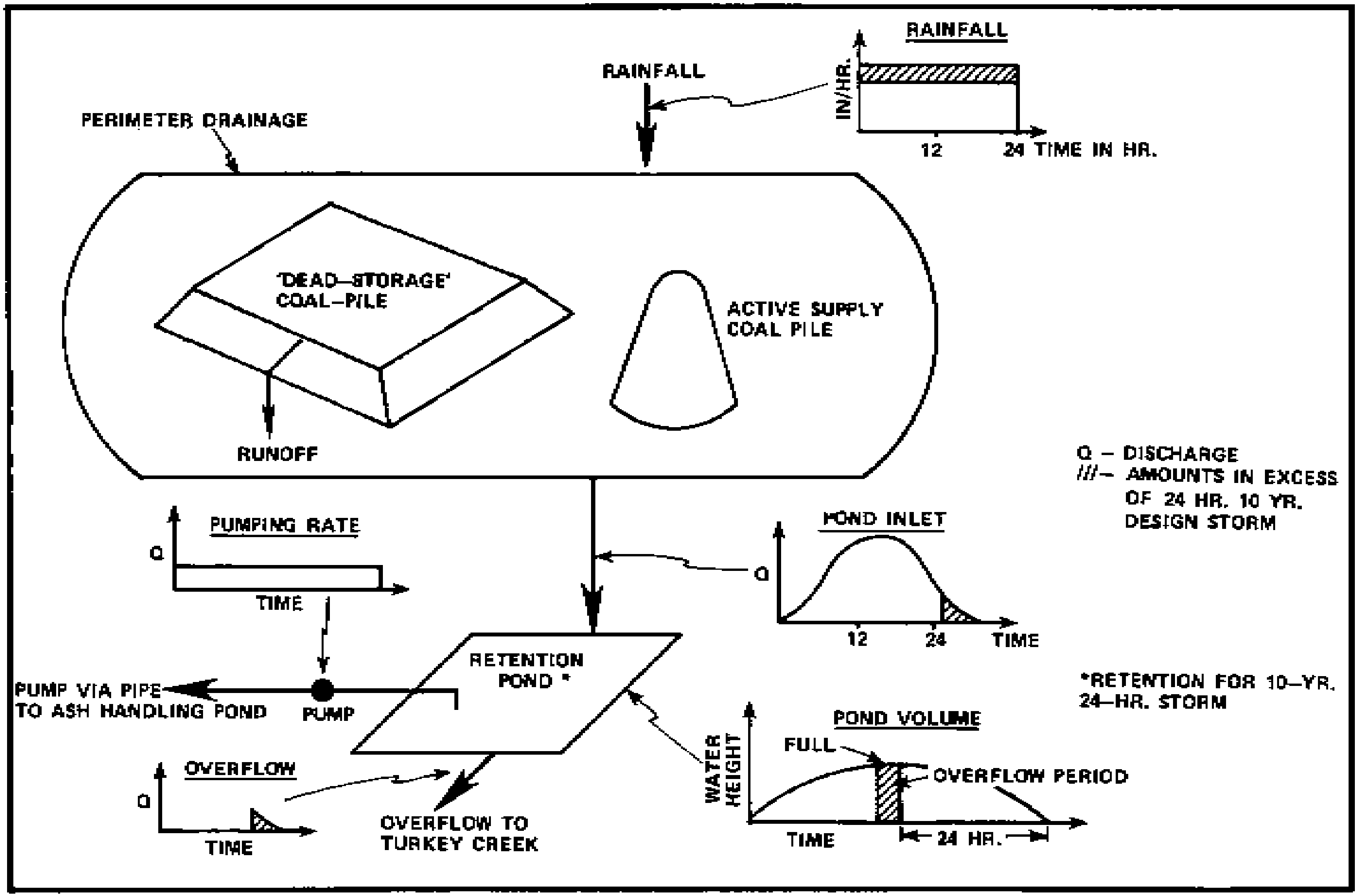

FIGURE 5.4-1 COAL PILE RUNOFF RETENTION SYSTEM.

southern tributary of Turkey Creek. No detectable seepage to the shallow aquifer from the coal pile area or retention pond will be permitted. Should the results of the Deerhaven site leachate movement evaluation indicate that lining of this area is necessary to prevent groundwater contamination, such lining shall be provided.

5.4.3 Ash Runoff and Leachate

Except for boiler blowdown water used to moisten fly ash prior to burial, and residual water in ash pond sediment, all water entering the ash sluicing and ash pond systems will either be evaporated or will be disposed of by deep well injection. None will go to surface drainage systems.

Active Bottom Ash Ponds - The active bottom ash ponds will occupy an area of approximately 6.5 acres (Figure 4.1-2). At present, it is anticipated that these ponds may receive either an internal lining or some other impermeable barrier to prevent infiltration of ash pond water into surrounding groundwaters. However, it is likely that direct rainfall on these ponds usually will be part of the recirculating ash sluicing water system, thus removing 6.5 acres of land area from contributing to the stormwater runoff/infiltration hydrological systems.

Ash Landfill - The 220 acre landfill area shown in Figure 4.1-2 will be utilized over approximately a 30-year period for ash disposal. It is anticipated that rectangular cells, each providing a five year ash storage volume, will be gradually cleared, stripped of topsoil, stockpiled with ash above ground, covered with previously stripped topsoil, and revegetated. Thus, approximately 37 acres will be stripped per five year period. Surface runoff from the active face of the landfill will be retained and introduced into use as process water via the ash pond system. Surface runoff from the remaining covered landfill area will be permitted to run to the on-site natural drainage system. Fortunately, the landfill site lies on the drainage divide between the north branch and south branch of Turkey Creek and along the drainage divide between Rocky Creek Basin and Turkey Creek Basin (Figure 2.5-1). Therefore, it is anticipated that landfill cell construction would have no appreciable effect on surficial groundwater movement.

5.4.4 Ecological Effects of Ash and Coal Handling System Runoff and Leachate

The ash landfill runoff pond, the active bottom ash pond and the coal pile runoff pond are all designed to contain the stormwater associated with a ten year, twenty-four hour event. Runoff in excess of the design storm will be allowed to overflow into the surface drainage. Surface waters could also potentially be contaminated from subsurface movement of leachate from the coal pile and ash disposal landfill areas. Impacts on the biota of Turkey Creek, the principal site drainage pathway, will depend on the type and concentration of chemical constituents reaching the aquatic habitats and the toxic response characteristics of potentially affected species.

5.4.4.1 Chemical Characteristics and Toxicity of Ash Pond Effluent and Coal Pile Runoff

A precise chemical characterization of the ash and coal pile runoff cannot be made since the source of coal has not yet been determined. In lieu of a site-specific analysis, data from the literature were assembled and are reported in Tables 5.4-3, 5.4-4 and 5.4-5. Table 5.4-5 also shows best estimates for Unit 2.

Studies on the biotic effects of ash and coal pile effluents offer no consistent conclusions. Gualke and Crawford (1976), who studied fly ash pond effluent levels of arsenic, cadmium, chromium, iron, lead, mercury, nickel, selenium, copper and zinc both individually and combined, reported no adverse effects on fish and benthic communities. Conversely, Guthrie, et al (1974) and Cherry and Guthrie (1975) reported a reduction in diversity of biotic communities associated with effluents from a coal ash basin. Most notably affected were primary and secondary consumers; with only a few species of aquatic insects and one fish species present in the portion of the stream receiving effluent. Current studies by Guthrie and Cherry (1976) and Cherry, et al, (1976) on this same basin report biological magnification of bromide, iodide, sodium, calcium, cadmium, selenium, tin, zinc, chromium, iron, copper, mercury, cobalt, and arsenic. However, they found the most active ash removal mechanism to be abiotic since 35 of the 40 analyzed elements accumulated in the sediments. A study by Cairns, et al, (1970) reported that highly caustic water (pH 12) was the primary toxic agent associated with fly ash pond spills into the Clinch River, Virginia.

Table 5.4-3 Chemical Waste Characterization of Coal Pile Drainage

Parameter*	$\bar{x}$	Range
Alkalinity	20	0 - 82
BOD	3	0 - 10
COD	830	85 - 1,099
TS	11,200	1,330 - 45,000
TDS	12,600	247 - 44,050
TSS	828	22 - 3,302
NH_4N	0.69	0 - 1.77
NO3N	1.31	0.3 - 2.25
P	0.72	0.23 - 1.2
Turbidity (JTU)	205	2.7 - 505
Acidity	9,907	8.7 - 27,810
Total Hardness	804	130 - 1,850
SO_4	6,880	525 - 21,920
Cl	130	3.6 - 481
Al	1,012	825 - 1,200
Cr	2.7	0 - 15.7
Cu	2.1	1.6 - 3.4
Fe	11,000	0.06 - 93,000
Mg	130	89 - 174
Zn	5.9	0.006 - 23
Na	890	160 - 1,260
pH	4.4	2.1 - 7.8

*All units in mg/l unless otherwise noted.

Source: U.S. EPA 1974 Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Steam Electric Power Generating Point Source Category. EPA 440/1-74.029-a.

Table 5.4-4 Ash Pond Effluent Characterization

	EPA, 1974 Net Discharge		EPRI		Guthrie & Cherry	Gaulke and Crawford '76		Rice & Strauss '77		Bottom Ash	
Para-meter	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)
Na	-4.7	-1609 to 982	---		7.7	---		---		---	
K	---		---		6.1	---		---		---	
Rb	---		---		0.4	---		---		---	
Cs	---		---		<0.01	---		---		---	
Be	---		0.003	0.001 to 0.004	---	---		0.001	<0.01 to 0.02	<0.01	All <0.01
Mg	15.3	-11 to 156	---		4.1	---		13.99	9.4 to 20.0	5.85	0.3 to 9.3
Ca	---		---		9.2	---		136	94 to 180	40.12	23 to 67
Sr	---		---		0.3	---		---	---	---	
Ba	---		<0.3	<0.3 (all)	0.7	---		0.25	0.2 to 0.4	0.15	<0.10 to 0.30
La	---		---		<0.01	---		---		---	
Ti	---		---		0.9	---		---		---	
V	---		<0.18	<0.1 to <0.2	0.04	---		---		---	
Cr	0.01	-0.113 to 0.139	<0.0001	<0.0002 to 0.004	0.2	0.0096	0.0008 to 0.025	0.067	0.012 to 0.17	0.009	<0.005 to 0.023

Table 5.4-4 Ash Pond Effluent Characterization (continued)

	EPA, 1974 Net Discharge		EPRI		Guthrie & Cherry	Gaulke and Crawford '76		Rice & Strauss '77		Bottom Ash	
Para-meter	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)
I	---		---		0.1	---		---		---	
Ce	---		---		0.2	---		---		---	
Th	---		---		0.03	---		---		---	
U	---		---		0.01	---		---		---	
CN	---		---			---		<0.01	all < 0.01	<0.01	all < 0.01
Total Alk. (as $CaCO_3$)	---		---			---		---		85	30 to 160
Conduc-tivity mhos/cm	---		---			---		810	615 to 1125	322	210 to 910
Total Hardness as($CaCO_3$)	---		---			---		260.5	185 to 520	141.5	76 to 394
pH	---		---			---		4.4	3.6 to 6.3	7.2	4.1 to 7.9
Dis-solved Solids	---		---			---		508	141 to 820	167	69 to 404
Sus-pended Solids	---		---			---		62.5	2 to 256	60	5 to 657

Table 5.4-4 Ash Pond Effluent Characterization (continued)

	EPA, 1974 Net Discharge		EPRI		Guthrie & Cherry	Gaulke and Crawford '76		Rice & Strauss '77		Bottom Ash	
Para-meter	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)
Ge	---		0.05	0.02 to <0.1	---	---		---		---	
Sn	---		---		0.1	---		---		---	
Pb	---		0.019	0.008 to 0.03	---	0.0076	0.0021 to 0.011	0.058	<0.01 to 0.2	0.016	0.01 to 0.031
NH_4(N)	-0.49	-5.0 to 3.4	---		---	---		0.43	0.02 to 1.4	0.12	0.04 to 0.34
NO_3(N)	0.79	-1.35 to 6.1	---		---	---		---		---	
P	-0.15	-1.19 to 0.41	---		---	---		0.021	<0.01 to 0.06	0.081	0.01 to 0.23
As	---		0.008	0.003 to 0.02	0.06	0.061	0.0 to 0.183	0.010	<0.005 to 0.023	0.006	0.002 to 0.015
Sb	---		0.01	0.003 to 0.03	0.07	---		---		---	
SO_4	06.4	-006 to 527	---		---	---		357.5	240 to 440	48.75	41 to 80
Se	---		0.008	0.0044 to 0.015	0.1	0.069	0.0 to 0.254	0.0019	<0.001 to 0.004	0.002	<0.001 to 0.004
F	---		2.9	0.35 to 10.4	---	---		---		---	
Cl	158	-140 to 1700	---		3.8	---		7.12	5 to 14	8.38	5 to 15
Br	---		---		0.1	---		---		---	

Table 5.4-4 Ash Pond Effluent Characterization (continued)

	EPA, 1974 Net Discharge		EPRI		Guthrie & Cherry	Gaulke and Crawford '76		Rice & Strauss '77		Bottom Ash	
Parameter	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)	$\bar{x}$ (mg/l)	Range (mg/l)
Mo	---		0.04	0.004 to 0.10	---	---		---		---	
Mn	0.04	-0.02 to 0.102	0.31	0.004 to 1.1	0.07	---		0.48	0.29 to 0.63	0.16	0.07 to 0.26
Fe	0.02	-4.6 to 2.89	---		16.9	0.0620	0.020 to 0.310	1.44	0.33 to 6.6	5.29	1.7 to 11
Co	---		---		0.1	---					
Ni	-0.002	-0.054 to 0.015	<0.05	<0.01 to 0.11	---	0.024	0.0095 to 0.070	1.1	0.06 to 0.13	<0.059	0.05 to 0.12
Cu	0.01	-0.037 to 0.02	0.03	<0.004 to 0.09	---	0.025	0.0029 to 0.090	0.31	0.16 to 0.45	0.065	<0.01 to 0.14
Ag	---		---		---	---		<0.01	all <0.01	<0.01	all <0.01
Zn	0.03	-0.02 to 0.162	0.67	0.12 to 2.5	0.4	0.023	0.0003 to 0.075	1.51	1.1 to 2.7	0.09	0.02 to 0.16
Cd	---		0.01	0.0001 to 0.04	0.1	0.0017	0.00037 to 0.0029	0.037	0.023 to 0.052	0.0011	<0.001 to 0.002
Hg	0.0009	-0.002 to 0.002	0.001	<0.001 to 0.0022	0.03	0.001	0.00003 to 0.0095	0.0003	<0.0002 to 0.0006	0.007	<0.0002 to 0.0026
B	---		0.54	0.233 to 0.47	---	---		---		---	
Al	0.96	-0.22 to 530	---		13.0	---		7.19	3.6 to 8.8	3.49	0.5 to 8.0
Si	---		---		---	---		12.57	10 to 15	7.4	6.1 to 8.6

Table 5.4-5 Representative Ranges of Values for Chemical Constituents of Coal Ash

Constituent	Bern[1] Range (%)	Bern[1] Average (%)	Rice & Strauss[2] Fly Ash (% by wt.)	Rice & Strauss[2] Bottom Ash (% by wt.)	Deerhaven Unit 2 Estimate[3]
Phosphorus Pentoxide, P_2O_5	N.R.[4]	N.R.	0.01-0.50	0.01-0.04	0.35-0.75
Silica, SiO_2	20-60	48	20.1-46.0	19.4-48.9	46.00-57.00
Aluminum Oxide, Al_2O_3	10-35	26	17.4-40.7	18.9-36.2	27.00-35.00
Titanium Oxide TiO_2	0.5-2.5	1	1.3-2.0	1.3-1.8	0.55-1.50
Magnesium Oxide, MgO	0.25-4	2	0.4-1.2	0.5-0.9	N.R.
Calcium Oxide, CaO	1.20	5	0.1-6.1	0.01-4.2	1.00-2.20
Magnesia	N.R.	N.R.	N.R.	N.R.	0.75-0.90
Sodium Oxide, Na_2O	0.4-1.5	1	0.3-0.8	0.2-0.8	0.25-0.75
Potassium Oxide, K_2O	1-4	2	1.2-2.4	1.7-2.8	0.85-2.00
Sulfur Trioxide SO_3	0.1-12	2	0.01-4.50	0.01-1.0	0.55-1.20
Carbon, C	0.1-20	4	N.R.	N.R.	N.R.
Boron, B	0.01-0.6	trace	<0.01	<0.01-0.3	N.R.
Phosphorus, P	0.01-0.3	trace	N.R.	N.R.	N.R.
Manganese, Mn	0.01-0.3	trace	110-150 ppm	150-200 ppm	N.R.
Molybdenum, Mo	0.01-0.1	trace	N.R.	N.R.	N.R.
Zinc, Zn	0.01-0.2	trace	N.R.	N.R.	N.R.
Copper, Cu	0.01-0.1	trace	90-150 ppm	0.01-300 ppm	N.R.
Mercury, Hg	0.00-0.02	trace	0.7-0.15 ppm	1-2 ppm	N.R.
Uranium, U & Thorium, Th	0.0-0.1	trace	N.R.	N.R.	N.R.
Arsenic, As	N.R.	N.R.	8-120 ppm	2-250 ppm	N.R.
Cadmium, Cd	N.R.	N.R.	0.01-8 ppm	0.01-15 ppm	N.R.
Cesium, Ce	N.R.	N.R.	100-8000 ppm	15-800 ppm	N.R.
Cobalt, Co	N.R.	N.R.	7-90 ppm	20-80 ppm	N.R.
Chromium, Cr	N.R.	N.R.	90-120 ppm	80-150 ppm	N.R.
Magnesium, Mg	N.R.	N.R.	0.0012-0.05	0.01-0.03	N.R.
Sodium, Na	N.R.	N.R.	0.0012-0.012	0.002-0.008	N.R.
Nickel, Ni	N.R.	N.R.	110-150 ppm	150-250 ppm	N.R.
Lead, Pb	N.R.	N.R.	110-150 ppm	150-250 ppm	N.R.
Tin, Sb	N.R.	N.R.	0.01-15 ppm	2-15 ppm	N.R.
Selenium, Se	N.R.	N.R.	25-75 ppm	3-10 ppm	N.R.
Titanium, Ti	N.R.	N.R.	0.009-0.02	0.005-0.015	N.R.
Vanadium, V	N.R.	N.R.	115-150 ppm	100-300 ppm	N.R.

[1]Reference: Bern (1976), p. 232, quoting Duvall (1975).
[2]Reference: Rice & Strauss (1977), values are representatives of Pensylvania coals.
[3]Reference: Correspondence from J.C. Hoffman, P.E., of Burns & McDonnell, Inc.
[4]N.R. = not reported.

Toxicity response data were assembled from a variety of sources (EPA, 1976; McKee and Wolf, 1963; Gualke and Crawford, 1976; and AEC, 1973) and reflect sensitivity, life stage, exposure time, and various abiotic conditions (McKee and Wolf, 1963). These data were compared to the chemical characteristics reported in Tables 5.4-3 and 5.4-4 in order to assess potential biotic effects and to identify chemical constituents of potential concern. Parameters which exceeded either the toxic response levels and/or Federal and state water quality standards (EPA, 1976; DER 17-3) are presented in Table 5.4-6. For copper, zinc, nickel, and selenium, the 96 hour LC50 (lethal concentration for 50% of the exposed population) of the most sensitive freshwater species was multiplied by an application factor to obtain a consistent criterion for comparison (EPA, 1976).

Information on the toxic response of freshwater aquatic life for certain parameters are listed in the following paragraphs.

Calcium

The toxicity of many compounds to fish and other aquatic fauna are reduced by calcium (McKee and Wolf, 1963). Concentrations of 50 mg/l calcium have been shown to cancel the toxic effect of 2 mg/l zinc; and 10 mg/l lead (Jones, 1938). In general, fish and other aquatic life can survive 1 to 3 days in water containing 2,500 to 4,000 mg/l $CaCl_2$ (Doudoroff and Ktaz, 1953) while various independent investigators have reported concentrations of between 300 and 1,000 mg/l of calcium in soft or distilled water as toxic to fish (McKee and Wolf, 1963).

Table 5.4-6 Summary of Parameters of Biological Concern Associated with Ash Pond Effluent-Coal Pile Runoff

Parameter	Aquatic Life Toxicity Response mg/l	Freshwater Life Criteria EPA, 1976 mg/l	Drinking Water Criteria EPA, 1976 mg/l	DER FAC Chapter 17-3 mg/l	Coal Pile Runoff	Ash Pond Effluent
Sodium	6.0 to 8250	---	---	---	A	A
Chromium	0.16 to 389	0.01	0.05	0.5	A,B,C,D	A,B,C,D
Iron	0.9 to 36.8	1.0	0.3	0.3	A,B,C,D	A,B,C,D
Copper	0.18 to 122	0.1 x 96hr LC_{50}	1.0	0.5	A,B,C,D	A,B
Zinc	0.2 to 40.9	0.01 x 96hr LC_{50}	5.0	1.0	A,B,C,D	A,B,D
Cadmium	7×10^{-4} to 5.0	4×10^{-4}	0.001	---	---	A,B,C
Mercury	2.3×10^{-4} to 0.31	5×10^{-5}	2×10^{-3}	None Detectable	---	A,B,C,D
Aluminum	0.7 to 50	---	---	---	A	A
Ammonium	0.2 to 2.0	0.02	---	---	A,B	A,B
Arsenic	3.0 to 20	0.05	0.05	---	---	B,C,D
Sulfate	---	2×10^{-3}	---	---	A*,B*,C*	A*,B*
Selenium	>0.003 to 183	0.01 x 96hr LC_{50}	0.01	---	---	A,B,C
Fluoride	1.5 to 1700	---	---	10**	---	A,D
Chloride	3.4×10^{-3} to 0.5	0.002	---	250	A	A,D
Cesium	0.15 to 30,000	---	---	---	---	A
Nickel	0.13 to 43	0.01 x 96hr LC_{50}	---	---	---	B
Manganese	1.5 to 1000	---	0.05	---	---	C
pH	<5, >9	6.5 to 9.0	5 to 9	±1	B,C,D	A,B,C,D
Dissolved Solids	---	---	250	1000	D	---
Turbidity	---	---	---	50	D	---

* = Possible problem as H_2S in swamps.
** = 1.4 for drinking water, 10 for other uses.
A = Exceeds toxicity response.
B = Exceeds freshwater life criteria.
C = Exceeds drinking water criteria.
D = Exceeds FAX 17-3 effluent criteria.

Manganese

Since tolerance values for freshwater aquatic life reported for manganese range from 1.5 to over 1,000 mg/l, manganese is generally not considered a problem in freshwaters (EPA, 1976). Conversely, permanganates are extremely toxic to fish and other aquatic life (2.2 to 4.1 mg/l can be lethal to fish) (EPA, 1976); however permanganates are not persistent and are rapidly reduced to a non-toxic form. A concentration of 1.0 mg/l manganese should not be deleterious to fish and aquatic life (McKee and Wolf, 1963).

Germanium

Elemental germanium, the oxide, and the sulfide are relatively and pharmacologically inert (Rothstein, 1953). Germanium has not been reported to accumulate in animal systems (McKee and Wolf, 1963).

Cesium

Cesium behaves like potassium in animal metabolism and, as such, has a low toxicity potential (McKee and Wolf, 1963). However, aquatic organisms have been found to bioaccumulate cesium (as Cs-137) dissolved in water 50-10,000 times (Pendleton, 1958). Human consumption of aquatic organisms high in cesium-137 is considered potentially hazardous.

Barium

The physical and chemical properties of barium generally preclude the existence of the toxic soluble form. Studies have shown that soluble barium would have to exceed 50 mg/l before toxicity to aquatic life is expected. As such, EPA (1976) concluded a restrictive criterion for aquatic life which appears unwarranted. A limit of 1.0 mg/l is recommended for domestic water supplies (EPA, 1976).

Phosphate

Phosphates seldom exhibit toxic effects upon fish and other aquatic life (McKee and Wolf, 1963); however, phosphates may result in an overabundant growth of algae with concomitant odors and detriment to fish. "To prevent the development of biological nuisances and to control accelerated or cultural eutrophication, total phosphates should not exceed 50 mg/l in any stream at the point where it enters any lake or reservoir, nor 25 mg/l within the lake or reservoir" (EPA, 1976). In streams and other flowing waters not discharging directly to lakes or impoundments, 100 mg/l is considered acceptable (Mackenthun, 1973).

Suspended and Settleable Solids and Turbidity

Suspended solids possibly affect fish and food populations "(1) by acting directly on the fish swimming in water in which solids are suspended, and either killing them or reducing their growth rate, resistance to disease, etc.; (2) by preventing the successful development of fish eggs and larvae; (3) by modifying natural movements and migrations of fish; and (4) by reducing the abundance of food available to the fish" (EIFAC, 1965). For example, suspended solids from a rock quarry (80 mg/l) have been associated with a 60% decline in macroinvertebrate density; a similar decline was noted in areas of sediment accumulation (Gammon, 1970). Similarly, burial of bottom organisms and decreased organism density have been associated with increased turbidity (25 ppm upstream versus 390 ppm downstream) from intensive logging (Tebo, 1955). Suspended materials may also reduce light penetration into the water, thereby reducing the photic zone depth, which in turn may reduce primary production. The EPA (1976) criterion for freshwater fish and other aquatic life is as follows: "settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10% from the seasonally established norm for aquatic life.

Dissolved Solids

All species of fish and other aquatic life must tolerate a range of dissolved solids concentrations under natural conditions. Rawson and Moore (1944) concluded that lakes with dissolved solids in excess of 15,000 mg/l were unsuitable for most species of freshwater fish. The NTAC Report (1968) also recommended osmotic pressure less than that caused by 15,000 mg/l NaCl or by 15,000 mg/l dissolved solids for most species of freshwater fish.

Hardness

The effects of hardness on freshwater fish and other aquatic life appear to be related to the ions causing the hardness rather than to hardness itself. Hardness is caused by the polyvalent metallic ions dissolved in water, principally calcium and magnesium. Iron, strontium, and manganese may also contribute to hardness.

Biochemical Oxygen Demand

The effects of Biochemical Oxygen Demand (BOD) of an effluent on fish and freshwater aquatic life is directly related to the reaeration characteristic of the receiving stream. As little as 5 mg/l of 5 day BOD may cause deoxygenation in a slow moving stream; whereas, as much as 50 mg/l may be handled without appreciable depletion of dissolved oxygen in a swift flowing mountain stream (McKee and Wolf, 1963).

5.4.4.2 Impact on Turkey Creek

Since a site-specific chemical characterization of coal and ash handling system overflow and leachate has not been made, resulting impacts on the biota of Turkey Creek can not be precisely defined. However, structural or environmental features which will minimize potential surface water contamination have either been incorporated into the facility design or are under analysis. In light of these mitigating measures, a qualitative assessment of potential impacts can be made.

It should be emphasized that retention pond overflows from the coal and ash handling systems will be a rare event associated with only the most severe storm occurring less than once in ten years (e.g. a twenty-five year storm). Furthermore, it is anticipated that mixing and subsequent dilution of the chemical constituents with runoff from surrounding areas will mitigate biotic impacts to some degree. Given the severity of the causative storm and the total runoff volume it could generate, dilutory reduction of contaminant concentrations should be substantial.

Vertical stratification of the pond waters during the storm will also serve to reduce the concentration of suspended solids in overflow.

In consideration of these mitigating features, it is doubtful that adverse impacts associated with pond overflow will be either extensive or extreme. In any event, the runoff quality characteristics will be monitored in order to determine if overflows would be problematic or in violation of state standards. If so, appropriate measures will be taken in accordance with Florida DER regulations and rules.

5.5 Stormwater Runoff

The existing Deerhaven site has an area of approximately 1,116 acres. Of this area, approximately 80 acres were cleared as part of the construction of the existing Unit 1 facility. The remaining site area is presently in an undeveloped, natural condition consisting primarily of pine and palmetto flatwoods. The thick, vegetative understory, combined with the relative flatness of upper site areas, tends to retard surface runoff with the result that soils throughout the site area remain saturated at or near ground surface for extended periods. At present, cooling tower blowdown from the Unit 1 cooling tower is discharged to Turkey Creek by means of drainage ditches which convey this flow through on-site swampy areas; blowdown leaves the site via box culverts located beneath U.S. 441 at the west site boundary. This flow averages approximately 0.8 cfs (500,000 gpd).

Design of Unit 2 site and drainage system improvements has not been finalized to the point where precise calculations are possible to predict hydrological changes which may occur either on-site or to off-site receiving streams due to site development. However, qualitative hydrological changes may be discussed as follows:

a. Rail Spur and Roadway - Figure 4.1-2 illustrates the location of the proposed on-site rail spur and adjacent roadway. Figure 4.1-3 presents a cross-section of roadbed construction. Both roadbeds will be constructed on raised embankments using fill materials excavated on-site. A raised embankment, 200 feet in width, will be required for the rail spur and roadway between the west site boundary and the west end of the on-site railroad loop. Surface drainage from areas to the north of this corridor will be intercepted and concentrated in stormwater culverts directing flows to the 28 acre on-site swamp. Such interception and concentration of flows may result in increased effective peak surface runoff rates for the flow coming from that portion of the site. In addition, the swales should act to depress the surface groundwater table in the area of the corridor during times of high groundwater level.

b. Roofing and Paving - As Figure 4.1-1 indicates, impermeable surfaces such as driveways, road paving and building roofs, will increase with the construction of Unit 2. The increased runoff volume and peak runoff rate should be expected to increase slightly from the presently cleared portion of the site due to such construction.

c. Unit 1 Cooling Tower Blowdown - It is anticipated that such removal of this blowdown (500,000 gpd) will result in Turkey Creek having no continuous base flow during low rainfall seasons. The removal of such flow from the Turkey Creek system may result in decreased stream erosion, and decreased total annual bedload transport.

The cumulative effect of the above mentioned modifications to the site area cannot be precisely quantified. However, examination of each of the modifications presented above seems to imply that the only major hydrological impact resulting from the operation will be the removal of continuous cooling tower blowdown baseflow from the Turkey Creek system.

5.5.1 Ecological Effects of Stormwater Runoff

Stormwater runoff from external plant areas will be dispersed into the natural site drainage through the use of swales and berms to allow spreading and downward percolation (Section 3.7). This, in conjunction with the flat topography of the site, should minimize potential contamination of Turkey Creek by accumulated surface materials. No significant impact to aquatic systems either on or off site is anticipated.

5.6 Effects of Air Pollutant Emissions

The impact of emitted particulate matter, SO_2 and fugitive dust from coal handling and storage from Unit 2 were evaluated by air quality modeling. The AQDM was used for the long-term impact evaluation and the PTMTPW for the short-term evaluation. These models and the criteria for their use have been discussed in Section 2.8.

Emissions from all existing and proposed sources were projected to the years 1981, 1985, and 1989 and the impacts evaluated.

5.6.1 Total Suspended Particulate Matter

The annual average twenty-four hour average TSP impact of Deerhaven Unit 2 and of existing sources in the Gainesville area were determined for the years 1981, 1985 and 1989. Figure 5.6-1 lists the figures in which these impacts are geographically summarized. The impact data are summarized in Table 5.6-2. Figures 5.6-4 and 5.6-5 present these impacts as they relate to the ambient standards.

To summarize, the annual TSP levels in the Gainesville area will decrease slightly from those existing during the baseline period and the twenty-four hour levels will increase slightly. During the baseline period the maximum annual average TSP level in the Gainesville area was 32 $\mu g/m^3$. During the years 1981, 1985 and 1989 this level will drop to 31 $\mu g/m^3$, excluding fugitive dust. The maximum impact of Deerhaven Unit 2 on annual TSP levels is less than 1 $\mu g/m^3$.

Table 5.6-1 Conditions Simulated with Air Quality Models to Establish Impact of Deerhaven Unit 2 and Existing Sources on TSP Levels Gainesville, Florida

Conditions	Model	Figure
1981 - Projected 1981 emissions from all proposed and existing sources		
24-hour	PTMTPW	5.6-1
Annual	AQDM, w/Briggs	5.6-1
1985 - Projected 1985 emissions from all proposed and existing sources		
24-hour	PTMTPW	5.6-2
Annual	AQDM, w/Briggs	5.6-2
1989 - Projected 1989 emissions from all proposed and existing sources		
24-hour	PTMTPW	5.6-3
Annual	AQDM, w/Briggs	5.6-3

24-hour meteorological data - day 096/1964 Jacksonville, Florida

Annual meteorological data - 1970-74 summary Jacksonville, Florida

Table 5.6-2 Summary of TSP Impact Evaluation for 1981, 1985 and 1989 - Gainesville, Florida

	Annual*(μg/m³)				24-Hour (μg/m³)**			
Period	Maximum	Baseline (1972/73)	Maximum Incremental Impact	Maximum Deerhaven Unit 2 Impact	Maximum	Baseline (1972/73)	Maximum Incremental Impact	Maximum Deerhaven Unit 2 Impact
1981	31	32	-1	1	64	62	2	2
1985	31	32	-1	1	64	62	2	2
1989	31	32	-1	1	63	62	2	2
Standard								
Air Quality	60	60			150	150		
PSD*** Increments			19	19			37	37

*Includes background of 29 μg/m³

**Includes background of 60 μg/m³; 24-hour impact reported for Deerhaven site area

***Prevention of Significant Deterioration increments permitted by the 1977 Clean Air Act amendments for Class II area

The maximum twenty-four hour TSP level for the baseline and other periods was predicted for an area 8.5 km (5.3 miles) northwest of the Deerhaven site. This occurs with the wind blowing from Gainesville toward Deerhaven, with the point of maximum concentration occurring downwind of the Deerhaven site. The maximum concentration occurring during the baseline period was 62 $\mu g/m^3$ (including 60 $\mu g/m^3$ background).

The maximum concentration occurring during the year 1981, 1985 and 1989 will be 64 $\mu g/m^3$. The impact of Deerhaven Unit 2 is 2 $\mu g/m^3$. For both time periods the incremental impacts are much less than permitted by the 1977 Clean Air Act Amendments.

Another source of particulate matter resulting from the operation of Unit 2 is the coal handling and storage. This will be a fugitive source, resulting from handling approximately 10,500 tons per week of coal. By using EPA emission factors (U.S. EPA, 1976) and assuming adequate control measures on site (such as watering and paving) a particulate matter emission rate of 700 pounds per week or about 4 pounds per hour has been determined.

Because of the diffuse area of this source (approximately 2 acres), the distance to the site boundary (approximately 1 kilometer) and the magnitude of the emission rate, the twenty-four hour and annual average impact on TSP levels at the site boundary will be less than 1 $\mu g/m^3$.

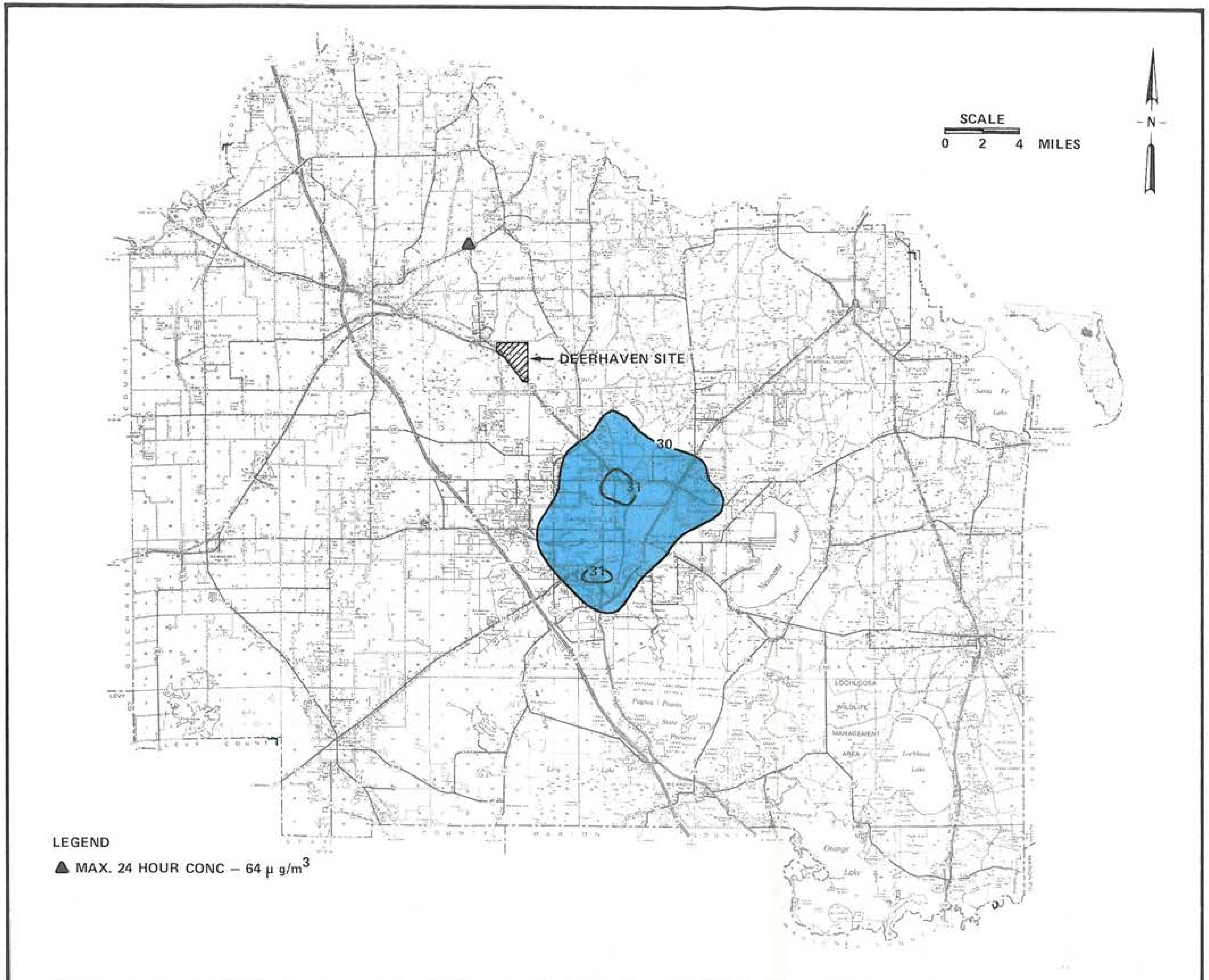

FIGURE 5.6-1 ANNUAL AVERAGE AND 24 HOUR AVERAGE 1981 TOTAL SUSPENDED PARTICULATE MATTER CONCENTRATION, ALACHUA COUNTY, FLORIDA.

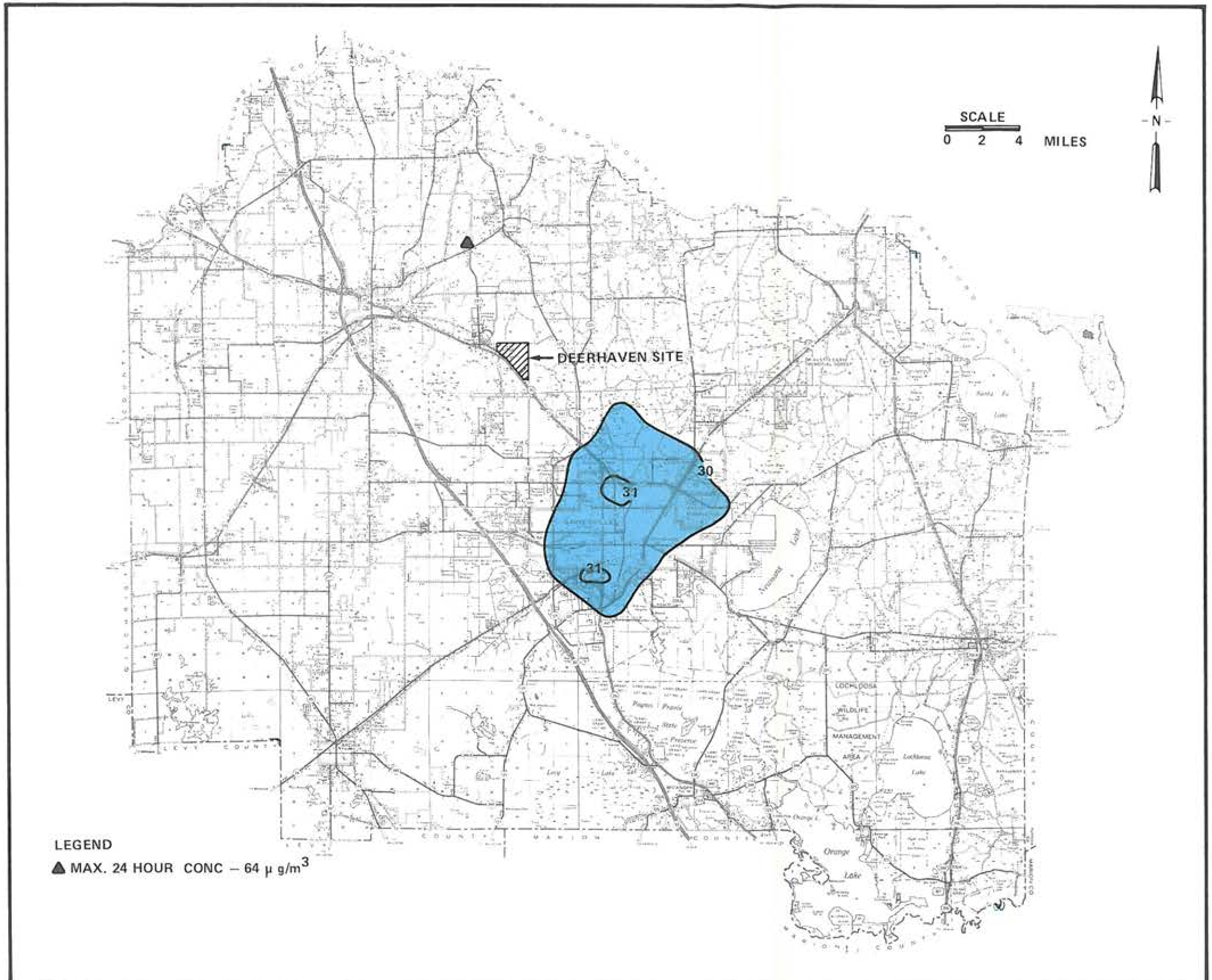

FIGURE 5.6-2 ANNUAL AVERAGE AND 24 HOUR AVERAGE 1985 TOTAL SUSPENDED PARTICULATE MATTER CONCENTRATION, ALACHUA COUNTY, FLORIDA.

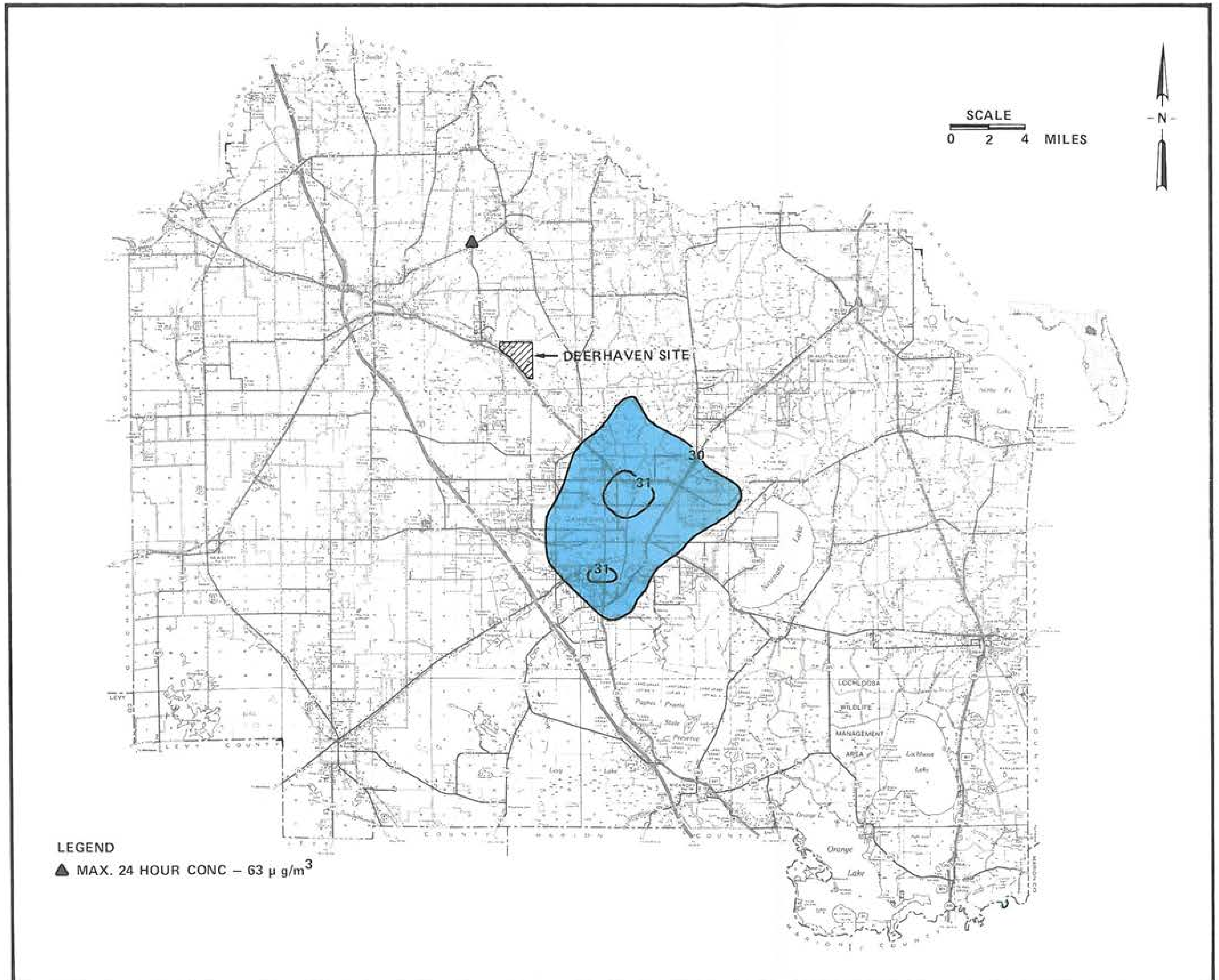

FIGURE 5.6-3 ANNUAL AVERAGE AND 24 HOUR AVERAGE 1989 TOTAL SUSPENDED PARTICULATE MATTER CONCENTRATION, ALACHUA COUNTY, FLORIDA.

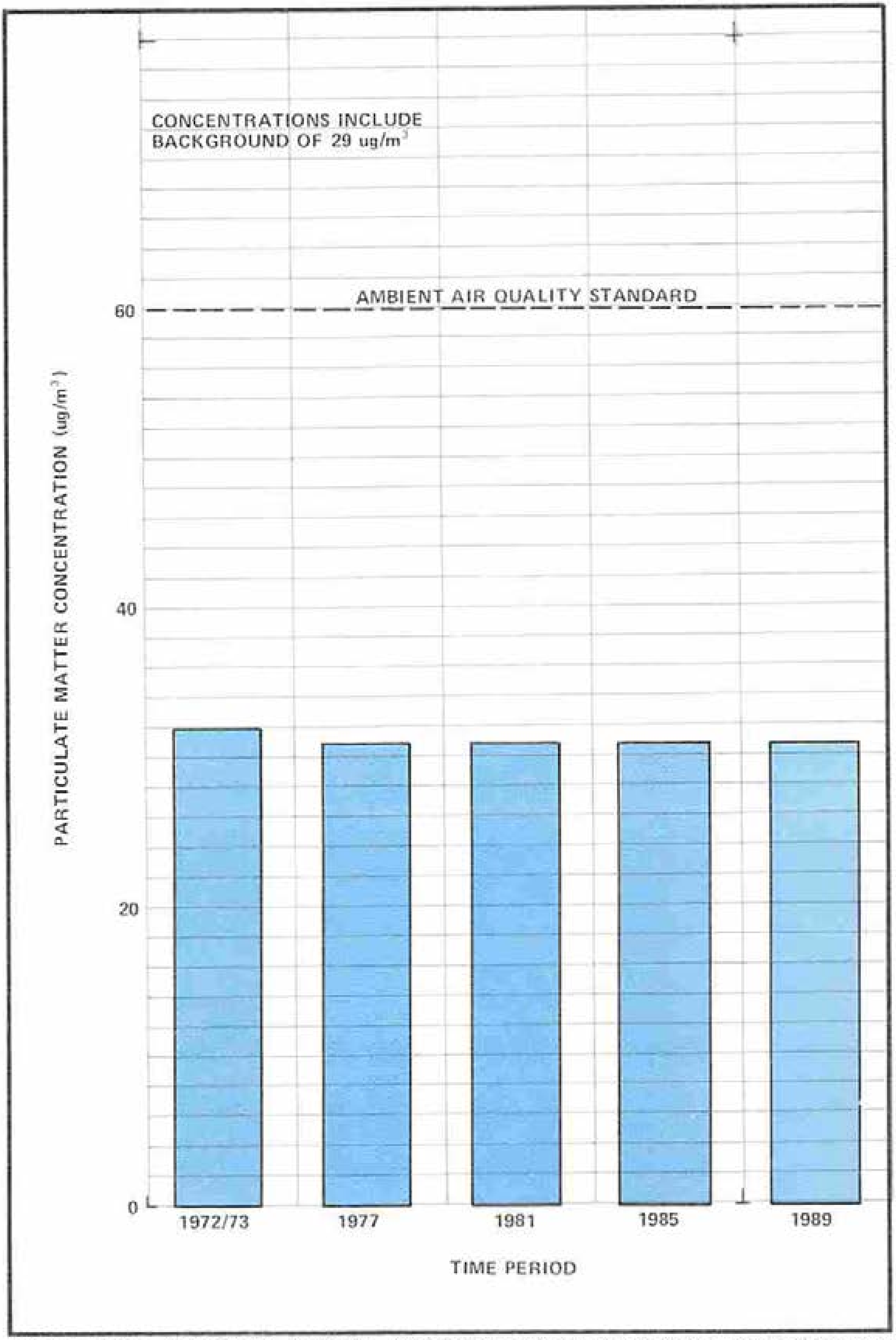

FIGURE 5.6-4 MAXIMUM ANNUAL AVERAGE TOTAL SUSPENDED PARTICULATE MATTER CONCENTRATION, 1972/73 TO 1989, ALACHUA COUNTY, FLORIDA.

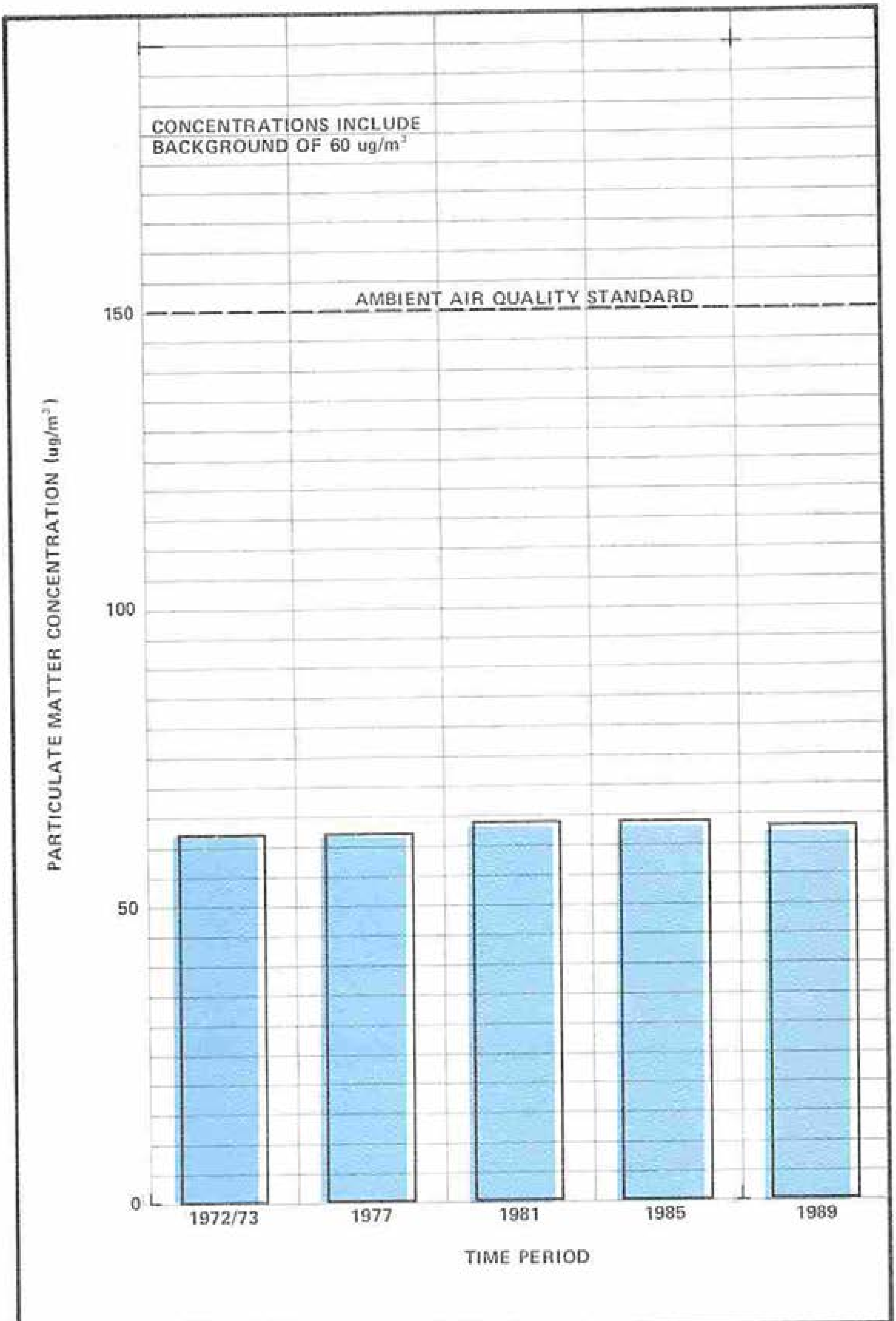

FIGURE 5.6-5 MAXIMUM 24 HOUR TOTAL SUSPENDED PARTICULATE MATTER CONCENTRATION, 1972/73 TO 1989, ALACHUA COUNTY, FLORIDA.

5.6.2 Sulfur Dioxide

The annual average, twenty-four hour average, and three hour average SO_2 levels were determined for the years 1981, 1985 and 1989. These data are presented geographically in Figures 5.6-4 to 5.6-6 (as described in Table 5.6-3) and summarized in Table 5.6-4.

During the baseline period the maximum annual average SO_2 concentration in the Gainesville area was 4 $\mu g/m^3$. During the periods 1981, 1985 and 1989, this level will drop to 2 $\mu g/m^3$. Annual average SO_2 levels increase from zero to 1 $\mu g/m^3$ northwest of Gainesville and the Deerhaven site.

The maximum twenty-four hour SO_2 level for the baseline period was 73 $\mu g/m^3$ at a point 8.5 kilometers (5.3 miles) northwest of the Deerhaven site. In 1981 and 1985 this level will increase to 82 $\mu g/m^3$ and then drop to 76 $\mu g/m^3$ in 1989. The maximum incremental impact is 9 $\mu g/m^3$, compared with an allowable incremental increase of 91 $\mu g/m^3$ (U.S. EPA, 1976). The maximum twenty-four hour impact of Deerhaven Unit 2 is 19 $\mu g/m^3$.

The maximum three hour SO_2 level for the baseline period was 241 $\mu g/m^3$ at a point 1.1 kilometers (.6 mile) northwest of the Deerhaven site. For the periods 1981, 1985 and 1989, the maximum three hour SO_2 levels are 265, 265 and 241 $\mu g/m^3$, respectively. The maximum incremental impact is 24 $\mu g/m^3$ compared with an allowable incremental increase of 512 $\mu g/m^3$ (U.S. EPA, 1976). The maximum three hour incremental impact of Deerhaven Unit 2 is 89 $\mu g/m^3$.

Table 5.6-3 Conditions Simulated with Air Quality Models to Establish Impact of Deerhaven Unit 2 and Existing Sources on SO_2 Levels - Gainesville, Florida

Conditions	Model	Figure
1981 - Projected 1981 SO_2 emissions from all proposed and existing sources		
3-hour	PTMTPW	5.5-4
24-hour	PTMTPW	5.6-4
Annual	AQDM, w/Briggs	5.6-4
1985 - Projected 1985 SO_2 emissions from all proposed and existing sources		
3-hour	PTMTPW	5.6-5
24-hour	PTMTPW	5.6-5
Annual	AQDM, w/Briggs	5.6-5
1989 - Projected 1989 SO_2 emissions from all proposed and existing sources		
3-hour	PTMTPW	5.6-6
24-hour	PTMTPW	5.6-6
Annual	AQDM, w/Briggs	5.6-6

24-hour meteorological data - day 096/1964 Jacksonville, Florida

Annual meteorological data - 1970-74 summary Jacksonville, Florida

Table 5.6-4 Summary of SO_2 Impact Evaluation for 1981, 1985, and 1989 - Gainesville, Florida

	Annual (µg/m³)				24-Hour (µg/m³)				3-Hour (µg/m³)			
Period	Maximum	Baseline (1972/73)	Maximum Incremental Impact	Maximum Deerhaven Unit 2 Impact	Maximum	Baseline (1972/73)	Maximum Incremental Impact	Maximum Deerhaven Unit 2 Impact	Maximum	Baseline (1972/73)	Maximum Incremental Impact	Maximum Deerhaven Unit 2 Impact
1981	2	4	1	1	82	73	9	19	265	241	24	89
1985	2	4	1	1	82	73	9	19	265	241	24	89
1989	2	4	1	1	76	73	3	19	262	241	21	89
Standard												
Air Quality	60	60			260	260			1300	1300		
PSD* Increments			20	20			91	91			512	512

*Prevention of Significant Deterioration Increments Permitted by the 1977 Clean Air Act Amendments for Class II Area

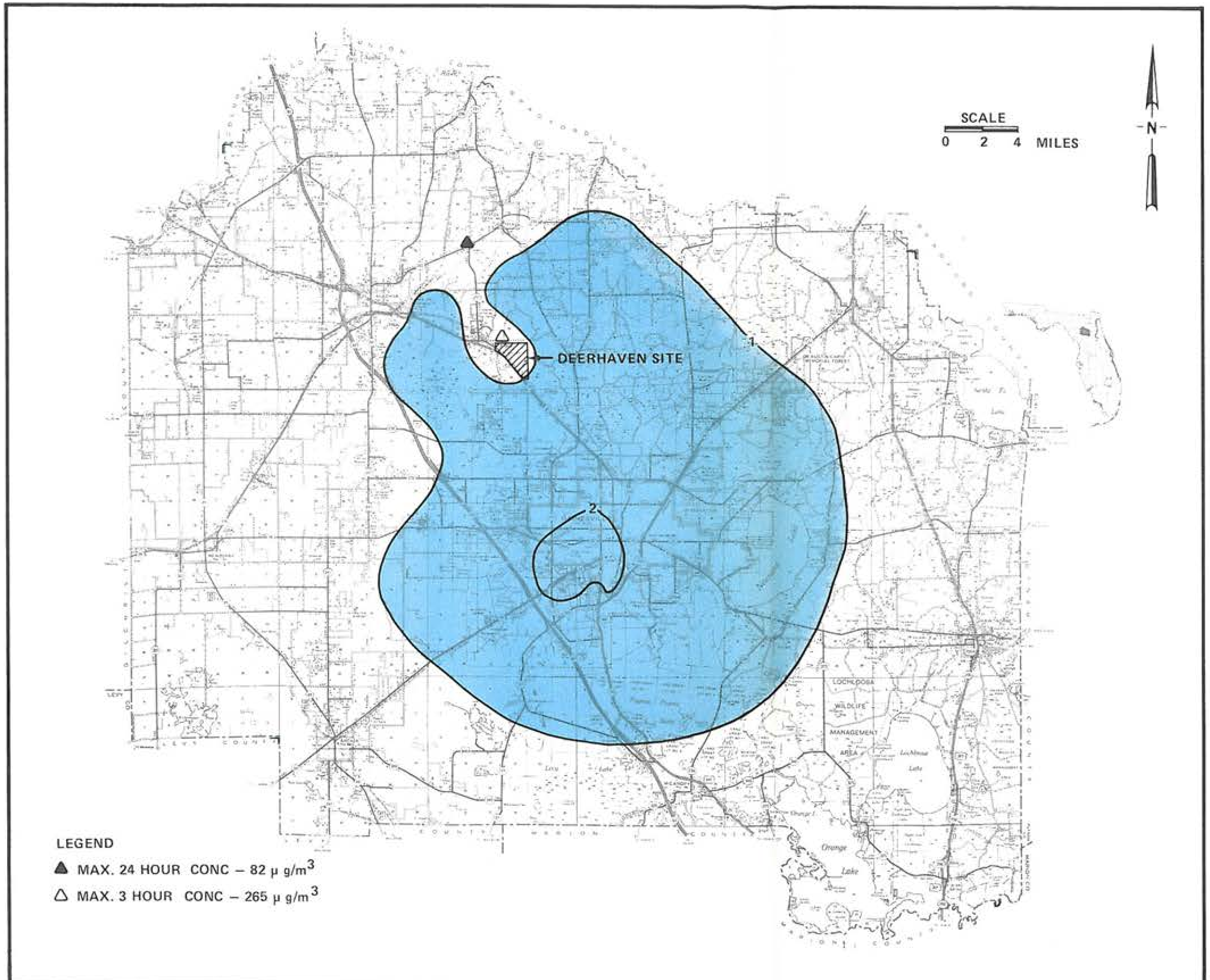

FIGURE 5.6-6 ANNUAL 24 HOUR AND 3 HOUR 1981 SULFUR DIOXIDE CONCENTRATION, ALACHUA COUNTY, FLORIDA.

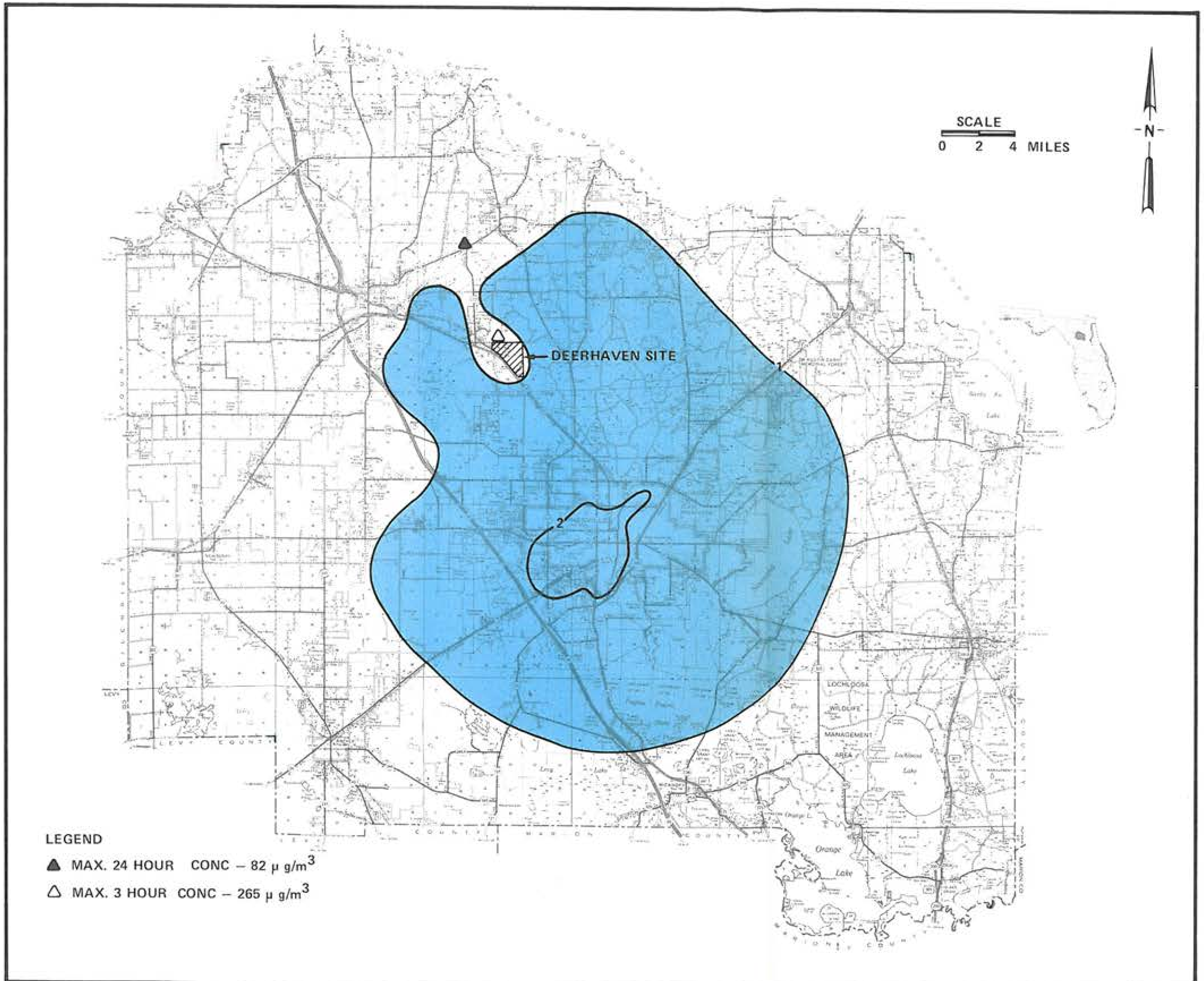

FIGURE 5.6-7 ANNUAL 24 HOUR AND 3 HOUR 1985 SULFUR DIOXIDE CONCENTRATION, ALACHUA COUNTY, FLORIDA.

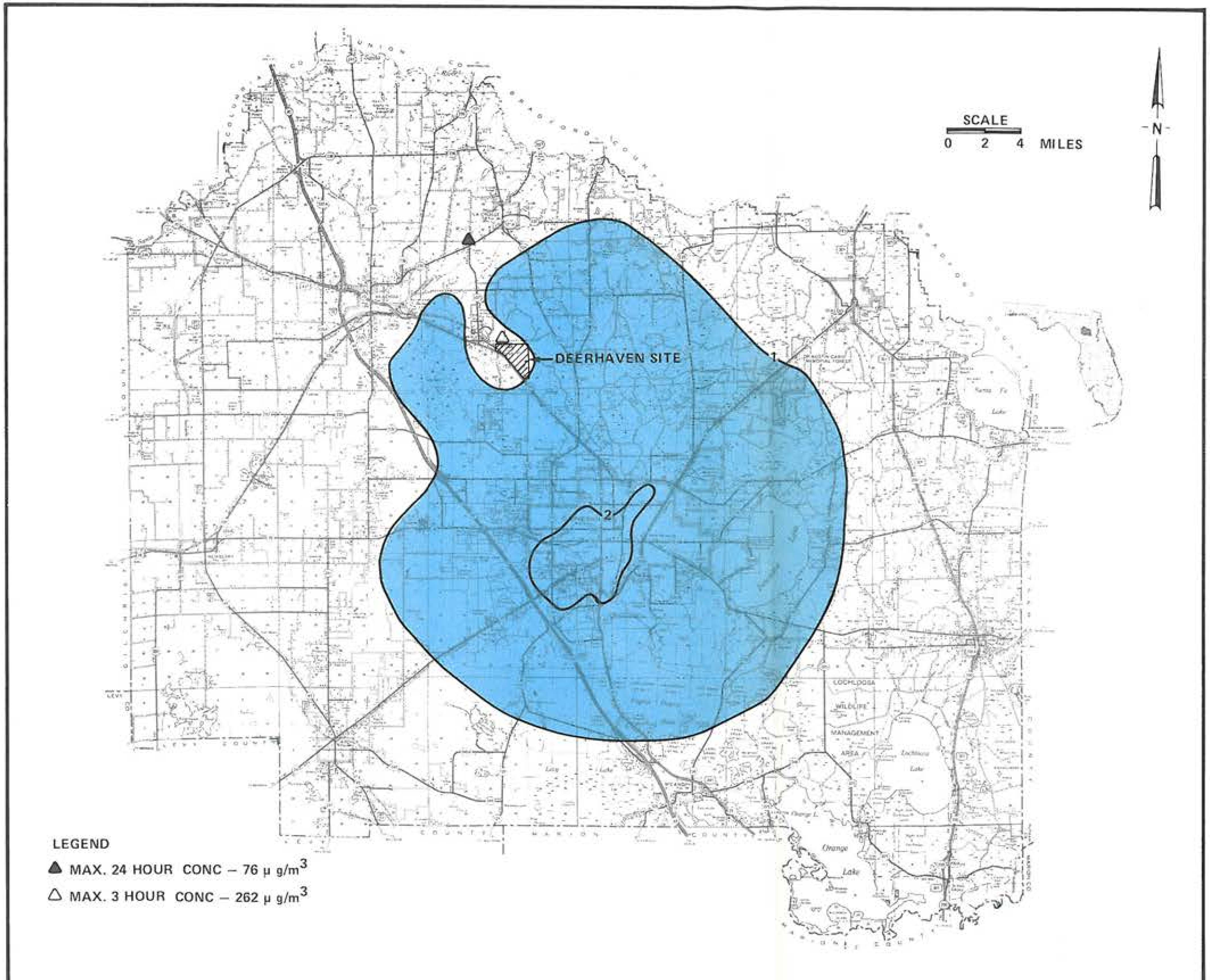

FIGURE 5.6-8 ANNUAL, 24 HOUR AND 3 HOUR 1989 SULFUR DIOXIDE CONCENTRATION, ALACHUA COUNTY, FLORIDA.

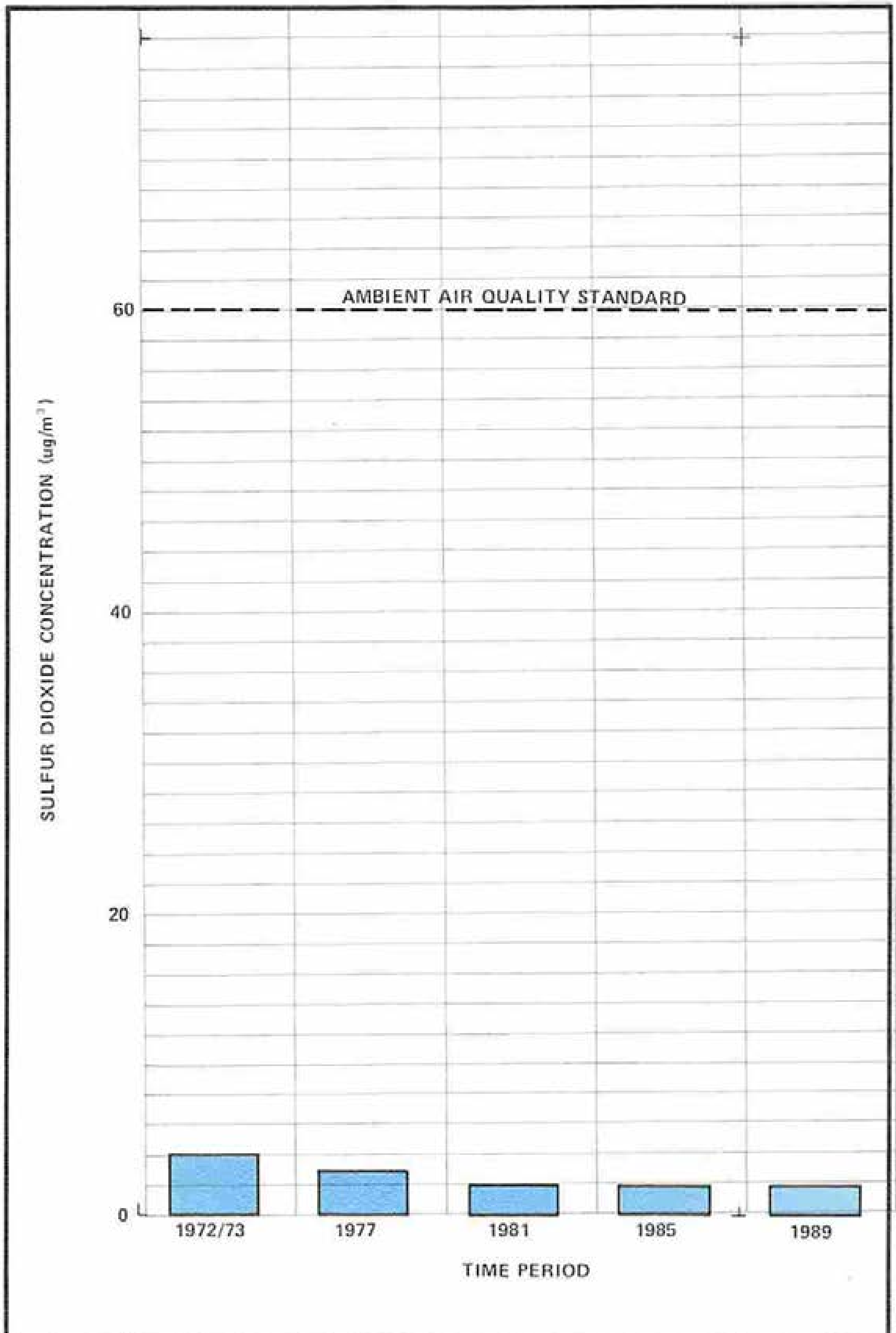

FIGURE 5.6-9 MAXIMUM ANNUAL AVERAGE SULFUR DIOXIDE CONCENTRATION, 1972/73 TO 1989, ALACHUA COUNTY, FLORIDA.

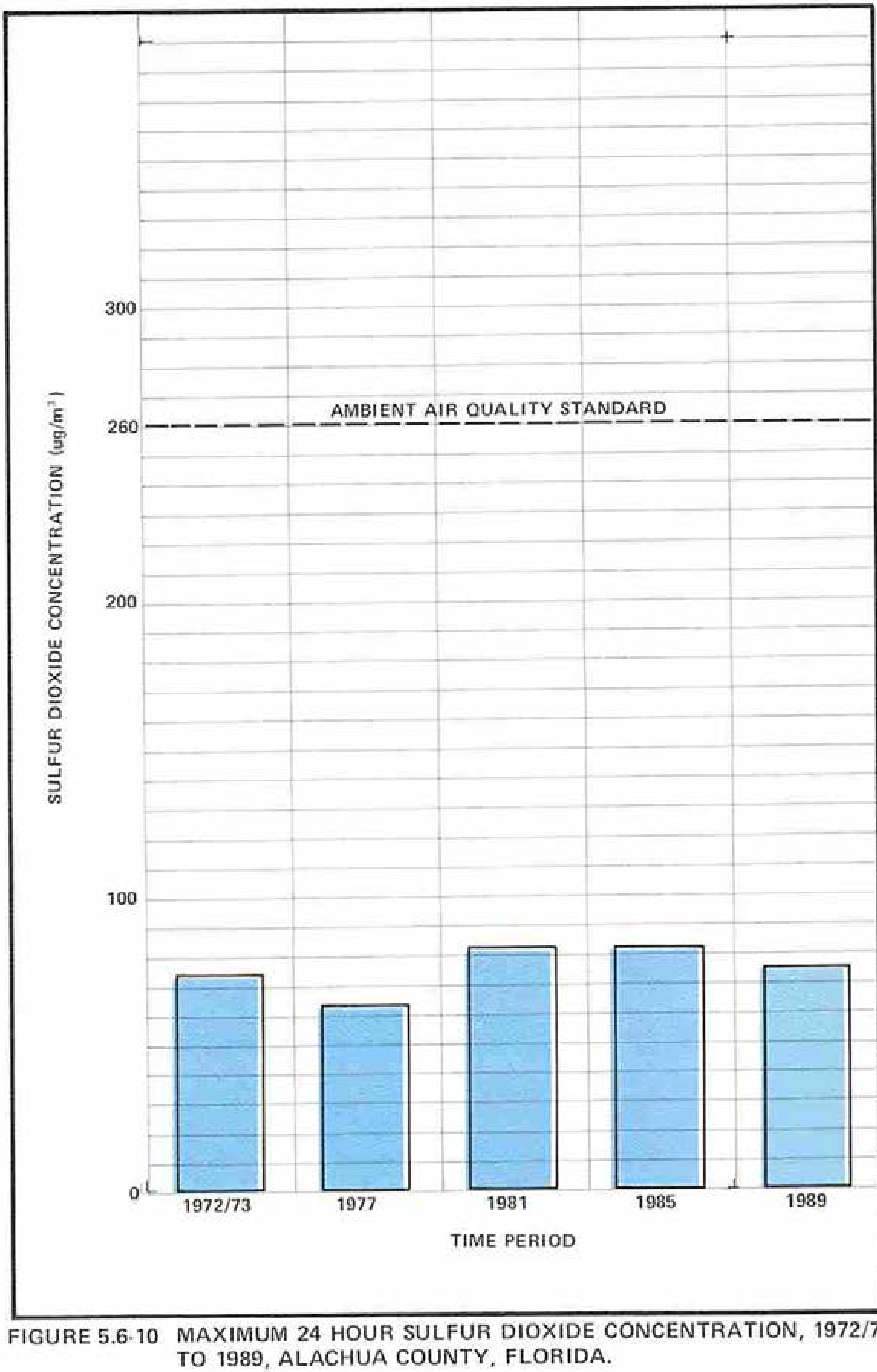

FIGURE 5.6-10 MAXIMUM 24 HOUR SULFUR DIOXIDE CONCENTRATION, 1972/73 TO 1989, ALACHUA COUNTY, FLORIDA.

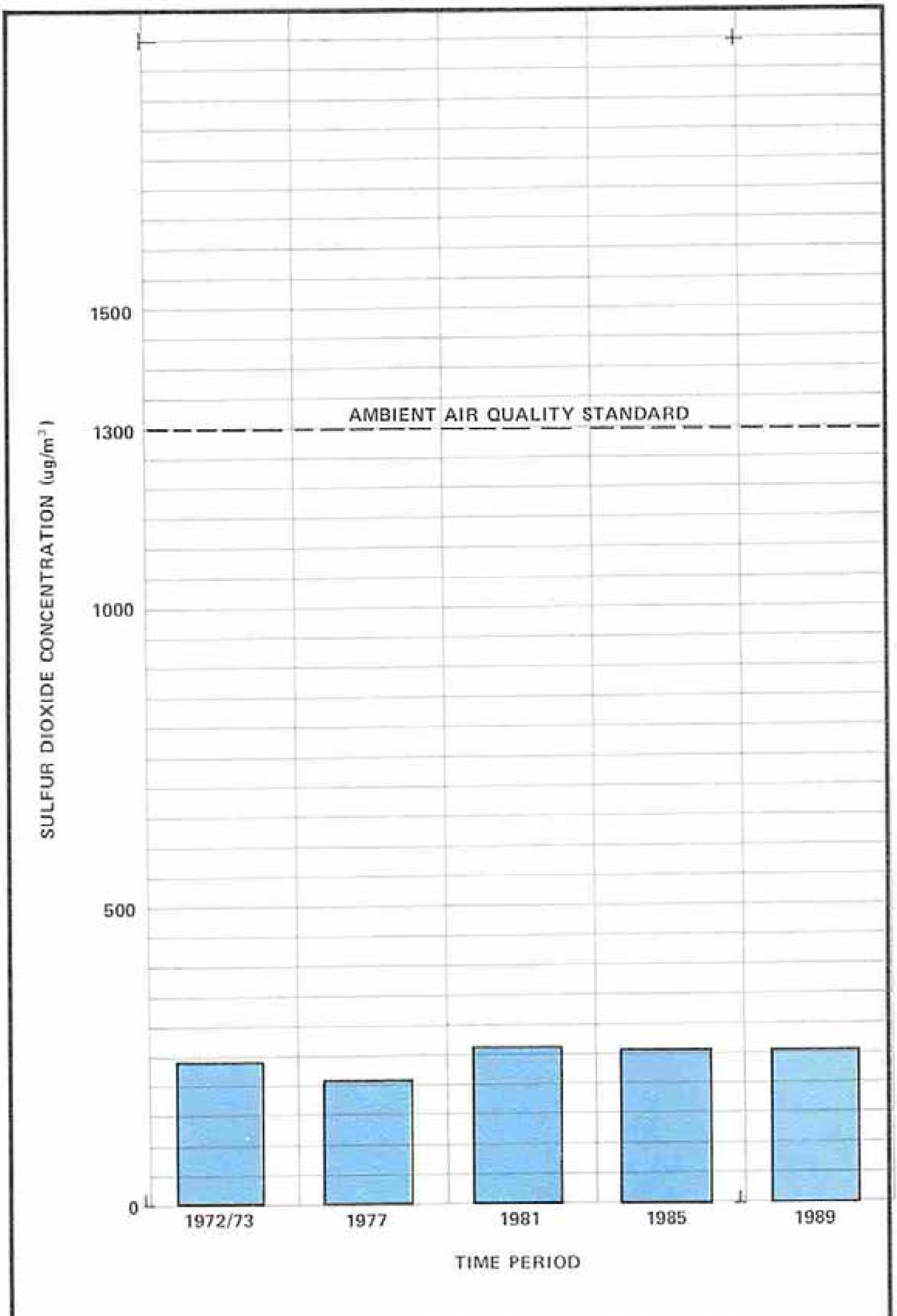

FIGURE 5.6-11 MAXIMUM 3 HOUR SULFUR DIOXIDE CONCENTRATION, 1972/73 TO 1989, ALACHUA COUNTY, FLORIDA.

5.6.3 Other Criteria Pollutant

The only other criteria pollutant that will be emitted from the proposed Deerhaven Unit 2 in significant quantities is NO_x. NO_x will be emitted at an annual average rate of 12.6 tons per day and a maximum rate of 20.2 tons per day. This will result in an annual average impact of less than 1 $\mu g/m^3$ and a maximum twenty-four hour impact of 12 $\mu g/m^3$.

5.6.4 Ecological Effects of Air Emissions

The only substance in the air emission inventory of potential concern to the surronding biota is sulfur dioxide. Vegetation injury from sulfur dioxide is dependent on the sensitivity and physiological condition of the plant and the duration and concentration of the exposure. Thresholds for acute injury are approximately 0.25-0.30 ppm and for chronic injury about 0.05 ppm on a seasonal or yearly average (Mukammal, 1976). Linzon (1973) concludes that there is a risk of sulfur dioxide damage to forests and lichen when the following concentrations persist: 0.02 ppm averaged over a year, 0.35 ppm averaged over four hours, and 0.55 ppm averaged over two hours.

Predicted ground level sulfur dioxide concentrations for the site and surrounding vicinity are provided in Section 5.6.2. Since the predicted maxima are below the Federal and state standards and the injury thresholds mentioned above and elsewhere in the literature, no impact to surrounding biotic environments is expected.

5.7 Effects of Directly Associated Facilities

Directly associated facilities include the new railroad spur and the coal handling and ash disposal facilities (Figure 3.1-2). Potential impacts associated with their operation on the surrounding areas include possible leachate contamination and wind-blown ash, and disturbance of wildlife due to operational noise.

A buildup of ash in the environment could affect local vegetation either through direct deposition on exposed foliage or through alteration of soil characteristics. Such effects are not anticipated, however, since the ash will be moistened prior to transport to the disposal site and the landfill cells will be covered with soil as soon as possible following disposal.

The sources, spectra and levels of noise emission for electric power generating facilities are well established (Noise Control Engineering, 1976). The relative size of the Deerhaven Unit 2 (235 mW) will increase operating noise levels very little above present Unit 1 levels. Delivery, unloading and handling of coal is expected to be the only significant source of permanent noise level increase on or near the site. It is anticipated that coal delivery will be made by a 70 car unit-train every 5 days. The unloading facility is to be located within approximately 1,000 feet of the east boundary of the site. Coal handling facilities are to be located more distant from the site boundary. Because of noise level attenuation with distance from the source plus additional attenuation with existing ground cover, noise abatement procedures will not be necessary.

The addition of Unit 2 could possibly increase average noise levels on the east boundary of the site by 3 to 5 dBA. Property adjacent to this boundary of the site is presently in agricultural use. Although residential development of this property is highly unlikely, the area would not be unsuitable for residences on the basis of noise considerations.

High levels of operational noise can affect local wildlife by causing a relocation of sensitive species into areas further removed from the source. Competition stress in the newly settled areas could result in net animal losses unless acclimation to the level of noise allows an eventual resettlement of the affected area. Based on the operational noise levels outlined previously, wildlife acclimation to the local noise levels should occur. No permanent displacement or loss of animals from adjacent habitats is expected.

5.8 Resources Committed

5.8.1 Ecological Resources

Ecological resources irreversibly committed to the operation of the proposed facility include:

a. 198 acres of flatwoods (in various stages of succession) and 22 acres of cypress swamp habitats committed to the ash landfill disposal site. The most obvious impact resulting from landfill ash disposal will be the ultimate loss of 220 acres of wildlife habitat. The regional significance of this loss will be minor since the affected habitats are quite common (Section 2.7) and since no endangered species are known to utilize the site. Existing habitats will be replaced by soil-covered 20 to 25 foot mounds which will be maintained in grasses.

b. Since Unit 1 began operation in 1972, cooling tower blowdown has been discharged into Turkey Creek. During this time, the stream biota and associated wetlands have undergone adjustments to the imposed hydro-period. This is particularly evident in the on-site cypress swamp which initially receives the discharge and has sustained some tree losses and other plant adjustments. As the new unit becomes operational, Unit 1 blowdown will no longer be routed into Turkey Creek, but will be deep well injected along with the Unit 2 operational effluents. As a result, Turkey Creek will no longer have a perennial flow, but will revert to its former intermittent hydro-period. Some biotic adjustments will ensue which, because of the reduced base flow, should include a net reduction of aquatic animal life. Vegetation in affected areas of the on-site swamp will begin a gradual transformation to its original composition.

As discussed in their corresponding sections, these impacts will be permanent, though of relatively minor significance to the region. This assessment assumes that the final design will effectively eliminate potentially adverse effects associated with leachate contamination of surface water.

5.9 Deep Well Injection

As described in Chapter 3 cooling tower blowdown from both Unit 1 and Unit 2 will be disposed of by means of on-site deep injection wells. At the time of writing this document, a test well program verifying the technical feasibility of this disposal technique is nearing completion. Should injection zone permeabilities be found to be too low to accept all anticipated disposal flows without pumping the flows at unacceptably high pressure, it is anticipated that cooling tower blowdown may be disposed of by any one of the active alternative techniques presented in Chapter 9.

Florida Geologic Survey Bulletin 33, which describes the geology of Citrus and Levy counties, discusses several fault features in the shallower bedrock units, but does not indicate how deeply these faults may extend nor does it directly answer the question of faulting in the region of the RUB site. About all that can be said is that there undoubtedly is faulting and fracturing in the area, as is the case generally in other parts of Florida. However, there is little or no evidence that the faulting and fracturing have provided direct hydraulic interconnections between deeper and shallower beds.

In previous injection well projects in Florida, the significance of faulting and fracturing was addressed by installing a monitoring tube in the shallow fresh water zone above the confining beds, which has been done on the pilot well. All such prior experience indicates that the confining beds have proven to be fully effective in isolating shallow fresh waters from deeper saline waters, and the presumption is that this will also be the case at the Deerhaven site. However, to provide direct proof of whether or not the confining beds are breached, RUB will monitor the zone immediately above the confining beds in the test injection well, by measuring water level changes continuously during the testing. If a permanent facility is installed, similar monitoring will be conducted periodically in the monitor well. This approach should provide a specific answer on whether or not there is hydraulic continuity across the confining beds due to faulting or fracturing.

Although vertical solution channels exist in Florida in some sinkholes, these rarely extend to depths of more than a few hundred feet below the land surface. There are no known instances of vertical solution channels extending to very great depths, except perhaps in the case of some large natural springs in the state.

There is much more evidence of lateral or horizontal solutional activity in the region of the site, reflected by the presence of shallow sinkholes and by openings in the rock formations that have been penetrated during drilling operations. Again, it appears that such solutional openings are prevalent mostly in the uppermost few hundred feet of materials, and are unlikely to be present in the deeper beds that are being considered as the potential injection zone. The deepest solutional activity may be in the upper Oldsmar Limestone and perhaps in the overlying Lake City, Avon Park, and Ocala formations.

Geologic conditions in the region of the site are believed to be somewhat complex, owing to disturbances associated with the Ocala Uplift. Some old faults mapped for this area are considered to be inactive, and it is believed that they are not conduits of water but instead are hairline cracks that probably contain gouge or relatively impermeable materials created by the shearing action along the walls of the faults. Natural fracturing is also believed to be present and will be identified to the degree possible on geophysical logs to be taken in the test well.

Based upon favorable results from the pilot well program, RUB proposes to inject cooling tower blowdown, reverse osmosis waste, demineralizer regeneration waste, and blowdown from the active bottom ash ponds which consists of ash sluicing water, landfill active-face runoff and coal-pile runoff. Table 5.9-1 presents the estimated flows and chemical constituents for each of these streams. The chemical constituents of cooling tower blowdown are based on laboratory analyses of cooling tower blowdown from the existing cooling tower and on the anticipated number of cooling tower concentrations of groundwater makeup for Unit 1 and Unit 2 facilities. Chemical concentrations of the ash handling wastes

Table 5.9-1 Estimated Chemical Characteristics of Injected Effluents

	Cooling Water[1]	Ash Handling Waste[2]	Reverse Osmosis Waste[3]	Demineralizer Waste
Flow (mgd)[4]	0.72 (1.92)	0.15 (0.22)	0.01 (.02)	0.01 (.02)
pH	7.0	5 - 10	6.5 - 7.0	6 - 9
Temperature	---	Ambient	Ambient	Ambient
TDS (mg/l)	3,612	3,000 - 5,000		20,000 mg/l
SO_4 (mg/l)	2,000	1,500 - 2,500		
$NaSO_4$ (mg/l)	---	---	---	15,000 mg/l
K (mg/l)	6	100 - 200		
Cl (mg/l)	60	5 - 50		
SO_4 (mg/l)	2,000	1,500 - 2,500		
Si (mg/l)	185	4 - 60		
B		4 - 20		
As		.01 - 2		
Zn		.01 - 1.5		
Ba		0.3 - 1.4		
Al		0 - 0.6		
Cr		0 - .12		
Ni		.10 - .50		
Fe		.05 - .25		
Cu		.05 - .10		
Se		.03 - .10		
Mn		.01 - .50		

[1]Heavy metal concentrations will be six times greater than concentrations of the local groundwater.

[2]Values of concentration are approximations based on information as supplied by MR. T.Y.J. Chu of TVA. The information as supplied is data from fly ash sluicing trench tests. The concentrations of chemical constituents for bottom ash sluicing should be less than those tabulated. No published information is available to substantiate any other values; the chemical composition of the water in the proposed system is not precisely known because the character of the coal and its products in the system are not known.

[3]Chemical constituent concentrations will be approximately eight to nine times the concentrations in the City of Gainesville's treated water supply.

[4]Flows presented are monthly averages. Flows in parentheses are anticipated monthly maximum.

are estimates only. At present the source of coal, ash fusion temperature, quality of ash sluice water, and performance of the ash settling pond are unknown. Reverse osmosis waste and demineralizer waste concentrations are based on known performance of existing units.

Figure 5.9-1 presents a schematic diagram of the test/monitoring well presently being drilled at the site. As indicated, the casings are pressure cemented to a depth of 2,000 feet to isolate the test injection fluid from upper geological zones. It is anticipated that two permanent injection wells will be installed at the site, cased through fresh water and into the deep injection zone. Preliminary indications are that this zone contains saline water with total dissolved solids concentration in excess of 17,000 mg/l. The on-site locations of these wells have not yet been identified.

The potential injection zone is presently anticipated to occur at depths from 2,500 to 3,300 feet below land surface, and thus is approximately 800 feet thick. In all likelihood, only some of the layers within this depth interval will prove to have an acceptable permeability, so that the true thickness of the receiving zone will not be known until the drilling and testing has been concluded. However, as mentioned above preliminary information from the pilot program indicates that the confining layers overlying the injection zone will be approximately 800 feet thick.

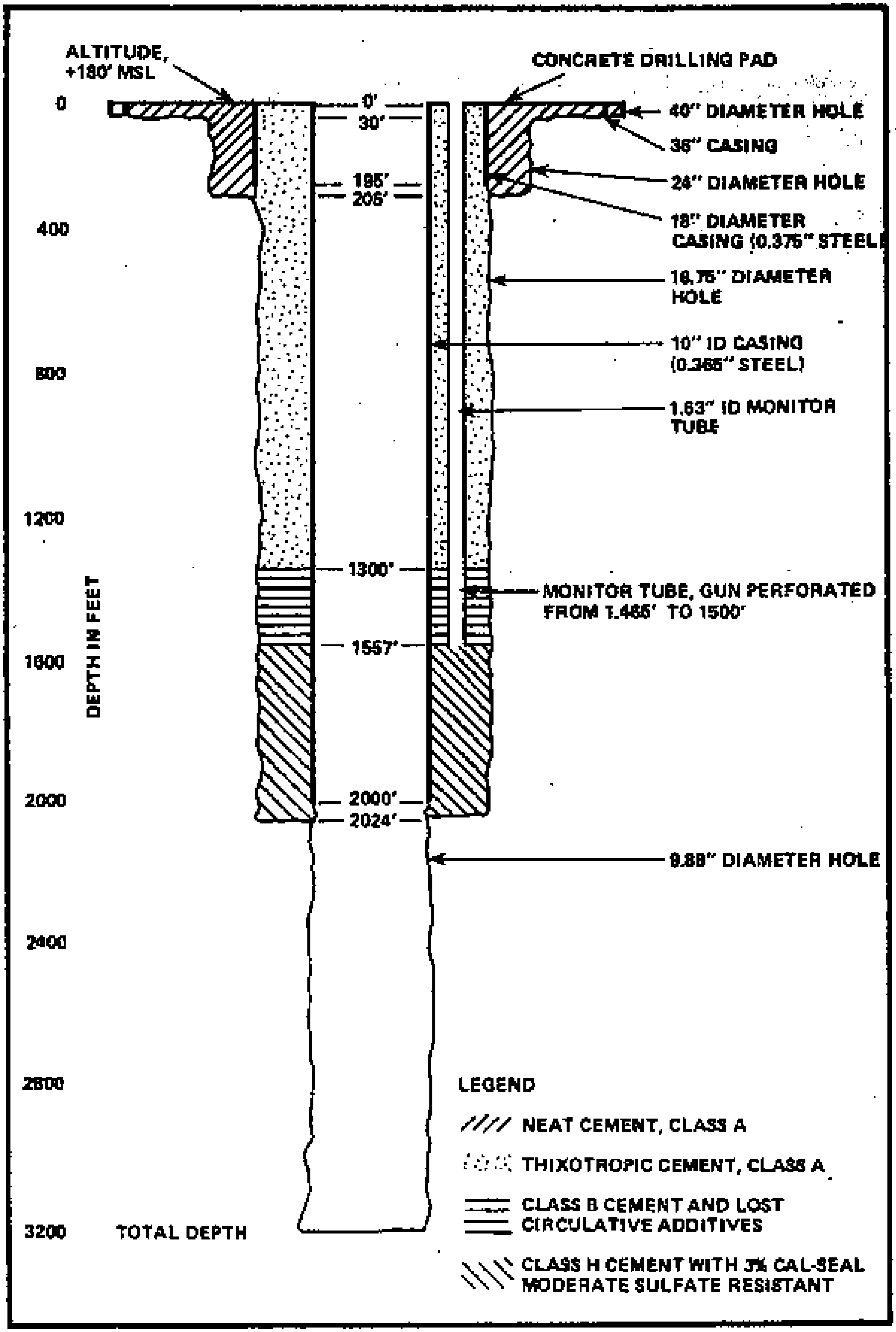

FIGURE 5.9-1 CONSTRUCTION DIAGRAM OF TEST – INJECTION WELL.

To date, the results of the water quality analysis indicates that the base of potable water is approximately 1,000 feet below ground surface. Although the water below this depth is not potable, it appears to remain fresh (less than 1,000 mg/l total dissolved solids), to approximately 1,520 feet. At 1,520 feet, sulfate concentrations are significantly higher, which correlates closely with the appearance of sulfate minerals in the cuttings at 1,540 feet. Sulfate concentrations in water samples collected to a depth of 2,024 feet are high and increase significantly wherever evaporite (gypsum and anhydrite) beds were penetrated.

A preliminary evaluation of the drill cutting samples and geophysical borehole logs indicate that potential confining units occur from 1,550 feet to approximately 2,500 feet in the Cedar Keys formation, Lawson Limestone, and Taylor Beds.

RUB is considering several alternative rates of injection for a final injection well facility, depending on what is learned during the test program with regard to the permeability or injection potential of the deep zones. If the overall permeability proves to be comparatively low, than the long-term injection rate may be as low as 0.2 mgd. However, if the potential for injection is much more favorable, RUB anticipates injecting as much as 1.3 mgd. Over the life expectancy of the plant, which has been set at 35 years, the total volume of injected fluid would be in the range of from 2.6 to 14 billions of gallons, depending on the injection rate. Assuming that the injection zone were to be 1,000 feet thick and were to have an overall effective porosity of 0.1, and also assuming that the waste fluid were to move radially outward equally in all directions from the injection well, then the theoretical radius of the cylinder of earth materials containing the injected fluid would be from about 1,000 feet to 2,500 feet at the end of the 35 year period, again depending on the injection rate. In actuality, these distances might be different if there is any natural flow pattern in the deep salt water zone or if the permeabilities are not uniform in the immediate area of the well.

The allowable maximum injection pressure in the injection well is 0.5 psi (pounds per square inch) per foot of overburden material, which has been established in order to protect overlying formations against fracturing. The RUB injection well would never be operated at such high pressures, and detailed records of pressures would be maintained at all times, both in the injection well and in the nearby monitoring well, to insure that the pressure limitations are never exceeded.

Prior experience in Florida indicates that no problems of any significance have arisen in injecting essentially water into water, despite the fact that the mineral concentrations in the injected and receiving waters may differ somewhat. The subject of compatibility of fluids is of much concern where radical differences in chemistry exist between the injected fluid and the native fluid. The principal such difference in the case of the RUB project is with respect to acidity, because the injected water has a pH of about 6.8. This pH level probably would cause some small degree of solutional activity in the zone penetrated by the injected waste water, but it is not believed that this would be of major consequence. In several other locations in Florida, for example, wastes of a very acidic nature are being successfully placed into injection wells without any apparent adverse consequences. Some of the reported problems in connection with wells injecting acid materials have been entirely due to the constructional characteristics of the wells themselves, rather than to the movement of the acidic fluid into the earth.

Some temperature anomalies have been encountered in the drilling and testing of injection wells in southeastern Florida, where the so-called "Boulder Zone" is used as the injection interval. There, the deeper waters are somewhat colder than would have been anticipated from an evaluation of normal geothermal gradients. At the Deerhaven site, it is likely that the temperature of the water in the injection zone will be on the order of 100° F, which more or less reflects the geothermal gradient measured at an injection well site in Orlando, where very detailed information was obtained during testing. At that site, the temperature of the native groundwater at a depth of 6,000 feet was roughly 130° F.

If any osmotic change were to take place during long-term injection, it most likely would be a very small migration of dissolved minerals from the native salty water or brine into the advancing front of the injected process water. Such minor effects, which could really only be estimated through laboratory experiments, have no real bearing on the feasibility of injection of the particular fluid to be discharged at the site. Osmotic determinations are of greater importance in cases where the injected fluid is radically different in composition from the native water, for example, where oils, other hydrocarbons, or highly concentrated waste chemicals are the waste materials entering a water-filled environment.

There are no known mineral resources of value at the site of the proposed injection facility. Moreover, even if some value were to be assigned to the surficial sands or limestone rock deposits, the injection well project would in no way diminish the availability of those resources.

No cumulative long-term negative effects of drilling and/or operating the well on the immediate surficial environment, either with respect to water resources or to any other part of the environment are anticipated. A body of injected fluid will eventually accumulate in the deep injection zone around the open part of the injection well, but this is normal for any injection well facility and will only affect non-potable waters that are hydraulically isolated from the physical and biologic environments at the land surface. More detailed evaluation of impacts will be thoroughly addressed upon the completion of the on-going pilot program. The results and findings will be provided as an addendum.

As part of implementation of Public Law 93-523, the Safe Drinking Water Act, EPA has formulated proposed rules for underground injection of wastes. These rules are presently being reviewed and rewritten by EPA. Proposed regulations issued in August, 1976, included the following major stipulations:

1. All underground drinking water sources of 3,000 mg/l total dissolved solids or less must be protected by a casing cemented to the land surface.

2. Cementing and installation of an injection tube with packers must be performed to insure that no migration of injected fluid above or below the injection zone occurs.

3. Injection pressures must be limited to preclude the possibility of fracturing the confining strata.

4. A comprehensive monitoring program must be instituted to assure that no contamination to underground drinking water sources, or failure of the injection system is occurring.

Injection into receiving zones with dissolved solids concentrations less than 10,000 mg/l will be prohibited if these proposed rules are adopted. The Deerhaven injection wells will comply with the proposed regulations.

CHAPTER 6

ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS

Presented in this chapter are the programs and methods by which baseline data in previous chapters were collected and the projected impacts determined and evaluated. Sample techniques are described as to station location, frequency, methodology, and instrumentation for both collection and analysis. Details on instrument accuracy, sensitivity, and reliability are also provided. For those computer programs utilized details on their source, assumptions, and applicability are provided. Sources of literature used and previous reports prepared are also discussed.

The final section of this chapter provides a detail explanation of the pilot program being undertaken for deep-well injection at the site. Details include a physical description of the well being drilled, drilling techniques and all logging performed during the program.

6.1 Pre-Application Monitoring

6.1.1 Surface Waters

Hydrological

This section summarizes pre-application surface water hydrological monitoring and evaluation programs. These programs and their results are presented in detail in "An Evaluation of Alternatives to the Present Releasing of Deerhaven Generating Station Blowdown to Turkey Creek" (Breedlove and Associates and Jones, Edmunds and Associates, 1977).

Computer Modeling - The hydrological and hydraulic analyses of Cellon Creek, Rocky Creek, and Mulatto Pen Branch were performed using computer models. Computer programs used to implement these analyses were developed by the U.S.D.A. Soil Conservation Service. These programs are used extensively by these agencies because of the high quality, rapidity and overall cost-effectiveness of this method of analysis.

The water surface profile program, entitled WSP-II, calculates water surface elevations for a given waterway under several flow conditions. Output data consist of stage-discharge curves for each cross-section or structure, hydraulic parameters for cross-sections and structures, and water surface elevations corresponding to given discharges.

Modeling of basin hydrology involved a second computer program, TR-20, which generates runoff from a natural or synthesized rainfall using hydrologic characteristics of in situ soils, land use, overland flow times, and natural storage capacities in the system. This program has a distinct advantage in that infiltration is computed and deducted from incident rainfall to give surface runoff. The procedures for developing input parameters are outlined in the National Engineering Handbook as prepared by the U.S.D.A. Soil Conservation Service.

Soil classifications and hydrologic groupings were taken from the U.S.D.A. Soil Map for Alachua County, Florida, and from the U.S.D.A. Soil Conservation Service Special Soil Survey Report, Maps and Interpretations -

Alachua County, Florida. Land uses were taken from available recent aerial photos provided by Alachua County government and the local office of the Soil Conservation Service. Times of concentration, storage, and other relief-dependent factors were developed from actual field survey information and from standard quadrangle maps published by the U.S. Geological Survey.

Flow Measurement - A program of daily flow measurements was conducted during September and October, 1976, in order to supplement base flow data, to provide comparative values for computer data, and to verify assumed channel roughness values.

Flow measurements for Rocky Creek and Cellon Creek were taken at Cross-Sections R003, R006, C003, C004, C008, C009 and at the box culverts where Cellon Creek crosses beneath U.S. 441. Additional flow measurements were attempted in Rocky Creek, however, flow velocities were too low to measure.

Each cross-section was transversely stationed with hubs evenly spaced on 1.0 to 4.0-foot centers, depending on the width of the channel. A staff gage was installed at each section. Stream bed profile elevations and staff gage elevations were precisely leveled to a temporary bench mark for future reference.

Water velocities were measured by means of an Ott propeller meter. The Ott meter is accurate to plus or minus 1% for flows above 0.17 feet/second and is operated so as to provide time-mean-velocity readings over a period of several minutes. A velocity profile was obtained at each traverse station by measuring time-mean-velocities at three depths at each station. Flows between stations were then manually integrated across the stream measurement section to obtain total flow.

Field Investigations and Surveys - For computer modeling purposes, Rocky Creek was divided into 28 channel reaches by a combination of 23 channel cross-sections and five roadway structures (Figure 2.5-5). In addition, several tributaries to Rocky Creek were considered to have sufficient influence upon the analysis that they required limited modeling. Three of these tributaries were broken down into nine channel reaches by six cross-sections and three roadway structures. Profiles for sections R001, R003, R006, R007, R008, R009, R010, R011, R012, R212, R013, R115, R016, and R017 were obtained through field surveys.

The cypress swamps to the north and south of the County road NW18C bridge were considered to be areas where substantial environmental impact could occur and, therefore, received detailed scrutiny. A level traverse was run from a Florida D.O.T. bench mark on SR-121 to the bridge on County Road NW18C to establish a temporary bench mark for this work.

For computer modeling purposes, Cellon Creek was divided into 19 representative reaches containing 16 cross-sections C001, C003, C004, C007, C208, C008, C010, and C012 were established by precise leveling and these profiles were tied to physical features that were identifiable on the Alachua County U.S.G.S. topographical maps. All precisely leveled profiles were calculated to an accuracy of 0.1 feet. Hydraulic structure data for the two farm roads crossing Cellon Creek, which included profiles of the roadway and both the upstream and downstream inverts of all culverts, were also obtained by precise leveling. All information pertaining to the structures located at the Cellon Creek crossing of U.S. 441 was taken from Florida Department of Transportation construction maps. Meander distances, roughness coefficients, and transition stations for section segments were estimated for each channel reach during the profiling of cross-sections.

A level traverse was run from a U.S.G.S. bench mark (Alachua BA 10) near U.S. 441 to Lee Sink in order to tie in 2 stage recorders and Cross-Sections C012, C010, C009 and C208, which were considered of special importance to the analysis. Bench marks for the remaining surveyed cross-sections were established from U.S.G.S. topographical maps. Profiles for Cross-Sections C002, C005, C006, C071, C108, C308 and C011 were developed from a combination of U.S.G.S. topographical maps and adjacent cross-section profiles.

Field investigation along Mulatto Pen Branch involved extensive on-site investigation and verification of control points in the channel. Field measurements and surveys covered 6 significant bridges and culverts, and 30 cross-sections (Figure 2.5-4). Level traverses were performed along Rocky Creek to establish sea level datum at all cross-sections near the confluence with Mulatto Pen Branch. Further, pooling along the middle reaches indicated a flat hydraulic gradient and probable points of constriction in the channel. These conditions were field verified through precise leveling and comparison of predicted water surface elevations with field observations.

Available technical literature on the Santa Fe River was reviewed and summarized for inclusion in this document. Hydraulic and hydrologic characteristics were verified through field observations made at several times during the study period. Close examination of the river channel between Rocky Creek and the bridge at U.S. 27 confirmed the extremely complex nature of the interchange of surface and groundwater flows and the relative impact of flows from the New River and from Olustee Creek. Both recent and long term statistical records collected and evaluated by the Suwannee River Water Management District and the U.S. Geological Survey were reviewed.

Instrumentation and Special Investigations - Instrumentation in the Rocky Creek basin consisted of installation and monitoring of a Richardson-type water level recorder at a gaging station established at cross-section R115. In addition, a non-recording rain gauge was installed near the center of the basin. This work was started in mid-October, 1976, and was unsuccessful in that no significant rainfall was received during the short monitoring period. Efforts were terminated when the water level recorder was vandalized and made inoperative.

Cellon Creek instrumentation consisted of a tipping bucket rain gauge with a battery powered recorder and two Stevens water level recorders. The rain gauge was installed and maintained in the area of the effluent treatment ponds on the General Electric battery plant site. One water level recorder was installed at Cross-Section C009 and the second was placed in the pool at Lee Sink. Daily flow measurements using the Ott meter were made and base flow data were successfully recorded.

In order to determine discharge into the ground at Lee Sink, it was necessary to perform a detailed topographic survey of the sink and the flooded upstream channel and to develop a storage-elevation curve. In this way, changes in storage in the pool at Lee Sink with respect to time could be determined from the record of water level at Lee Sink and the storage-elevation curve. Similarily, flow into the pool at Lee Sink was continuously recorded by means of the water level recorder at Cross-Section C009 and a water level-versus-discharge curve which was developed for this cross-section.

Flow into the ground at Lee Sink was computed for short time increments by subtracting incremental changes in pool storage from cumulative inflow. This flow into the ground was plotted as a function of Lee Sink pool surface elevation in order to develop curves for the hydraulic capacity of Lee Sink.

This instrumentation and these techniques were helpful in evaluating basin hydrology. The highest rainfall during the monitoring period fell on October 8, 1976, and amounted to 1.97 inches in 15 hours. Total runoff from this event amounted to 1.07% of incident rainfall. This amount was found to be in agreement with predicted runoff based on parameters used in the computer model, TR-20. Peak outflow from Lee Sink into the ground was slightly greater than 4 cfs, but considerably less than the anticipated base flow of 7 cfs. Further testing was deemed necessary to confirm stage-discharge values for Lee Sink.

Flooding of the large borrow pit and the adjacent low-lying area upstream of Lee Sink was accomplished by temporarily blocking a 48-inch CMP culvert beneath the haul road between the borrow pit and the channel to the sinkhole. A topographic survey of the borrow pit was made and a storage-elevation curve was calculated. Approximately nine acre-feet of water were impounded in this area. Blocking of the culvert was performed by using 2-inch by 12-inch stop-planks sealed with plastic sheeting. Wire cables, attached to each plank, permitted rapid release of stored water. Discharge into the ground at Lee Sink was again determined by subtracting changes in storage per unit time from inflow into the pool area. The initial effort generated a peak discharge into the ground of slightly more than 5.8 cfs. A second test was conducted with results closely paralleling those of the first test. It should be noted that the high water levels predicted for Lee Sink were developed by extrapolation of the data to discharges much higher than any observed during this study period. Experience indicates that a sinkhole may not achieve maximum hydraulic capacity until it has been flushed a number of times during the rainy season.

Erosion and Deposition Analyses - Potential bedload transport was used to predict changes in erosion and deposition patterns for the open channels being evaluated. The analysis of sediment transport was performed using Einstein's Bedload Function (Einstein, 1950), DuBoys' empirical equation (DuBoys, 1879) and the results of TR-20 and WSP-II computer modeling. These techniques of calculation were employed to establish potential transport rates for the existing condition and for increased, sustained discharges from Deerhaven station.

Field investigation consisted of sampling both bed and bank materials at several representative cross-sections in each creek. A standard sieve analysis was performed on all bed samples and, due to the similarities in size distribution, a composite grain size distribution curve was developed for each creek. Control cross-sections, selected and monitored in each creek, established physical evidence of scour and deposition. Finally, direct observations of various channel reaches confirmed existing areas of scour, deposition, and quasi-equilibrium.

Summary calculations were performed using Straub's values (Straub, 1935) in DuBoys' equation. Preliminary calculations were performed for cross-section C003 (see Figure 2.5-3) using both Einstein's and DuBoys' methods. Results by both techniques were of the same order of magnitude. It should be noted that DuBoys' approach primarily addresses the shear stress relationship between flowing water and soil particles while Einstein's approach includes statistical considerations of flow-induced lift forces. DuBoys' equation was employed in all subsequent bedload transport calculations. These calculations were performed for flows at selected cross-sections located throughout Rocky Creek and Cellon Creek. In all cases, determination of the average shear stress required calculation of an adjusted hydraulic radius reflecting both effective grain size and prevalent bed form. Potential bedload transport rates were then used as a basis of comparison and as an indicator of channel scour and deposition.

Water Quality

Representative sample stations were located upstream of roads, culverts, or other man-made features and marked with numbered aluminum tags.

Separately labelled collection containers were used for major groups of parameters (e.g. nutrients, heavy metals, pesticides, oil and grease, etc.). All containers were pre-cleaned in the laboratory and rinsed twice with the ambient water prior to sample collection. Grab samples were collected in mid-channel at mid-depth. Those collected from swamps or marshes were taken from the approximate center.

Hydrogen sulfide was collected in 4 mid-stream subsamples with a 35 cc syringe. Each subsample was injected below the surface of 2 ml of zinc acetate in a 4 oz. nalgene bottle, with care taken not to aerate the sample. Preservation/fixation was completed by adding 2 ml of sodium hydroxide (APHA, 1975).

Samples collected for metals analysis were acidified in the field with concentrated nitric acid. Upon return to the laboratory, all samples were stored at 4° C until analyzed.

In situ analyses of dissolved oxygen (DO) were performed with a YSI Model 57 dissolved oxygen meter equipped with a YSI 5739 probe and a YSI 5791A submersible stirer. Temperature and conductivity analyses were made with a YSI Model 33 S-C-T meter equipped with a YSI 3300 conductivity/temperature probe.

The analytical methods employed for all of the above water quality parameters are listed in Table 6.1-1.

Table 6.1-1 Water Quality and Sediment Characteristics Measured, Methods of Analysis, Detection Limits and References

Characteristics	Method of Analysis	Detection Limit	Units	Reference
Aluminum	Atomic Absorption	0.1	mg/l	EPA Storet 01105
Arsenic	Silver Diethyldithiocarbamate	0.03	mg/l	Std. Methods 404 A
Cadmium	Atomic Absorption	0.0005	mg/l	EPA Storet 01027
Cyanide	Distillation, pyridine-pyrazalone	0.02	mg/l	EPA Storet 00720
Chromium	Atomic Absorption	0.01	mg/l	EPA Storet 01034
Hexavalent Chromium	Colorimetric	0.01	mg/l	Std. Methods .211(11) D 1971
Copper	Atomic Absorption	0.001	mg/l	EPA Storet 0.1042
Iron	Atomic Absorption	0.01	mg/l	EPA Storet 01045
Lead	Atomic Absorption	0.01	mg/l	EPA Storet 01051
Manganese	Atomic Absorption	0.01	mg/l	EPA Storet 01055
Mercury	Flameless Atomic Absorption	0.0002	mg/l	EPA Storet 71900
Molybdenum	Atomic Absorption	0.1	mg/l	EPA Storet 01062
Nickel	Atomic Absorption	0.01	mg/l	EPA Storet 01067
Zinc	Atomic Absorption	0.005	mg/l	EPA Storet 01092
Ammonia	Automated Phenolate	0.01	mg/l	EPA Storet 00610
Kjeldahl Nitrogen	Automated Digestion, Phenolate	0.05	mg/l	EPA Storet 00625
Nitrate	Automated Cadmium Reduction	0.01	mg/l	EPA Storet 00630
Total Phosphorus	Manual Digestion, Automated Single Reagent	0.01	mg/l	Std. Methods 425 C (1975) and EPA Storet 70597
Sulfates	Gravimetric	0.1	mg/l	Std. Methods 427 A (1975)
Sulfides	Titrimetric - Iodine	0.1	mg/l	Std. Methods 428 D (1975)
Free Mineral Acidity	Electrometric Titration pH 3.7	0.1	mg/l	Std. Methods 201 (1971)
Total Organic Carbon	Combustion - Infra Fed	1	mg/l	EPA Storet 00680
Magnesium	Atomic Absorption	0.0005	mg/l	EPA Storet 00927
Calcium	Atomic Absorption	0.003	mg/l	EPA Storet 00916
Alkalinity	Potentiometric titration	0.2	mg/l	Std. Methods 403 (1975)
Hardness	EDTA Titrimetric	0.1	mg/l	Std. Methods 309 B (1975)
Total Dissolved Solids	Total Filtrable Residue @ 103/105°C	1	mg/l	Std. Methods 208 C (1975)
Color	Platinum, Cobalt Visual	1 Unit		Std. Methods 204 A
Turbidity	Hach 2100 A Turbidimeter	0.02	NTU	Std. Methods 214 A
Sulfate in Sediment	HCl Digestion, Gravimetric	0.1	mg/l	Private Communication, EPA Region IV
Sulfide in Sediment	HCl HNO_3 Digestion, Atomic Absorption			
Heavy Metals in Sediment:				
Chloride	Argentometric	0.1	mg/l	Std. Methods 4084 (1975)
Fluoride	Distillation - Electrode	0.01	mg/l	Std. Methods 414 A & B (1975)
Sodium	Atomic Absorption	0.002	mg/l	EPA Storet 00929
Potassium	Atomic Absorption	0.005	mg/l	EPA Storet 00937
Conductivity	Texas Instruments Conductivity Bridge	0.1	µmhos/cm	Std. Methods 215 (1975)
pH	Electronic Glass Electrode	0.01 Unit		Std. Methods 424 (1975)
Total Dissolved Oxygen	Membrane Electrode (TI)	0.1	mg/l	Std. Methods 422 F (1975)
Biological Oxygen Demand	5 day incubation @ 20°C TI/DO Analyzer	0.1	mg/l	Std. Methods 507 (1975)
Chemical Oxygen Demand	Dichromate Oxidation Titration	0.1	mg/l	Std. Methods 508 (1975)
Oil & Grease	Partition Gravimetric	0.1	mg/l	Std. Methods 502 A (1975)
Phenols	Distillation-Extraction Colorimetric	0.001		Std. Methods 510 A & B (1975)
Detergents	Methylene Blue Colorimetric	0.002	mg/l	Std. Methods 512 A (1975)

Table 6.1-1 Water Quality and Sediment Characteristics Measured, Methods of Analysis, Detection Limits and References (continued)

Characteristics	Method of Analysis	Detection Limit	Detection Units	Reference
Aldrin	Extraction-Florisil Cleanup Gas Chromatography - EC Detector	0.001	mg/l	Std. Methods 509 A
Chlordane		0.003	mg/l	
DDT		0.005	mg/l	
DDE		0.005	mg/l	
Dieldrin		0.001	mg/l	
Endrin		0.0002	mg/l	
Heptachlor		0.0001	mg/l	
Heptachlor Epoxide		0.0001	mg/l	
Lindane		0.004	mg/l	
Methoxychlor		0.1	mg/l	
Toxaphene		0.005	mg/l	
2,4 D (Acid)	Extraction-Ethylation, Gas Chromatography W/EC Detector	0.01	mg/l	Std. Methods 509 B
2,3,5 TP (Silvex)		0.01	mg/l	Std. Methods 509 B
Chloroform Other Chlorinated Hydrocarbons	Gas Phase Stripping, Gas Chromatography W/EC Detector	0.01		EPA 670/4-74-009 Bellar & Lichtenberg

Pesticides in sediments extracted and analyzed in accordance with EPA "Manual of Analytical Methods for the Analysis of Pesticide Residues in Human and Environmental Samples" Section 11, B (ff)

Sediments - Sediment samples were collected primarily at water sampling locales. Initially, a hand-operated linear type core sampler was used; however, problems in pushing the sampler through fibrous root mats, removing the core, and carrying the sampler to remote areas necessitated direct collection by hand. Samples taken by hand were approximately the upper 5 cm of sediment. Sediments were placed in labeled double Ziploc bags for heavy metal, pesticide and herbicide analyses. Samples intended for sulfate and sulfide analysis were collected under water in labeled wide-mouth glass bottles to which zinc acetate was then added to prevent the loss of hydrogen sulfide. All samples were stored in the laboratory at 4° C until analysis was begun.

Data Interpretation - Any abnormalities in water quality and sediment data were examined and the corrected data keypunched for computer analysis. The raw data printout was checked for input processing and corrected. SAS-76 was used for data management and statistical analysis.

Duncan's multiple range test with Kramer's adjustment for unequal cell frequencies was employed to determine which variables were significantly different. In order to use Duncan's procedure, the data were grouped to represent stream segments. From Duncan's procedure and visual inspection of the data, the parameters were categorized as: (1) those which showed no significant difference between streams and segments of streams; (2) those that were significantly higher in the segment of Cellon Creek below the battery plant outfall; (3) those that were significantly higher in the present Deerhaven discharge ditch and associated on-site swamp; and (4) those that were significantly higher in portions of streams receiving only agricultural runoff or inputs.

A Hewlett-Packard Model 25 desk-top calculator was programmed to test the significance between mean concentrations of sediment parameters. The t-statistic for two means which has the t distribution with $n_1 + n_2 - 2^o$ of freedom was used to test the null hypothesis at the 5% probability level.

Existing water quality was compared to water quality standards (State of Florida FAC Chapter 17-3; EPA, 1976). STORET, Alachua County Department of Pollution Control, and USGS data were used to further characterize the regional and local area water quality, including that of Turkey, Cellon, and Rocky Creeks.

Water Flow - Current was measured with a Marsh-McBirney Model 201 portable water current meter. Prior to use, the meter was checked against a previously calibrated meter and later rechecked for accuracy in the flow tank at the University of Florida Hydrology Research Laboratory. Accuracy was ±4% (average) which is in agreement with the manufacturer's specifications. At each sampling station current was recorded at 0.2 and 0.8 of the depth from the creek bottom where the water was 0.5 to 1.5 feet deep. In places where the water was too shallow to take 2 readings, 1 reading at mid-depth was taken, while in places where depth was greater than 1.5 feet, all measurements were taken 0.6 of the depth from the bottom. Velocity was measured at 5 to 10 points equally spaced across the stream. Width and depth were measured with a tape measure and used to calculate cross-section areas (ft^2).

6.1.2 Groundwater

6.1.2.1 On-Site Shallow Groundwater Table

At present, no long-term data exist which show the behavior of the perched on-site groundwater table. Water levels were recorded in some auger borings performed during September, 1976. These boring logs are presented in Section 2.4 along with selected cross-sections showing assumed soil stratification and groundwater elevations. Groundwater table observations were made following three successive rain-free days. The greatest depth of the water table was found to be approximately 6 feet. However, in most borings the depth was found to be 2 to 3 feet and in the southern part of the site, the depth was found to be only 1 foot below ground surface. Simplified mathematical and computer models indicated little possibility for reliable on-site cooling tower blowdown disposal by percolation. Such models also inferred low lateral groundwater seepage. These conclusions correlate well with observations of plant operating personnel that surficial soils are completely saturated during some parts of the year and that most rainfall leaves the site as surface runoff during those periods.

Leachate Program

The leachate program consists of a network of on-site soil borings, a network of observation wells monitoring the potentiometric surface and continuous recording of groundwater elevation at key observation wells. Permeability testing will be performed on undisturbed soil samples and by means of pumping tests of surficial sands. Modeling will be performed to predict the potential leachate movement.

6.1.2.2 Floridan Aquifer

The condition of the Floridan Aquifer in the study area has been obtained from information published by the Suwannee River Water Management District, the United States Geological Survey, the Department of Natural Resources, and logs and tests of area water supply wells.

6.1.3 Geology

Geological information presented in this document has been obtained from publications of the U.S. Geological Survey, the Florida Geological Survey, the U.S. Department of Agriculture Soil Conservation Service, and from well logs, drilling logs, and geological reconnaissance of the area. It should be noted that the site has been "proof loaded" by the existing generating plant and associated structures for approximately 5 years with no evidence of soils or geological instability.

6.1.4 Ecological

Macroinvertebrates

Benthic macroinvertebrates were initially collected with standard Ekman grabs (232.2 cm^2), which are light and well-suited to soft, finely-divided substrates (EPA, 1973), such as are found in streams of the project area.

Grabs were taken in representative portions of streams away from roads, bridges, culverts, or other man-made structures. Proceeding upstream at each station, grabs were taken from near the left bank, at the center, and near the right bank in sequence. Four replicates of 4 grabs each were taken for each station, sieved through U.S. standard 30 mesh screen, transferred to labelled double Ziploc bags, and kept separate as basic analysis units (Southwood, 1974; Atomic Industrial Forum, 1974). In addition, a 5 minute sweep sample was taken at each station; the sweep net was moved upstream as sediment was agitated ahead of it.

In order to sample other habitats and to supplement the organism lists, stream width samples were taken with a 4 x 15 foot x 0.25 inch mesh minnow seine in a known area of stream.

Invertebrates were picked within 72 hours, or preserved in ethanol and stored at 4° C. After picking, all organisms were put into labeled vials with 70% ethanol.

Organisms were identified to the lowest possible taxon (Ward and Whipple, 1959), and checked against a reference collection.

After identification, the benthic communities of each station were evaluated according to the Biotic Index (Beck, 1955), Shannon-Weaver diversity (EPA, 1973), equitability (MacArthur, 1957; EPA, 1973), and population density (number/m^2). These indices, based primarily on Ekman samples, were then used to estimate overall stream sensitivity and quality.

Fish

Fish were collected with minnow seines and trot lines. The seines were 0.25-inch mesh lined with mosquito netting. At each collecting station a block net was placed upstream of the seine, which was then moved to the block net. Care was taken to probe under overhanging banks, to pass closely over and around obstructions, and to keep the lead line in contact with the block net until the seine was lifted clear of the water; 1 team member watched to see that no fish escaped under or over the seine or block net.

Standing crop was determined from the surface area and volume of each stream segment seined.

The trot lines carried No. 6, 7, and 4-0 hooks baited with liver or cut fish and were checked once a day for 5 days.

Specimens were put into labelled double Ziploc bags with 10% formalin. Later, they were sorted and transferred to labeled glass jars and preserved (Knudsen, 1972).

Fish were identified to the lowest possible taxon using accepted keys (Blair, et al, 1968; Eddy, 1969; Carr, 1937).

Small specimens were weighed on a Mettler analytical balance, larger ones on an Ohaus triple beam balance or a spring type fish scale. Length (cm) was determined on a fish board. Numbers and weight (g) of each catch were used to extrapolate and estimate standing crop for each species and for all fish at the station, subsystem, and the system level (Ricker, 1971).

Reptiles and Amphibians

Herptile surveys and collections were made using dip nets, turning over debris with a potato rake, excavating and screening sediments, and walking shorelines. Additional specimens were captured on trotlines intended for fish or observed during other field studies. Uniformity was attempted by spending equal time at each station.

Specimens were identified to the lowest possible taxon using accepted keys (Altig, 1970; Carr and Goin, 1955; Conant, 1975), then checked against expected species lists for the habitat types afforded by each stream.

Terrestrial Vegetation

Determination of the composition and extent of vegetation communities and land use types for the respective creek basins was accomplished using belt transects, existing ASCS aerial photographs, new aerial color infrared photographs, planimetric readings, vehicular and on-foot ground truthing, and individual plant specimen identification.

Thirty-two belt transects were established along the perimeters of the Rocky Creek swamps (Figure 6.1-1). The beginning of each transect was marked with a numbered tag affixed to a tree or plastic stake. Dominant plant species were recorded at 10 to 50 foot intervals along each transect, depending on homogeneity. Changes in elevation were recorded with a Leitz MS-27 stereoscope. A Leitz 28253 planimeter was used on photographs to determine acreages. Areas of interest were planimetered at least three times for accuracy. Plant specimens were identified using accepted keys (Kurz and Godfrey, 1962; Radford, et al, 1968).

Salt Drift Deposition Calculations

In lieu of a predictive model for salt drift deposition, (Section 5.2.2) empirical observations on the extent of drift were derived from the literature and used to identify a probable deposition zone. Using the projected drift rate of 20,000 gallons/day for Units 1 and 2 combined (Burns & McDonnell, 1977) and the expected solids concentrations of the recirculating cooling system waters (Section 3.3.7). An estimate of total salt drift was made which was assumed to be evenly dispersed

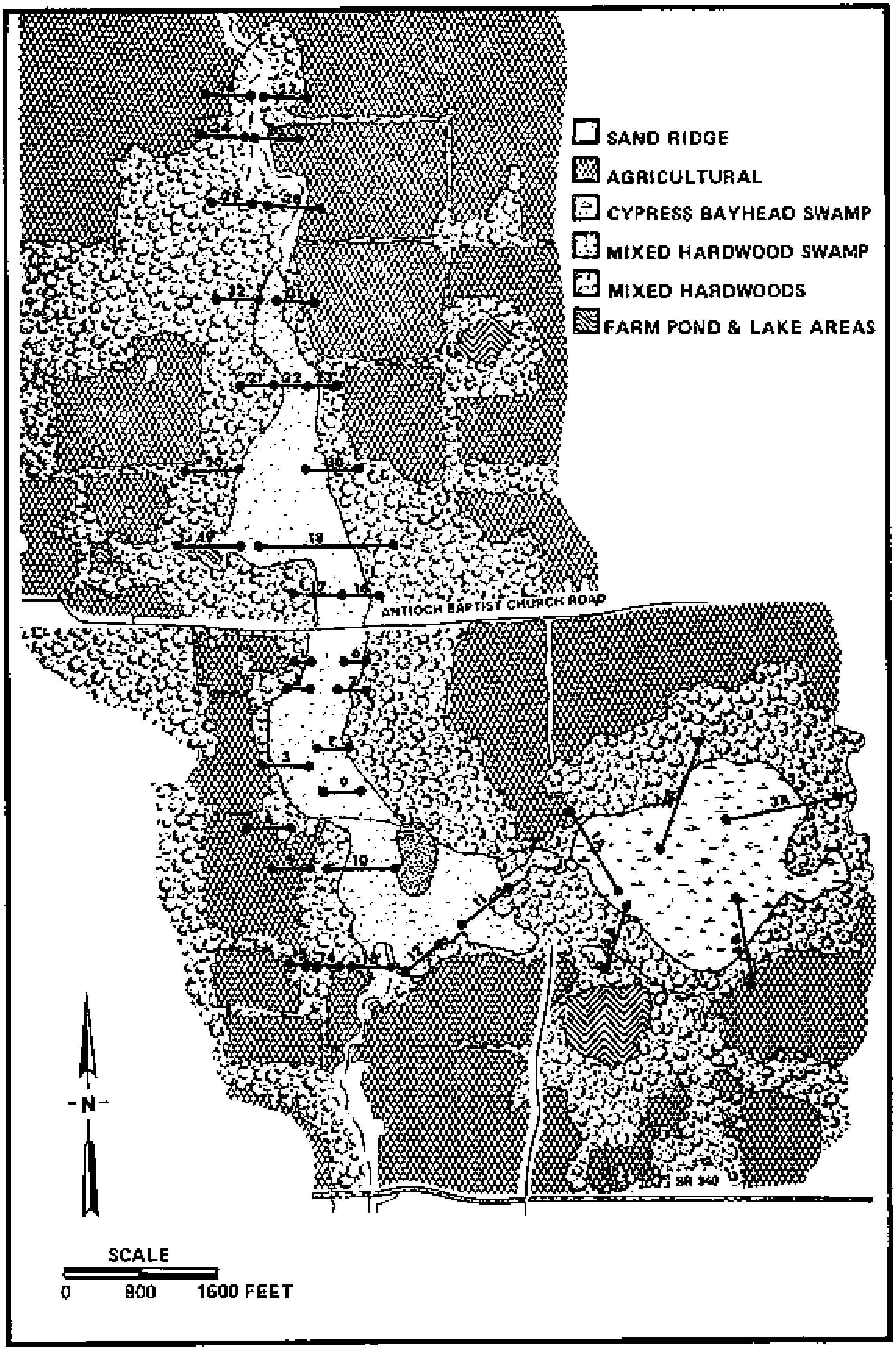

FIGURE 6.1-1 LOCATION OF ROCKY CREEK SWAMPS VEGETATION TRANSECTS.

throughout the deposition zone. While the underlying assumptions from this type of analysis are highly simplistic and the results therefore are of only marginal predictive value, it should serve to adequately identify whether cooling tower drift from the planned facility is potentially detrimental to the environment.

6.1.5 Archaeological and Historical Survey and Assessment Methods

An archaeological and historical study was performed. A total of 23 man-days was spent on the project, 5 in documentary research and interpretation, 9 in field work, and 9 in materials analysis and report preparation.

Methods used in the study may conveniently be divided after the example of Mueller (1974) in the categories of objectives, strategies, tactics, and tasks. Objectives designated before beginning the project included: (1) identify properties listed in or under consideration for nomination to the National Register of Historic Places; (2) conduct a literature and documentary search to determine known site locations and to permit the prediction of areas with high site potential; (3) conduct an intensive survey of the impact area to locate prehistoric, historic, and architectural properties; (4) evaluate all sites in terms of National Register criteria and potential impact; (5) propose a program of mitigation including research design, public and scientific value, and cost; and (6) prepare a detailed report of investigations.

A strategy may be considered a general plan for achieving the objectives of a project, while tactics are minor plans useful for organizing work in specific areas. Strategies were developed both before and during the study, and, for the most part, were determined by standard or current archaeological and historical research procedures. For example, collection of site location data from areas surrounding the survey area was useful in predicting potential archaeological site distribution on the property. Aerial photography from 1938 to 1974 was studied to gain knowledge of past land use, disturbance, and historic site distribution. Also, documentary research by a historian was carried out using historical sources at state libraries, deed and survey records at the Florida Bureau of Public Lands, and Alachua County deeds and tax rolls.

Tactics used during the archaeological survey were chosen to suit the nature of various areas of the tract with respect to natural features, accessibility, degree of disturbance, and potential for site location. Since ground cover was dense over most of the tract, and because much of the habitable, dry ground had been disturbed during cultivation for planted pines, some areas were not tested except where access and surface exposure was provided by trails, fire lanes, dirt roads, or similar disturbances. A tactic heavily relied upon was interpretation of aerial photographs. Stereo pairs of various scales, flown in 1938, 1949, 1961, and 1974, were examined to gain an understanding of environments and landscape features. Blue line prints of 1974 coverage, with a scale of 1 inch = 400 feet, were used during field work to plan survey routes, plot site locations, and identify vegetation types.

The survey was accomplished by one archaeologist on foot. Vehicle reconnaissance was precluded by lack of good roads and poor surface exposure. Approximately 31 miles were walked, about two-thirds of this on the Deerhaven tract. All such soil exposures as dirt roads, ditches, trails, fire lanes, railroad embankment, cleared ground, fence lines, and power line cuts were searched for surface material. Subsurface testing was done in areas where artifacts were found on the surface.

A list of tasks accomplished:

1. Check Florida Master Site File at Florida Division of Archives, History and Records Management,
2. Consult National Register and staff of State Historic Preservation Officer for sites in process of nomination,
3. Check site records and survey data at Florida State Museum,
4. Interview archaeologists at Florida State Museum,
5. Conduct literature search,
6. Plot known site distribution,
7. Predict potential site locations and functions as allowed by data,
8. Search surveyor's field notes and plat sheets from mid-nineteenth century at Bureau of State Lands,
9. Search map collection at P. K. Yonge Library of Florida History,
10. Interview RUB personnel at Deerhaven about artifact finds,
11. Plot artifact locations,
12. Walk all available soil exposures,
13. Walk and test creeks, pond margins, and suspected site locations,

14. Interview local residents,
15. Search historical sources at R. M. Strozier Library and P. K. Yonge Library,
16. Search Alachua County deed books and tax rolls,
17 Search State of Florida deed books,
18. Interview Historic Gainesville, Inc. for results of Alachua County historic building survey,
19. Evaluate results of documentary study,
20. Walk pipeline corridors,
21. Assemble site data,
22. Determine National Register eligibility in consultation with staff of State Historic Preservation Officer,
23. Analyze occupation and environmental data, and
24. Prepare report.

6.1.6 Identification of Alternative Siting Areas

Alachua County was surveyed to identify areas potentially compatible with the siting of the proposed power generating facility. Alternatives were identified using a modified McHarg overlay approach (McHarg, 1969) for cumulatively excluding areas from consideration on the basis of land use or environmental incompatibilities. Excluded areas were delineated by shaded screens on a transparent overlay of the county base map (Figures 8.1-1 through 8.1-3). All overlays were then composited onto a single map to identify alternative siting areas as those not superimposed by a shaded screen (Figure 8.1-4). Final analysis of alternative areas for the purpose of identifying the best siting location was made on the basis of facility support features and economic considerations (Section 8.1).

6.1.7 Noise Survey Method

A noise survey of the site was completed on October 4, 1977. Measurements were made during afternoon hours with a clear sky, a moderate wind from a northerly direction and ambient temperatures near 75° F. The instruments used included a B & K type 2202 Precision Sound Level Meter, a B & K type 4230 Acoustic Calibrator and a B & K type UA 0207 Windscreen. The windscreen was attached to the sound level meter during all measurements and a calibration check was performed both before and after the period of measurements (on the same day).

Eighteen sampling locations were selected of which four were on the site near (within 15 meters) major noise sources from Unit No. 1. The remaining locations were around the perimeter of the site. Figure 6.1-2 shows the noise level sampling locations.

6.1.8 Air Quality

Ambient Air Quality Monitoring Program

A ambient air monitoring network, that has grown to nine stations, has been operated in Alachua County by the Alachua County Pollution Control District since 1973. Total suspended particulate matter (TSP), sulfur dioxide (SO_2), and/or nitrogen oxides (NO_x) have been monitored at these sites. The original monitoring site in the Alachua County area, as required by the State Implementation Plan (SIP), was established by the Florida Department of Environmental Regulation (FDER) in September 1972. This site, designated as B in Figure 6.1-3, was operated initially by FDER and later by the Alachua County Pollution Control District.

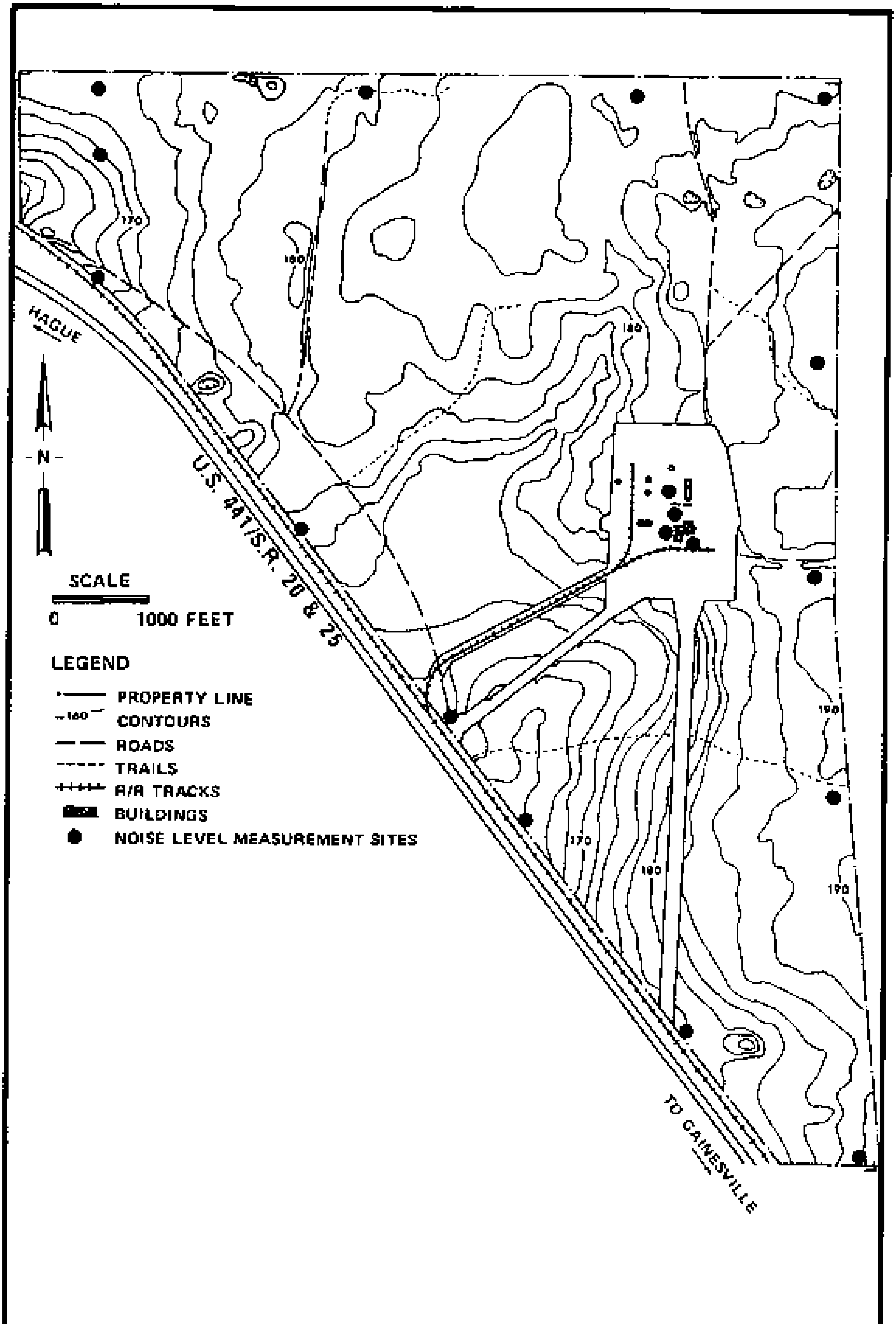

FIGURE 6.1-2 NOISE LEVEL SURVEY MONITORING SITES DEERHAVEN SITE, GAINESVILLE, FLORIDA.

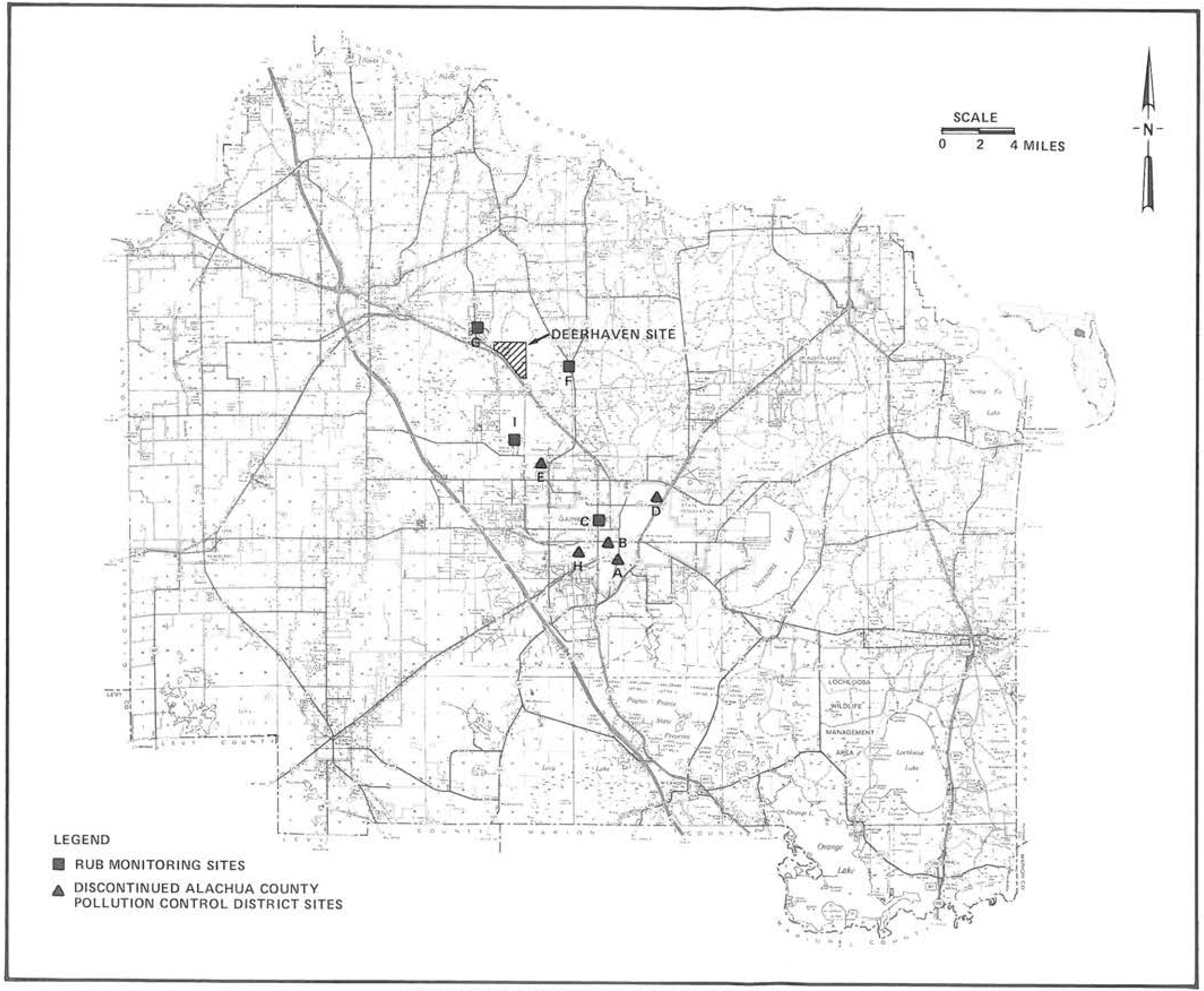

FIGURE 6.1-3 AIR QUALITY MONITORING SITES.

In November and December of 1974, six additional monitoring sites, identified as A, C, D, E, F, G and H in Figure 6.1-3 were established. Sites A, D, E and H were county sites and sites C, F, and G were RUB sites operated by the county.

An additional monitoring site was established (site I, Figure 6.1-3) and site G moved to its present location in February 1977 by RUB. These monitors are also operated by the county. The pollutants monitored at each of these sites are listed in Table 6.1-2.

The monitors at each site were operated on a six-day schedule corresponding to the schedule adopted by the U.S. Environmental Protection Agency (EPA) and the FDER. The monitoring methods employed were reference methods adopted by EPA and published in Title 40, Part 50, Code of Federal Regulations at the time of program implementations. EPA later discovered deficiencies in the SO_2 and NO_x monitoring methods. The deficiencies in the NO_x monitoring method were announced by EPA in June 1972 while the deficiencies in the SO_2 monitoring method were announced in December 1974. Although criticism has been directed toward the TSP monitoring method, no serious deficiencies have been announced.

In December 1976 RUB purchased temperature controllers for the four samplers in the monitoring network supported by that agency. The temperature controlled samplers were installed te overcome the deficiency of the SO_2 monitoring method. In June 1973 EPA published a

Table 6.1-2 Air Quality Monitoring Sites and Pollutants Monitored
Alachua County, Florida

Identification[1]	Site Activated	Site Discontinued	Responsible Agency	Pollutants Monitored TSP	SO_2	NO_x
A	9/1972	10/77	County[2]	x	x	x
B	11-12/1974	10/77	County	x		
C	11-12/1974	-	RUB[3]	x	x	x
D	11-12/1974	10/77	County	x	x	x
E	11-12/1974	10/77	County	x		
F	11-12/1974	-	RUB	x	x	x
G	10/1976	-	RUB	x	x	x
H	11-12/1974	10/77	County	x		
I	2/1974	10/77	RUB	x	x	x

(1) See Figure 6.1-3.
(2) County - Alachua County Pollution Control District
(3) RUB - Gainesville-Alachua County Regional Electric, Water & Sewer Utilities Board; these sites operated by the County prior to 10/1977 and by private contractor subsequent to 10/1977.

candidate monitoring method for NO_x which was adopted by the county in December 1976. The official reference method later specified was the gas phase chemiluminescenct method (U.S. EPA, 1976). When specifying the new reference method, EPA also stated that the sodium arsenite manual method, the method adopted by the county in 1973, was evaluated and found to have good performance. However, the method has not yet been specified as an equivalent method.

In summary the SO_2 data collected in the Alachua County area except those samples collected at the four RUB sites prior to January 20, 1977 are suspect because of the temperature instability of the monitoring method. Likewise, all NO_x monitoring data collected in the Alachua County area prior to June 1973 are also suspect since the reference method is not utilized. TSP monitoring data collected in the Alachua County area appears to be valid.

On October 1, 1977 the operation and maintenance of monitoring sites C, F, G and I (those owned by RUB) were taken over by a private contractor. The five remaining sites in the county were continued to be operated by the ACPCD. The monitoring methods used in the RUB network are:

TSP: The high-volume air sampler method specified by the U.S. Environmental Protection Agency in 40 CFR 50, Appendix B.

SO_2: The paraosaniline method specified by the U.S. Environmental Protection Agency in 40 CFR 50, Appendix A, with the temperature controlled to less than 68° F (20° C).

NO_x: The monitoring method for nitrogen oxide is the sodium arsenite method as published in the Federal Register, volume 38, number 110, page 15174, June 8, 1973.

Modeling

While the above ambient monitoring network has been in operation for several years, air quality models were used exclusively for establishing pre-certification as well as post-operational ambient levels of SO_2 and NO_x. This is due to the discoveries that the SO_2 monitoring method was temperature sensitive above temperatures of 68° F (20° C) and that deficiencies less well defined, but equally serious, existed with the NO_x sampling method.

The monitoring method used for TSP, is the high-volume sampling method adopted by EPA (40 CFR 50, Appendix B). No major discrepancies have been discovered with this sampling method. Data collected by the Alachua County Pollution Control District using this method were evaluated during the establishment of pre-certification air quality. It was determined that the TSP monitoring data could best be used to establish background TSP concentrations and that air quality models could best be used to establish the spacial distribution of TSP and to establish the highest TSP levels to be expected in the County for the pre-certification and post-operational time periods.

TSP levels measured at Alachua County Pollution Control District monitoring site 10-0020-101 (site F, Figure 6.1-3), located approximately 1.9 miles

(3 kilometers) southeast of the Deerhaven site, was selected to establish TSP background levels. The methodology used in establishing annual and twenty-four hour background levels is described in Section 2.8.

Background levels of SO_2 and NO_x were assigned values of zero. This is to say that all SO_2 and NO_x discharged into the ambient air in the Alachua County area is from anthropogenic sources.

Ambient levels of TSP, SO_2 and NO_x above background levels was determined by air quality modeling and procedures promulgated by the U.S. EPA and adopted by the FDER. These techniques require that air quality modeling be conducted to establish annual average TSP, SO_2 and NO_x levels; that short-term modeling be conducted to establish twenty-four hour levels of TSP and SO_2; and that short-term modeling be conducted to establish three hour ambient SO_2 levels. The air quality models used for these tasks were the AQDM with the Briggs plume rise equation, and the PTMTPW. The AQDM was used for annual average modeling and the PTMTPW was used for twenty-four hour and three hour air quality modeling.

Description of AQDM

The Air Quality Display Model (AQDM) is a computer program designed to estimate the spacial distribution of pollutants over a long-term averaging time. The computer code for the AQDM was developed in 1968 and has been modified since to accomodate changes in the state-of-the-art of air quality modeling. The version used for the Deerhaven site studies is defined as the AQDM with the Briggs plume rise equation.

The model is based on the Gaussian-diffusion equation which describes the horizontal and vertical spread of a plume as it is transported downwind from a continuously emitting point or area source. The model is utilized to compute annual arithmetic average ground-level pollutant concentrations resulting from specified point and area sources. The model calculates the impact of each source on each receptor for observed combinations of wind direction, wind speed, and atmospheric stability. The relative frequency of occurrence for each combination is stored as a factor, and the resulting factors are summed for each receptor over all combinations of meteorological conditions and all sources.

The plume is assumed to be normally distributed about its center line (i.e., a Gaussian distribution) in the vertical direction and distributed as a linear function of crosswind distance in the crosswind direction. The pollutant distribution in the vertical direction is controlled by the magnitude of the vertical standard deviation of pollutant concentration. The program uses the vertical standard deviation values given by Pasquill (1961) and Gifford (1961). These values are functions of the source-receptor downwind distance and atmospheric stability category. The stability categories (1 through 5, in order of increasing stability) are defined on the basis of the objective criteria specified by Turner (1964). These categories are used to define both the standard deviation of the plume concentration distribution and the mixing depth of the atmosphere.

Input data to the AQDM includes the following:

A. Receptor Data - Up to 225 receptor locations corresponding to the intersections in a grid pattern having equidistant vertical and horizontal spacing may be specified, together with a maximum of twelve individually located receptors.

B. Source Data - Both area and point sources may be specified. For each point source the location, average annual emission rate and stack parameters must be specified. The stack parameters (physical stack height, stack exit diameter, effluent exit velocity, and effluent temperature) are used to obtain the effective height of release for use in the diffusion calculations. For each area source (assumed square in shape) the area, centroid location, average annual emission rate, and effective height of release must be input.

C. Meteorological Data - These data give the relative frequency of occurrence for each wind direction, wind speed class, and stability category combination as observed for the region and time period of interest. The data represent sixteen wind directions, six wind speed categories and five atmospheric stability categories. In addition to these data an annual average mixing depth and ambient temperature must be specified.

PTMTPW Description

The PTMTPW (point/multiple point) air quality model was developed by EPA to predict hourly concentrations of pollutants at several pre-selected receptor locations resulting from emissions from several point sources. The location of the receptors and the location of the point source are pre-defined by a rectangular grid system.

The model is based on the Gaussian-diffusion equation which describes the spread of a plume as it is transported downwind from an elevated continuous emitting point source. The plume spread in the horizontal and vertical directions is defined by the Pasquill-Gifford dispersion coefficients. Plume spread in a downwind distance is defined by wind speed. The plume rise is calculated according to the Briggs (1969) plume rise model (Briggs, G.A., 1969).

For each source receptor pair the downwind and crosswind distances are calculated. If the downwind distance is closer than the distance required for the plume to attain its final height the plume rise for the distance is calculated. The concentration from the source at the receptor is then determined by the Gaussian model using the calculated downwind, crosswind and plume height distances. This procedure is repeated to determine the contribution of each source to each receptor for each hour of meteorological data input.

The number of hours of meteorological data can vary from one to twenty-four. If multiple hours of meteorological data are input the model will average the hourly pollutant concentrations at each receptor over the number of hours of meteorological data input. For example, if twenty-four hours of meteorological data are input the resulting model output will be a twenty-four hour average pollutant concentration at each receptor.

The input data to the model includes:

A. Receptor Location - The location of each receptor is defined by its location in a rectangular grid system. The elevation of the receptor, if different from the elevation of the air pollution source base, can also be defined.

B. Source Data - Emission data from up to 25 point sources can be input to the model. For each source the location, as defined by a rectangular grid system, must be specified. In addition the pollutant emission rate, stack height, stack gas temperature, stack gas velocity, and stack diameter must be defined.

C. Meteorological Data - Hourly values for wind direction, wind speed, atmospheric stability, mixing height, ambient temperature, and ambient pressure must be specified. For determining the maximum expected twenty-four hour and three hour pollutant concentrations. The meteorological data used with the PTMTPW for the Deerhaven site is described in Section 2.8.

6.1.9 Socio-economics

Socio-economic data and information used to assess social and economic impacts were collected in a variety of ways. Initially, published secondary information such as planning reports, labor publications, newspapers and periodicals were collected and reviewed. In addition, intensive interviewing of key community individuals was conducted in order to gain a better understanding of community socio-economic characteristics and attitudes.

6.2 Pilot Injection Well Program

The program is designed to test the feasibility of injecting process water into very deep saline water zones that are totally isolated from the surficial environment and fresh groundwater resources. The principal purpose of the program is to explore the feasibility of deep injection as the best alternative for effluent disposal in terms of protecting public health and the natural environment. RUB has intensively investigated a number of other alternatives for the disposal, and has reached the conclusion that the highest degree of protection to public health and the environment would be achieved if the process water were to be stored at great depth where it could in no way impact the environment.

Currently, a test well is being constructed to a depth of approximately 3,300 feet, with the final casing string installed to a depth of 2,000 feet to isolate the well from geologic formations that are known to contain fresh water. The remainder of the hole is being drilled with a highly controlled fresh water mud, after which geophysical logs will be run to define water quality and to indicate potential injection zones. Upon completion of this work, injection tests will be conducted, using fresh water, to define the hydraulic characteristics of the deep beds and to provide information needed for the design of a permanent injection well. Depending on the permeability characteristics, RUB may design the permanent well to inject only a very small quantity of process water or, if the situation proves to be extremely favorable, to inject somewhat larger quantities.

A key element to be investigated in the testing of the injection well will be the pressures required for injecting fluid at different rates. Careful testing will be conducted and the test results will be evaluated by different quantitative methods to show patterns of pressure change with time, with distance from the injection facility, and at different assumed rates of injection. Because the ultimate objective is to make certain that injection pressures in the injection well do not exceed the 0.5-psi requirement, a series of predicted responses will be developed so that DER will have the best advance information on how the injection facility will function. In any event, if the program proceeds into an operational stage, detailed measurements will be made continuously of pressure changes in the injection well and in the monitoring well to verify the initial findings, and if at any time these pressures were to approach the stipulated maximum, the injection rate would be reduced or other corrective changes would be made in the operation of the system. The key fact to be determined, of course, is the maximum pressure in the system, which will be that recorded in the injection well itself. All other pressure changes at various distances from the well will be less than the one recorded in the well itself.

Based on an analysis of the oil test well data and other geologic information for this part of Florida, it is anticipated that some degree of permeability will be found in the potential injection zone. What is unknown at this time is whether this permeability will be high enough to support injection at the desired rate, and acquiring this information is, of course, the primary purpose for installing the test well. No other injection wells have been drilled into the deep saline zone within distances of many miles from the RUB site, and it is probably unwise to extrapolate findings from these more distant wells. At the closest such well, however, which was installed roughly twelve miles northeast of the RUB site, there apparently were good indications of an injection potential at the depths to be penetrated by the RUB well. Unfortunately, this nearest well was never completed successfully and was abandoned as a result of sanding problems that occurred in the deeper layers. The sanding problem appears to have been caused by acidizing the injection zone to improve its permeability.

Throughout the entire investigation, the highest level of field supervision and scientific control is being exercised, in order to provide a very detailed analysis of the hydrogeologic sequence from land surface to bedrock. Experienced geologists are present at all times during the drilling to collect geologic information, water quality information, data on water levels and head changes, and information on the respective permeabilities of the different layers that will be penetrated. Water samples will be collected to compare the characteristics of the injected water with those of the native groundwater in the injection zone. It is anticipated that the chemical quality of the native groundwater in the injection zone will be at least equal to that of sea water and perhaps even may be several times more concentrated than sea water. All regulatory requirements with regard to design of the well, operating procedures, pressure requirements during injection, and other similar elements will be strictly adhered to during the test program.

Drilling Program

Two drilling methods are being used to construct the well: conventional mud-rotary and air-reverse rotary. The test hole has a diameter of 9 5/8 inches and will have an approximate ultimate depth of 3,300 feet. During the drilling of the upper part of the hole, which was first by the mud-rotary method and later by the air-reverse method after losing circulation, open mud pits were used because the water was still fresh. While drilling below a depth of 1,270 feet, the drilling fluids are being contained in leak proof concrete tanks rather than open mud pits.

An organic based mud "Dristac" is being used for drilling from 2,400 feet to the final depth. After drilling through the Cedar Keys formation to a depth of about 2,000 feet, a blow-out preventer was installed on the 10-inch diameter casing, which was set to a depth of 2,000 feet.

Well Construction

Figure 5.9-1 shows schematically the construction details of the proposed test well. Note that a monitor tube has been installed to a depth of 1,537 feet and that water levels will be collected during the testing phase to provide direct evidence on whether or not the deep injection affects groundwater levels in the shallower beds. The 18-inch diameter surface casing has been installed to a depth of about 195 feet while the 10-inch diameter long-string casing has been installed to a depth of about 2,000 feet. The wall thickness of the surface casing is 0.375 inches and for the long-string casing, 0.365 inches. Both are block steel pipe, with welded joints, conforming to AWWA standard A100-66, with weights of 70.6 lbs./ft. for the surface casing and 40.5 lbs./ft. for the long-string casing. The long-string casing was fitted with half-moon, strap-type centralizers, welded every 20 feet along the lower 100 feet of the casing and every 100 feet along the rest of the casing.

Neat cement was used for the surface casing while the long-string casing was pressure cemented in place, with a moderate sulfate-resistant type concrete used through the deeper zones containing brackish to salty water having a high sulfate content. Pressure cementing in a single stage was used for the surface casing and for the lower part of the long-string. Successive stages of cementing for the long-string casing was by tremie pipe. The potential injection zone is anticipated to occur at the depth interval from 2,500 feet to 3,300 feet, in the deeper sediments of Cretaceous age, which consist of interbedded limestone, dolomite, sandstone, and shale containing salt water or brine. The porosity and permeability are unknown, but will be determined by the injection tests and the evaluation of geologic and geophysical logs.

Data Collection Program

Drill cutting are collected at each 10 foot interval and at all significant changes in lithology. Duplicate samples are sent to the state geologist in Tallahassee for description of lithology and formation contacts. Side wall cases will be taken in potential confining beds and deeper zones to determine vertical permeabilities and to provide information that will be useful in correlating well bore geophysical logs. The geophysical logs include a selected suite of electrical logs, temperature log, caliper log, natural gamma log, borehole-compensated sonic log or equivalent, and cement-bond log. These logs will be used to help define water quality changes, formation contacts, primary and secondary porosity, fracturing, and numeral identification. In addition the program included the collection of water samples for chemical analysis at intervals of approximately 100 feet to a depth of about 2,000 feet. Other samples will be collected after the hole has been cleaned out for testing purposes. The samples are analyzed by a certified laboratory for standard water quality parameters.

Monitoring to detect any head changes in the formations overlying the confining beds above the injection zone will take place during the testing at a depth of 1,500 feet (Figure 5.9-1). During the injection test, pressures in the test injection well will be monitored by a pressure gage at the well head. If the project proceeds into a long-term injection program, a complete monitoring system will be developed, in coordination with the Suwanee River Water Management District, to provide specific data on pressure changes, temperatures, injection rates, and other factors.

If the testing operations prove successful, RUB proposes to install two permanent injection wells at the site, cased through fresh water and into the deep saline zone. One of the wells will be an operating injection well, with the other left as a stand-by well in the event that a temporary failure of some kind takes place in the operating injection well. The stand-by well also will serve as a monitoring well during long-term injection, so that careful records can be compiled of changes in the potentiometric levels. The stand-by well also will serve to detect the time of arrival of the injected fluid.

If the well is abandoned, it will be plugged and sealed in conformance with regulatory requirements. There are no access roads that would have to be restored, and only a minor amount of regrading would be needed on the small tract that would have been disturbed. All such restoration would take place within a few days after completion of the project.

The principal test will be the injection of fresh water, at rates of up to 500 gpm (gallons per minute), for a minimum of 48 hours. During this test, pressure changes will be monitored by a pressure gage installed at the well head. Drill-stem are not planned tests because it is not critical to know the precise chemical composition of the native water in each specific bed in the potential injection zone. Also, detailed knowledge of formation pressures is not essential because the injection test itself will demonstrate conclusively the rates at which injection can be carried on without exceeding pressure build-up limitations. With regard to fluid compatibility, the blowdown water will be essentially water of the calcium-sulfate type, with a pH of about 6.8. It is not anticipated that precipitation of solids would occur under these conditions, and that in fact the injected fluid may slightly increase the natural permeability of the geologic layers.

Status of Pilot Injection Well Program

A preliminary evaluation of the drill cutting samples and geophysical borehole logs indicate that potential confining units occur from 1,550 feet to approximately 2,500 feet in the Cedar Keys formation, Lawson Limestone, and Taylor Beds.

Throughout the drilling of the test injection well, water quality is being monitored in the field and water samples are being collected for laboratory analysis to aid in identifying zones of fresh, brackish, and salty water. To date, the results of the water quality analysis indicates that the base of potable water is approximately 1,000 feet below ground surface. Although the water below this depth is not potable, it appears to remain fresh (less than 1,000 mg/l total dissolved solids), to approximately 1,520 feet. At 1,520 feet, sulfate concentrations are significantly higher, which correlates closely with the appearance of sulfate minerals in the cuttings at 1,540 feet. Sulfate concentrations in water samples collected to a depth of 2,024 feet are high and increase significantly wherever evaporite (gypsum and anhydrite) beds were penetrated.

The formation water grades from brackish to salty (greater than 10,000 mg/l total dissolved solids) between the depths of 1,520 and 2,020 feet. At a depth of 2,020 feet a drill-stem water sample was collected which showed a dissolved solids concentration of 17,244 mg/l.

Throughout the drilling of the test injection well, water levels are measured in the borehole to determine the nature of the head gradients with depth.

At present, the proposed program is to collect water samples in the interval from 2,024 feet to the bottom of the well after the mud drilling fluid has been removed. Two techniques will be used for sampling: (1) a thief sampler; and (2) a "repeat information tester" which collects an "in situ" sample of the formational fluid. After completion of drilling, additional tests will be conducted to obtain more quantitative information about the potential confining units, and the hydrologic properties of the potential injection zone.

CHAPTER 7

ECONOMIC AND SOCIAL EFFECTS OF CONSTRUCTION AND OPERATION

A large-scale development such as a power plant represents not only a large capital investment, but also a multitude of environmental and socio-economic ramifications associated with the nature of the project activities. Such a project can produce changes in the existing character of the socio-economic structure of the area in which it is to be located. The extent and magnitude of these changes vary; they can be defined as long-term/short-term, local/regional, and primary/secondary. Also, the nature of a significant change, or "impact", can be described as beneficial or adverse. While some impacts associated with a project may stress various segments of the community, other impacts can provide short-term and long-term stability. The generation of new jobs and monies can provide a base for expanded social services, business, and trade, but in other sectors, it can stress community facilities, such as schools, water supply or housing.

The purpose of this chapter is to assess the economic and social effects related to the construction and operation of the proposed Deerhaven Unit 2 generating facility. Existing or baseline conditions are described in Section 7.1. The baseline study specifically addresses four broad subject areas: (1) population characteristics; (2) economic trends such as employment and income; (3) housing; and (4) infrastructure. Section 7.2 discusses the potential social and economic impacts likely to occur as a result of Deerhaven Unit 2. Specific emphasis is placed upon analyzing the internal project costs and benefits, population, employment, wages and income, housing, infrastructure, and attitudes.

7.1 Study Area Profile

Defining an appropriate study area is an important step in the socio-economic impact assessment process. The particular geographical areas chosen must reflect consideration of the locations in which impacts are likely to occur. Ordinarily, these impacts result from construction worker and permanent employee in-migration, and are a function of the supply (capacity) and demand characteristics of an area's public services.

For example, a power plant built within a highly metropolitan area usually has the advantage of a readily available labor force. This tends to reduce the number of workers and their families that must relocate and, consequently, decreases the need for new community infrastructure. Furthermore, those persons who do migrate represent a relatively small incremental increase in demand on the wide range of services which exist in urban areas. Conversely, the more rural an area, the more likely it is that it will experience impact from a project of any given size.

As Figure 7.1-1 shows, the proposed Deerhaven Unit 2 plant site is located on U.S. Highway 441 between Alachua and Gainesville. With a 1976 population of 70,228, the City of Gainesville represents by far the largest close urban center (University of Florida, 1976a). Gainesville was therefore considered to be the area likely to receive the most concentrated socio-economic impacts. For this reason, it was chosen as the primary impact study area. Based upon a number of factors, including typical commuting characteristics of construction workers (Environmental Research and Technology, 1976; Tennessee Valley Authority, 1976; Woodward-Clyde Consultants, 1975), the secondary study area was chosen to be Alachua County, and includes Alachua, Archer, Hawthorne, High Springs, LaCrosse, Micanopy, Newberry, and Waldo.

7.1.1 Population

Alachua County has grown substantially since 1950. Population rose by 30% from 1950-1960, 41% from 1960-1970, and 26% from 1970-1976 (North Central Florida Regional Planning Council, 1976c; University of Florida, 1976a). Of this increase (1970-1976), totaling over 26,000, approximately 79% resulted from in-migration (North Central Florida Regional Planning Council, 1976c, Table R13). During the period 1970-1976, Florida's population increased by approximately 26% per year (University of Florida, 1976b; Smith, 1977). Gainesville's population grew by 8.9% from 1970-1976 (Table 7.1-1), however, its share of county population shrank from 62% in 1970 to 53% in 1976, in part because of the accelerating growth of unincorporated suburban areas. During the same period, unincorporated areas grew by over 60%, reflecting the outward expansion of the City. Table 7.1-1 illustrates the contributions to growth made by incorporated cities and towns.

The population density of Alachua County in 1975 was 142.8 people per square mile, as compared with a statewide figure of 156.9 people per square mile, and a national average of 60.3 people per square mile

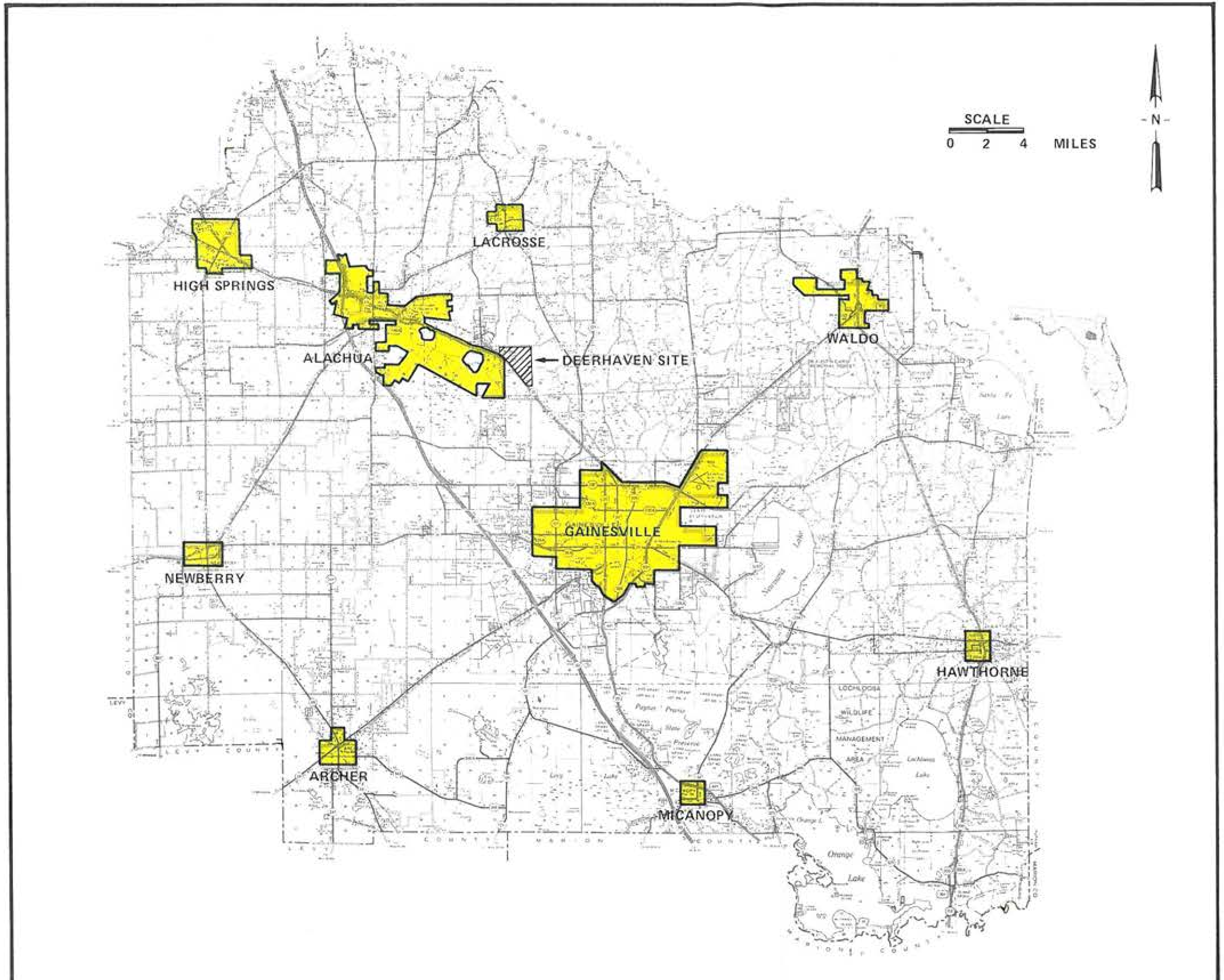

FIGURE 7.1-1 STUDY AREA.

Table 7.1-1 Alachua County Population

	April 1970	July 1976	Percent Change
Alachua County	104,764	131,552	26
Alachua	2,252	3,169	41
Archer	898	1,028	14
Gainesville	64,510	70,228	9
Hawthorne	1,126	1,328	18
High Springs	2,787	3,000	8
LaCrosse	365	360	(1)
Micanopy	759	837	10
Newberry	1,247	1,569	26
Waldo	800	944	18
Unincorporated	30,020	49,089	64

Source: University of Florida, 1976a.

( ) = negative value

(North Central Florida Regional Planning Council, 1976c). This county level is somewhat high, particularly since the statewide density (only slightly higher than Alachua County) includes the heavily populated coastal regions.

The age group distribution in Alachua County shows that, from 1970-1975, the number of individuals in the 15-24 age group increased, most rapidly, by approximately 37% (Table 7.1-2). Over the same period, growth in the number of residents in the 25-54 age group was approximately 34% (North Central Florida Regional Planning Council, 1976c). Although the Alachua County-Gainesville area is becoming increasingly desirable as a retirement area, it is noted that the number of residents over 65 years of age increased by only 27% during the 1970-1975 period.

A number of different population projections for Alachua County have been developed by various agencies and research groups. These include the North Central Florida Regional Planning Council, the Bureau of Economic Research, the City of Gainesville's Department of Community Development, the Alachua County Comprehensive Plan, and the Bureau of the Census. In general, such estimates differ in terms of assumptions, modeling techniques utilized, and conclusions reached. This generates a range of possible or expected outcomes. As events capable of influencing future economic conditions develop, the projections may vary accordingly.

Table 7.1-2 Age Group Distribution Alachua County, 1950-1975

Age Groups	1950	1960	1970	1975
0-14	15,197	22,531	27,646	28,228
15-24	13,648	17,396	30,298	41,416
25-54	21,421	24,795	33,333	44,577
55-64	3,290	4,673	6,903	8,246
65+	3,470	4,679	6,584	8,371
Total	57,026	74,074	104,764	130,838

Source: North Central Florida Regional Planning Council, 1976c.

Population projections developed by the University of Florida's Bureau of Economic and Business Research were selected for analysis in this study, essentially because this set of estimates expresses the average of most other available population studies, and offers a high-medium-low range for each year shown (Table 7.1-3). Alachua County's population may reach 188,200 by 1990 (high estimate), which represents an annual average growth rate of about 2.7%. The low growth projection, also through 1990, would reflect a yearly growth rate of slightly more than 1%.

7.1.2 Economy

Employment

Because agricultural activity represents a small portion of overall Standard Metropolitan Statistical Area (SMSA) employment, the following discussion generally relates to industrial or nonagricultural jobs. However, in terms of total employment, it is noted that in March 1977, total SMSA employment was 61,700 (Gainesville SMSA Labor Market Trends). Also in 1977, it is estimated that there are approximately 1,000 agricultural jobs, comprising 1.6% of total SMSA civilian employment (personal communication with Dennis Harmon, Labor Market Analyst, State of Florida Department of Commerce).

Historically, the period 1960 through 1970 was characterized by strong, steady growth in the number of nonfarm jobs in the Gainesville SMSA. During this interval, an average of 1,500 jobs per year were generated. Over 40% of this annual average increment was attributable to activity

Table 7.1-3 Population Growth Estimates, Alachua County

	Estimate July 1, 1976	1978	1980	1985	1990	1995	2000
Alachua County	131,552						
Low		133,500	135,500	141,800	152,900	162,100	170,900
Medium		135,100	141,400	153,400	170,600	183,900	197,500
High		139,600	147,700	165,000	188,200	208,900	228,900

Source: Smith, 1977.

within the government sector (Gainesville SMSA Labor Market Trends). The period 1970 through 1974 produced even stronger growth, with nonfarm employment increasing by an average of 4,200 jobs per year (Gainesville SMSA Labor Market Trends, 1977).

Between 1974 and 1976, Alachua County experienced an economic recession, with manufacturing and contract construction each losing approximately 1,000 total jobs. By 1976, government activity began to reflect the effects of the recession, and growth in government jobs leveled off.

Among Gainesville SMSA nonagricultural employees, 48.5% were employed by government in 1976. By contrast, government employment in the entire State of Florida accounted for only 19.8% of nonagricultural workers. Nationwide, the percentage of government workers among nonagricultural employees was 19.1% (Florida State Employment Service, no date). Table 7.1-4 summarizes the 1976 industrial composition of total nonagricultural workers for the Gainesville SMSA, the State of Florida, and the Nation.

From 1976 through March 1977, the local economy began to recover, and total SMSA employment among nonagricultural establishments increased by 1,800 jobs, 1,200 of which were in the government sector. No other single industrial group showed such a significant employment increase. For the purposes of this study, it is therefore assumed that the data presented in Table 7.1-4 generally reflect current employment levels.

Table 7.1-4 1976 Industrial Composition of Nonagricultural Employment: Gainesville SMSA, Florida, and Nation

	Gainesville SMSA		Statewide	Nationwide
	Average Number of Employed	Percent of Total	Percent of Total	Percent of Total
Total	53,000	100.0	100.0	100.0
Contract Construction	2,500	4.7	6.6	4.3
Manufacturing	3,900	7.4	12.3	24.0
Durable Goods	2,600	4.9	6.2	13.9
Nondurable Goods	1,300	2.5	6.1	10.1
Transportation, Communication, Electric, Gas & Sanitary Services	1,500	2.8	6.5	5.7
Trade	10,600	20.0	26.1	22.1
Wholesale	1,700	3.2	5.6	5.4
Retail	8,900	16.8	20.5	16.7
Finance, Insurance & Real Estate	2,300	4.3	6.8	5.5
Services, Mining & Miscellaneous	6,500	12.3	22.5	19.3
Government	25,700	48.5	19.8	19.1

Sources: Estimates by Labor Market Analyst, Florida Department of Commerce; Current Employment Statistics Program, Office of Research and Statistics, Division of Employment Security; Employment and Earnings, Bureau of Labor Statistics, as quoted in ANNUAL PLANNING REPORT, Gainesville SMSA, Florida State Employment Service. (unpublished report).

In general, Table 7.1-4 shows that percentage components of industrial employment within the Gainesville SMSA were significantly less than State and nationwide percentages. For example, manufacturing accounted for only 60% of statewide levels, and only 31% of the nationwide figure. Proportionate employment within the services sector was less than 50% of state composition.

Table 7.1-5 summarizes employment by general occupational class for 1970 and 1974, and presents employment estimates for 1977 and 1978, and a projection for 1985. Data are reported for two general job areas: "Crafts and Kindred Workers" and "Operatives". These categories were focused upon since they describe the bulk of the expected Deerhaven Unit 2 construction force. A more complete breakdown, showing employment by occupational title, may be found in Appendix Table A7-1, which contains roughly 140 additional specific job categories.

It is anticipated that medical, health, and educational services will show relatively large employment increases through 1985. On the other hand, categories such as trade contractors, general contractors (heavy), and general building contractors are not expected to increase substantially. Table 7.1-6 illustrates this trend and lists the 20 Gainesville SMSA industries expected to show the largest employment increases through 1985. Through 1978, however, contract construction may realize rapid short-term growth in employment. Several projects within the SMSA have received funding through the Public Works Employment Act, and could

Table 7.1-5 Employment By Crafts and Operatives, Gainesville SMSA

	1970	1974	Est. 1977	Est. 1978	Projected 1985
Crafts and Kindred	3,742	5,780	6,710	7,040	9,180
Construction Crafts	1,665	2,690	3,120	3,260	4,310
Blue Collar	316	440	520	540	710
Metalworking Craft	117	140	180	180	250
Mechanics, Repairers, Installers	893	1,360	1,550	1,620	2,070
Printing Trade Crafts	68	80	90	100	130
Transportation Public Utility Craft	322	560	650	670	880
Other Crafts, Kindred	361	510	600	620	830
Operatives (Excludes Transportation)	2,897	3,540	4,200	4,410	5,960
Semiskilled Metal Working	91	160	180	190	240
Semiskilled Textile	--	--	--	--	--
Semiskilled Packing and Inspecting	276	310	360	380	520
Other Operatives	1,455	1,650	1,960	2,060	2,770
Transportation Equipment Operatives	1,075	1,420	1,700	1,780	2,430

Source: Unpublished data compiled by Office of Research and Statistics, Florida Department of Commerce.

Table 7.1-6 Twenty Gainesville SMSA Industries Expected to Show Largest Employment Increases: 1974-1985

	Rank According to Additional Jobs Provided	Projected Employment Increase 1974-1985	Ave. Ann. Employment Increase 1974-1985	Percent Increase in Employment 1974-1985
Medical & Other Health Services	1	5,903	537	97
Education Services	2	4,968	452	49
Eating & Drinking Places	3	1,992	181	85
Local Public Administration	4	1,757	160	109
Elect. Machinery Manufacture	5	1,281	116	54
Misc. Business Services	6	1,012	92	127
Retail Food & Dairy Stores	7	813	74	50
Utilities & Sanitary Services	8	788	72	93
Auto Dealers, Gas Stations	9	783	71	58
Misc. Retail Stores	10	772	70	55
Retail Gen. Merchandise Stores	11	762	69	49
Spec. Trade Contractors	12	677	62	29
Gen. Contractors (heavy)	13	655	60	61
Hotels & Lodging Places	14	650	59	60
Gen. Building Contractors	15	619	56	40
Insurance	16	611	56	75
Non-profit Organizations	17	569	52	92
Professional Services (Other than Business, Legal, Medical)	18	448	41	47
Communications	19	431	39	45
Banking	20	390	35	75

Source: Florida State Employment Service (unpublished report), no date.

generate approximately 700 short-term jobs (Harmon, 1977). Should this occur, it would signify an average annual employment increase of 14% through 1978. This number is based upon the contract construction work force of 2,500 (Table 7.1-4). If employment increased to 3,200 over a 2 year period, it would average to about 14% per year.

In March of 1976, the unemployment rate within Alachua County was 6.3%. By March of 1977, however, this rate had dropped by nearly one-third to 4.4%, reflecting the strong 1976-1977 economic recovery (Gainesville SMSA Labor Market Trends). It is estimated that by 1978, the SMSA unemployment rate could rise to 5% among all persons 16 and over, and to 8.4% among workers of ages 20-24 (Table 7.1-7) (Harmon, 1977).

Statewide, the unemployment average in March of 1976 was 11%, down only 0.8% from the previous year. The national unemployment rate in January 1976 was 8.3%, or nearly twice the Gainesville SMSA rate (unemployment figures are seasonally adjusted).

As may be expected, the most extreme surplus of job seekers is currently among unskilled or marginally skilled individuals, while the greatest undersupply occurs among highly skilled applicants. Thus, while general construction labor is often in great supply, craftsmen such as skilled carpenters or sheet metal workers are sometimes difficult to locate (Harmon, 1977).

Table 7.1-7 Projected 1978 Unemployment Rates for Selected Segments of SMSA Labor Force

	Projected Share of Labor Force (%)	Projected Share of Unemployed (%)	Projected Number of Unemployed	Projected Unemployment Rate (%)
Total (Persons 16+)	100.0	100.0	3,300	5.0
Whites	83.7	82.5	2,721	4.9
Nonwhites	16.3	17.5	579	5.3
Males	54.0	47.1	1,554	4.3
Females	46.0	52.9	1,746	5.7
White Males	45.8	41.3	1,364	4.5
Nonwhite Males	8.2	5.8	190	3.5
White Females	37.9	41.1	1,357	5.4
Nonwhite Females	8.1	11.8	389	7.2
Ages: 16-19 yrs	9.6	23.7	781	12.2
20-24 yrs	23.3	39.5	1,305	8.4
25-34 yrs	26.1	16.2	533	3.1
35-44 yrs	15.3	7.6	251	2.5
45-64 yrs	22.9	10.8	358	2.4
65+ yrs	2.8	2.2	72	3.9

Sources: Projected by Labor Market Analyst, Florida Department of Commerce; Current Employment Statistics Program, Office of Research and Statistics, Division of Employment Security; Employment and Earnings, Bureau of Labor Statistics, as quoted in Annual Planning Report, Gainesville SMSA, Florida State Employment Service (unpublished report).

Income

Personal income is defined as the total income received from all sources by residents of an area before the deduction of income taxes and other personal taxes, but after the deduction of personal contributions to social security and other social insurance programs. Personal income is a useful economic indicator in that it provides an understanding of relative consumer access to goods and services.

Personal income within the Gainesville SMSA increased by 134% from 1950-1960, 165% from 1960-1970, and 102% from 1970-1975 (State of Florida, Department of Commerce, Bureau of Economic Analysis). Table 7.1-8 shows personal income by major sources for the period 1970 through 1975, as well as per capita income for the Gainesville SMSA. It is estimated that total SMSA personal income will reach $543 million (1967 dollars) in 1980, and $859 million (1967 dollars) by 1990 (University of Florida, 1976b).

The SMSA percentage distribution of personal income for 1974 is presented below, and it is noted that the overwhelming share of personal income (47%) is derived from government activity (University of Florida, 1976b).

Table 7.1-8 Gainesville SMSA Personal Income, 1970-1975 (Thousands of Dollars)

	1970	1971	1972	1973	1974	1975
By Type						
Wage and Salary Disbursements	250,918	281,974	343,191	410,586	456,322	488,415
Other Labor Income	7,826	9,269	12,166	14,569	17,465	19,265
Proprietors Income	20,954	23,529	25,081	33,061	30,258	32,613
Farm	3,551	5,024	4,327	7,234	6,662	7,018
Nonfarm	17,403	18,505	20,754	25,827	23,596	25,595
By Industry						
Farm	6,073	7,327	6,801	9,954	9,676	10,088
Nonfarm	273,625	307,445	373,637	448,262	494,369	530,205
Private	138,162	154,096	185,376	229,372	253,728	260,339
Manufacturing	24,870	24,262	28,435	35,171	41,200	39,793
Mining	(A)	313	427	545	625	538
Contract Construction	17,771	21,652	31,288	38,600	35,758	29,056
Wholesale and Retail Trade	39,961	45,082	52,306	62,066	68,808	76,234
Finance, Insurance, and Real Estate	11,246	13,382	16,786	20,094	23,376	24,518
Transp., Comm. & Public Util.	11,311	12,524	13,843	16,854	19,507	19,485
Services	31,409	35,585	40,545	53,009	61,657	68,133
Other Industries	(A)	1,296	1,745	3,033	2,797	2,582
Government	135,463	153,349	188,262	218,890	240,641	269,368
Federal, Civilian	16,207	19,249	22,762	24,085	25,610	28,670
Federal, Military	2,503	2,681	3,090	3,295	3,550	3,887
State and Local	116,753	131,419	162,410	191,510	211,481	236,309
Personal Income by Place of Residence	308,303	351,600	422,808	509,706	567,677	623,604
Per Capita Income	2,917	3,302	3,654	4,214	4,545	4,813
Total Population (Thousands)	105.7	106.5	115.7	121.0	124.9	129.6

Source: State of Florida, Bureau of Economic Analysis, Regional Economics Information System.

(A) Information not disclosed.

Farm Total	2.71
Nonfarm Total	97.29
Manufacturing	8.09
Services	12.43
Contract Construction	7.06
Wholesale, Retail Trade	13.55
Finance, Insurance, Real Estate	4.73
Government	47
Other	4.43

Between 1970 and 1975, as population in the Gainesville SMSA increased by around 23%, per capita income increased by 65%. This represented an average increase of 13% per year. In 1973 and 1974, per capita income was 84% of the national average. During this same period, Florida per capita income was 99% of the national figure (University of Florida, 1976b).

Figure 7.1-2 shows the rise in the Gainesville SMSA per capita income for 1950 through 1975. This trend is derived from information presented in Table 7.1-8, and in the 1976 Florida Statistical Abstract, and points out the accelerating rate of growth. For example, between 1950 and 1965, personal income grew at a compound rate of 5.3% per year. Between 1965 and 1975, however, compound growth was 10.3%.

Local Government

Within Alachua County there are ten local governments, the county government and nine incorporated municipalities. Municipalities range in population size from about 360 in LaCrosse to over 70,000 in the City of Gainesville, the county seat (Table 7.1-1). Alachua County has a number of elected constitutional officers, including county and circuit

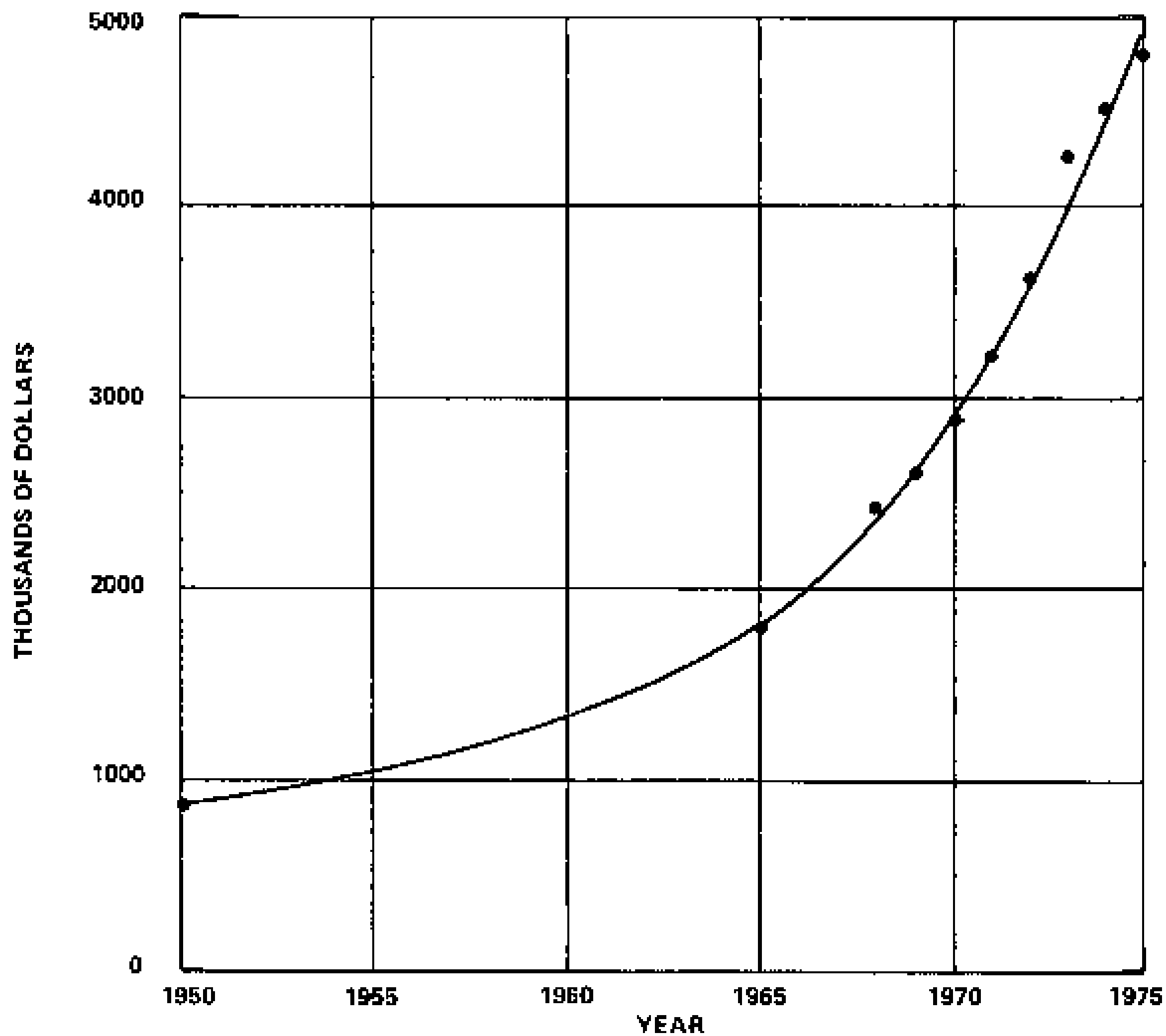

FIGURE 7.1-2 GAINESVILLE SMSA PER CAPITA INCOME, 1950-1975.

judges, clerk of the circuit court, sheriff, tax assessor, tax collector, and the supervisor of elections.

The City of Gainesville operates under a council-manager plan. The governing body is a five member commission, elected at-large for staggered three-year terms. The commissioners elect a mayor among themselves to serve a one-year term. The City Manager is appointed by the Gainesville City Commission and oversees the government operations.

In 1972, the City of Gainesville and Alachua County entered into an Interlocal Agreement establishing RUB for utilities services within the county. RUB is composed of the five Gainesville City Commissioners and the five Alachua County Commissioners. Under this interlocal agreement, RUB assumed responsibility for providing electric, water, and sanitary sewer services on a regional basis where needed in the city and throughout the unincorporated areas of the county.

7.1.3 Housing

The basic types of housing in Alachua County can be classified as single-family, multifamily, and mobile homes. The following discussion presents housing characteristics of the county in terms of these types.

Single-family homes are the predominant dwelling unit in Alachua County, although since 1960 they have declined as a percentage of all housing units. For example, single-family residences accounted for 76% of all units in 1950, 82% in 1960, 69% in 1970 and about 59% in 1975 (North Central Florida Regional Planning Council, 1976a). Consistent with their decline as a percentage of all housing units, the growth rate for single-family units has been below that of multifamily units and mobile homes since 1960. The increase in single-family units was 29% from 1960-1970 and 20% from 1970-1975 (North Central Florida Regional Planning Council, 1976a).

Multifamily units have increased substantially in Alachua County, from 21% of all housing units in 1950 to 29% in 1975. From 1960-1970, the growth rate for multifamily units was 147%, greatly exceeding the 29% growth rate for single-family units. This trend has continued in the 1970's (North Central Florida Regional Planning Council, 1976a).

Mobile homes have recently experienced the county's highest growth rate, increasing by 88% from 1950-1960, 206% from 1960-1970, and 186% from 1970-1975. However, as a proportion of total housing units, there are still fewer mobile homes than multifamily and single-family units. Within the urban area of Alachua County, mobile homes are fast becoming the most economical alternative to single-family homes. This is reflected in a county-wide increase in mobile homes of 186% from 1970-1975. The majority of these are found in mobile home parks in the urban area, with scattered-site units in the rural portion of the county (City of Gainesville, Department of Community Development, 1976).

Table 7.1-9 summarizes the housing statistics for Alachua County. The rapid growth of multifamily and mobile homes in Alachua County since 1960 can be largely attributed to increased enrollments at the University of Florida and Santa Fe Community College. In 1975, the University of Florida adopted a new enrollment policy limiting all education programs to a combined base enrollment of 27,000 students. Once that limit has been reached, student body increases will be allowed at a rate of 2% annually. The effect of this policy is to slow down multifamily construction unless an impetus is provided by another source. It should be noted that the number of construction permits issued in the early 1970's for the Gainesville urban area indicates that housing activity has fluctuated, with peaks in 1971 and 1972. Most of this fluctuation was due to variations in multifamily unit construction.

A U.S. Postal Survey conducted in the Gainesville area on November 17, 1976 indicates the vacancy rates of residences and apartments. The survey is based on reports of individual mail carriers covering a total of 38,812 possible deliveries, and shows Gainesville area vacancy rates for 1975 vary from 1.8% (residences) to 3.5% (apartments). For 1976 vacancy rates range from 2.8% (residences) to 4.5% (apartments). The vacancy rate considered ideal to allow for market flexibility ranges from 5% to 6% (U.S. Postal Service, 1977).

In the past four years, new single-family home building has been strongest outside Gainesville's city limits. Recently, construction has begun to

Table 7.1-9 Housing Statistics--Alachua County

Housing Characteristics	1950 Number	1950 Percent	1960 Number	1960 Percent	1970 Number	1970 Percent	July 1975 Number	July 1975 Percent
Total Population	57,026		74,074		104,764			
Total Housing Units	15,988	100.0	21,978	100.0	33,538	100.0	47,312	100.0
Total Occupied Units	14,811	92.6	19,888	90.5	31,115	92.8	44,189	93.4
Vacant	1,145	7.2	2,045	9.3	2,405	7.2	3,123	6.6
Other*	32	.2	45	.2	18	**	--	--
Housing Types								
Single Family	12,251	76.6	17,987	81.8	23,271	69.4	27,833	58.8
Multifamily	3,379	21.1	3,319	15.1	8,203	24.5	13,627	28.8
Mobile Homes	358	2.3	672	3.1	2,046	6.1	5,852	12.4
Public Housing Units	0		0		785	2.3	785	1.7

Sources: North Central Florida Regional Planning Council, 1976a, personal communications with Gail Monahan, Executive Director, Gainesville Housing Authority and Scott Koons, North Central Florida Regional Planning Countil, September 23, 1977.

*Includes seasonal and migratory housing units.

**Trace

NOTE: "Housing Types" for 1970 does not add up to "Total Housing Units" because of apparent differences in data reporting methodology.

move beyond the urban area into the rural county. The new multifamily apartments are clustered in the southwest quadrant, near the University of Florida, and in the northern section of the city.

Prices for homes in the urban area have accelerated rapidly. The median sales price of a new home in 1976 reached $38,500, and the average resale home cost was $36,000. Over 40% of the homes listed for sale in 1976 were over the $45,000 range, as compared to about 17.5% nationally (City of Gainesville, Department of Community Development, 1976).

Rents are higher in the Gainesville area than in other north Florida cities. The University of Florida Off-Campus Housing Office reports that average rents range from $167 per month for an unfurnished one-bedroom apartment to $355 per month for unfurnished four-bedroom apartments. Most of the rental units surveyed by the University of Florida (over 90%) were in large apartment complexes located within the Gainesville city limits. Apartment units in older duplexes, triplexes and converted single-family homes rent for somewhat less.

An important source of rental units in the Gainesville urban area is the single-family home. Older housing, along East University Avenue and east of the campus of the University of Florida, draws the lowest rents. Homes in the southeast quadrant and the area north of the center of the city rent for $150 to $250 per month, middle income range. Rentals in the northwest and southwest, with newer units closer to the University campus, command higher rents (City of Gainesville, Department of Community Development, 1976). The 1970 census revealed that 42% of the rental units in Alachua County were single-family homes. In the City of Gainesville, 34% were single-family homes.

The cost of mobile homes in the Gainesville urban area is below the national average. Costs range from $10.42 to $11.4 per square feet as compared to the national average of $12.50 per square feet.

Future housing requirements for the Gainesville urban area are projected in Table 7.1-10. Table 7.1-11 indicates the number of building permits authorized in the Gainesville urban area between 1970 and 1975. The historical trend has been that about 90% of the permits granted are actually translated into construction starts. Assuming the projections made on Table 7.1-10 are accurate, more housing starts than the number shown on Table 7.1-11 must be commenced in the future to meet the demand of the next ten years.

7.1.4 Infrastructure

Education

All public school facilities providing instruction for grade levels K- in Alachua County are under the direction of an elected Board of Public Instruction. Existing facilities consist of 20 elementary (K-5), 6 middle (6-8) and 6 secondary (9-12), of which 3 of the preceding 32 facilities are special education schools (Table A7-2) (North Central

Table 7.1-10 Gainesville Urban Area Housing Requirement Projections

	1975-80	1980-85
1. Population growth during the projection period:	15,841 - 19,876	19,000 - 30,028
2. Estimated number of new household formations during projection period:	4,982 - 6,408	8,541 - 12,653
3. Estimated total number of housing units required during projection period:	5,425 - 6,903	9,104 - 13,362
Annually:	1,085 - 1,380	1,821 - 2,672
Annually: (1975-85)[1]	1,453 - 2,026	
4. Total annual effective demand for new sales units:[2]	660 - 931	
$30,000 - 40,000	106 - 149	
40,000 - 50,000	132 - 186	
50,000 - 60,000	125 - 177	
60,000 - 70,000	118 - 168	
70,000 - 80,000	79 - 112	
80,000+	100 - 139	
5. Total annual effective demand for rental units:	793 - 1,095	
$150 - 179	31 - 43	
180 - 209	207 - 286	
210 - 239	265 - 366	
240 - 269	159 - 221	
270 - 299	74 - 100	
300+	57 - 79	

[1] Annual demand for 10 year period, 1976-1985. Figures are an average of the low and high projections for 1975-80 and 1980-85.

[2] The new sales:rental ratio is 45%:55% (average over 10 years). In 1975, the City had an owner:renter ratio of 49%:51%. It is assumed that tenure shift will lean towards rentals, particularly in the 1975-80 period, based upon the growing gap between real income and the high cost of new housing. Home ownership may represent a higher percentage from 1980 to 1985.

Table 7.1-11 Units Authorized by Building Permits
Gainesville Urban Area

<table>
<tr><th rowspan="3">Year</th><th colspan="4">Number of Permits</th></tr>
<tr><th colspan="2">Single-Family Units</th><th colspan="2">Multifamily Units</th></tr>
<tr><th>GUA</th><th>City</th><th>GUA</th><th>City</th></tr>
<tr><td>1970</td><td>494</td><td>220</td><td>105</td><td>85</td></tr>
<tr><td>1971</td><td>660</td><td>230</td><td>2,765</td><td>1,350</td></tr>
<tr><td>1972</td><td>794</td><td>206</td><td>1,636</td><td>678</td></tr>
<tr><td>1973</td><td>668</td><td>111</td><td>445</td><td>144</td></tr>
<tr><td>1974</td><td>602</td><td>118</td><td rowspan="2">487</td><td>109</td></tr>
<tr><td>1975</td><td>575</td><td>92</td><td>78</td></tr>
</table>

Source: City of Gainesville, Department of Community Development, 1976.

Florida Regional Planning Council, 1976a). Overall enrollment numbers are approximately 14% below capacity. Elementary school enrollment represents 45% of the total public school enrollment, with the middle and secondary schools representing 23% and 32%, respectively.

Historical and projected school system enrollments for Alachua County are shown on Table 7.1-12. As can be seen, enrollments increased between 1950 and 1970, and stabilized after 1970 (actually, a slight decrease was realized). In addition, the percentage of elementary age students has been decreasing since 1950.

The two main higher educational institutions in Alachua County are the University of Florida, with an enrollment of 28,514 (1975 estimate), and Santa Fe Community College, with an enrollment of 6,171 (1975 estimate) (North Central Florida Regional Planning Council, 1976a).

For 1974-1975, the expense per full-time student (grades K-12) was $1,270 (University of Florida, 1976b). The estimated ration of instructional staff to pupils for 1974 was 1:19 (University of Florida, 1976b). For 1977, this ration is estimated to be 1:20, and includes all instructional staff except aids. Also for 1977, the expense per full-time student (grades K-12) has risen to $1,355 (Personal Communication with Mr. Lanny Alcorn, Director of Personnel, Board of Education).

Table 7.1-12 Historical and Projected School System Enrollments, Alachua County

Year	Total Enrollment (K-12)	Percent Change
1950	10,182	--
1955	12,439	+22
1960	15,676	+26
1965	19,971	+27
1970	22,481	+13
1975-76	22,040	-2
1976-77	21,922	-0.5
1977-78	21,723	-1
1978-79	21,321	-2
1979-80	20,991	-2

Source: North Central Florida Regional Planning Council, 1976a; University of Florida, 1976b.

Law Enforcement

Law enforcement services in Alachua County are provided by several city police departments and the Alachua County Sheriff's Office. The cities of Gainesville, Waldo, LaCrosse, High Springs, and Alachua maintain individual police departments while the sheriff's office is responsible for the balance of the remaining cities and all of the unincorporated areas of the county. In 1975 there were a total of 286 sworn officers in Alachua County, representing a ratio of 2.19 officers per 1,000 individuals. This is approximately the same as the number recommended by the Federal Bureau of Investigation of 2.1 officers per 1,000 individuals (North Central Florida Regional Planning Council, 1976a; Personal communication with City of Alachua Sheriff's Office, 10-5-77).

Fire Protection

The unincorporated areas of Alachua County are provided fire protection service through contractual agreements with the City of Gainesville and volunteer fire departments in each of the smaller municipalities. A total of ten fire and rescue service districts are now established by the Alachua County Department of Public Safety to provide fire protection. The Gainesville urban area comprises one district and is serviced by five fire stations located in and operated by the City of Gainesville. The remaining nine districts are served by a single volunteer fire station each. There are 325 fire fighters in the county (North Central Florida Regional Planning Council, 1976a).

Health Care

Table 7.1-13 presents statistics regarding the medical services of Alachua County. As can be seen, the ratios of various medical services to population for Alachua County exceed those of the State of Florida.

An important part of the health care provided by a community relative to construction projects is its emergency rescue and medical services. The Alachua County Department of Public Safety and the Alachua Ambulance Service, Inc. provide emergency ambulance service throughout the county. A total of six ambulances and one emergency transport vehicle are owned by the county and leased to the Alachua Ambulance Service. In addition to the ambulance service, the county has established a "Rapid Response" service which operates an emergency vehicle in each of the ten fire and rescue districts. The units are manned and operated by volunteer or regular fire department personnel from the district which they serve. These units are not equipped to transport victims to the hospitals (North Central Florida Regional Planning Council, 1976a).

Transportation

Alachua County is served by Interstate 75, which has seven active points of access; four other major U.S. highways (U.S. 441, U.S. 301, U.S. 41, U.S. 27); nineteen state roads; and many local service roads.

Two factors which may be indicative of major traffic problems are the presence and location of congestion. There are at least five locations

Table 7.1-13 Alachua County Medical Statistics

Number of Physicians per 1000 population (1975)	4.30 (1.49)*
Number of Dentists per 1000 population (1975)	0.55 (0.46)
Number of Registered Nurses per 1000 population (1975)	9.65 (5.25)
Number of Licensed Practical Nurses per 1000 population (1975)	3.39 (2.52)
Number of General Hospitals (1974)**	3
Number of Long-Term Care Facilities (1974)	3
Number of Beds at General Hospitals (1975)	1,061
Number of Beds at Long-Term Care Facilities (1974)	332

*Denotes State of Florida Averages.

**In addition to the three general hospitals shown above, there is a Veterans Administration Hospital in Gainesville which has approximately 480 beds.

Sources: University of Florida, 1976b; the Gainesville Chamber of Commerce, 1977.

in Alachua County where traffic congestion is a serious problem (North Central Florida Regional Planning Council, 1976a). These areas are (1) the central business district of Gainesville, where high volumes of traffic are characteristic; and (2) northwest and southwest 13th Street, where high volumes of vehicular traffic are in conflict with pedestrian bicycle movement, as well as the high-volume curb cuts created by strip commercial developments; (3) West University Avenue at NW 34th Street, where both roads experience high traffic volumes; (4) Archer Road, where high volumes of traffic are generated by high density residential and commercial development; and (5) Hawthorne Road, where average daily traffic volumes exceed design capacity. Work is underway to widen Archer Road and Hawthorne Road to four lanes and to provide left turn facilities. When completed, these areas will be able to more safely handle large volumes of traffic.

Present locations noted for high incidence of accidents (25 or more annually) are: (1) Archer Road near its intersection with West 34th Street; (2) U.S. 441 at its intersection with I-75 west of the City of Alachua; and (3) within the City of Gainesville along University Avenue and along SW 34th Street.

Traffic accidents in the county numbered 3,817 in 1974, with 2,603 of these occurring in the City of Gainesville. From January through August 1975, 3,874 accidents occurred in the county, of which 2,246 were in the City of Gainesville. These figures reflect a county increase of 1.5%

over the 1974 rate and a decrease in the City of 14% (North Central Florida Regional Planning Council, 1976a).

The largest generators of traffic in Alachua County are the educational institutions (the University of Florida and Santa Fe Community College), the Veterans Administration Hospital, the central business district of Gainesville, and the major shopping areas such as the Gainesville Mall. Specific points outside the urban area that are considered to be traffic generators are the General Electric plant near Hague and the small incorporated cities (North Central Florida Regional Planning Council, 1976a).

Most traffic in Alachua County is generated by trips originating within the county, and most of these trips terminate within the Gainesville urban area. The vast majority of internal-external trips (trips with one terminus inside the county) will be carried mainly on five principal routes: U.S. 441 north and south, SR 24 north, SR 20 east, and SR 26 west. The vast majority of external-external trips (trips having both of their termini outside the county) will be in a nort-south direction (North Central Florida Regional Planning Council, 1976a).

7.2 Impact Assessment

7.2.1 Project Parameters

A major determinant of the extent of the impact that construction and operation of a power plant will have on an area is obviously the absolute size of the project. Other important considerations are the size and composition of the labor force required, the number of workers that may be added to the local populace, and the project schedule. The purpose of this section is to identify these types of key parameters to serve as the foundation for the following impact assessment. It is important to emphasize that conservative estimates will be utilized throughout, in an attempt to avoid any overestimation of the benefits while at the same time accounting for the "worst-case" impact potential.

Schedule

Timing of construction for the proposed unit influences not only the degree of impact, but also the duration of increased demands upon community facilities. Figure 7.2-1 illustrates that construction is projected to begin during the summer of 1978 and end in the early part of 1981. This figure also estimates the annual construction work force requirements for the construction period.

Direct Employment

Peak construction employment is expected to reach approximately 350 workers. The composition of the construction work force is shown in Table 7.2-1 as a percentage of the total estimated man-hours required for construction, and does not necessarily express worker composition by specific year.

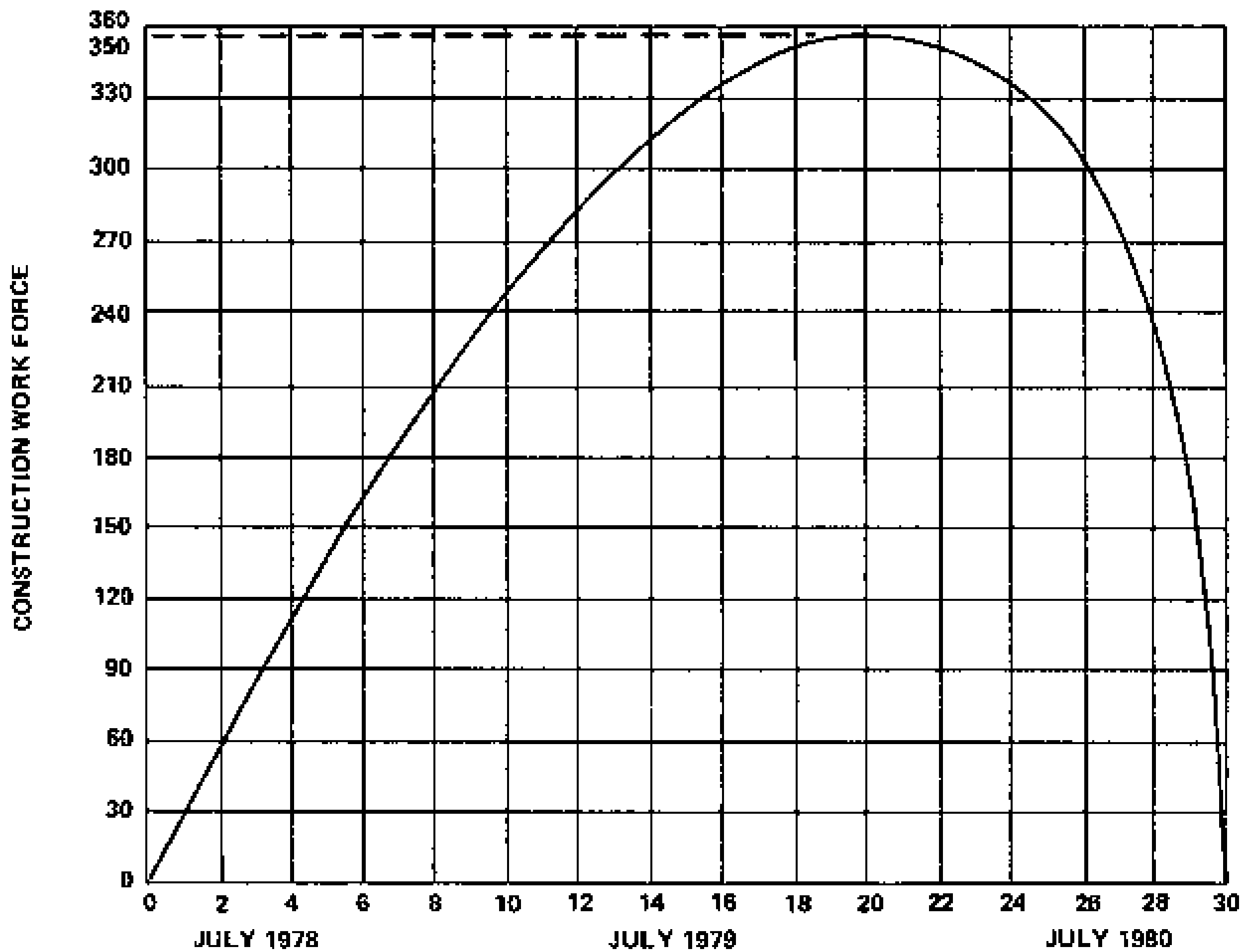

FIGURE 7.2-1 CONSTRUCTION EMPLOYMENT.

Table 7.2-1 Composition of Workforce

Skill	Estimated Percent of Total Labor By Skill
Asbestos Workers	2
Boilermakers	13
Bricklayers	1
Carpenters	7
Cement Masons	1
Electricians	12
Iron Workers	14
Laborers	10
Millwrights	2
Operating Engineers	6
Painters	2
Pipefitters	20
Sheetmetal Workers	2
Teamsters	1
Other	3
Field Non-Manual	4

NOTE: Total estimated labor required is 1.2×10^6 man-hours.

It is estimated that 25% to 50% of all Deerhaven Unit 2 construction workers will be hired locally, especially electricians, carpenters, and general laborers. Of the remaining 50% to 75%, to be hired from outside the Gainesville area, it is estimated that approximately 20% will temporarily move into the area. Using the 75% estimate for non-local workers to represent a worst-case situation, it is projected that approximately 15% of the total work force will move to the Gainesville area. The following shows the annual peak construction work force based on the above assumptions.

Annual Peak Construction Work Force

Year	Total Work Force	Total Influx of Workers
1978	165	25
1970	345	52
1980	350	53

The previous estimates for work force influx were based on the following:

1. Experience with the construction of Deerhaven Unit 1. Although exact employment records are not available, key individuals involved with the project were contacted to obtain employment information relevant to this Unit. The worker influx patterns were found to be similar to the ones predicted above. The majority of the workers were from the Jacksonville area and commuted daily to the site.

2. The proximity of Jacksonville, a major union labor center located 65 miles from Gainesville via Interstate 10 and

U.S. 301. It appears unlikely that in-migration in excess of 15% would occur. This conclusion is based in part upon the demonstrated willingness of workers to commute such distances on a daily basis, over good roads (Tennessee Valley Authority, 1976).

3. The relatively short construction time frame of 30 months, which would tend to encourage commuting rather than relocation.

It is estimated that approximately 36 individuals will be required for operation of Deerhaven Unit 2. Although some individuals having experience with coal-fired power plants will probably move into the area, it is not anticipated that significant numbers of operating personnel will in-migrate.

7.2.2 Internal Project Costs and Benefits

The purpose of this section is to present the economic impact of the proposed coal-fired electric generation project in terms of quantifiable economic benefits and costs. Also presented for comparative purposes are the economic impacts of power supply alternatives to the proposed coal-fired Deerhaven Unit 2. These economic benefits and costs are shown in the form of gross revenue requirements. Such gross revenue requirements are financial models of the electric utility operations for the various power supply alternatives studied and are presented herein on a comprehensive system-wide basis. Additionally, certain significant financial elements such as capital investment and fuel costs related exclusively to the various alternatives are presented on an incremental basis.

Baseline data used for this section were obtained from the "Report on the Status of Deerhaven Unit II" dated November 1976, which was compiled to assess alternatives to constructing a low-sulfur oil electric generating facility.

Alternatives Considered

Alternatives available to a utility for power supply lie within a limited framework of how best to meet the requirements of customers while maintaining the necessary reserve allowances for both scheduled and forced outages of generating equipment. Accordingly, the scheduling of new construction is dependent upon the demands of customers for increases in services. Given the service demands discussed in Chapter 1, the primary criteria used to select one of the following project alternatives are continuous electric service and minimization of charges to customers for such service.

In its action of October 1976, RUB initiated an evaluation of the then-possible alternatives to the project. The following three alternatives to the oil-fired unit were concluded to be the most viable, and were further evaluated:

1. Convert the project to accommodate the use of low-sulfur coal from either contract or leased coal supply.

2. Convert the project to accommodate the use of high-sulfur coal.

3. Cancel all contracts, sell any equipment possible, purchase power and jointly participate in future generating projects to supply the system's requirements.

Tables A7-3, A7-4, and A7-5 summarize costs associated with these alternatives in terms of system gross revenue requirements for the 1977-1987 period. Also shown on these tables are projected average electric rates per kWh for the 1977-1987 period and a present-worth representation of the average rates, entitled "Levelized", for each alternative. The components of these gross revenue requirements are discussed in the following subsections.

RUB, as all utilities, continually reviews and refines its plans and projections and, therefore, data in this section as taken from the status report may be superseded by refinements or improvements from time to time.

Costs

Minimum Net Revenue Requirements - The minimum net revenue requirement provides funds for transfers to the system's Utility Plant Improvement Fund (renewal and replacements) and the General Fund of the city and is therefore vital to the design of the gross revenue requirements. These revenue requirements must be designed to ensure not only sufficient cash availability, but they must also meet all of the city's covenants with its bond holders. The city has covenanted with the holders of bonds that, so long as any bonds are outstanding and unpaid, or until there is set apart a sum sufficient to pay the principal and interest on the bonds when due, that: The city will fix the rates and will collect charges which will provide revenues in each year equal to 125% of principal and interest on bonds maturing in such year, plus 100% of all other required annual payments or any other obligations payable from the revenues.

Additional Parity Bonds - Additional bonds, payable on a parity with outstanding bonds may be issued if:

1. Average annual net revenues, during the immediately preceding 24 calendar months, are at least 125% of the maximum principal and interest becoming due in any fiscal year thereafter on all outstanding bonds and the bonds proposed to be issued.

2. Estimated average annual net revenues, increased by one-fifth of the additional net revenues to be derived from additions, extensions or improvements, or which will be derived from any then foreseeable additional services during the first five fiscal years following completion and placing in operation of such additions, extensions and improvements, is at least 150% of the amount of debt service described above.

Capital Costs - The construction costs of Deerhaven Unit 2 and alternatives as developed in 1976 include costs of construction of the generating facility and related requirements such as the initial fuel inventory and a unit train. The capital costs for construction of a low-sulfur oil project and both low and high sulfur coal projects are developed on Table A7-6. The project-related capital budget is summarized on Table A7-7. Comparison of estimated construction costs on a per kilowatt basis for the proposed alternatives (235 mW) is as follows:

Fuel Type Alternatives	Generation Investment per Kilowatt	% Increase over Oil
Low-sulfur oil	$308	--
Low-sulfur coal	$496	61
High-sulfur coal	$582	89

Financing the capital requirements for the above fuel types assumes a 6 3/4% interest rate. The oil alternative financing assumes that one year's interest and bond reserves are both financed by the bond issues. The coal alternatives assume these interest and reserve requirements are fully met with current earnings of the utility. The coal alternatives also assume a somewhat longer average maturity of bonds in order to hold down the magnitude of additional electric rate increases.

The project-cancellation alternative includes charges which will be incurred in order to cancel equipment contracts that have already been let. Such costs are estimated to be about $20,000,000. The coal-fired generation alternatives include equipment contract cancellation charges of about $11,000,000.

Operation and Maintenance Costs Excluding Fuel - A summary of operating and maintenance (O&M) expenses for the entire system incorporating the

Deerhaven Unit 2 project alternatives are shown below. "Production O&M Expense" is related to the operation of existing and proposed generating facilities. "Other O&M Expenses" include transmission, distribution, engineering, and administrative and general expenses which are common to all project alternatives. Production O&M expense assumes 70% of total production labor is a fixed cost.

Projected Operation and Maintenance Expenses

Year	Production O&M Expense (Excluding Fuel Costs) Low-Sulfur Oil	Low-Sulfur Coal	High-Sulfur Coal	Total All Other O&M Expense
1977	1,746	1,746	1,746	3,887
1978	1,955	1,955	1,955	4,353
1979	2,190	2,190	2,190	4,875
1980	2,449	2,449	2,449	5,452
1981	2,709	3,305	4,839	6,031
1982	2,997	3,680	5,442	6,671
1983	3,314	4,015	5,826	7,377
1984	3,668	4,496	6,643	8,163
1985	4,054	4,986	7,369	9,021
1986	4,483	5,438	7,905	9,975
1987	4,959	6,067	8,905	11,031
Average Compound Annual % Increase	11.0%	13.3%	17.7%	11.0%

Fuel Costs - The assumptions used for projecting the fuel costs of each generation alternative are itemized as follows based on 1976 costs:

	$/Btu x 10^6	$/Purchase Unit
Low-Sulfur Oil	$1.95	$12.00/bbl
Low-Sulfur Coal:		
Contract coal	$1.39	$33.37/ton
Leased coal	$1.13	$27.14/ton
High-Sulfur coal	$1.29	$28.38/ton

Purchase Power and Participation Costs - To evaluate the cancellation alternatives, it was necessary to make several assumptions concerning the method by which the system would meet its future energy requirements. It was assumed that the system would be able to purchase its energy requirements for the period 1981 through 1985 through firm interchanges with other utilities in the State of Florida. This would be an incremental sale of capacity and energy and therefore would not reflect the fully allocated costs of providing this capacity. It was assumed that in 1986 the system would jointly participate with a 210 mW share of an 800 mW low-sulfur coal-fired electric generation project.

Gross Revenue Requirements

Summation of the projected operation and maintenance expense, projected fuel expense, projected minimum net revenue requirements (Section 7.2.2), and projected debt service provides gross electric revenues required for each project alternative. Tables A7-3, A7-4, and A7-5 show total revenue requirements for the project alternatives from 1977 to 1987. Projections of gross revenue requirements are based on trends of 8% annual load growth to 1981 and 7% from 1981 to 1987 for the various fuel alternatives on Table A7-3. To provide a critical reference for the gross revenue requirements at the above mentioned 8% and 7% growth rates, revenue requirements were projected based upon 5% annual load growth on Table A7-4. Table A7-5 shows the gross revenue requirements for the project cancellation alternative. Financial models for high-sulfur coal were not completed and are not included in the gross revenue requirements analysis because the economic results of the high-sulfur coal alternative were significantly poorer based on projected electric rate increases.

The estimated system-wide electric rate increases (including fuel cost adjustments) needed to meet the projected revenue requirements are as follows:

Assumed Percentage Electric Rate Revenue Increases Including Fuel Adjustment Clause Increases

	April 1977	April 1978	April 1979	Combined Total Percentage Increase Over 1976 Average Electric Sales Revenues
Low-Sulfur Oil	9.6	3.2	-	13.11
Low-Sulfur Coal	6.4	3.3	3.1	13.32
Cancellation (with Bond Defeasement)	19.8	-	-	19.8
Cancellation (without Bond Defeasement)	6.2	-	-	6.2

Based on data in Tables A7-3, A7-4, and A7-5 the average annual residential customer savings in electric costs over the 1977-1987 period are:

Alternative	Average Monthly Residential Customer Savings Compared to Oil-Fired Project (assumes 1,000 kWh sales)
Low-Sulfur Coal (contract)	$ 46
Low-Sulfur Coal (leased)	$ 86
Cancellation with Bond Defeasement	$(69)
Cancellation without Bond Defeasement	$(32)

NOTE: () represents cost rather than savings

Based on the above data, the leased-coal project appears most economically beneficial to the electric customers, while the contract-coal project would provide the second preferred alternative.

Benefits

The projected generation capability of Deerhaven Unit 2 is an integral part of an overall, continuing plan of generation expansion to assure an adequate and reliable supply of electricity. The need for an incremental addition of base load generation capability of this size was demonstrated in Chapter 1 of this report. Fulfilling this need will contribute to the improved health, safety, well-being, and productivity of the consumers in the region. This then is the primary benefit of this project.

As mentioned, the benefit of electricity produced is more than can be measured by the dollar value of the electric revenues collected. However, as a conservative (underestimated) forecast, the benefits that can be expressed quantitatively are: (1) transfers to the City of Gainesville General Fund; (2) surplus power sales; (3) diversification of fuel sources; and (4) capacity additions that ensure the system reliability and stability.

General Fund Transfers - Annual transfers are made to the City of Gainesville's General Fund. Future projections of transfers are based upon an amount equal to the historical return on system equity. Payments of this kind are often made by municipal utilities to the general funds of cities and such transfers can be considered a benefit to the city.

Surplus Power Sales - The construction alternatives include projected sales of surplus power and energy in 1981, 1982, and 1983 (Tables A7-3 and A7-4). These surplus sales for the coal-fired alternatives represent about $12 million of revenues and result in lower projected rate increases to electric consumers. These surplus sales are about 8% of total revenue requirements for the above mentioned years for the coal-fired alternatives, and about 3% for the oil alternative. Of course, such sales are not available to the cancellation alternative.

Energy Sources - Adoption of the coal-fired alternative provides diversification of fuel sources for generation and thus insulates the system to some degree from price, supply, and political considerations, particularly in the short term. Additional information concerning energy sources is given in Section 8.2.

Reliability of Service - The ability of RUB to meet system load and energy requirements is dependent upon having adequate capacity on its system, either by firm purchase or from its own units. Peninsular Florida utilities, through interconnection agreements and operating criteria, share reserves and provide back-up services (Section 1.1.2). Should RUB contract with another system to provide firm capacity for its system requirements rather than add Deerhaven Unit 2, the adequacy and reliability of electric service would be dependent upon the terms of purchased power, wheeling arrangements, and internal system generation. Assuming the contracted commitments were firm, the reliability of service would not be diminished by such arrangements. However, in order to assess the actual increase or decrease in reliability with or without Deerhaven Unit 2, one must examine the peninsular Florida capacity situation.

The addition of Deerhaven Unit 2 in 1981 would add to the overall reliability of peninsular Florida interconnected systems, particularly in light of the low reserve margins presently predicted by Florida's two largest utilities in the 1981-1986 period (Table 1.6-1). Although these projections are not expected to change significantly, it is anticipated that more recent information will be provided, for agency review, as soon as the required information is made available from other state utilities.

Without the planned addition, excess capacity would have to be purchased from other systems in the 1981-1986 period and it is likely that RUB would plan jointly or alone to add additional capacity in the late 1980's. This would, however, result in a continuing dependence on oil for generation requirements through most of the 1980's. A new addition in the late 1980's would reflect the increased costs of new capacity at that time. RUB would be required to amortize the funds currently expended for Deerhaven Unit 2. Additionally, potential economy energy sales from coal-fired generation would not be available to other interconnected systems.

7.2.3 Population

The population increase due to the 53 workers expected to move to the project site area during peak construction is estimated to be 118 individuals. This is based on 65% of the work force being married and an average of 2.89 individuals per household. These ratios are 1970 State of Florida averages (Florida Department of Commerce, 1977), since the workers will be drawn from parts of the state outside Alachua County. The projected population for Alachua County in 1980 is 135,500, which represents a 4,000 increase over the 1976 population. The population associated with the worker influx of 118 individuals is about 3% of the projected population increase from 1976 to 1980. The increase will be a non-discernible fraction of the 1980 projected Alachua County population of 135,500. The above estimates are conservative because it is conceivable that a certain portion of the worker influx may commute to the site on a weekly basis (Monday through Friday) and therefore will not move to the site area with their families.

7.2.4 Economy

Indirect Employment

Direct employment (Section 7.2.1) will generate a certain number of indirect jobs, mostly in the service sector, that will be needed to support the direct employment. However, no worker influx is anticipated to fill these jobs.

Employment multipliers provided by the Florida Department of Commerce indicate that, on the average, new power plant construction in the State of Florida generates 0.478 additional jobs for each single construction job. That is, each such "basic" job will, on the average, support an additional 0.478 "nonbasic" local jobs. During peak construction activity, therefore, the potential for 517 total jobs (350 direct and 167 indirect) will exist. Because most workers are expected to commute to the project, it is anticipated that few indirect jobs will be created locally. The employment multiplier for "operation of an electric utility" is 2.15, meaning that for each single operating employee an additional 1.15 local jobs could potentially be supported (State of Florida, Department of Commerce, 1976). Based upon the operating work force of 36 individuals (Section 7.2.1), total direct and indirect operating employment could eventually generate 77 local jobs.

It should be noted, however, that these multipliers describe the general relationship between "basic" and "nonbasic" employment. Several factors may influence this relationship, including possible time lags before the multiplier takes effect, excess capacity within the regional economy, or variances among intraregional linkages.

<u>Income</u>

Based upon union wage rates for the expected Deerhaven Unit 2 workers, and assuming the worker composition breakdown described in Section 7.2.1, it is estimated that total direct worker income will be over $10 million (1977 dollars). This estimate is further based upon the assumption that the total man-hours required for construction will be 1.2 x 10^6. Table 7.2-2 shows this breakdown by worker skill, estimated percentage of job jours involved, and total estimated wage income by skill.

The direct construction income will itself generate a certain amount of indirect income, in part because of increased local demand for goods and services. It is apparent that with a large number of workers commuting from Jacksonville, much of this direct $10.7 million income will be exported, or re-spent elsewhere. By applying the Florida Department of Commerce income multiplier of 2.23, it is calculated that the potential for an additional indirect income of 13.2 million is created (Florida Department of Commerce, 1976). This would total approximately $23.9 million in direct and indirect income resulting from the project. Thus, for each dollar of Deerhaven Unit 2 construction worker income, the potential for an additional 1.23 dollars of regional income develops. This does not necessarily mean that the entire amount will actually be generated, but simply points out that the potential for such an additional income increase will be created.

Assuming the operational work force of thirty-six workers described in Section 7.2.1, and by applying an average operating employee gross salary of $15,000 per year, it is estimated that direct operating worker income would reach $540,000 per year. With an economic multiplier of 1.9 (Florida Department of Commerce, 1976), this would total $1,026,000

Table 7.2-2 Deerhaven Unit 2 Worker Income By Job Skill

Skill	Estimated % of Total Man-Hours	Estimated Total Hours	Hourly Wage	Total Job Wages
Asbestos Workers	2	24,000	$ 9.00[a]	216,000
Boilermakers	13	156,000	9.50[b]	1,482,000
Bricklayers	1	12,000	9.25[d]	111,000
Carpenters	7	84,000	8.92[c]	749,280
Cement Masons	1	12,000	8.92[c]	107,040
Electricians	12	144,000	9.25[c]	1,332,000
Iron Workers	14	168,000	8.85[c]	1,486,800
Labor	10	120,000	5.32[c]	638,400
Millwrights	2	24,000	9.23[c]	221,520
Operating Engineers	6	72,000	8.90[d]	640,800
Painters	2	24,000	8.17[c]	196,080
Pipefitters	20	240,000	9.10[d]	2,184,000
Sheetmetal	2	24,000	9.08[c]	217,920
Teamsters	1	12,000	8.16[d]	97,920
Other	3	36,000	8.50[a]	306,000
Field, Non-Manual	4	48,000	15.22[d]	730,560
TOTAL:		1,200,000		10,717,000 (rounded)

Sources:

[a]Estimate based upon comparative wage levels.
[b]Business Manager of Jacksonville Boilermakers, Jacksonville, Florida.
[c]Gerald Clements, Labor Market Analyst, Jacksonville, Florida. State Employment Service.
[d]Estimates from Merom Station Units 1 and 2, Hoosier Energy Division. Letter of April 27, 1976.

per year. That is, the multiplier for the operation of an electric generating facility states that, for each dollar of operating income, the potential for an additional $0.90 of local income would be created. Since it has previously been assumed that operating personnel will be furnished locally, it is concluded that the majority of related income would be re-spent within the Gainesville area.

In addition to generated wage incomes, it is estimated that $1 million in supplies and materials will be purchased locally. These purchases will create further economic benefits to the local area.

7.2.5 Impacts on Housing

Based on the estimated percentage of the construction work force that will move into the Gainesville area as a result of the proposed project, no significant adverse housing impacts are anticipated. The worker influx will range from approximately 25 workers in 1978 to approximately 53 workers in 1980. The peak construction period will occur during the last part of 1979 and early to mid 1980. It is expected that nearly all the operating personnel will be from the Gainesville area, and thus will create little demand for housing.

Assuming a conservative ratio of one worker per housing unit, a maximum of 53 housing units will be needed at peak. These housing units will be distributed among single-family, multifamily, and mobile home rentals. From estimates presented in Section 7.1.4, Table 7.1-10, this project-related need for housing represents less than 4% of the projected annual household formations during the 1979-1980 time frame in the Gainesville urban area.

According to Mr. Carl Opp, Director of Off-Campus Housing, University of Florida, present housing and apartment starts will flood the market with about 3,000 more units in 1978. This will probably have the effect of stabilizing rents, perhaps even lowering rents in some cases. This excess in apartment rental units corresponds to the beginning of the project period.

The October 1975 U.S. Postal Survey vacancy rates in Alachua County averaged 3.5% for apartments and 1.8% for single-family residences. With a sub-standard housing percentage of 4% (North Central Florida Regional Planning Council, 1976b), about 455 apartments and 480 single-family residences were vacant in Alachua County. Although these are 1975 estimates, they show that, in general, the housing demands anticipated as a result of the project are a small fraction of the vacancies occurring in Alachua County.

The projected increase in apartment rental units, the normal vacancy rates occurring in the Gainesville area, and the urban setting of the proposed project will combine to minimize the housing effects in the area. It should also be noted that the above estimates of housing needs are potentially high because: (1) some of the workers who will move into the area may own mobile homes and would therefore locate in mobile home parks in the vicinity of the project site; (2) some of the single workers may choose to share housing units; and (3) some of the projected influx of workers may commute from outside Alachua County on a weekly basis (Monday through Friday). This group may tend to find housing accommodations in hotels/motels and/or rooming houses in the area.

7.2.6 Infrastructure

Overall adverse impacts on the infrastructure of Alachua County due to construction and operation of Deerhaven Unit 2 will be minimal. The impact areas judged to require further discussion are: (1) education, due to the fact that most families have direct contact with the educational system and are therefore more interested in education than in other social services; and (2) transportation, because transportation impacts are potentially more significant than other impacts. These two impact areas are discussed below.

Due to the urban setting of the project, other areas such as law enforcement, fire protection, and health care (Section 7.1.5), are not discernible enough to warrant further discussion.

Education

Data presented in Section 7.1.5 indicates that there is a 14% excess capacity in public school facilities for grade levels K-12. This overall percentage is composed of a 13% excess for elementary schools, a 16% excess for middle schools, and a 15% excess for secondary schools. Enrollments projected for 1979-1980 are approximately the same as present levels (actually, a 2% drop is projected).

The projected increase of school age children, as a result of the worker influx at the peak construction period, is 24 pupils. This is based on a peak influx of approximately 53 workers, approximately 65% of whom will be married; a household size of 2.89 individuals; and 0.701 school age children (K-12) per household (Florida Department of Commerce, 1977).

This influx of 24 pupils represents less than 0.6% of the excess capacity for grades K-12 in 1979-1980 and is therefore not expected to have any significant impact on the public school facilities of Alachua County.

Again, this estimate is conservative due to the fact that a certain number of the workers will commute weekly to the site without their families. Moreover, some of the children will probably not be of school age.

Transportation

Since a majority of the construction workers will commute daily to the plant site from areas outside Alachua County, a certain degree of adverse traffic impact is expected. This impact will occur mainly during the morning work reporting hours and after termination of work in the evenings. As noted earlier, Jacksonville is expected to be the main source of the construction work force. The expected route taken by most Jacksonville commuters would be impacted to a certain degree by the increased traffic.

7.2.7 Environmental Enhancement

There are no direct on-going benefits from environmental enhancement in support of the propagation of wildlife and the improvement of wildlife habitats. However, the removal of Deerhaven Unit 1 blowdown from Turkey Creek should restore the creek to pre-Deerhaven conditions. In addition, RUB previously contacted the Florida Game and Freshwater Fish Commission concerning the utilization of undeveloped land surrounding Deerhaven Unit 1 for research and/or tagging and trapping projects. The Commission expressed no interest in this proposal.

Ecological studies performed in the Turkey Creek, Cellon Creek, and Rocky Creek watersheds have increased our knowledge of water quality and invertebrate and fish population characteristics of small brown water streams in Central Florida. Comparisons have been made between naturally intermittent streams with no industrial influences (e.g. Rocky Creek) and intermittent streams which have modified water quality and water quantity characteristics as a result of industrial discharges.

7.2.8 Attitudes

Based upon field interviews conducted between August 1 and August 9, 1977, it was learned that both support of and opposition to the Deerhaven Unit 2 project exist among the residents of Alachua County. Both proponents and opponents of the project were contacted to obtain an insight into the basis of their support or opposition. These interviews were not intended to yield statistically relevant data. Therefore, since the number of informants contacted was limited and not statistically representative of the local population, views obtained cannot be clearly judged to represent the opinions of major segments of the population.

In general, among those contacted, commonly expressed opinions were that sufficient power at some (reasonable) environmental cost was the most practical option available. Those individuals favoring community growth most strongly endorsed this belief, stating that industry might be attracted to the Gainesville area if ample power supply were available. It was argued that this would stimulate the economy and could provide a number of local jobs. As has been previously noted, it is estimated that Deerhaven Unit 2 would generate 594 direct and indirect local jobs (517 construction jobs and 77 operating jobs). In addition, nearly $25 million in construction/operation income would be created. Also, approximately $1 million would be spent locally for supplies and materials, which in turn would stimulate the local economy.

Among those expressing some concern regarding environmental effects of the Deerhaven Unit 2 project were organized groups such as the Florida Defenders of the Environment, the Gainesville Group of the Sierra Club, and the Alachua Audubon Society. These organizations feel that at least three main issues warrant additional consideration: (1) the need for power; (2) potential air quality problems; and (3) potential water quality impacts, particularly as they may affect the San Felasco Hammock area.

CHAPTER 8

ALTERNATE ENERGY SOURCES AND SITES

The basis for RUB's selection of coal as a fuel source and the Deerhaven site as the geographical location for the proposed 235 mW, low-sulfur, coal-fired, generating unit follows. In section 8.1 environmentally compatable siting areas within the RUB service area are identified and analyzed and in section 8.2 the economic criteria which must be considered if an alternate site were to be developed are presented. In sections 8.3 and 8.4, together, the rationale for the construction of a coal-fired generating unit is considered in light of the availability of other fuel sources and capacity alternatives. Section 8.5 is a summary of the overall analysis designed to present a clear demonstration that the proposed choice of site and fuel best serves the interests of the public.

8.1 Alternative Siting Areas

A variety of environmental criteria are reported in relevant literature which might be considered in siting a power generating facility. Many general siting criteria apply, however, to areas of broad geographic, hydrologic, atmospheric and ecological variability, and are, thus, inappropriate in the present application because of RUB's relatively small service area (Alachua County).

Areas of Alachua County having land use or environmental features incompatible with the siting of the proposed facility were excluded from consideration (Section 6.1.6). Exclusion criteria used in this survey were: (1) ecologically sensitive or recreationally important areas; (2) existing or planned residential, commercial, or institutional land uses; and (3) areas of existing or potentially high agricultural productivity.

8.1.1 Ecologically Sensitive or Recreationally Important Exclusion Areas

Eleven areas were excluded from consideration on the basis of ecological sensitivity or recreational importance (Table 8.1-1 and Figure 8.1-1). The areas include: all of the major lakes, wetlands, wildlife management areas and sanctuaries, publicly-owned parks and recreational resources in the county.

8.1.2 Residential, Commercial and Institutional Exclusion Areas

Areas of Alachua County which are presently, or are planned to be, used for residential, commercial, or institutional areas were eliminated from consideration as potential plant sites. More than 25 such areas were identified, including: all of the major cities, communities, and residential developments, and the commercial areas and institutionally owned facilities (e.g. the University of Florida and its extensions) in the county (Figure 8.1-2 and Table 8.1-1). Exclusion area boundaries around towns and cities include any outlying residential areas and planned growth limits as indicated by the Alachua County Land Use Plan (1976).

Table 8.1-1 Descriptions of areas excluded from consideration as a power plant site.

Figure	Exclusion Area Number	Description
Figure 8.1-1 (Ecologically Sensitive Areas)	1	Relatively undeveloped areas adjacent to the Santa Fe River.
	2	O'Leno State Park.
	3	Major wetland and recreational area containing Lakes Santa Fe, Little Santa Fe, Altho, Hickory, Bonnet, Black and Elizabeth.
	4	San Felasco Hammock.
	5	Devil's Millhopper.
	6	Major wetland and recreational area containing Newnan's Lake, Gum Root Swamp and lower Hatchet Creek basin.
	7	Wetland area containing Watermelon and Horseshoe ponds.
	8	Wetland and recreational area containing Lake Kanapaha and Hogtown and Sugarfoot Prairies, and the Biven's Arm, Lake Alice and Colclough Pond Audubon Sanctuaries
	9	Paynes Prairie.
	10	Major wetland and recreational area containing Orange, Lochloosa, Tuscawilla, Jeffords, Little Orange and Little Lochloosa Lakes, a variety of Ponds; Levy, Kanapaha, Grass, Horse and Fish Prairies; Magnesia Springs; Cross Creek, River Styx, a variety of swamps and marshes, the Lochloosa Wildlife Management Area and the Orange Lake and Micanopy Cypress Audubon Sanctuaries.
	11	Major swamp and marsh area containing Buck Bay swamps and Potato Patch Bay.
Figure 8.1-2 (Residential, Commercial and Institutional Land-Use)	1	High Springs Area*
	2	La Crosse
	3	Waldo Area*
	4	Alachua Area*
	5	University of Florida Experimental Farm
	6	University of Florida Agricultural Experiment Station
	7	University of Florida Beef Research Unit

Table 8.1-1 Descriptions of areas excluded from consideration as a power plant site (continued)

Figure	Exclusion Area Number	Description
Figure 8.1-2 (continued)	8	Austin Cary Memorial Forest
	9	Santa Fe Beach
	10	Orange Heights
	11	Newberry Area*
	12	University of Florida Experimental Farm
	13	Gainesville Area*
	14	Windsor Area*
	15	Campville
	16	Archer Area*
	17	Micanopy Area*
	18	Evinston Area*
	19	Rochelle
	20	Grove Park and Magnesia Springs
	21	Hawthorne Area*
	22	Cross Creek Area*
	23	Island Grove
	24	Lochloosa
	N/A	Unnamed Residential Areas
Figure 8.1-3 (Productive Agricultural Land)	N/A	Approximate distribution of the most productive soils in the county. Those include the undulating and rolling phases of Gainesville loamy fine sand, Gainesville-Arredondo loamy fine sands, Arredondo-Fellowship loamy fine sands, Arredondo loamy fine sand - fine sand, Fort Meade loamy fine sand and Alachua loamy fine sand, which are considered the best general farming land in the county; and Hernando-Jonesville fine sands, Jonesville-Hernando fine sands, Archer-Jonesville fine sands and Chiefland fine sands which are considered the best in the county for bright tobacco and peanuts and also well suited to watermelon, sugarcane and truck crops (Alac. Co. Soil Survey, 1954).

*Areas contain existing and projected city limits and surrounding residential development. (Alachua County Land Use Plan, 1976).

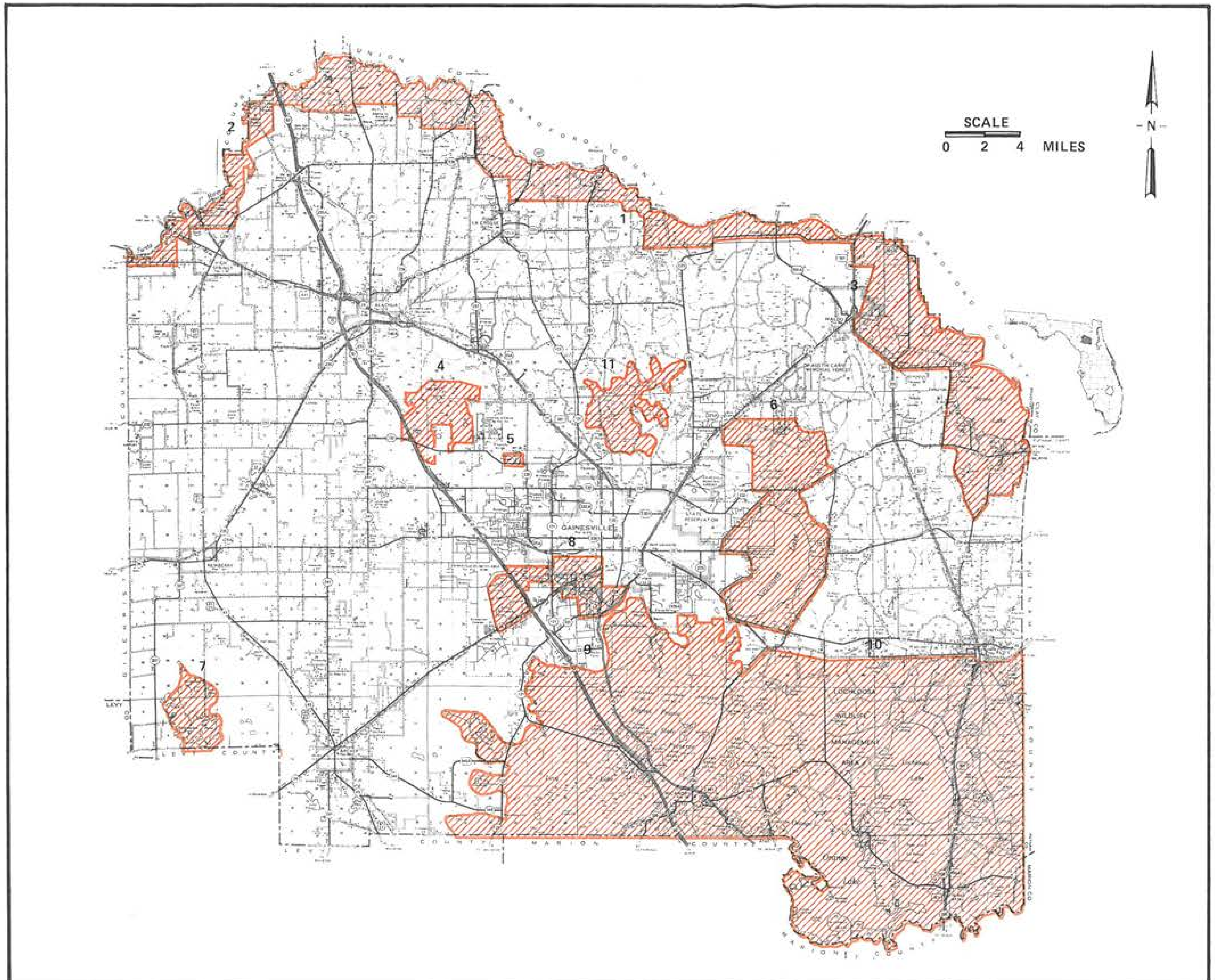

FIGURE 8.1-1 ECOLOGICALLY SENSITIVE OR RECREATIONALLY IMPORTANT EXCLUSION AREAS.

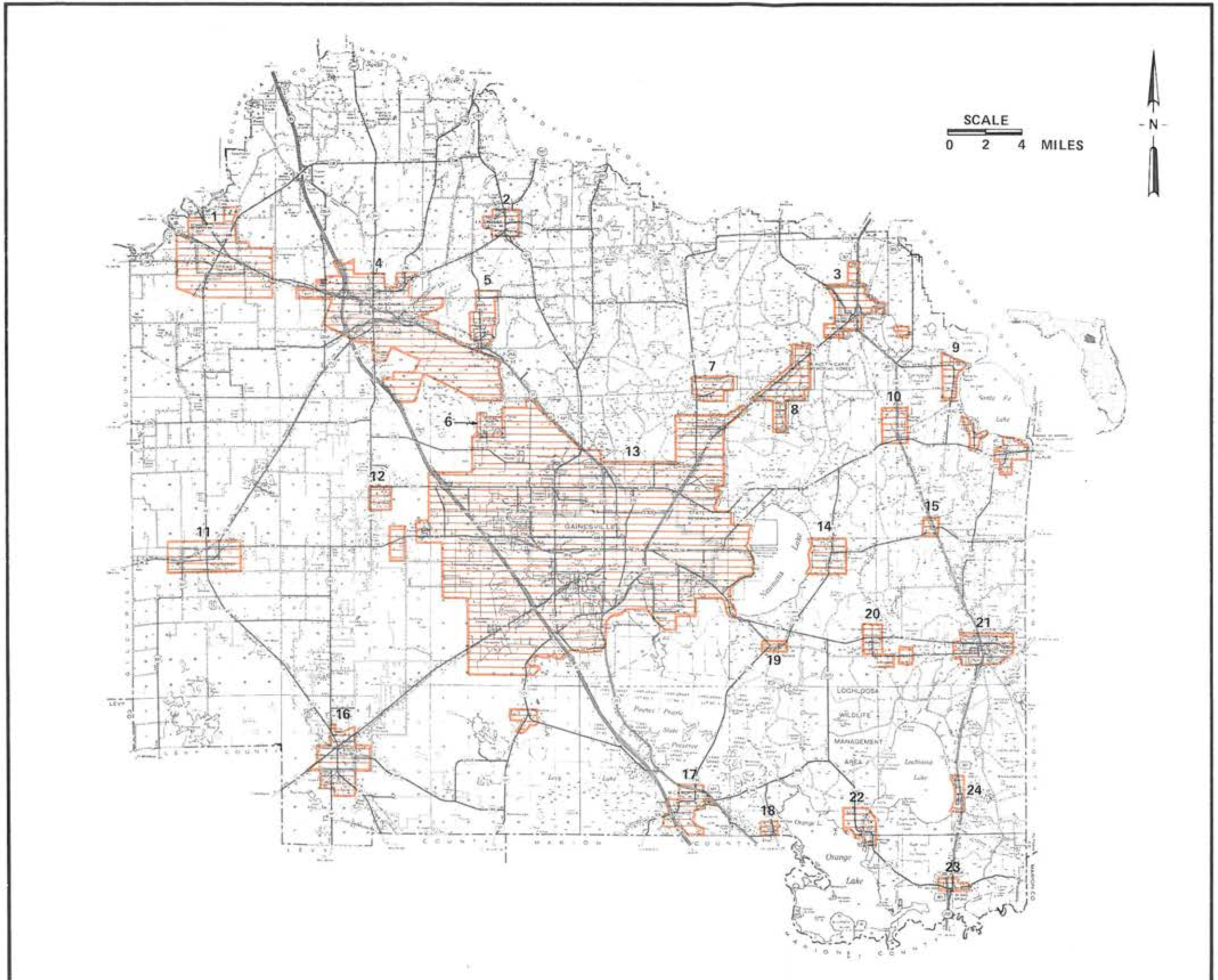

FIGURE 8.1-2 RESIDENTIAL, COMMERCIAL, AND INSTITUTIONAL EXCLUSION AREAS.

8.1.3 Agricultural Exclusion Areas

Areas of existing or potentially high agricultural productivity were eliminated from consideration as potential sites. Existing production areas were identified from recent aerial photos while potentially productive areas were identified from the only complete, county-wide soil survey (SCS, 1954), as the most versatile and productive soil types (Figure 8.1-3 and Table 8.1-1).

8.1.4 Identification and Analysis of Alternative Areas

The exclusion area overlays and the existing RUB transmission network, were composited to identify alternative siting areas on Figure 8.1-4, with the exception of several areas which were too small or too isolated for further consideration. The above technique identified one broad alternative area starting to the north and ending to the east of Gainesville. This area extends from northeast of Alachua to just west of Waldo, then curves southeasterly to include the area east of Newnan's Lake and north of Hawthorne.

8.2 Economic Feasibility of Alternative Sites

An analysis of this area, to identify suitable site locations, was made using facility support features and economic feasibility as major selection criteria. Necessary support features are dictated by the input and output needs of the facility and include accessibility to highway and rail lines and availability of a suitable water supply and discharge routes.

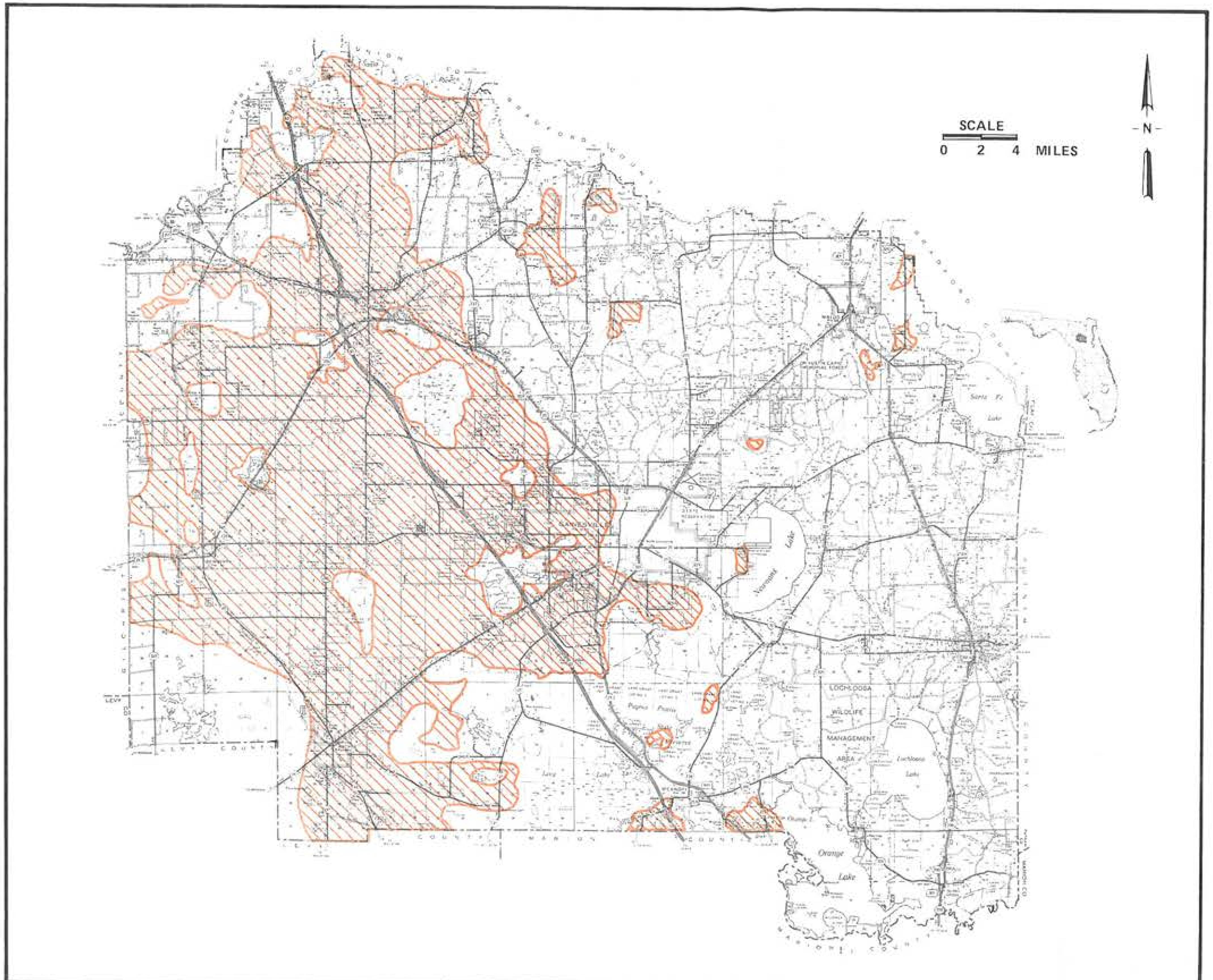

FIGURE 8.1-3 AGRICULTURAL EXCLUSION AREAS.

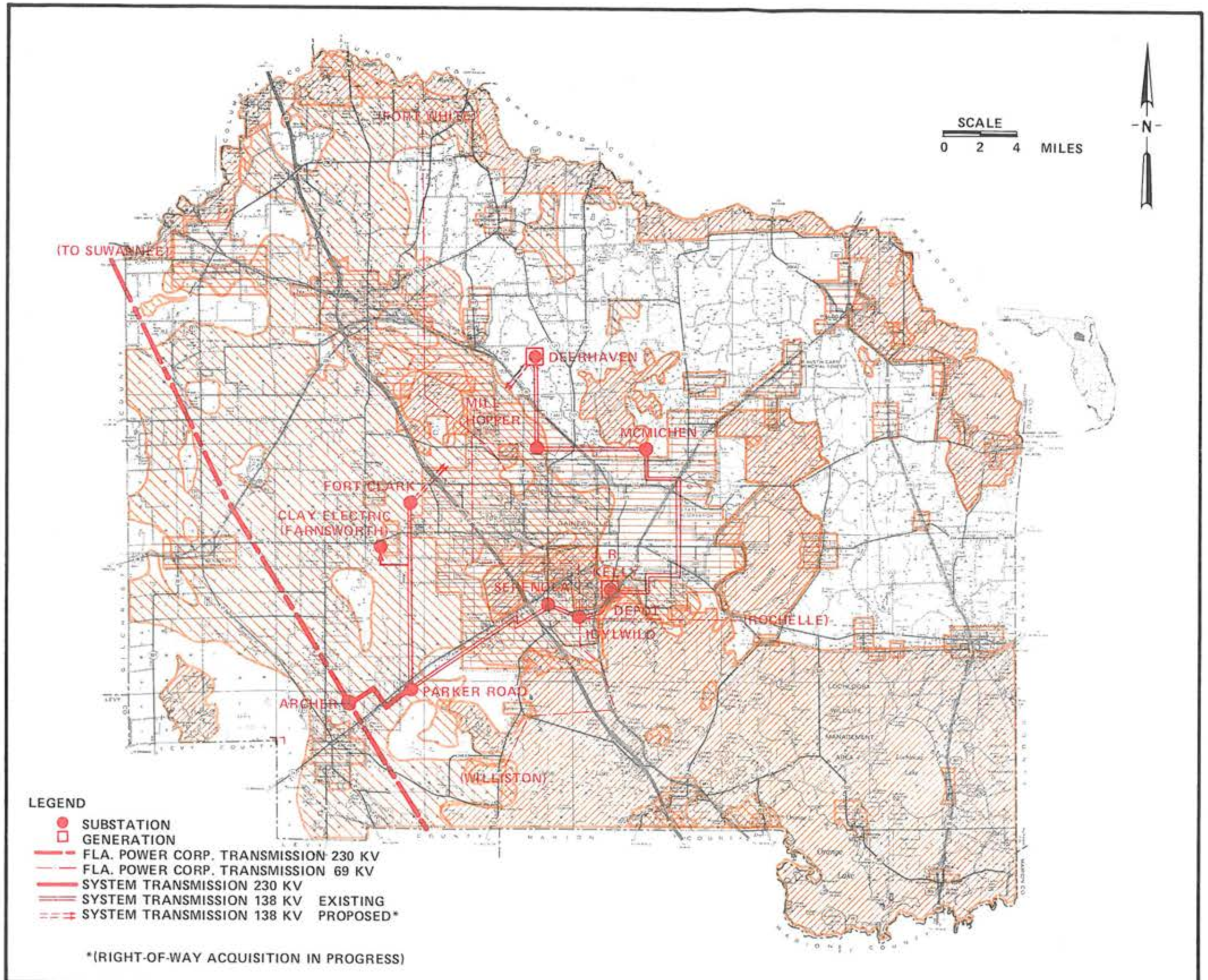

FIGURE 8.1-4 COMPOSITE OF ALL EXCLUSION AREAS WITH EXISTING TRANSMISSION FACILITIES.

8.2.1 Accessibility

Areas serviced by a suitable highway and rail lines lie along either U.S. 301, between Hawthorne and Waldo, U.S. 441, between Gainesville and Alachua, or SR-24, between Gainesville and Waldo.

Upon a review of Seaboard Coast Line/Louisville & Nashville (SCL/L&N) system maps, it was determined that other tracks within the alternative area are not main lines and would therefore result in additional switching charges. Assuming conservative estimates of 300 railroad-car shipments during the construction period and a minimum of one 70-car train shipment of coal to the site every five days for the life of the plant, the additional transportation charges would be significant.

8.2.2 Additional Construction Costs

Table 8.2-1 summarizes the minimum estimated, additional costs associated with constructing the proposed unit at a presently undeveloped alternate site. As noted on the table, the additional cost is in excess of $11 million, and does not include the costs of additional transmission lines and associated right-of-way. From the available alternative area boundaries, as shown on Figure 8.1-4, it appears unlikely that an alternate site could be developed any closer than 5 miles from the existing transmission facilities or any farther than 20 miles. Utilizing these distances to develop cost estimates for transmission construction and right-of-way procurement, a range from $650,000 to $2,000,000 is derived.

Table 8.2-1 Estimate of Additional Costs to Construct the Proposed Unit at an Undeveloped Alternate Site

Required Facilities	Estimated Costs
Site Procurement (1,000 acres)	$ 1,000,000
Site Planning, Surveying and Environmental Monitoring	350,000
Site Investigation and Monitoring Well	500,000
Site Development	1,250,000
Substation Facilities	2,500,000
Site Paving and Landscaping	800,000
Railroad Spurs	750,000
Fire Main, Hydrants and Elevated Storage Tank	300,000
Sanitary Disposal Facilities	10,000
Miscellaneous Yard Structures	200,000
Street and Yard Lighting and Start-up Transformers	500,000
Miscellaneous Electrical Yard Piping	100,000
General Construction Facilities	250,000
Machine Shop Facilities	500,000
Fencing	250,000
Office Facility Structures	100,000
Emergency Power Facilities	250,000
Turbine Room Crane	100,000
Cathodic Protection	50,000
Water Supply Wells, Storage Tank and Back-up Compressors	600,000
Yard Supply Piping	210,000
Dispatching Facilities	50,000
Fire Alarm System	50,000
Construction Site Security	200,000
General Plant Equipment	250,000
On-Site Equipment and Materials Transfered	750,000
TOTAL ADDITIONAL COSTS:	11,370,000
Transmission Line Facilities	125,000/mile
Right-of-Way Procurement	15,800/mile

Consumable water, for any alternate site, would be drawn only from wells and it is assumed for the purposes of this evaluation that plant effluents would be deep-well injected. Since the transmissivity of the Floridan Aquifer would not be expected to vary significantly from location to location within the service area, an evaluation of geohydrological factors would not benefit the alternative site selection process. Therefore, the estimated costs in Table 8.2-1 do not reflect costs for any geohydrological analysis.

8.2.3 Additional Personnel Requirements

It is anticipated that the proposed unit constructed at the Deerhaven site will require 36 personnel in addition to those now utilized for the operation of Deerhaven Unit 1 (Section 7.2.1). The construction of the proposed unit at an alternate site would necessitate an increase in manpower requirements.

Manpower estimates developed for such a unit would anticipate at least 57 operating, maintenance and administrative personnel broken down as follows:

Alternate Site Personnel Requirements

Functional Description	Required Personnel
Operators (5 shifts/5 per shift)	25
Maintenance	5
Technicians	7
Coal and ash handling	10
Janitorial	4
Administrative and Supervisory	3
Clerical	3
TOTAL	57

8.3 Alternative Energy Sources

Base load generating capacity on the order of 235 mW may be developed utilizing any of several different generation technologies powered by various energy sources. This section presents the rationale for the selection of coal as the fuel source for the proposed power plant.

Hydroelectric

Developed conventional hydroelectric power within the State of Florida yields a total of 30,168 kW and 232,900 mWh per year, of which 30,000 kW and 232,400 mWh per year are generated at the Jim Woodruff plant site located on the Apalachicola River and owned by the Corps of Engineers (Federal Power Commission, 1976). The undeveloped conventional hydroelectric potential within the state is very limited. Projected undeveloped capacity potential is estimated at 83,500 kW, with an average annual energy generation equaling 68,600 mWh per year (Federal Power Commission, 1976). Hence, the hydroelectric resource is not available within the state to fulfill the required 235 mW generating capacity of the proposed unit.

Geothermal

Four major types of geothermal resources are dry steam, wet steam, hot dry rock and geopressurized zones. Of these, only the least abundant, dry steam, is relatively well understood and used. Hot dry rock and geopressurized systems have not yet been exploited beyond the research and exploratory stages because of prohibitive economics and technical uncertainties. Currently, the three geothermal areas using dry steam are Larderello, Italy (396 mW); the Geysers, California (502 mW); and Matsukawa, Japan. The largest geothermal electrical generating installation in the world is the Geysers, Pacific Gas and Electric Company's generating facility some 90 miles northeast of San Francisco. Several additional power units are scheduled in the future, raising the Geysers' output to more than 1,000 mW. Other geothermal areas that are producing electricity are the Wairakei and Kawerau fields of New Zealand (170 mW), using steam flashed from hot water wells; the Cerro Prieto plant in Northern Mexico (75 mW), using steam flashed from hot brine; four installations in Japan (in excess of 50 mW); and small geothermal pilot plants in Russia and Iceland (Atomic Industrial Forum, Inc.).

Cost estimates for geothermal power plants indicate that installation costs may range from $500 to $700 per kW, and operation costs for binary conversion systems may range from 20 to 40 mills/kWh (Kruger, 1975).

Potential adverse environmental impacts resulting from geothermal power plants are air pollution from hydrogen sulfide, ammonia, and other effluents; pollution of surface water and groundwater resulting from disposal of toxic and saline waters; land subsidence; and use of large amounts of land, which are thus unavailable for other purposes.

Most of the known geothermal resources in the United States are located in the western states. As part of the development of federal procedures for utilizing geothermal resources, the U.S. Geological Survey has investigated geothermal areas in the western United States, and has identified certain of these as "Known Geothermal Resource Areas" (KGRAs) (Federal Register, 1975). Based on current information, the expected geothermal potential in the State of Florida does not indicate that it can provide the energy requirements of the proposed project (Geraghty, Miller, Van Der Leeden and Troise, 1973; White and Williams, 1975).

Nuclear

For several reasons, installation of a nuclear generating station to supply the projected energy needs of the proposed project is not considered an acceptable alternative. First, based on the energy requirements of the project, a nuclear generating station is not as economical as other alternatives. At present, to achieve economical competitiveness with other methods of generation, the nuclear unit size would have to be in excess of 850 mW. Finally, longer lead times are required for design and construction of nuclear units than for other types because of more extensive and more stringent regulatory requirements. Previous experience indicates that about 10 years are required from initiation of a nuclear project to startup. Therefore, such construction should have already begun to have a unit on-line by the early 1980's.

Oil and Gas

Of the resources utilized in the technically feasible generation systems (oil, gas, coal, uranium, water, dry steam), oil and gas are the most critical in terms of availability. The United States collectively depends on oil and gas for about 75% of its total energy and for about 35% of its electricity (Federal Energy Administration, 1976). By contrast, oil and gas make up about 7% of the country's fossil energy resources (Federal Energy Administration, 1976). In response to this supply-demand imbalance, and to the threat of scarcity, inflationary prices, and uncertain availability of imported oil, the federal government has initiated efforts to reduce oil and gas usage in noncritical applications such as electric power generation (CFR, Title 10; Energy Supply and Coordination Act, 1974).

At the present time, RUB primarily utilizes oil and natural gas to fire its generating units. Utilization of oil or gas as boiler fuel in new plants would aggravate potentially serious fuel availability problems and contribute to potential increases in cost of service.

Solar

The application of a commercial solar power plant to meeting base load energy requirements is still in the developmental stages (Bradley, 1977). The United States Research and Development Administration (ERDA) has devised a program plan and schedule aimed at the eventual commercialization of solar power plants. This program began in 1975 and includes such goals as the operation of a 5 mW (thermal) solar test facility in 1977 at Sandia Laboratories, a 10 mW pilot plant by 1980 at Barstow, California, and the first commercial demonstration plant by 1985.

A potential environmental disadvantage of a solar power plant is its large land requirement. It is estimated that a 250 mW solar power plant would require about 6,400 acres. In addition, siting solar power plants would require integration of unique criteria such as high insolation and favorable meteorological conditions with transmission requirements to deliver the power to the load centers. The most important advantage of solar power plants is the use of a nonexhaustible fuel supply and emission of fewer pollutants into the atmosphere as compared to other types of generation.

In summary, solar power cannot be relied upon as an alternative energy source to generate the base load energy requirements of the proposed project by the early 1980's.

Wood

Wood waste from logging operations or wood-consuming processes has been used as both an auxiliary fuel and a primary fuel in steam and/or electric generating plants. It is unlikely that sufficient quantities of wood can be secured near the vicinity of the proposed site to be used as fuel for a 235 mW power plant.

Municipal Waste

The utilization of refused-derived fuel (RDF), as a supplementary fuel for a suspension-fired utility boiler, is still in the developmental stages, and, thus, has certain inherent risks. Five such facilities are presently operating, starting-up, or under construction in the United States. These facilities are typically located in urban or suburban areas where the quantities of municipal waste generated and the difficulty of using traditional (landfill) disposal methods may combine to make this energy source an attractive alternative.

In July 1977, a study was completed which examined the feasibility of utilizing processed municipal refuse (refuse-derived fuel) produced within Alachua County as a supplementary fuel for Deerhaven Unit 2. It was determined that firing refuse-derived fuel (RDF) would not be economically feasible in the 1981 time frame. However, based on the assumptions made in the study, RDF would prove to be economically feasible when compared with disposal by sanitary landfill by 1991. For this reason RUB has determined that it will proceed on the basis of making minimum expenditures for provisions to use RDF in the future. In other words, allowances will be made in the design and construction of the project so as not to economically preclude future RDF firing.

Coal

The vast reserves of coal in the United States amount to three times the energy contained in the Middle East's oil reserves and currently account for more than 90% of the United States' proven energy reserves (Federal Energy Administration, 1976). The use of coal for the proposed unit would enable RUB to be less dependent on a relatively scarce resource such as oil, and would aid in reducing the dependence of the United

States on foreign imports of energy. When the proposed unit becomes operational, approximately 46% of the net winter capability will be supplied from coal as compared to none at the present time.

The move to a more abundant fuel such as coal will create certain environmental impacts more adverse than those expected from the use of oil and gas. The use of coal will result in greater impacts on air quality by emitting more pollutants into the atmosphere such as SO_2, particulates, and NO_x; greater impacts associated with water effluents and solid waste; and possibly greater transportation impacts. However, technologies do exist to enable coal-fired units to meet applicable air, water, and land environmental regulations.

Other Sources

Numerous other sources of energy have been advanced by the scientific community. These include systems such as wind, nuclear fusion, tides, magneto-hydrodynamics, and fuel cells. None of these is sufficiently developed at present to be used for base load generation in the early 1980's.

8.4 Alternatives to Acquiring Additional Generating Capacity

In order to supply required base load capability, this section examines alternatives that could preclude the construction of a new generating unit.

8.4.1 No Action

The need for the Deerhaven Unit 2 project is described in Chapter 1 of this report. Pursuant to that discussion, the no action alternative would not allow RUB to meet its projected demand, energy and reserve requirements.

8.4.2 Purchase Power

As an alternative to the construction of Deerhaven Unit 2, the potential exists for purchasing excess firm capacity and associated energy from other interconnected utilities. Based upon review of the current plans of the peninsular Florida utilities as presented in the 1977 Ten-Year Plan prepared by the FCG, it is most likely that any such available excess capacity on other peninsular Florida systems would be oil-fired.

During the 1981 to 1986 time frame, as shown in Table 1.6-1 in Chapter 1, of the seven systems in peninsular Florida comparable to or larger than RUB, the largest system, Florida Power & Light, projects reserves in excess of 20% only in the years 1982 and 1983 while the next larger, Florida Power Corporation, projects no reserves in excess of 20%.

In fact, both of these large systems will be capacity-short during most of that period. Of the remaining five systems, all except Tampa Electric Company and the City of Lakeland have essentially all oil-fired generation. The City of Lakeland has scheduled the addition of a 236 mW coal-fired addition in 1983, and prior to this addition, the system is essentially all oil-fired. Tampa Electric Company is projecting reserves below 20% in 1984 and 1985 prior to the addition of a 425 mW coal-fired unit in 1986.

8.4.3 Increased Utilization of Existing Facilities

The existing RUB system is comprised of a mixture of four fossil-steam turbines, five combustion turbines, one black start internal combustion diesel unit and a portion of Crystal River 3 nuclear plant. With the exception of Crystal River 3, the units are operated by oil or natural gas. All are operated as either peaking units or intermediate units, except Deerhaven Unit 1, which is operated as a base load unit. Therefore, the increased utilization of existing units would not alleviate the need for additional base load capacity. In addition, increased utilization of existing units would increase the dependence on natural gas and/or oil for base load generation.

8.5 Summary of Final Site and Fuel Selection

In order to supply required base load capability, RUB has elected to construct a 235 mW coal-fired generating unit in its service territory.

Economic site selection criteria indicate a preferred site would be collocational with the existing Deerhaven Unit 1. The site is of sufficient size to preclude the need for additional property aquisition and is linked to the existing transmission network as shown on Figure 8.1-4. Additional savings realized by using this site include: (1) a minimization of the total manpower needs for both units; (2) sharing of support facilities by both units; and (3) improved logistics and management efficiency resulting from having both facilities on the same site.

FEA stated in its construction order for this unit, dated June 21, 1977: "FEA cannot find that an adequate and reliable supply of coal is not reasonably expected to be available".

This finding by FEA, combined with further reviews of alternative energy sources and alternatives to the addition of base load capability, indicates that the installation of a 235 mW generating unit utilizing coal as the energy source appears to be the most practical alternative overall.

CHAPTER 9

PLANT DESIGN AND DISCHARGE ALTERNATIVES

This chapter presents the alternatives considered during the preliminary design of the project for various in-plant systems and methods of effluent disposal. Of primary concern was the method and source of process water treatment and effluent disposal.

Section 9.1 discusses alternatives and ranks the alternatives into two categories, active and rejected. Active alternatives are those considered to be feasible by RUB from an economic, engineering, and environmental standpoint and would receive further consideration should deep well injection not be utilized. Rejected alternatives are those determined not to be feasible based on the above parameters and would not receive further consideration. The alternatives are presented in detail along with their projected environmental impacts. Detailed comparative economic and environmental data are presented for the active alternatives while similar, less detailed data are provided for rejected alternatives.

The remaining sections discuss various segments of the process water system and those provisions made regarding future use of flue gas desulfurization equipment.

9.1 Water Treatment and Discharge Alternatives

9.1.1 Active Alternatives

Several alternatives to the disposing of cooling tower blowdown and low volume waste have been investigated. These alternatives have been evaluated by RUB and have been ranked in order of preference as shown on Table 9.1-1. This table presents the source of cooling water, whether from wells on the site or from the RUB's water distribution system; the cooling tower blowdown and low volume waste disposal method for each alternative; the total groundwater withdrawal for each alternative; the total liquid discharge from the power plant, both cooling tower blowdown and, where applicable, low volume waste; the concentration of sulfates, chlorides and total dissolved solids in the plant discharge stream; and the net groundwater withdrawal from the freshwater aquifer. If consumptive use is defined as the total groundwater withdrawn from the freshwater aquifer and not directly returned, Table 9.1-1 then provides a measure of the consumptive use associated with each alternative.

9.1.1.1 Description of Process Water Treatment, Wastewater Treatment and Use Alternatives

The process water treatment, wastewater treatment and use system presented in Chapter 3 is preferred in regard to capital costs, operation and maintenance costs, use of natural resources, and conservation of energy. Other alternatives are available should this system not be acceptable.

Alternative 1 - Deep Well Injection/Side Stream Treatment - The flow scheme (water and solids) for this alternative (Figure 9.1-1) is the same as for the chosen system (Figure 3.3-1) with the exception of the cooling cycle.

Table 9.1-1 Active Disposal and Treatment Alternatives

	Alternative Designation	Cooling Tower Conc.	Cooling Tower Blowdown SO_4 Conc. (mg/l)	Cl Conc. (mg/l)	TDS Conc. (mg/l)	Flow (MGD)	Cooling Tower Makeup (MGD)	City Water Makeup (MGD)	On-Site Ground-Water Makeup (MGD)	Makeup From Floridan Aqu. (MGD)	Consumptive Water Use (MGD)
1.	GW-5-SST/DW	(5.3){46.6}	8,900	460	14,000	0.05(0.09)	3.84(5.44)	0.07(0.11)	4.01(5.77)	4.08(5.88)	4.05(5.83)
2.	GW-5-SST/BC*	(5.3){46.6}	8,900	460	14,000	0.05(0.09)	3.84(5.44)	0.01(0.01)	3.84(5.51)	3.85(5.52)	4.05(5.83)
3.	CW-2-NT/DW	2.8	184	86	500	2.05(2.90)	5.83(8.24)	5.90(8.35)	0.17(0.33)	6.07(8.68)	3.98(5.73)
4.	CW-1-NT/BC	3.7	250	117	666	1.37(1.94)	5.14(7.26)	5.04(7.11)	0.17(0.33)	5.21(7.44)	3.98(5.73)
5.	GW-1-FE/BC	3.6	250	122	786	1.42(2.02)	5.19(7.34)	0.01(0.01)	5.25(7.51)	5.26(7.52)	4.00(5.75)

*Essentially zero discharge system.

LEGEND: ((All Flows expressed in Million Gallons per Day (MGD))
0.00 = Average Monthly Flow Rate
(0.00) = Normal Maximum Monthly Flow Rate
( ) = Cooling Tower Concentrations Relative to Flow to Side Stream Treatment Plant from Cooling Towers
{ } = Cooling Tower Concentrations Relative to Flow to Process Waste Disposal System from Side Stream Treatment Plant

```
CW-1-NT/BC
|  | |  └──── Process Waste Disposal Method:
|  | |           BC = Brine Concentrator
|  | |           DW = Deep Wells
|  | └─────── On-Site Cooling Water Treatment:
|  |             NT = No On-site Cooling Water Treatment
|  |             FE = Front End (Excess Lime Softening) Treatment
|  |            SST = Side Stream (Lime-Soda Softening) Treatment
|  └───── Relates to System Designation
└── Cooling Tower Makeup Source:
      CW = City Water
      GW = On-Site Wells
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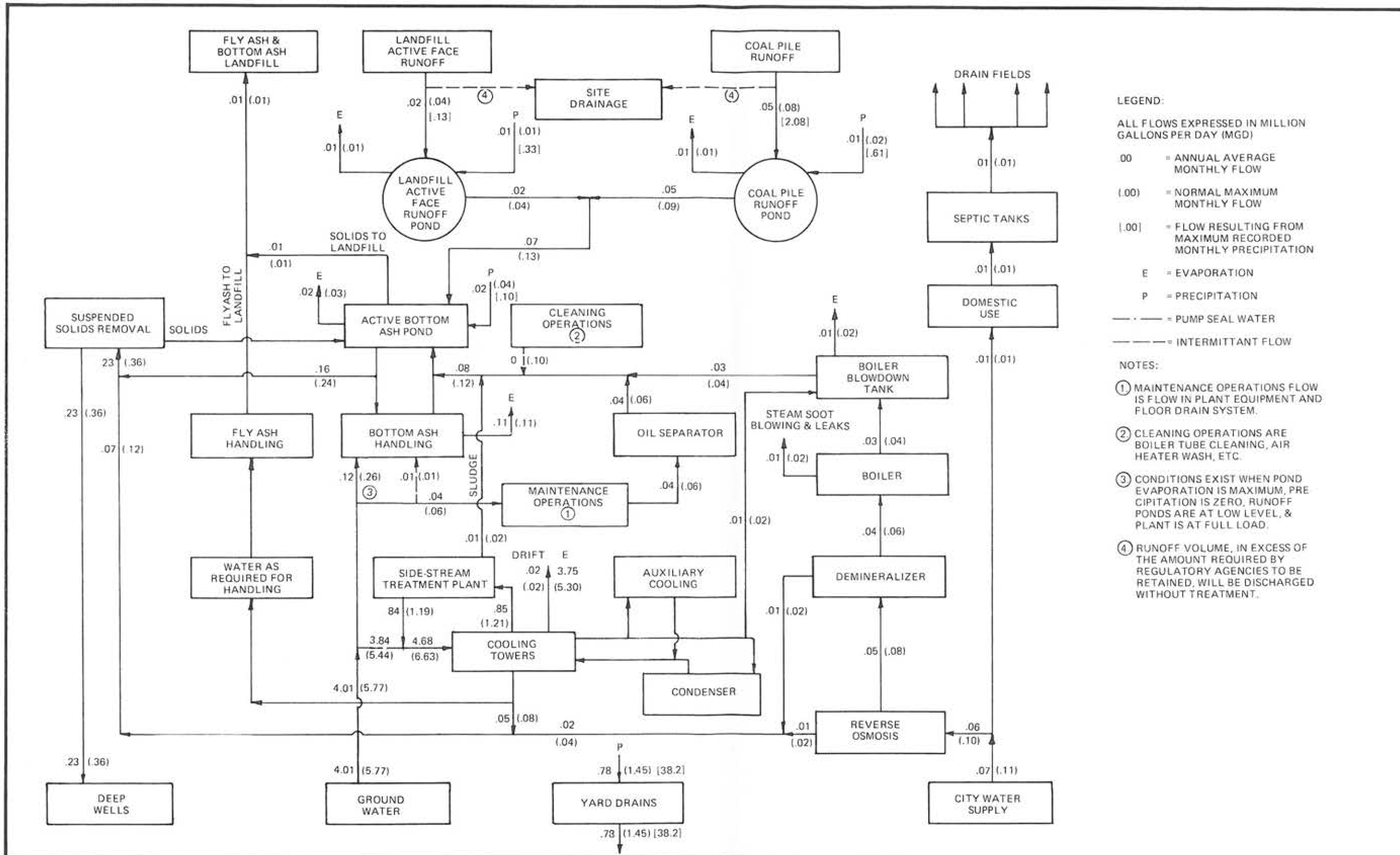

FIGURE 9.1-1 PROCESS FLOW DIAGRAM ALTERNATIVE 1.

The cooling water system for this alternative employs side-stream treatment for softening of the cooling water. This enables the system to operate at a higher number of concentrations than can a conventional cooling cycle which does not have treatment or which has only front-end treatment, thus reducing the quantity of blowdown.

With this scheme, a side-stream from the cooling towers (Units 1 and 2) is treated in a side-stream treatment plant. The flow rate of this stream is based on 5.3 concentrations in the cooling cycle. The lime-soda ash softening water treatment plant is capable of reducing the concentration of hardness causing ions (e.g. Ca^{++}, Mg^{++}, etc.) to their respective groundwater concentrations. The product water from the treatment plant is combined with raw groundwater for cooling tower makeup. Therefore, the concentration of hardness causing ions in the cooling water will be approximately 5.3 times their concentration in the groundwater. The sludge generated by the treatment plant will be disposed of in the active bottom ash pond, from which it will be incorporated into the ash landfill.

The quantity of blowdown from the entire cooling system, including the water treatment plant, will be that quantity of water required for sludge removal from the clarifiers. It is expected that this quantity would be 7% to 8% of the flow into the treatment plant. This would result in the cooling system as a whole being operated at approximately 46 concentrations, thus concentrating the nonhardness causing constituents to approximately 46 times their respective concentrations in the raw groundwater.

For a description of the manner in which all other plant systems would be operated, see Chapter 3.

The advantages of this alternative over the chosen system are that it requires approximately 86% of the average annual consumptive water use of the chosen system. Additionally it only injects approximately 25% of the average annual deep-well-injected waste and utilizes approximately 86% of the Floridan Aquifer withdrawal as compared to the chosen system.

The disadvantages over the preferred system are that it will require approximately 700 tons per year of lime, approximately 2,300 tons per year of soda ash, approximately 150 tons per year of polymer, and approximately 30,000 kilowatt hours per year more of electricity than the preferred system. The capital and operating costs are approximately 1.6 and 5.6, respectively, times the costs for the preferred system.

Alternative 2 - Zero Discharge - This alternative differs from the chosen system in that the cooling water system employs side-stream treatment and the process wastes are treated for dissolved solids removal and reused, thus not making use of deep-well injection. See Figure 9.1-2 for the water and solids flow scheme for this alternative.

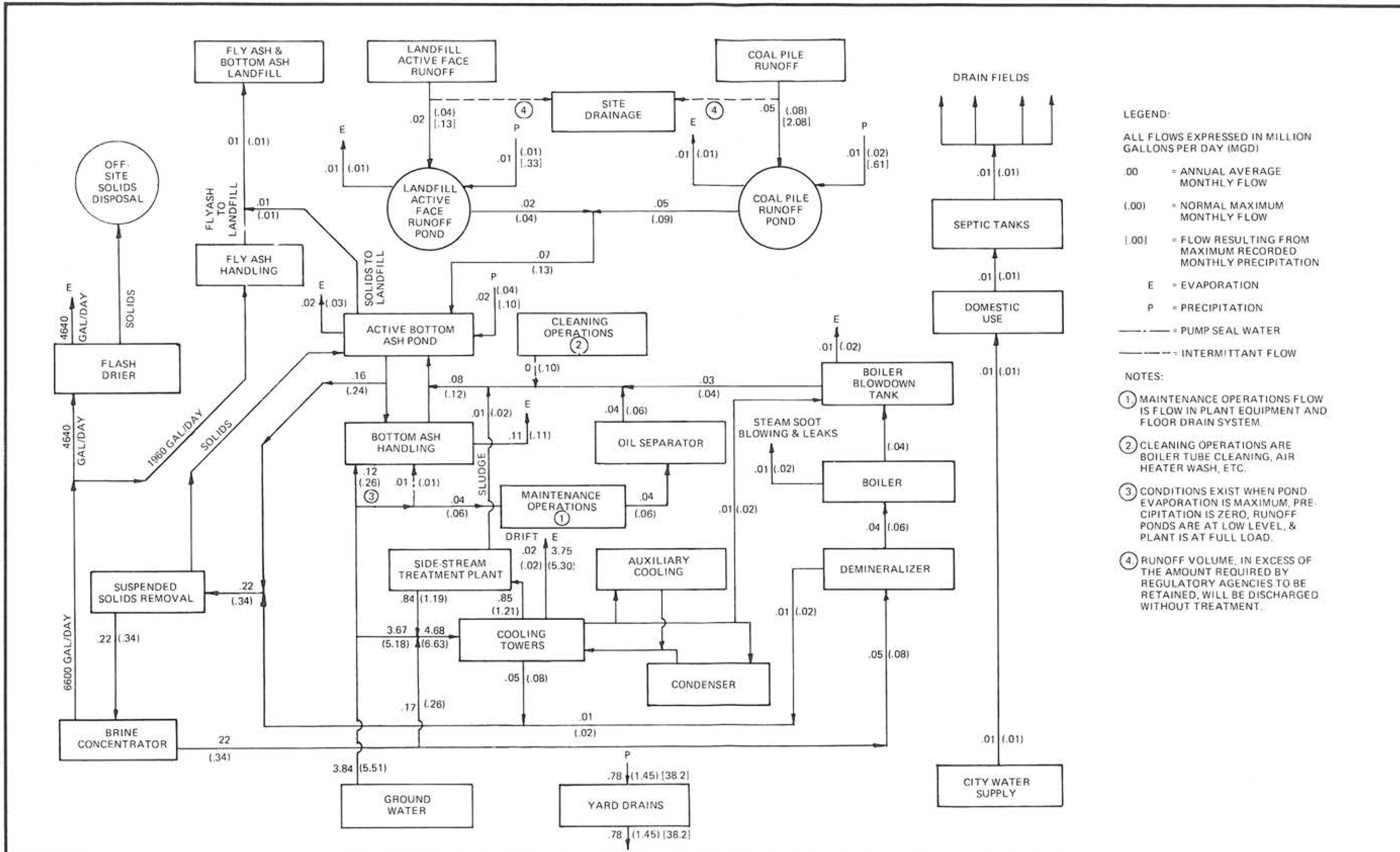

FIGURE 9.1-2 PROCESS FLOW DIAGRAM ALTERNATIVE 2.

The cooling water system for this alternative is the same as for Alternative 1.

The process wastes are generated, collected and undergo suspended solids removal in the same manner as for the chosen system and for Alternative 1. However, instead of being deep well injected, they are routed to a vapor-compression evaporator (brine concentrator) for dissolved solids removal. The brine concentrator evaporates the water from the waste, converts the vapor to condensation and recovers the condensate as a product water. This product water is then used as cooling system and boiler makeup.

A portion of the waste product (brine) produced by the evaporator is used to moisten the fly ash as required for proper handling. The remainder of the waste is either disposed of in the ash landfill where it is encapsulated with fly ash or is flash dried and the remaining solids hauled off-site for disposal by a disposal contractor.

The advantage of this alternative is that it requires approximately 81% of the average annual consumptive water use and approximately 81% of withdrawal from the Floridan Aquifer as compared to the chosen system.

The disadvantages over the chosen system are that it will require approximately 700 tons per year of lime, approximately 2,300 tons per year of soda ash, approximately 150 tons per year of polymer and approximately 7.5 million kilowatt hours per year more of electricity than the preferred system. Also, the capital and operating costs for this alternative are approximately 2.4 and 6.8 times the respective costs of the chosen system. In addition, there is an expense and waste of energy in the form of gasoline or diesel fuel to haul the brine to Baton Rouge if not disposed of in the landfill.

Other Alternatives - Two other alternatives were considered wherein water from the RUB system or treated on-site groundwater is used for cooling tower makeup, cooling tower blowdown is shallow-well injected, and process wastes are deep well injected. However, these alternatives require large amounts of lime and polymer and have capital and operating costs ranging for RUB water from 4 to 5 and for on-site groundwater 5 to 8 times the respective costs of the chosen system.

These alternatives consider disposing of cooling tower blowdown by means of on-site shallow injection wells which would recharge the freshwater aquifer. In order to achieve an acceptable level of water quality in cooling tower blowdown prior to injection, softening of cooling tower makeup water would be required. Thus, if groundwater obtained from Deerhaven wells were used as cooling tower makeup water, an on-site water softening treatment plant would be required. Cost analyses favor utilizing previously softened water from the RUB distribution system rather than construction of an on-site water softening treatment plant. In addition, subsequently described evaluations indicate technical difficulties associated with simultaneous on-site groundwater withdrawal and recharge. Although the RUB water system is the preferred water supply source for this alternative, evaluations are presented both for water withdrawal from on-site wells and for water supply from the RUB system. Pumping rates and injection rates for each evaluation are shown below:

WITHDRAWAL AND INJECTION RATES FOR DISPOSAL OF COOLING TOWER BLOWDOWN BY ON-SITE SHALLOW WELL INJECTION

Source of Water	Pumping Rate (mgd)	Injection Rate (mgd)
Wells on-site	6.6 (average)	2.85 (average)
	9.31 (max)	4.04 (max)
RUB's Murphee wellfield	5.79 (average)	2.05 (average)
	8.16 (max)	2.90 (max)

9.1.2 Rejected Alternatives

In addition to the discharge system alternatives previously discussed detailed investigations have been performed to evaluate the technical and environmental feasibility of other disposal alternatives. This section briefly summarizes each alternative and the rational leading to its rejection. Detailed information on the feasibility of discharging to the main branch of Rocky Creek, Mulatto Pen Branch, Cellon Creek, and on-site spray irrigation systems or percolation ponds can be found in "An Evaluation of Alternatives to the Present Releasing of Deerhaven Generating Station Blowdown to Turkey Creek" (Breedlove and Associates, and Jones, Edmunds and Associates, 1977).

Mulatto Pen Branch - This alternative calls for the introduction of a high quality cooling tower blowdown into Mulatto Pen Branch, a tributary of Rocky Creek, at its intersection with SR-121. The Mulatto Pen Branch drainage basin is shown on Figure 9.1-3 along with the assumed cooling water pipeline route and the proposed discharge location. As indicated, two discharge routes have been considered.

One route would require piping the cooling water discharge from point "A" to point "B", construction of a wholly excavated open channel from point "B" to point "C", followed by extensive modification to the natural channel of Mulatto Pen Branch down to SR-121. The right-of-way requirements for open channel modifications would vary from a minimum of 50 feet to a maximum of 75 feet with clearing and grubbing and berm construction within right-of-way limits. A continuing maintenance program would be necessary including biannual cleaning and reshaping of the water course and berms plus grass and brush cutting within the right-of-way.

The second route would involve pumping cooling tower blowdown via pipeline from point "A" to point "D". Discharge into Mulatto Pen Branch at point "D" would eliminate the open channel construction and maintenance discussed above. Hydrologic modeling of Mulatto Pen Branch by means of advanced computer models indicates that the tributary has sufficient channel capacity to accept and convey the discharge from point "D" to the primary channel of Rocky Creek without modification. Hydrological impacts would be limited to only local short-term adjustment in the

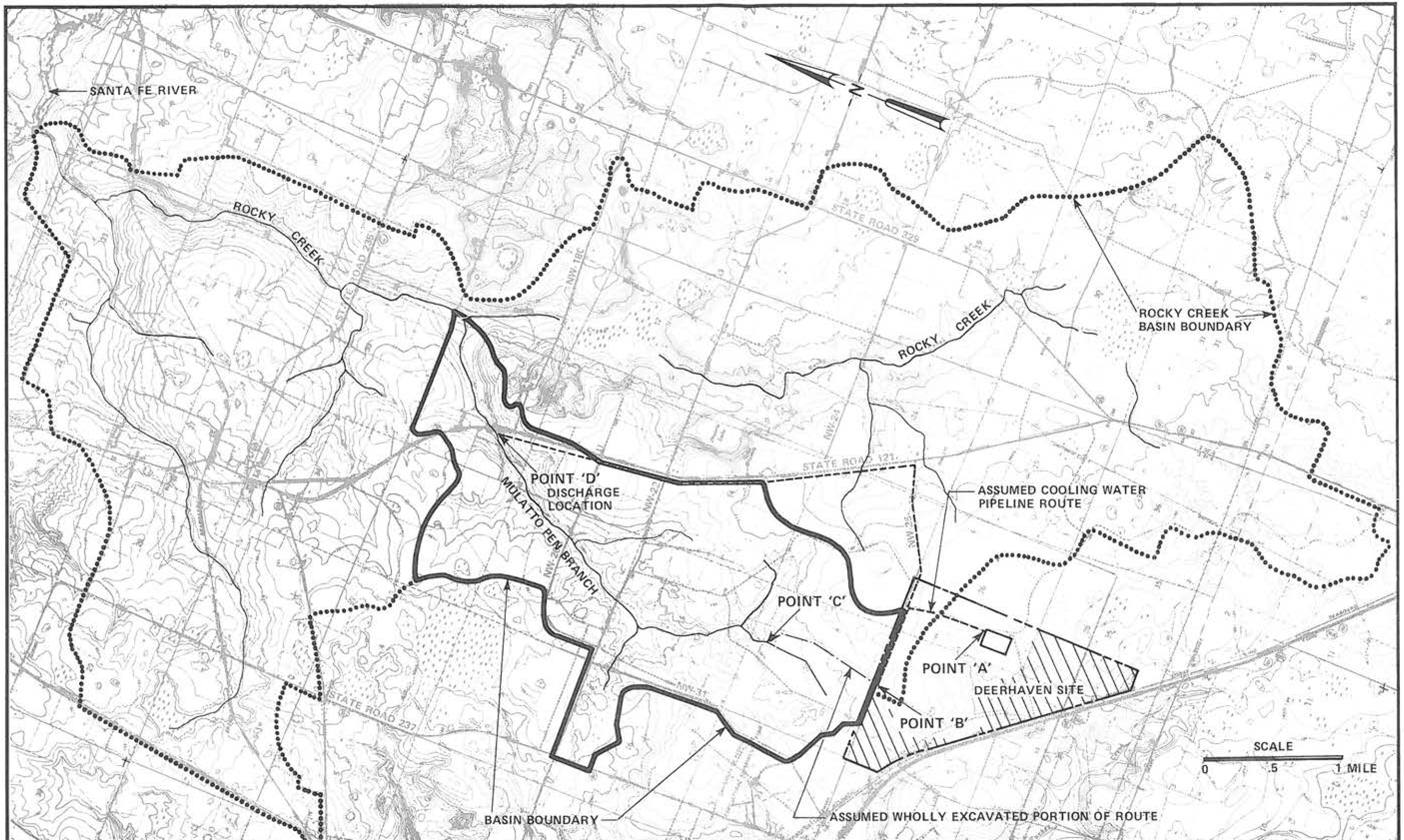

FIGURE 9.1-3 MULATTO PEN BRANCH DRAINAGE BASIN, SHOWING PROPOSED COOLING TOWER BLOWDOWN DISCHARGE ROUTES.

channel for the sustained increase in flow. With the exception of the improvement of two shallow farm crossings and construction of a simple outfall structure at point "D", no other channel improvements would be anticipated. Hydrologic modeling of Rocky Creek from its point of confluence with Mulatto Pen Branch down to its confluence with the Santa Fe River indicates little hydrological impact due to the introduction of the cooling tower blowdown flow.

Because of the minimized environmental impact of cooling tower blowdown discharge at point "D" in Mulatto Pen Branch, this is considered to be the most feasible and desirable surface stream discharge alternative.

Discharge Into Upper Rocky Creek Basin - This alternative assumed piping of blowdown from the power plant to a small stream in the southern end of the Rocky Creek drainage basin which is tributary to Rocky Creek at its upper reaches (Figure 2.5-9). Upon joining Rocky Creek, the discharge would pass south through two swamps and proceed to the Sante Fe River. High erosion in the tributary from Cross-section R101 to R003 were predicted by the analysis. Otherwise, little hydrological impact on natural stream channels was predicted. However, this alternative was rejected due to the potential for hydrogen sulfide generation in the swamp systems between Cross-sections R065 and R313.

Discharge Into Cellon Creek Drainage Basin - This alternative considered piping the cooling tower blowdown along U.S. 441 northwest of the Deerhaven site into the Cellon Creek drainage basin (Figure 2.5-3). Two alternative discharge points were considered. Discharge point "A" is located at the box culvert where Cellon Creek passes beneath U.S. 441 near the General Electric battery plant. Discharge point "B" is just upstream of Cellon Creek's terminus at Lee Sink, where, it is believed, Cellon Creek connects with the Floridan Aquifer. Environmental investigations indicated that the Cellon Creek system is presently stressed from a biological standpoint and that the introduction of cooling tower blowdown water would have little additional impact. Hydrological analyses and modeling of the stream channel indicated that erosion would increase between Cross-sections C007 and C008. Stream water levels were predicted to increase insignificantly due to the additional flow. However, stage-discharge relationships developed for Lee Sink implied that the sinkhole would not accept the additional discharge without extensive flooding in the area of the sinkhole and, possibly, overflow into an adjacent drainage basin. Although the stage-discharge relationships were preliminary in nature and based on instrument recordings for only one storm event and only two flow tests of the sinkhole, it was felt that additional investigation was unwarranted unless all active discharge alternatives were to prove unfeasible.

Disposal by On-site Spray Irrigation Systems or Percolation Ponds - This alternative considered the feasibility of on-site disposal of cooling tower blowdown by either an on-site spray irrigation system or by percolation ponds. Several borings were performed at selected locations to determine the stratigraphy and properties of site soils. Samples were retained and subjected to permeability testing. Based on such information, mathematical and computer models were performed to determine whether cooling tower blowdown could be disposed of by spray irrigation on the Deerhaven site without surface runoff occurring. It was felt that if spray irrigation were feasible, the feasibility of percolation ponds would then be investigated. However, mathematical and computer model results indicated that the net quantity of water that can be infiltrated on the Deerhaven site is extremely small and that overland runoff of cooling tower blowdown would occur.

Discharge Into Turkey Creek - Cooling tower blowdown from Deerhaven Unit 1 has been discharged into an on-site tributary of Turkey Creek since plant startup (see Figure 2.5-2). Although environmental investigations imply that environmental impacts to the Turkey Creek system would not increase due to additional cooling water flow from the proposed Unit 2, this alternative is not under active consideration, because of extreme objection expressed by the Department of Natural Resources.

Use of Cooling Tower Blowdown for Water Supply at RUB's Murphee Water Treatment Plant - This alternative considered the transporting of cooling tower blowdown via pipeline to the Murphee Water Treatment Plant, approximately 7 1/2 miles southeast of the Deerhaven site, for treatment and use as potable water. This alternative was rejected because of the expense of conveyance and treatment of the cooling tower blowdown, the degrading effect of the cooling tower blowdown water on treated water quality, and the doubtful acceptability of cooling tower blowdown as a source of potable water by regulatory agencies.

Disposal by Shallow Well Injection at RUB's Kanapaha Wastewater Treatment Plant - This alternative considered transporting the cooling tower blowdown by pipeline to the Kanapaha Wastewater Treatment Plant, approximately 12 miles south of the Deerhaven site, and injecting blowdown into shallow disposal wells constructed on that site. This alternative was rejected due to the costs of transporting the cooling tower blowdown to the wastewater treatment plant.

9.1.3 Impacts of Alternatives

9.1.3.1 Ecological Impacts of Plant Design Alternatives

9.1.3.1.1 Active Alternatives

There are three categories of active discharge alternatives: (1) modified deep well injection; (2) zero discharge; and (3) shallow well injection.

Those alternatives utilizing "side-stream treatment" (modified deep well and zero discharge) result in the concentration of dissolved constituents, and as a consequence salt drift (NaCl) becomes a matter of concern. If the same method for determining TDS deposition from blowdown is used as was used in Section 6.1.4, the expected TDS deposition is 2,950 lb./acre-year (Figure 9.1-4). Sodium chloride is approximately 3% of the TDS in the blowdown (Table 9.1-2). Therefore, NaCl deposition within the 2,000

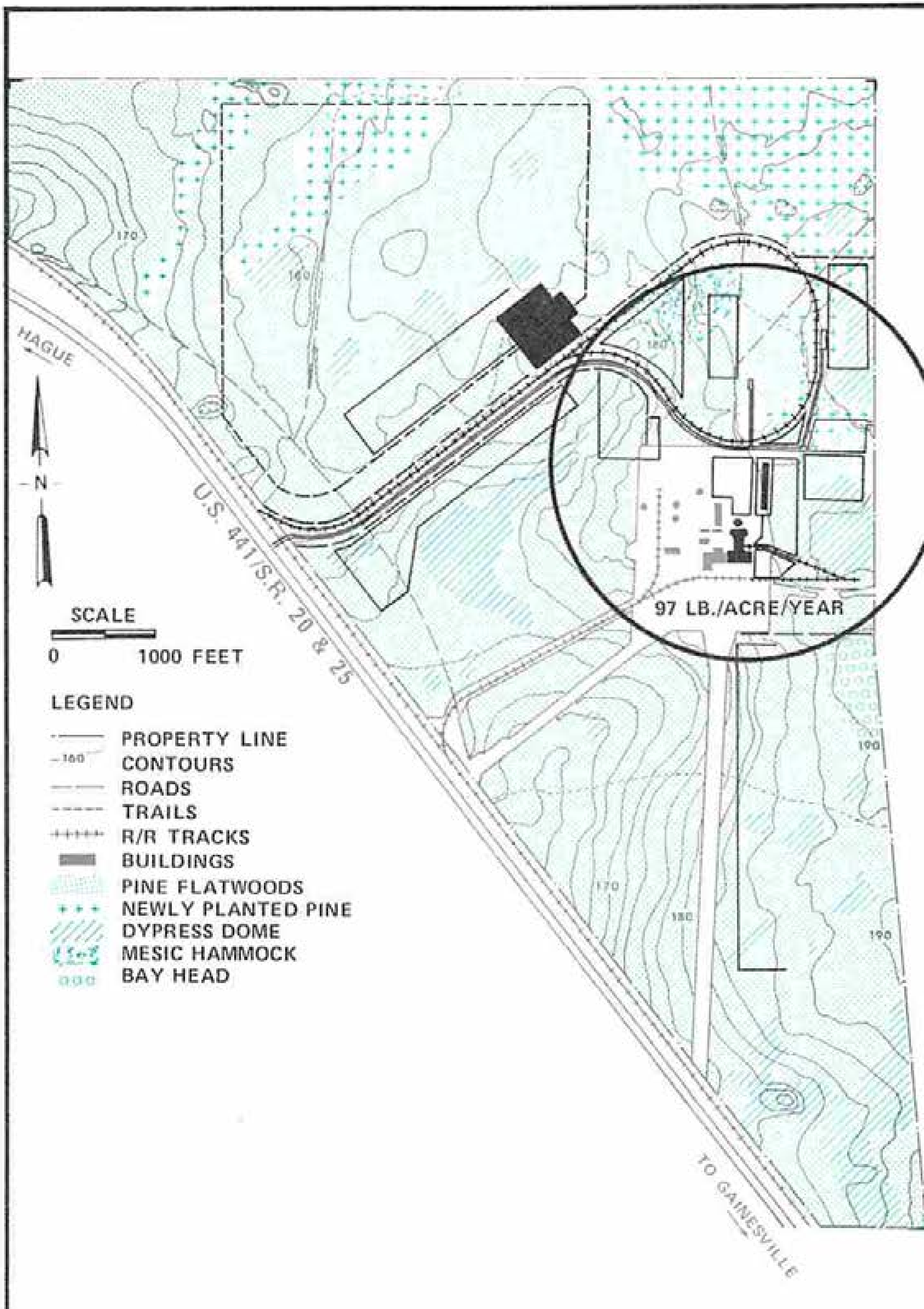

FIGURE 9.1-4 PROJECTED SALT DEPOSITION FROM COOLING TOWER DRIFT USING SIDE STREAM TREATMENT.

Table 9.1-2 Anticipated Concentration of Various Constituents in Deerhaven Blowdown Drift

Parameter	Deepwell Six Concentrations (mg/1)	Sidestream Treatment Forty-Six Concentrations (mg/1)
NaCl	98.4	750
$CaSO_4$	1600	1000
$MgSO_4$	680	1300
KFl	9.0	140
Na_2SO_4	---	10500
TDS	2800	14000

foot radius is estimated to be 97 lb./acre-year over ambient levels. While the calculations are simplistic in nature, deposition at this rate could cause toxic responses in sensitive plant species (Table 5.2-1). Should one of these alternatives have to be seriously considered, further analyses and studies should be performed to: (1) ascertain whether the potential for injury truly exists; and (2) to more accurately map problematic areas.

The zero discharge alternative would use groundwater as a source of cooling water makeup, requiring a side-stream treatment facility to treat the cooling tower blowdown so that a portion can be recycled. Low volume plant wastes, including the unusable output from the side-stream treatment, are piped into a brine concentrator which condenses the effluent into a sludge. This sludge would be either landfilled on-site or hauled off-site for disposal by a disposal contractor. The brine concentrator produces a high quality water which is returned to the system for re-use. This method eliminates water effluent.

Ecological effects of construction and operation of the zero discharge alternative would be similar to and of the same magnitude as those discussed in Chapters 4 and 5. These anticipated effects are: (1) minimal adverse impacts to vegetation, aquatic life and wildlife; (2) a return of Turkey Creek flow to pre-Deerhaven conditions through removal of Deerhaven Unit 1 blowdown; (3) a subsequent change in presently affected vegetation and aquatic life in the on-site cypress swamp and the chronically flooded portion of Sanchez Prairie to pre-Deerhaven Unit 1 conditions; and (4) impacts of a concentrated drift as described above for "side-stream treatment" alternatives.

Shallow Well Injection On-site

For the purpose of these evaluations, the Floridan Aquifer was considered to be the injection zone to a depth of 1,000 feet. Water below this zone was assumed to be brackish. The geologic formations overlying the Floridan Aquifer have permeabilities too low for injection to be feasible at the suggested rates. Available data for the study site and the surrounding area indicate that water in the Floridan Aquifer may either be confined or unconfined, depending upon the time of year. Water level responses to injection and withdrawal were calculated using the Theis non-equilibrum model. A storage coefficient of 1×10^{-1}, which reflects unconfined aquifer conditions, was used in the model to provide conservative estimates which would indicate the "worst possible case" for cone of depression and mounding effects. It should be noted that the Theis non-equilibrium model estimates changes only in a highly idealized situation where many assumptions must be made about the fluid and the media through which it flows. Unfortunately, little data exist which would permit a more accurate evaluation of groundwater system behavior.

Figure 9.1-5 shows the estimated net water level changes which would result from shallow well injection and groundwater withdrawal, both occuring on-site. The analysis on which this map is based assumed a spacing of 4,500 feet between the injection and water supply wells, aquifer transmissibility of 200,000 gpd/ft. for the water supply wells, aquifer transmissibility of 251,000 gpd/ft. for the single assumed injection well (reflecting viscosity differences between 71° F Floridan Aquifer water and 90° F cooling tower blowdown water), and the storage coefficient of 1×10^{-1} previously referred to. An assumption was also made that both the injection and water supply wells were open to the same zones in the Floridan Aquifer. The contours shown represent theoretical changes in potentiometric surfaces after thirty years of simultaneous on-site injection and withdrawal, without allowing for variation in rates of natural recharge or potentiometric surface changes caused by groundwater withdrawal elsewhere in the region. The use of two different values for transmissibility for calculation of potentiometric surface change is not rigorously correct, in that the temperature effects do not extend outward equally in all directions. However, for the sake of simplicity, it is felt that this approach gives a better answer than using a single transmissibility value for both the pumping and injection wells.

The skewed pattern of potentiometric surface drawdown shown on Figure 9.1-5 represents the results of both drawdown and buildup of potentiometric surface around the wells. The drawdown is the dominant effect because the rate of pumping is greater than the cooling tower blowdown injection rate, and also because the transmissibility in the injection analysis is greater than that used for the water supply well withdrawal

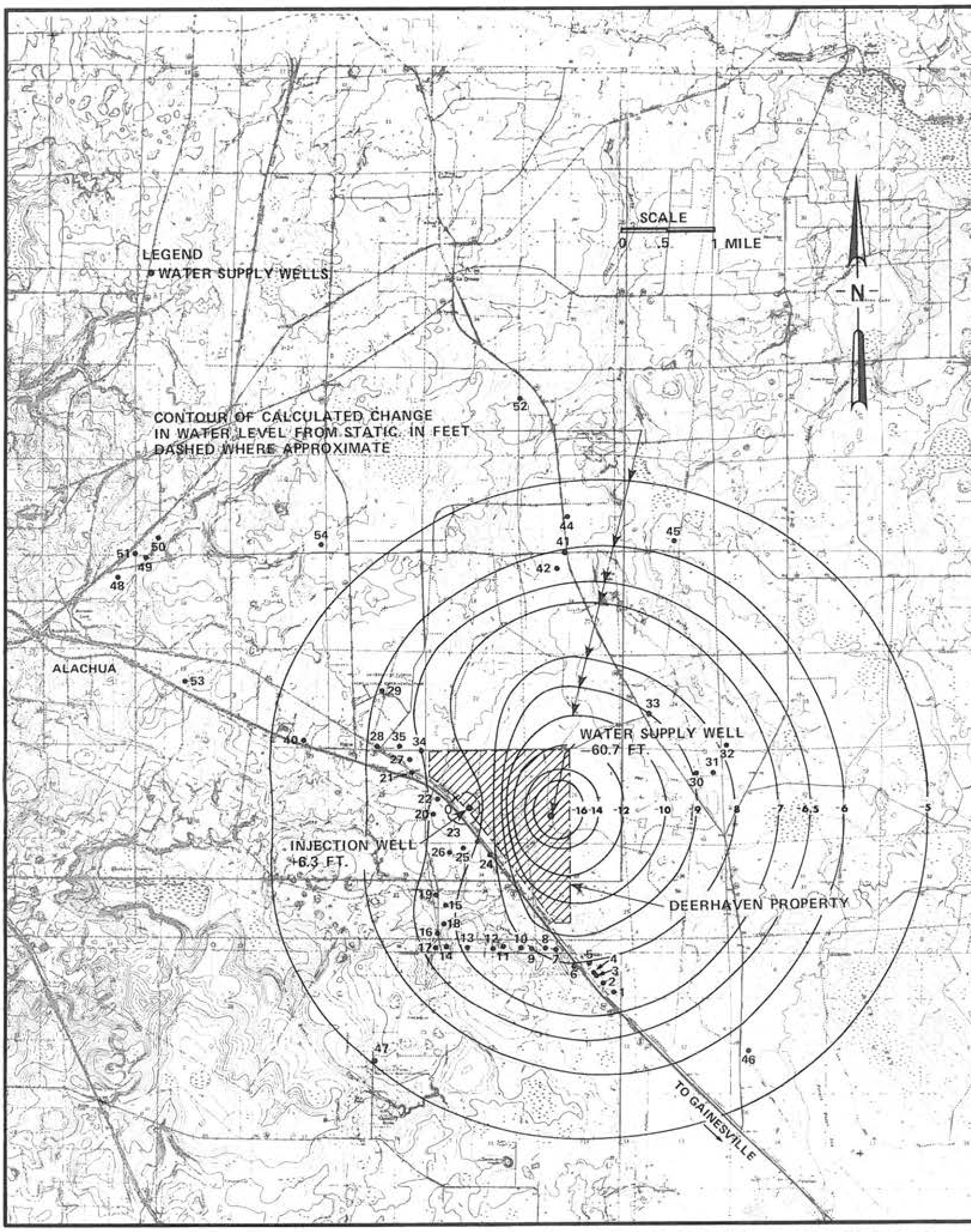

FIGURE 9.1-5 NET WATER LEVEL CHANGES IN AQUIFER IN RESPONSE TO ON-SITE WITHDRAWAL OF 6.6 MGD AND INJECTION OF 2.85 MGD.

analysis. The inference from this analysis is that the injected water would move essentially down-gradient from the injection well toward the pumping well and that none of it would escape from the cone of depression. The theoretical transit time between the injection and supply wells, calculated using Darcy's Law, is about one year. Should the injection and withdrawal wells tap different zones in the aquifer, the effects would be different from those indicated. Migration velocities of the injected water towards the water supply well would probably be slower due to the large differences between horizontal and vertical permeabilities in the aquifer. However, regardless of such differences, the flow from the injection well would still be toward the water supply wells. In either case, a plume would form and move down-gradient with the temperature of the water in the plume being higher than the temperature of the native groundwater. Temperatures at the outer perimeter of the plume would probably be close to background temperatures, whereas temperatures near its center and near the injection well would approach the original temperature of the injectant (assumed to be 90° F). An additional result would be that total dissolved solids contained in the injected cooling tower blowdown would ultimately recirculate into on-site water supply wells and thus into the recirculating cooling water system. It is doubtful that simultaneous shallow well injection of cooling tower blowdown and on-site water supply well operation will be considered for this reason.

In the event that the water supply for the power plant were to be imported and the injection were to take place on-site, the average injection rate would probably be 1,424 gal./min. (2.04 mgd). Figure 9.1-6 shows the estimated contours of net potentiometric surface change in the Floridan Aquifer after thirty years of injecting 90° F water, using an assumed transmissibility value of 251,000 gpd/ft. and an assumed storage coefficient of 1×10^{-1}. As indicated, the estimated potentiometric surface in the 14 inch diameter injection well would be 15.6 feet above the initial potentiometric surface when injection began. This injection would result in an increase in potentiometric surface elevation of approximately 2.3 feet at a radius of 3 miles from the injection well. If there were no regional pattern of groundwater flow in the aquifer, the injected fluid would move outward and perpendicular to the potentiometric surface contours shown. However, because natural flow in the Floridan Aquifer is to the west, the body of injected fluid would probably form a plume extending in that direction and moving at approximately the same velocity as water in the aquifer. Average rates of groundwater flow in the aquifer probably range from a few inches per day to as much as several feet per day. It is believed that large conduits occur in the aquifer which may transport groundwater at much higher rates. Any artificial gradients in the aquifer would change the direction and flow of the plume. This might occur, for instance, if a new nearby well were to begin pumping and if its zone of influence were to intersect the plume of injected water. The injected water then would alter its direction of movement, moving towards the pumping well. If drawdown

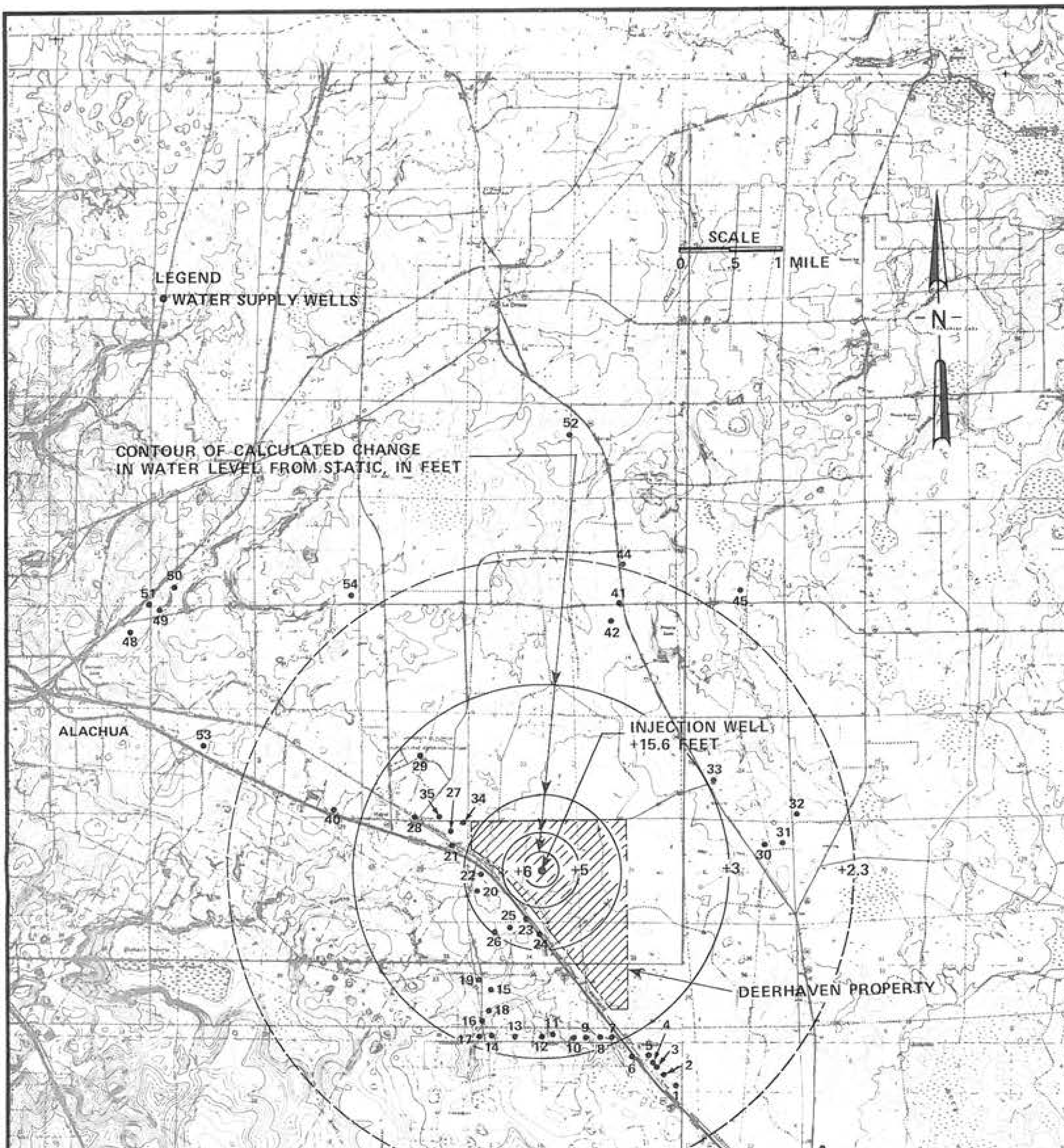

FIGURE 9.1-6 NET WATER LEVEL CHANGES IN AQUIFER IN RESPONSE TO INJECTING 2.05 MGD ON-SITE AND IMPORTING PLANT WATER SUPPLY.

from such a well produced large gradients in the potentiometric surface, the rate of movement of injected water toward the well could be appreciable compared with the natural rate of aquifer groundwater flow.

Temperature changes in the aquifer caused by the higher temperatures of the injected fluid would be similar to those cited in the first evaluation. Temperatures near the injection well would be close to the original injectant temperature and would rapidly drop off to ambient temperatures up-gradient from the well. Temperatures in the direction of movement of the injected water would fall off more slowly, approaching ambient temperatures only as the leading edge of the plume was neared.

Water in the Floridan Aquifer is essentially in chemical equilibrium with its environment. Foreign water introduced into the aquifer would probably go through various chemical reactions such as solution of the limestone and precipitation of various salts, until a new chemical equilibrium was reached. Temperature, pH, and concentration of chemical constituents would affect the rate at which equilibrium is established. Chemical and physical measurements of the cooling tower blowdown are compared with median values of parameters of the Floridan Aquifer water in Alachua County in Table 9.1-3. Shown are the characteristics both of cooling tower blowdown from existing Unit 1 cooling tower and characteristics which would be expected due to softening of supply water and reducing cooling water cycles for the combined cooling tower blowdown from Unit 1 and Unit 2 facilities.

Table 9.1-3 Chemical/Physical Analyses of Cooling Tower Blowdown and Floridan-Aquifer Water[1]

	Unit 1 Cooling Tower Discharge[2]	Proposed Cooling Tower Discharge for Shallow Well Injection	Floridan Aquifer Water[3]	Floridan Aquifer Water[4]
Calcium (Ca)	120	NA	50	57
Sodium (Na)	18	NA	10	NA
Bicarbonate (HCO_3)	12	NA	202	239
Chloride (Cl)	26	NA	12	15
Sulfate (SO_4)	480	161 to 184[5]	8	55
Dissolved solids residue @180°C	750	500	203	341[6]
Noncarbonate hardness	480	NA	5	28
pH (units)	6.8	6.8	7.9	7.7
Temperature (°F)	98.6	90	78	71[7]
Iron (Fe)	0.370	NA	0.07	0.04

[1]All chemical concentrations given in milligrams per liter.
[2]Date sampled May 30, 1975, analysis by USGS, Water Resources Division.
[3]The chemical analyses presented show the median value for the parameter as reported in IC43, "Water Resources Data for Alachua, Bradford, Clay, and Union Counties, Florida," for all wells in Alachua County.
[4]Water sample from supply well at power plant, sampled on May 4, 1970, analysis by Black, Crow and Eidsness, Inc.
[5]Sulfate content dependent on source of cooling water.
[6]Dissolved solids determined by conductivity.
[7]Temperature measured on July 21, 1977, in six-inch well at plant site.

As indicated, the cooling tower blowdown injectant would possibly have significantly higher TDS and sulfate contents than the Floridan Aquifer water; however, not enough is known of the chemistry of the injectant to predict its effect on the aquifer. The injected water would, as previously discussed, move down-gradient as a plume, with diffused mixed waters at the plume boundary and essentially undiluted injectant toward its center. The water quality in wells intercepting the plume would gradually be degraded as this plume moved into their cones of influence.

It should be noted that the region northwest, west, and southwest of the site is riddled with numerous sinkholes which indicate high solution activity. Past dye-tracer tests have shown that there are apparently excellent hydraulic connections between some sinkholes and down-gradient streams. In one such test, dye was detected in a deep sink 2.5 miles from the point of injection in less than 36 hours after the dye was injected. These facts point out the complexity and unpredictable nature of the hydrologic systems in the vicinity of the Deerhaven site. Thus, assumptions made in the models presented above pertaining to the homogeneity and isotropy of the Floridan Aquifer are not necessarily accurate.

For example, in homogeneous and isotropic aquifer systems, a plume would develop and migrate slowly down-gradient from a shallow injection well such as discussed herein whereas in an aquifer such as may exist near the Deerhaven site, the plume could enter a solution conduit and travel many miles in a short period of time, essentially undiluted and at the same temperature at which it was first injected. Results of such rapid transport could be either favorable or unfavorable.

The possibility exists that such a conduit could convey the injected water rapidly out of the Deerhaven area, mixing it with additional groundwater and discharging into an area river at a spring. On the other hand, if a water supply well happened to tap that particular solution channel, the quality of its water could become rapidly degraded by the injected cooling tower blowdown.

Conference calls with the DER and the Suwannee River Water Management District (SRWMD) have been made to ascertain the thinking of regulatory officials with regard to shallow well injection of cooling tower blowdown at the Deerhaven site. Some of the officials contacted felt that injection into relatively fresh water might not constitute a severe problem, and, in a later conversation with DER (July 13, 1977), it was stated that as long as the injected water met all public health standards for drinking water, there should be no problem with permitting. It should be noted that the quality of the proposed cooling tower blowdown to be shallow well injected would meet such regulatory standards.

The U.S. Environmental Protection Agency (EPA) is now recommending to states that restrictive criteria be set for underground injection. The proposed regulation for injection practices, published by the EPA in

August, 1976, states that all underground drinking water sources of 3,000 mg/l total dissolved solids (TDS) or less shall be protected by casings cemented to the ground surface. The 3,000 mg/l value was established as a minimum and it was recommended that states protect all groundwater up to a 10,000 mg/l TDS content. The proposed EPA regulations are presently being revised. Upon final passage, these regulations will be the minimum standard upon which any state can base its own regulations. It is not known when these regulations will go into effect, nor is it known how the regulations will be applied to existing facilities.

As discussed above, insufficient information exists to determine whether recirculation between on-site shallow drainage wells and on-site water supply wells would result if the shallow wells were to inject into a permeable zone which might exist at an elevation deeper than, and separated by impermeable zones from, the on-site water supply wells. It is doubtful that this question can be resolved without a shallow well test injection program. Similarly, a shallow test injection well program would probably be required to determine whether area water supply wells would be affected by such on-site shallow wells.

Construction and operational effects would be similar to those described in Chapters 4 and 5. No further ecological effects are anticipated from injecting discharge water into the shallow aquifer.

9.1.3.1.2 Rejected Alternatives - Surface Streams

Surface stream discharge alternatives would utilize either groundwater or RUB water for cooling tower makeup. The cooling tower blowdown is of high quality and is discharged into a surface stream. Constructional and operational impacts from this method are considerably different from those of other alternatives and are therefore presented in more detail below.

In a previous investigation, Breedlove (1977) studied Turkey, Cellon and two branches of Rocky Creeks as potential surface stream blowdown discharge alternatives. Based upon ecological considerations, Turkey and Cellon Creeks were considered as the most suitable surface stream alternatives since both already showed evidence of industrial influences. However, each was rejected for other reasons. Turkey Creek flows through the Sanchez Prairie portion of San Felasco Hammock (Figure 2.7-4), recently purchased by the Florida Department of Natural Resources under the Environmentally Endangered Lands Program. The fact that Deerhaven Unit 1 blowdown may have affected a small part of Sanchez Prairie (Section 2.7) precluded the alternative of discharging the combined blowdown into Turkey Creek. Cellon Creek terminates in a swallow hole which discharges to the aquifer. Based upon predicted hydrological modeling (Breedlove, 1977) it was determined that the aquifer connection would not accomodate the stream's base flow, discharge from the General Electric plant, and the combined blowdown from Deerhaven Units 1 and 2.

The two other surface stream alternatives were Mulatto Pen Branch and an unnamed tributary designated "A". Both of these tributaries discharge into Rocky Creek (Figure 2.7-16 and Section 2.7) and are considered healthy and diverse intermittent stream systems (Breedlove, 1977). Mulatto Pen Branch, however, offers a clear difference in the projected impacts to Rocky Creek should a surface stream alternative become viable. Discharge into Rocky Creek "A" would result in blowdown flowing through two relatively large mixed hardwood swamps (Figures 2.7-16 and 2.7-19). Each of these swamps is a potential impact zone due to projected flooding (Figure 9.1-7) and the production of hydrogen sulfide. Mulatto Pen Branch, which bypasses the swamps, offers considerably less opportunity for a real impact.

Detailed evaluation of these alternatives are presented in "An Evaluation of Alternatives to the Present Releasing of Deerhaven Generating Station Blowdown to Turkey Creek" (Breedlove and Associates, and Jones, Edmunds and Associates, 1977).

9.2 Coal-pile, Ash Landfill, and Stormwater Runoffs

As discussed in Chapter 2 the majority of the Deerhaven site lies within Turkey Creek drainage basin and surface runoff naturally flows to Turkey Creek by means of either the north or south branch of that creek. Consequently, coal-pile runoff in excess of retention basin capacity, landfill runoff, and stormwater runoff from the site will flow into Turkey Creek. No alternative discharge routes for such flows have been

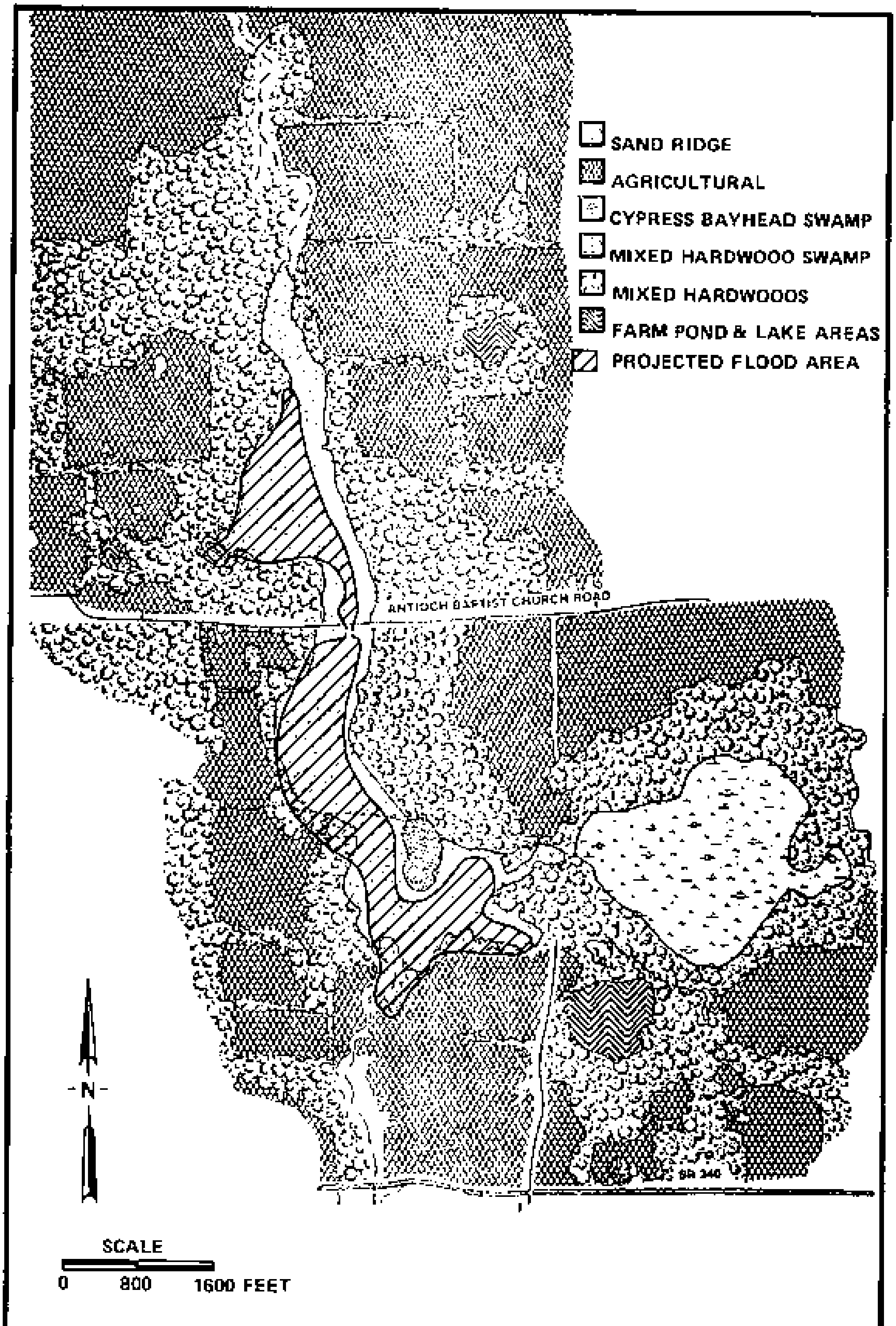

FIGURE 9.1-7 PROJECTED FLOODED AREA OF ROCKY CREEK SWAMPS UTILIZING ROCKY CREEK "A" DISCHARGE ALTERNATIVE (FROM BREEDLOVE, 1977).

evaluated due to the high cost of diverting these flows into other drainage basins and the legal principles which might prevent such diversion.

9.3 Sanitary Waste Systems

Use of the existing on-site septic tank system for the disposal of sanitary wastes from Unit 1 has demonstrated this sanitary waste treatment technique to be feasible for on-site disposal of sanitary wastewater. Discussions with the Alachua County Health Department have indicated that no objections exist to the expansion of the existing septic tank system to treat additional sanitary wastewater which will be produced by Unit 2 operating personnel.

Other systems which could have been considered as alternatives to the proposed septic tank system were a packaged secondary wastewater treatment plant with deep well disposal of effluent or on-site spray irrigation of effluent, a packaged advanced wastewater treatment plant with disposal of effluent to surface water, or pumping of untreated sanitary wastes to the nearest wastewater collection system. These alternative techniques are not presently under consideration due to the simplicity, feasibility, and economics of expanding the existing septic tank system.

9.4 Low-volume Wastes

Low-volume waste streams generated at the Deerhaven station will be from such activities as boiler fireside cleaning, boiler waterside cleaning, air preheater cleaning, condenser waterside cleaning, boiler blowdown, demineralizer regeneration, stack cleaning, floor drainage, blowdown from recirculating ash sluicing water systems, and other miscellaneous maintenance operations. These waste-streams will be directly injected into on-site deep injection wells without treatment. The following alternative disposal techniques were considered. Prior to disposal of low-volume wastes by any of the following techniques, the wastes would be concentrated, probably in an on-site brine concentrator, to reduce the volume of free water and increase solids concentration.

1. Disposal with Fly Ash in Landfill - This technique would involve using the concentrated brine solution as a wetting agent prior to transporting of fly ash to the landfill area. Moisture content of the ash would be increased to approximately 15% to 20% by weight, reducing dust generation, permitting easier handling of moist fly ash and disposing of the concentrated brine solution.

2. Flash Drying - This technique would involve removing remaining water from the concentrated brine solution by means of a vacuum chamber and/or heat addition. The resulting solid residue would be buried at either an on-site or off-site landfill or, perhaps, removed to a controlled treatment center for disposal.

3. Truck Hauling to Controlled Treatment Center - In this disposal technique, the brine solution would be transported

to a commercial controlled treatment center and disposed of by an approved, environmentally safe technique.

9.5 Flue Gas Desulfurization

The flue gas duct system will be designed in such a manner as to be able to add a Flue Gas Desulfurization (FGD) system at a later date should compliance coal become unavailable. The proposed stack is designed to handle either dry or saturated flue gas should scrubbing become necessary.

Space is allotted and reserved in the plant yard for a future FGD system. It is anticipated at this time that such a system would be either a limestone or double alkali system.

Gainesville
Alachua County
Regional Electric
Water & Sewer
Utilities Board

Progress
Through
Cooperation

December 9, 1977

Mr. Joseph W. Landers, Jr., Secretary
Department of Environmental Regulation
2562 Executive Center Circle East
Montgomery Building
Tallahassee, Florida 32301

RE: Site Certification Application for Deerhaven Unit 2

Dear Mr. Landers:

In accordance with Section 403.506 of the Florida Electrical Power Plant Siting Act and the rules and regulations of the Department of Environmental Regulation, the City of Gainesville and the Gainesville-Alachua County Regional Electric, Water & Sewer Utilities Board are pleased to submit this amended application for its new 235 mW Deerhaven 2 generating unit.

This environmental assessment herein has been prepared in accordance with the Department of Environmental Regulation rules and regulations, Chapter 17-17. Enclosed under separate cover is the required application fee.

As your agency and other state agencies review this application, we are sure that many questions and comments will arise. We welcome these questions and comments and stand ready to respond to them. In order to effectively handle these comments, we request that you direct all queries to Mr. Larry R. Gawlik, Project Manager, P. O. Box 490, Gainesville, Florida, 32602, 904/374-2910.

Respectfully submitted,

Aaron Green
Mayor-Commissioner
City of Gainesville

Respectfully submitted,

Shellie Downs, Chairman
Gainesville-Alachua County
Regional Utilities Board

AG:SD:pm

(1-25-78)

AMENDED APPLICATION FOR CERTIFICATION

for the Deerhaven Unit 2 Steam Electric Generating Facility

CITY OF GAINESVILLE &
GAINESVILLE/ALACHUA COUNTY
REGIONAL ELECTRIC, WATER &
SEWER UTILITIES BOARD

ACKNOWLEDGEMENTS

RUB acknowledges the complete cooperation by various consultants in the preparation of extensive technical studies and engineering analyses as follows:

The Project impact on the terrestrial and aquatic environment by Breedlove & Associates, Inc., Gainesville, Florida under the direction of Mr. Ben Breedlove.

The surface and sub-surface hydrological work conducted by Jones, Edmunds & Associates, Gainesville, Florida, and Geraghty & Miller, Inc., Tampa, Florida under the direction of Mr. Bob Edmunds and Mr. Paul Hackenberry, respectively.

The investigation of the need for the facility and the socio-economic impacts of the Project by R. W. Beck & Associates, Orlando, Florida and Denver, Colorado offices under the direction of Mr. Bruce Holmes and Mr. Joe Brack.

The Project impact on noise and air quality by Scholtes & Koogler, Inc., Gainesville, Florida under the direction of Dr. John Koogler.

The evaluation of potential Project impacts to historical and archaeological sites by Cultural Resources, Inc., Tallahassee, Florida under the direction of Mr. James Miller.

The descriptions of the plant and associated facilities by Burns & McDonnell, Architect-Engineers, Kansas City, Missouri under the direction of Mr. Karl Wolfs.

The Deerhaven Unit 2 Project Team acknowledges the complete cooperation of the entire RUB staff without which this report could not have been accomplished.

PREFACE

The City of Gainesville, pursuant to Chapter 12760, Laws of Florida, Special Acts of 1927, as amended and supplemented, owns and operates an integrated electric, water and sewer utilities system to provide the city and certain unincorporated areas of Alachua County with electric, water and sewer service. The electric system was established in 1912 to provide street lighting and electric service to the downtown Gainesville area. Continuous expansion of the electric system and its generating capacity has resulted in an electric system which currently serves about 38,000 customers.

In 1972 the City of Gainesville and Alachua County entered into an interlocal agreement pursuant to Florida Interlocal Cooperation Act of 1969, Section 163, Part 1, Florida Statutes (1975), which authorizes cities and counties to enter into local contracts with each other to provide services and facilities in accordance with geographic, economic, population and other factors influencing the needs and development of the local community. Under this agreement, on December 19, 1972, the Gainesville Utilities Department and the county owned electric, water and sewer systems combined to form the Gainesville-Alachua County Regional Electric, Water & Sewer Utilities Board (RUB) whose duty it is to provide electric utility, water and sanitary sewer services to the city and the unincorporated areas of the county. Under the terms of the agreement, the city acquired the county's electric, water and sewer system to operate with its own as a single, combined utility. Pursuant to the agreement, the RUB makes all policies for the administration, operation, maintenance, extension enlargement, development, replacement and repair of the system. The RUB consists of five elected City Commissioners and five elected County Commissioners each having one vote. The System's official headquarters are located at 700 Southeast Third Street, P. O. Box 490, Gainesville, Florida, 32602.

Mr. B. Harold Farmer, City Manager of Gainesville is the chief operating officer of the city's Utilities Department. Mr. Farmer is also the Chief Executive Officer and General Manager of the Gainesville-Alachua County Regional Utilities Board. To assist the General Manager in carrying out the policies of the city and RUB, Mr. Farmer has appointed Mr. Stanley L. Livengood as Deputy City Manager for Utilities, whose responsibility it is to administer all aspects of finance, operations, engineering and planning for the system. Mr. Livengood has assigned Mr. Larry R. Gawlik, as RUB's Project Manager, the responsibility of obtaining certification for the Deerhaven Unit 2.

The Deerhaven site is located approximately six miles northwest of Gainesville on U.S. Highway 441 in the county of Alachua. The site is located at latitude 29 degrees, 45 minutes, 30.75 seconds and longitude 82 degrees, 23 minutes, 18.40 seconds. Its corresponding UTM is East 364875 and North 329625. RUB's existing facilities at this site consist of an 81,000 kW steam electric generating unit and two 20,000 kW combustion turbines. The Deerhaven 2 expansion consists of the addition of a coal-fired 235,000 kW steam electric generating unit and related facilities at the existing 1,116 acre site. This unit will include a modern steam generator, a reheat turbine generator, groundwater pumping facilities, cooling towers, ash handling, fuel storage and handling facilities, complete auxiliary equipment, instrumentation, control, step-up transformers and associated equipment.

For effluent disposal this unit will utilize a zero discharge system whereby process and cooling effluents are treated for dissolved solids removal by a brine concentrator and the water reused. This system consists of some of the most advanced technology available for effluent handling. Through the use of this system the national goal of elimination of the discharge of pollutants into waters of the U.S. by 1985 as stated in the Federal Water Pollution Control Act, will be attained for both the new unit and existing unit.

The following environmental analysis of the Deerhaven Unit 2 Project was written to assist the Department of Environmental Regulation and other agencies in their review of the Project. The purpose of the analysis is to give the public as well as all interested state agencies an opportunity to review and comment on the environmental impacts of the Project. This analysis, along with other supporting documentation, can be found at the:

Board of County Commissioners
Alachua County Courthouse
Fourth Floor
Gainesville, Florida

Clerk of the City Commission
City Hall
200 East University Avenue
Gainesville, Florida

Gainesville-Alachua County
Regional Utilities Board
Engineering and Planning Building
700 Southeast Third Street
Gainesville, Florida

North Central Florida Regional
Planning Council
2002 Northwest 13th Street
Suite 202
Gainesville, Florida

Santa Fe Regional Library
222 East University Avenue
Gainesville, Florida

(NOTE: This application is being submitted jointly by the City and RUB, but for convenience of reference throughout this document, RUB will be used to denote both applicants.)

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CHAPTER 1

PURPOSE OF THE PROPOSED FACILITY

To assess the need for Deerhaven Unit 2, the following sections describe the existing RUB electric generating system, as well as the characteristics of the customers it serves and is projected to serve. Furthermore, changes that could occur in end use, conservation, and other areas that affect generation planning are described.

The overall power supply situation in Florida is reviewed and presented with respect to existing and planned types of generating capacity. The ability of such to serve existing and forecasted energy demands is also considered. Finally, the relationship between RUB and other Florida utilities as they relate to power supply operations and transactions, reliability considerations, and generation planning are delineated generally and specifically, because they affect RUB and its proposed Deerhaven Unit 2 coal-fired generating unit.

1.1 Description of Existing System

RUB operates a fully integrated generation, transmission and distribution system (Table 1.1-1). The service area of the RUB system includes the City of Gainesville and the unincorporated area of Alachua County, an area of over 900 square miles (Figure 1.1-1). The existing electric system facilities currently serve an area of approximately 150 square miles including all of Gainesville. Electric service is also provided in the unincorporated area of Alachua County and in other municipalities by Florida Power and Light Company, Florida Power Corporation, Clay Electric Cooperative and Central Florida Electric Cooperative.

Table 1.1-1 RUB Existing Generating Facilities (DSP Form 1A)

Plant Name	Unit No.	Location	Type	Fuel Primary	Fuel Alternative	Commercial In-Service Mo/Yr	Expected Retirement Mo/Yr	Gen.Max. Nameplate KW	Net Capability Summer MW	Net Capability Winter MW
J.R. Kelly		Section 4 Township 10S Range 20E						138,412	124	128
	8		Fossil	Heavy Oil	Natural Gas	4/29/65	Unknown	50,000	44	45
	7		Fossil	Heavy Oil	Natural Gas	8/29/61	Unknown	25,000	23	23
	6		Fossil	Heavy Oil	Natural Gas	3/24/58	Unknown	18,750	14	14
	3		Combustion Turbine	Light Oil	Natural Gas	2/7/69	Unknown	14,500	14	15
	2		Combustion Turbine	Light Oil	Natural Gas	9/3/68	Unknown	14,500	14	15
	1		Combustion Turbine	Light Oil	Natural Gas	5/1/68	Unknown	14,500	14	15
			Diesel	Light Oil		9/9/49	Unknown	1,162	1	1
Deerhaven		Section 26 27 35 Township 8S Range 19E								
	1		Fossil	Heavy Oil	Natural Gas	8/25/72	Unknown	75,000	81	83
	1		Combustion Turbine	Light Oil	Natural Gas	8/12/76	Unknown	26,640	20	26
	2		Combustion Turbine	Light Oil	Natural Gas	8/12/76	Unknown	26,640	20	26
Crystal River	3	Section 33 Township 17S Range 16E	Nuclear	Nuclear		3/14/77	Unknown	12,113	12	12
							TOTAL:		257	275

Source: 1977 Ten Year Site Plan.

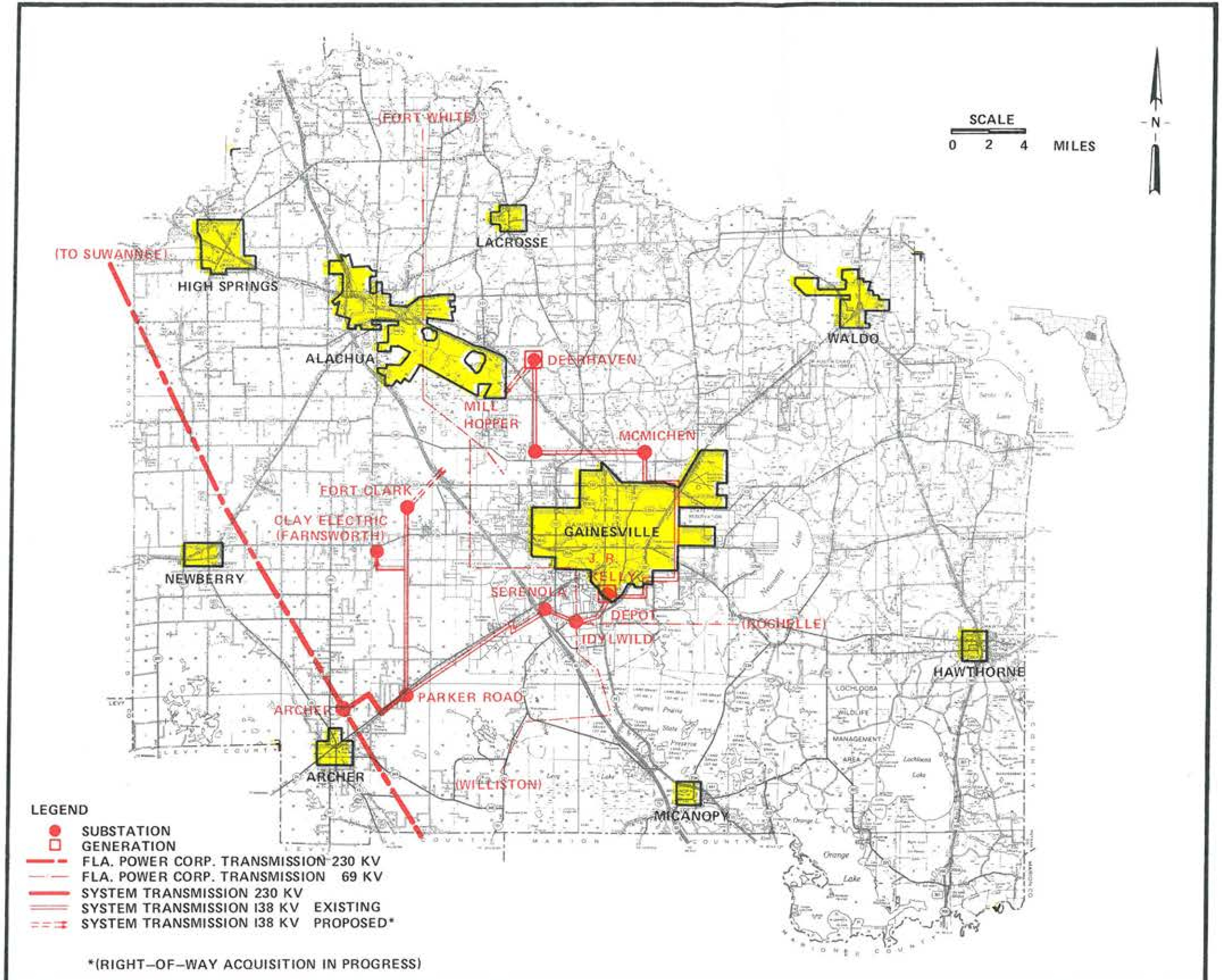

FIGURE 1.1-1 RUB ELECTRICAL SYSTEM SERVICE AREA, GENERATION AND TRANSMISSION FACILITIES.

RUB owns and operates two oil/gas fueled generating stations having a combined total net summer capability of 245,000 kW. RUB also owns a 11,620 kW share of the Crystal River 3 nuclear powered electric generating unit. All of the System's power requirements are provided from these generating stations via a 138 kilovolt (kV) transmission network and three interconnections with Florida Power Corporation.

The John R. Kelly Station (JRK Station) is located in southeast Gainesville and consists of three steam generators, three combustion turbines and one black-start diesel unit. All of the units at this station are equipped for oil/gas firing. The JRK Station has a maximum summer capability of 124,000 kW.

The Deerhaven Station is on a 1,116 acre site approximately 6 miles northwest of Gainesville and consists of one steam turbine and two combustion turbine units. Deerhaven Unit 1 was completed in 1972 and placed into commercial operation in August, 1972. Unit 1 is equipped for oil/gas firing and has a net maximum summer capability of 81,000 kW. With the addition of two combustion turbines of 20,000 kW each in 1976, the Deerhaven Station has a net maximum summer capability of 121,000 kW.

Crystal River 3 is an 825,000 kW nuclear powered electric generating unit. RUB owns a 1.4079% (11,620 kW) share of the plant capacity. The power from this unit is transmitted over Florida Power Corporation's transmission system to its points of interconnection with RUB pursuant to a tariff filed with the Federal Energy Regulatory Commission (FERC).

1.1.1 Existing Generating Capability

The RUB system is operated based on dispatching procedures which take into account fuel costs, expected load conditions, coordinated reserve requirements and scheduled maintenance. By consideration of these factors generation from the system capability is added to meet system energy requirements reliably and economically.

The four fossil steam turbines located at the JRK and Deerhaven Stations are capable of burning No. 6 oil or natural gas. Deerhaven Unit 1 is primarily used for base load, JRK Units 7 and 8 for intermediate load, and JRK Unit 6 for peaking purposes. Although the fossil steam units represent only 63% of the system's net summer capabilty, they produced 98.8% of the energy supplied to the system in 1976.

The five combustion turbines on the system are fueled by No. 2 oil or natural gas and are used for peaking purposes and emergencies. These units, which can be started and placed on line in less than 30 minutes, represent 32% of the system's net summer capability, but since they are less efficient than steam units and are designed for peaking operation, they produced less than 2% of the energy supplied to the system in 1976. A 1,162 kW diesel unit at the JRK Station is used only for black-start purposes.

The 11,620 kW ownership interest in Crystal River 3 represents approximately 4.7% of the system's net summer capability and is expected to produce 9% of the energy requirements by 1978.

1.1.2 Interconnected Operations

RUB as well as most municipal, investor owned and rural electric cooperative utilities in Florida are members of the Florida Electric Power Coordinating Group, Inc. (FCG). The members of FCG have developed and published an active operating handbook which makes recommendations for standard practices associated with various facets of interconnected operations. The handbook covers the allocation of daily operating reserves for each system, emergency procedures, scheduled and inadvertent interchange procedures, time error correction procedures, control of regulating errors and various communication channels between the system control centers.

Present bilateral interconnection agreements among FCG members provide various classes of scheduled interchange services. These classes include Emergency Service, Scheduled Electric Service for use during maintenance of facilities, Economy Service on a split-the-savings basis and Firm Electric Service used primarily to stagger generating unit additions between systems to take advantage of the economies of scale. Use of these services varies according to each system's needs and its ability to meet the needs of other systems. These services provide system operators flexibility in meeting their system requirements in a manner consistent with established operating guidelines, the need for reliability and economy, and the responsibility of each system first to provide reliable service to its own customers.

Florida Power Corporation/RUB Interconnection Agreement

RUB entered into an Interconnection Agreement with Florida Power Corporation effective July 2, 1973, for an initial period of seven years, automatically renewable for periods of three years each. The contract calls for six electric service schedules consisting of Emergency, Scheduled, Energy Interchange, Firm, Secondary, and Power Transmission electric service. RUB's Parker Road Substation with 200,000 kVA of transformation from 230 kV to 138 kV interconnects with Florida Power Corporation's Archer Substation via a 230 kV transmission line. Two additional interconnections are provided between RUB's 138 kV network and Florida Power Corporation's 69 kV subtransmission system via an 88,000 kVA 138/69 kV transformer at the Florida Power Corporation Idylwild Substation.

Coordination With Other Systems

As a member of FCG, RUB shares installed and spinning reserves with other members thus achieving a substantial reduction in the amount of reserves required for proper operation and reliability.

RUB is also a member of the Southeastern Electric Reliability Council (SERC), along with other major utilities in the southeastern United States. The purpose of SERC is to augment further the reliability and adequacy of bulk power supply in the areas served by its member systems.

1.2 Historical Power Supply Requirements

Projecting future power supply demands requires an understanding of electrical energy consumption patterns on the RUB system, of the factors which influence seasonal and annual changes in these patterns and of potential influences on future energy use.

The following sections examine: (1) monthly electric demand and energy use for 1972-1977 to determine seasonal demand and energy use patterns; (2) average monthly growth rates for the same period to determine changes and possible patterns; (3) annual energy use by customer class for 1967-1976 to detect changes in customer class relationships; and (4) average annual demand and energy growth rates for RUB and other utilities.

Three definitions are important to an understanding of the data in this and the following sections:

1. Demand represents usage of electricity at a point in time (usually an hour) and is expressed in kilowatts (kW) or megawatts (mW). A megawatt (mW) equals 1,000 kW.

2. Energy represents demand summed over time and is expressed as kilowatt hours (kWh), megawatt hours (mWh) or gigawatt hours (gWh). One megawatt hour (mWh) equals 1,000 kWh. One gigawatt hour (gWh) equals 1,000,000 kWh.

3. Load Factor represents the average load $(\frac{\text{kilowatt hours}}{\text{hours}})$ for a period divided by the peak load (kW) for the same period.

1.2.1 Monthly System Demands

An examination of growth rates in peak monthly demand for 1972-1976 reveals average annual growth rates ranging from 4% to 17% (Table 1.2-1). The largest growth rates were for the winter months of January (17%), February (10%), March (11%), and for the summer months of July (10%), and August (8%). The annual peak demand occurred consistently during the summer months of July, August and September. Demand data can be misleading when used to analyze short term trends since abnormally severe or abnormally moderate weather conditions in the summer or winter can cause abnormally high or low demands on a system. Such factors, however, must be taken into account in planning requirements to provide adequate service for extreme weather conditions.

The effect of increased oil prices can be seen in data for 1973 and 1974 (Table 1.2-1). Demand increased from 134 mW in 1973 to 142 mW in 1974 (6%), but energy use for the same period increased only 2%, from 593 mWh to 604 mWh. This disparity can be attributed mainly to the fact that price and conservation awareness inhibit use until a certain level of discomfort causes heating or air conditioning loads to be added.

Table 1.2-1 RUB 1972-1976 Monthly Historical Demand and Energy Analysis

Month	1972 Demand (MW)	1972 Energy (GWH)	1973 Demand (MW)	1973 Energy (GWH)	1974 Demand (MW)	1974 Energy (GWH)	1975 Demand (MW)	1975 Energy (GWH)	1976 Demand (MW)	1976 Energy (GWH)	1972-76 Average Annual Growth Rate Demand (%)	1972-76 Average Annual Growth Rate Energy (%)
Jan.	70	34	95	43	84	39	113	48	133	58	17	14
Feb.	75	33	97	39	103	40	94	41	108	47	10	9
Mar.	66	33	94	40	90	41	104	46	101	47	11	9
Apr.	85	35	87	43	107	42	119	46	107	47	6	8
May	92	41	123	47	137	57	141	60	117	53	6	7
June	105	47	127	57	137	58	148	63	138	59	7	6
July	109	53	128	64(1)	136	61	137	63	160(2)	71(1)	10	8
Aug.	108	54(1)	134(2)	62	140	63(1)	148(2)	68(1)	147	69	8	6
Sept.	117(2)	52	129	61	142(2)	63	140	61	148	62	6	5
Oct.	103	43	131	53	111	47	128	55	121	51	4	4
Nov.	100	39	97	41	99	45	110	49	131	52	7	7
Dec.	92	39	96	43	111	48	114	51	121	55	7	9
Max. Annual Demand - (MW)	117(2)		134(2)		142(2)		148(2)		160(2)		8%	
Total Annual Energy - (GWH)		503		593		604		651		671		7%

(1) Largest monthly kWh sales for the year.
(2) Peak demand for the year.

1.2.2 Monthly System Energy Use

The largest average annual growth rates for energy by months for 1972-1976 occurred in the winter months of January (14%), February (9%), March (9%), and December (9%) (Table 1.2-1). The largest monthly energy usage, however, occurred consistently in the summer months of July and August. Three reasons for the higher demand and energy use in the summer season are: (1) electric air conditioning demands are greater than those experienced with electric heating; (2) the hours of daily operation for electric air conditioning exceed those experienced with electric heating; and (3) the saturation level for electric air conditioning is higher than that experienced with electric heating.

The increasing energy use in winter months from 1974-1976 apparently results from a gain in the use of electric heating over oil and natural gas. This gain must be considered in forecasting future use of the system.

1.2.3 Energy Use by Customer Class

RUB segregates rate schedules and customer classes into Residential, General Service, Large Power, Lighting, Sale for Resale, and Utility Uses and Losses. Table 1.2-2 presents total sales (gWh), net peak demands (mW) and load factors for 1967-1976. Average annual growth rates for the customer classes are at the bottom of each column. The sales to each class as a percentage of the total sales for each year are presented on an annual basis.

Table 1.2-2 RUB Historical Sales by Customer Class (GWH), Instantaneous Net Peak and Load Factor

Fiscal Year	Residential (GWH)	Residential (%)	General Service (GWH)	General Service (%)	Large Power (GWH)	Large Power (%)	Lighting (GWH)	Lighting (%)	Utility Use and Losses (GWH)	Utility Use and Losses (%)	Total Sales (GWH)	Total Sales (%)	Net Peak (MW)	Load Factor (%)
1967(2)	111	44	117	47	NA(1)	-	5	2	18	7	251	100	57(4)	50.3
1968	137	45	152	39	NA(1)	-	5	2	13	4	307	100	71(4)	49.4
1969	158	45	159	46	NA(1)	-	6	2	26	7	349	100	80(4)	49.8
1970	183	51	156	39	25	6	7	2	26	7	397	100	91(4)	49.8
1971	204	47	175	40	26	6	9	2	24	5	438	100	99(4)	50.5
1972	222	45	197	41	29	6	10	2	28	6	487	100	117(4)	47.7
1973	268	46	229	40	36	6	11	2	34	6	578	100	134	49.4
1974	280	47	230	38	40	6	12	2	39	7	601	100	142	48.2
1975	302	48	231	36	48	8	14	2	32	5	636(3)	100(3)	148	49.0
1976	304	45	244	35	52	9	13	2	40	6	670(3)	100(3)	160	47.9
Avg. Annual Growth Rate: 1967-76	11.8		8.5		13.0		11.2		9.0		11.5		12.4	49.2 Avg.

(1) Data not available.
(2) 1967-1976 Data: 1977 Ten Year Site Plan.
(3) Total Sales includes 9 GWH (1%) and 17 GWH (3%) of Sales for Resale in 1975 and 1976 respectively.
(4) Represents gross values adjusted by approximation of system auxiliaries.

The two major classes are Residential and General Service, which together comprise about 80% of sales. The Residential class has represented from 44% to 51% of total sales since 1967 and has grown at an average annual rate of 11.8%. This class presently has the largest percentage of total system sales.

General Service was the largest class until Large Power was made a separate class in 1970. It now includes commercial, general power, and a former separate rate schedule known as the hospital class. Although it has represented from 35% to 41% of total system sales since 1970, with an average annual growth rate of 8.5%, its percentage of total sales decreased from 41% in 1972 to 35% in 1976.

Although the Large Power class retained a constant percentage of total sales until 1974, the latest trend shows this class increasing. This trend could continue with additional industry being attracted to the RUB system service area.

One future industrial addition to the RUB system is the firm of Bear Archery, a large sporting goods manufacturer, which is anticipated to begin operation in late 1978. Another existing large power consumer within the RUB service area is the University of Florida. Although not presently serviced by RUB, future service negotiations will be carried out.

The Lighting class has been a constant percentage of total sales, though it has grown at an average annual rate of 11.2%. The Utility Uses and Losses percentage has ranged from 4% to 7%. Since 1971 it has remained relatively constant at 5% to 7%.

A new class called Sales for Resale was created in 1975 when RUB began selling wholesale power to Clay Electric Cooperative. Although not shown in Table 1.2-2 as a separate class, 9 gWh and 17 gWh were sold in 1975 and 1976, respectively, representing 1% and 3% of total sales.

The last three columns in Table 1.2-2 show historical total sales, peak demand, and the resulting load factor. Since load factor relates average energy use to peak demand in the system, it represents the utilization efficiency of installed capacity, therefore providing a comparative relationship between expected peak demand and forecast energy use. In spite of certain changes in customer usage patterns, the overall system load factor has remained relatively constant over the 10-year period 1967-1976.

Figure 1.2-1 graphically portrays historical system energy use from 1968 through fiscal year 1977. Although the average annual growth rate over the 1967-1976 period was 11.8%, the quadrupling of oil prices in late 1973 and the following period of inflation and recession have resulted in a lowering of system energy use and an average annual growth of only 5.6% from 1974-1976.

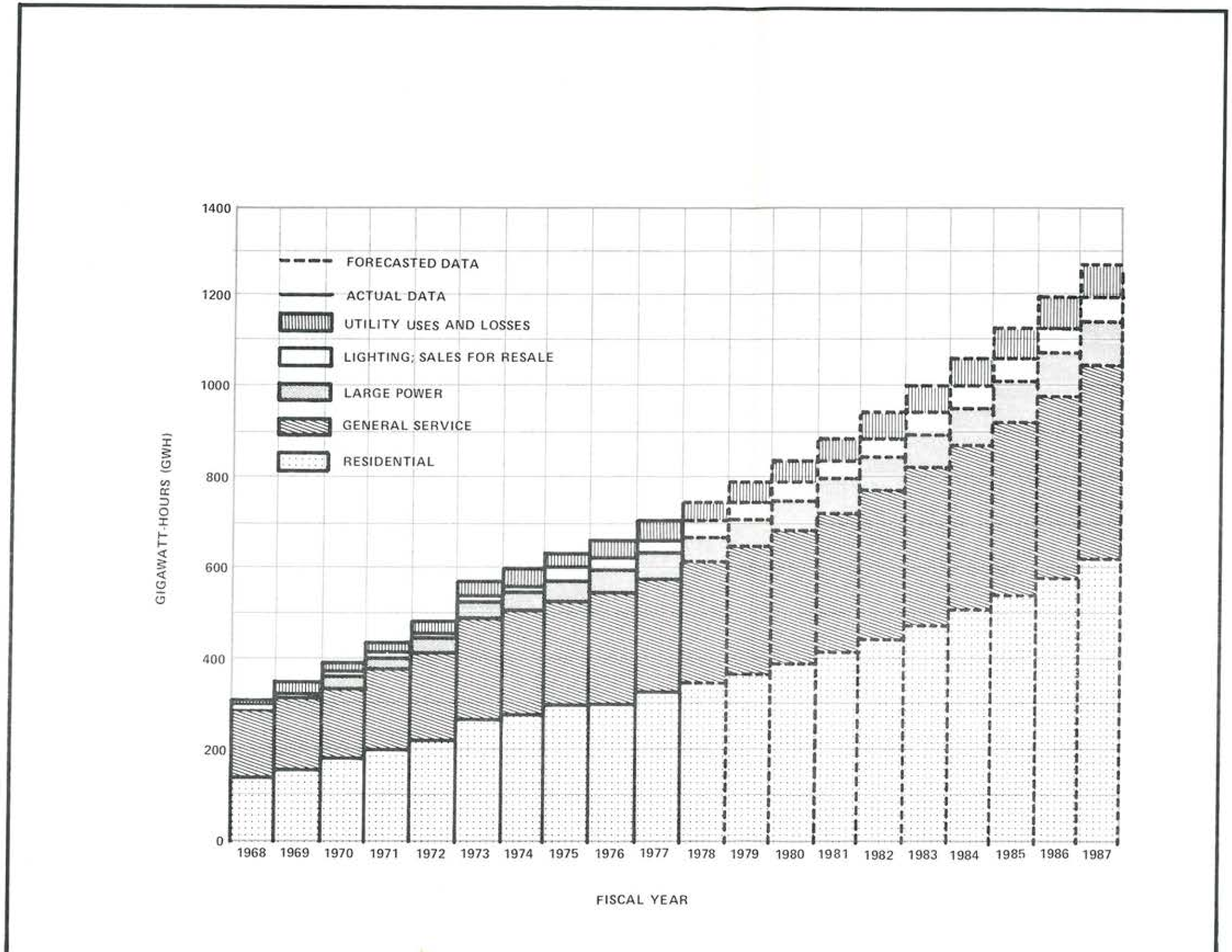

FIGURE 1.2-1 HISTORY AND FORECAST OF ENERGY CONSUMPTION.

1.2.4 Demand and Energy Use - Peninsular Florida

For major peninsular Florida utilities, the recession beginning in 1974 resulted in approximately 50% lower growth rates in net energy for load (Table 1.2-3) and summer peak demand (Table 1.2-4) than for the overall 1966-1976 period. However, in every year since 1967, except 1972, RUB's growth in demand and energy use has been higher than the aggregate of these utilities (Figures 1.2-2 and 1.2-3).

1.3 Demand and Energy Forecast

The most recent forecast of future demand and energy requirements was developed in October of 1977. An econometric model incorporating growth rates of inflation, population, per capita income, and consumption correlated with expected average system power costs, was jointly developed by RUB and the University of Florida Bureau of Economic and Business Research for application to the forecast. Econometric modeling, as applied to electric energy forecasting, is a state of the art technique and is used to be descriptive of the economic situation, economic motives, and resulting economic behavior, and thus the nature of the consumers' demand for electricity. A probabilistic forecast using historical peak load data and regression techniques was presented in the 1977 Load and Energy Forecast and is used for comparative purposes.

1.3.1 The Econometric Model

The following assumptions were the basis for the projection of future economic conditions used in the Econometric forecast:

Table 1.2-3 History of Net Energy for Load - GWH (Millions of KWH) (1)

Year	FPL(2)	FPC(2)	FTP(2)	GVL(2)	GPC(2)	JEA(2)	LWU(2)	LAK(2)	OUC(2)	TAL(2)	TEC(2)	VER(2)	Total
1966	15,056	5,921	126	245	2,435	2,771	101	433	925	358	4,952	104	33,437
1967	16,640	6,573	135	251	2,588	2,928	112	457	985	405	5,383	116	36,573
1968	19,347	7,627	148	307	3,059	3,351	134	502	1,111	492	5,629	132	41,839
1969	22,218	8,713	172	349	3,346	3,709	150	567	1,250	559	5,885	149	47,067
1970	25,113	9,855	195	397	3,764	4,098	172	635	1,375	656	6,542	164	52,966
1971	25,884	10,961	210	438	4,072	4,454	186	687	1,480	708	6,846	182	58,108
1972	31,498	12,678	245	487	4,604	4,831	205	793	1,677	802	7,429	211	65,460
1973	35,185	14,817	271	578	4,978	5,281	231	901	1,893	915	8,291	244	73,585
1974	35,465	14,402	269	601	4,983	4,968	226	890	1,787	886	8,485	243	73,205
1975	37,151	15,237	283	636	5,148	5,318	236	935	1,866	947	9,015	258	77,030
1976	38,025	16,032	296	670	5,474	5,575	235	965	1,917	971	9,294	267	79,721
Avg. Annual Growth Rate: 1966-76	9.7%	10.5%	8.9%	10.6%	8.4%	7.2%	8.8%	8.3%	7.6%	10.2%	6.5%	9.9%	9.1%
1974-76	3.6%	5.5%	4.9%	5.6%	4.8%	5.9%	2.0%	4.1%	3.6%	4.7%	4.7%	4.8%	4.4%

(1) 1976 and 1977 Ten Year Site Plan for State of Florida - Table A3.

(2) FPL - Florida Power & Light Company
FPC - Florida Power Corporation
FTP - Fort Pierce Utilities Authority
GVL - Gainesville/Alachua County Regional Utilities Board
GPC - Gulf Power Company
JEA - Jacksonville Electric Authority
LWU - Lake Worth Utilities Authority
LAK - City of Lakeland
OUC - Orlando Utilities Commission
TAL - City of Tallahassee
TEC - Tampa Electric Company
VER - Vero Beach Municipal Utilities

Table 1.2-4 History of Summer Peak Load by Utilities - Net MW (1)

Year	FPL(2)	FPC(2)	FTP(2)	GVL(2)	GPC(2)	JEA(2)	LWU(2)	LAK(2)	OUC(2)	TAL(2)	TEC(2)	VER(2)	Total
1966	2,827	1,104	26	53(3)	497	568	22	84	194	86	802	24	6,287(3)
1967	3,160	1,254	27	57(3)	523	598	23	90	213	93	865	26	6,929(3)
1968	3,789	1,487	32	71(3)	620	688	28	101	238	109	951	33	8,147(3)
1969	4,329	1,710	36	80(3)	711	763	32	112	271	127	1,005	39	9,215(3)
1970	5,031	1,988	40	91(3)	774	834	36	130	288	149	1,098	40	10,499(3)
1971	5,496	2,143	43	99(3)	842	898	41	142	310	160	1,194	39	11,407(3)
1972	6,243	2,564	52	117	956	1,013	44	169	352	195	1,302	46	13,053
1973	6,894	2,862	59	134	1,014	1,090	51	186	400	202	1,441	55	14,388
1974	7,235	2,835	60	142	1,081	1,067	52	197	379	203	1,527	58	14,836
1975	7,076	2,975	60	148	1,078	1,116	51	198	385	216	1,565	61	14,929
1976	7,598	3,223	62	160	1,140	1,181	54	202	406	227	1,568	60	15,881
Avg. Annual Growth Rate: 1966-76	10.4%	11.3%	9.1%	11.7%	8.7%	7.6%	9.4%	9.2%	7.7%	10.2%	6.9%	9.6%	9.7%
1974-76	2.5%	6.6%	1.7%	6.2%	2.7%	5.2%	1.9%	1.3%	3.5%	5.8%	1.3%	1.7%	3.5%
Winter Growth Rates (1967-68/1976-77)	11.2%	12.2%	10.2%	12.8%	11.5%	10.7%	8.9%	10.8%	10.4%	14.5%	7.0%	13.4%	10.9%

(1) From 1976 and 1977 Ten Year Site Plan for State of Florida - Table A1.

(2) FPL - Florida Power & Light Company
FPC - Florida Power Corporation
FTP - Fort Pierce Utilities Authority
GVL - Gainesville/Alachua County Regional Utilities Board
GPC - Gulf Power Company
JEA - Jacksonville Electric Authority
LWU - Lake Worth Utilities Authority
LAK - City of Lakeland
OUC - Orlando Utilities Commission
TAL - City of Tallahassee
TEC - Tampa Electric Company
VER - Vero Beach Municipal Utilities

(3) October 1977 Revision.

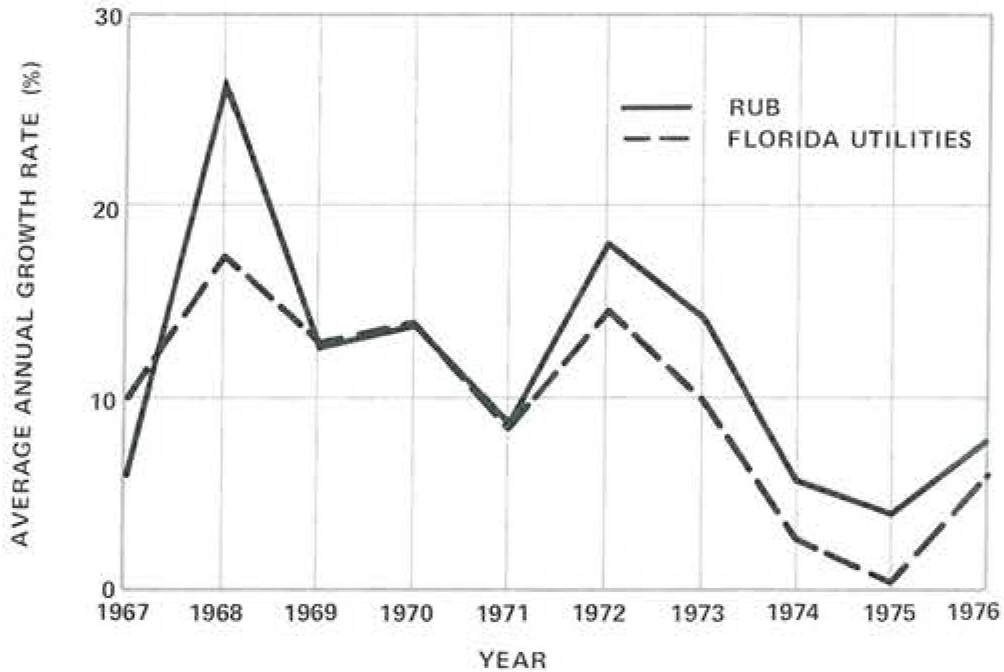

FIGURE 1.2-2 ANNUAL SUMMER PEAK DEMAND GROWTH RATE.

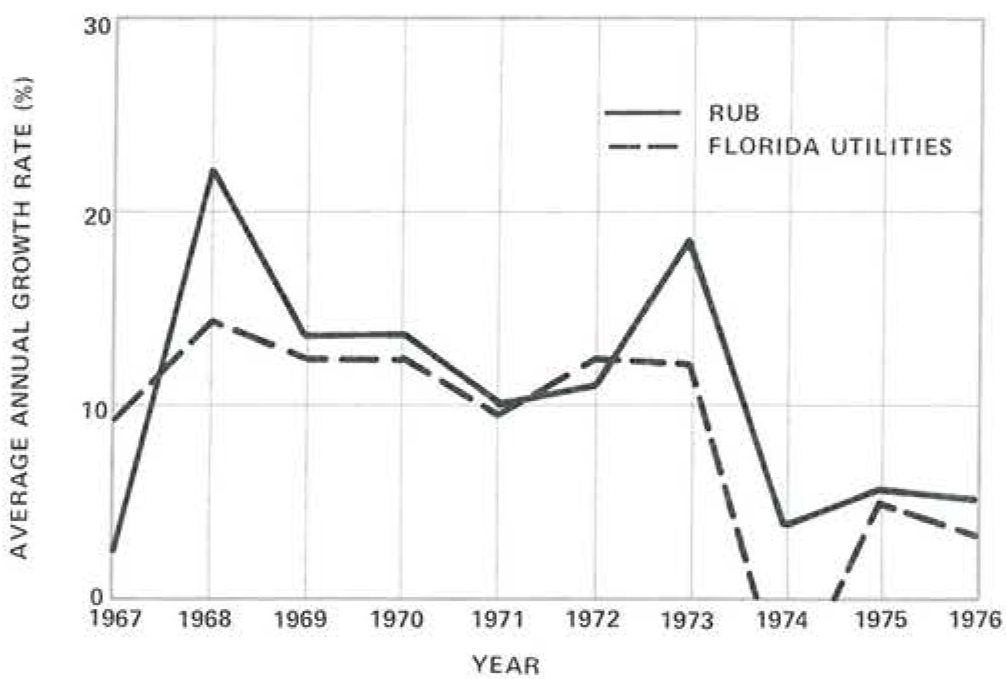

FIGURE 1.2-3 ANNUAL ENERGY GROWTH RATE

Econometric Model Growth Rate Assumptions

	*AAGR 1977-1987 (percent)
Fuel Cost	
Oil	6.0
Coal	5.0
Nuclear	8.0
Population	2.1
Income	9.7
Inflation	6.0

*Average Annual Growth Rate

The econometric model used by RUB considers cost of electricity and income, adjusted for inflation. The forecast was developed from the preceding economic conditions by customer class (Section 1.2). From log-linear regression analysis, a price elasticity coefficient of -0.459 was determined and used, together with electricity price and per capita income assumptions, to predict expected electric consumption.

The econometric model was used to project annual customer consumption in kWh, which was then multiplied by the projected number of customers to give the Residential sales forecast in mWh.

The General Service consumption forecast used the econometric technique considering the price of electricity and the number of Gainesville Urban Area households. Historical consumption requirements for Large Power customers were reviewed. Based on that review, Large Power Consumption was projected as a uniform percentage of the forecasted General Service consumption.

Forecasts (mWh) made for the Lighting Class (Rental and Public Lighting) were developed from historical trends. The Sales for Resale service growth rate was projected at 6.7% and System Losses at 5.9% of total sales to ultimate customers per year.

All of the energy forecasts for each class were totaled to yield a forecast reflecting the assumed economic conditions with an average annual growth rate of 5.9% for 1977-1986. The history and forecast of energy use is presented in Table 1.3-1 and is shown graphically in Figure 1.2-1. A constant load factor of 49%, determined from historical data, was used to calculate net summer peak demand. For this figure to change significantly there would have to be a large increase in the industrial load, and no such additions are foreseen. Summer and winter net peak loads for this forecast are shown in Figures 1.3-1 and 1.3-2.

Econometric Forecast Assumptions

Power Costs - Projected average annual power costs and operation and maintenance expenses for 1977-1990 were developed based on the addition of Deerhaven Unit 2 as a low-sulfur, coal-fired unit with commercial operation beginning in 1981. Total costs were developed from a determination of the minimum net revenue and debt coverage requirements necessary to meet financing requirements for sale of electric revenue bonds to fund construction of Deerhaven Unit 2. This analysis assumed the cost escalation rate for coal to be 5%, oil 6%, and nuclear fuel 8%. The average annual power cost was determined from the projected system sales.

Table 1.3-1 RUB History and Forecast of Energy Use (DSP Form 2)

Fiscal Year Ending	Rural and Residential GWH	Rural and Residential No. of Customers	Rural and Residential Average KWH Consumption Per Customer	General Service GWH	General Service Average No. of Customers	Large Power GWH	Large Power Average No. of Customers	Street & Highway Lighting GWH	Other Sales to Ultimate Consumers GWH	Total Sales to Ultimate Consumers GWH	Sales For Resale* GWH	Utility Use & Losses GWH	Net Energy For Load GWH
1967	111	15,999	6,937	117	1,923	1/	1/	5	0	233	0	18	251
1968	137	17,084	8,037	152	2,002	1/	1/	5	0	294	0	13	307
1969	158	19,118	8,272	159	2,129	1/	1/	6	0	323	0	26	349
1970	183	20,915	9,564	156	2,460	25	4	7	0	371	0	26	397
1971	204	22,189	9,212	175	2,790	26	4	9	0	414	0	24	438
1972	222	23,122	9,608	197	3,068	29	5	10	0	459	0	28	487
1973	268	25,485	10,500	229	3,244	36	6	11	0	544	0	34	578
1974	280	27,900	10,030	230	3,343	40	7	12	0	562	0	39	601
1975	302	30,300	9,970	231	3,418	48	8	14	0	594	9	32	636
1976	304	31,424	9,690	244	3,349	52	8	13	0	613	17	40	670
1977	329	32,470	10,132	256	3,395	55	8	13	0	653	20	45	718
1978	351	33,136	10,586	269	N/A	58	N/A	15	0	692	20	43	755
1979	372	33,836	11,004	283		61		15	0	732	21	46	798
1980	395	34,551	11,437	298		64		16	0	772	23	47	843
1981	422	35,518	11,888	313		68		16	0	819	24	51	894
1982	451	36,512	12,357	329		71		17	0	868	26	54	948
1983	482	37,534	12,844	346		75		18	0	921	28	57	1,006
1984	515	38,585	13,350	364		79		18	0	977	30	61	1,067
1985	550	39,665	13,877	383		83		19	0	1,035	32	64	1,131
1986	588	40,789	14,424	403		87		20	0	1,098	34	68	1,200

1/ Data not available prior to 1970. Large power is included in General Service prior to this time.
2/ Includes rental lighting sales.
* To Class III and Class V systems.

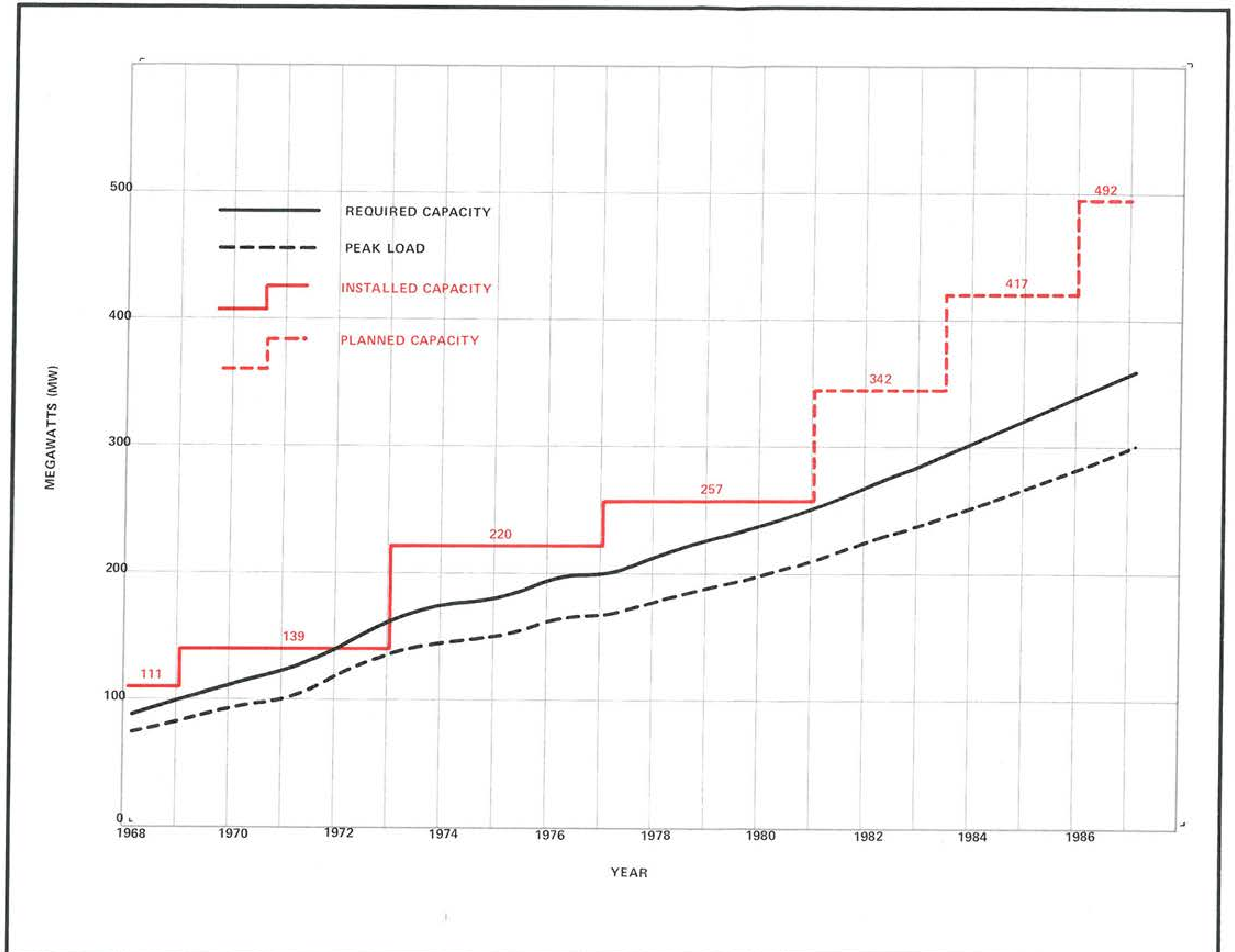

FIGURE 1.3-1 SUMMER NET PEAK LOAD AND GENERATION CAPACITY.

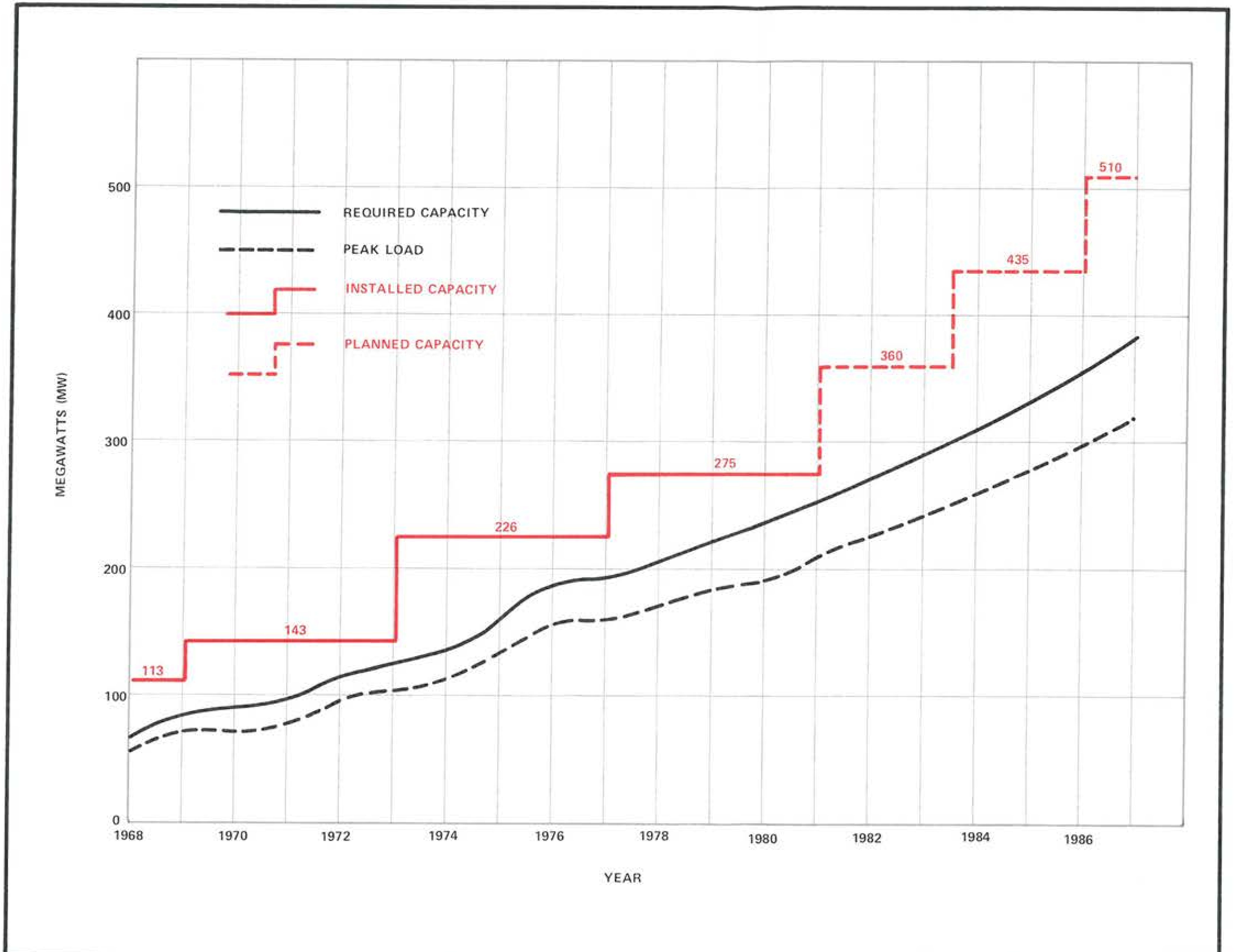

FIGURE 1.3-2 WINTER NET PEAK LOAD AND GENERATION CAPACITY.

Population Forecast - The population projection was developed by the Bureau of Economics and Business Research, College of Business Administration, University of Florida in July, 1977. Historical population trends (Table 1.3-2) show that Florida, the Gainesville Urban Area, and Alachua County have experienced higher average annual growth rates than the nation. Their average annual growth rates for 1950-1970, respectively were 4.6%, 4.2%, and 3.1%, compared to the U.S. growth rate of 1.5%.

The population growth rate utilized in the forecast was 2.1%. This is lower than the historical rate for Alachua County and the Gainesville Urban Area and should therefore prove to be conservative when applied to the RUB system.

Per Capita Income - Per capita income information for the State of Florida and Gainesville (Table 1.3-3) was taken from the Florida Statistical Abstract - 1976, prepared by the Bureau of Economics and Business Research, College of Business Administration, University of Florida. Gainesville's per capita income has historically been lower than that of the State, but the average annual growth rate has been higher (Table 1.3-3). The historical average annual growth rate for Gainesville for 1950-1974 was 7.2%, 10.9% from 1965-1974 and more recently, 12.0% from 1970-1974. The forecast projection of a growth rate of 9.7% is conservative and consistent with historical experience.

Table 1.3-2 Population Changes* (000)

	1950	1960	1970	Average Annual Growth Rates 1950-1960	1960-1970	1950-1970
United States	151,683	179,992	203,213	1.7%	1.2%	1.5%
Florida	2,771	4,952	6,789	6.0%	3.2%	4.6%
Gainesville Urban Area**	36.36	53.111	82.411	3.9%	4.5%	4.2%
Alachua County**	56.5	72.6	103.268	2.5%	3.6%	3.1%

* U.S. Department of Commerce, Bureau of Census 1950, 1960, 1970, Census of Population taken from Alachua County Comprehensive Plan 1975-1995 dated December, 1975, Revised August, 1976.

** Alachua County Comprehensive Plan 1975-1995, Revised August, 1976.

Table 1.3-3 Per Capita Income 1950-1974 For Gainesville and the State of Florida

Year	State of Florida	Gainesville
1950	$1,280	$ 861
1965	$2,404	$1,809
1968	$3,119	$2,467
1969	$3,444	$2,647
1970	$3,738	$2,917
1971	$4,034	$3,302
1972	$4,510	$3,654
1973	$5,041	$4,195
1974	$5,412	$4,588
	Average Annual Growth Rates	
1950-1965	4.3%	5.1%
1950-1974	6.2%	7.2%
1965-1974	9.4%	10.9%
1970-1974	9.7%	12.0%

Source: Florida Statistical Abstract - 1976: Bureau of Economic and Business Research, College of Business Administration, University of Florida.

Inflation - The forecast assumed a 6.0% inflation rate based on the Consumer Price Index for 1971-1976 (Table 1.3-4). This is within the range of 3.3% to 11.0% for the years 1972-1976 and does not assume a repeat of the recessionary period experienced in 1973.

Appliance Saturation - In January 1977, RUB conducted a telephone survey of 282 residential customers to determine appliance saturation. There were 120 acceptable responses obtained from the sample selected. The resulting information was used to determine the average annual energy consumption per customer and was compared to the results of the econometric model.

1.3.2 Probabilistic Forecast

A probabilistic forecast was developed in the 1977 Load and Energy Forecast. Probabilistic load forecasting uses historical data to find a statistical description of the system peak load at some future point in time. A probability density function must be calculated to quantify the uncertainty associated with the forecast load and establish a range within which the load will likely fall.

The probabilistic forecasting method assumed that the load was divided into a weather-sensitive component, a seasonal component, and a non-weather-sensitive component. The non-weather-sensitive component was extrapolated by using a second order discounted multiple regression technique. The seasonal and winter weather-sensitive components were

Table 1.3-4 U.S. Consumer Price Index

Year	Consumer Price Index 1967 Dollars (1)	Growth Rates (%)
1970	116.3	
1971	121.3	4.3 (2)
1972	125.3	3.3
1973	133.1	6.2
1974	147.7	11.0
1975	161.2	9.1
1976	169.2 (3)	5.0

(1) U.S. Bureau of Census. Statistical Abstract of the United States, 1976, Washington, D.C., July 1976, p. 43.

(2) Consumer Price Index (CPI) 1971/CPI 1970

(3) As of May 1976.

considered relatively stable and were modeled using a linear least squares technique. The summer weather-sensitive component, attributed mainly to air conditioning, grew rapidly to 1973 and due to saturation effects in customer usage, was modeled by an inverted decaying exponential. The uncertainties of the components were expressed in the form of probability density functions which were combined through convolution to produce one probability density. From this, a mean forecast with associated confidence intervals was determined. The net peak load from this forecast with a 90% confidence interval along with the net peak load from the econometric forecast is shown in Figure 1.3-3.

1.4 Load Effecting Programs

The Customer Service Division, through the use of public information programs, promotes energy conservation with presentations to schools and civic and business groups concerning the efficient use of electric energy. Bill stuffers are also mailed periodically to remind customers to conserve during peak seasons. RUB has no advertising programs promoting the sale of electrical energy. Promoting conservation and efficient use of electrical energy can affect patterns of energy use and possibly reduce peak or largest demands. Other methods of controlling peak demand period are through load management programs.

1.4.1 Load Management

The purpose of load management is to control the use of energy during peak period hours and thus reduce peak demand. Studies of systems

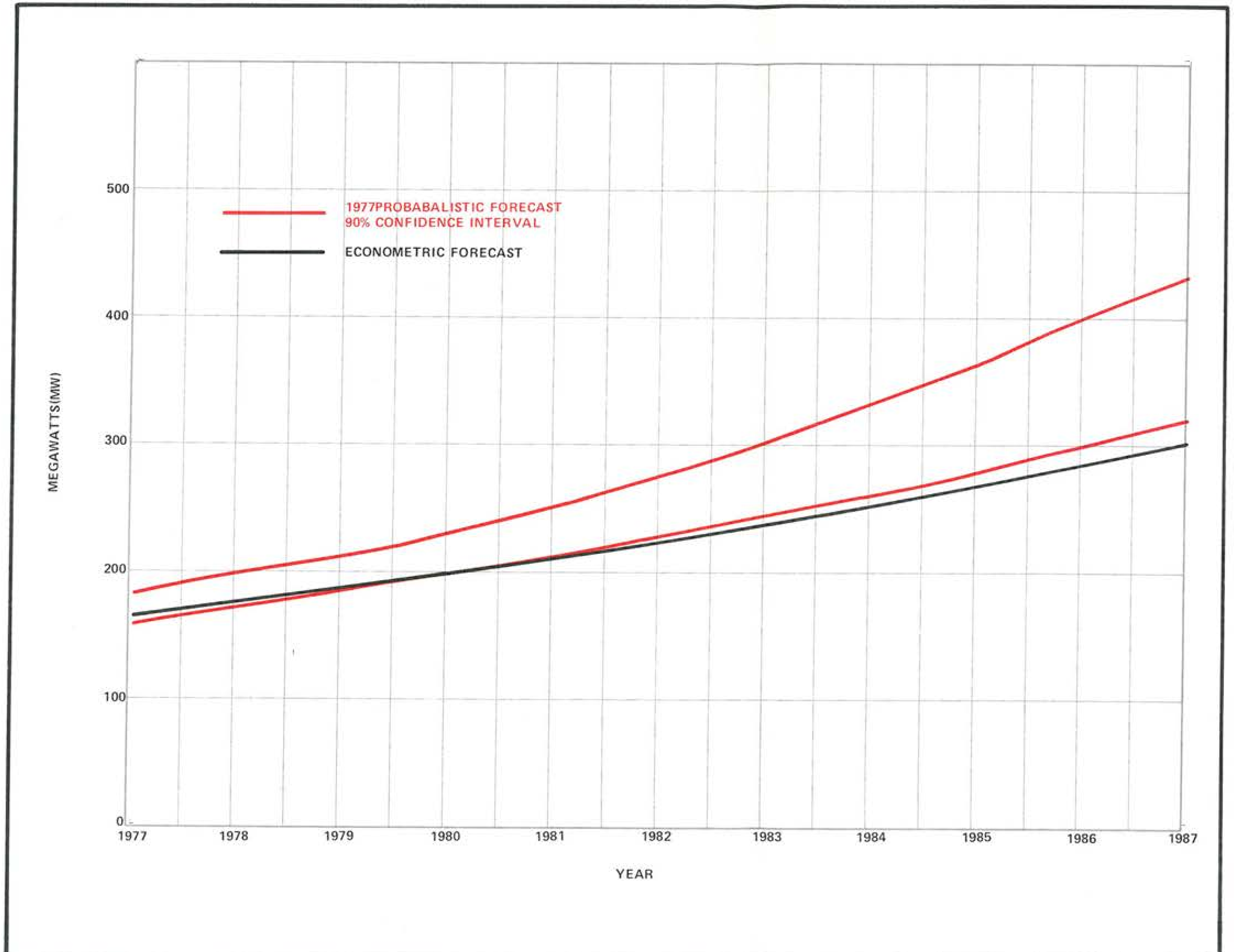

FIGURE 1.3-3 COMPARISON OF PEAK LOAD FORECAST.

indicate that although peak loads can be modified, the total energy requirements for a system will be approximately the same with or without a load management program.

Several methods of load management are available that could possibly reduce the annual peak demand on most any utility system. The cost and benefits of installing such a program depend upon the power supply characteristics unique to each system. A load management program for the RUB system would result in an immediate increase in fixed costs on the system. However, it could reduce fixed costs in the future and immediately reduce amounts of higher cost fuels for combustion turbines used during peak demand periods. In future years, such a program could modify the amount of additional generating capacity required to meet peak loads and provide adequate reserves. A cost-effective program would require that savings from reduced fuel consumption and capacity exceed the cost of installing and maintaining the program.

In order to evaluate the potential effect of a load management program on RUB's future power supply requirements, a cursory estimate of the reduction in peak load that might be achieved through control of central air conditioners was prepared. Assuming such a program were started in 1978, the earliest probable date full implementation could be achieved would be 1981, as the program would require installation of some 16,000 control devices on central air conditioning units in individual homes and apartments, as well as the monitoring and control system. Table 1.4-1 presents the estimated controllable demand and reduction in forecast peak demand for 1981. In order to maintain this level of reduction, all central air conditioning units installed in the future would have to be controlled. If total energy consumption remained the same, such a program could result in an annual system load factor improvement. Although such a program could initially result in an immediate peak demand decrease, future increases in demand and energy use would make the impact of the improvements less significant.

The available methods of active load management are categorized as either indirect or direct utility control. Indirect control includes voltage reduction where no direct control exists on any particular appliances. Two of the available direct methods presently utilized are radio control and ripple control. These methods allow particular electric appliances to be directly controlled by the utility. A brief discussion of these three methods is presented below.

Voltage Reduction

Within limits, the load on an electrical distribution system is approximately proportional to voltage. In practice, it has been found that a 5% reduction in voltage results in less than a 2% reduction in kilowatt load even though the distribution feeders tested had some degree of motor load, such as air conditioning, in addition to lighting and heating loads.

Table 1.4-1 Possible Effects of Load Management on Demand in 1981

1	Number of Residential Customers	35,518
2	Central Air Conditioner Saturation	53.2%
3	Total Central Air Conditioners	18,896
4	Percent of Installations Adaptable to Load Management	75%
5	Total Available Central Units	14,172
6	Number of Single Family Units (1)	9,212
7	Number of Apartment Units (1)	4,960
8	Diversified Controlled Single Family Load	1.35 kW
9	Diversified Controled Apartment Load	.65 kW
10	Total Controllable Single Family Demand (2)	12,436 kW
11	Total Controllable Apartment Demand (3)	3,224 kW
12	Total Effective Controllable Demand	15,660 kW
13	Projected System Summer Demand	208,000 kW
14	Estimated Summer Peak Reduction	7.5%

(1) Estimated 65% single family, 35% apartments
(2) Line 6 times Line 8
(3) Line 7 times Line 9

Naturally, there are limits below which voltage cannot be reduced without incurring customer complaints or risking damage to motors. A utility contemplating the use of voltage reduction during peak load times must ensure that customers far from the substation will receive adequate voltage at their service entrance.

Radio Control

Radio-controlled switches have been used in the United States for the past ten years for control of customer appliances in load management systems and have proven reliable and effective when properly applied. The basic Radio Control System consists of: (1) load-measuring or load-predicting devices; (2) a central controller; (3) a radio transmitter; (4) a radio control switch; and (5) communication channels, such as leased telephone lines, from load measuring points to the central controller and from controller to transmitter.

Load measuring or load predicting devices provide input to the programmed central controller, which interprets the input data and produces appropriate commands to the transmitter. The transmitter sends out brief audio tone signals to the radio switches. Approximately 40 tones are available, but usually only ten are used for control of radio switches and two or three others are used for auxiliary functions. Each switch is responsive to one or more of these tones. When the correct tone is received, the switch is activated and a relay contact inside the switch opens to interrupt the external circuit connected to it. The systems in general use utilize a relay contact which remains open for five to nine minutes. If another tone is received in this interval, the timer is reset and the open interval is extended.

Ripple Control

In western Europe and many other countries in different parts of the world, so-called "Ripple Control" systems are in widespread use. Ripple control is just now being introduced into the United States as a method of load management. This belated interest has been caused by the energy crisis and increasing energy costs. Countries where ripple control has been in use for many years have either not had the full resources of the United States or have at least been more frugal in their use.

In the ripple control system, a coded audio-frequency signal can be injected into the power system at transmission or distribution service delivery points. This ripple signal appears at all points on the system, including the internal circuits within homes and businesses, and conveys switching commands to receivers, which in turn control the operation of air conditioners, water heaters, or other appliances.

The Ripple Control System comprises: (1) load measuring or load predicting devices; (2) transmitting equipment - a central controller, a static frequency converter, and a coupling circuit; (3) receivers with one, two, three or four independent relays; and (4) communication channels from load measuring points to the transmitter.

The type of injection mode is adapted to the network under consideration. Basically, there are two possibilities: (1) parallel injection; and (2) series injection.

Parallel injection is accomplished by coupling the three-phase ripple signal to the three phases of the power system through capacitors similar to the high voltage capacitors used for power factor correction. Series injection involves the use of three large high-voltage current transformers, one in each phase of the load circuit, to inject the signal. Both methods require a switching structure and appropriate disconnect and bypass switches to facilitate maintenance.

1.4.2 Other Energy Conservation Measures

RUB has made public appeals through the news media to reduce demand and consumption during critical peak load periods. Although the results were effective, a continual use of such appeals would most likely diminish their effectiveness.

More efficient energy use can be achieved by revising building codes to require increased insulation in new residential and commercial buildings and, where possible, upgrade the insulation of existing structures to reduce air conditioning and heating requirements. Minimum standards of efficiency for air conditioners and other appliances are under consideration at the Federal and state level, analogous to federal fuel consumption standards being considered for automobiles.

1.5 Projected Power Supply Requirements

The overall average annual growth rate of 5.9% projected in the Econometric Forecast (Section 1.3) is the basis for the history and forecast of demand and energy for RUB as shown in Table 1.5-1. Although energy growth rates of other major Florida utilities range from 2.9% to 6.7%, with an 5.4% aggregate rate (Table 1.5-3), the RUB projection is consistent with historical trends wherein RUB has had one of the higher growth rates in Florida.

1.5.1 Comparison of Previous Forecasts

Projections of expected summer peak demands on the RUB system prepared in 1974-1977 have been compared with historical peak summer demands (Figure 1.5-1) and with the aggregate of major Florida utilities forecasts for 1974-1977 (Figure 1.5-2). The average annual growth rates of the probabilistic forecast limits (Section 1.3.2) bound all of the past forecasts except the highest 1974 forecast.

1.5.2 Other Major Florida Utilities 1977 Forecasts

Tables 1.5-2 and 1.5-3 present the 1977 forecasts of summer peak load and net energy requirements for each of the major Florida utilities. The average annual growth rates for summer peak demand range from 3.9% to 11% but due to the large load influence of the Florida Power & Light system, the aggregate growth is 5.6%. The same effect is also present in comparing individual and aggregate forecasts of energy requirements. Because of the dominant effect of the projected requirements of the

Table 1.5-1 RUB History and Forecast of Seasonal Peak Demand and Annual Energy Requirements (DSP Form 4)

Fiscal Year Ending	Summer Peak Demand Net MW Interruptible	Summer Peak Demand Net MW Total	Net Energy For Load - GWH	Load Factor %	Winter	Winter Peak Demand Net MW Interruptible	Winter Peak Demand Net MW Total
1967	0	57*	251	50.3	1967-68	0	50
1968	0	71*	307	49.4	1968-69	0	52
1969	0	80*	349	49.8	1969-70	0	68
1970	0	91*	397	49.8	1970-71	0	71
1971	0	99*	438	50.5	1971-72	0	75
1972	0	117*	487	47.7	1972-73	0	92
1973	0	134	578	49.4	1973-74	0	103
1974	0	142	601	48.2	1974-75	0	113
1975	0	148	636	49.0	1975-76	0	133
1976	0	160	670	47.9	1976-77	0	156
1977	0	163	718	50.3	1977-78	0	160
1978	0	176	755	49.0	1978-79	0	171
1979	0	186	798	49.0	1979-80	0	183
1980	0	196	843	49.0	1980-81	0	196
1981	0	208	894	49.0	1981-82	0	210
1982	0	221	948	49.0	1982-83	0	225
1983	0	234	1,006	49.0	1983-84	0	241
1984	0	249	1,067	49.0	1984-85	0	258
1985	0	263	1,131	49.0	1985-86	0	276
1986	0	280	1,200	49.0	1986-87	0	296

*These peaks represent gross values adjusted by approximation of system auxillaries.

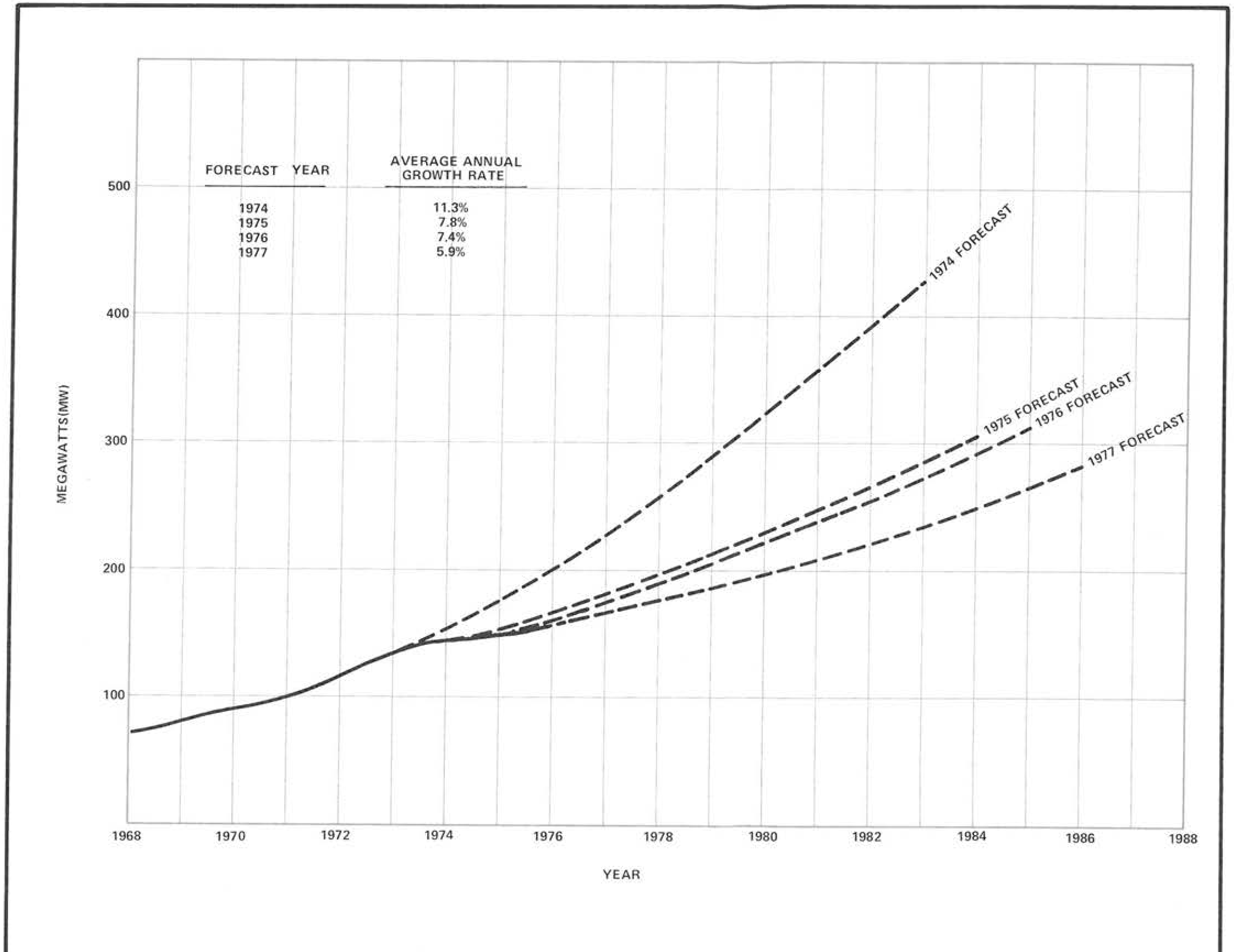

FIGURE 1.5-1 RUB HISTORY AND PROJECTED FORECASTS OF SUMMER NET PEAK DEMAND.

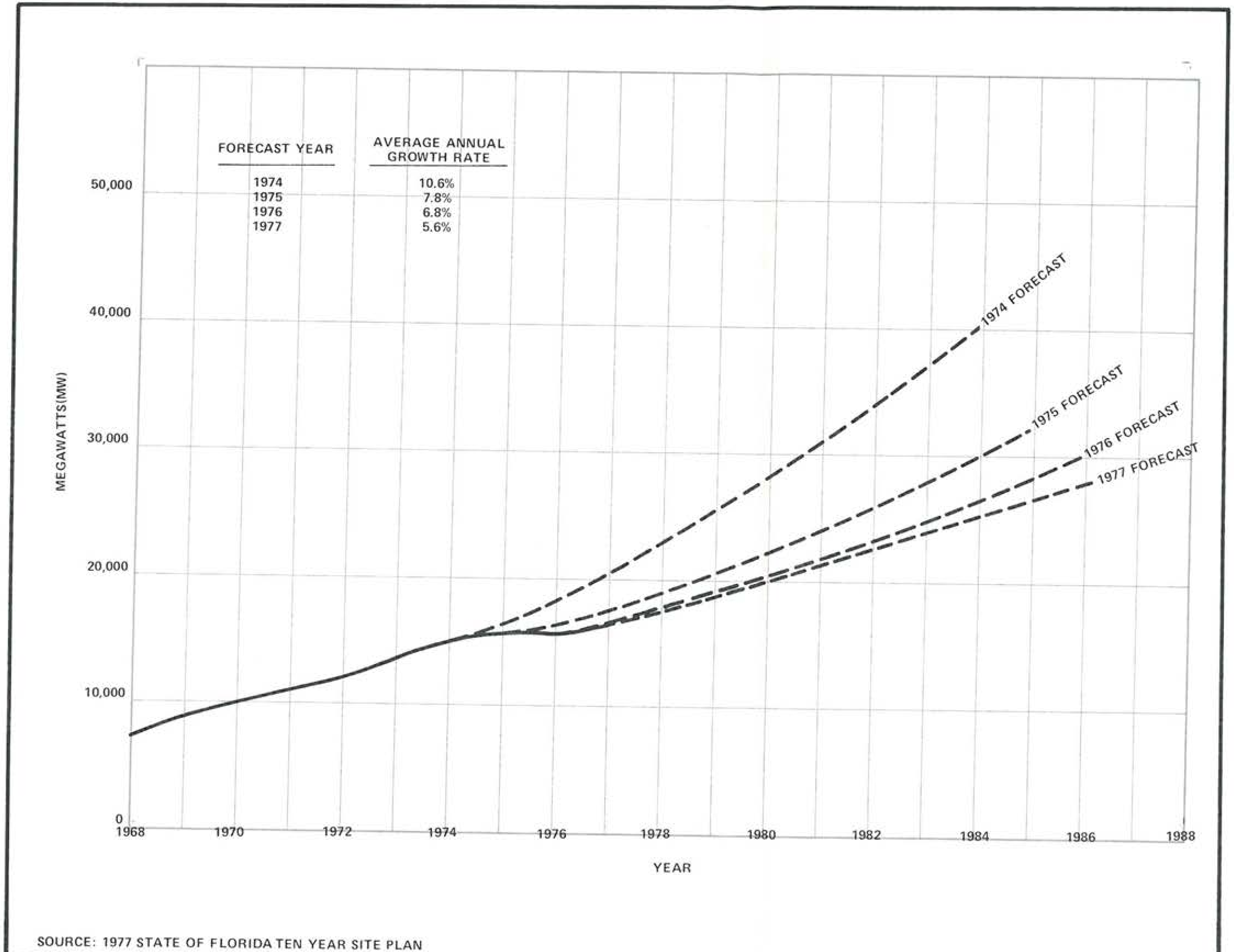

FIGURE 1.5-2 STATE COMPOSITE OF HISTORY AND PROJECTED FORECASTS OF SUMMER NET PEAK DEMAND.

Table 1.5-2 Major Florida Utilities Forecast of Summer Peak Load by Utility - Net MW (1)

Year	FPL(2)	FPC(2)	FTP(2)	GVL(2)(3)	GPC(2)	JEA(2)	LWU(2)	LAK(2)	OUC(2)	TAL(2)	TEC(2)	VER(2)	Total (3)
1977	8,090	3,440	66	163	1,256	1,252	56	216	432	244	1,664	72	16,951
1978	8,615	3,700	69	176	1,370	1,327	59	230	458	266	1,720	88	18,078
1979	9,160	3,990	72	186	1,486	1,407	62	245	493	285	1,786	97	19,269
1980	9,705	4,300	76	196	1,609	1,491	65	261	528	304	1,856	108	20,499
1981	10,250	4,630	80	208	1,723	1,580	68	278	556	326	1,919	121	21,749
1982	10,780	4,970	84	221	1,839	1,675	72	297	584	348	2,011	136	23,017
1983	11,295	5,280	88	234	1,925	1,776	75	317	607	372	2,089	152	24,210
1984	11,790	5,560	92	249	2,023	1,882	79	338	627	398	2,155	167	25,360
1985	12,260	5,800	97	263	2,139	1,995	83	361	646	424	2,244	176	26,488
1986	12,730	6,040	102	280	2,252	2,115	87	385	661	452	2,338	184	27,626
Avg. Annual Growth Rate:	5.2%	6.5%	5.0%	6.2%	6.7%	6.0%	5.0%	6.6%	4.8%	7.1%	3.9%	11.0%	5.6%
Winter Peak Load Growth Rates (1977-78/1986-87)													
	5.6%	6.2%	5.0%	7.1%	6.7%	7.0%	4.9%	6.7%	5.3%	7.1%	3.9%	8.6%	5.8%

(1) 1976 and 1977 Ten Year Site Plan for State of Florida - Table A3.

(2) FPL - Florida Power & Light Company
FPC - Florida Power Corporation
FTP - Fort Pierce Utilities Authority
GVL - Gainesville/Alachua County Regional Utilities Board
GPC - Gulf Power Company
JEA - Jacksonville Electric Authority
LWU - Lake Worth Utilities Authority
LAK - City of Lakeland
OUC - Orlando Utilities Commission
TAL - City of Tallahassee
TEC - Tampa Electric Company
VER - Vero Beach Municipal Utilities

(3) October 1977 Revision

Table 1.5-3 Major Florida Utilities Forecast of Net Energy for Load - GWH (Millions of KWH)(1)

Year	FPL(2)	FPC(2)	FTP(2)	GVL(2)(3)	GPC(2)	JEA(2)	LWU(2)	LAK(2)	OUC(2)	TAL(2)	TEC(2)	VER(2)	Total(3)
1977	40,220	17,074	310	718	6,083	5,911	250	1,030	2,050	1,054	9,968	310	84,978
1978	42,775	18,482	324	755	6,481	6,236	267	1,099	2,172	1,144	10,298	316	90,349
1979	45,470	20,005	339	798	6,949	6,579	278	1,173	2,338	1,218	10,597	322	96,066
1980	48,315	21,621	356	843	7,433	6,941	289	1,252	2,505	1,297	10,889	331	102,072
1981	51,175	23,349	374	894	7,949	7,322	300	1,336	2,651	1,382	11,206	342	108,280
1982	54,025	24,899	392	948	8,373	7,725	314	1,426	2,779	1,471	11,569	359	114,280
1983	56,620	26,428	411	1,006	8,741	8,150	329	1,522	2,890	1,567	11,893	377	119,934
1984	59,125	27,825	431	1,067	9,192	8,598	344	1,624	2,989	1,669	12,173	396	125,433
1985	61,510	29,146	452	1,131	9,670	9,071	360	1,733	3,078	1,777	12,547	416	130,891
1986	63,905	30,423	474	1,200	10,158	9,570	374	1,849	3,157	1,893	12,943	436	136,382
Avg. Annual Growth Rate:	5.3%	6.6%	4.8%	5.9%	5.9%	5.5%	4.6%	6.7%	4.9%	6.7%	2.9%	3.9%	5.4%

(1) 1976 and 1977 Ten Year Site Plan for State of Florida - Table A3.
(2) FPL - Florida Power & Light Company
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VER - Vero Beach Municipal Utilities

(3) October 1977 Revision

Florida Power & Light system, any change in its individual forecasted growth rate, which is among the lowest, will have a significant impact on the aggregate demand and energy requirements.

1.6 Planned Capacity Additions

Additions to a utilities system should be planned to satisfy expected future growth and to allow for replacement of older, uneconomical units. Because larger units offer economies of scale and greater operating efficiency, utilities usually prefer to add the largest economically feasible unit to their system. Selling the excess capacity or economy energy to other systems can, besides being a source of additional revenue, allow a utility to purchase larger units rather than add smaller units more often or purchase capacity from other systems.

The coal-fired Deerhaven Unit 2 is currently the only planned addition to the RUB system. The preliminary estimate for this Unit's continuous capability is 235 mW. Assuming a 5.9% yearly growth in demand and the accepted capacity reserve level of 20% above projected annual peak loads, existing reserves will be sufficient to carry the RUB system through 1981. But if the actual growth rate should exceed the projection, additional capacity will be imperative in 1981. The projected system reserves without the addition of this unit will be 24% in 1981 and 16% in 1982. The wide range of projected growth rates as reported by other Florida utilities indicates the uncertainties of the future.

Following sections analyze the effect of adding Unit 2 to the system by addressing the possible range of circumstances and potential options.

1.6.1 Contract Sale to Florida Power Corporation

Pursuant to a Letter of Commitment executed August 17, 1976, Florida Power Corporation is committed to a purchase of 75 mW of firm capacity for 3 years beginning June 1, 1980, or when Deerhaven Unit 2 begins commercial operation, whichever is later. Florida Power Corporation has an option to purchase an additional 75 mW of firm capacity, as well as an option to purchase any excess firm capacity for use during the same time period and under the same terms as the initial 75 mW. A third option is available for the purchase of any excess firm capacity from the end of the 3 year period up to May 31, 1986. Whether or not Florida Power Corporation exercises any option, it has refusal rights on any excess capacity from October 2, 1978, through May 31, 1986, at a price equal to another system's final offer. Effects of Florida Power Corporation's contracted purchase and exercising of options have been projected using the forecast 5.9% annual growth rate (Figure 1.3-1).

These projections indicate that RUB will meet its system requirements, the Florida Power Corporation contract, and the 75 mW option in 1981. With the coal-fired Unit 2 to displace oil-fired generation on interconnected systems, capacity would be available in 1981 for economy exchange to interconnected utilities. If Florida Power Corporation exercises the 75 mW option, a sufficient reserve would be available from system capability, assuming that the maximum sale to Florida Power Corporation occurred during the RUB system peak. The reserve margin would fall to 28% in 1983 and it is likely that less capacity would be available for economy interchange.

1.6.2 Potential Markets for Excess Capacity and Economy Energy

A review of projected maximum peak demands, installed capacities, and expected reserves of other systems comparable to or larger than RUB reveals several potential markets for excess capacity lasting well beyond the 1981 planned commercial operation date (Table 1.6-1). Although Table 1.6-1 presents the most recent information presently available, it is anticipated that additional reserve calculations will be provided for agency review as soon as the required information is made available from other State utilities.

Florida Power Corporation's projected reserves range from 4.0% to 18.7% over 1981-1986. The larger Florida Power & Light system projects reserves of 20.2% and 21.6% for 1985 and 1986. Tampa Electric projects reserves of 15.3% to 15.9% over 1983-1985. Several smaller utility systems in the State are potential markets for excess capacity from the RUB system.

Even with no sale of excess capacity other than that contracted to Florida Power Corporation, coal-fired generation from Deerhaven Unit 2 could be used as economy energy to displace oil-fired generation on other Florida systems, assuming reasonable price differentials in coal and oil and taking wheeling charges into account.

Table 1.6-1 Forecast of Maximum Peaks, Installed Capacities, Additions/Retirements and Reserves for Major Florida Utilities of Comparable Size or Larger than RUB (11)

Year	Maximum Peak (MW)	Capacity (MW)	Additions and (Retirements) (MW)	Reserve (%)	Maximum Peak (MW)	Capacity (MW)	Additions and (Retirements) (MW)	Reserve (%)	Maximum Peak (MW)	Capacity (MW)	Additions and (Retirements) (MW)	Reserve (%)
	Florida Power & Light Company (12)				Orlando Utilities Commission				Jacksonville Electric Authority			
1977	7,841	9,740	484 (1)	30.39	432	750	13 (2)	76.62	1,252	1,550		23.80
1978	8,220	10,224	775 (3)	33.81	458	763		66.59	1,327	1,550	518 (3)	58.84
1979	8,650	10,999		27.16	493	763		54.77	1,407	2,068		46.98
1980	9,125	10,999	1,258 (3)	34.32	528	763		44.51	1,491	2,068		38.70
1981	9,615	12,257	775 (3)	35.54	556	763		37.23	1,580	2,068		30.89
1982	10,125	13,032		28.71	584	763	100 (3)	47.77	1,675	2,068		23.46
1983	10,620	13,032	802 (2)	30.26	607	863	(40) (8)	35.58	1,776	2,068	490 (3)	44.03
1984	11,065	13,834		25.02	627	823		31.26	1,882	2,558		35.92
1985	11,505	13,834		20.24	646	823		27.40	1,995	2,558		28.22
1986	11,950	13,834	700 (3)	21.62	661	823		24.51	2,115	2,558		20.95
	City of Lakeland				Florida Power Corporation				Tampa Electric Company			
1976/77	234	394		68.38	3,899	3,830	0	0	1,784	2,063	402 (3)	38.17
1977/78	252	394		56.35	4,150	3,830	708 (5)	9.35	1,712	2,465	73 (3)	48.25
1978/79	269	394		46.47	4,450	4,538	565 (6)	14.67	1,953	2,538	48 (3)	32.41
1979/80	287	394		37.28	4,750	5,103		7.43	2,056	2,586	24 (3)	26.95
1980/81	306	394		28.76	5,050	5,103	150 (4)	4.02	2,125	2,610		22.82
1981/82	326	394		20.86	5,360	5,253	400 (4)	5.47	2,195	2,610		18.91
1982/83	348	394	185 (7)	66.38	5,660	5,653	640 (3)	11.18	2,263	2,610		15.33
1983/84	371	579		56.06	5,760	6,293	250 (1)	13.59	2,318	2,610	65 (4)	15.40
1984/85	396	579		46.21	6,050	6,543	640 (3)	18.73	2,365	2,675	65 (4)	15.86
1985/86	423	579	(25) (3)	30.97	6,140	7,183	(44) (3)	16.27	2,423	2,740	425 (3)	30.62
	City of Tallahassee											
1977	244	278	11 (2)	18.44								
1978	266	289	238 (3)	98.12								
1979	285	527		84.91								
1980	304	527		73.36								
1981	326	527		61.66								
1982	348	527		51.44								
1983	372	527		41.67								
1984	398	527	18 (9)	36.93								
1985	424	545		29.54								
1986	452	545	70 (10)	36.06								

Footnotes:

(1) Combined Cycle.
(2) Nuclear.
(3) Fossil Steam.
(4) Combustion Turbine.
(5) Fossil Steam-(28MW), 9/77; Nuclear - 736 MW, 3/77
(6) Fossil Steam - 515 MW, 4/78; - 50 MW, 1978.
(7) Fossil Steam - 236 MW, 9/82; (18 MW), 3/83; Combustion Turbine - (33 MW), 3/83.
(8) Fossil Steam - (90 MW), 12/82; Nuclear - 50 MW, /83.
(9) Combustion Turbine - 50 MW, 5/84; Fossil Steam - (32 MW), 5/84.
(10) Unknown.
(11) Revised 1977 Ten Year Site Plans for individual State of Florida utilities.
(12) FP&L revision to the Florida Public Service Commission dated 10/77.

With these facts in mind, RUB is currently involved in negotiating interchange agreements with several of Florida's interconnected utilities. Such contracts will allow RUB to offer these utilities any energy in excess of system demands and reserve margins.

1.7 Consequences of Delay

The effect of a two-year slip of Deerhaven Unit 2 to commercial operation in 1983 has been analyzed against the assumed 5.9% annual growth forecast taking into account the Florida Power Corporation purchase.

With a slippage of the commercial operation date to 1983, there would be a projected peak of 208 mW in 1981 against a system capability of 257 mW. This would leave the system with 24% reserves, and no sales would be made to Florida Power Corporation under the contract since Deerhaven Unit 2 would not be in service.

In 1982 with a projected net peak demand of 221 mW, the reserve would be reduced below 20% to 16% and again no sales could be made to Florida Power Corporation.

In 1983, with a summer peak demand of 234 mW and a system capability of 492 mW with Deerhaven Unit 2 in service, sufficient capacity would be available to serve the 75 mW sale to Florida Power Corporation (Figure 1.7-1). However, the additional 75 mW option, if exercised through 1985, would reduce the reserve to 24% in 1985.

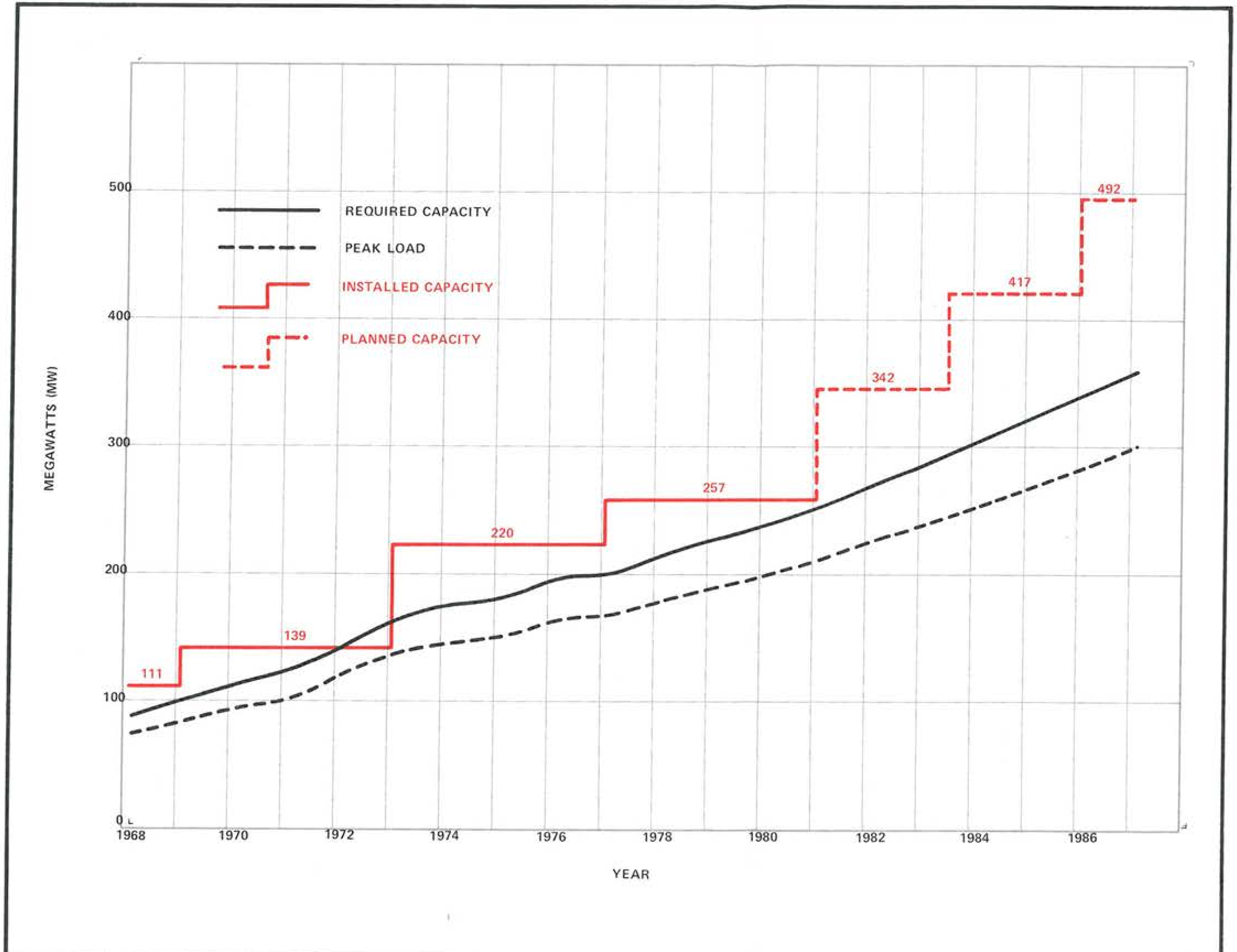


FIGURE 1.7-1 SUMMER NET LOAD AND GENERATION CAPACITY FOR DEERHAVEN UNIT 2 DELAYED TO 1983.

1.8 Effect on Statewide Reliability

The addition of Deerhaven Unit 2 in 1981 will enhance the reliability of the RUB system as well as the overall reliability of the peninsular Florida interconnected systems. This contribution to statewide reliability is significant in light of the low reserve margins predicted by Florida's utilities in the 1981-1986 period (Section 1.6).

1.9 Pertinent Factors Influencing Power Supply Planning

FCG, in response to Florida Public Service Commission (FPSC) Order 7080 issued on January 14, 1976, undertook a study to compare a method of generation planning proposed by the FPSC which excluded company boundaries to the present method by which each utility independently plans its own generation. The study began in May, 1976, and the Final Report was issued July 28, 1976. Although no definative results were obtained from this study, RUB believes that joint planning for future generation is necessary and economically advantageous, as is the utilization of economic dispatching for all generating units in peninsular Florida.

RUB, as a member of FCG, is involved in the Central Dispatch Study being developed to evaluate the economic benefits of dispatching all units in peninsular Florida against the statewide load. The results of this study may indicate an efficient and economically advantageous means of providing the electrical power requirements for peninsular Florida utilities and the customers they serve.

In considering the need for Deerhaven Unit 2 on the RUB system, a number of pertinent factors must be considered in light of past and recent events. Before 1974, RUB as well as other Florida utilities had been experiencing growth in electrical energy use in the range of 7% to 11% per year, and the planning for additional capacity was based on meeting this rate of growth. Since the 1973 oil embargo and the rapid rise in oil costs and resultant recession, the rate of growth for Florida utilities has reduced to approximately half of prior growth rates.

Based on these previously experienced growth rates, RUB initially proposed the addition of an oil-fired unit in the 235 mW range. Subsequent to that decision, the Federal Energy Administration ordered Unit 2 constructed such that it would be capable of burning coal and the subject application has therefore been revised accordingly. With that restriction, the consideration of a smaller unit on RUB's system would not be cost-effective because of the economies of scale associated with coal-fired plants.

As reported by the Ad Hoc Committee on Energy of the United States House of Representatives and as subsequently passed by the House of Representatives, the proposed National Energy Act has three principal themes: (1) energy conservation; (2) conversion to coal; and (3) incentives to production of domestic energy resources. The addition of the coal-fired Deerhaven Unit 2 is directly in concert with the conversion goal. Additionally, there will be generation available from Deerhaven Unit 2, which, when not being utilized to meet the requirements and commitments of the RUB system, can be sold through economy energy transactions to other interconnected utilities. This will serve to further lessen the use of oil-fired generation in Florida.

The broader question of need for the unit must be assessed in light of relevant present circumstances, not only of the RUB system, but of the state and the Nation as well. When assessing additional capacity necessary to meet the RUB system's projected requirements over the five to eight-year period following the commercial operation of Deerhaven Unit 2, the fact that the unit is to be coal-fired is significant considering the existing and projected dependence on oil of RUB and other Florida utilities. The 1977 FCG Ten-Year Site Plan projects that oil will provide 45% to 55% of the annual energy requirements of other Florida utilities through 1986. The reduction of this dependence on oil is one of the major goals of the National Energy Act. This clearly indicates a need for a greater portion of Florida's electrical generating capacity to be produced by plants utilizing coal as a primary fuel to strike a reasonable balance among the three logical choices of nuclear, oil and coal fuel sources.

CHAPTER 2

THE SITE AND SURROUNDING AREA

Presented in this chapter are the detailed relevant data describing those physical, ecological, meteorological and man-made characteristics of the existing environment of the site and surrounding area. While the site and surrounding area within a five mile radius are presented in detail, emphasis is placed on those parameters of the existing environment that might be affected by the construction and operation of the project.

General categories presented are: (1) site location; (2) regional demography, land and water use; (3) historic, cultural and natural landmarks; (4) geology; (5) hydrology; (6) meteorology and climatology; (7) ecology; and (8) ambient air. Each of these categories are discussed in detail for both the site and surrounding area. It should be noted that this chapter primarily deals with the physical environment, therefore while briefly mentioned in this chapter, demography is discussed in greater detail in Chapter 7.

2.1 Site Location

Deerhaven Unit 2 will be located adjacent to Unit 1 on the existing 1,116 acre Deerhaven site, which lies on the northeast side of U.S. 441 approximately six miles northwest of Gainesville in Alachua County in north-central Florida. The rural community of Hague lies approximately one-half mile to the northwest of the site. Gainesville is the economic, educational and governmental focal point of north central Florida,

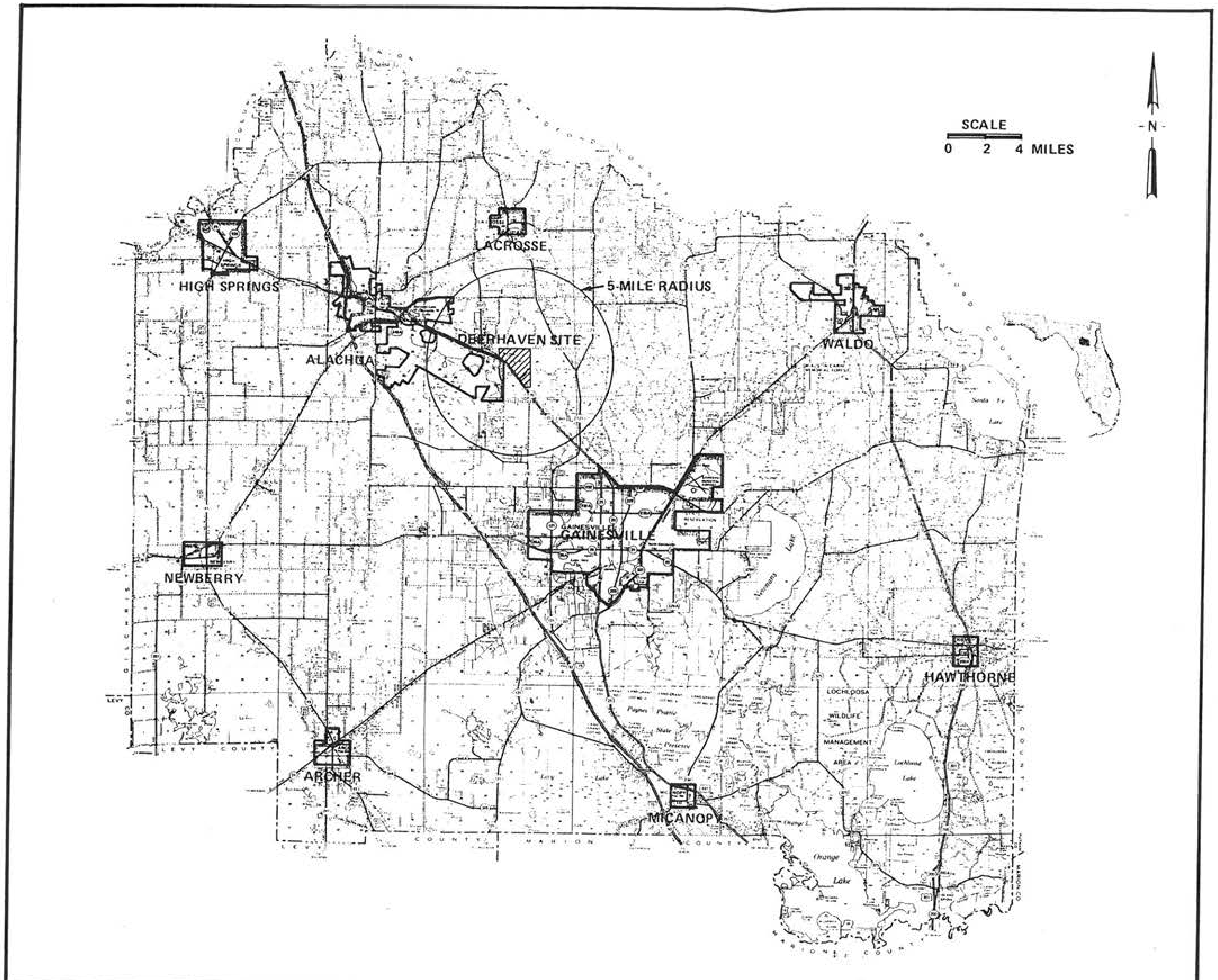


FIGURE 2.1-1 DEERHAVEN SITE LOCATION.

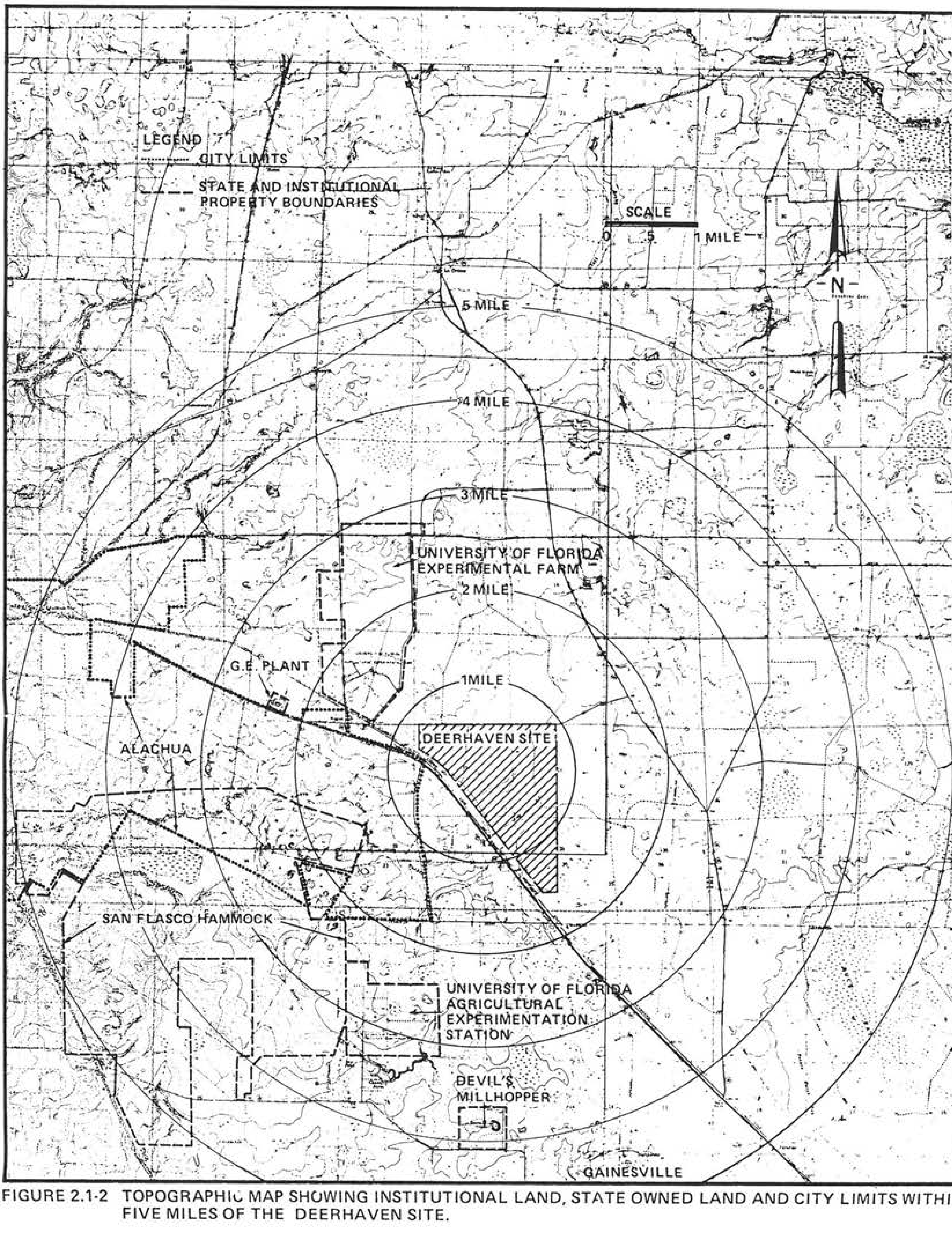


FIGURE 2.1-2 TOPOGRAPHIC MAP SHOWING INSTITUTIONAL LAND, STATE OWNED LAND AND CITY LIMITS WITHIN FIVE MILES OF THE DEERHAVEN SITE.

having the University of Florida, numerous branches of both state and Federal governmental agencies, and various commercial service oriented businesses and financial institutions within its confines or nearby. Alachua County lies almost equidistant from the Gulf of Mexico and the Atlantic Ocean (Figure 2.1-1).

Incorporated areas within the five mile radius of the site include Alachua, a small portion of Gainesville, and the unincorporated area of Hague (Figure 2.1-1). The area of Alachua is newly annexed and contains the residential developments now underway in the vicinity of Hague and Turkey Creek. At present, however, much of the area is still predominantly agricultural and natural land. Commercially developed land within Alachua (outside the Central Business District - CBD) is concentrated near the junction of I-75 and U.S. 441.

Governmental land within a five mile radius of the Deerhaven site includes the University of Florida Dairy Research Unit, the Horticulture Research Unit, San Felasco Hammock, and the Devil's Millhopper (a State Geological Site). A General Electric Company nickel/cadmium battery plant is located northwest of Deerhaven in Hague (Figure 2.1-2).

2.2 Regional Demography, Land and Water Use

2.2.1 Demography

While those portion of Gainesville and Alachua within a five mile radius of the site are sparsely populated, these cities are the largest population centers within the general area of Deerhaven site and Alachua County (Figure 2.1-1 and 2.1-2). The 1976 populations of Alachua and Gainesville, as reported by University of Florida, Bureau of Economic Research, are 3,169 and 70,228, respectively. More detailed discussion of population statistics and characteristics of Alachua County are presented in Chapter 7.

2.2.2 Land Use

The majority of the land within five miles of the site is undeveloped or agricultural in nature with scattered concentrations of recent residential and commercial development (Figure 2.2-1, inserted in rear cover pocket). Some moderate scale housing developments are currently under construction and since the Alachua County 1995 comprehensive plan generally anticipates further such development, it seems reasonable to anticipate continued development. Industrial and commercial development is localized along U.S. 441 near Hague and near the junction of U.S. 441 and SR-121. This industrial and commercial development includes the General Electric plant, a small warehousing and commercial industrial park and some retail businesses southeast of the site. Within the past five years, new single family and multiple unit dwellings have been located in the area of Devil's Millhopper and SR-121. These residential developments are a northern expansion of the Gainesville suburban residential area.

Other major area land uses include: managed land for pulp and timber production to the north and east of the Deerhaven site, which are owned by Owens-Illinois Corporation; San Felasco Hammock, a State owned tract southwest of Deerhaven, managed as a preservation and conservation area; and the Devil's Millhopper, a State Geological Site.

The Deerhaven Unit 2 site is zoned for agricultural use with a public use permit for power generation and accessory uses. It is the location of RUB's existing oil-fired Deerhaven Unit 1 and two combustion turbines. RUB applied for State Site Certification of Deerhaven Unit 2 as an oil-fired facility in March, 1974. A public hearing was held May 16, 1974, to consider the proposed expansion's compliance with applicable, local zoning and land use ordinances. The hearing examiner's report found the site properly zoned and in compliance with local land use plans. At the July 24, 1974, meeting of the then Florida Pollution Control Board (predecessor to the Environmental Regulation Commission) approved, adopted and confirmed, en toto, the hearing examiner's report (Board Order No. 74-23).

The following sections present in greater detail the land use within five miles of the site by drainage basin (Figures 2.2-1 and 2.2-2).

Turkey Creek

Land use in Turkey Creek basin is changing very rapidly. Until a few years ago agriculture was the predominant activity in the basin. Much of the central portion of the basin was improved pasture with hardwood stands along drainageways. In the western area, San Felasco Hammock was, and still is, heavily forested with mixed pine and hardwoods.

At the present time, urbanization in the basin is proceeding rapidly. Deerhaven Station, two industrial parks, a saw mill, and a mobile home park occupy large areas of the basin north and east of U.S. 441. The pine and palmetto flatwoods in the southeast corner have been cleared and drained for homesites. Other residential developments are opening between U.S. 441 and Turkey Creek. An extensive development that will include several hundred homesites and a full-size golf course and clubhouse is under construction along Turkey Creek just south of Hague. The hydrological and environmental implications of development are difficult to assess without a detailed, long term study in the area; however, urbanization tends to increase surface runoff, soil erosion, and losses of beneficial vegetation. Water quality tends to decline due to polluted storm runoff.

Cellon Creek

Present basin land use is predominately agricultural (Table 2.2-1). General Electric has operated its battery manufacturing plant for over 12 years near the basin center. A small industrial park has been opened adjacent to General Electric on the east bank of the creek. The community of Hague contains many small homes, mobile homes and agricultural buildings. Hague has become inactive as an agricultural processing and shipping point. The balance of the basin, including the experimental farm, is used for cattle grazing or remains as woodlands or scrub. A few homes and farmsteads are scattered across the basin. Several major power transmission lines cross the basin south of U.S. 441.

Table 2.2-1 Land Use[(1)] in Cellon Creek Basin

Land Use	Present Condition	Future Condition[(2)]
Woodlands	32%	16%
Croplands	5%	2%
Pasture	59%	19%
Water	1%	1%
Commercial	1%	5%
Residential (1 acre)	2%	2%
Residential (¼ acre)	--	55%

(1) Predominant localized land use affecting hydrology.

(2) Source: Alachua County Comprehensive Land Use Plan.

NOTE: Total basin area is 3,490 acres.

Future land use appears to be directed toward urbanization. Land development companies have purchased large tracts particularly in the area south of U.S. 441. Housing developments and retail stores are being opened along U.S. 441 from Gainesville to Alachua. It is reasonable to expect manufacturing and light industry to continue to grow in their present locations and to provide a demand for housing in the immediate area. Basin topography is naturally attractive and will easily accommodate urban development. The Alachua County Comprehensive Land Use Plan for 1995 indicates land use trends in this area as outlined above. Easy access via U.S. 441 and rail and utilities services provide additional advantages in developing this area.

Mulatto Pen Branch

The pine flatwoods in the high end of the basin are currently managed as commercial pine forest by Owens-Illinois, Incorporated. A significant portion of these lands have been cleared or harvested during the past few years. Those areas more recently cut over have much of the waste and unusable timber remaining on the site. Windrows of waste, generally perpendicular to Mulatto Pen Branch channel tend to cause shallow ponding of surface runoff and inhibit overbank flow in times of flood. This is particularly true of that reach immediately south of County Road NW 22. The higher, better drained lands, general lying north of Owens-Illinois holdings, are employed in crop production. Most of the land within a quarter mile of the channel itself serves as pasture and grazing land or remains as woodland. This zone along the channel includes the natural floodplain. Soils in this zone tend to remain saturated for most of the year and grazing quality seems poor. Other improvements in the basin are limited to agriculturally related features such as stock ponds and farm buildings. Table 2.2-2 presents general land use in Mulatto Pen Branch drainage basin. The Alachua County Comprehensive Land Use Plan for 1995 indicates no changes in use for this basin.

Rocky Creek

The present land use of the improved acreage in Rocky Creek basin is predominately agricultural (Table 2.2-3). The western and northern parts of the basin contain a few large farms and many smaller farms, producing beef cattle and various crops. Commercial pine forests are found in the southern end of the basin along SR-121. Extensive areas of the eastern and southern parts of the basin remain heavily wooded. Pine and hardwoods are found in the better drained areas, with cypress and other water-tolerant trees in the swampy and low-lying areas.

Residential development in the basin is generally limited to a town called LaCrosse. However, scattered residences are found throughout the basin. According to the Alachua County Comprehensive Land Use Plan for 1995, all lands within the Rocky Creek basin, except for those within the LaCrosse city limits, are zoned only for agricultural, conservational, or recreational usage. No significant changes are anticipated in Rocky Creek basin land use before 1995.

Table 2.2-2 Land Use[1] in Mulatto Pen Branch Basin

Land Use	Present Condition	Future Condition[2]
Commercial Pine Forests	32%	N/C[3]
Other Woodlands	33%	N/C
Pasture	14%	N/C
Croplands	21%	N/C
Residential	less than 1%	N/C

[1] Predominant localized land use affecting hydrology.

[2] Source: Alachua County Comprehensive Land Use Plan.

[3] No change.

NOTE: Total basin area is 3,701 acres.

Table 2.2-3 Land Use[1] in Rocky Creek Basin

Land Use	Present Condition	Future Condition[2]
Woodlands	60%	N/C[3]
Croplands	26%	N/C
Pasture	13%	N/C
Water	1%	N/C
Residential	less than 1%	less than 1%

[1] Predominant localized land use affecting hydrology.

[2] Source: Alachua County Comprehensive Land Use Plan.

[3] No change.

NOTE: Total basin area is 21,142 acres.

2.2.3 Water Use

Water demand within the near vicinity of the Deerhaven site is changing in character due to the gradual urbanization of this area. Most private residences in this area have individual wells for potable water. Major users are listed and briefly described as follows:

Deerhaven Generating Station - Potable water is supplied to Deerhaven Station by the RUB's water system at an average rate of 0.2 million gallons per day. This water is utilized for domestic and certain process waters.

General Electric Battery Manufacturing Plant - This manufacturing plant pumps and treats raw water for both potable supply and manufacturing needs. The present pumping rate is approximately 1.8 mgd (Pers. Com., General Electric Staff, 1977).

Turkey Creek (Residential Development) - Eight hundred single family dwelling units are presently under construction at Turkey Creek subdivision, south of the community of Hague. Two 10-inch wells and a 200,000 gallon elevated storage tank have been constructed to provide for an ultimate demand of approximately 4.4 mgd (Pers. Com., Chief Engineer, Turkey Creek Development, 1977).

Agricultural irrigation and stock watering needs account for a major water use in this area. Demand and withdrawal for either wells or surface streams is quite variable, depending on crop needs and rainfall. The University of Florida Dairy Research Unit at Hague typically withdraws only 5,000 gallons per day for stock watering (Pers. Com., Dr. Herbert Head, University of Florida Dairy Research, 1977). Mr. Larry Rogers, an area vegetable grower, typically pumps 600 gallons per minute from his 10-inch well for twenty-four hours per day for 20 days each year (Pers. Com., 1977). Major field crops, such as corn and soybeans, are not irrigated in this area. Vegetable crop irrigation is usually performed during late April through early June and during October and early November. Stock watering is accomplished by using both surface streams and wells.

Water sources within the near vicinity of Deerhaven Generating Station include a RUB potable water main, the Floridan Aquifer, a shallow water bearing stratum in the Hawthorn Formation and such surface streams as Turkey Creek, Cellon Creek, Rocky Creek, Mulatto Pen Branch, Monteocha Creek and Hatchett Creek. Table 2.5-6 presents a complete listing of water supply wells within a five mile radius of Deerhaven Station Site. Each well is located on Figure 2.5-9.

2.3 Regional Historic, Scenic, Cultural and Natural Landmarks

In accordance with Federal mandates including Executive Order 11593, the National Environmental Policy Act, and the National Historic Preservation Act, as implemented by Title 36, Code of Federal Regulations (CFR), Part 800, "Procedures for the Protection of Historic and Cultural Properties", a study was performed to determine the potential impact of the proposed construction upon cultural resources. Information from such varied sources as personal interviews, county tax and deed records, United States section survey records, early aerial photography, museum files of recorded sites, and an archaeological field survey was assembled to document all sites found on the property, their significance, and degree of endangerment (Appendix Table A2-1).

2.3.1 Potentially Affected Areas of Historic, Scenic, Cultural or Natural Significance

Potentially affected areas were taken to include any land within the 1,116 acre site.

Sites Included in the National Register of Historic Places

The Florida Master Site File at the Division of Archives, History and Records Management lists eight properties in Alachua County included in the National Register of Historic Places. These are: Hotel Thomas, Rochelle School, Matheson House, Neilson House, Bailey House, Buckman Hall, Epworth Hall, and Marjorie Kinnan Rawlings House. All are located more than five miles from the Deerhaven property and discharge alternatives. Consultation with the staff of the State Historic Preservation Officer revealed no additional Alachua County nominations in preparation or pending approval.

Sites Included in the National Registry of Natural Landmarks

In consultation with the National Park Service, Southeast Regional Office, it was determined that three properties in Alachua County currently enjoy Natural Landmark status. These are: Paynes Prairie, Devil's Millhopper, and San Felasco Hammock. Paynes Prairie is located more than five miles from the project site and will not be affected. Devil's Millhopper, situated 3.6 miles southwest of Deerhaven Unit 1's stack is a solution cavity some 500 feet in diameter at the surface and 120 feet deep. The sink is fed by surface water, primarily from the north and west, and contributes to the shallow aquifer system. Runoff from the Deerhaven tract is prevented from reaching Devil's Millhopper by the intervening drainage of Turkey Creek. Devil's Millhopper will receive neither visual nor audible impact from the proposed project.

San Felasco Hammock is located several miles west of the Deerhaven property and currently receives discharge from Deerhaven Unit 1 operations. The construction and operation of Unit 2 will result in Unit 1's discharge being removed from the Hammock and thus no foreseeable impacts on archeological sites within same should occur.

Sites Eligible for Inclusion in the National Register of Historic Places

According to "Procedures for the Protection of Historic and Cultural Properties", environmental assessments shall include consideration of impact upon sites eligible for inclusion in the National Register of Historic Places, in addition to those already listed on the Register. The archaeological and historical survey of the Deerhaven tract was designed to locate unknown sites and determine their eligibility according to the "National Register Criteria" (36 CFR 800.10).

During the study thirteen artifact loci were recorded and assessed (Table 2.3-1). In consultation with the staff of the State Historic Preservation Officer, it was determined that one of the eleven loci within the area of the undertaking's potential impact met criteria for National Register eligibility. Two are outside the area of impact and are therefore not considered.

The site eligible for inclusion in the National Register is prehistoric, dating perhaps to the Deptford period. It is located on-site in a small developing hardwood hammock. Cursory surface and posthole surveys of the area produced an artifact collection consisting of: three ceramic sherds, one of which appeared to be Deptford Simple Stamped; one chipped stone projectile point, perhaps late Archaic in age but not assignable to any defined type; and 39 flint waste flakes.

The site is interesting in several respects: its location on well drained soil supporting hardwood vegetation; the presence of Deptford series ceramics; and its undisturbed condition. These features are in contrast to characteristics of other sites in the area, and suggest that the site has value for increased understanding of several aspects of aboriginal culture on a regional level. Construction impacts to this site are discussed in Sections 4.1.2 and 4.2.2; excavation plans are also reported in Section 4.1.2.

Table 2.3-1 Artifact Loci

Number	Description	Location	Age	Nat. Reg. Eligible
1-3-A	Single projectile point from road surface near springhead	Deerhaven	Prehistoric	No
8A1368	Disturbed Archaic? flint surface scatter near Turkey Cr.	Deerhaven	Prehistoric	No
1-4-B	Two flint chips on power line cut	Deerhaven	Prehistoric	No
8A1369	Deptford? period site in hardwood hammock	Deerhaven	Prehistoric	Yes
1-5-B	Disturbed Archaic? flint surface scatter at plant site	Deerhaven	Prehistoric	No
1-6-A	Farmstead site at cleared 40 acre tract on north boundary	Deerhaven	Early 20th century	No
1-6-B	Sawmill site adjacent to U.S. 441	Deerhaven	ca. 1885-1905	No
2-8-A	Turpentine still site adj. to U.S. 441	Deerhaven	ca. 1925-1945	No
2-8-B	House site near north boundary	Deerhaven	Early 20th century	No
8A1370	One projectile point near trailer park	Alternate pipeline corridor	Prehistoric	No
8A1372	Archaic flint scatter 30 yds. north of U.S. 441	Alternate pipeline corridor	Prehistoric	No
2-9-A	Ceramic period site east of Rocky Creek Swamp	Alternate pipeline corridor	Prehistoric	Unknown
2-9-B	Mill pond dike on Rocky Creek	Alternate pipeline corridor	Early 20th century?	No

2.3.2 Historic Documentation

In an effort to locate significant cultural resources which might be mentioned in historical and documentary sources, a search was made of records at the Florida Bureau of State Lands, Alachua County courthouse, R. M. Strozier Library, Florida State Library, and P. K. Yonge Library of Florida History. While neither aboriginal nor historic sites of significance were revealed by the survey, the study was valuable in suggesting past land use and settlement patterns. In general, it was shown that the Deerhaven tract never supported intensive habitation, and that its primary exploitable resource was timber.

2.4 Geology

2.4.1 Surrounding Area

The Deerhaven Station site is underlain by approximately 3,200 feet of stratified sedimentary rocks which overlie a "basement" of dense crystalline and metamorphic rocks. The uppermost 110 feet of stratified deposits consist predominantly of fine to coarse grained sands mixed with clays, porous limestone, fine to coarse grained sandstone, and siltstone. Collectively these stratum make up the Hawthorn Formation and below lie formations consisting predominantly of limestone, dolostone, and dolomitic limestone. Layers of sandstones and shales are present in deep formations below a depth of about 2,600 feet. Figure 2.4-1 is a map indicating the location of deep exploratory wells in Alachua County and surrounding areas. Figure 2.4-2 is generalized geologic cross sections which were constructed using data obtained from these deep exploratory wells and the deep test injection well.

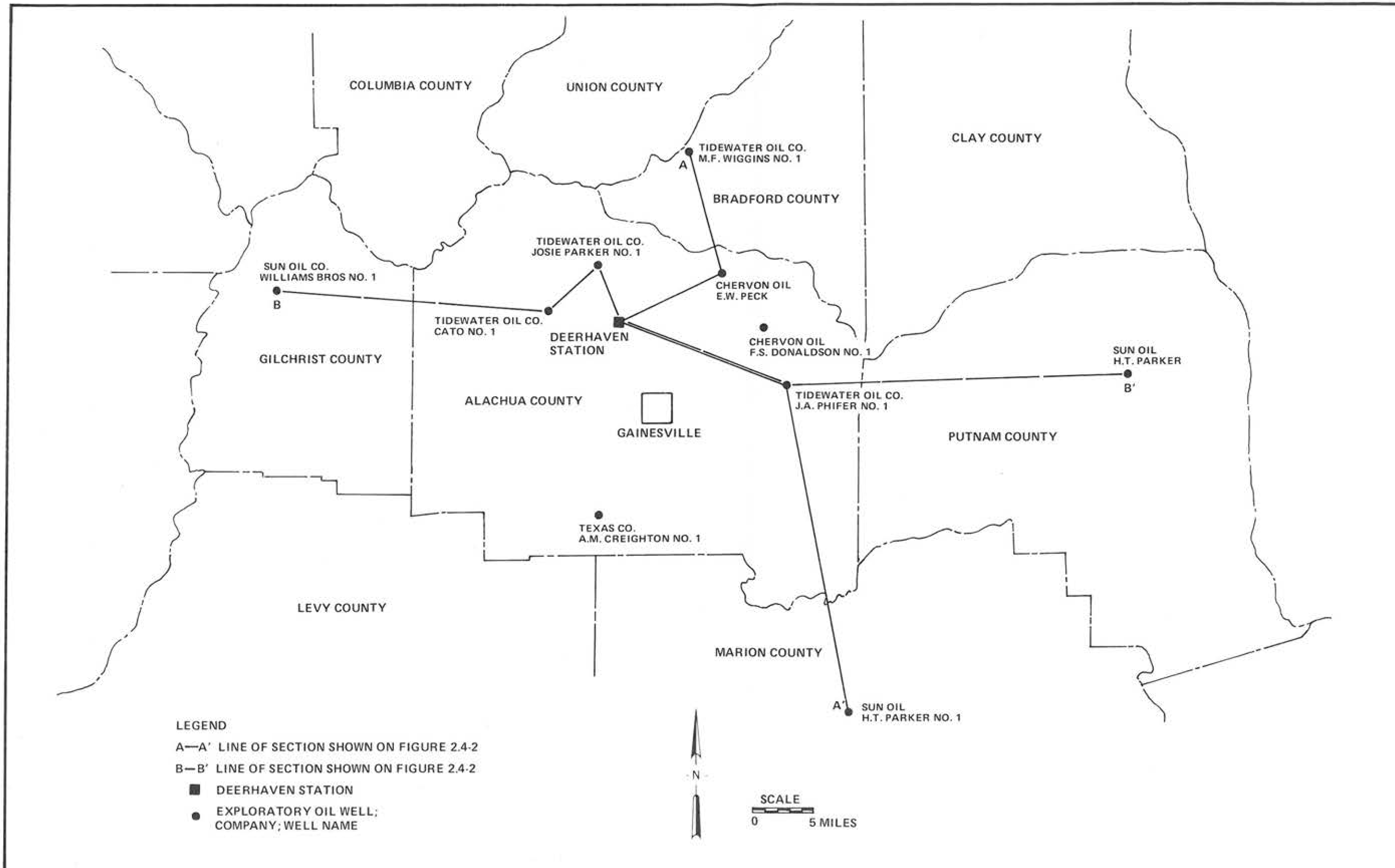


FIGURE 2.4-1 DEEP EXPLORATORY WELLS IN ALACHUA COUNTY AREA.

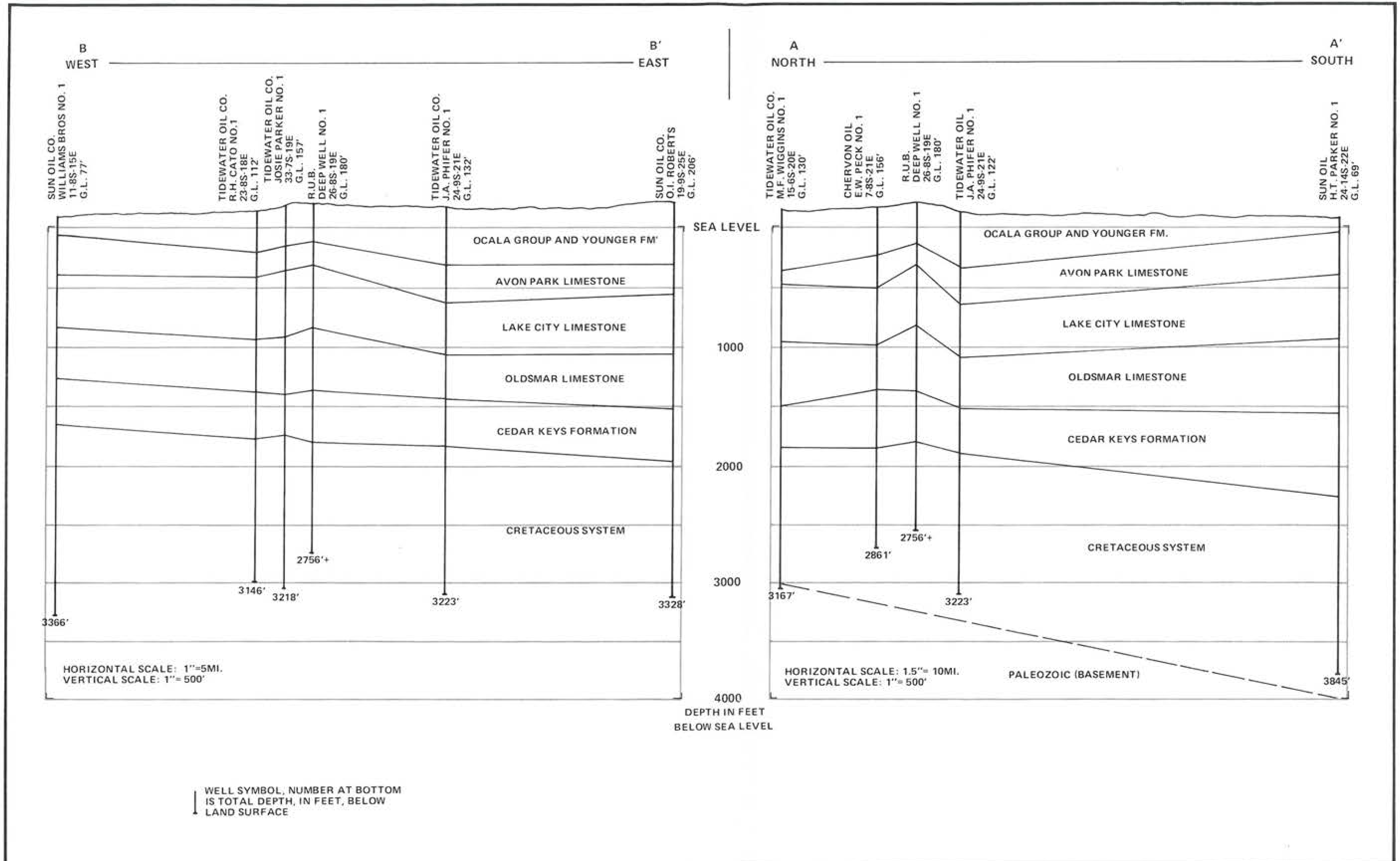


FIGURE 2.4-2 GEOLOGICAL CROSS-SECTIONS ALONG LINES A-A' AND B-B' PRESENTED IN FIGURE 2.4-1.

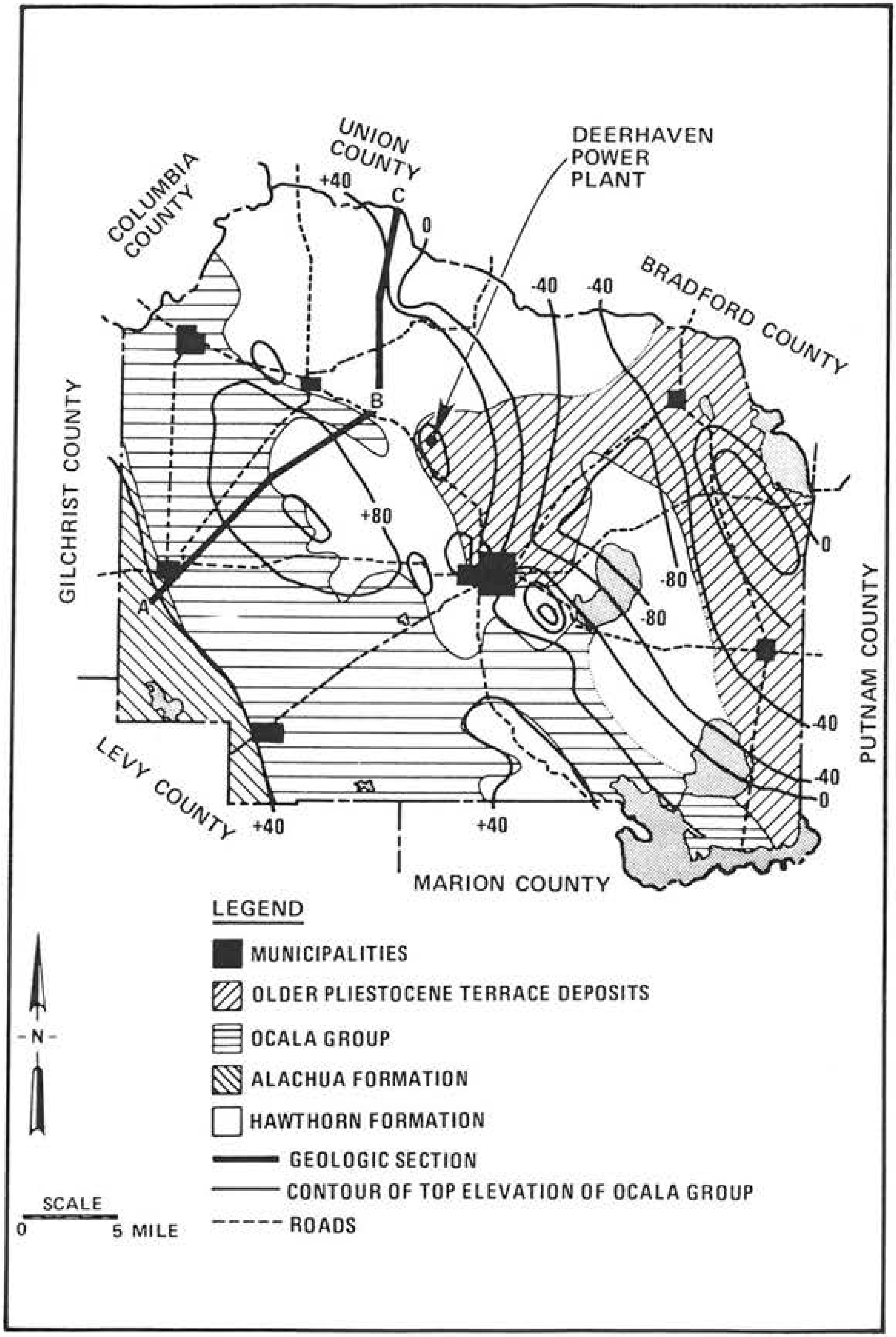


FIGURE 2.4-3 SURFICIAL GEOLOGY OF ALACHUA COUNTY.

Considerable information is available on the composition and permeability of the formations to depths of about 1,000 feet, because these are the beds utilized by most water wells in the region. Somewhat less is known about the geologic units below 1,000 feet because these units have been explored in only a few places in a search for oil and gas deposits and when the drilling of the test injection well is completed more definitive information about the deeper units will be available. In all of Alachua County, only about three wells have been drilled to the Paleozoic contact. The oldest formation known to be penetrated by water wells in Alachua County is the Lake City Limestone of the Eocene Age. In Alachua County area the Ocala Group, the Avon Park Limestone, the Lake City Limestone, and, to some extent, the Oldsmar Limestone, are thought to act as a single hydrologic unit and are termed the Floridan Aquifer. The geologic units composing the Floridan Aquifer consist of interbedded layers of soft to hard limestone, dolomitic limestone and dolostone which generally have high permeability in a lateral direction and low permeability in a vertical direction. The Cedar Keys Formation, which underlies the Oldsmar Limestone, contains beds of limestone and dolostone impreganted with gypsum and anhydrite and are relatively impermeable and therefore may function as confining layers below which saline or highly mineralized water exists. Below this, to the basement at about 3,200 feet are the Lawson Limestone, the Taylor Beds, and layers of limestone, sandstone and shale. Table 2.4-1 describes the geologic units as they exist below the Deerhaven Site. Definite detail at all geological levels has been developed subsequent to test injection well drilling and is discussed more completely in Chapter 6.

Table 2.4-1 Description of Geologic Units Encountered During Drilling of Test-Injection Well and Shallow Borings

ERA	System	Series	Formation	Approximate Depth and (Thickness)	Description
CENOZOIC	Quaternary	Pleistocene	Alachua	0 (8')	Sand and clayey sand, gray, brown and black, disseminated organic matter.
		Pliocene	Bone Valley	8' (9')	Sand, white to yellow, clayey sands, varicolored clays and phosphate grains and pebbles.
		Miocene	Hawthorn	17' (93')	Clay and sandy clay, white to tan interbedded lenses of sandstone, siltsone, and sandy phosphatic limestone, firm.
	Tertiary	Eocene	Ocala Group	110' (220')	Limestone, white to tan, gray, moderately indurated, porosity - moldic, vugular, micrite cement, fossiliferous, heterostegina.
			Avon Park Limestone	330' (185')	Limestone, dolomitic, microcrystalline to very fine, tan to dark brown, moderate to well indurated, porosity - solution channel, vugular; interbedded limestone buff to cream, porosity - vugular, saccharoidal, moderate induration.
			Lake City Limestone	515' (505')	Limestone, dolomitic, microcystalline to fine, euhedral, subhedral, cream to brown, porosity - moldic, moderate to well indurated; interbedded dolostone, microcrystalline to fine, euhedral, light brown to drak brown, porosity - vugular, well indurated; interbedded lignite, fractured, pasty.
			Oldsmar Limestone	1020' (530')	Dolostone, cryptocrystalline to medium, euhedral, subhedral, light tan to drak brown, porosity - intercrystalline, pin-point vug, calcite cavity filling, moderate to well indurated; interbedded limestone, white to gray, light tan, porosity - moldic, vugular, poor to moderate induration, cavity filling micrite.
		Palecene	Cedar Keys Formation	1550' (445')	Dolostone, microcrystalline, cream to gray, euhedral, subhedral, porosity - intercrystalline, vugs filled by gypsum, trace anhydrite; interbedded anhydrite oolitic limestone, poor to moderate induration.
MESOZOIC	Cretaceous	Gulf	Lawson Limestone	1995' (180')	Limestone, dolomitic, very fine to medium, euhedral, subhedral, white to tan, chalky, pasty, porosity intergranular, poor to moderate induration, gypsum impregnations throughout. Upper zone coquinoid.

Table 2.4-1 Description of Geologic Units Encountered During Drilling of Test-Injection Well and Shallow Borings (continued)

ERA	System	Series	Formation	Approximate Depth and (Thickness)	Description
MESOZOIC	Cretaceous	Gulf	Taylor Beds	2225' (500')	White to cream chalky limestone separated by thin beds and seams of tan, crystalline dolomite, gray marl.
			Austin Beds	2725' (400')	Marly shales; fine-grained, argillaceous sandstones; sandy, micaceous clay; and some limestone.
			Eagle Ford Shale	3125' (100')	Sandy, dense, hard, shaly limestone interbedded with thin seams of sandstone and flecks of lignite; poorly sorted, slightly calcareous sandstone; blocky, micaceous shale.
	Tertiary	Gulf	Woodbine Sandstone	3225'	Micaceous, calcareous sand overlying calcareous shale and shaly limestone with lignite and gypsum; irregularly interbedded in the shale are a quartz sandstone with thin shale partings and a coarse sand and gravel conglomerate.
		Comanche		3275' (50')	Red, green, and brown clastics, largely shales and sandstones. The base is a coarse sand containing pebbles of Paleozic sediments.
	Triassic			3325'	Quartz diabase and igneous intrusives.
PALEOZIC	Lower Devonian or Upper Silurian ...?...?...?... Lower Rodovician				Quartzitic sandstones and black, micaceous shales; slightly fossiliferous.

NOTE: Data on the Alachua through Lawson Limestone foundations are as found from the pilot program for deep injection well.

The principal geologic structure underlying this area is the Peninsular Arch which trends south-southeast. The dip of the formations on the flanks of the arch is to the east-northeast, however, as this structure is deeper than 2,500 feet in the Alachua County area the beds are dipping uniformly and uniaxilly away from its axial plane in a regional context. The subsurface geology and regional structure will be discussed more completely in Chapter 6.

In the vicinity of the Deerhaven Site, three types of terrain can be observed. These three types, basically controlled by stratigraphy are a limestone plain in the southwest, a high marine terrace in the northeast, and a transition zone separating these two areas. Figures 2.4-3 and 2.4-4 present the surficial geology of Alachua County in plan and section.

The limestone plain is the exposed surface at the Ocala Group of upper Eocene Age. This limestone is a soft, friable, fossiliferous, marine limestone, white to tan and is approximately 200 feet thick in the area where it is exposed.

The high marine terrace is characterized by the Hawthorn Formation of middle Miocene Age. This formation consits of interbedded clays, sandy clays, silty and clayey sands, and phosphatic limestones, and unconformably overlies the Ocala Group. The high terrace is generally poorly drained. The clays of the Hawthorn Formation are poorly conductive and

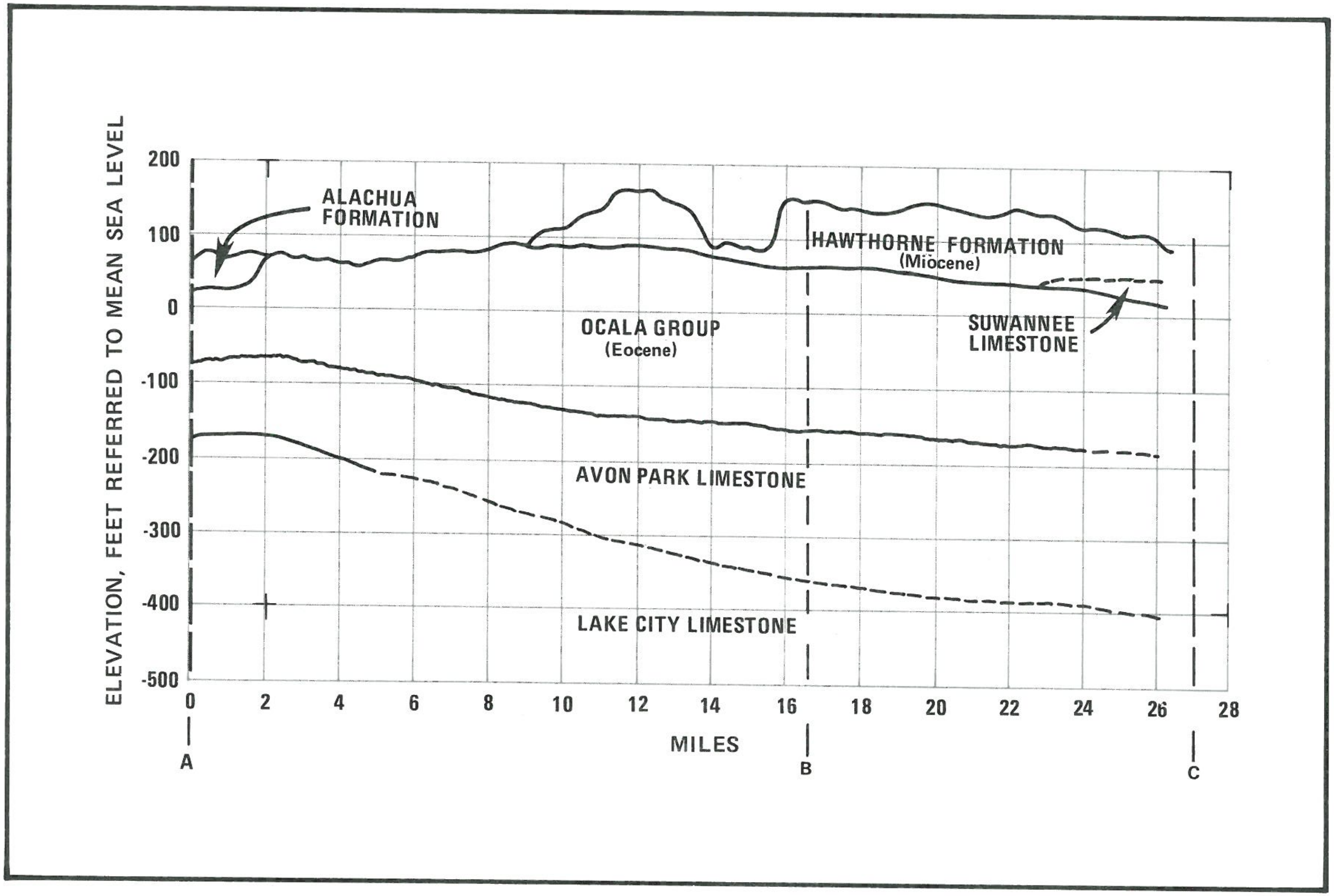


FIGURE 2.4-4 GEOLOGIC CROSS-SECTION THROUGH ALACHUA COUNTY.

tend to create a perched water table which, when exposed, is characterized by numerous cypress domes and swamps.

Between the limestone plain and the high terrace is a transition zone which is characterized by rolling hills, caves, solution basins, steep-sided sinkholes, and sinking streams. The Hawthorn Formation can be found capping the hills and along streambeds, while at locations on lower slopes and lower elevations, outcroppings of the Ocala Group occur.

The limestone plain is characterized by an almost complete lack of surface drainage. Most surface water infiltrates directly into the limestone of the Ocala Group. The Ocala Group is the dominant member of the Floridan Aquifer in the study area and the regional water table is within this formation.

Much of the rainfall runoff in the transition zone flows into streams which have developed in the clay strata. These streams flow to locations where the Hawthorn clays are breached by sinkholes. Millhopper Creek, Goose Creek, Turkey Creek, and Cellon Creek are perched streams which disappear from the surface at sinkholes, some of which, it is believed, directly recharge the Floridan Aquifer.

Seismic Activity

There are no records of any seismic events or earthquakes in Alachua County and there is no evidence that Alachua County has ever received any damaging earthquake waves.

2.4.2 Soils of the Deerhaven Site

Soils of the Deerhaven site have developed from the weathered products of the Hawthorn Formation. The natural drainage is poor because of the level or slightly depressed nature of the land surface and the presence of impervious layers of sandy-clay and clay. Figure 2.4-5 presents the U.S. Department of Agriculture Soil Conservation Service soil survey for the Deerhaven site. Table 2.4-2 presents the characteristics of the soil structure over the Deerhaven property. Nearly all soils are classified as poorly drained sands with varying silt and clay content. In general, the Basinger, Adamsville, Pomona, and Wauchula sands which underlie the higher and flatter pine-palmetto areas are poorly drained. The Electra and Sparr series found downslope are better drained because of their lower clay content and/or milder slope.

In a previous investigation, twenty-one auger borings were made at selected locations on the Deerhaven site to obtain subsurface information (Figure 2.4-6) (Breedlove, 1977). Figures 2.4-7 through 2.4-11 present soil stratification inferred from these borings at selected cross sections. As indicated, the soil tends to become less permeable with depth, forming an aquiclude on which the surficial groundwater is

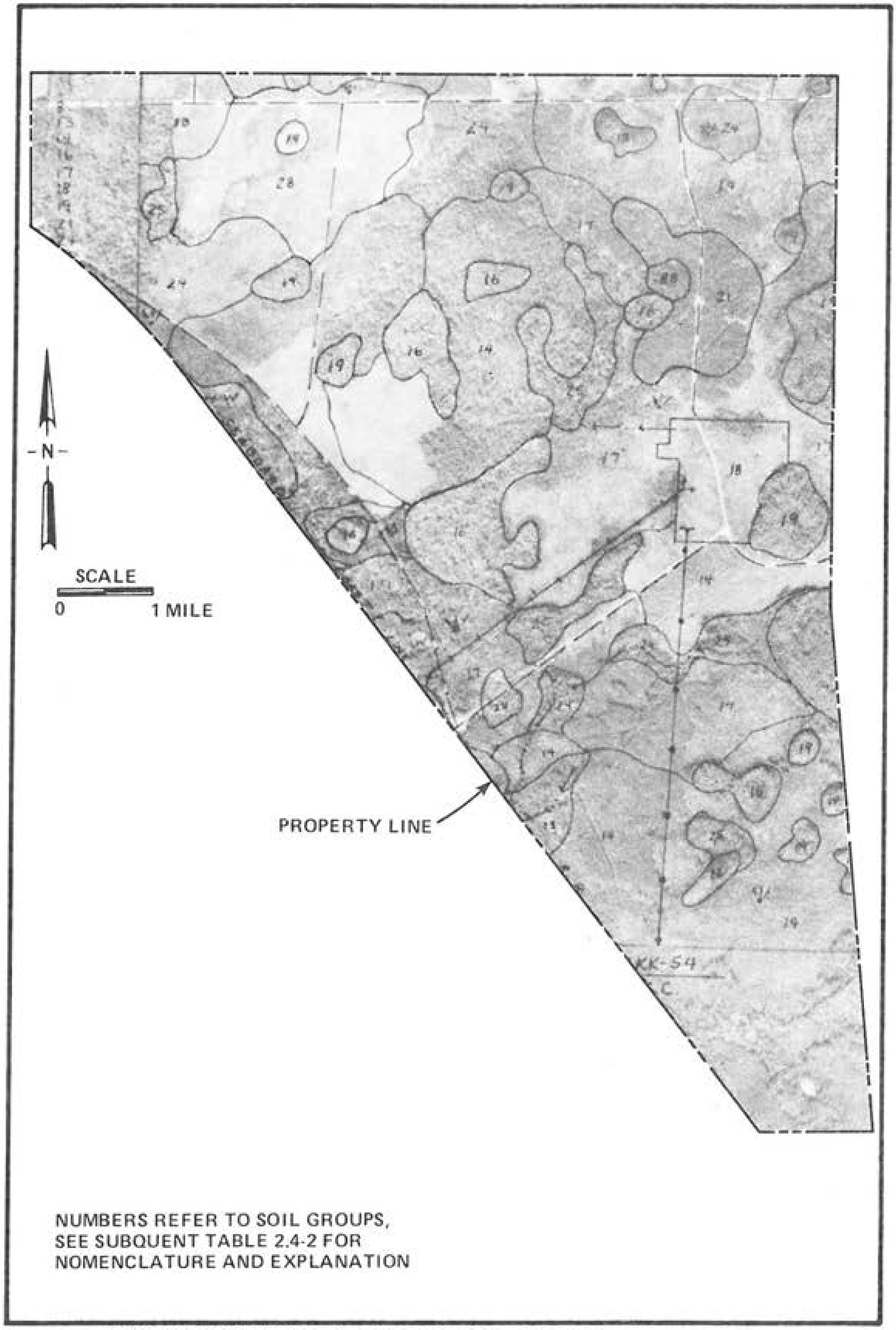


FIGURE 2.4-5 U.S.D.A. SCS SOIL MAP OF DEERHAVEN SITE.

Table 2.4-2 Nomenclature and Characteristics of Soil Groups Shown on Figure 2.4-5

Map No.	Name	Hydraulic Category(1)	Stratum Depth (feet)	Permeability (feet/hour)
7B	Kanapaha Fine Sand (0 to 5% Slopes)	A/D	0 - 2	.5 - 1.7
			2 - 4.6	.05 - .17
			4.6 - 5.8	.017 - .05
			5.8 - 6.7	.017 - .05
8B	Sparr Fine Sand (0 to 5% Slopes)	A	0.0 - 4.0	0.67 - 1.67
			4.0 - 6.7	0.05 - 0.17
13	Pelham Sand	B/D	0.0 - 2.2	0.5 - 1.67
			2.2 - 5.7	0.05 - 0.17
14	Pomona Sand	B/D	0.0 - 2.2	0.5 - 1.67
			2.2 - 3.3	0.05 - 0.17
			3.3 - 4.3	0.5 - 1.67
			4.3 - 6.0	0.05 - 0.17
16	Surrency Sand	B/D	0.0 - 1.8	0.5 - 1.67
			1.8 - 2.6	0.5 - 1.67
			2.6 - 5.4	0.05 - 0.17
17	Wauchula Sand	B/D	0 - 0.6	0.5 - 1.67
			0.6 - 1.8	0.5 - 1.67
			1.8 - 2.3	0.05 - 0.5
			2.3 - 3.1	0.5 - 1.67
			3.1 - 6.7	0.05 - 0.5
18	Wauchula - Urban Land Complex	B/D	0 - 0.6	0.5 - 1.67
			0.6 - 1.8	0.5 - 1.67
			1.8 - 2.3	0.05 - 0.5
			2.3 - 3.1	0.5 - 1.67
			3.1 - 6.7	0.05 - 0.5
19	Pomona Variant Sand	D	0.0 - 1.4	0.5 - 1.67
			1.4 - 3.6	0.5 - 1.67
			3.6 - 5.1	0.5 - 1.67
			5.1 - 6.0	0.05 - 0.17
21	Electra Variant Sand	A	0.0 - 1.1	0.5 - 1.67
			1.1 - 4.3	0.5 - 1.67
			4.3 - 6.7	0.05 - 0.17

Table 2.4-2 Nomenclature and Characteristics of Soil Groups Shown on Figure 2.4-5 (continued)

Map No.	Name	Hydraulic Category(1)	Stratum Depth (feet)	Permeability (feet/hour)
24	Basinger Variant Sand	C	0.0 - 4.3 4.3 - 6.0	0.5 - 1.67 0.05 - 0.17
25	Basinger Variant Sand Depressional	C	0.0 - 4.3 4.3 - 6.0	0.5 - 1.67 0.05 - 0.17
28	Adamsville Sand (0 to 2% Slopes)	C	0.0 - 1.0 1.0 - 6.0	0.5 - 1.67 0.5 - 1.67

(1) A--High infiltration rate; low runoff potential
B--Moderate infiltration rate; moderately low runoff potential
C--Low infiltration rate; moderately high runoff potential
D--Very low infiltration rate; high runoff potential
A/D--Category D if natural; category A if drained
B/D--Category D if natural; category B if drained

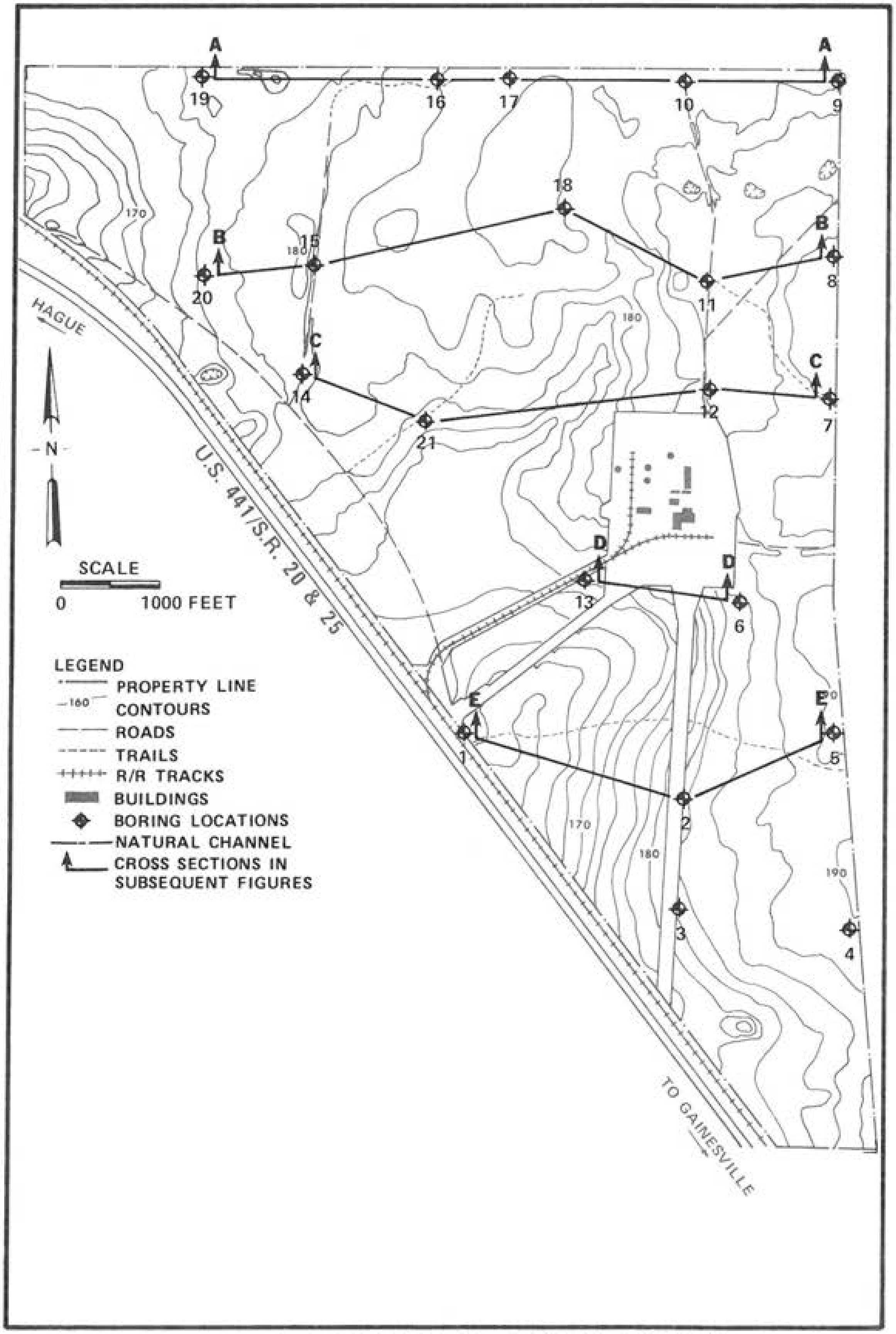


FIGURE 2.4-6 DEERHAVEN SITE BORING LOCATIONS.

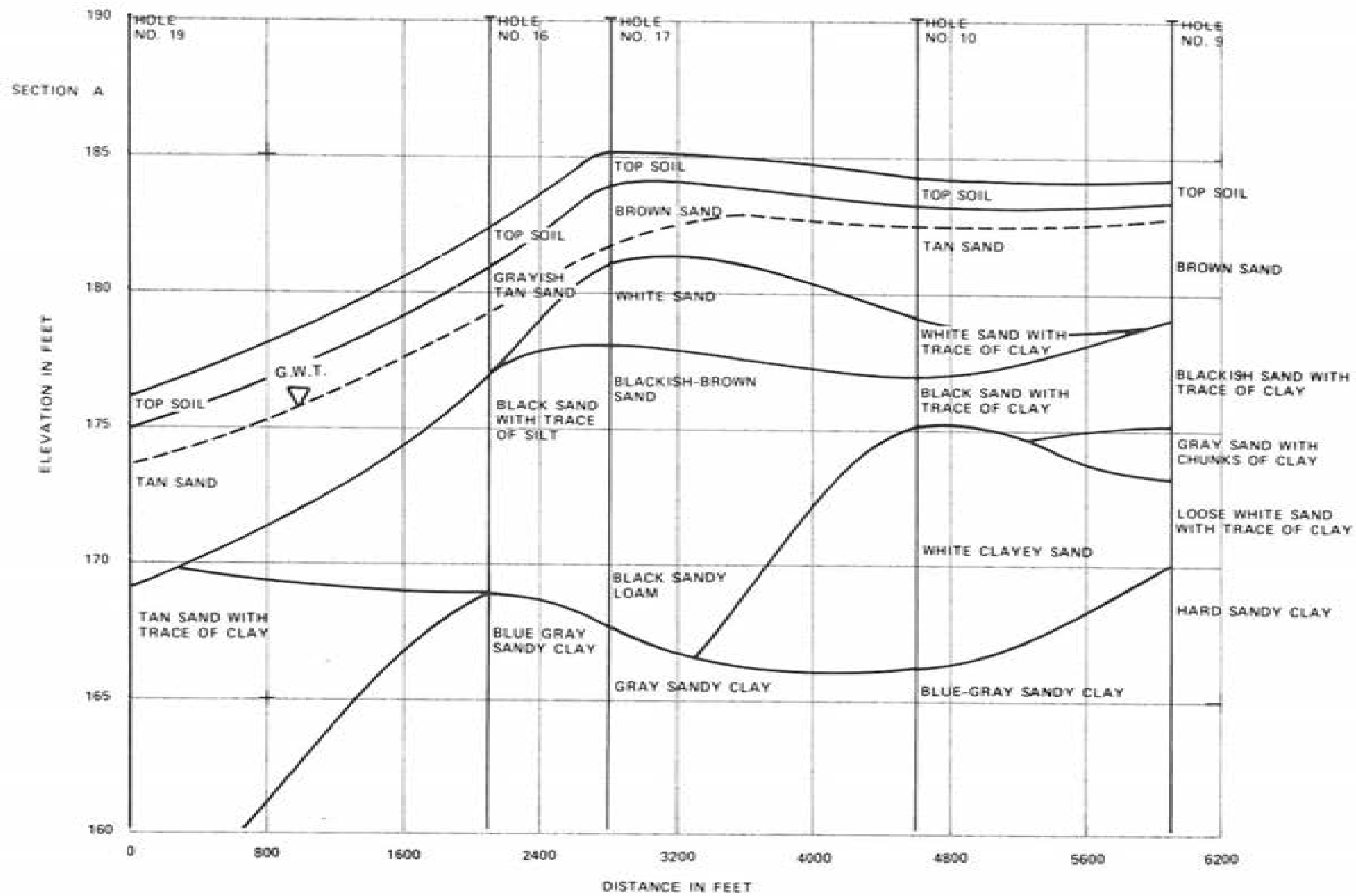


FIGURE 2.4-7 INFERRED STRATIFICATION IN SELECTED CROSS-SECTIONS OF DEERHAVEN SITE.

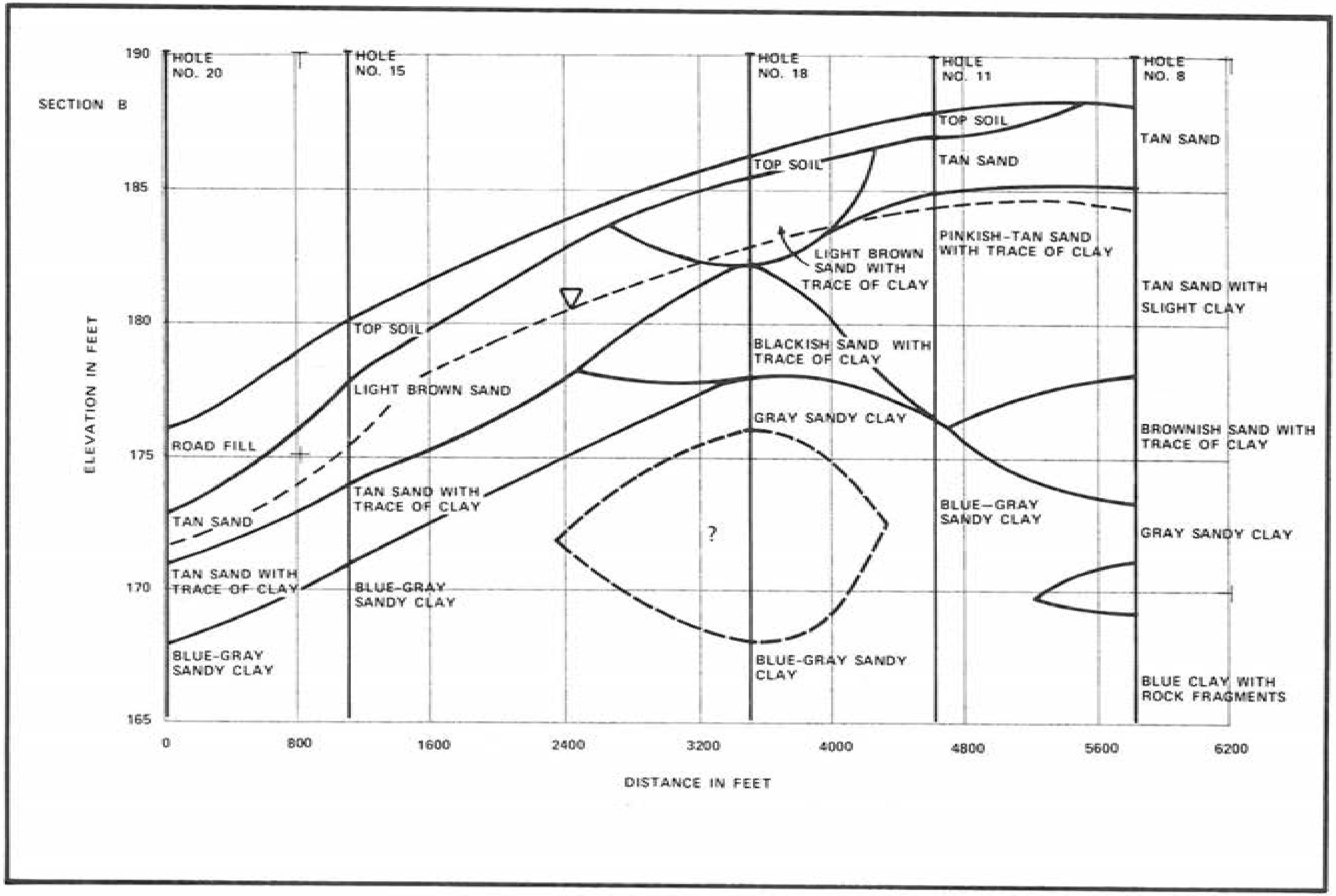


FIGURE 2.4-8 INFERRED STRATIFICATION IN SELECTED CROSS-SECTIONS OF DEERHAVEN SITE.

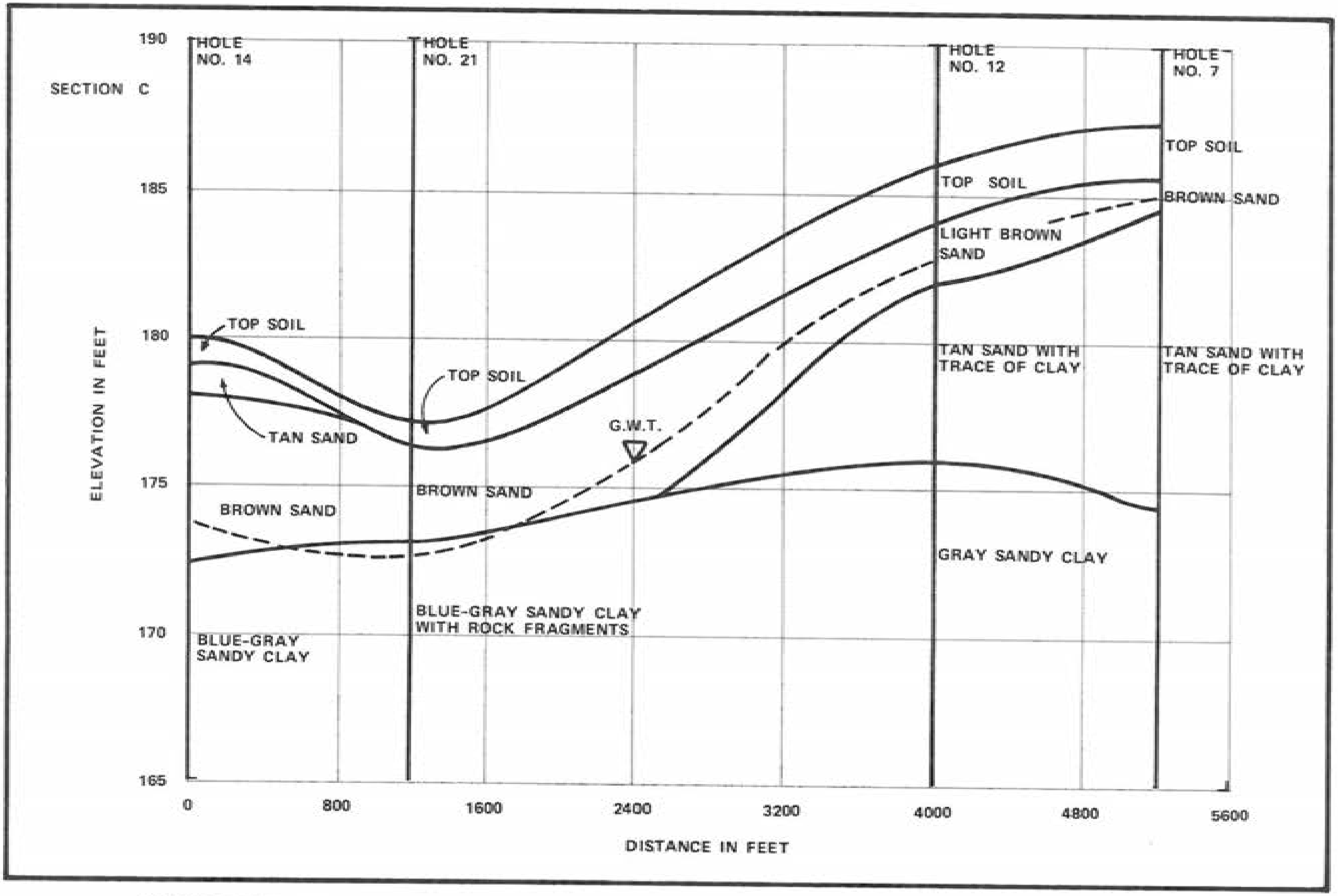


FIGURE 2.4-9 INFERRED STRATIFICATION IN SELECTED CROSS-SECTIONS OF DEERHAVEN SITE.

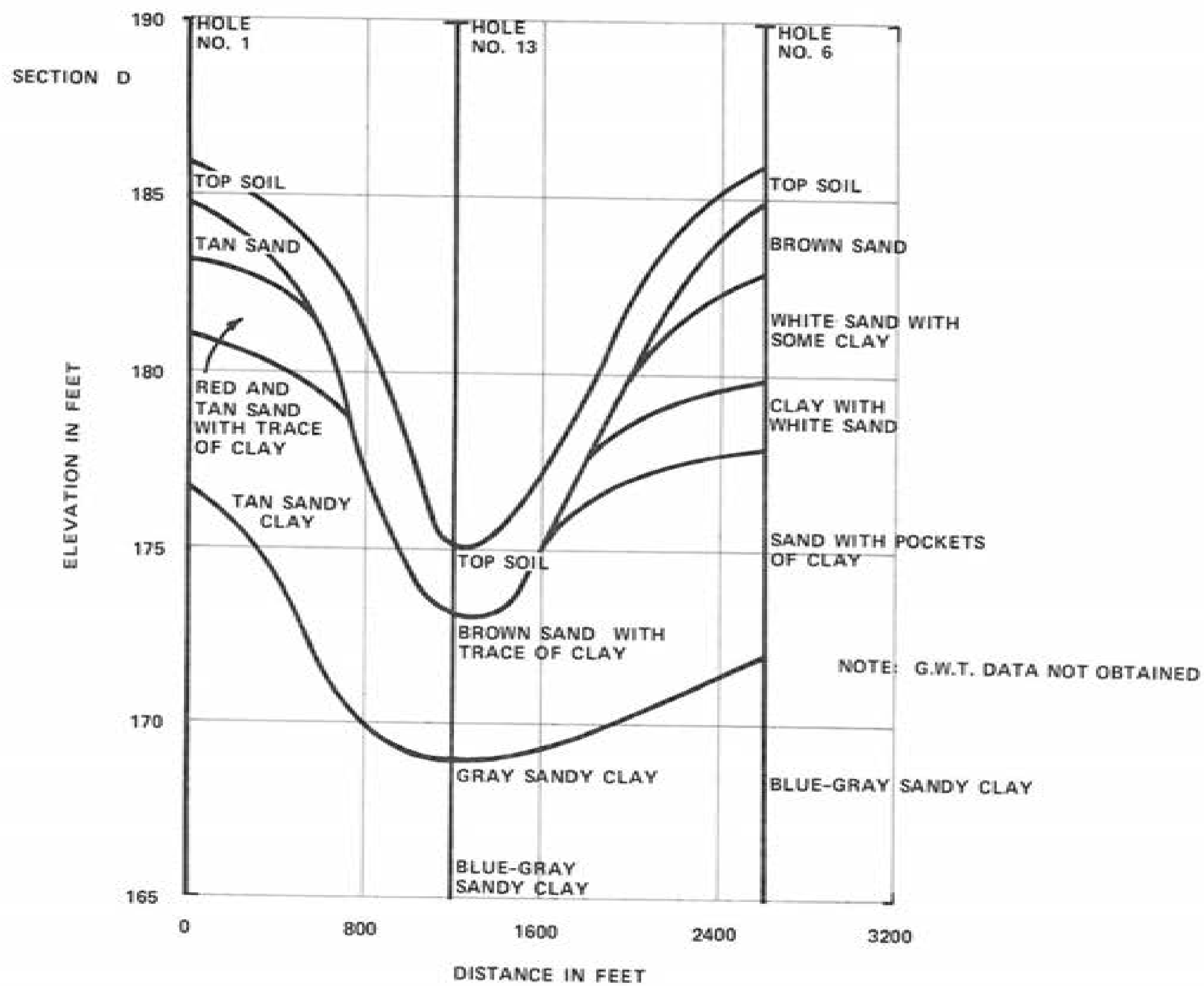


FIGURE 2.4-10 INFERRED STRATIFICATIONS IN SELECTED CROSS-SECTIONS OF DEERHAVEN SITE.

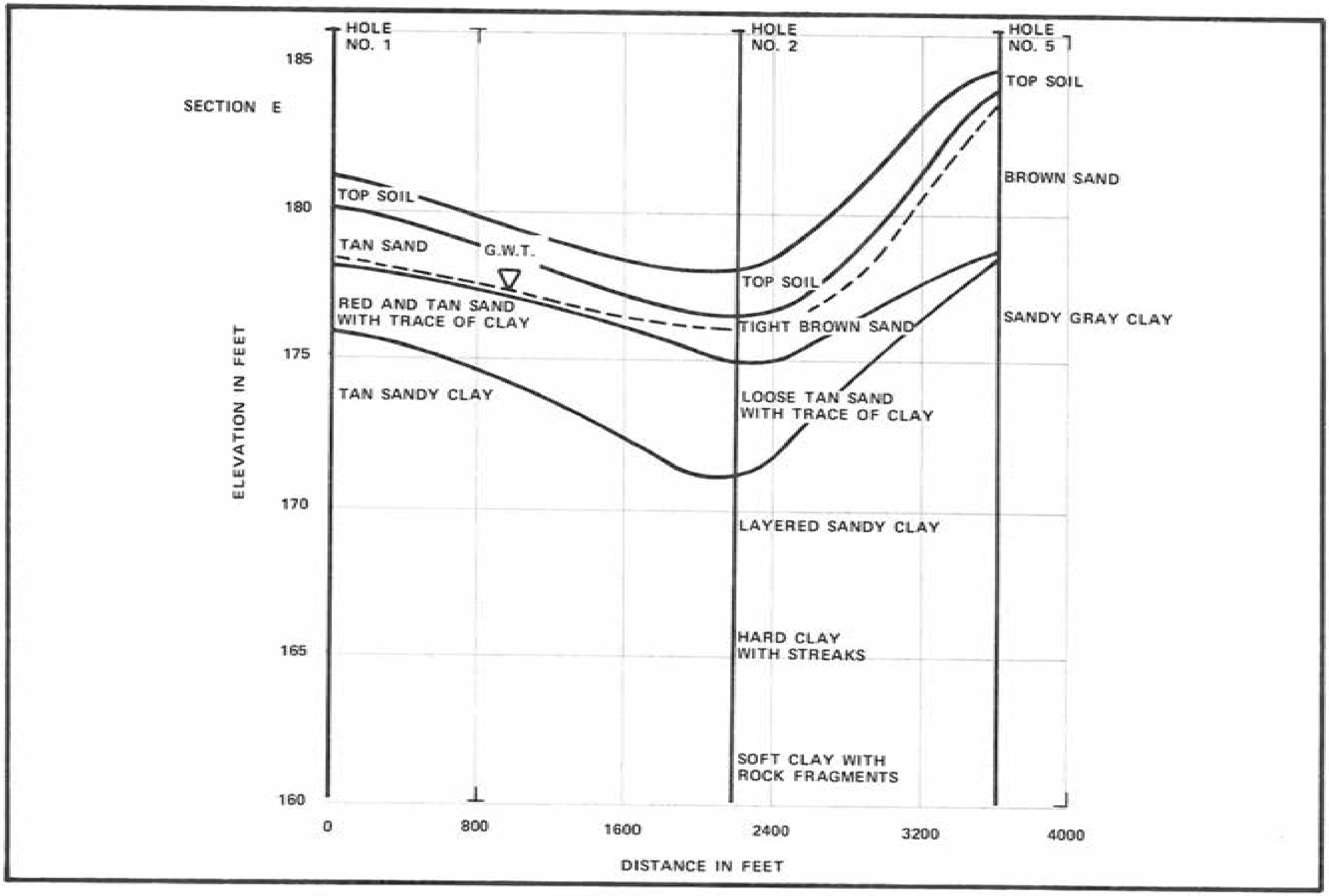


FIGURE 2.4-11 INFERRED STRATIFICATIONS IN SELECTED CROSS-SECTIONS OF DEERHAVEN SITE.

perched. Soils are sandier and better drained to the northwest as the water table is lower there. The greatest depth to the water table was found to be approximately six feet; however, in most borings the depth was found to be only two to three feet. In the southern end of the site, the groundwater depth was often within one foot of the surface. All groundwater observations were made following three successive days with no rainfall. It should be noted that groundwater levels fluctuate seasonally, and that deeper and shallower groundwater levels are dependant upon antecedent rainfall conditions. Auger borings and groundwater level measurements were performed in September, 1976.

In January, 1974, ten split-spoon borings were performed at selected locations on the improved site area, each boring penetrating thirty feet below grade. These borings indicated continuous clayey strata beginning from 3 1/2 feet below grade to 13 feet below grade, overlain by gray sand with traces of clay and dark-brown sand. The groundwater table was observed to vary from 4 to 6 feet below grade.

In August, 1974, nine split-spoon borings were taken in the improved site area, seven of which were performed adjacent to the existing generating guilding. Seven of the nine borings penetrated to 100 feet, while the other two were terminated at 30 feet below grade. Clay was encountered in each boring from 5 to 13 feet below grade and various clay strata were penetrated continuously down to the 100-foot depth. Encountered clays were extremely stiff, often requiring 100 blows of the driving hammer to achieve less than a foot of split-spoon penetration. No significant limerock or sand deposits were found within the clay. The clay surface was overlain by gray clayey sand and brown topsoil. Water levels were found to vary from 6 inches to 4 1/2 feet below grade.

2.5 Hydrology of the Area

City of Gainesville and Alachua County lie along the peninsular drainage divide. The Hatchett Creek watershed is generally located east of Gainesville and south of Waldo, forming the headwaters of a surface drainage system which flows south through Newnan's Lake, Prairie Creek, Orange Lake, and Orange Creek to the Oklawaha River. From the Oklawaha, flow continues through the St. John's River to the Atlantic. The northern areas of the county, lying atop the Hawthorn Formation, generally drain through small surface streams such as Rocky Creek and Monteocha Creek to the Santa Fe River. The Santa Fe flows generally in a westerly direction to the Suwannee River and, thence, to the Gulf of Mexico. Major portions of the county lie along the transition zone between the high plateau of the Hawthorn Formation and the limestone plain of the Ocala Formation. Drainage in these areas and on the plain itself is accomplished through relatively small surface streams and wet weather runs that discharge surface runoff directly to sinkhole systems. It is believed that this subsurface system of caverns and solution conduits generally discharges runoff through an extensive series of springs and seeps along the Santa Fe River. The interchange of groundwater and surface waters is reversible in that the Santa Fe surface flow may

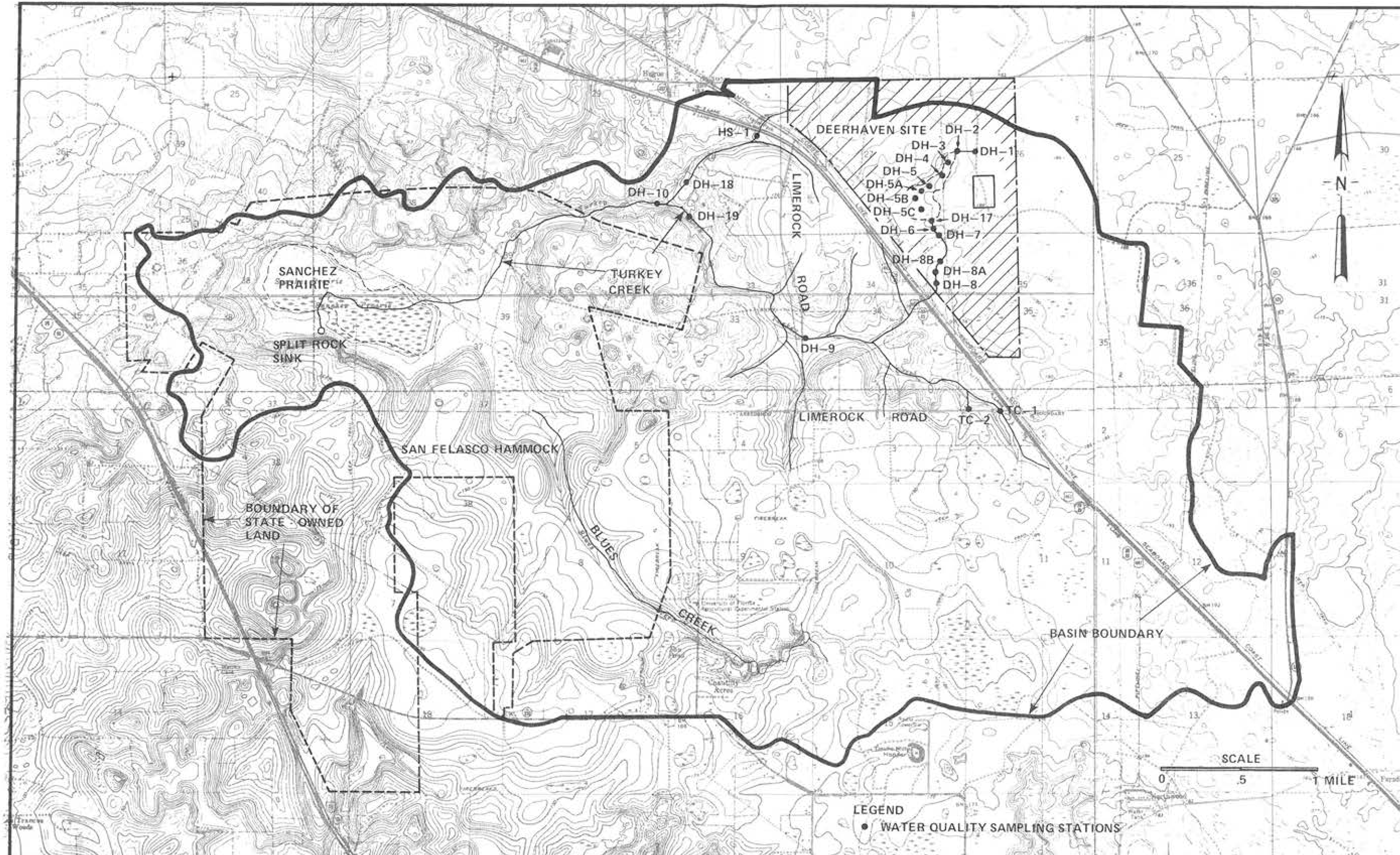


FIGURE 2.5-2 TURKEY CREEK DRAINAGE BASIN.

recharge portions of the limestone aquifer when the head differential is reversed. Hogtown Creek, Turkey Creek, Cellon Creek, and Burnett's Lake basins are typical examples of fairly small basins draining directly to limestone sinks. Figure 2.5-1 outlines the drainage basin systems adjacent to the Deerhaven site.

2.5.1 Surface Water Hydrology

2.5.1.1 Turkey Creek

Turkey Creek basin lies in the transition zone between the plateau of the Hawthorn Formation and the limestone plain of the Ocala Formation. This basin is centered about two miles south of the community of Hague (Figure 2.5-2). The major or long axis of this elliptically shaped basin is generally aligned in a northwest-southeast direction. Elevations in the basin range from 190 feet mean sea level (msl) to less than 80 feet msl. As Figure 2.5-2 indicates, Turkey Creek basin has been shown to include Blues Creek, since in times of flood these two creeks would respond as one hydrological system. The combined area of this system is approximately twenty square miles. Blues Creek serves as the principal drainageway for the south-central one-third of this basin while Turkey Creek and its tributaries drain the northern and eastern one-half. The remaining area drains directly to Sanchez Prairie and Split Rock Sink.

The western one-third of the basin falls within San Felasco Hammock, a reservation owned and managed by the State of Florida. It is believed

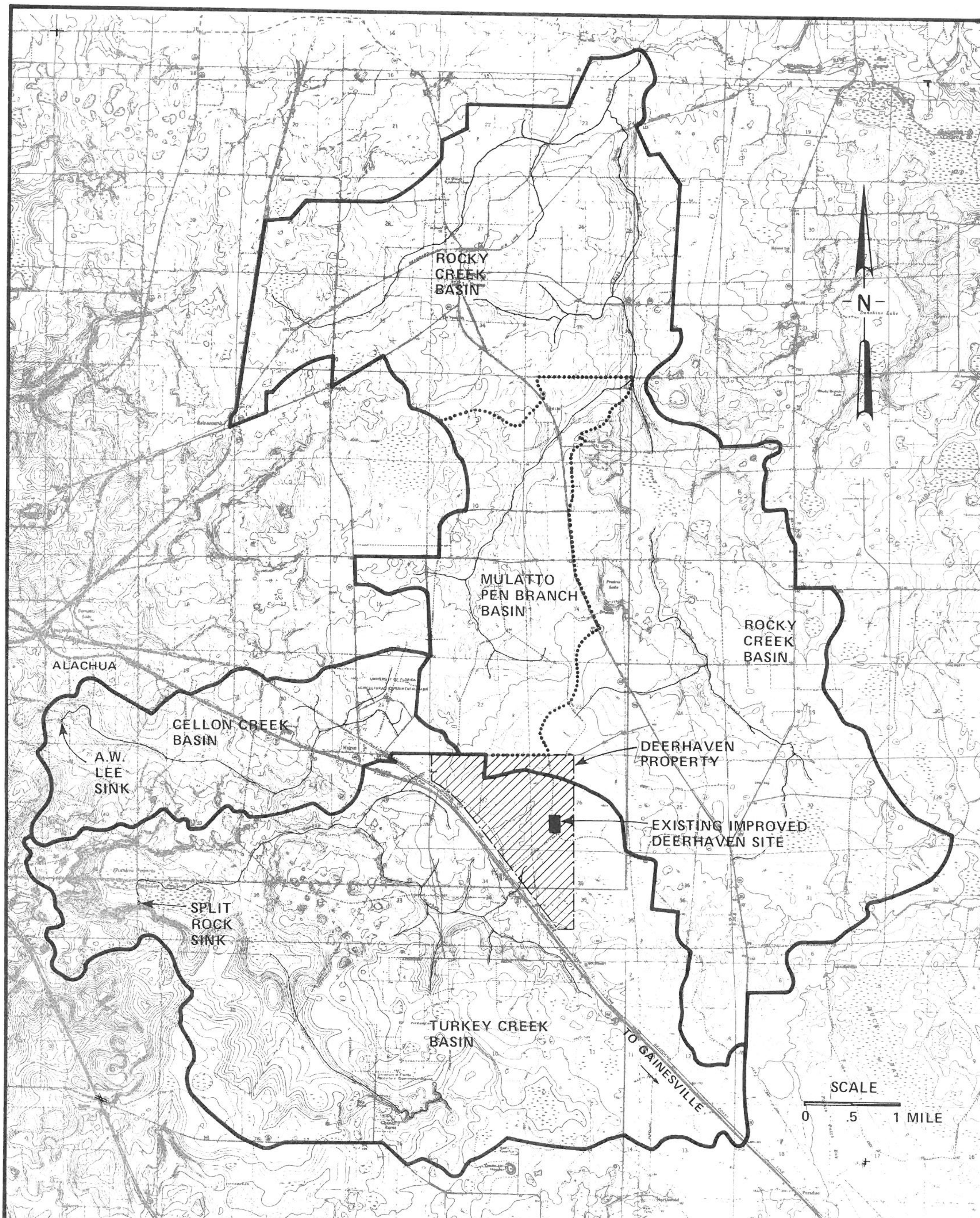


FIGURE 2.5-1 DRAINAGE BASINS ADJACENT TO DEERHAVEN SITE.

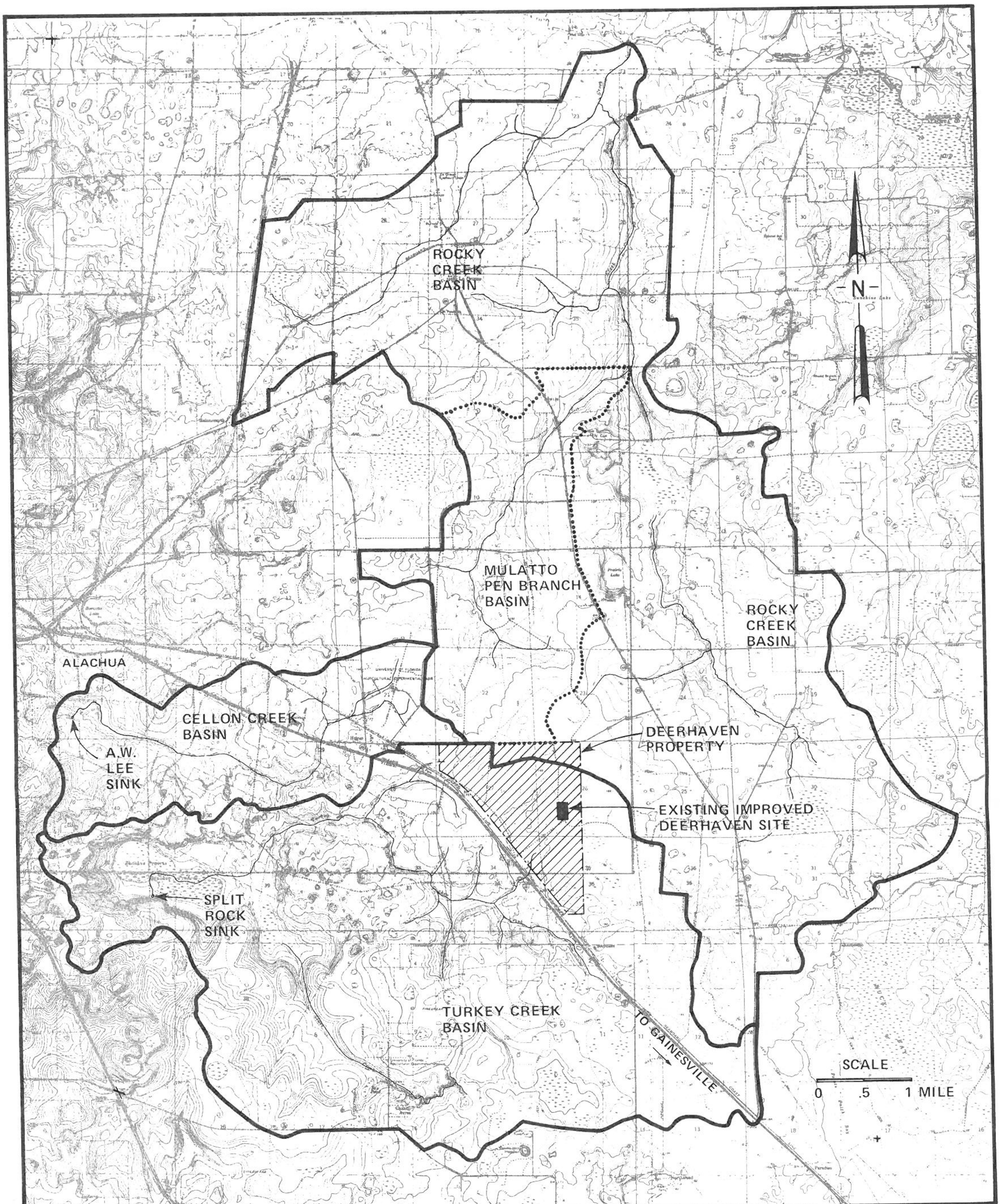


FIGURE 2.2-2 DEERHAVEN STATION LOCATION IN RELATION TO TURKEY, CELLON AND ROCKY CREEKS.

that Split Rock Sink, located within San Felasco Hammock at the edge of Sanchez Prairie, passes surface flow directly to the underlying Floridan Aquifer. This sinkhole is the principal outfall for flows from Turkey Creek.

Soils

Basin pine woods have soils that are typically poorly drained sands underlain by loams and clay layers. Pomona, Basinger, Surrency and Wauchula soil series are common to the flatwoods areas. Scattered cypress ponds contain deposits of organic muck such as the Samsula series.

Tavares and Arredondo series soils are somewhat better drained fine sands with loamy subsoils. These series are found along the eroded edges of the Hawthorn Formation, appearing in pasture and cropland areas within the basin; along with other fine sands and loams, they are also typical of the upland mixed hardwood and pine forests. Generally the lowland forests have poorly drained fine sands, loams, and clays. Organic muck deposits may be found in cypress ponds and other wetland areas.

Hydrology

Turkey Creek originates in a series of cypress heads found in the pine flatwoods in the eastern end of the basin. The main channel flows to the west in a meandering fashion over a distance of 5.5 miles before entering Sanchez Prairie. Surface runoff from the pine flatwoods lying north and east of U.S. 441 flows to the main channel through a series of branches. Various other branches accept runoff from the central and southeasterly areas of the basin. Flows in these branches and in the upper reaches of the main channel are intermittent and dependent on rainfall and groundwater seepage; however, a well-defined spring flow can be found in the branch which originates near the curve in U.S. 441, south of Hague.

Within Sanchez Prairie, Turkey Creek rapidly spreads and becomes a slow-moving flow. Portions of this area contain cypress and other water tolerant vegetation indicating that the majority of the area contains standing water for long periods of time. Flow becomes briefly channelized again before entering a pool and swallow hole at Split Rock Sink.

In summary, Turkey Creek has three distinct channel segments: (1) the initial or headwater segments are low gradient sandy channels connecting cypress domes in the pine flatwoods; (2) the intermediate channels have clayey or loamy banks, are steeper sloped, well-defined and contain relatively high velocity flows through hardwood forests; and (3) the third segment is flat sloped and often flows in broad pools connected by marshy, low banked channels.

Water Quality

Turkey Creek, along with Cellon and Rocky Creeks, was sampled for those parameters characteristic of Deerhaven Unit 1 discharge, basin land uses, and natural system influences. Sediments were also collected and analyzed for heavy metals, sulfate and sulfide (Tables A2-2 through 9) (Figure 2.5-2).

The Turkey Creek base flow is primarily Deerhaven Unit 1 blowdown. The source of water for Deerhaven operations is groundwater from the Floridan Aquifer which has a high dissolved solids content and high specific conductance (Table 2.5-1). On occasion, the groundwater exceeds state water quality standards for specific conductance prior to utilization by Unit 1. Due to evaporative water loss in the cooling tower, heating during condenser passage, and the addition of sulfuric acid for pH adjustment, the blowdown exceeds state water quality standards (FAC Chapter 17-3) for total dissolved solids, conductivity and temperature. The concentrations of sulfate, total dissolved solids and conductivity decrease to some extent downstream (Table 2.5-1), but are still above acceptable limits at Split Rock Sink where surface flow re-enters the groundwater. Thermal effects are confined to a 28 acre on-site cypress swamp, through which the blowdown from Unit 1 is presently routed (Berger and Eichler, 1975).

The on-site swamp, because of water discharge from the cooling tower and low dissolved oxygen, contains a high concentration of hydrogen sulfide

Table 2.5-1 Deerhaven Unit 1 Water Quality. All data in mg/l except where noted.

Station No. / Date of Collection (1975)	1 5/30	2 5/30	3 5/30	4 6/12	5 6/12
Carbon Dioxide (CO_2)	--	--	--	--	--
Biochemical Oxygen Demand (BOD, 5 Day)	--	--	--	--	--
Nitrite (NO_2 as N)	--	--	--	0.01	0.01
Nitrate (NO_3 as N)	--	--	--	0.08	0.01
Calcium (Ca)	63	120	88	80	84
Magnesium (Mg)	23	46	31	32	33
Sodium (Na)	9.2	18	29	22	24
Potassium (K)	1.0	2.2	2.0	2.6	2.8
Silica (SiO_2)	2.8	53	34	23	20
Bicarbonate (HCO_3)	248	12	60	76	79
Carbonate (CO_3)	0	0	0	0	0
Sulfate (SO_4)	46	480	330	290	290
Chloride (Cl)	10	26	21	19	19
Fluoride (F)	0.6	0.3	0.8	0.6	0.6
Nitrate (NO_3)	--	--	--	0.4	0
Dissolved Oxygen (DO)	--	--	--	--	--
Dissolved Solids					
Calculated	280	750	570	510	510
Residue on evaporation @180°C	316	776	636	580	560
Hardness as $CaCO_3$	250	490	350	330	350
Alkalinity as $CaCO_3$	203	10	49	62	65
Iron	0.02	0.3	0.05	0.02	0.04
Specific conductance (micromhos at 25°C)	600	1200	900	850	850
pH (units)	7.8	6.8	7.9	7.4	7.2
Color (Platinum cobalt units)	0	5	45	45	45
Temperature (°C)	22.5	37	26	--	--
Strontium (Sr) (μg/l)	810	2400	1800	1600	1000
Turbidity (JTU)	--	--	--	2	1
Acidity (milliequivalents per liter)	--	--	--	--	--
Specific gravity	--	--	--	--	--
Phosphorus, total as P	--	--	--	0.42	0.54
Phosphorus, total Ortho	--	--	--	0.37	0.47
Boron (B) (μg/l)	--	--	--	--	--
Arsenic (As) (μg/l)	--	6	--	--	--
Cadmium (Cd) (μg/l)	--	0	--	--	--
Chromium (Cd) (μg/l)	--	<10	--	--	--
Cobalt (CO (μg/l)	--	--	--	--	--
Copper (CU) (μg/l)	--	67	--	--	--
Lead (Pb) (μg/l)	--	2	--	--	--
Zinc (Zn) (μg/l)	--	90	--	--	--

Table 2.5-1 Continued

Station No. Date of Collection (1975)	1 5/30	2 5/30	3 5/30	4 6/12	5 6/12
Manganese (Mn) (μg/l)	--	30	--	--	--
Polychlorinated biphenyls (PCB) (μg/l)	--	--	--	--	--
Insecticides and herbicides (μg/l)	--	--	--	--	--
Mercury (Hg) (μg/l)	--	0.0	--	--	--
Silver (Ag) (μg/l)	--	0	--	--	--

Station No.	Station Description
1	Deerhaven Power Plant - Well No. 1
2	Deerhaven Power Plant - Cooling Tower Discharge
3	Turkey Creek - At County Road T.8S, R.19E, Sec. 34
4	Turkey Creek - At Entry to Pond in Sanchez Prairie
5	Turkey Creek - Near Entry to Sink in Sanchez Prairie

Source: USGS letter to DER, May 14, 1975.

(Breedlove, 1975a, 1976a, and 1976b) (Table A2-7). The maximum total hydrogen sulfide concentration was 11.0 mg/l. Upper portions of the swamp have an oxygenated water column, but the sediments are anaerobic and high in sulfate, sulfide and nickel (Table A2-6). The sulfate is derived from cooling tower blowdown and the metals from low volume wastes. Hydrogen sulfide is rapidly lost from the water column as it leaves the on-site swamp (Table A2-7) (Breedlove, 1975a). However, due to the high sulfate load in Turkey Creek, any low oxygen environments would be potential hydrogen sulfide production zones.

Water quality changes very little after passing off site. Dilution of the discharge with seepage flow and runoff occurs (Breedlove, 1975a, 1975b, 1976b) (Table 2.5-1), but the parameter concentrations remain relatively constant with increased distance from the site. High concentrations of sodium, calcium, magnesium, arsenic and hardness were found in Turkey Creek. High levels of nickel and lead were observed in the sediments, and, on one occasion, in the water of the cooling tower discharge ditch and the on-site swamp (Table 2.5-1 and Tables A2-6 and A2-10 through A2-47).

Sediment sulfate and sulfide concentrations are quite variable but high in the on-site swamp and the flooded tree area of Sanchez Prairie within the San Felasco Hammock (Table A2-9). Production of hydrogen sulfide occurs in the stream bottom within Sanchez Prairie.

Pesticides and herbicides were not detected in any water or sediment samples (Tables A2-8 and A2-9).

2.5.1.2 Cellon Creek

Cellon Creek drainage basin covers some 5.5 square miles (Figure 2.5-3). The major axis lies in a northeast-southwest direction with the basin center approximately 3,500 feet southwest of the General Electric battery plant at Hague. The high end of the basin is occupied by the University of Florida Agricultural Experiment Farm at Hague. Cellon Creek originates in this area as several small rills or runs flowing in a southwesterly direction. As the channel becomes better defined, it passes underneath the Seaboard Coastline Railroad and intersects a tributary originating in a swampy, wooded area to the north of the General Electric plant. Flow continues to the south through drainage structures under U.S. 441. The channel bends to the west approximately one-half mile south of the highway and, paralleling the highway, flows in a west-northwest direction to its terminus at A. W. Lee Sink.

Disregarding local meanders, the channel is approximately 4.5 miles long. Elevations in this basin range from a high of 175 feet above mean sea level on the experimental farm to a low of 49 feet msl at Lee Sink. It is significant to note that ground-surface elevations fall 125 feet over the 4.5 mile channel length, a relatively steep slope for Florida. The basin begins in the high, mildly sloping pine and palmetto scrub along the east side of the experimental farm. Proceeding downslope, the

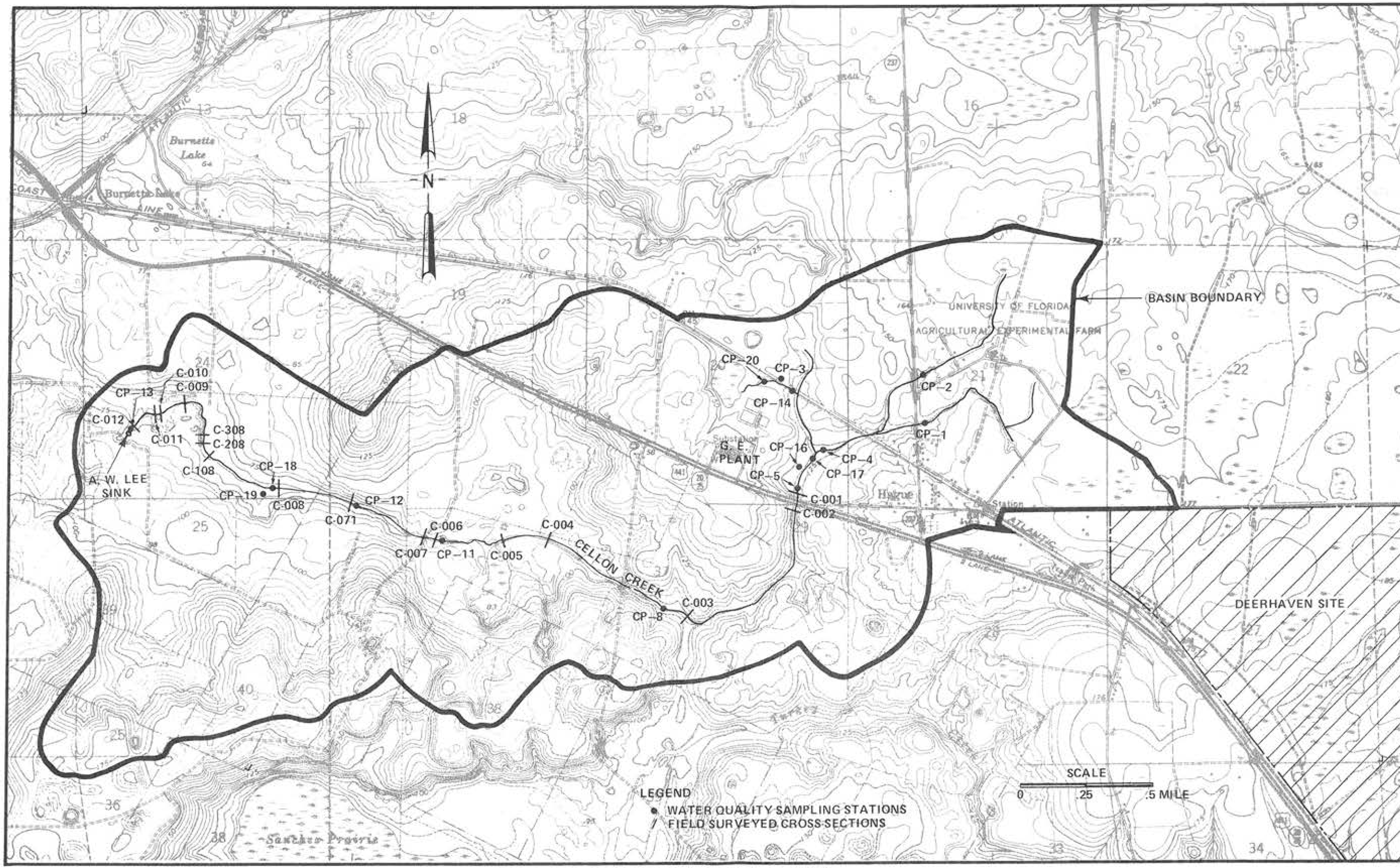


FIGURE 2.5-3 CELLON CREEK DRAINAGE BASIN.

farm is open pastureland in the area east of Highway S-237 and heavy scrub occurs along the creek to U.S. 441. Alternating woods and pastureland occur over the balance of the basin. The basin contains gently rolling ground south of U.S. 441. The ridges and knolls top out at 150 to 175 feet in elevation with the creek bottom predominant at 70 to 100 feet.

Overland flow distances from basin drainage boundaries vary from a few hundred feet to several thousand feet. Many shallow sinks and depressions intercept overland flow, providing substantial upland storage. In addition, several small ponds are scattered throughout the basin. The largest pond lies just north of the General Electric physical plant and covers about 10 acres. Several smaller ponds are found in the area south of the highway. Those ponds not directly connected to the creek channel are perched on impervious strata and are both nourished and relieved by lateral seepage in surficial sandy layers and by overland flow. Cavernous limestone substrata are evidenced by numerous active sinkholes, irregularly flowing springs and stable depressions resulting from past subsidences or collapses of solution cavities.

Flow in Cellon Creek is subject to seasonal variation. Prior to introduction of flow from the General Electric plant, this creek was probably subject to extended periods of extremely low flow during the dry winter months. Wet season flows apparently seldom exceeded two or three cubic feet per second in view of channel size, drainage structures and the general condition of the creek bottom. General Electric began discharging into the creek during the early 1960's and presently discharges approximately 2.3 cfs (1.49 mgd), providing a continuous base flow downstream of the plant.

Shown on Figure 2.5-3 are locations where Cellon Creek channel cross-sections were field-surveyed during previous investigations. At each location an accurate cross-sectional profile of the stream bed, banks, and flood plain was obtained by close-order level traverse. Each cross section was chosen as being typical of the channel within its vicinity. "C" prefixed numbers, mentioned in the following text, refer to cross sections in this figure.

It is of interest to note that an excavated channel with raised embankments was constructed in the early 1950's to divert flow into the pond near the center of the basin. This diversion was constructed to maintain sufficient water in the pond for stock watering and irrigation (Pers. Com., Don Hough). The diversion embankment begins near Cross-Section C004 and continues along the creek before turning sharply south to the pond. The existing embankment has been breached near Cross-Section C005, resulting in a flow that presently continues along the natural creek channel.

Another prominent feature in this basin is the large depression just upstream of Lee Sink which was excavated as a borrow pit to provide material for the U.S. 441 railroad overpass at Alachua. A haul road was constructed and the forty-eight inch corrugated metal pipe culvert installed by the contractor.

The channel of Cellon Creek varies in character and can be subdivided into several distinct reaches. That portion of the system upstream of U.S. 441 includes both slow-moving, ponded storage areas and well-defined channels with good slopes and flow velocities. From U.S. 441 to Cross-Section C004, the channel is relatively steep-sloped, has steep banks of cohesive material, sharp meanders which considerably lengthen flow distance, and occasional deadfalls and other growth projecting into the channel. This reach has been eroded; however, the meandering channel combined with strongly cohesive soils has minimized erosion effects. As previously noted, the channel has been improved between Cross-Sections C004 and C005. This reach is relatively straight and both banks and parallel embankments are in good condition. Downstream of Cross-Section C005, the slope flattens considerably and the channel is not well-defined. Wide, marshy deltas characterize this portion of Cellon Creek. The channel becomes more restricted near Cross-Section C071 and then alternates between a well-defined, meandering section and a broader, marshy channel. The final reach through the borrow pit and down into Lee Sink is well-defined with some meandering.

Soils

Some variation in soils exists across the basin. In the area of the experimental farm, the U.S.D.A. Soil Conservation Service's Soil Survey for Alachua County shows sandy soils classified in the Felda, Basinger, Adamsville and Tavares Series. Nearly all of these soils are poorly drained fine sands with varying percentages of silts and clays. These soils are typical of Florida's pine flatwoods. Further downslope, Kendrick, Arredondo, Sparr and Fort Meade Series are predominant. These soils are somewhat better-drained fine sands, silty-clayey sands, and loams. These soils have relatively high percentages of silts and clays beneath the surficial layers. The creek bottom and floodplain have similar materials along with occasional organic peat deposits and banks composed of silts and clays where natural erosion has cut deeply into existing materials. Vertical or undercut banks occur along substantial reaches of the creek. Lateral seepage in the surficial sand layers has been observed in several places. A clay hardpan is evident throughout the area of Lee Sink and the upstream borrow pit. Good ground cover throughout the area prevents erosion of most sandy soils.

Hydrology

The existing base flow in Cellon Creek was modeled using the U.S.D.A. Soil Conservation Service's WSP-II computer program (Breedlove, 1977). General Electric currently discharges 2.3 cfs (1.49 mgd) of treated process and cooling water into the creek. This flow was added to an estimated natural base flow of 0.7 cfs (0.45 mgd) for a calculated total base flow of 3.0 cfs (1.94 mgd). Field measurements of channel velocities and discharges during September and October, 1976, showed some variation with 3.0 cfs being slightly higher than the mean of selected observations. Average channel velocities for a flow of 3.0 cfs varied from a low of 0.3 fps to a high of 1.4 fps, according to the results of computer simulation.

A statistical analysis of rainfall records is summarized and published in the "Rainfall Frequency Atlas" by the U.S. Department of Agriculture. Alachua County, according to this publication, receives approximately four inches of rainfall over a twenty-four hour period, once each year. Restated, a four-inch rainfall of twenty-four hours duration has a recurrence interval of one year in Alachua County. This storm event was selected for evaluation of existing basin hydrology during a previous investigation (Breedlove, 1977). Channel stage versus discharge relationships, generated by WSP-II, together with land use, soil type, available storage, overland flow times, existing base flow and Lee Sink discharge capacity (determined as part of the investigation) were incorporated into TR-20, a computer model for hydrology developed by the U.S.D.A. Soil Conservation Service.

The runoff from the four-inch, twenty-four hour rainfall was imposed on the existing baseflow through TR-20. Surface runoff and channel flow, arriving at Lee Sink during the sixty hour simulation, totaled 54.3 acre-feet, whereas total rainfall volume (4 inches over 3,490 acres) amounts to 1,164 acre-feet. Thus, only 4.7% of the total rainfall was predicted to arrive as surface flow at Lee Sink for this event.

Water surface elevations in the pool at Lee Sink normally vary between 49.0 feet and 53.0 feet msl. The peak water surface elevation predicted by computer simulation was 64.0 feet for this event. Flooding of the sinkhole and borrow pit occurs as inflow exceeds the discharge capabilities of the sink. Temporary ponding or storage of stormwater is predicted to extend from Lee Sink upstream to Cross-Section C308. Flows above this cross section are contained within existing channel banks or in the immediate floodplain adjacent to the channel. Storm flows result in relatively broad overbank flooding in the reach above Cross-Section C071.

The peak inflow rate to the Lee Sink system was indicated to occur 26.5 hours after the beginning of the storm and to reach a maximum of 50.8 cfs (32.8 mgd). Extrapolations of field test data have implied that Lee Sink will pass 5.9 cfs (3.8 mgd) with a corresponding water surface elevation of 64.0 feet.

Land use parameters incorporated into this model were revised to reflect future conditions in the basin as discussed in Section 2.2-2 (Table 2.2-1). A second computer simulation was performed using the annual, twenty-four hour rainfall imposed on a 3 cfs (1.9 mgd) base flow. Total runoff arriving at Lee Sink during the sixty hour simulation increased from

54.3 acre-feet (existing land use) to 100.3 acre-feet. The peak water surface elevation was predicted to be 65.64 feet MSL, an increase of 1.64 feet for future conditions. Peak discharge through Lee Sink was 6.15 cfs (3.97 mgd). It should be noted that no changes were made in subbasin times of concentration, nor was any allowance made for stormwater detention-retention systems normally incorporated into residential developments.

Water Quality

The major water quality determinants for Cellon Creek are the University of Florida Agricultural Research Unit and the General Electric nickel/cadmium battery plant (Figure [illegible]). The University of Florida dairy research unit waste ponds and herd lots drain into the upper part of Cellon Creek. Nitrate, ammonia, total nitrogen, calcium, hardness, sodium, conductivity, total dissolved solids and dissolved oxygen are higher in the upper creek area (Stations CP-3 and CP-4) (Tables A2-2 through A2-47) and are indicative of the presence of animal wastes. The stream segment below the General Electric plant has relatively high concentrations of arsenic, total dissolved solids, sodium, sulfate, chromium, chloride, cadmium, alkalinity, conductivity, calcium and hardness (Tables A2-10 through A2-47). Aluminum, potassium, oil and grease, nickel, total phosphorus, pH, copper, ortho-phosphorus, nitrates and total Kjeldahl nitrogen, although not significantly high, are higher in the lower creek segment than above the General Electric discharge point. These data are comparable to those collected by the Alachua County Pollution Control Department (Table 2.[illegible]).

Table 2.5-2 Water Quality of the General Electric Effluent Discharge and A.W. Lee Sink (data compiled from Alachua County Pollution Control Department test results)

Parameter	DER Station Number[1]	Sample Period/Date 5/2/75 - 6/7/76	Sample Period/Date 7/22/76
		$\bar{x}$	$\bar{x}$
pH	013	7.25[2]	--
	014	8.04	--
Total solids	013	1437	387
	014	1273	400
Total filterable solids	013	1290	256
	014	1153	287
Total volatile solids	013	146	131
	014	130	113
Total suspended solids	013	12.5	14.0
	014	54.2	10.5
Filterable suspended solids	013	6.9	7.5
	014	40.2	7.0
Volatile suspended solids	013	5.6	6.5
	014	14.0	3.5
Dissolved solids	013	1424	373
	014	1229	389.5
Chemical oxygen demand	013	46.1	16.0
	014	26.7	24.0
Nitrate	013	92.7	138.1[4]
	014	55.4	38.0
Ortho-phosphorus	013	0.59	0.61
	014	0.67	0.64
Sulfate	013	678.2	100.3
	014	558.1	94.2
Chloride	013	62.4	17.9
	014	56.4	19.8
Total hardness	013	138.5	232.0
	014	141.0	200.0

Table 2.5-2 Water quality of the General Electric effluent discharge and A.W. Lee Sink (continued)

Parameter	DER Station Number[1]	Sample Period/Date 5/2/75 - 6/7/76	7/22/76
		$\bar{x}$	$\bar{x}$
Conductivity μmhos/cm	013	1870	550[5]
	014	1575	565
Nickel	013	0.04	0.04[4]
	014	0.03	0.03
Cadmium	013	0.03	0.08[4]
	014	0.01	0.06
Chromium	013	0.02[3]	--
	014	<0.02	--
Iron	013	0.14	<0.3
	014	0.26	<0.3

[1] 013 = G.E. combined effluent at discharge pipe (Breedlove and Associates, Inc. Station 20), 014 = A.W. Lee Sink (Breedlove and Associates, Inc. Station 13)

[2] All values in mg/l unless otherwise noted.

[3] 5/2/75 only

[4] Through 8/9/76

[5] From 9/23/76 through 1/5/77 conductivity average was 1960 μmhos/cm at Station 013 (Breedlove and Associates, Inc. data)

Of the fifty-seven sampled Cellon Creek parameters, twelve either equalled or exceeded water quality standards (DER, FAC 17-3; EPA, 1976; Tables A2-2 through A2-5 and A2-7 and A2-8). The segment upstream of the General Electric plant had six parameters which did not meet the standards, while the downstream segment had eleven parameters not meeting the standards. Of the six parameters within the upstream segment, arsenic, iron, ammonia and total dissolved solids increased in concentration, manganese decreased to acceptable levels and mercury remained the same after passing into the downstream segment. Cadmium, lead, nitrate, sulfate, conductivity and phenols also exceeded the drinking water criteria within the downstream segment. Of the eleven parameters that did not meet the standards in the downstream area, only mercury, ammonia and phenols exceeded fish and wildlife criteria (McKee and Wolf, 1963).

Sediment nickel, cadmium, sulfide and sulfate concentrations at areas below the General Electric plant were significantly higher than baseline conditions in an apparent control stream (Rocky Creek) (Table A2-6). Concentrations of nickel, cadmium, lead, sulfate and sulfide within the upper reaches of Cellon Creek were comparable to Rocky Creek baseline conditions.

Pesticides and herbicides were not detected in the creek in water or sediments (Tables A2-8 and A2-9).

To test for possible biological accumulation of heavy metals discharged into Cellon Creek, benthic macroinvertebrates were collected from the Cellon Creek marsh and analyzed for dry weight concentrations of nickel, cadmium and lead. In each case, concentrations in the biological samples exceeded those corresponding concentrations found in the sediments. Organism dry weight concentrations were 22.6, 70.0 and 3.5 ppm as compared to sediment concentrations of 1.5, 17.0 and 1.5 ppm for nickel, cadmium and lead, respectively (Table A2-6).

2.5.1.3 Mulatto Pen Branch

Mulatto Pen Branch drainage basin contains approximately 5.8 square miles of commercial pine forest, woodlands, pasture, croplands, and scattered farmsteads. This basin is generally oriented in a north-south direction along what is known as Mulatto Pen Branch, a tributary to Rockey Creek. As Figure 2.5-4 shows, the high end of the basin lies just north of the Deerhaven site while the low or north end merges with Rocky Creek about three-quarters of a mile south of SR-235. The basin length is about 4.5 miles with some variation in width along this length. Elevations in the basin range from a high of 180 feet above mean sea level to a low of 100 feet at the juncture with Rocky Creek. The south or high end of the basin is typical pine flatwoods terrain, occasionally interrupted by ponded areas dominated by cypress, gum, and other water-tolerant vegetation. The central portion of the basin, west of SR-121, has more of a rolling character along the channel. However, many small ponded areas are apparent, particularly along the western drainage

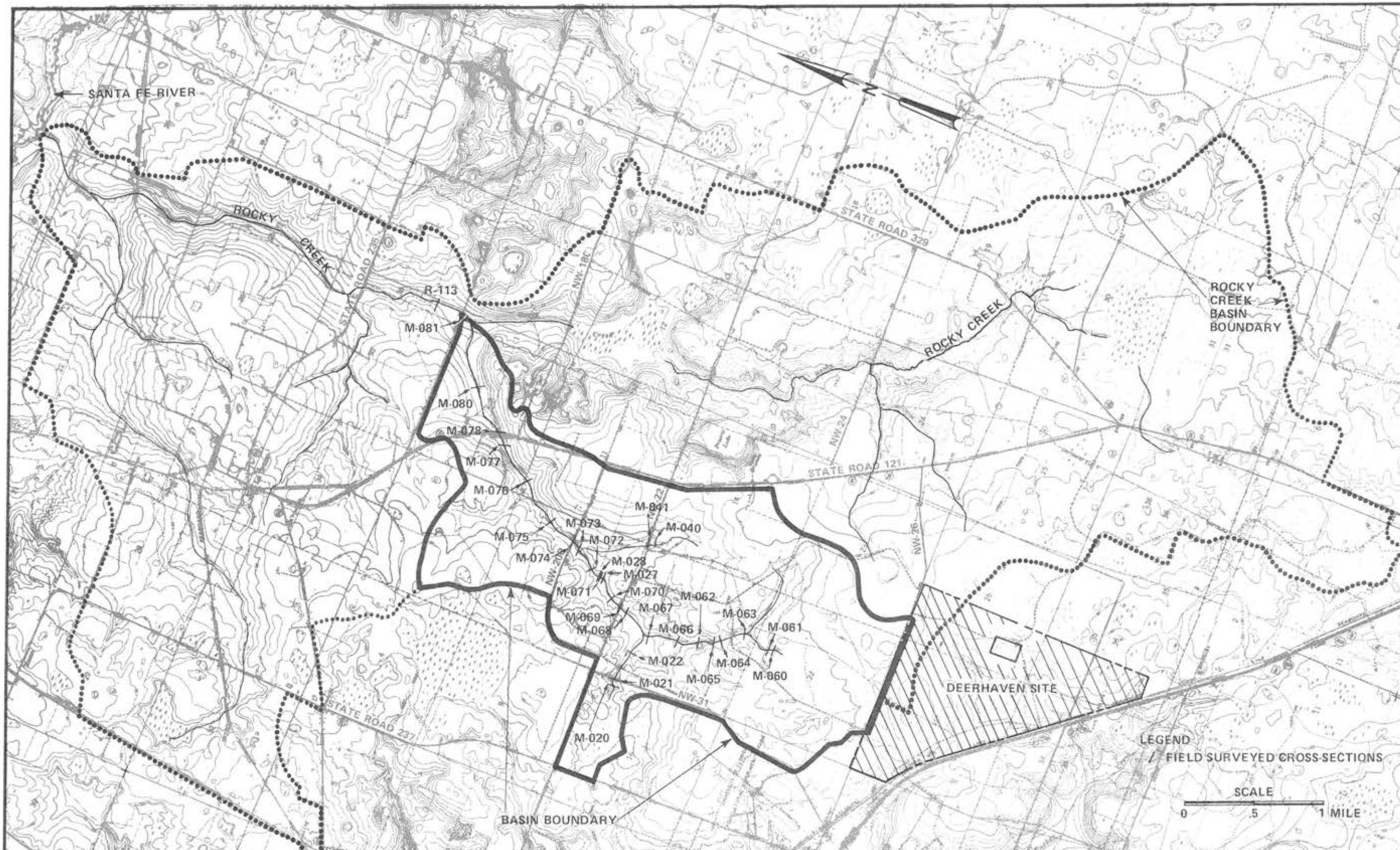


FIGURE 2.5-4 MULATTO PEN BRANCH DRAINAGE BASIN.

divide. That portion of the basin east of SR-121 is heavily wooded along the channel and near the confluence with Rocky Creek. Here, too, as these stream valleys join together, gently rolling ground is typical.

The high pine flatwoods in the southern end of the Mulatto Pen Branch basin are drained by a combination of small excavated channels, semi-improved natural channels and existing natural channels. This system converges (between Cross-Sections M060 and M064) to form Mulatto Pen Branch in the central and northern flatwoods. Disregarding local meanders, the channel length is about 4.5 miles in length beginning at Cross-Section M060 near the north line of Section 22 - Township 8 South - Range 19 East and ending at Rocky Creek (Cross-Section R114). The character of the channel varies in the upper reaches. Some portions are stable, well-defined sections while others, damaged during recent timber and farm clearing operations, are not well established. A relatively flat reach occurs between Cross-Sections M028 and M066. Much of this reach was originally broadly ponded and slow moving. Some portions have been cleared and partially improved; however, flow is sluggish and frequently breaks into overbank flow. The downstream end of this reach (at Cross-Section M028) is severely constricted by cypress trees and other wetland vegetation. The channel steepens and remains well-defined as it passes under County Road NW 20B. Mulatto Pen Branch follows a gradual arc to the northeast, passing under SR-121 as it approaches Rocky Creek. In the heavily wooded 'bottom' near the confluence, channel meanders become quite severe. The junction of flow at Rocky

Creek is through a series of small distinct channels breaking away from the branch and flowing easterly to the Rocky Creek main channel. Much of this delta-like area is totally inundated during high flows. The lower reaches of Mulatto Pen Branch are also characterized by shallow flood channels and past meanders of the main channel.

Many small tributaries to Mulatto Pen Branch are found throughout the basin. These tributaries tend to flow intermittently with incidental rainfall. Also, springs and seeps are found all along the channel, particularly in wet weather.

The primary structures along Mulatto Pen Branch are limited to three road crossings. County Roads NW 22 and NW 18C both cross the channel via wooden bridges with spans of about 46 feet and widths of about 26 feet.

Deposition of eroded material has occurred on the upstream side of both structures; however, these sandy deposits are not restrictive except at relatively high flows. The third structure is a double 10' by 10' by 60' concrete box culvert located where the branch passes beneath SR-121. In addition, several unimproved farm crossings are currently in use along this branch. These crossings are shallow fords in the stream that can be negotiated by light trucks.

Soils

Soils found in the pine forests of the southern end of the basin are typical of Florida pine flatwoods. They are poorly drained fine sands with at least 5% fines. These soils are classified in the Rutlege, Scranton and Leon series according to available soil surveys by the Soil Conservation Service and by the University of Florida. Further north, the croplands are mostly well-drained fine sands underlain by sandy clays such as Orlando fine sand and Blanton fine sand. Pasture soils vary but are typically fine sands with higher percentages of fines making them less well-drained. These soils are characteristically underlain by sand loam and/or limerock strata. The immediate channel banks and bottoms are of undifferentiated alluvial soils and are poorly drained. The hydrological characteristics of these soils are consistent with what has been observed elsewhere in Rocky Creek basin. Percolation is poor along streams and in the flatwoods while good infiltration and lateral seepage is apparent in the higher, rolling croplands.

Hydrology

Flows in Mulatto Pen Branch are dependent on several factors. Among these are incidental rainfall, season of the year and location in the basin. Substantial upland storage of rainfall runoff in the flatwoods, cypress ponds and other wetlands tends to both moderate and extend the duration of flows in Mulatto Pen Branch. Further, the sandy soils found throughout the basin act to absorb and slowly release percolated rainfall. However, dry season conditions result in extended periods of little or no flow. Wet season conditions provide sustained flows with storm-related discharges at the confluence of Mulatto Pen Branch and Rocky Creek in excess of 100 cfs (64.6 mgd) as determined through both computer analysis and applicable regression equations.

According to a statistical analysis of rainfall records a 4 inch, twenty-four hour rainfall will be equaled or exceeded at least once each year in this area. In previous investigations, this storm condition was used to investigate existing Mulatto Pen Branch flood potential (Breedlove, 1977).

It is apparent that significant overbank flooding is limited to the reach from Cross-Section M029 through Cross-Section M066. This flooding is a result of high flow resistance, a relatively flat bed slope and a low capacity, low banked channel. The channel between Rocky Creek and Cross-Section M029 is subject to limited overbank flooding except at the confluence where a backwater condition forces flow out over a broad area. The channel upstream of Cross-Section M066 has adequate capacity and slope for this storm event; however, this low relief area is subject to ponding of runoff.

Water Quality

Sampling station locations for Mulatto Pen Branch and Rocky Creek are shown in Figure 2.5-5. Mercury, manganese, iron, and phenolics concentrations equalled or exceeded state (DER, FAC Chapter 17-3) and/or

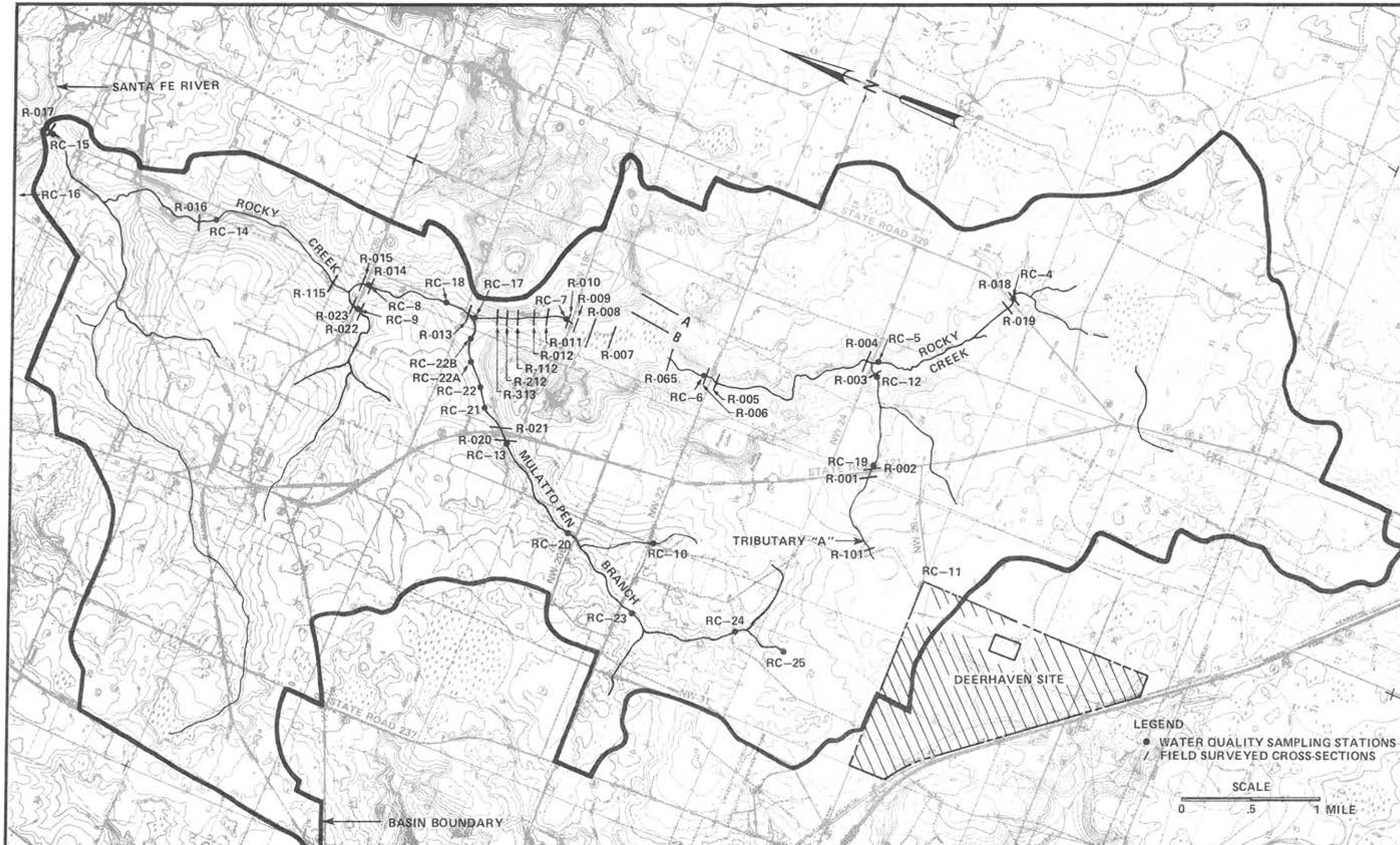


FIGURE 2.5-5 ROCKY CREEK DRAINAGE BASIN.

federal (EPA, 1976) water quality standards, but are within acceptable limits for the water's present agricultural use and for supporting local aquatic and wildlife (Tables A2-2 through 6) (McKee and Wolf, 1963). Therefore, Mulatto Pen Branch waters are considered to be of relatively high quality. Since the stream is relatively free of industrial and urban influences, these concentrations most likely are associated with leaching from plants and/or soil, rainfall, and other natural and agricultural inputs.

Sediment concentrations of sulfate, sulfide, nickel, lead and cadmium (Breedlove and Associates, 1976) were comparable to other high quality streams in the area, such as Rocky Creek and its other tributaries (Table 2.5-3 and Table A2-6) and are considered representative of natural background levels.

Mulatto Pen Branch water and sediments were not analyzed for pesticides or herbicides because these compounds were not detected in any samples collected from Cellon, Turkey, or Rocky Creeks.

2.5.1.4 Rocky Creek

As Figure 2.5-5 indicates, Rocky Creek drainage basin is a comparatively large watershed covering approximately 33 square miles. The center of the basin is approximately 6.5 miles due east of the City of Alachua. Ths basin averages three to four miles in width and is ten miles in length, with its primary axis in the north-south direction. SR-121 runs

Table 2.5-3 Surface Water Quality Data for Rocky Creek near LaCrosse, Florida[1]

Parameter	Units	No. Observed	Mean	Maximum	Minimum
Dissolved Iron	mg/l	2	75	80	70
Dissolved Calcium	mg/l	5	7.4	10.0	2.8
Dissolved Magnesium	mg/l	5	2.8	5.0	0.9
Dissolved Sodium	mg/l	5	5.6	8.7	2.9
Dissolved Potassium	mg/l	5	1.5	2.4	0.1
Total Sulfate	mg/l	5	6.0	9.0	2.8
Dissolved Chloride	mg/l	5	12.0	18.0	5.5
Dissolved Fluoride	mg/l	5	0.4	0.4	0.2
Hardness (Total)	mg/l	5	30.0	44.0	10.0
Non Carb. Hardness	mg/l	5	12.2	18.0	5.0
Alkalinity	mg/l	5	17.8	35.0	3.0
Conductivity	µmhos	5	89.8	126.0	40.8
Dissolved Solids	mg/l	5	54.2	80.0	22.0
HCO_3^-	mg/l	5	21.8	43.0	4.0
$CO_3^=$	mg/l	3	0.0	0.0	0.0
pH	SU	5	6.3	7.3	5.5
Temperature	°C	3	18.4	21.7	12.8
Nitrite Nitrogen	mg/l	3	0.01	0.02	0.00
Nitrite Nitrogen	mg/l	5	0.02	0.10	0.-0
Total Ortho-Phosphorus	mg/l	1	0.7	--	--
Dissolved Silica	mg/l	5	7.1	9.6	3.4
Color	Pt.-Co.	5	101.0	130.0	45.0
CO_2	mg/l	3	12.5	20.0	3.4

[1]Source: (Semi-Annual) Florida Geological Survey. 1964. Report of Investigations. No. 35 (July 1957 - Sept. 1960)

the full length of the basin along the north-south axis. Other roadways in the basin include S-231, S-237 and SR-235 and County Roads NW24, NW22, and NW18C.

The Rocky Creek basin is primarily composed of farmland, woodland, and swamp with scattered homes and farmsteads. The southern portion of Rocky Creek basin is relatively flat and contains numerous cypress heads, swamps, and ponds. This area provides substantial storage for storm runoff. Large tracts along SR-121 are composed predominantly of farmland, pine and hardwood forests with a few ponds and cypress heads. This area contains the highest land elevations in the basin, approximately 190 feet msl. The University of Florida Agricultural Experiment Farm straddles the western boundary of this section.

The central section of the basin, east of SR-121, consists largely of cypress swamp, hardwood forest, and farmland. Along Rocky Creek are numerous cypress heads, small ponds and a large cypress swamp located both to the north and south of NW18C. Prairie Lake, which covers approximately 30 acres, is located between Rocky Creek and SR-121 and is approximately 500 feet south of NW22. This depression receives only a limited amount of runoff and remains dry for most of the year. During large storms, water flows from Rocky Creek into the depression, which then slowly empties back into Rocky Creek when system storage capacity is exceeded. This saddle is roughly centered on the gas pipeline (Section 'A') (Figure 2.5-5). A large cypress swamp is located just south of

NW18C with a smaller swamp directly to the north across NW18C. The area adjacent to NW18C, between Rocky Creek and SR-121, contains numerous sinkholes, depressions and small ponds. These features intercept run-off, provide storage, and eventually overflow into Rocky Creek.

The northern or lower end of Rocky Creek basin, north of SR-235, is mixed agricultural, forest and wetlands. Swamps and wetlands west of the City of LaCrosse provide substantial stormwater storage in this area.

Rocky Creek generally flows in a northerly direction over a distance of approximately ten miles before discharging into the Santa Fe River at a point 2.5 miles downstream of SR-235. The creek originates at the south end of the basin as discharge from a marsh system located three-quarters of a mile east of the intersection of highways SR-121 and S-231. The channel bed falls from elevation 150 feet msl to elevation 65 feet msl at the Santa Fe River. For the greater part, Rocky Creek flows in a meandering, well-defined channel. This channel system is occasionally interrupted by cypress ponds and similar reaches of broadened flow. Numerous tributaries of greater and lesser significance intersect the primary channel along its full length.

A level traverse was performed at channel location to obtain an accurate cross-sectional profile of the stream bed, banks, floodplain and upland terrain (Figure 2.5-5). Each cross section was chosen as being typical of the channel within its vicinity. "R" prefixed numbers mentioned in the following text refer to cross-section numbers on Figure 2.5-5.

The primary channel begins in a marsh system and flow to the northwest before intersecting a tributary from the west at Cross-Section R004. This tributary from the west originates at a logged out cypress pond approximately one mile north of Deerhaven Station. The tributary channel is well defined with a moderately steep bed slope. Flow passes beneath SR-121 by means of a concrete drainage structure, then continues downslope to the previously noted intersection at Cross-Section R004. Proceeding downstream from this intersection, Rocky Creek flows northwest and, then, north for approximately 1.25 miles in a well-defined, somewhat meandering channel with a mild bed slope. The immediate stream valley is wooded with occasional cypress trees scattered along the channel. At Cross-Section R005, the creek enters a large cypress swamp. The swamp's first one-quarter mile is characterized by severely meandering channel systems, low-lying wooded islands, swampy areas, and a broad variety of trees. The remainder of the swamp, north to Cross-Section R009, is at least partially inundated throughout the year. Wet season water depths generally run to 30 inches with occasional pools over four feet in depth. Rocky Creek becomes somewhat constricted at a point 400 feet north of County Road NW18C. Field observations and measurements have shown that this constriction limits flow from the swamp when the upstream water surface elevation is below 105 feet msl.

Approximately 800 feet north of NW18C, the creek is characterized by a meandering, low-banked, flood-prone channel. Then, at Cross-Section R011, it enters a large, triangular-shaped swamp which is not clearly shown on the U.S.G.S. quadrangle map from which Figure 2.5-5 was developed. Water depths in this swamp vary to 24 inches with some potholes over five feet deep. A small pond is located at the southeast corner of the swamp. At Cross-Section R212, there is an embankment, apparently constructed prior to 1900 as a mill pond dam. The creek flows through a 100-foot wide gap in this embankment. From this breach, Rocky Creek flows northward in a wide, shallow channel with mild bed slope. The surrounding area is heavily wooded, with numerous cypress trees near the channel. At Cross-Section R013, Mulatto Pen Branch, a significant tributary originating in the flatwoods west of SR-121, joins the creek. At Cross-Section R115, a smaller tributary joins. Both the main channel and this tributary channel have been dredged for a short distance above and below SR-235.

North from Cross-Section R115 to its outlet at the Santa Fe River, Rocky Creek channel meanders severely with a continued mild bed slope. Immediately north of Cross-Section R115, the channel banks are shallow, whereas near the Santa Fe River the channel is deeply cut, and is as much as ten feet below gound surface. Stream banks are generally bounded by woodlands. A few scattered cypress trees occur where the channel occasionally broadens. A major tributary, providing drainage for a large land area north and west of LaCrosse, joins the main channel approximately one mile south of the Santa Fe River.

Soils

A variety of soil series, as defined by the U.S.D.A. Soil Conservation Service, are present in the Rocky Creek basin. Most of the surface soils are fine sands or loamy fine sands. The southern end of the basin is composed primarily of Leon fine sand with lesser amounts of Plummer and Scranton fine sands. From Cross-Sections R013 to R005, stream bed parent material is either poorly drained Fellowship loamy fine sand or moderately drained Leon fine sand. Along NW18C, predominant soil types are Arredondo, Fort Meade, and Gainesville loamy fine sands which have fairly good infiltration characteristics. From Cross-Section R005 north to Cross-Section R014, the channel is composed of moderate to well-drained alluvial soil. Extensive areas of poorly drained Rutlege fine sand are found from Cross-Section R014 to the Santa Fe River. This basin also contains broad areas of Orlando fine sand, primarily along SR-121 and in areas both north and east of LaCrosse.

Hydrology

The discharge in Rocky Creek varies seasonally with the amount of rainfall received. During the winter months, portions of the creek and its high tributaries remain dry while the middle and lower reaches contain ponded water with slight flows. Lateral seepage from a few small springs produces minor main channel flow during the winter months. Typical small springs and seeps can be found near Cross-Section R115. The water level drops significantly in most of the cypress swamps during the winter months; however, the large cypress swamps between Cross-Sections R065 and R112 remain broadly ponded.

During the summer months, Rocky Creek flows may vary from zero to several hundred cubic feet per second during heavy storms. Some of the tributaries are intermittently flowing during the summer months. Cypress swamps between Cross-Sections R065 and R112 provide substantial storage volumes and attenuate downstream flow, especially during storm events preceded by dry spells. Although flows in Rocky Creek may be dramatically large following major storm events, they are normally quite low during most of the year. Consequently, for the purposes of the following discussion, Rocky Creek was considered to have no base flow.

Statistics reveal that a four-inch, twenty-four hour rainfall can be expected once a year in the basin. In previous investigations (Breedlove, 1977), this storm condition was used to investigate Rocky Creek's flood potential. Assuming average antecedent moisture conditions (i.e., neither a prolonged drought nor a prolonged wet spell prior to the storm being modeled), an annual twenty-four hour storm was modeled for the Rocky Creek basin. Predicted discharge rates, flow velocities and water surface elevations were obtained at regular intervals over the full length of Rocky Creek.

Limited flooding is predicted by the model to occur in the middle and upper reaches of Rocky Creek as a result of a four-inch, twenty-four hour rain. However, because of the steep channel bed slope, the model predicted very little flooding between Cross-Sections R001 and R003. A predicted 75 cfs (48.5 mgd) peak discharge occurs with a maximum depth of flow of 1.5 feet. Water velocities are correspondingly high, reaching over 2.5 fps.

Due to the extensive drainage area in the southern end of the basin, the peak discharge between Cross-Sections R019 and R004 is predicted to be approximately 220 cfs (143 mgd). It should be noted that stormwater storage in the southern end of this basin can be substantial. Limited topographic information combined with ongoing drainage improvements prevented a wholly accurate determination of available storage. Storage estimates were made on the basis of available topographic information and field observations, and may be considered conservative.

Although the predicted peak discharge in the reach between Cross-Sections R003 and R005 is high, 270 cfs (175 mgd), the computer model indicates little flooding due to the moderately steep channel slope and good conveyance. However, some flooding may be expected in the reach between Cross-Sections R006 and R065 where the channel bed slope flattens as Rocky Creek approaches the large swamp.

For this event, the water surface elevation in the cypress swamp between Cross-Sections R065 and R009 is predicted to rise from an elevation of 105.7 feet to 107.7 feet above msl. Flooding is predicted to occur throughout this low-lying area. The large wooded depression, lying to the east of Rocky Creek, acts as a reservoir for immediate upstream runoff and for overflow from the adjoining pond. This depression has an overflow elevation of 108.0 feet at Section 'A'. Considering this elevation and storm magnitude, no backflow into this tributary system from the primary channel of Rocky Creek will occur.

The channel in the vicinity of Cross-Section R010 floods moderately, simply because the channel is not very deep and the banks are mildly sloped. The storm is predicted to produce a water depth of approximately two feet and a flooded channel width of several hundred feet.

Predicted stormwater levels in the swamp north of NW18C are not excessive. The banks on both sides of this swamp are steeply sloped and the stormwater level of 105.7 feet inundates only a small additional area. The breached embankment at Cross-Section R212, at the northern end of this swamp, does not constrict storm flows associated with this event.

Between Cross-Sections R212 and R014, the channel is shallow with a mild bed slope and shallow side slopes. This reach is more prone to flooding. Additional flow from Mulatto Pen Branch adds significantly to the already high peak discharge of 350 cfs (226 mgd).

The area on either side of SR-235 at Rocky Creek is similarly flood-prone. However, continuing north, flooding between Cross-Sections R015 and R017 decreases as the creek channel becomes better defined. At Cross-Section R015, the peak storm discharge of approximately 350 cfs results in a flooded channel width of over 500 feet, while at Cross-Section R017, a peak storm discharge of 430 cfs (278 mgd) is contained within a 50-foot flooded channel width.

As described above, the resultant flooding from the twenty-four hour storm, statistically equalled or exceeded once each year, is confined primarily to the middle reaches of Rocky Creek. The peak storm discharge predicted for the creek is 430 cfs at Cross-Section R017. Thirty-six hours after the storm has ended, the discharge at Cross-Section R017 is predicted to be approximately 85 cfs (55 mgd). The total volume of storm water which flows through Cross-Section R017 due to the storm is predicted to be over 1,000 acre-feet out of a total rainfall volume of over 7,000 acre-feet.

Water Quality

The major inputs to Rocky Creek and its tributaries are runoff and seepage from pinelands, cypressheads, mixed hardwood stands, and agricultural lands. The majority of the parameters sampled yielded values comparable to other streams in Florida lacking industrial and urban discharges (Tables A2-2 through A2-6, A2-8, A2-9) (Figure 2.5-5). The stream is relatively free of industrial and urban influences and is typical of high-quality waters. Data collected by the Florida Geological Survey (1964) from Rocky Creek near LaCrosse (Table 2.5-3) were comparable to those collected by Breedlove (1976).

Although Rocky Creek water quality is representative of baseline conditions, lead, mercury, manganese, and iron concentrations exceeded state water quality standards and federal water quality criteria (Breedlove, 1976). However, the water is within acceptable limits for its present agricultural use and for supporting freshwater aquatic and wildlife.

Sulfate, sulfide, nickel, lead, and cadmium concentrations found in Rocky Creek sediments are assumed to be natural background levels for this basin (Table A2-6). Concentrations were not significantly different in sediments from swamp and stream stations. Pesticides and herbicides (Table A2-9) were not detectable.

2.5.1.5 The Santa Fe River

The Rocky Creek system is a direct tributary to the Santa Fe River. Turkey Creek and Cellon Creek are both believed to drain to the underlying limestone aquifer and are believed to contribute to the spring flows found along the Santa Fe. Thus, a brief synopsis of overall Santa Fe basin hydrology has been included to provide a broadened view of area hydrology.

The following description, taken from Water Resources of Alachua, Bradford, Clay and Union Counties, Florida (Clark et al, 1964), includes statistical information obtained from stream gage records.

> The Santa Fe River basin covers an area of 1,440 square miles. Flow from the basin reaches the Gulf of Mexico by way of the Suwannee River. The Santa Fe River starts in Santa Fe Lake and flows generally westward, picking up flow from the tributaries, Sampson River, New River, and Olustee Creek, before the river disappears into a sinkhole at O'Leno State Park, 5 miles north of High Springs. The river emerges abruptly from the ground after being underground for a distance of 3 miles.

The hydrology of the basin is very complex. The average runoff from the basin is about 22 inches per year. However, average runoff from subareas varies from 6 to 85 inches. On the average the basin receives 52 inches of rainfall per year. The ratio of runoff to rainfall varies by areas from about 0.1 to more than 1.5, which is an extreme variation within an area of 1,440 square miles. Topography and geology are among the causes of the unusual runoff conditions in this basin.

Major changes in streamflow characteristics occur in the vicinity of O'Leno State Park. Above this point surface streams are prevalent throughout Union and Bradford counties and the part of Alachua County.

Below O'Leno State Park there is a noticeable absence of surface streams. The stream channel has been cut into porous limestones. Sinkholes are prevalent and springs are numerous throughout this area. From the point where the river emerges from the ground downstream to the confluence with the Suwannee River, springs are visible along the channel, usually flowing from circular pools in the banks of the river. The large pickup in streamflow in this vicinity comes from springs. The lower half of the basin is covered with a relatively thin mantle of sands overlying porous limestone. Rain on this area seeps directly into the ground or is carried by short surface channels to sinkholes.

The flow of the Santa Fe River at Worthington Springs is indicative of the hydrologic conditions in the lower basin. The Worthington Springs station measures flow from the upper 630 square miles of the basin wherein surface streams receive a high rate of direct runoff, respond rapidly to rainfall, and recede rapidly to a low base flow. Streamflow at the Fort White station does not respond to rainfall as quickly, stays up for longer periods after rains, and has a much higher base flow. A comparison of extreme flows of the two stations will also point up the difference in streamflow characteristics. At the Worthington Springs station the average flow is 424 cfs (274 mgd), the maximum is 17,500 cfs (11,300 mgd), and the minimum is 0.5 cfs (0.3 mgd). At the Fort White station the average flow is 1,576 cfs (1,019 mgd), the maximum is 12,300 cfs (7,950 mgd), and the minimum is 609 cfs (394 mgd).

An average flow if 650 cfs (420 mgd) enters the ground at O'Leno State Park. This flow comes from four streams: 130 cfs (84 mgd), or 20%, from Olustee Creek; 240 cfs (155 mgd), or 37%, from New River; 100 cfs (65 mgd), or 15% from Sampson River; and 180 cfs (116 mgd), or 28%, from the main stem and smaller tributaries.

Rocky Creek intersects the Santa Fe River at a point five miles upstream (disregarding meanders) of the gaging station at Worthington Springs.

Water Quality

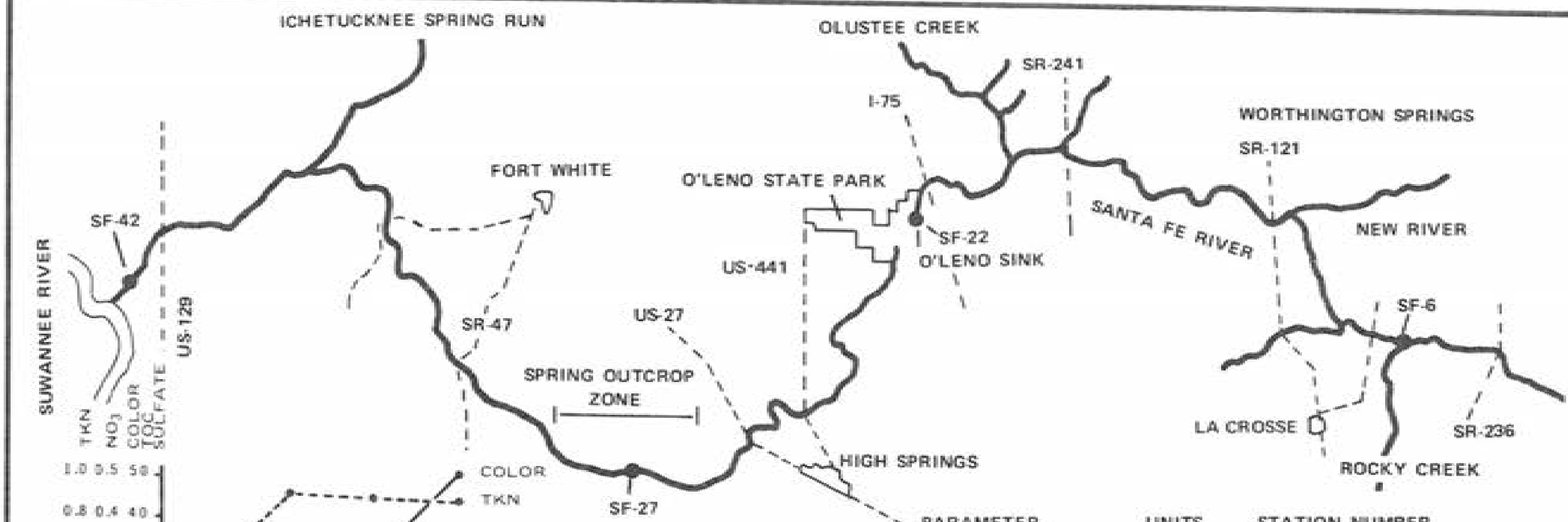
The upper Santa Fe River shows a large range of discharges (0.1 - 20,000 cfs) with a mean that is skewed toward the lower end of the discharge (Table 2.5-4). Likewise, the lower Sante Fe River shows a large range (31 - 20,000 cfs) and a mean discharge that is skewed toward the lower end of the range. The mean discharge in the lower Santa Fe River is considerably higher than that of the upper Santa Fe River and is the result of numerous spring outcrops which provide a more stable base flow. During periods of high runoff both the upper and lower river segments are characteristically brown, acidic river systems. During low flow conditions the upper Santa Fe remains a brown water river, while the lower Santa Fe becomes clear due to limited runoff and presence of numerous clear springs.

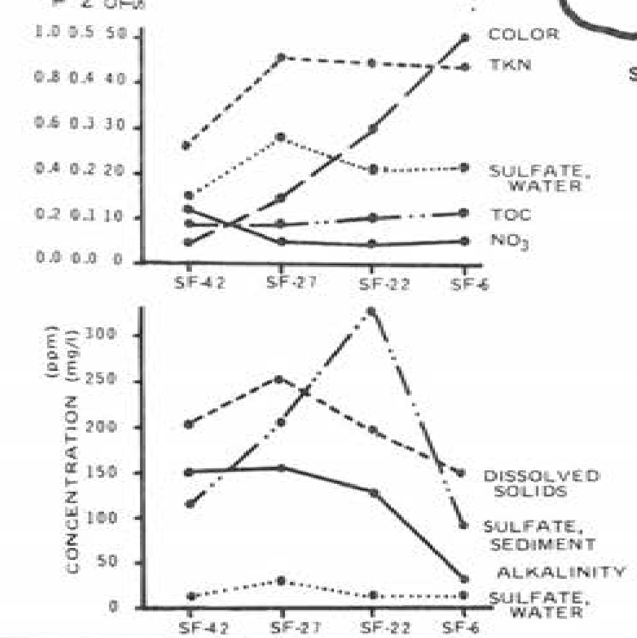
The water quality and discharge data for Worthington Springs indicate the following: (1) neither upper nor lower segments appear stressed by any chemical constituents; (2) discharge during low flow conditions in the upper Santa Fe is the major affector of a diverse and stable aquatic community; and (3) discharge during low flow conditions in the lower Santa Fe is sufficient to maintain a diverse and stable aquatic community (Table 2.5-5) (Figure 2.5-6).

Table 2.5-4 Mean, Maximum and Minimum Discharges of Various Portions of the Santa Fe River[1]

Station	Period of Record (yrs)	Drainage Area (sq. mi.)	Discharge Max (cfs)	Discharge $\bar{x}$ (cfs)	Discharge Min (cfs)
	(Upper Santa Fe River)				
Santa Fe River near Graham, Florida (above Rocky Creek)	8	95	2,360	76	0.1
Santa Fe River at Worthington Springs Florida (below Rocky Creek)	34	582	20,000	433	0.5
	(Lower Santa Fe River)				
Santa Fe River near High Springs, Florida	34	950	20,000	809	31
Santa Fe River near Ft. White, Florida	35	1,080	17,000	1,622	609

[1]Source of Data: U.S. Geological Survey. 1971. Selected Flow Characteristics of Florida Streams and Canals, Info. Cir. No. 69. State of Florida. Department of Natural Resources, Tallahassee, Florida 595 pp.





PARAMETER	UNITS	STATION NUMBER A SF-42	SF-27	SF-22	SF-6
WATER					
Temperature	°C	24.8	24.8	27.8	27.5
DO	ppm	7.0	6.7	6.0	5.7
ORP	mv	+130	+150	+150	+90
pH		7.9	7.7	7.6	6.8
Alkalinity, Total	mg/l	150	154	130	31
Conductivity	µmhos/cm	342	400	364	23
Dissolved Solids, Total	mg/l	205	251	198	147
Color	Pt.-Co	5	15	30	50
Organic Carbon, Total	mg/l	9	9	11	12
NH_3-N	mg/l	0.02	0.01	<0.01	0.16
NO_3-N	mg/l	0.12	0.07	0.05	0.06
TKN-N	mg/l	0.52	0.92	0.90	0.87
P-Total	mg/l	<0.01	0.02	0.13	0.07
Sulfate	mg/l	14.8	28.0	21.4	22.2
SEDIMENT					
* Sulfate	ppm	123	206	329	82
Sulfide, Total	ppm	0.095	0.174q	0.023	0.015
% Moisture		35.46	59.48	48.96	28.63

FIGURE 2.5-6 SANTA FE RIVER SAMPLING STATION LOCATIONS AND WATER QUALITY DATA COLLECTED DURING JUNE, 1977.

Table 2.5-5 Surface Water Quality Data for the Santa Fe River at Worthington Springs

Parameter	Units	Santa Fe River at Worthington Springs[1] No. Observed	Mean	Maximum	Minimum
Total Aluminum	mg/l	1	160.0	--	--
Dissolved Arsenic	mg/l	1	10.0	--	--
Total Arsenic	mg/l	1	1.0	--	--
Dissolved Cadmium	mg/l	1	1.0	--	--
Total Cadmium	mg/l	1	0.0	--	--
Hexavalent Chromium	mg/l	1	0.0	--	--
Dissolved Copper	mg/l	3	1.5	3.0	0.0
Total Copper	mg/l	2	0.5	1.0	0.0
Dissolved Lead	mg/l	3	1.0	2.0	0.0
Total Lead	mg/l	2	6.0	12.0	0.0
Dissolved Manganese	mg/l	2	25.0	30.0	20.0
Total Manganese	mg/l	2	25.0	40.0	10.0
Total Mercury	mg/l	3	0.0	0.0	0.0
Dissolved Zinc	mg/l	3	10.0	20.0	0.0
Dissolved Iron	µg	3	370	--	--
Total Iron	µg	2	590	--	--
Total Nickel	mg/l	1	0.0	--	--
Dissolved Calcium	mg/l	4	7.2	8.6	6.2
Dissolved Magnesium	mg/l	4	2.7	2.9	2.6
Dissolved Strontium	mg/l	4	58.8	70.0	40.0
Dissolved Sodium	mg/l	4	6.8	7.5	6.0
Dissolved Potassium	mg/l	4	0.9	1.2	0.4
Total Sulfate	mg/l	4	12.8	15.5	9.6
Dissolved Chloride	mg/l	4	10.9	12.0	10.7
Dissolved Fluoride	mg/l	4	0.4	0.5	0.3
Hardness (Total)	mg/l	4	30.0	34.5	26.0
Non Carb. Hardness	mg/l	4	15.9	19.5	12.0
Alkalinity	mg/l	4	13.9	17.0	9.0
Conductivity	µmhos	Daily[2]	84.0	204.0	33.0
Dissolved Solids	mg/l	4	87.2	90.0	80.0
HCO_3^-	mg/l	4	17.0	21.0	11.0
$CO_3^=$	mg/l	4	0.0	0.0	0.0
pH	SU	4	6.7	--	--
Temperature	°C	Daily[2]	21.1	29.0	9.0
Ammonia Nitrogen	mg/l	8	0.06	0.10	0.04
Nitrite Nitrogen	mg/l	8	0.01	0.03	0.01
Nitrate Nitrogen	mg/l	8	0.07	0.20	0.00
Organic Nitrogen	mg/l	8	0.86	1.02	0.68
Total Ortho-Phosphorus	mg/l	8	0.17	0.23	0.11

10yr 24 hour storm
.33"/hr
per DOT Stormwater
Handbook

Table 2.5-5 Surface Water Quality Data for the Santa Fe River at Worthington Springs

Parameter	Units	Santa Fe River at Worthington Springs[1] No. Observed	Mean	Maximum	Minimum
Total Phosphorus	mg/l	8	0.19	0.27	0.12
Dissolved Silica	mg/l	8	4.4	6.0	2.8
Turbidity	JTU	8	5	15	2
Color	Pt.-Co.	4	150	210	30
Total Organic Carbon	mg/l	2	20.0	22	19
BOD (5 day)	mg/l	3	0.5	0.7	0.4
Dissolved Oxygen	mg/l	2	7.3	7.3	7.3
Percent Saturation		2	79.0	80.0	79.0

[1]Source of Data: U.S. Geological Survey. 1975. Water Resources Data for Florida, Volume 1. Northern Florida. Water Data Report FL-75-1 (October 1971 - April 1975).

[2]Source of Data: (Daily) Florida Geological Survey. 1964. Report of Investigations. No. 35 (July 1957 - Sept. 1960).

2.5.1.6 Summary Comparison of Turkey, Cellon and Rocky Creek Water Quality

Comparisons of water quality data using cluster analysis suggest that Turkey Creek and Cellon Creek below the General Electric plant are similarly affected by industrial discharges. Rocky Creek and Mulatto Pen Branch water quality is similar to baseline conditions of other area streams not influenced by industrial discharges.

Calcium, magnesium and hardness were shown to be significantly higher in Turkey Creek than in Cellon Creek or the Rocky Creek system. In addition, sulfate, arsenic, sodium, and total dissolved solids were found in significantly greater concentrations and conductivity was higher in Turkey Creek than in any segment of Rocky Creek. The same parameters were high in Cellon Creek below the General Electric battery plant outfall.

Cluster analysis of the above parameters, plus alkalinity, chloride, cadmium and chromium (Figure A2-3 through A2-14), generally grouped the Deerhaven discharge and on-site stations with the segment of Cellon Creek below the General Electric plant discharge. A cluster analysis of all significantly variable parameters (Figure A2-1) also grouped DH-1, the cooling tower discharge, with the stations downstream of the General Electric discharge (CP-5, CP-8 and CP-13); and clustered Turkey Creek stations DH-6, DH-7, DH-8 and DH-9 with the stations located in the upper reaches of Cellon Creek (CP-4).

Nickel and lead concentrations were higher in the Deerhaven on-site discharge than in Rocky Creek. The discharge ditch and on-site swamp contained exceptionally high levels of nickel (439 mg/l maximum, $\bar{x}$ = 71.1 mg/l) compared to the remaining Turkey Creek Stations ($\bar{x}$ = 1.85). The highest levels of lead (19.0 mg/l maximum) were found in the on-site swamp sedimentation delta (Table A2-6).

Cluster analysis associated Station CP-3, which represents drainage from a small cypress gum swamp and agricultural lands, with the clean water stations of Rocky Creek. Station CP-3 is clustered at the first level with Station RC-6, RC-7 and RC-8, which are representative of cypress swamp water quality. Station CP-4, representing the combined drainage of upper Cellon Creek and runoff from the dairy research unit, is clustered with Stations DH-6, DH-8 and DH-9. This cluster is a function of those parameters which are higher in Turkey Creek and at Station CP-4 than in Rocky Creek. Parameters primarily responsible for the association are: conductivity, calcium, hardness and chloride.

2.5.2 Groundwater Hydrology - Floridan Aquifer

The Floridan Aquifer is the principal aquifer in Alachua County and extends throughout the State of Florida and parts of Alabama, Georgia, and South Carolina. In the study area the Floridan Aquifer includes parts or all of the middle Eocene (Avon Park and Lake City Limestone), upper Eocene (Ocala series), Oligocene (Suwannee Limestone), and Miocene (Tampa Limestone) groups. It also includes permeable parts of the Hawthorn Formation that are in hydrologic contact with the rest of the aquifer.

The Floridan Aquifer is one of the most productive aquifers in the country. Specific capacities of wells (i.e., well yield per foot of drawdown) range from less than 100 gpm/ft. to over 500 gpm/ft. The Floridan Aquifer is encountered 120 feet below the Deerhaven site and consists of approximately 700 feet of porous limestone and dolomite or dolomitic limestone. The lithologic and hydrologic character of the Floridan Aquifer is not uniform either horizontally or vertically. The limestones and dolomites have high permeability in lateral directions and low permeability in the vertical direction. No rock formation is absolutely uniform in structure, density, and hardness. Certain portions of limerock formations, particularly those which have been weakened by joints, are more susceptible to dissolution than others. These weakened zones are dissolved to form underground channels or caverns by enlargement of the joints. The structure of the limestone formations controls the direction of joints or cracks within the limestone and these joints control the orientation of solution conduits. In the areas south and west of Deerhaven, this joint-controlled dissolution can be observed in Warren's Cave. Within this cave the overall trend of passageways is northwest-southeast and northeast-southwest. Recent high altitude multispectral photographs of this area show a similar direction of alignment of sinkholes. It has been shown that modification of limestone by dissolution can result in groundwater flow being localized in the resulting solution conduit. Relatively fast-moving large-volume groundwater flow may take place in these conduits while flow through nearby rock of low permeability may be by diffuse flow.

In general, water recharges the Floridan Aquifer by percolating down from above. In the central highlands area, which contains the Deerhaven site, the clays of the Hawthorn Formation have a very low permeability and support a perched water table above the Floridan Aquifer. Water recharges the Floridan Aquifer in this area by leaking through breaches in the impervious clay strata of the Hawthorn Formation. In the transition zone and limestone plain in the southwestern part of the county, the aquifer has been breached by many sinkholes which develop when materials overlying limestone caverns collapse. Surface water may then flow directly into the aquifer as is believed to occur at Split Rock Sink, Lee Sink, and the Devil's Millhopper. Often materials wash into these sinks and they become partially clogged to form perched lakes. Water from these lakes is then slowly filtered through the sand and clay that forms the floor of the sinkhole. Sometimes such lakes "flush" rapidly and produce local contamination of the aquifer.

Concentration of dissolved solids is generally associated with major formational changes. Calcium and sulfate, apparently dissolved from gypsum sediments, generally increase near the top of the Ocala group and of the Avon Park Limestone. Total dissolved solids in county wells generally range from 150 to 300 ppm, hardness (expressed as calcium carbonate) generally ranges from 100 to 200 ppm, and sulfate and chloride concentrations are generally 10 ppm or less. The temperature of the water of the Floridan Aquifer generally increases with depth at a rate of about 0.5° F to 1° F for each 100 feet. The temperature of the water in the Floridan Aquifer generally remains constant at a given location and depth throughout the year.

The potentiometric surface of an aquifer is a surface which defines the elevation, relative to mean sea level, that water levels can be expected to rise to under static conditions. The potentiometric surface fluctuates due to changes in the rate of recharge to, and discharge from, the aquifer. These are in turn due to fluctuations in the rate of rainfall, the rate of evapotranspiration, and changes in withdrawal from the aquifer. Figure 2.5-7 presents contours of the potentiometric surface in Alachua County measured in June, 1960, and in November, 1976. As noted, the potentiometric surface was generally approximately 10 feet lower in November, 1976, than in June, 1960. Figure 2.5-8 presents a hydrograph of a ten-inch water supply well in High Springs, Florida. This hydrograph illustrates the long term fluctuations in aquifer water level as well as short term fluctuations due to major storms and droughts. As indicated, the long term average water level fluctuated by about five feet during the period of record whereas the water level increased over a short time interval by nine feet due to a 1964 hurricane.

In wells where the static water level rises above impermeable strata at the top of the aquifer, the aquifer is said to be artesian. In parts of the aquifer where the water level lies within the limits of the aquifer, that aquifer is said to be a water-table aquifer. By comparing elevations of the top of the Ocala group presented in Figure 2.4-3 with the

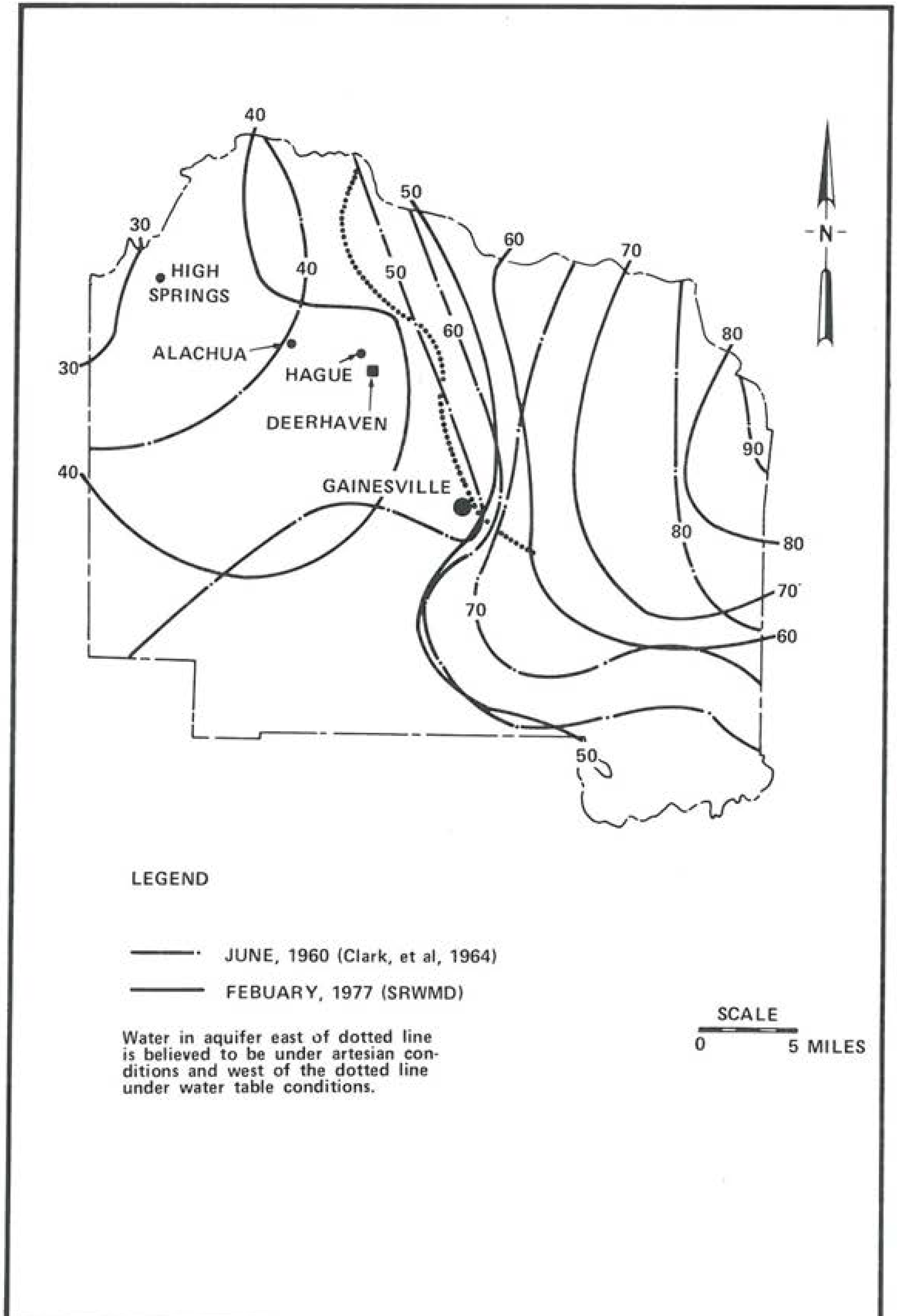


FIGURE 2.5-7 POTENTIOMETRIC SURFACE IN FLORIDIA AQUIFER.

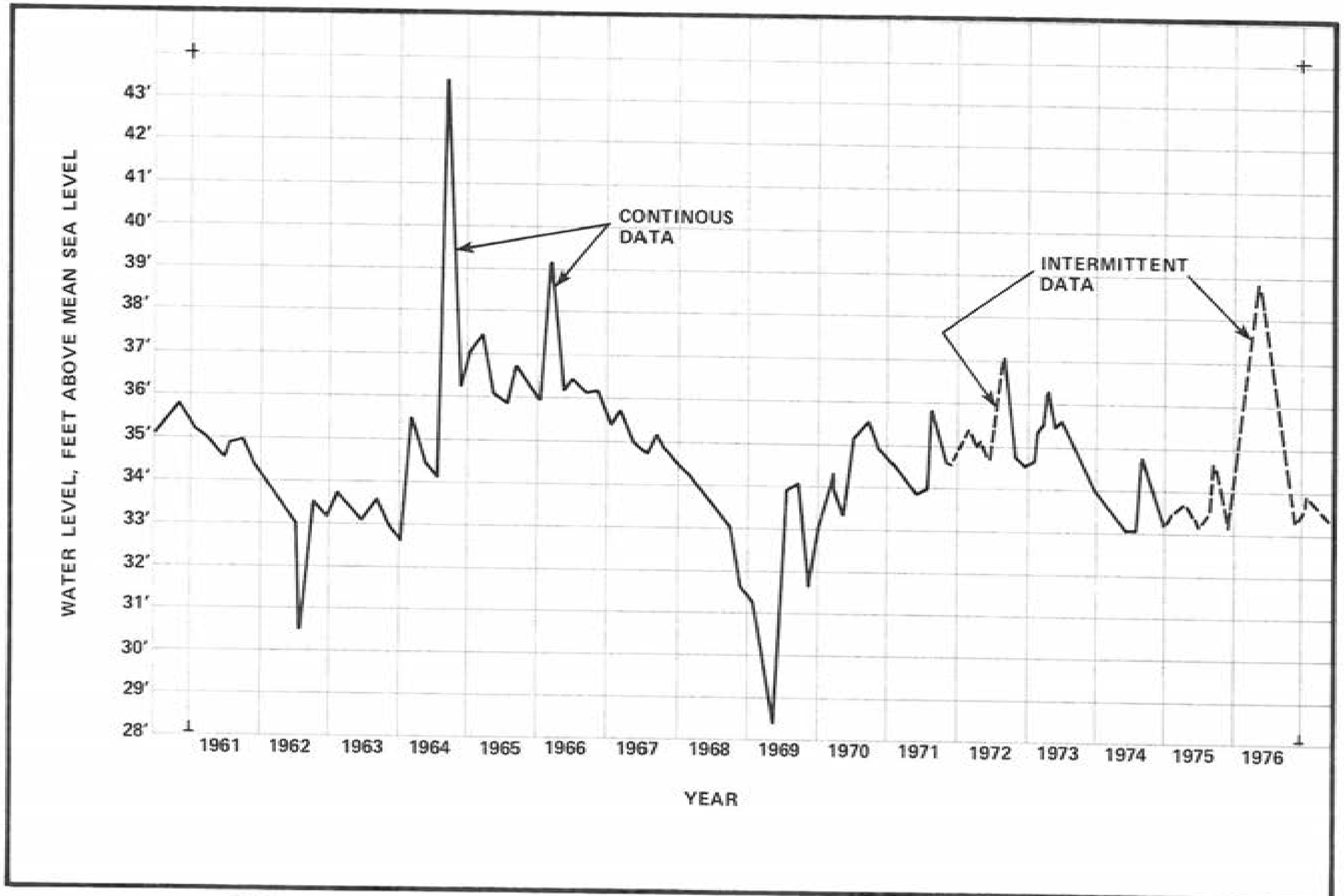


FIGURE 2.5-8 WATER LEVEL IN WATER SUPPLY WELL AT HIGH SPRINGS, FLORIDA.

potentiometric surface presented in Figure 2.5-7 some authors have suggested constructing a dividing line as shown to indicate that the Floridan Aquifer is artesian in the northeastern part of the county and a water-table type aquifer in the southwestern part of the county.

Figure 2.5-9 presents the water supply wells within five miles of the Deerhaven site. Table 2.5-6 presents information regarding these wells. The single major source of groundwater withdrawal in the Gainesville area is the RUB's new wellfield at its Murphree Water Treatment Plant, 6 1/2 miles southeast of the Deerhaven site. Groundwater withdrawal from this wellfield is presently between 11.0 and 15.0 mgd. A well test performed in this wellfield in 1969 produced a value for transmissibility of 212,000 gpd/ft. and a storage coefficient of .000207. This well penetrates the Floridan Aquifer by 270 feet with static water level reported to rise 100 feet above the top of the aquifer, thus confirming the artesian nature of the aquifer in that area and corroborating the low storage coefficient normally expected in an artesian aquifer. Several other well tests have been run in the Gainesville area. Aquifer coefficients from these tests are reported in Table 2.5-7.

Results from tests performed on the disposal wells at RUB's Kanapaha AWT plant can be used to estimate the hydraulic properties of the aquifer at depths between 450 and about 1,050 feet below land surface. Geologic logs from these wells indicate that each is open to the lowermost 25 feet of the Avon Park Limestone and to about 575 feet of the Lake City

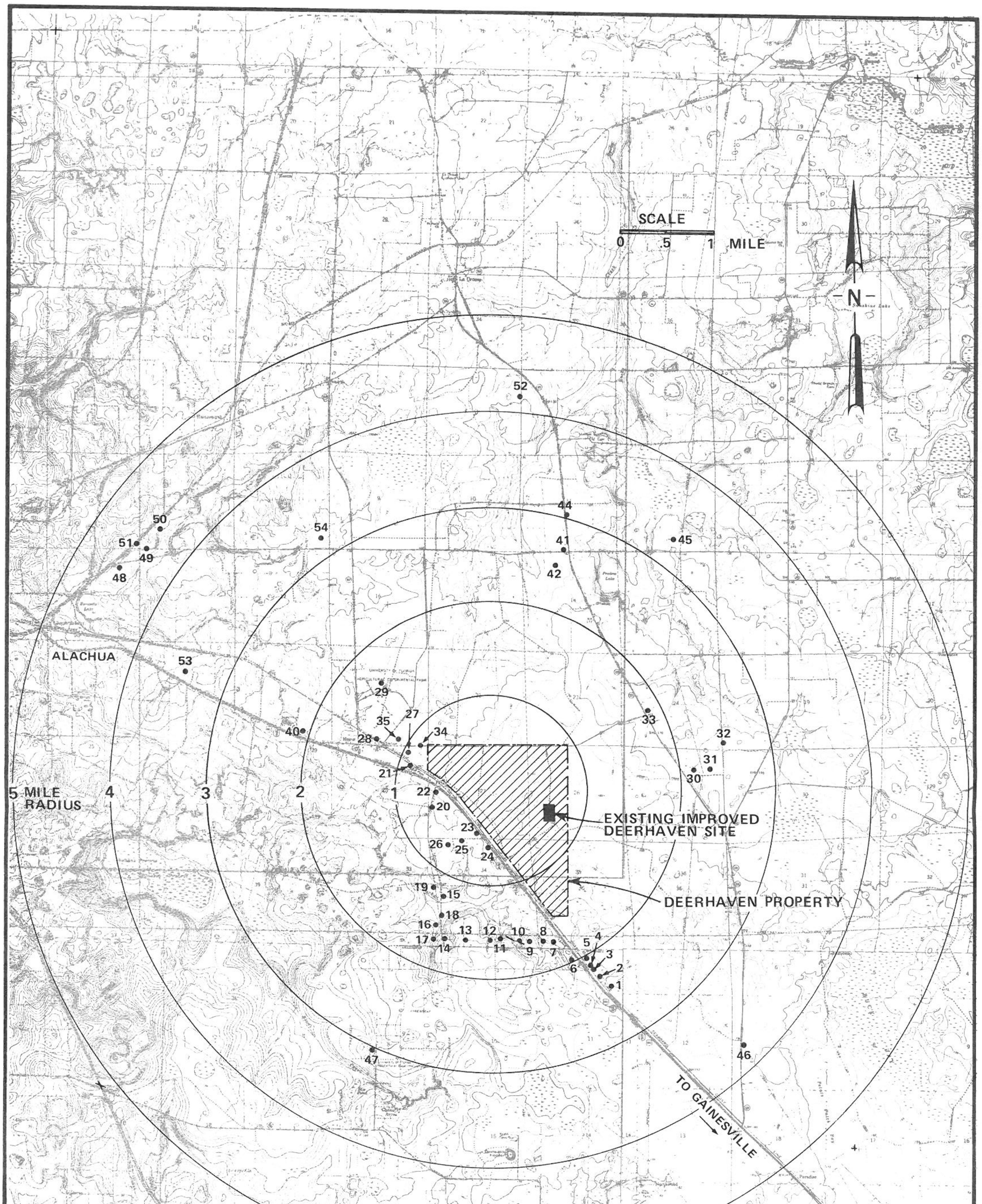


FIGURE 2.5-9 WATER SUPPLY WELLS WITHIN 5—MILE RADIUS OF THE DEERHAVEN SITE.

Table 2.5-6 Water Supply Wells within Five Miles of the Deerhaven Site

Well No.	Owner	Casing Diameter (in)	Casing Depth (ft)	Well Depth (ft)
1	Whitney Residential Park	6	135	180
2	Norman Watson	4	120	160
3	A.G. Fabrick	4	120	--
4	Robert Griffen	4	120	--
5	James Griffis Lumber Co.	4	135	198
6	Hipp Ford Tractor	--	--	18
7	Joe Tate	4	120	140
8	R.W. Rodgers	4	115	160
9	R.E. Lines	4	120	160
10	J.J. Pickerin	4	--	175
11	Randall Avery	4	90	195
12	John Walker	4	160	200
13	B. Oakley	4	--	210
14	B.D. Goff	4	150	174
15	M.L. Shea	6	189	200
16	W.A. McNally	4	--	195
17	H.W. Vories	4	--	190
18	Marshall Wright	4	--	185
19	Tommy Thomas	4	--	200
20	Woody Jasper	6	9½	12
21	Progress Trailer Park	6	150	219
22	Turkey Creek Utilities, Ltd.	10	130	300
23	Thompson's Nursery	4	148	185
24	Sans Souci Ranch	4	--	170
25	Mary Peterson	4	140	200
26	Danny Cave	4	--	180
27	Harry Hooey	4	--	165
28	Beverly Hills Plantation, Inc.	6	--	400
29	UF Agric. Experimental Farm	10	185	400
30	Hamp Holdeb	2	30	--
31	Lenard Holder	4	145	178
32	Earl Phips	1¼	9½	12
33	T.D. Kirby	4	110	162
34	J. Willis	1¼	--	22
35	J.D. Harrell	2	75	100

Table 2.5-6 Continued.

Well No.	Owner	Casing Diameter (in)	Casing Depth (ft)	Well Depth (ft)
40	General Electric Company	--	--	--
41	Unknown	--	--	--
42	Rogers	10	89	277
43	General Electric Company	12	87	427
44	Cellon	4	162	180
45	Craft	4	92	130
46	Owens Illinois Glass Co.	4	109	187
47	UF Agricultural Exper. Stat.	--	--	--
48	Frentzen	4	84	183
49	Jacks	4	162	220
50	Williams	--	--	--
51	Williams	4	112	160
52	Spencer	--	--	--
53	GE Supply Well No. 2	--	--	350
54	Crummer	4	140	200

Table 2.5-7 Summary of Aquifer Coefficients for the Florida Aquifer in Alachua County

Well Name	Location	Depth of Well (ft)	Depth of Casing (ft)	Transmissivity (gpd/ft)	Storage Coefficient	Permeability (gpd/ft^2)	Specific Storage[1] (ft^{-1})
Murphree N-1	T9S,R20E,Sec 15	530	173	166,000	.00022	465	6.16×10^{-7}
Murphree N-2	T9S,R20E,Sec 15	475	185	165,000	.0002	569	6.90×10^{-7}
Murphree N-3	T9S,R20E,Sec 15	540	217	326,000	.00066	1,009	2.04×10^{-6}
Murphree N-4	T9S,R20E,Sec 15	545	190	262,000	.00091	738	2.56×10^{-6}
Murphree N-5	T9S,R20E,Sec 15	500	190	129,000	.00037	416	1.19×10^{-6}
Murphree N-6	T9S,R20E,Sec 15	521	189	203,000	.0006	611	1.81×10^{-6}
Murphree N-7	T9S,R20E,Sec 15	534	181	N.A.	N.A.	N.A.	N.A.
Murphree N-8	T9S,R20E,Sec 15	538	180	N.A.	N.A.	N.A.	N.A.
Kanapaha -1	T10S,R19E,Sec 16	1,047	450	500,000	N.A.	826	N.A.
Kanaphah -2	T10S,R19E,Sec 16	1,050	450	725,000	N.A.	1,208	N.A.
Kanapaha -3	T10S,R19E,Sec 16	1,028	450	525,000	N.A.	908	N.A.
Kanapaha -4	T10S,R19E,Sec 16	1,031	450	660,000	N.A.	1,136	N.A.
Sperry Rand[2]	T9S,R20E,Sec 13	350	160	165,000	.0001[a]	868	5.26×10^{-7}

[1]Calculated by dividing storage coefficient by length of open hole.

[2]USGS Well #942-216-2 as reported by Clark, et al, 1964.

[a]Estimated by Clark, et al., 1964.

Limestone (personal communication with Michael Knapp, 6/28/77). Testing in these wells resulted in estimates of T (transmissivity), ranging from 500,000 to 725,000 gpd/ft. Permeabilities for the zones, calculated by dividing the T by the length of open borehole in each well, ranging from 826 to 1,208 gpd/ft^2.

A test was performed on a well a mile or so west of the Murphee Water Plant (Clark et al., 1964). The well was open to about 200 feet of the aquifer, which, based on a survey of geologic logs, was probably mostly Ocala Limestone. Clark reports a T of 160,000 gpd/ft and estimates the storage coefficient to be 1×10^{-4}. The permeability is 800 gpd/ft^2.

Tests performed on six wells at the Murphee Water Plant in 1968 and 1969 showed values of T ranging from 129,000 to 326,000 gpd/ft and storage coefficients ranging from 2×10^{-4} to 9.1×10^{-4}. Each of the wells was about 500 feet deep and had about 200 feet of casing. They were probably open to all of the Ocala Limestone and to about 100 to 200 feet of the Avon Park Limestone.

At present three 14-inch water supply wells are installed at the Deerhaven site. Each well is served by a vertical turbine pump with 1,000 gpm (1.4 mgd) capacity. Present groundwater withdrawal at Deerhaven station for all purposes averages approximately 1,000 gpm (1.4 mgd). A six-inch on-site well has been recently logged with caliper, gamma-ray, and temperature logs and has been fitted out as an observation well. The gamma-ray log indicates that the top of the Ocala formation is at elevation 70 feet above msl. The static water level in the well has been recorded at 42 feet above msl, after six hours without pumping. The water supply wells penetrate the Floridan Aquifer by approximately 300 feet. The observation well penetrates the Floridan Aquifer by 162 feet. Water temperature near the upper surface of the observation well's water level was measured at 71° F. The temperature log detected an increase in water temperature of 0.7° F over a vertical water depth of 140 feet. Chloride concentration in the observation well was measured to be 17 ppm. Water samples collected from Deerhaven water supply wells in April of 1975 indicated a pH of 7.4, total dissolved solids of 345 mg/l, hardness of 244 mg/l (calcium carbonate), and chloride concentration of between 18 and 20 mg/l.

2.5.3 Deerhaven Site Hydrology

<u>Site Drainage</u>

The 1,116 acre Deerhaven site occupies an area that may be described as typical pine flatwoods with considerable understory vegetation and scattered cypress domes. Much of the site is poorly drained and remains in a relatively natural state. Runoff from the site passes to the Turkey Creek basin on the south and west sides and to Rocky Creek basin on the north and east sides. Figure 2.5-1 shows the site with respect to major drainage basins. The low relief features of the Deerhaven site have resulted in a natural drainage system of broad, shallow depressions interconnected by poorly defined channels. These depressions remain ponded for much of the year and are apparent as cypress domes and wetland areas. The predominant soil associations in this area are typically poorly drained fine sands with increasing percentages of silts and clays in the lower layers and with deposits of organic muck in the wetlands. The Hawthorn clays form a relatively impermeable aquiclude beneath the surface soils. Surface runoff occurs when surface soils become saturated and when rainfall exceeds available storage, as is the case during much of the year. On-site surface runoff velocities are very low due to the flat slopes and thick understory vegetation. Approximately 80% of the Deerhaven site drains to the south and west into Turkey Creek basin through two distinct channels. Prior to construction of Deerhaven Unit 1, the area was utilized as commercial pine forest. Minor improvements to site drainage were made as part of the forest management program. Small drainage swales were excavated to accelerate runoff from the pinelands to the many cypress domes and wetland areas on the site. Also, some graded roads were constructed on slightly raised embankments. These improvements have produced minor changes in drainage patterns. The construction of Deerhaven Unit 1 included the clearing and developing of approximately 80 acres, which included the plant site, railroad spur and entrance road. About 740 acres, or 65% of the site area, is drained by the south branch of Turkey Creek, the dominant watercourse on the property. This tributary rises in a pine-palmetto area north of the existing improved site area.

General characteristics of the surface hydrology of the existing Deerhaven site are illustrated in Figure 2.5-10. About 190 acres of the north portion of the site drain to Rocky Creek. Approximately 190 acres at the northwest corner drain to a Turkey Creek tributary which is herein termed the "north branch". This is a small, ephemeral channel that continues through a trailer park just west of the property, to cross beneath U.S. 441. A small portion of the northwest of the property might drain to Cellon Creek; this is not believed to be the case, but drainage in that area is very indistinct.

The improved site area is drained by means of a perimeter ditch system that directs flows to three drainage corridors:

1. the ditch at the north edge of the improved site area conveys both storm runoff and cooling tower blowdown (0.5 mgd) to a 28-acre cypress swamp where flow turns to the south;

2. runoff from the fuel handling area is directed to swales paralleling the entrance road and railroad spur; and

3. a wetland system that runs parallel to and on the south side of the entrance road.

This system receives much of the storm runoff collected in the immediate area of the plant and switch yard. Flows converge at area 5 (Figure 2.5-10). As indicated by the contours, there the basin steepens and a well-defined

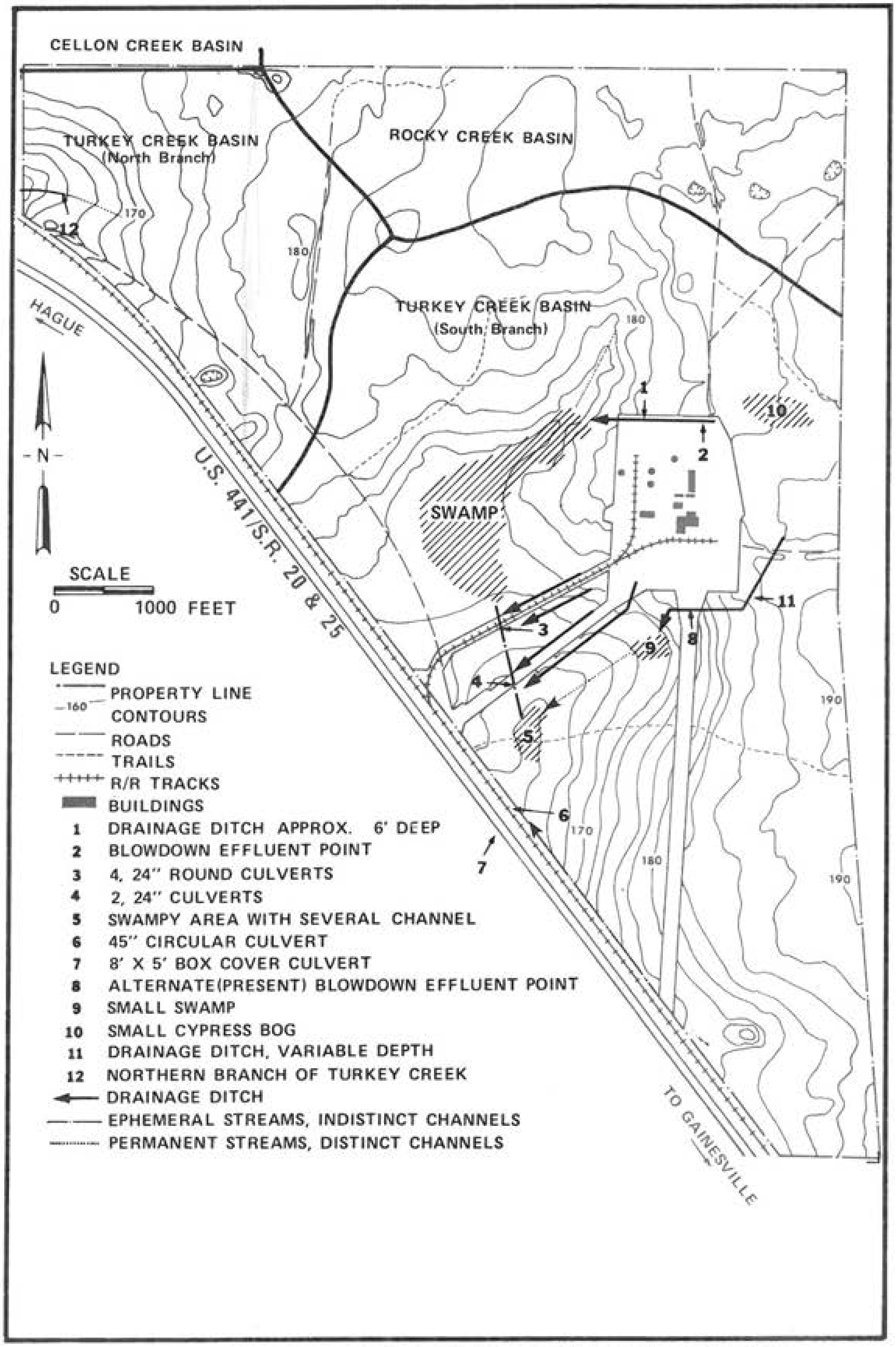


FIGURE 2.5-10 DEERHAVEN SITE EXISTING SURFACE DRAINAGE.

channel with clay and clay loam banks conveys combined flows to culverts under the railroad and under U.S. 441 to the main channel of Turkey Creek.

Drainage of the Existing Improved Site Area

Most surface runoff is directed by the topography and drainage ditches northward to the interceptor ditch, and thence westward to the south branch of Turkey Creek via the north end of the on-site swamp (Figure 2.5-11). The eastern border of the improved site area is about 189 feet above msl, and at the western end of the interceptor ditch is lowest or approximately 176 feet above msl. With only about 13 feet of relief, surface drainage is slow, and considerable ponding occurs.

Sealable stormwater inlets in the oil tank enclosures can be capped to prevent oil from entering the stormwater system in the event of a rupture. Water running off the oil truck unloading area is not presently detained; however, a plant-wide oil spill prevention program is now being designed. In accordance with existing NPDES permit requirements, all plant effluents except for cooling tower blowdown are being pumped into a 2-acre percolation/evaporation pond just north of the interceptor ditch.

Groundwater Hydrology of the Site

Figures 2.4-6 through 2.4-11 present stratification inferred from auger borings performed at selected locations at the Deerhaven site. Where possible, groundwater elevations were obtained. Permeability tests were

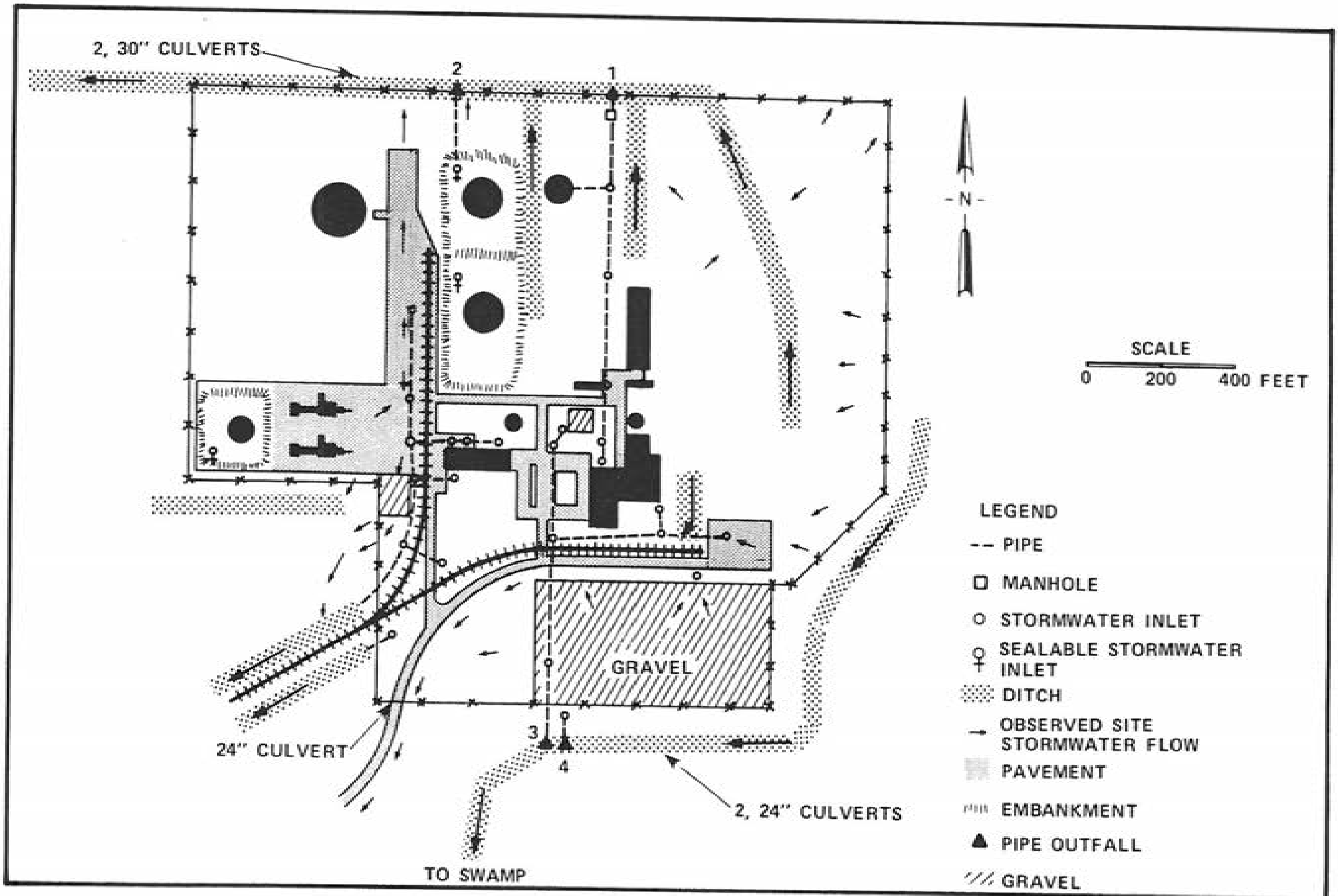


FIGURE 2.5-11 DRAINAGE OF THE EXISTING DEERHAVEN IMPROVED SITE AREA.

performed on sand samples retained at selected borings. As part of an investigation to determine the feasibility of cooling tower blowdown disposal on-site by means of spray irrigation, a simplified computer model was developed to infer the infiltration capacity of the study area. This model-assumed axisymmetrical radial flows from a 600-acre circular spray irrigation area with a radius of 2,884 feet. A sand stratum, fifteen feet deep with a coefficient of permeability of 0.43 feet per day was assumed to overlie an impermeable aquiclude. The groundwater level within this conductive sand was assumed to be five feet below grade prior to applying infiltration. The numerical model was performed to predict the allowable net infiltration which would cause the groundwater mound to just reach ground surface and, thus, produce no surface runoff. Program results indicated that the groundwater mound would reach the ground surface at the edge of the recharge area when the net infiltration into the 600-acre irrigation area was between 900 gpd and 1,125 gpd. This model contained many simplifying assumptions and was used only to predict whether further analysis of spray irrigation feasibility was justified. However, it is felt that results from this computer model corroborate observations of Deerhaven Generating Station plant personnel that: (1) during the rainy season, the groundwater approaches the ground surface at many site locations, and (2) during such periods of saturation almost all incidental rainfall leaves the site as surface runoff.

2.6 Meteorology and Climatology

2.6.1 Climatology

The surface meteorology for the Deerhaven site is defined from data obtained from the Federal Aviation Authority (FAA) office at the Gainesville Municipal Airport and from the National Oceanic and Atmospheric Administration (NOAA) station in Jacksonville, Florida. The Gainesville FAA station is located approximately 8 miles (13 km) southeast of the Deerhaven site. The Jacksonville NOAA station is located approximately 65 miles (105 km) northeast of the site.

Wind data from Jacksonville have been used in earlier air quality studies conducted for the Deerhaven site (Wilson, 1974). Comparisons were made between the Jacksonville wind data and similar data collected in Gainesville. The data were found to be quite similar. Since EPA currently requires air quality modeling for annual average periods to incorporate a five year meteorological record (Burch, EPA, 1977), Jacksonville data were used since the Jacksonville NOAA station is a first order station and data from these stations are readily available from NOAA.

Gainesville is located in the central peninsula of Florida approximately 90 miles (144 km) south of the Georgia-Florida State line. It is near the northern boundary of the trade winds and is characterized by relatively dry winters and rainy summers, a high annual percentage of sunshine, and high humidities. The terrain of the area is level and produces no significant effect on local climatology. Being south of the usual path of winter storms, the area seldom experiences strong winds or severe cold weather. Winds in the area are moderate, blowing from the southwest during the late spring and summer, the northeast in the fall, and the northwest during the winter and early spring. Ground fogs occur during the cool weather season. The fogs form in the late evening to early morning hours as a result of nighttime radiation cooling. Such fog occurs 30 to 40 days per year but is usually dissipated by early morning.

The greatest rainfall is usually in the form of local thundershowers and occurs primarily during the months June through September. During this period measurable amounts of rain can be expected one day in two. The relative humidity averages about 75%, ranging from 90% in the early morning to 55% during the afternoon.

The annual mean temperature for Gainesville is 70° F (21° C). June, July, and August are the hottest months with an average temperature of 81° F (27° C). During December, January, and February, the coldest months, the temperature averages 58° F (14° C). Temperatures fall below freezing about twelve times per year but in most cases the temperature rises above freezing during the daytime hours.

2.6.2 Descriptive Meteorology

Temperature

The annual average temperature for the Gainesville area, based on a 30 year record, is 70° F (21° C). This ranges from an average of 75° F

(24^{o} C) in July to an average of 57^{o} F (14^{o} C) in January. Table 2.6-1 presents the average and extreme monthly and annual temperatures. The extreme temperatures recorded during the period of record (1939-1968) were 104^{o} F (40^{o} C) in June, 1952, and 12^{o} F (-11.1^{o} C) in December, 1962.

The average number of heating degree days per year is 1,108 (65^{o} F base) with greater than 95% of these falling between November and March. The months May through September have no degree days.

Freezing temperatures are not uncommon, occurring about twelve times per year. The first winter freeze normally occurs in early December and the last freeze in mid February. The mean number of non-freeze days between these dates is 295.

Rainfall

The rainfall of the Gainesville area can be divided into two regimes: the wet summer months (characterized by thunderstorm activity) and the dry fall and winter months. Rainfall during the fall and winter is usually generated by the passage of frontal systems. On these occasions the rainfall is widespread and of low intensity.

During the months of June, July, August, and September rainfall is usually in the form of thundershowers. These will occur on the average of one day in two and account for over 50% of the annual rainfall.

Table 2.6-1 Average and Extreme Temperatures - Gainesville, Florida 1939-1968

Month	Average (°C)	MAXIMUM (°C)		MINIMUM (°C)	
		Average	Extreme	Average	Extreme
Jan.	13.4	20.0	31.1	7.5	-8.9
Feb.	15.0	21.9	31.7	8.5	-8.3
Mar.	17.5	24.5	32.8	10.9	-5.0
Apr.	20.8	27.3	35.0	14.0	1.1
May	24.2	30.8	37.8	17.5	6.1
June	26.3	32.5	40.0	20.9	10.5
July	27.1	32.9	38.3	22.1	16.7
Aug.	26.9	32.6	37.2	21.9	16.7
Sept.	26.2	32.5	36.1	21.0	10.0
Oct.	21.9	27.7	35.0	15.6	1.1
Nov.	17.7	24.0	22.2	10.7	-6.1
Dec.	14.5	20.8	30.6	8.1	-11.1
AVERAGE:	21.0 (69.8°F)	27.3 (81.1°F)		14.9 (58.8°F)	
EXTREME:			40.0 (104°F)		-11.1 (12°F)

Rainfall data for the Gainesville area are presented in Table 2.6-2 and rainfall intensity data in Table 2.6-3.

Vertical Mixing and Ventilation

The vertical mixing depth is the thickness of the atmospheric layer, through which turbulent mixing occurs. It is limited at the base (usually) by the earth surface and at the top by a layer of stable air. In air pollution studies the vertical mixing depth defines the vertical dimension of the volume of air that pollutants can be dispersed into. The transverse dimension is defined by the fluctuations in wind direction and by horizontal dispersion. The longitudinal dimension is defined by wind speed and time. The combination of these factors defines atmospheric ventilation.

The vertical mixing depth has no significant effect on the maximum ground-level pollutant concentration until the mixing depth becomes less than twice the physical stack height. In the case of the Deerhaven facility this would be less than 210 meters (2 x 350 ft. stack height). According to Hosler (1961) this occurs approximately 33% of the total hours in the Gainesville area. The annual morning mixing depth averages 450 meters; ranging from 400 meters in the fall and winter to 580 meters in the summer. The annual afternoon mixing depth averages 1,450 meters; ranging from 1,100 meters in the winter to 1,700 meters in the summer (Holzworth, 1972).

Table 2.6-2 Monthly and Annual Rainfall Data - Gainesville, Florida 1954-1976

Month	Average Monthly Rainfall (inches)
January	2.84
February	3.70
March	4.26
April	3.02
May	3.50
June	6.81
July	8.03
August	8.25
September	5.67
October	3.67
November	1.92
December	2.88
ANNUAL:	54.59

Table 2.6-3 Rainfall Intensity Data (Inches of Rainfall for Duration Period) - Gainesville, Florida

Reoccurrence Period (yrs)	Rainfall Duration (Hours)						
	0.5	1	2	3	6	12	24
1	1.3	2.0	2.2	2.4	2.8	3.2	3.7
2	1.7	2.2	2.6	2.8	3.4	3.8	4.3
5	2.1	2.7	3.3	3.5	4.2	4.9	5.8
10	2.4	3.0	3.6	4.0	4.7	5.7	6.7
25	2.6	3.4	4.0	4.5	5.5	6.8	7.8
50	2.9	3.6	4.5	5.0	6.0	7.5	8.6
100	3.2	3.9	5.0	5.5	6.8	8.5	9.5

Holzworth reports that there was only one stagnation period (mixing depth <500 meters and wind speed <6m/s) in the Gainesville area in a five year period. This period lasted three days.

Severe Weather

Since 1885 there have been 75 hurricanes reported in Florida, 42 since 1900. Of the 42 hurricanes since 1900, 10 have passed through the Gainesville area. The storms usually approach from the south to southwest and, because of the relatively long overland travel distance, are usually reduced to tropical storms (wind speeds <73 mph) before reaching Gainesville. The chance of a hurricane force wind in the Gainesville area in any given year is less than 1 in 50 (Dunn, 1960).

In the period 1916-1969, a total of 590 tornadoes have been reported in Florida. Approximately 66 of these were associated with the passage of tropical storms. According to statistics compiled by Thom (1963), the mean annual frequency of a tornado occurring in a one degree square (4,145 square miles) centered at Gainesville is 0.65. The probability of a tornado hitting any given spot in the Gainesville area is 0.000442 or once in 2,260 years.

The extreme wind speed (Thom, 1967) expected to occur once in 100 years in the Gainesville area is 110 mph; that expected in 50 years is 90 mph; and that expected in 25 years is 80 mph. Based on a gustiness factor of 1.3 (Huss, 1946), the extreme gust expected in 100 years is 143 mph.

Hailstorms (Flora, 1956) occur quite infrequently in Florida. During the period 1904 to 1943 the frequency of occurrence statewide was less than one per year. During the period 1925-1954, 37 hailstorms were reported in Florida. Approximately 60% of these occurred in April and May and most occurred between the hours of 1400-1800. Of the 37 hailstorms reported during the 1925-1954 period, no severe storms (damage >$100,000) occurred in the Gainesville area.

Humidity and Fog

Humidity is of importance because of the fogging potential created by cooling towers. It has been reported (GPU Report, 1972) that the potential for artificially created fog occurs when there is a deficit between the actual and saturation moisture content of air of less than 0.1 gram per cubic meter. This deficit is related to air temperature and relative humidity as defined in Table 2.6-4.

In Gainesville such a deficit existed 422 total hours in 1975. The deficit was zero (100% relative humidity) in 155, or approximately 37% of the cases.

Fog normally occurs 30 to 40 days per year in Gainesville. The fog forms at night or in the early morning and is generally dissipated by mid morning. Periods of fog are usually five to six hours in duration.

Table 2.6-4 Relative Humidity at Various Air Temperatures to Give a Deficit Between Actual and Saturation Humidity of $\leq$0.1 gram/meter

Dry Bulb Temperature (°C)	(°F)	Relative Humidity (%)
>18	>65	$\geq$99
16	60	$\geq$98
13	55	$\geq$98
10	50	$\geq$97
4	40	$\geq$96
-1	30	$\geq$93
-7	20	$\geq$86
-12	10	$\geq$82

Wind and Atmospheric Stability

Wind and atmospheric stability are two of the three major factors affecting atmospheric ventilation, the rate of air pollutant dispersion. Wind direction and the horizontal dispersion rate (a function of stability) define the transverse dimension of the volume of air into which a pollutant is dispersed. Wind speed and time define the longitudinal dimension.

Wind and stability data from both Jacksonville and Gainesville were considered for the Deerhaven site evaluation. In earlier studies (Wilson, 1974) Jacksonville and Gainesville wind and stability data were input to a long-term air quality model at the request of the Florida Department of Environmental Regulation and the model outputs compared. This comparison showed that there was no significant difference in the meteorological data from the two locations.

The Jacksonville weather station is a first order station, and data are readily available from the NOAA National Climatic Center. The Gainesville station is an FAA Station and data are available only on original log sheets. Since EPA now requires long-term air quality models to be run with a five year record of meteorological data (Burch, EPA, 1977), and since the Jacksonville and Gainesville meteorological data are similar, the more readily available Jacksonville data were selected for use.

The atmospheric stability categories are defined from measurements of insolation and wind speed. Jacksonville data were used for this purpose also. The atmospheric stability categories were defined by the system of Turner (1961). The area has an occurrence of unstable conditions 22% of the time, neutral conditions 37%; and stable conditions 41%.

For comparative purposes the wind direction distribution for 1973 in Gainesville and 1970-1974 in Jacksonville are shown in Figure 2.6-1. Winds are normally from the northeast in the fall, northwest in the winter and early spring and southwest in the summer. The annual average wind speed is 3.1 meters per second (7 mph), with 95% of the winds less than 5.9 meters per second (13 mph), 78% less than 4.4 meters per second (10 mph), and 56% less than 3.0 meters/second (7 mph) (Dohrenwend, 1974). The maximum wind speed, occurring with the passing of hurricane Donna in 1964, was 36.6 meters per second (82 mph).

Joint wind speed/wind direction/stability frequencies are presented in Table 2.6-5 for the five year period 1970-1974 for Jacksonville, Florida.

2.7 Ecology

The area terrestrial systems have been highly modified by development, farming, or forestry practices. Mixed upland and floodplain hardwoods occur primarily along streams and section lines in the area. Pine flatwoods with associated cypress domes and bay head occupy the headwaters area for all three streams (Turkey, Cellon and Rocky Creeks) (Breedlove, 1976b). Major portions of the pine flatwoods, north and east of the site, are owned by Owens-Illinois and are in planted pine (Figure 2.2-1).

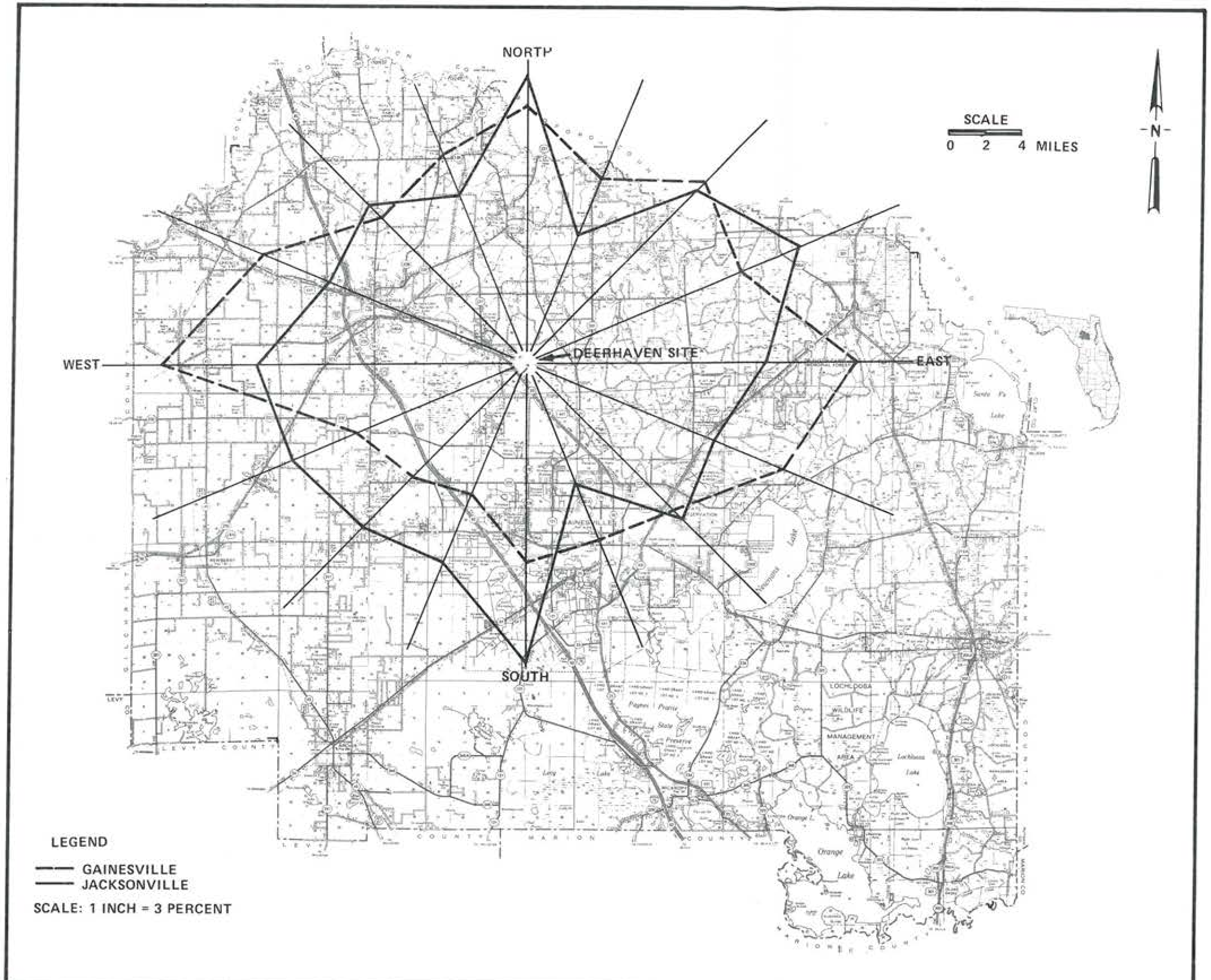


FIGURE 2.6-1 WIND DIRECTION FREQUENCY DRISTRIBUTION FOR 1973 ANNUAL PERIOD - JACKSONVILLE AND GAINESVILLE, FLORIDA.

Table 2.6-5 Meteorological Input Data for the Annual Season Five-Year Data Base (1970-1974) - Jacksonville, Florida - Stability Class 1

Wind Direction	Windspeed Class 1	2	3	4	5	6
N	0.0002	0.0002	0.0	0.0	0.0	0.0
NNE	0.0001	0.0001	0.0	0.0	0.0	0.0
NE	0.0003	0.0002	0.0	0.0	0.0	0.0
ENE	0.0003	0.0003	0.0	0.0	0.0	0.0
E	0.0005	0.0006	0.0	0.0	0.0	0.0
ESE	0.0002	0.0004	0.0	0.0	0.0	0.0
SE	0.0000	0.0001	0.0	0.0	0.0	0.0
SSE	0.0003	0.0003	0.0	0.0	0.0	0.0
S	0.0003	0.0004	0.0	0.0	0.0	0.0
SSW	0.0001	0.0002	0.0	0.0	0.0	0.0
SW	0.0002	0.0005	0.0	0.0	0.0	0.0
WSW	0.0003	0.0007	0.0	0.0	0.0	0.0
W	0.0001	0.0002	0.0	0.0	0.0	0.0
WNW	0.0002	0.0003	0.0	0.0	0.0	0.0
NW	0.0004	0.0003	0.0	0.0	0.0	0.0
NNW	0.0002	0.0002	0.0	0.0	0.0	0.0

NOTES: Mixing Depth = 1000. meters
Ambient Temperature = 293. degrees, Kelvin
Ambient Temperature = 1000. millibars

Table 2.6-5 Meteorological Input Data for the Annual Season Five-Year Data Base (1970-1974) - Jacksonville, Florida - Stability Class 2

Wind Direction	Windspeed Class 1	2	3	4	5	6
N	0.0022	0.0024	0.0008	0.0	0.0	0.0
NNE	0.0008	0.0011	0.0009	0.0	0.0	0.0
NE	0.0006	0.0010	0.0011	0.0	0.0	0.0
ENE	0.0010	0.0016	0.0012	0.0	0.0	0.0
E	0.0007	0.0025	0.0018	0.0	0.0	0.0
ESE	0.0006	0.0013	0.0014	0.0	0.0	0.0
SE	0.0013	0.0022	0.0014	0.0	0.0	0.0
SSE	0.0004	0.0010	0.0009	0.0	0.0	0.0
S	0.0014	0.0024	0.0015	0.0	0.0	0.0
SSW	0.0009	0.0014	0.0009	0.0	0.0	0.0
SW	0.0018	0.0025	0.0023	0.0	0.0	0.0
WSW	0.0013	0.0029	0.0019	0.0	0.0	0.0
W	0.0017	0.0027	0.0024	0.0	0.0	0.0
WNW	0.0010	0.0023	0.0012	0.0	0.0	0.0
NW	0.0014	0.0027	0.0013	0.0	0.0	0.0
NNW	0.0012	0.0014	0.0009	0.0	0.0	0.0

Table 2.6-5 Meteorological Input Data for the Annual Season Five-Year Data Base (1970-1974) - Jacksonville, Florida - Stability Class 3

Wind Direction	Windspeed Class 1	2	3	4	5	6
N	0.0012	0.0027	0.0033	0.0001	0.0	0.0
NNE	0.0006	0.0014	0.0021	0.0005	0.0	0.0
NE	0.0006	0.0013	0.0039	0.0005	0.0	0.0
ENE	0.0005	0.0016	0.0064	0.0018	0.0	0.0
E	0.0004	0.0011	0.0092	0.0028	0.0001	0.0
ESE	0.0002	0.0009	0.0062	0.0019	0.0	0.0
SE	0.0006	0.0016	0.0055	0.0017	0.0	0.0
SSE	0.0009	0.0012	0.0024	0.0003	0.0	0.0
S	0.0012	0.0023	0.0042	0.0006	0.0	0.0
SSW	0.0007	0.0018	0.0040	0.0009	0.0001	0.0
SW	0.0010	0.0025	0.0051	0.0012	0.0001	0.0
WSW	0.0011	0.0027	0.0079	0.0012	0.0	0.0
W	0.0010	0.0037	0.0074	0.0019	0.0002	0.0
WNW	0.0009	0.0014	0.0036	0.0010	0.0001	0.0
NW	0.0011	0.0019	0.0040	0.0006	0.0	0.0001
NNW	0.0007	0.0010	0.0022	0.0002	0.0	0.0

Table 2.6-5 Meteorological Input Data for the Annual Season Five-Year Data Base (1970-1974) - Jacksonville, Florida - Stability Class 4

	Windspeed Class					
Wind Direction	1	2	3	4	5	6
N	0.0025	0.0052	0.0123	0.0047	0.0001	0.0001
NNE	0.0008	0.0029	0.0075	0.0084	0.0005	0.0001
NE	0.0007	0.0033	0.0092	0.0156	0.0023	0.0003
ENE	0.0009	0.0034	0.0094	0.0125	0.0011	0.0
E	0.0013	0.0042	0.0103	0.0125	0.0007	0.0
ESE	0.0006	0.0027	0.0077	0.0077	0.0003	0.0001
SE	0.0007	0.0021	0.0090	0.0107	0.0006	0.0001
SSE	0.0008	0.0027	0.0064	0.0042	0.0005	0.0001
S	0.0016	0.0048	0.0122	0.0075	0.0005	0.0
SSW	0.0010	0.0029	0.0088	0.0055	0.0003	0.0
SW	0.0010	0.0041	0.0130	0.0101	0.0012	0.0
WSW	0.0010	0.0032	0.0090	0.0094	0.0010	0.0002
W	0.0011	0.0044	0.0080	0.0123	0.0026	0.0005
WNW	0.0011	0.0032	0.0041	0.0084	0.0023	0.0003
NW	0.0010	0.0027	0.0060	0.0075	0.0017	0.0001
NNW	0.0009	0.0027	0.0051	0.0041	0.0002	0.0

Table 2.6-5 Meteorological Input Data for the Annual Season Five-Year Data Base (1970-1974) - Jacksonville, Florida - Stability Class 5

Wind Direction	Windspeed Class 1	2	3	4	5	6
N	0.0146	0.0149	0.0048	0.0	0.0	0.0
NNE	0.0048	0.0051	0.0011	0.0	0.0	0.0
NE	0.0061	0.0069	0.0013	0.0	0.0	0.0
ENE	0.0086	0.0121	0.0017	0.0	0.0	0.0
E	0.0076	0.0104	0.0036	0.0	0.0	0.0
ESE	0.0068	0.0085	0.0045	0.0	0.0	0.0
SE	0.0087	0.0125	0.0050	0.0	0.0	0.0
SSE	0.0075	0.0077	0.0024	0.0	0.0	0.0
S	0.0149	0.0178	0.0034	0.0	0.0	0.0
SSW	0.0101	0.0138	0.0020	0.0	0.0	0.0
SW	0.0126	0.0165	0.0038	0.0	0.0	0.0
WSW	0.0124	0.0156	0.0062	0.0	0.0	0.0
W	0.0176	0.0164	0.0061	0.0	0.0	0.0
WNW	0.0149	0.0118	0.0036	0.0	0.0	0.0
NW	0.0112	0.0113	0.0040	0.0	0.0	0.0
NNW	0.0095	0.0082	0.0032	0.0	0.0	0.0

2.7.1 Site Ecology

Terrestrial Communities

Like most land in this area of Alachua County, the site is flat and poorly drained with vegetation consisting largely of pine flatwood plantations interspersed with cypress domes.

The flatwoods have an overstory of slash pine (*Pinus elliottii*) and an understory dominated by saw palmetto (*Serenoa repens*), gallberry (*Ilex galabra*), wax myrtle (*Myrica cerifera*) and *Vaccinium* sp. The principal ground cover is pineland threeawn (*Aristida stricta*), broom sedge (*Andropogon* sp.), and various ferns and lichens.

The cypress domes are dominated by pond cypress (*Taxodium ascendens*), interspersed with red maple (*Acer rubrum*), black gum (*Nyssa biflora*), sweet bay (*Magnolia virginiana*), red bay (*Persea* sp.) and loblolly bay (*Gordonia lasianthus*). Understory dominants are typically fetterbush (*Lyonia lucida*) and wax myrtle. Various ferns dominate the ground strata.

There are two minor exposures of well drained, fine sandy soil within the property boundary. One is located along the northern edge of the tract near the western boundary and includes a 40 acre field which was cultivated prior to site aquisition. The other area, approximately 7 acres north of the plant, is occupied by early successional, hardwood pines, and shrubs; grasses and sedges are found in open areas.

The wildlife characteristic of the site is typical of other pineland areas in the region (Section 2.7.2). Whitetailed deer are known to occur within the site boundary though their population size has not been determined. Deer movement across the property borders is restricted by the high fence which surrounds the site. Other commonly observed animals include raccoon, oppossum, armadillo and a variety of birds and small mammals. There are no significant breeding areas or endangered species habitats on the property and no utilization by an endangered species is known (Crider, 1976).

Aquatic Communities

There is no open, standing water on site other than a roadside ditch located along a portion of the eastern property boundary. Although relatively broad and deep, the ditch is not a significant aquatic habitat either in terms of fish production or use by upland wildlife.

Unit 1 blowdown is discharged into a small canal which flows for a distance of 300 yards before dispersing into a 28-acre cypress dome west of the facility. The canal is six to eight feet wide at the water surface and has steeply sloping banks five feet in height. Flow in Turkey Creek above the discharge canal is minor relative to the blowdown volume and is seasonally intermittent. The canal banks are partially clear of vegetation and presently eroded. Wax myrtle, blackberry and Carolina willow (Salix caroliniana) grow at the water edge.

Within the canal, cattail (Typha latifolia) and Ludwigia sp. are dominant upstream and downstream of the outfall but do not occur in the direct vicinity of the outfall. There are no submergent vascular plants. Gambusia, a hardy live-bearing fish common throughout the state, is abundant in the canal except adjacent to the outfall and for a short distance downstream. Periphyton and benthic invertebrates are also rare to non-existent along this stretch, though they are present elsewhere along the canal.

The canal empties into a 28-acre cypress swamp which is one of the farthest upstream swamps contributing to Turkey Creek. Water enters as a shallow flow over a sediment delta in the upper end of the swamp and leaves through a narrow outlet bordered by cypress trees. Cypress roots have prevented the outlet from eroding.

Since Unit 1 began operation in 1972, vegetation in the swamp has undergone adjustment to the increased water volume. The dome may be divided into three effect zones on the basis of plant reaction to the input of cooling tower blowdown. These are: (1) the sediment delta in the upper portion of the swamp; (2) the swamp center, which consists of water tolerant vegetation which was occasionally flooded prior to the constant Unit 1 input; and (3) the swamp edge, which characteristically did not flood and in which intolerant species have died following the addition of blowdown.

The sediment delta is three to four acres in size. It originally contained water intolerant vegetation such as sweet gum and several species of oak and pine. In the period since the addition of blowdown, sustained soil saturation and deposition of sand eroded from the outfall canal have killed the former vegetation. Tolerant woody vegetation has not become established due to the short interval since the initiation of blowdown related effects. However, lizard's tail (Saururus cernuus), a species characteristic of shallow water systems, is prevalent and forms a dense cover over much of the delta.

The dome interior has a relatively open canopy of cypress and black gum, the majority of which are less than 20 inches in diameter at breast height. Sections of turpentine pine are found, indicating that dry conditions persisted in this area for a long time prior to Deerhaven operations.

Most of the understory vegetation is restricted to material projecting above the water level. Old tree stumps, logs, and boles of trees with matted organic matter around their bases serve as a sufficiently dry substrate to support a variety of plant species with varying degrees of water tolerance. These species include cinnamon fern (Osmunda cinnamomea), royal fern (Osmunda regalis), swamp rose (Rosa palustris), buttonbush (Cephalanthus occidentalis) and Virginia willow (Itea virginica).

The water surface serves as the other major substrate supporting vegetation in the dome interior. As the velocity of water over the sediment delta decreases, duckweed (Lemna sp.) begins to cover the surface. Other species in the surface mat are Azolla wolffia and floating heart (Nymphoides sp.). The dome interior is covered with this mat of floating species except near the outfall of the dome. A patch of sawgrass (Cladium jamaicensis) has become established near the swamp exit.

The constant water input to the swamp has resulted in persistent shallow flooding of a narrow border of water intolerant vegetation around the periphery of the cypress dome. Water depth ranges from a saturated soil condition to standing water several inches deep. Species affected by the flooding include slash pine, wax myrtle, fetterbush and gallberry.

Animal species found in the cypress swamp include water moccasin, rabbits, raccoon, wood duck, tree frogs, Gambusia and crayfish. Benthic invertebrates have been sampled (Breedlove, 1975), and reveal low numbers of organisms and taxa.

Water leaves the dome through a channelized stream which extends for a distance of 300 yards, connecting the swamp to the natural stream channel at U.S. 441. The channel has moderate slopes, one to two foot banks and a width of six to eight feet. Soil banks along the side of the canal are covered with vegetation, which includes Juncus sp., Scirpus sp., wax myrtle, Carolina willow and rose. Smartweed (Polygonum sp.) and Ludwigia sp. dominate the canal itself. Principal invertebrate species along the canal include dragonfly larvae and bloodworms. Vertebrate species which utilize the canal include Gambusia, snakes, amphibians and small mammals and birds.

2.7.2 The Project Area Within a Five Mile Radius

2.7.2.1 Plant Communities

Of the seven major forest communities characterizing north central Florida (Monk, 1968), six are represented within five miles of the project area (Figure 2.2-1). These include: (1) pine flatwoods; (2) sandhills; (3) cypress swamps; (4) mixed hardwood swamps; (5) bayheads; and (6) southern mixed hardwoods. In the following sections, each of these community types is described in terms of its general physiography, vegetation, successional status, wildlife relationships, existing land use, and environmental stress factors. The production characteristics and wildlife relationships of agricultural land within the area of concern are also discussed.

Pine Flatwoods and Pine Plantations

The pine flatwoods are the most abundant vegetation type in Florida and the most common community in the project vicinity. Flatwoods occupy level to gently rolling sites. Surface soils are sandy, acid and low in plant nutrients. There are few flatwoods sites within the area which are not under intensive pulpwood management. Since the composition and density of vegetation within each stand is directly related to age and management intensity, the community exhibits considerable local variation.

The dominant tree (overstory) species is slash pine, although Longleaf pine (Pinus palustris) is occasionally dominant on drier sites. Commonly encountered woody understory species include saw palmetto, gallberry, wax myrtle, huckleberry (Gaylussacia sp.) and several species of Vaccinium.

Ground cover species are wire grass (Aristida stricta), broom sedge, several ferns and a lichen (Cladonia sp.).

Pine flatwoods and pine plantations are sub-climax communities which require periodic burning or management intervention to prevent succession into southern mixed hardwoods.

Where understory and ground cover are well established, the flatwoods provide suitable habitat for a variety of herbivorous and omnivorous animal species such as whitetailed deer, armadillo, rabbits and various rodents and songbirds. Predatory animals include various frogs, lizards, snakes, hawks, owls and occasionally bobcat and gray fox.

Pine plantations are notably devoid of diverse wildlife populations when the canopy of densely planted pines reaches sufficient size to shade out understory and ground cover vegetation. Recently planted plantations, however, develop a ground cover similar to that of abandoned agricultural fields and are capable of supporting sizeable small mammal and bird populations. Large sections of the pine plantations within the project area have been recently planted. In addition, the intensely managed pinelands are interspersed with swamps and strands of mixed hardwoods which aid in improving the habitat diversity of the area through the provision of valuable edge and ecotone habitats.

Sandhills

Sandhills are a community type which occupy well-drained, sandy sites with undulating to gently sloping relief. This community is of limited extent in the project vicinity and is largely confined to the San Felasco Hammock. There are two recognized variants or phases of the community: (1) the pine-southern red oak forest; and (2) the longleaf pine-turkey oak forest (Alachua Audubon Society, 1973).

The pine-southern red oak phase has an open canopy dominated by longleaf pine, red oak (Quercus falcata), mockernut hickory (Carya floridana), and occasionally sand post oak (Quercus stellata var. margaretta) and turkey oak (Quercus laevis). The longleaf pine-turkey oak phase is dominated by longleaf pine, turkey oak and occasionally blue jack oak (Quercus incana), sand post oak and southern red oak. Immature overstory trees comprise the majority of the woody understory. The ground stratum is dominated by wire grass, although sassafras (Sassafras albidum) and running chinquapin (Castanea alnifolia) are common in some locations.

Both of these communities are fire-maintained sub-climaxes. Succession is toward the mesic or xeric phase of the southern mixed hardwoods. The pine-southern red oak forest is considered to be successionally intermediate between mesic hammock and longleaf pine-turkey oak forest (Monk, 1968).

Due to high evaporation rates and the rapid percolation of rainwater through sandy soil, sandhill communities are characteristically dry and subject to extremes in temperature. As a result, much of the associated fauna is adapted to a burrowing existence. The pocket gopher and gopher tortoise are common. A variety of snakes, lizards and amphibians, which are incapable of burrowing, inhabit the gopher tortoise burrows. Included among these are the diamond-backed rattlesnake and the threatened indigo snake and gopher frog (Alachua Audubon Society, 1973). Unusually high acorn production in the sandhills provides food for such primary consumers as whitetailed deer, gray squirrel and the threatened fox squirrel. Predators such as bobcat, gray fox, skunk, hawks and owls frequent these areas.

Cypress Swamps

Cypress swamps occur within the area as isolated communities occupying pineland depressions and as strands along the sluggish headwaters of various streams. Soils consist of acidic organic peat and muck. The smaller, more isolated sites are commonly referred to as cypress heads or domes. These depressions are seasonally flooded by rainfall and lateral seepage and contribute to the drainage of surrounding flatwoods. Water loss in depressions occurs primarily through evapotranspiration, though slow lateral drainage occurs into the headwater areas.

Plant species found in cypress swamps are generally tolerant of a high water table and can withstand prolonged seasonal flooding. However, most of these species require a dry seed bed to germinate and become established. Therefore, a fluctuating water table is necessary for the long-term existence of the community.

The cypress dome dominant overstory species is pond cypress. Other species, such as red maple, black gum, sweet bay, red bay, loblolly bay and slash pine become more common at drier sites or along the community edges. Important woody understory species include fetterbush and wax myrtle. Herbaceous ground cover includes sphagnum (Sphagnum sp.) and several ferns.

Cypress swamps are a sub-climax community which gradually succeed into a bayhead or mixed hardwood swamp as the organic substrate accumulates and seasonal inundation becomes less prolonged. Improved drainage through channelization can speed this successional process. Most of the cypress swamps within the managed pineland areas have been channelized and lumbered.

As an integral part of the flatwoods system, cypress swamps provide nesting, breeding and escape cover and additional food to raccoon, oppossum, deer, rabbit and a variety of snakes and wading birds. The aquatic habitat supports a variety of amphibians and reptiles.

Mixed Hardwood Swamps

Mixed hardwood swamps occupy seasonally flooded sites along creeks and basin headwater areas. Their surface soils are moderately acidic and high in organic matter and nutrients.

Broad-leaved deciduous trees dominate the community. The more commonly encountered species include black gum, bald cypress (Taxodium distichum) pop ash (Fraxinus caroliniana), red maple and sweet gum (Liquidambar styraciflua). Laurel oak (Quercus laurifolia), water oak (Quercus nigra), Florida elm (Ulmus floridana), dahoon (Ilex cassine), sweet bay, wax myrtle, button bush (Cephalanthus occidentalis), and American horn beam (Carpinus caroliniana) are important subdominants. The ground cover is variable and usually dominated by seedlings and a variety of ferns.

The best examples of this community type within the project area include two relatively large (132 acres) mixed hardwood creek swamps located along Rocky Creek about three miles southeast of LaCrosse, and an 80 acre hardwood/bald cypress swamp at the mouth of Blue's Creek within the San Felasco Hammock. A relatively rare variant of the community type, a water elm swamp, occupies about 100 acres in Sanchez Prairie and a few other small areas within the San Felasco Hammock (Alachua Audubon Society, 1973). This community is dominated by water elm (Planera aquatica) found in conjunction with Carolina ash (Fraxinus caroliniana).

Mixed hardwood swamps are considered a climax stage in wetland plant succession. However, drainage improvements can bring about transformation into a moist southern mixed hardwood community (Monk, 1968).

Mixed hardwood swamps provide valuable nesting habitat to local breeding birds, which include wood ducks, woodpeckers, hawks, owls and a variety of songbirds. They are also important feeding and refuge areas for deer, rabbits, wild turkey, oppossum, raccoon, gray fox, bobcat, gray squirrel, rats and mice. A well developed, insect-based food chain, which includes most local amphibians and a variety of aquatic and upland snakes, is also characteristic of these swamps.

Bayheads

Bayheads are another swamp community occupying depressions and headwater sites within the project area. These communities are seasonally flooded though not to the depth characteristic of the cypress or mixed hardwood swamps. The soils are peaty, highly acid and relatively sterile.

The vegetation is dominated by broad-leaved evergreens. Typical dominants include sweet bay, swamp bay (*Persea palustris*), loblolly bay and cypress. Sweet gum, red maple, loblolly pine, slash pine, and black gum are either locally dominant or subdominant. Wetter areas contain a higher percentage of cypress and black gum. Fetterbush is the most prevalent shrub and sometimes forms dense thickets, although Virginia willow and buttonbush are also abundant.

Bayheads are the climax stage of succession in peaty areas. However, like the mixed hardwood swamp, they may, with improved drainage, be gradually transformed into a moist southern mixed hardwood community.

Like the other wooded swamplands in the area, bayheads are important feeding and refuge sites for local upland wildlife. This evergreen dominated community type is especially important for cover and forage during winter months when the cypress and hardwood dominated swamps lose their deciduous foliage.

Southern Mixed Hardwoods

Southern mixed hardwoods are a highly variable, hardwood dominated upland community type found where limestone and phosphatic deposits outcrop or in less fertile areas where fire has been suppressed long enough for hardwoods to assume dominance over pines (Monk, 1965). These areas are also commonly referred to as "hammocks" and are further distinguished on the basis of soil moisture into hydric (wet), mesic (moderate), and xeric (dry) hammock types. The San Felasco tract contains the largest stand (approximately 3,300 acres) of mesic hammock in the State of Florida. Hydric hammock is the predominant community type within the Sanchez Prairie area of San Felasco Hammock. Other less extensive stands of upland mixed hardwoods are scattered throughout the surrounding area bordering swamps and creeks, along section lines and in uplands not being intensely managed for pine or agriculture.

The southern mixed hardwoods community has the highest plant diversity found in the State. Monk (1965) reported finding a minimum of 71 different important tree species. Typical species include: southern magnolia (Magnolia grandiflora), live oak (Quercus virginiana), laurel oak, water oak, red maple, Florida maple (Acer barbatum), Florida elm, hickory (Carya sp.), spruce pine (Pinus glabra), and loblolly pine (Pinus taeda). The understory includes wax myrtle, American holly (Ilex opaca), dahoon, American horn beam, dogwood (Cornus sp.), several hawthorn species (Crataegus sp.) and a variety of flowering shrubs. Generally, the mesic and hydric sites are dominated by a greater proportion of deciduous species, while drier and sterile sites are dominated by a greater percentage of evergreens (Monk, 1966). In addition, the density of trees increases from dry to mesic sites and slightly decreases from mesic to wet sites (Monk, 1966 and 1968).

The southern mixed hardwoods are the climax of upland succession in north-central Florida (Monk, 1968). Their development is initiated whenever the pine dominated communities are protected from periodic burning, or when the swamp communities are protected from prolonged flooding.

The community displays such a wide variety of habitats that most local upland wildlife species may be expected to inhabit a mixed hardwoods forest. Mast production is high and is extensively utilized by deer, turkey, squirrel, raccoon and other small mammals. The large size of the San Felasco tract makes it an especially good habitat for such wide ranging species as deer, bobcat, and fox.

Agricultural Land

Alachua County is a leading county in the state in terms of agricultural diversity and among the top five in total agricultural production (Andrews, 1977). Agricultural lands comprise about 385,000 acres, or 67% of the total county land area. Approximately 52% of the county is in commercial timber production, 31% in improved pasture or pasture crops such as hay and improved pasture, and 16% in vegetable, fruit, and field crops. Current production statistics for the major crops are given in Table 2.7-1.

Within the five mile radius of the existing Deerhaven facility, agricultural development occurs on the well drained areas north and west of the site. Crops produced on active farmlands vary from year to year but largely reflect the production characteristics of the county.

The University of Florida operates a dairy farm three miles northwest of the Deerhaven plant and an Agricultural Experiment Station four miles to the southwest. The experiment station produces vegetables, turf, and a variety of fruits, including peaches, nectarines, tangelos, apples, pears, blueberries, avocados, and plums.

There are ten commercial horticultural and fruit crop operations within the five mile area (Figure 2.2-1). They currently produce blueberries, strawberries, blackberries, grapes and a variety of fruit trees and ornamentals.

Table 2.7-1 Agricultural Production Statistics for Alachua County, 1976

Crop	Production (Acres/Yr)	Production (Per Acre)	Total Value
Corn	35,000	70 Bu.	$5,000,000
Tobacco	2,000	2,000 Lb.	$4,000,000
Peanuts	2,000	3,500 Lb.	$2,000,000
Soybeans	10,000	35 Bu.	$2,000,000
Watermelon	4,500	30,000 Lb.	$1,500,000
Hay Crops	20,000	300 Bales	$2,250,000
Improved Pasture	100,000	0.5 Cow	---
Fruits and Nuts	4,000	Variable	$1,000,000
Vegetable Crops*	7,500	Variable	$3,500,000
Timber	200,000		$4,500,000

*Principal vegetable crops include peppers, cucumbers, squash, beans and eggplant.

Source: Mr. A.T. Andrews, County Agricultural Agent, Alachua County.

As a wildlife habitat, crop and pasture lands can supply an abundance of food, though utilization of these areas by less mobile upland species is limited by a lack of plant diversity and/or cover. The principal species are insectivorous and granivorous birds. Less mobile mammal species require adequate cover, making their use of these areas dependent upon the size of the plot and its relation to wooded refuges.

2.7.2.2 Other Natural Features and Considerations

2.7.2.2.1 Rare, Threatened and Endangered Species

The Florida Audubon Society Committee on Rare and Endangered Plants and Animals (Florida Audubon Society, 1974), the Florida Game and Fresh Water Fish Commission (FGFWFC, 1975), and the U.S. Department of the Interior (USDI, 1976) lists of species whose existence is endangered or threatened have been reviewed and an inclusive area specific list developed.

The Florida Committee on Rare and Endangered Plants and Animals lists five categories of concern for rare and endangered plants and animals. Other sources of species lists present similar definitions.

Endangered

Plants or animals in imminent danger of extinction or extirpation if the deleterious factors affecting them continue to operate. These are forms whose numbers have already been so drastically reduced or degraded that immediate action is required to prevent their loss.

Threatened

Forms believed likely to become endangered in the near future if the causal factors now at work continue to operate. Included in this category are taxa in which most or all populations are decreasing because of over-exploitation or environmental disturbance; taxa whose populations have been heavily depleted by adverse factors and, while not actually endangered, are still in critical condition; and taxa which may still be relatively abundant but are under threat from serious adverse factors throughout their range.

Rare

Species, subspecies, or unique local populations which, though not presently endangered or threatened as defined above, are potentially at risk because they are only found within a restricted geographic range. They may be insular or otherwise isolated forms or relict populations with wider distribution.

Species of Special Concern

Forms that do not clearly fit into any of the foregoing categories, yet which warrant special attention. Included are forms that, although presently relatively abundant, are particularly vulnerable to certain types of exploitation or environmental modifications and have experienced long-term population decline and forms whose status in Florida may have significant impact on endangered or threatened species elsewhere.

Status Undetermined

Species, subspecies, or local populations that are suspected of falling in one of the above categories but for which the available data are not adequate to provide the basis for a decision.

Vertebrates

Vertebrate species and subspecies that have been placed in one of the above categories that are known or expected to occur in Alachua County and their habitat preference are presented in Table 2.7-2. Table 2.7-3 provides summary statistics for vertebrates listed in Table 2.7-2. Included are eight endangered, 13 threatened, 12 rare, and 12 species of special concern. Additional information on those species which may be affected by any or all of the discharge alternatives is provided below.

Endangered Vertebrates

Woodstork

The woodstork is not currently listed by the USDI (1976) as either endangered or threatened; however, the Florida Committee lists it as endangered, and the FGFWFC lists it as threatened. Although the closest known rookeries are in Micanopy and near Newnan's Lake, this bird will travel as far as 40 miles one-way between rookeries and feeding sites. Therefore, the woodstork may presently or potentially utilize portions of Rocky Creek Swamp, Cellon Creek marsh, and/or Sanchez Prairie for feeding. Due to their specialized feeding technique, storks are adversely affected by any alteration in hydro-period or water quality which reduces total fish biomass in wetlands.

Table 2.7-2 Rare and Endangered Vertebrates of Alachua County, Florida, Their Status, Preferred Habitat and Occurrence

Species	Status USDI[1]	Status FGFWFC[2]	Status FC[3]	Habitat Preference	Occurrence in Alachua County
BIRDS					
Wood Stork (*Mycteria americana*)	--	T	E	Primarily cypress and mangrove swamps; areas where fish become concentrated during periods of falling water are attractive feeding sites.	Locally common resident; Micanopy and Newnan's Lake.
American Peregrine Falcon (*Falco peregrinus*)	E	E	E	Opportunistic, may exploit among others the birdlife of agricultural areas.	Extremely rare transient, winter resident. Highly unlikely in area of concern.
Red Cocaded Woodpecker (*Dendrocopus borealis hylonomus*)	E	E	E	Mature to overmature stands of southern pines (especially longleaf).	Uncommon resident.
Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*)	--	E	E	Stunted growth of saw palmetto and dwarf oaks. May be adapting to cattle pastures.	Uncommon to rare.
Southern Bald Eagle (*Haliaeetus l. leucocephalus*)	E	T	T	Primarily associated with the coast or lake and river shores, usually nesting near where they feed along shore or over shallow water bodies. Some interior pairs nest on tree islands in large marshes or in mainly dry prairies with small marshes and ponds, far from open water. Outside nesting season not as closely limited to shores. Gathers where food is most easily available.	Rare resident. Formerly bred.
Osprey (*Pandion haliaetus carolinensis*)	--	T	T	Nests placed in tops of living or dead cypress, mangrove pine, or swamp hardwoods near sea coasts, interior lakes, large swamps, or large rivers. Quite tolerant of people where not disturbed and may locate on utility poles, radio towers, channel markers, etc. near water. Occur anywhere in state where there is a water body with abundance of fish for food.	Fairly common resident.

Table 2.7-2 Rare and Endangered Vertebrates of Alachua County, Florida, Their Status, Preferred Habitat and Occurrence (continued)

Species	Status USDI[1]	FGFWFC[2]	FC[3]	Habitat Preference	Occurrence in Alachua County
American Kestrel (*Falco sparverius palus*)	--	T	T	Open field oriented - prefers open pine forests where dead trees found.	Vagrant. Does not occur in area of concern.
Audubon's Caracara (*Caracara cheriway auduboni*)	--	T	T	Dry prairies with scattered cabbage palms and wetter areas. Also occurs in improved pasture land and in relatively wooded areas with limited stretches of open grassland.	Vagrant. Does not occur in area of concern.
Sandhill Crane (*Grus canadensis pratensis*)	T	T	T	Prefers wet prairies, lake margins, low-lying improved cattle pastures, sparsely vegetated marshes, shallow-flooded open areas. Avoids forests, deep marshes, and areas of heavy human utilization.	Common winter visitor. Few breed on Paynes Prairie.
Florida Scrub Jay (*Aphelocoma coerulescens coerulescens*)	--	T	T	Resides permanently in oak scrub consisting of live oak, myrtle oak, Chapman oak, along with saw palmetto, sand palmetto, and scattered sand pine and rosemary. Avoids wet habitats and forests (including canopied sand pine stands).	Uncommon resident. Does not occur in the area of concern.
Great White Heron (*Ardea herodias occidentalis*)	--	T	SC	May feed in interior wetlands.	Sporadic. Does not occur in the area of concern.
Antillean Night Hawk (*Chordeiles minor vicivus*)	--	--	R	Feeds in the air over open terrain and nests in any large area of bare or lightly vegetated ground.	Common summer resident.
American Redstart (*Setophaga ruticilla ruticilla*)	--	--	R	Preferred breeding habitat is second growth deciduous woodland, usually with a canopy of larger, mature trees. Usually found in low, wet areas. Habitat tolerance much greater in migration.	Fairly common transient.
Louisiana Waterthrush (*Seiurus motacilla*)	--	--	R	Confined to wooded streams and swamps; can nest in cavity of roots of fallen trees or cavities in steep banks.	Uncommon summer resident.

Table 2.7-2 Rare and Endangered Vertebrates of Alachua County, Florida, Their Status, Preferred Habitat and Occurrence (continued)

Species	Status USDI[1]	Status FGFWFC[2]	Status FC[3]	Habitat Preference	Occurrence in Alachua County
Short-tailed Hawk (*Buteo brachyurus fuliginosus*)	--	--	R	Mature cypress, riparian hardwoods, mangroves, or pines, particularly adjacent to broad open prairie or marshland. Hunts over open or open-woodland interface, over clean, modern pasture or clearcut woodland edges.	Vagrant. Does not occur in the area of concern.
Little Blue Heron (*Florida caerulea*)	--	--	SC	Ponds, swamps, ditches, marshes.	Common resident.
Snowy Egret (*Egretta thula*)	--	--	SC	Marsh, swamp.	Common resident.
Louisiana Heron (*Hydranassa tricolor*)	--	--	SC	Lakes, marshes, cypress swamps, ditches, streams.	Common resident.
Black Crowned Night Heron (Nycticorax nycticorax)	--	--	SC	Swamps, lagoons.	Fairly common resident.
Yellow Crowned Night Heron (*Nyctanassa violacea*)	--	--	SC	Creeks, swamps.	Fairly common resident.
Least Bittern (*Ixobrychus exilis*)	--	--	SC	Marshes, ponds, swamps.	Not uncommon summer resident.
White Ibis (*Eudocimus albus*)	--	--	SC	Freshwater and estuarine wetlands. Nests on islands in lakes, marshes, or mangroves. Feeding requires shallow water (<8"). Nesting success depends on utilization of sequentially available feeding locations.	Locally common resident.
Cooper's Hawk (*Accipiter cooperii*)	--	--	SC	Breeds in wooded river bottoms and hammocks, generally near mixed woods and open country it prefers for hunting. May move to more open country out of the breeding season.	Uncommon resident.
Burrowing Owl (*Speotyto sunicularia floridana*)	--	--	SC	High sandy ground with little growth, particularly prairies, sandhills and pastures, less commonly sparse pinelands with eroded limestone substrate containing pockets of sand.	Locally common resident. Does not occur in the area of concern.

Table 2.7-2 Rare and Endangered Vertebrates of Alachua County, Florida, Their Status, Preferred Habitat and Occurrence (continued)

Species	Status USDI[1]	Status FGFWFC[2]	Status FC[3]	Habitat Preference	Occurrence in Alachua County
White-breasted Nuthatch (*Sitta carolinensis carolinensis*)	--	--	SC	Prefers mature woodlands or at least large trees. In Florida prefers pines and probably does not breed in purely hardwood situations; may, however, forage there, especially during the breeding season.	Rare resident.
Hairy Woodpecker (*Dendrocopus villosus audubonii*)	--	--	SC	Various forested areas, pinelands, cypress stands, deciduous swamp forest and high areas.	Uncommon resident. Not presently in area of concern.
Worm-eating Warbler (*Helmitheros vermivorus*)	--	--	SC	In breeding season largely confined to steep slopes of deciduous woodlands and undergrowth. In migration (and presumably winter) likely to be found in a greater variety of wooded or even brushy areas.	Possible resident in winter. Probably a rare transient.
Merlin (*Falco columbarius*)	--	--	SU	Open country, seldom in forested areas unless large open areas exist for hunting. Most often seen near edges of open woodlands, salt marshes, mangroves, and along sea coasts.	Likely resident in winter.
MAMMALS					
Sherman's Fox Squirrel (*Sciurus niger shermani*)	--	T	T	Longleaf pine-turkey oak of sandhills. Remains in reduced numbers in turkey oak forests, especially where bayhead meets slash pine flatwoods and on margin of flatwoods cypress ponds.	Probable in suitable habitat.
Florida Mouse (*Peromyscus floridanus*)	--	T	T	Primarily sand pine scrub in an early successional stage but also occurs in longleaf pine-turkey oak, south Florida slash pine-turkey oak, and scrubby flatwoods assns. All are relatively xerix, open tree stands, clumps of scrubby oaks and other shrubs with scattered patches of bare ground, and well-drained sandy soils.	Likely, but only in areas of suitable habitat. Very tolerant of other than suitable conditions.

Table 2.7-2 Rare and Endangered Vertebrates of Alachua County, Florida, Their Status, Preferred Habitat and Occurrence (continued)

Species	Status USDI[1]	Status FGFWFC[2]	Status FC[3]	Habitat Preference	Occurrence in Alachua County
Southeastern Weasel (*Mustela frenata olivacea*)	--	T	R	No distinct preference. Found in sand pine scrub, cypress swamps, pine-palmetto flatwoods, live oak-cabbage palm hammocks, and old fields.	Rare in all locales.
Southeastern Shrew (*Sorex longirostris longirostris*)	--	--	R	Swamp forests and moist river floodplain forests, usually dominated by bald cypress, various bay trees, sweet gum, water tupelo and water oaks.	Probable resident.
Big Brown Bat (*Eptesicus fuscus*)	--	--	R	Buildings, bridges, hollow trees. Uncommon in caves.	Rare, presence unknown.
Hoary Bat (*Lasiurus cinereus cinereus*)	--	--	R	Roosts in the foliage of trees with dense cover above - open below.	Migrant, common in river swamps.
Southeastern Big-eared Bat (*Plecotus rafinesquii*)	--	--	R	Heavily forested regions. Roosts in old buildings in pine or hardwood forests. Also utilizes hollow trees but never found in Florida caves.	Sparingly present.
Round-tailed Muskrat (*Neofiber alleni*)	--	--	SU	Shallow emergent marshes. Prefers dense stands of maidencane and pickerelweed.	Common where present, possible in all but southwestern part of county.
REPTILES					
Short-tailed Snake (*Stilosoma extenuatum*)	--	E	E	Restricted chiefly to longleaf pine-turkey oak assns. Occasionally in upland hammocks, but only adjacent to longleaf pine-turkey oak stands.	Possible in areas of suitable habitat.
American Alligator (*Alligator mississippiensis*)	E	T	SC	Edges of large lakes and ponds, rivers, and interiors of swamps and freshwater marshes.	Located throughout county.

Table 2.7-2 Rare and Endangered Vertebrates of Alachua County, Florida, Their Status, Preferred Habitat and Occurrence (continued)

Species	Status USDI[1]	Status FGFWFC[2]	Status FC[3]	Habitat Preference	Occurrence in Alachua County
Suwannee Cooter (Chrysemys concinna suwanniensis)	--	T	T	Restricted to certain rivers and spring runs draining into the Gulf of Mexico. Reaches highest densities in areas of heavy Naias and Sagittaria growth including grassy flats off of river mouths. Apparently tolerant to broad variations of salt concentrations.	Possible, but not to any large extent. Lower portion of Rocky Creek, if at all.
Gopher Tortoise (Gopherus polyphemus)	--	T	T	Dry, well drained soils, especially beach scrub, sand pine, longleaf pine-turkey oak and live oak hammock and old field successional stages leading to these.	Resident in suitable habitats.
Striped Newt (Notophthalmus perstriatus)	--	--	R	Most frequently in flatwoods ponds in pine-palmetto habitats. Also in sinkhole ponds and in ponds in scrub or sandhill areas. Terrestrial newts usually found in well-drained sandy areas under debris. Only occasionally in same ponds with the spotted newt.	Reported resident.
Gulf Hammock Dwarf Siren (Pseudobranchus striatus lustricolus)	--	--	SU	Occurs in cypress and flatwoods ponds, drainage ditches and smaller floodplain lakes, independent of terrestrial plant assns. Principle habitat is water hyacinth (where is occurs).	Possible in southwestern part of county.
FISH					
Mud Sunfish (Acantharchus pomotis)	--	--	R	Low gradient, often blackwater, streams and ponds with heavy growths of submergent aquatic vegetation and a bottom of mud and organic detritus.	Possible occurrence throughout county. Found near Gainesville.
Suwannee Bass (Micropterus notius)	R	R	R	River and shoal areas having a moderate to swift current, a bottom comprised of limestone, and water of high pH and hardness. Also springs and spring runs.	Common in the Santa Fe River, especially the lower portion.

[1]USDI's FWS Endangered and Threatened Wildlife and Plants. Federal Register, Vol. 41, No. 208, Wednesday, October 27, 1976. Part IV.
[2]Florida Game and Fresh Water Fish Commission (FGFWFC), Endangered and Threatened Species Included in the Wildlife Code. Effective July 1975.
[3]Florida Committee on Rare and Endangered Plants and Animals (FC), Florida Audubon Society, 1974.

Table 2.7-3 Summary of the Number of Classified Species of Vertebrates

Status	Birds	Mammals	Reptiles/ Amphibians	Fish
Endangered	6	0	2	0
Threatened	6	3	4	0
Rare	4	3	3	2
Special Concern	12	0	0	0
Status Undetermined	1	1	2	0

Threatened Vertebrates

Sherman's Fox Squirrel

This subspecies is listed as threatened by both the Florida Committee and the FGFWFC, but remains unlisted by the USDI (1976). Most of the primary habitat of this fox squirrel has been lost through logging or planting in citrus crops. Mostly suboptimal habitats remain, such as pure turkey oak forests, flatwoods/cypress ponds, and bayhead/flatwood ecotones. These suboptimal habitats are, and will continue to be, under intense pressure for development.

Eastern Indigo Snake

Listed by the State of Florida as threatened, by the Florida Committee as a species of special concern, and by the USDI as neither endangered nor threatened, this snake inhabits dry, sandy areas, but is characteristic of moister habitats, such as flatwoods.

Florida Gopher Frog

The Florida Committee lists this amphibian as threatened. It has been recorded as moving well over a mile to reach suitable breeding sites which are generally recorded as grassy cypress ponds.

Rare Vertebrates

Southeastern Shrew

In Florida, this mammal has been found to inhabit moist river floodplain forests or swamp forests. Moist and well vegetated soil along streams is a preferred habitat.

Hoary Bat

This rare mammal is a migrant to the study area; however, it is common in the river swamp habitat for three weeks in autumn and three weeks in spring.

American Redstart

The recorded nesting habitat in Florida for this rare bird is mature deciduous woodlands (with undergrowth) along streams.

Louisiana Waterthrush

This rare bird is confined to wooded streams and swamps.

Spotted Turtle

This reptile is listed as rare by the Florida Committee. Habitat preference is generally boggy or swampy areas of shallow water. Its occurrence in marshy areas of Turkey Creek and Sanchez Prairie or lowland cypress areas of Rocky Creek is a possibility.

Striped Newt

This amphibian is listed as rare by the Florida Committee. It is frequently collected in flatwood ponds and sinkhole ponds.

Mud Sunfish

The mud sunfish is in no immediate danger of being endangered or threatened, but it is regarded as rare (Dr. Carter Gilbert, Florida State Museum). It is commonly associated with low gradient black water streams and ponds.

Suwannee Bass

The Suwannee bass, a popular game fish, is the only species of fish yet discovered that is endemic to the Suwannee and Ochlockonee river systems. It is classified as rare because of its restricted range, though there is little reason to suspect that this species is substantially less common than it ever was.

Vertebrate Species of Special Concern

Little Blue Heron, Snowy Egret, Yellow Crowned Night Heron

These herons, and possibly others listed as species of special concern, may utilize the low wet areas of all three creek basins. Sanchez Prairie contains a little blue heron rookery and the Rocky Creek swamps are potentially useful foraging sites for all three species.

White Ibis

This bird is listed as a species of special concern by the Florida Committee. White ibis feed in shallow water and are common residents of the area.

Copper's Hawk

This raptor is classified as a species of special concern by the Florida Committee. Copper's hawk may use portions of Sanchez Prairie and the Rocky Creek swamps as breeding habitat. The bird is, however, an uncommon resident in the project area.

Hairy Woodpecker

This uncommon area resident is classified as a species of special concern by the Florida Committee. The hairy woodpecker inhabits various forest types, including swamp forests.

Plants

There are two plants listed as endangered, two as threatened, and eight as rare by the Florida Committee on Rare and Endangered Plants (1974) which are known to occur in Alachua County. The habitat preference and occurrence of these twelve plants are summarized in Table 2.7-4. Both of the endangered plants - the dwarf spleenwort (Asplenium pumilum) and the sinkhole fern (Blechnum occidentale) are not known to occur to any of the three drainages; however, their occurrence is highly possible within the calcareous ravine at Split Rock Sink.

Needle palm (Rhapidophyllum hystrix) and the cycad coontie (Zamia integrifolia), which are listed as threatened, have been reported to occur within San Felasco Hammock (Alachua Audubon Society, 1973). Needle palm has been found within deep ravines, while coontie has been found within one of the longleaf pine/turkey oak forests of the hammock (Ward, 1977).

Of the rare plants listed by the Florida Committee, Venus'-hair fern (Adiantum capillus-veneris), pond-spice (Litsea aestivalis), poppy mallow (Callirhoe papaver), and green adder's-mouth (Malaxis unifolia) are the species most probably occurring in the area of concern. The deep ravines

Table 2.7-4 Endangered, Threatened, and Rare Plants Known to Occur in Alachua County, Their Habitat Preference, and Occurrence in the Project Area

Species	Habitat Preference	Occurrence in Alachua County	Occurrence in Project Area
ENDANGERED			
Asplenium pumilum (Dwarf Spleenwort)	Only found on limestone or other calcareous rocks in moist hammocks.	West of Interstate 75 near Newberry.	Not known to occur in area; possible.
Blechnum occidentale (Sink-hole Fern)	Deep shaded ravines or elsewhere in moist and dense hammocks; occassionally on sheer rock walls of deep sinkholes.	Deep sinkholes north of Newberry.	Not known to occur in area; possible.
THREATENED			
Rhapidophyllum hystrix (Needle Palm)	Sinkholes and ravines; shaded spots.	Near Millhopper and San Felasco Hammock.	Found in shaded ravines in San Felasco Hammock.
Zamia integrifolia (Coontie)	Nigh, dry pine area.	Found in southern and central Alachua County which is northeastern-most range.	Found in San Felasco Hammock in one longleaf pine-turkey oak community.
RARE			
Adiantum capillus-veneris (Venus'-hair Fern)	Shady, calcareous slopes and rocks; sinkholes.	Paynes Prairie and Millhopper.	Not known to occur in area; possible.
Brickellia cordifolia (Flyr's Nemesis)	Dry upland woods and at times under large live oaks.	Known from the southern portion of San Felasco Hammock.	Known to occur in San Felasco Hammock.
Callirhoe papaver (Poppy Mallow)	Dry sandy woods and edge of woods.	Known from southern portion of San Felasco Hammock.	Not known to occur in area; may occur in Mulatto Pen Branch basin.
Drosera intermedia (Water Sundew)	Bogs, savannahs and wet ditches; often in standing water.	Known only from a prairie in eastern Alachua County.	Not known to occur in area.
Litsea aestivalis (Pond-spice)	Found along pond and swamp margins and low wet woodlands.	Known from San Felasco Hammock.	Possible in Sanchez Prairie.
Malaxis unifolia (Green Adder's-mouth)	Bogs, meadows, and moist slopes of forests.	Millhopper and San Felasco Hammock.	Possible in Sanchez Prairie.
Peltandra sagittifolia (Spoon-flower)	Bogs.	Single specimen known from edge of Newnan's Lake.	Not known to occur in area.
Polygonum meisnerianum (Mexican Tearthumb)	Moist muck soil and swamp areas.	Known in Florida only on portion of Newnan's Lake.	Not known to occur in area.

and limestone boulders within San Felasco Hammock provide suitable habitat for Venus'-hair fern, and the Sanchez Prairie fringe offers suitable habitat for pond-spice and green adder's-mouth. Poppy mallow has been reported in mixed woods in the southern portions of San Felasco Hammock. This rare plant is not expected to occur in Sanchez Prairie; however, it may occur within suitable mixed woods along all three creeks. The four remaining rare species listed are not expected to occur in the area of concern. Flyr's nemesis (Brickellia cordifolia) is not expected in Sanchez Prairie, but has been found in another part of San Felasco Hammock (Ward, 1977).

In addition to the above plants, the proposal to purchase San Felasco Hammock submitted to the State of Florida by the Alachua Audubon Society (1973) mentions that a sizable proportion of the entire population of bluff oaks (Quercus austrina) is within San Felasco Hammock. This rare white oak is associated with the rich well drained soils of mesic hammocks.

The proposal also mentions the occurrence of a "relatively rare forest type", the water elm swamp. This swamp is dominated by water elm and Carolina ash and "occupies about 100 acres ... of ... Sanchez Prairie and a few other small tracts". The proposal also reports that a very rare spleenwort, one-sorus spleenwort (Asplenium monanthes) occurs on limestone boulders in several ravines. Lt. K. C. Alvarez (Department of Natural Resources, 1973) on a reconnaissance of San Felasco Hammock reported the presence of this spleenwort and the bead fern (Onoclea sensibilis). The bead fern is unusual to the south and was found to be abundant in a ravine outside the areas of interest.

No other endangered, threatened, or rare plants are known to occur in the Sanchez Prairie area. None of the above species were recorded outside of San Felasco Hammock during field surveys. With the exception of the water elm swamp, none of the above species has been affected by present Deerhaven Unit 1 operations, nor have they been observed in the area affected by Deerhaven Unit 1. The water elm is in those portions of Sanchez Prairie affected by present Deerhaven operations (Section 2.7.3.1).

2.7.2.2.2 Unique or Sensitive Areas - San Felasco Hammock and Sanchez Prairie

The San Felasco Hammock, which includes Sanchez Prairie, is a 5,200 acre parcel of land located southwest of the proposed plant site between Gainesville and High Springs. In 1974, the area was purchased by the State of Florida under Environmentally Endangered Lands Program in order to protect the unique combination of geological and biological features from cultural modification.

Geologically, the San Felasco area contains an exceptional localization of solution and erosion features which illustrate the formation of Karst topography and groundwater recharge in Karstic areas (Alvarez, 1973). As a biotic area, it includes a sample of almost every natural community and animal habitat in the north-central part of the state. Included among these are 220 acres of longleaf pine flatwoods, 340 acres of sandhills, 980 acres of southern red oak forest, 2,640 acres of mesic hammock (the largest remaining example of this community type in Florida), 360 acres of hydric hammock, 180 acres of forested swamp, 10 acres of marsh, 100 acres of ponds, and 50 acres of planted pine (Alvarez, 1973). A detailed description of the floral and faunal communities, geology, and other significant features of San Felasco Hammock is provided in the Florida Audubon Society Proposal to purchase these lands which was submitted to the State Department of Natural Resources in 1973.

The Sanchez Prairie is an excellent example of the successional development of larger prairies in the region. The area is about 330 acres in size and is occupied by hydric hammock and swamp communities.

Several species of plants and animals classified as endangered, threatened, rare, or "status undetermined" inhabit San Felasco Hammock and Sanchez Prairie. These include several small herbaceous plants, three trees, and two birds (Alvarez, 1973). A detailed consideration of endangered, threatened, and rare species is provided in Section 2.7.2.2.1.

The existing encroachments on San Felasco Hammock include two roadways, a power line, the present cooling tower blowdown and surface drainage from several housing communities which drain via Turkey Creek into Sanchez Prairie. The effects on Sanchez Prairie of current Deerhaven discharge are considered in detail in Section 2.7.3.1.

Wetlands

Wetlands are of considerable value in maintaining natural hydrologic systems and in supporting diverse food chains and fish and wildlife resources. However, they are particularly sensitive to alteration by drainage, filling, and pollution (USDI, 1975).

The most significant wetland type encountered within five miles of the Deerhaven station is the wooded swamp. These are predominantly cypress swamps, with mixed hardwood and bayhead swamps also occurring but occupying less total acreage (Section 2.7.2.1). Most (particularly those in the managed pinelands east of the site) have been channelized to promote drainage. However, there are several swamps in the area which, because of certain unique features, are deserving of special mention.

Along Rocky Creek are two mixed hardwood swamps (132 acres) located about three miles southeast of LaCrosse. These swamps, which are perhaps the most significant feature along Rocky Creek, are encircled by a thin fringe of southern mixed hardwood forest and by crop and pasture land (Section 2.7.3.3). There are also several large (greater than 100 acres) cypress "heads" to the east and north of the site. Due to their isolation from human activity and/or their size and maturity, each of these swamps offers an especially suitable breeding and refuge habitat for local wildlife.

There are two swamps worthy of note in the San Felasco Hammock area. One is an 80 acre, hardwood-bald cypress swamp located at the mouth of Blue's Creek. It supports a closed canopy of trees, some of which are more than 100 feet tall. The other is a relatively rare type in Florida, a water elm swamp, which occupies about 100 acres in Sanchez Prairie.

A scattering of small ponds and a few shallow freshwater marshes are also found within five miles of the site. The ponds vary considerably in both size and vegetation. Many are covered with floating plants such as duckweed (*Lemna* sp.), floating heart (*Nymphoides aquatica*) and frog's bit (*Limnobium spongia*). Freshwater marshes are occasionally found where streams pass through level, low-lying depressions. The vegetation consists of buttonbush and various grasses and sedges. Although these wetlands are too small and isolated to be of individual importance, they do contribute to the habitat diversity of associated land areas and aquatic systems.

There are no permanent lakes within the five mile radius. An intermittantly flooded 30 acre basin known as Prairie Lake is located on private agricultural land about three miles north of the site. This lake receives water from Rocky Creek during high flow conditions and upon a drop in water level forms a small lake. The lake bed is currently dry (July, 1977) and is used as pastureland.

Devil's Millhopper

Because of the predominance of agricultural land and pine plantation in the project area, few other sensitive features need be noted. The Devil's Millhopper, a large sinkhole two miles northwest of Gainesville on S-232 and 3.6 miles southwest of the Deerhaven stack, is now designated a State Geological Site. This bowl-shaped sink has a diameter of 500 feet and a depth of about 120 feet. It was formed through erosion of underground limestone deposits and the subsequent collapse of the resulting cavern. The Devil's Millhopper is a valuable site for geologists and paleontologists, because of the exposure of rock strata and the abundance of fossils. Much of the flora and fauna are typical of ravines in the southern Appalachians. This area is physically isolated from present Deerhaven operations.

Rookeries

There is a rookery for cattle egrets and little blue herons, 250-700 breeding pairs, in Sanchez Prairie (Nesbitt, 1977), but no other rookeries or nesting sites exist in the project area (Nesbitt, 1977 and Owens, 1977).

2.7.3 Drainage Basins and Stream Ecology Within the Project Area

The Deerhaven site is located in the upper reaches of several small watersheds (Figures 2.2-1 and 2.2-2). Most of the site and all of the blowdown water from Deerhaven Unit 1 currently drain into Turkey Creek. Rocky and Cellon Creek basins meet near the northern property boundary. Several other watersheds are within five miles of Deerhaven, but are not linked directly with the site. Cursory descriptions of these streams are presented in Section 2.7.3.4. Descriptions of the watersheds, surface water hydrology, and water quality of Turkey, Cellon and Rocky Creeks are presented in Section 2.5. Sections 2.7.3.1 through 2.7.3.3 present ecological analyses of Turkey, Cellon and Rocky Creeks.

Streams within the project area are detritus - forced systems; that is, organic debris from terrestrial and aquatic vegetation provides energy for aerobic and anaerobic bacteria and detritivorous macroinvertebrates, which in turn are fed upon by predatory invertebrates and vertebrates. The vertebrate food chain includes such higher order consumers as fish, amphibians, reptiles, and terrestrial forms such as wading birds and small predatory mammals.

Detritus input from terrestrial sources is determined by vegetation, topography and land use adjacent to the stream. Pastureland, for instance, contributes little detritus, though it may add to the nutrient loading of the water. Growth of aquatic herbaceous vegetation is influenced by the relative degree of shading, the amount and consistency of flow, and the depth of water. Where aquatic herbs grow in abundance, their contribution into the detritus pathway is significant.

Local conditions may vary greatly along a stream, creating distinct aquatic habitats or subsystems, each of which contributes uniquely and in sequence to the stream's overall character. For each of the three drainage systems linked to the Deerhaven site, functional aquatic subsystems and their forcing functions (those factors responsible for directing materials or energy through components of a system) have been identified (Breedlove, 1976) and are described in sequence from the headwaters to the point of stream discharge. The extent and taxonomic composition of benthic macroinvertebrate populations have also been examined in Turkey, Cellon and Rocky Creeks and subjected to analysis using Beck's Biotic Index (Beck, 1955), Shannon-Weaver diversity, and equitability (EPA, 1973). Higher order consumers - fish, amphibians, and reptiles - have been described for the three streams. Finally, those amphibians and reptiles regarded as endangered (E), threatened (T), rare (R), of special concern (SC), or of undetermined status (SU) are mentioned as to their probable occurrence in each creek basin.

2.7.3.1 Turkey Creek

Figures 2.7-1 and 2.7-2 present the creek channel profiles, associated ecological subsystems and major vegetation associations for Turkey Creek. The creek has several distinct segments. The headwater segment is characterized by low gradient sandy channels connecting cypress domes within the pine flatwoods community. Deerhaven is located at the headwaters of one of the various branches that forms Turkey Creek. The intermediate channel is more steeply sloped and surrounded by a mixture of pasture and mixed hardwoods forest. This channel is well-defined with relatively high velocities. Within this segment a small spring originating near Hague provides additional water to the creek. The third segment is occupied by a part of the Sanchez Prairie hydric hammock forest.

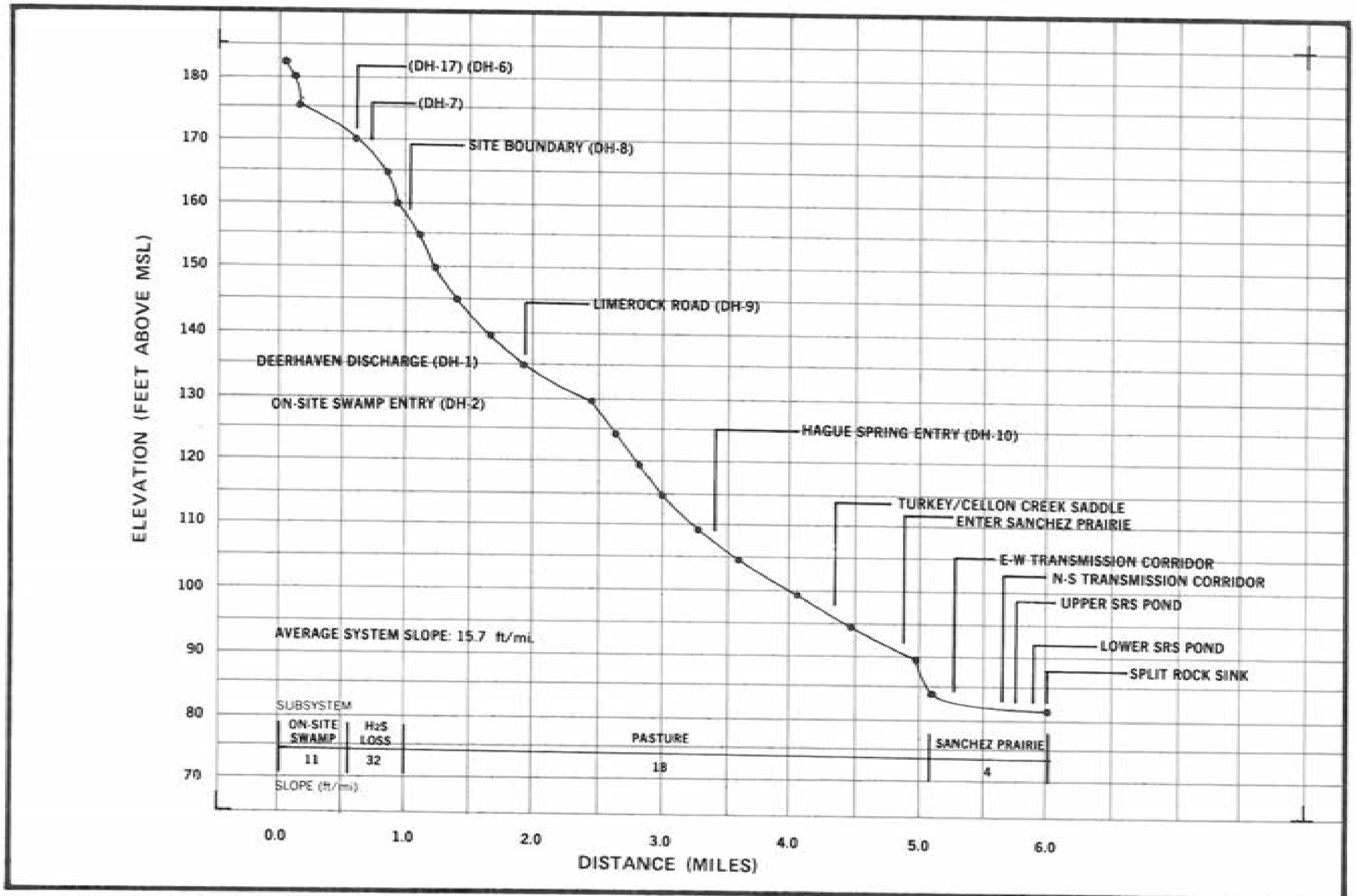


FIGURE 2.7-1 TURKEY CREEK CHANNEL PROFILE, ASSOCIATED ECOLOGICAL SUBSYSTEMS AND SLOPES.

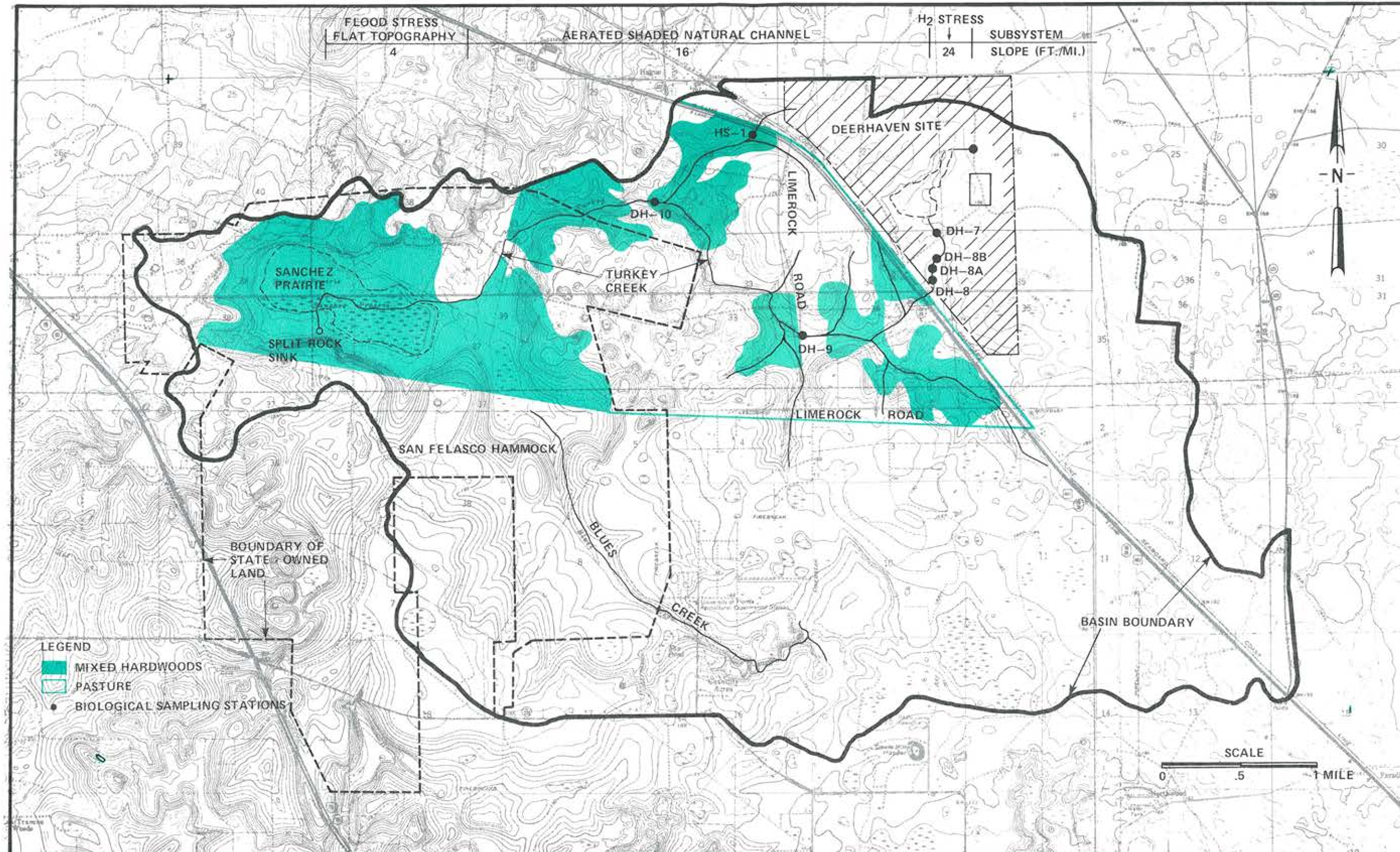


FIGURE 2.7-2 TURKEY CREEK ECOLOGICAL SUBSYSTEMS AND VEGETATION ASSOCIATIONS.

This portion of Turkey Creek is a low gradient stream characterized as a slow-moving sheet flow connected by marshy, low banked channels. Prior to entering Split Rock Sink the creek flows into a shallow pond surrounded by water elm, pop ash and willow.

Aquatic Subsystems and Forcing Functions

Turkey Creek is considered to have three distinct subsystems: (1) The Deerhaven site subsystem; (2) the natural well-defined channel segment; and (3) the Sanchez Prairie subsystem. Each of these subsystems may have one or more forcing functions which largely govern its character and composition and energy flow through it.

The Deerhaven discharge canal, on-site cypress swamp, and exit canal comprise an aquatic system that is largely influenced by blowdown released from Deerhaven Unit 1. The discharge canal is a steep-sided ditch containing a soft sand substrate, cattails, and a bank growth of wax myrtle and broom sedge. The flow is shallow, warm, well-oxygenated and has high sulfate, dissolved solids, conductivity, and temperature.

A 28 acre cypress dome receives the blowdown from the discharge canal. Chronic flooding due to a relatively constant increased discharge within this portion of a naturally intermittent creek and conversion of sulfate to hydrogen sulfide due to anaerobic conditions in the swamp have resulted in the stressing of water tolerant cypress and blackgum and a lack of benthic macroinvertebrates (Breedlove, 1975 and 1976a). Hydrogen sulfide concentrations within portions of the Deerhaven site are considerably above toxic levels for virtually all aquatic organisms. Berger and Eichler (1975) have shown in addition that the dome acts as an effective heat sink.

The discharge stream from the cypress dome to the site boundary is well mixed and oxygenated and serves to remove hydrogen sulfide from the water. The upper part of this zone has been channelized, is well shaded and has a white substrate coating of sulfide-oxidizing bacteria. In a study of upper portions of Turkey Creek Breedlove (1975) did not detect hydrogen sulfide below the site boundary. The point of zero hydrogen sulfide concentration is 1,000 feet upstream of the site boundary. The loss rate of hydrogen sulfide was calculated to be 1.0 mg/l per 185 feet of stream channel (Figure 2.7-3).

From the Deerhaven site to Sanchez Prairie, Turkey Creek passes through permanent pasture and mixed hardwoods. Area land use is shifting toward suburban development (Section 2.2). Discharge into this subsystem is derived from Deerhaven Unit 1, cypress dome runoff, the developing area west of U.S. 441, pasture runoff, and a small spring run. However, in terms of volume, Deerhaven Unit 1 blowdown is presently the major source of water and, due to its constant input, prevents seasonal drying of the creek. The velocity of water is relatively high and tends to keep the creek well mixed and oxygenated. Erosion and scour is not thought to be a major factor in the upper portion of this segment.

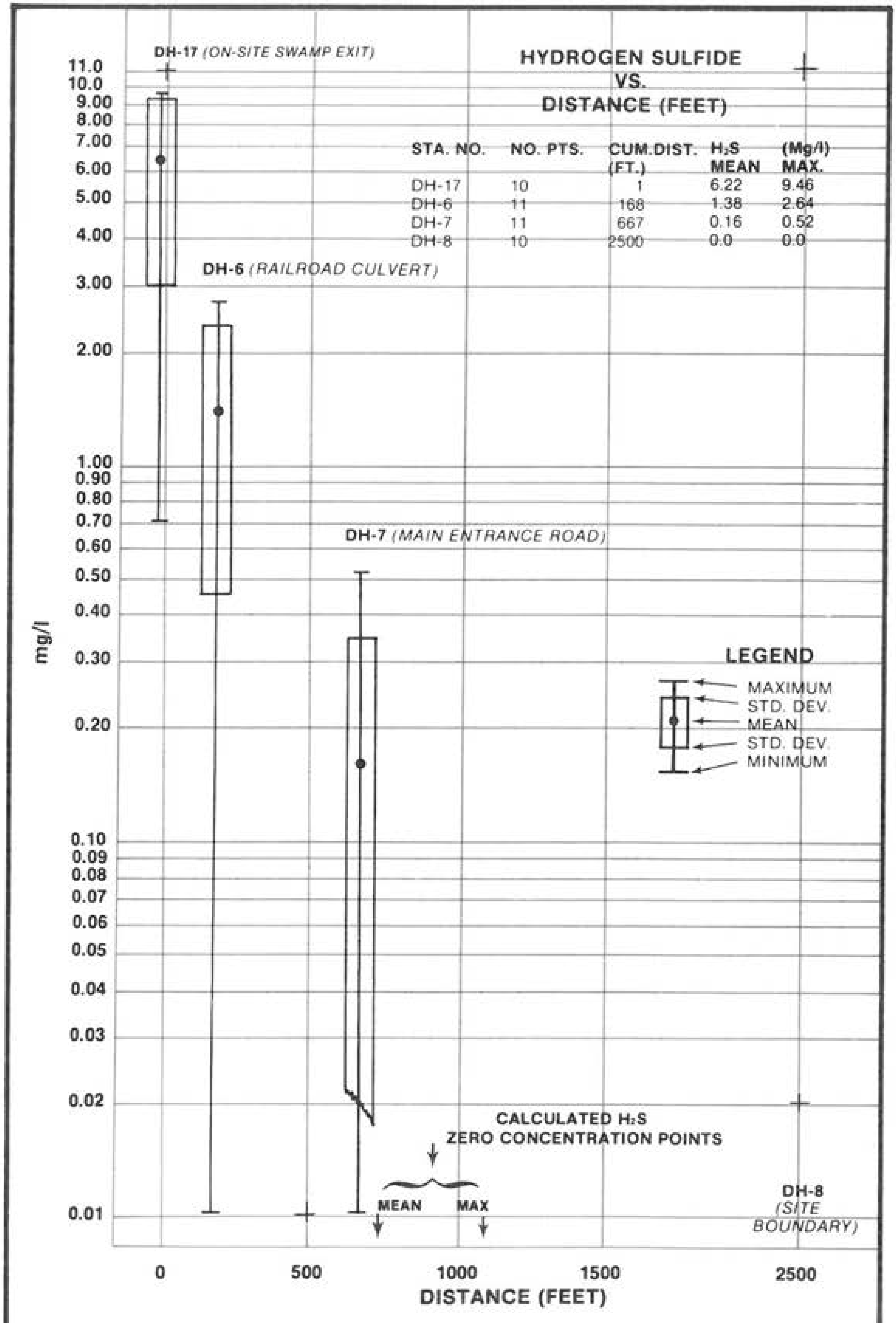


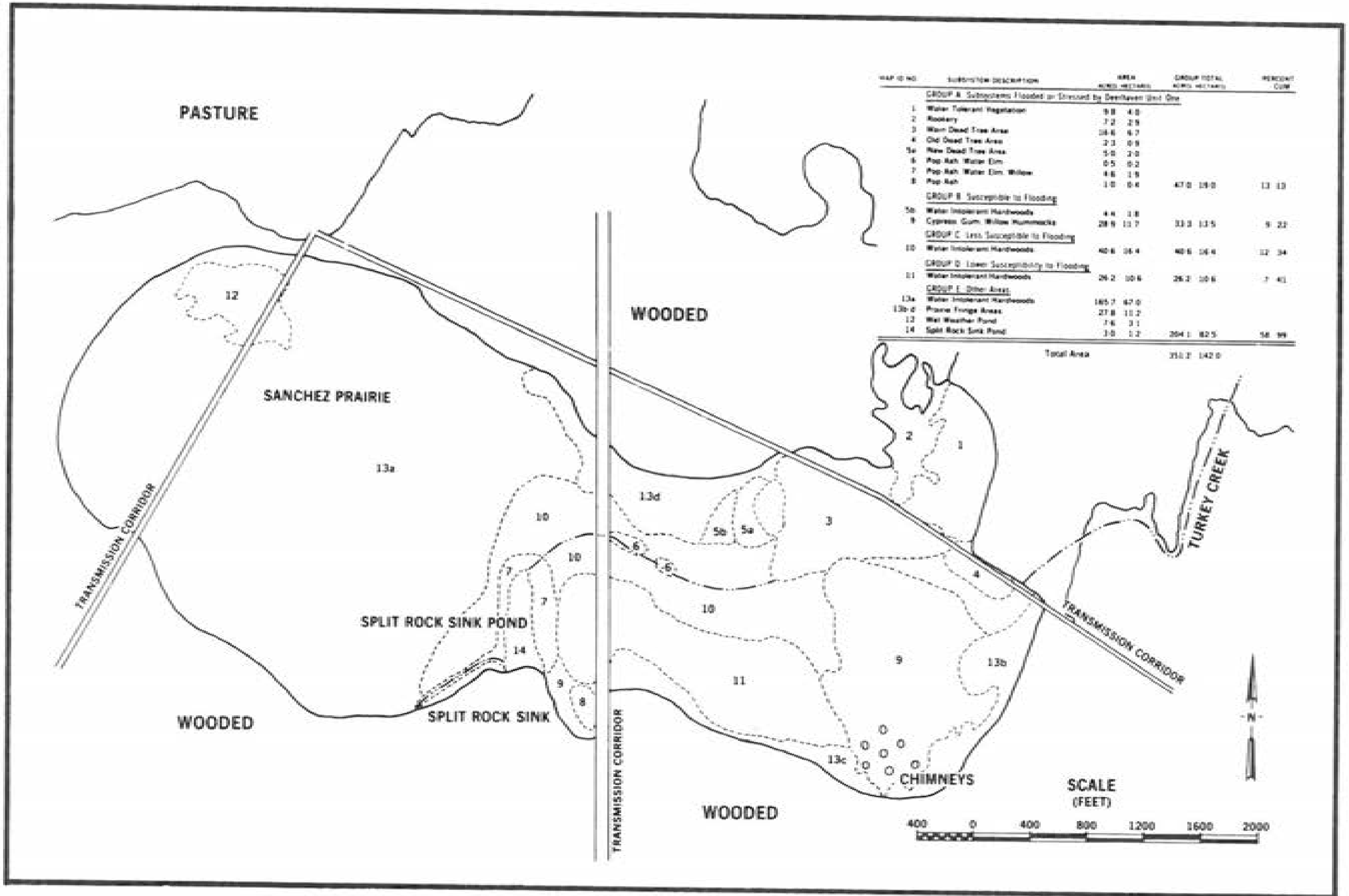
FIGURE 2.7-3 RELATIONSHIP BETWEEN DISTANCE AND HYDROGEN SULFIDE CONCENTRATION BELOW THE DEERHAVEN STATION ON-SITE SWAMP.

Aquatic vegetation grows along the stream edge and aufwuchs (growths of periphyton, i.e. algae and associated invertebrates) cover the available substrates. Coarse and finely-divided detritus occurs in pools and as layers in sand bars.

At the point of entry into the Sanchez Prairie hydric hammock, Turkey Creek stream gradient decreases (Figure 2.7-1) and the water spreads out of its banks and begins to move as sheet flow. Apparently, the channel has been recently filled with sediment and aquatic herbs.

Flow spreading in the area, adjacent to and downstream of the channel, has chronically flooded an area of water-intolerant woody vegetation (Figure 2.7-4, map I.D. Number 3; Figure 2.7-5) and maintained shallow standing water in areas of water-tolerant woody vegetation (Figure 2.7-4, map I.D. Number 4). In addition, a newly flooded area (Figure 2.7-4, map I.D. Number 5) has been recently created. Several small areas also show limited signs of stress on some trees (Breedlove, 1977). Around Split Rock Sink Pond, the water elm patches (Figure 2.7-4, map I.D. Number 6) and the pop ash and willow stands are dead or stressed as a result of chronic flooding.

It is not known presently whether hydrogen sulfide production in this portion of Sanchez Prairie due to low oxygen concentrations is responsible for any of the stressed areas. High concentrations do exist in the sediment of Sanchez Prairie (Breedlove, 1977).



MAP ID NO.	SUBSYSTEM DESCRIPTION	AREA ACRES	AREA HECTARES	GROUP TOTAL ACRES	GROUP TOTAL HECTARES	PERCENT	CUM
	GROUP A. Subsystems Flooded or Stressed by Deerhaven Unit One						
1	Water Tolerant Vegetation	9.8	4.0				
2	Rookery	7.2	2.9				
3	Worn Dead Tree Area	16.6	6.7				
4	Old Dead Tree Area	2.3	0.9				
5a	New Dead Tree Area	5.0	2.0				
6	Pop Ash Water Elm	0.5	0.2				
7	Pop Ash Water Elm Willow	4.6	1.9				
8	Pop Ash	1.0	0.4	47.0	19.0	13	13
	GROUP B. Susceptible to Flooding						
5b	Water Intolerant Hardwoods	4.4	1.8				
9	Cypress Gum Willow Hummocks	28.9	11.7	33.3	13.5	9	22
	GROUP C. Less Susceptible to Flooding						
10	Water Intolerant Hardwoods	40.6	16.4	40.6	16.4	12	34
	GROUP D. Lower Susceptibility to Flooding						
11	Water Intolerant Hardwoods	26.2	10.6	26.2	10.6	7	41
	GROUP E. Other Areas						
13a	Water Intolerant Hardwoods	165.7	67.0				
13b-d	Prairie Fringe Areas	27.8	11.2				
12	Wet Weather Pond	7.6	3.1				
14	Split Rock Sink Pond	3.0	1.2	204.1	82.5	58	99
	Total Area			351.2	142.0		

FIGURE 2.7-4 SANCHEZ PRAIRIE VEGETATION ASSOCIATIONS AND PROBABLE SEQUENCE OF FLOODING.

FIGURE 2.7-5 UPPER SANCHEZ PRAIRIE FLOODED AREA.

Animal Life

Macroinvertebrates - Benthic macroinvertebrates are generally characterized as relatively long-lived and relatively immobile. Therefore, they are commonly used as indicators of water quality conditions. As mentioned previously, Turkey Creek has a stable base flow and high sulfate, total dissolved solids, and specific conductance as a result of Deerhaven Unit 1. Hydrogen sulfide is produced under the low oxygen levels of the on-site cypress dome and Sanchez Prairie aquatic sediment.

Figure 2.7-2 shows the station locations for benthic macroinvertebrate collections. A summary of the macroinvertebrates collected at these stations is presented in Tables A2-48 through 61 and Table 2.7-5.

Breedlove (1975) showed that the species composition and biotic indices of macroinvertebrates collected at the on-site swamp were quite low. Breedlove (1977) later showed that no intolerant organisms were collected from the on-site stream with high hydrogen sulfide concentrations. Those species present are predominantly pollution tolerant Oligochaetes and Chironomids, which tolerate low dissolved oxygen conditions. From the site boundary to Sanchez Prairie the species composition and biotic indices of macroinvertebrates were indicative of clean water conditions, or of essentially baseline faunal conditions in Florida streams (Breedlove, 1975, 1977).

Table 2.7-5 Benthic Macroinvertebrate Taxa Collected From Turkey Creek and Ranked According to Beck's Tolerance Classifications

	Class I (Intolerant)	Class II (Facultative)	Class III (Tolerant)	Class IV (Air-breathing)	Class V
	Agria sp Corydalus cornutus Macromia sp. Polypedilum halterale Progomphus obscurus Pyralididae sp. Steanonema sp.	Stenelmis sp. Polypedilum tritum Gomphus sp. Cheumatopsyche sp. Dubiraphia sp. Procambarus sp. Calopteryx sp. Agrion sp. Dicrotendipes sp. Lampsilis sp. Microcyllaepus sp. Nematoda Enallagma sp.	Physa sp. Oligochaeta Sphaerium sp. Bezzia sp. Chironomus attenuatus Chironomus fulvipilus	Belostoma sp. Dineutus sp. Trichocorixa sp. Peltodytes sp. Ranatra sp. Tipulidae sp. Veliidae sp.	Aeschna sp. Boyeria sp. Tetragoneuria sp. Campeloma sp. Chromagrion sp. Hyponeura sp. Cordulagaster sp.
No. Taxa:	7	13	6	7	7
Percent of Total:	17.5%	32.5%	15.0%	17.5%	17.5%

Total No. Taxa = 40

Turkey Creek BI = 27

The appearance of Stenonema (mayfly) and Acrocuria (stonefly) near Sanchez Prairie indicated that present conditions would support a diverse fauna (Breedlove, 1975). Similar findings were reported by Breedlove (1977) when burrowing dragonfly species (Gomphus sp. and Progomphus sp.) were collected.

Collection replicate diversity and equitability values were quite variable because of the low number of organisms collected (Table 2.7-6); however, no diversity equal to or greater than three was obtained for any sample replicate or composite of replicates for any station or subsystem of the creek (Table 2.7-6). Equitability values may range from 0-1.00 with levels below 0.5 indicative of some degree of pollution. Equitability values greater than one are indicative of an insufficient number of organisms collected (EPA, 1973). Compositing by subsystems appeared to improve the usefulness of the equitability value and the system composite of 0.37 appears to be valid.

Fish - Four species of fish were collected in Turkey Creek, all of which are considered relatively tolerant of pollution (McKee and Wolf, 1971). The dominant species was Gambusia affinis (Table 2.7-7). Largemouth bass (Micropterus salmoides) and bowfin (Amia calva) have been observed in the pond area around Split Rock Sink (Breedlove, 1975). Low standing crop (Table 2.7-7) and the presence of bass and bowfin in the only significant area of pooled water indicate that habitat is a major limiting factor in Turkey Creek. The standing crop values indicate that the creek is not capable of supporting a sport fishery.

Table 2.7-6 Turkey Creek Benthic Macroinvertebrate Shannon-Weaver Diversity and Equitability Based on Replicated Ekman Grabs

Sta. No.	No. Species	Shannon-Weaver Diversity DBAR	Equitability	
11	1	0.0	1.00	DH-1
15	1	0.0	1.00	
61	3	1.27	0.98	
62	2	0.68	0.92	
63	2	0.91	1.11	DH-6
64	1	0.0	1.00	
65	3	0.85	0.69	
71	4	1.52	0.91	
72	5	1.00	0.48	
73	4	1.68	1.02	DH-7
74	4	1.53	0.91	
75	6	1.61	0.64	
81	2	0.92	1.11	
82	1	0.0	1.00	DH-8
84	5	2.19	1.22	
85	5	2.16	1.19	
91	5	1.90	0.97	
92	5	1.41	0.66	
93	6	2.22	1.04	DH-9
94	4	1.57	0.94	
95	10	2.55	0.80	
101	1	0.0	1.00	
102	2	0.92	1.11	
103	3	1.50	1.19	DH-10
104	1	0.0	1.00	
105	3	1.20	0.93	
981	5	1.54	0.73	
982	4	1.22	0.71	Subsystem
983	4	1.67	1.02	DH-6, 7
984	4	1.53	0.91	H_2S Impact
985	5	1.58	0.76	
991	6	2.21	1.03	
992	6	1.80	0.75	
993	8	2.46	0.94	Subsystem
994	6	2.32	1.12	DH-8, 9, 10
995	12	2.85	0.84	
1001	10	1.72	0.42	Subsystem DH-1,
1002	9	1.84	0.52	6, 7, 8, 9, 10
1003	11	2.03	0.49	All Turkey
1004	9	2.00	0.58	Creek Stations
1005	15	2.05	0.37	

Notes:

1) Nos. 1-4 in unit position of Sta. No. column are replicates.

2) No. 5 in unit position of Sta. No. column is a station diversity calculated from composited replicate data.

3) Nos. 96-100 represent subsystems composed of indicated stations.

4) Number of organisms collected was usually <100 at replicate level.

Table 2.7-7 Standing Crop of Fish Collected in Turkey Creek By Block Seine Sampling

				Area Sampled		Station Standing Crop	
St. No.	Fish	No.	Wt.(g)	Ha	A	Kg/Ha	Lb/A
DH-8B	*Gambusia affinis*	25	4.5794	0.003	0.007	1.5265	1.3615
DH-9	*Notemigonus crysoleucas*	1	3.8926	0.013	0.031	0.2994	0.2670
	Gambusia affinis	253	27.4750	0.013	0.031	2.1135	1.8850
	Heterandria formosa	10	0.6859	0.013	0.031	0.0528	0.0471
	Lepomis punctatus	4	0.1270	0.013	0.031	0.0098	0.0087
DH-10	*Gambusia affinis*	31	6.9326	0.018	0.043	0.3851	0.3435

Reptiles and Amphibians - An eastern cottonmouth (Agkistrodon piscivorous piscivorous) and bronze frog tadpoles (Rana clamitans clamitans) were collected from Turkey Creek and Hague Spring Run, respectively. In addition, green tree frogs, green anoles, a coral snake, alligators, and gopher tortoise have been sighted in the Turkey Creek basin (Breedlove, 1977). Based on range maps and habitat preference (Conant, 1958), a list of aquatic, semiaquatic and terrestrial herptiles expected to occur in northern Alachua County is presented in Tables A2-48 through 61.

Endangered Species - With the exception of the Suwannee cooter (R), the alligator snapping turtle (SU) and the Gulf Hammock dwarf siren (SU), all other herptiles listed in Table 2.7-2 are expected to utilize portions of the Turkey Creek drainage. Sanchez Prairie presently provides potentially suitable habitat for the alligator (E) and one is usually present at the culverts under the Deerhaven entrance road (Station DH-7). Although the gopher tortoise (T) was sighted in the hammock, it is primarily restricted to uplands. The gopher frog (T), which utilizes the burrow of the gopher tortoise, may find the Sanchez Priarie marsh suitable for laying its eggs; however, grassy cypress ponds are its primary breeding sites. The spotted turtle (R) and striped newt (R) might also find this marsh habitat suitable.

2.7.3.2 Cellon Creek - General

Cellon Creek varies in character and can be broadly subdivided into several distinct reaches. The portion upstream of U.S. 441 varies from a slow-flowing pooled area to a small creek with well defined channels and moderate flow velocities. South of U.S. 441 to a point below CP-9 the channel slope is relatively steep, possesses incised banks and has sharp meanders (Figure 2.7-7). Below this point the channel gradient lessens and in some places the channel is poorly defined. However, near the A. W. Lee Sink the stream changes to a relatively fast flowing stream within a deeply incised channel.

Aquatic Subsystems and Forcing Functions

Cellon Creek has several aquatic subsystems within each of the broadly defined segments described above (Figure 2.7-6). The upper reaches of the stream, above U.S. 441, are small and largely composed of southern mixed hardwoods (Figure 2.7-6). The University of Florida Dairy Research Unit and General Electric nickel/cadmium battery plant are the two major influences on the stream (Figure 2.7-8 and Section 2.5). Within the dairy research unit, improved pastures are mowed for hay. Forage crops have been planted in some areas. Stream flow is largely due to runoff and the water quality is presently within the criteria set for livestock use (Section 2.5.1.2). Industrial discharge from the General Electric battery plant enters the creek between the railroad and U.S. 441 (Figure 2.7-8). The discharge enters the stream through a deep grassy channel to the north and east of the plant and flows through a flooded wooded area prior to entering the creek. This discharge provides a continuous flow to Cellon Creek and has affected water quality (Section 2.5.1.2).

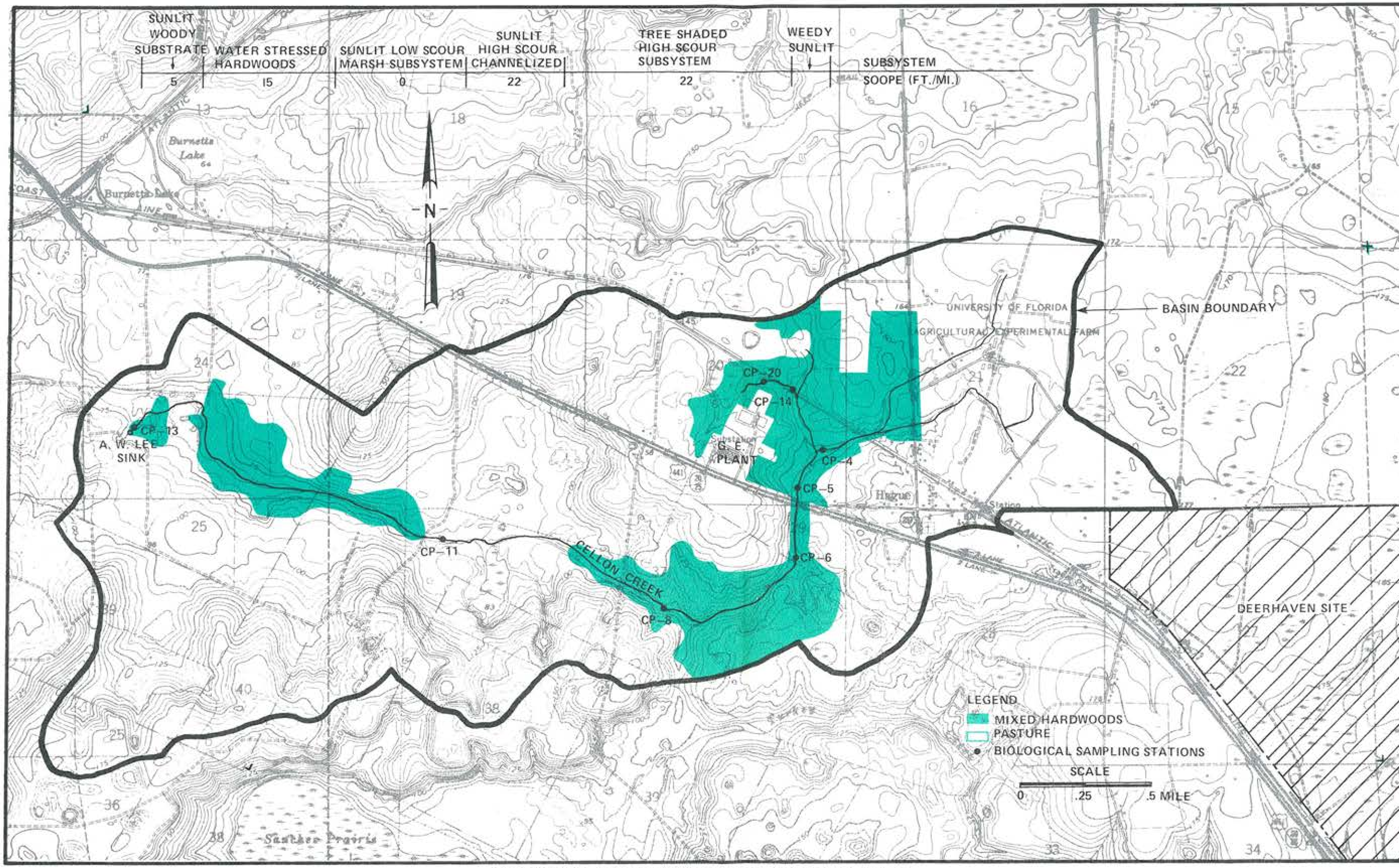


FIGURE 2.7-6 CELLON CREEK ECOLOGICAL SUBSYSTEMS.

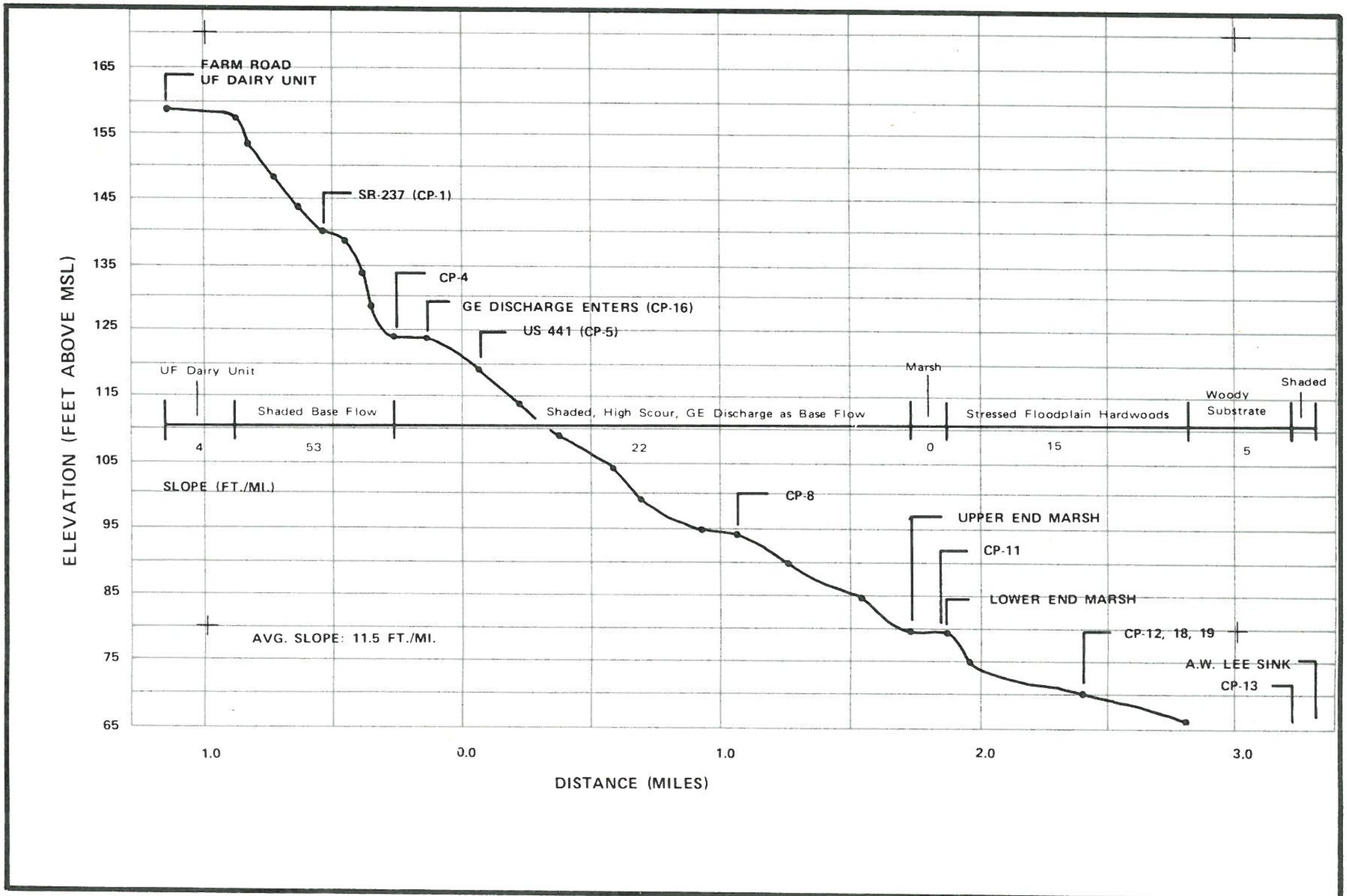


FIGURE 2.7-7 CELLON CREEK CHANNEL PROFILE, ASSOCIATED ECOLOGICAL SUBSYSTEMS AND SLOPES.

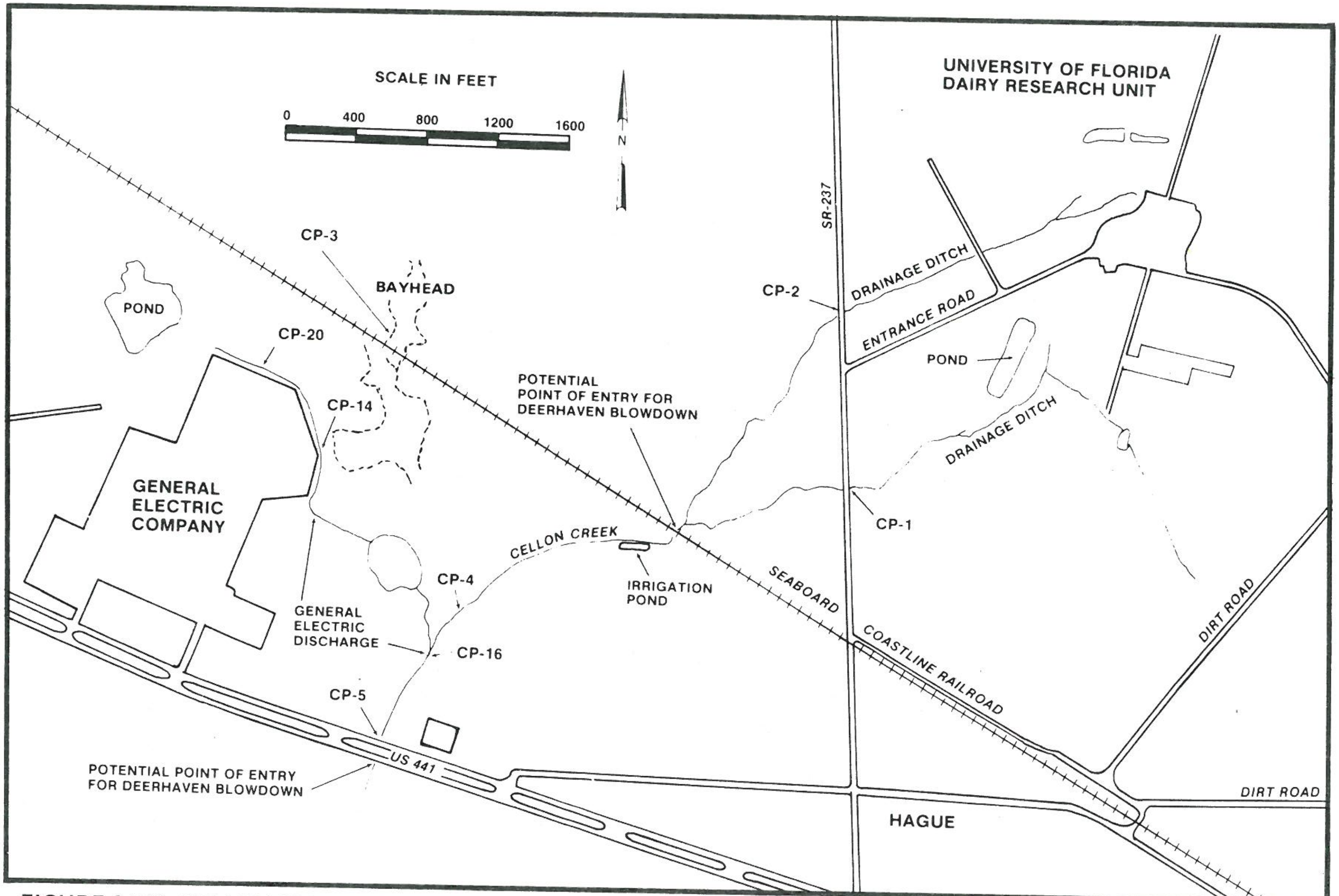


FIGURE 2.7-8 CELLON CREEK HEADWATERS NEAR THE UNIVERSITY OF FLORIDA DAIRY RESEARCH UNIT AND THE GENERAL ELECTRIC COMPANY.

Below U.S. 441 southern mixed hardwoods occur along the stream (Figure 2.7-6) in the area with incised banks and sharp meanders. The General Electric discharge is retained within the present bank system. However, due to the high stream gradient and meanders, the aquatic system is unstable and continues to adjust to the imposed flow regime. This is evidenced by: (1) caved and undercut banks; (2) a marl or clay based stream bottom below an actively moving bedload; and (3) sediment deposition within a downstream marshy area. This relatively high energy/high scour system is substrate-limited due to scour and associated particle destruction and to the rapid transport of detritus downstream. Primary production by aquatic plants is negligible due to the hardwood canopy and absence of a stable substrate.

At station CP-11 a marsh subsystem exists in a low gradient portion of the stream (Figure 2.7-7). As a result of a decrease in stream velocity and poorly defined channel banks, spreading of water and sheet flow occurs. Sediment eroded from the upstream segment is deposited within the marsh. High light intensity has favored the establishment of shrubs and herbs among which are <u>Hydrocotyle</u> sp., water hyacinth (<u>Eichornia crassipes</u>), wax myrtle, sea myrtle (<u>Baccharis halimifolia</u>), buttonbush, and various grasses, sedges and rushes. Dead pines and oaks in various stages of decay occur within the marsh. Older dead specimens occur in the lower end of the marsh while recently killed trees occur in the upper end, indicating that the marsh is extending upstream as sediment is deposited. The marsh has a large detritivorous macroinvertebrate population which is preyed upon by a variety of birds. Cattle egrets, white ibis, Wilson's snipe, and blue winged teal have been observed in the area (Breedlove and Associates, 1977).

Below the marsh the stream channel continues to be ill-defined as it flows through a southern mixed hardwood stand. Chronic stress of flood-plain hardwoods adjacent to the stream has occured (Figure 2.7-9) and appears to be of recent origin as only a few fallen or dead standing trees were observed.

Below the stressed tree zone is an open area of the stream along which willow is common (Figures 2.7-6 and 2.7-9). This habitat is free from the scour of upstream segments. Autotrophic and consumer populations occur on the willow trunks and exposed root systems.

The stream enters another zone of southern mixed hardwoods as it once again changes from a low scour/low bank system to a fast flowing system with eroded banks (Figures 2.7-6 and 2.7-9). However, herbaceous and grassy vegetation occur in a few isolated areas with reduced current and low scour.

The terminus of Cellon Creek is a sink pond (Figure 2.7-9). It is shallow and has a short retention time and a well developed aquifer connection. No aquatic plants occur in the pond. Livestock utilize the pond frequently, causing the water to remain turbid and the steep-sided banks to erode. Southern mixed hardwoods occur as overstory vegetation.

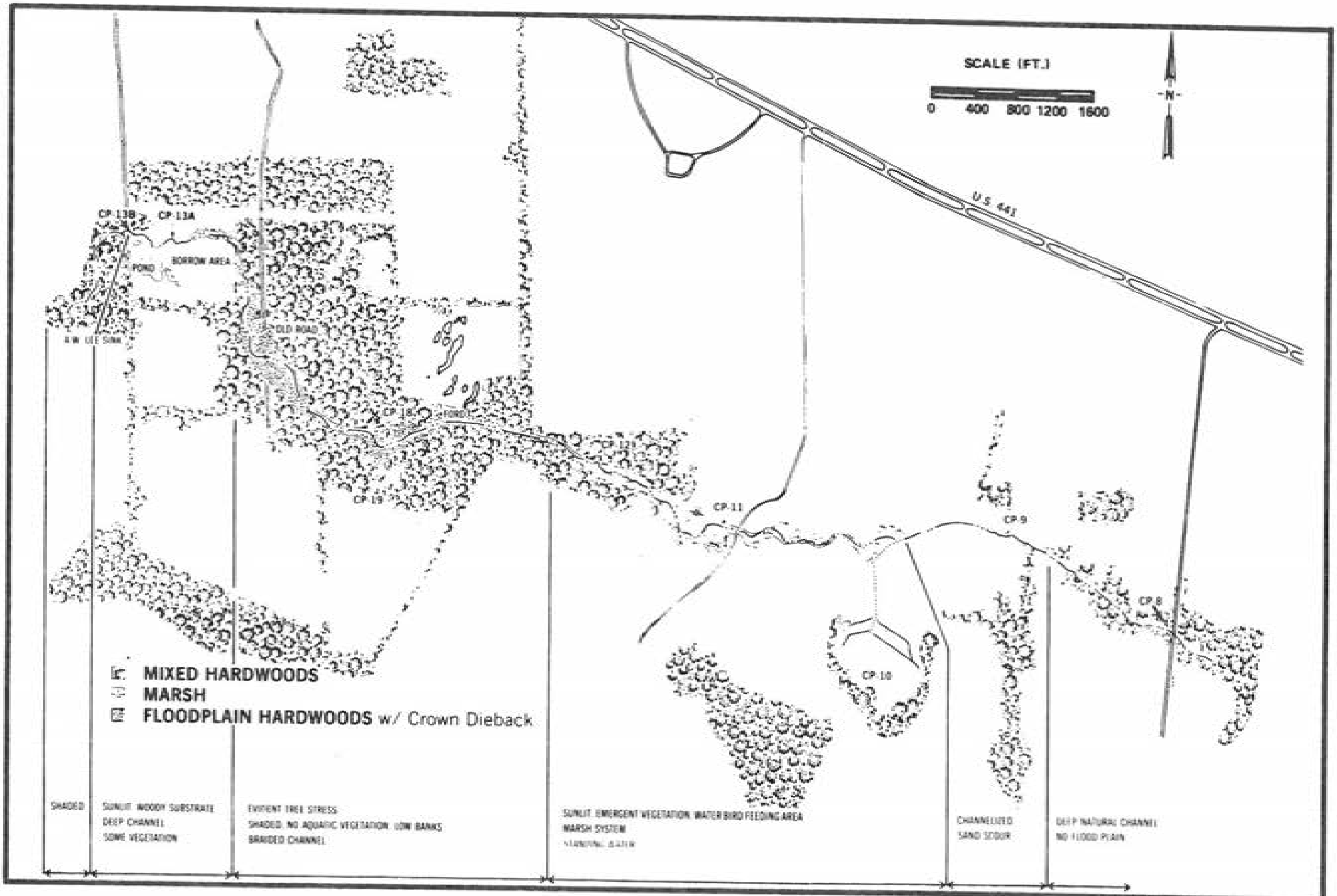


FIGURE 2.7-9 CELLON CREEK MARSH AND STRESSED TREE ZONE.

Animal Life

Macroinvertebrates - Figure 2.7-6 shows the station locations for benthic macroinvertebrate collections. A summary of the invertebrates collected is presented in Tables A2-48 through 61 and Table 2.7-8.

The macroinvertebrate faunal composition of Cellon Creek is a function of: (1) livestock usage and subsequent modification of aquatic habitat in the upper, middle and lower reaches; (2) dense aquatic weed growth in the upper reaches near the General Electric plant; (3) the habitat limitation imposed by an augmented flow below the General Electric plant in areas with a high stream gradient; (4) the presence of a densely vegetated marsh area and accumulation of organic debris; and (5) the accumulation of woody substrate in the open willow area. These forcing functions have acted to influence the number of taxa, number of organisms, and the stress tolerance characteristics of the stream macroinvertebrate community.

Oligochaetes are numerically dominant in Cellon Creek as a whole though this dominance may be misleading. They are tolerant of poor water quality but intolerant of scour, although specimens collected in high scour areas are small enough to inhabit sheltered niches. Their numerical dominance may also be due to other macroinvertebrates' lack of scour tolerance rather than to oligochaetes' particular suitability to the environment.

Approximately 44% of the collected taxa are facultative (Class II) and 25% are classified as tolerant (Class III). Fifteen percent of the taxa are intolerant to stress (Class I) (Table 2.7-8).

Water quality in Cellon Creek is largely influenced by the General Electric battery plant (Section 2.5.1.2). However, an analysis of the macroinvertebrate community reveals that continual bedload movement and scour may be equal to or greater in magnitude than water quality as a forcing function on the invertebrate community. Progomphus obscurus, a large dragonfly naiad, is a dominant species in terms of biomass, though not numerically. It burrows in clean shifting sand near stream margins and feeds primarily on dipteran larvae. It is considered intolerant of poor water quality but tolerant of scour due to its structure and burrowing ability. Corydalus cornutus is another large intolerant organism which is common in the lower parts of Cellon Creek, though it inhabits pieces of submerged wood and not the sand, thus removing scour as a limiting factor. This may be true of other collected scour intolerant genera such as Polypedilum, Rheotanytarsus, and Tanytarsus. Hyalella azteca is found under debris or vegetation and thus requires high dissolved oxygen. It was a numerical dominant at one station (CP-4). The caddis worm (Cheumatopsyche sp.) tolerates organic loading but not toxic materials; it is numerically dominant in the weedy subsystem behind the General Electric plant and in the sunlit subsystem with woody substrate.

Table 2.7-8 Benthic Macroinvertebrate Taxa Collected From Cellon Creek Near Hague, Florida Ranked According to Beck's Tolerance Classifications

	Class I (Intolerant)	Class II (Facultative)	Class III (Tolerant)	Class IV (Air-breathing)	Class V
	Agria sp	*Hyalella azteca	*Oligochaeta	Belostoma sp.	Paratendipes sp.
	*Progomphus obscurus	Procambarus sp.	Bezzia sp.	Dineutus sp.	
	Polypedilum halterale	Gomphus sp.	Cryptochironomus fulvus	Tropisternus sp.	
	Corydalus cornutus	Pachydiplax longipennis	Polypedilum scalaenum	Chrysops sp.	
	Acroneuria sp.	Dicrotendipes nervosus	Sphaerium sp.	Tipulidae sp.	
	Macromia sp.	Rheotanytarsus sp.	Pisidium sp.	Helisoma duryi	
	Asellus sp.	Tanytarsus sp.	Palpomyia tibialis	Helisoma sp.	
		Nematoda	Physa sp.		
		Calopteryx sp.	Chironomus stigmaterus		
		Stenelmis sp.	Chironomus decorus		
		Clinotanypus sp.	Helobdella sp.		
		*Cheumatopsyche sp.	Glyptotendipes sp.		
		Procladius sp.			
		Polypedilum illinoense			
		Pseudosuccinea sp.			
		Cladotanytarsus sp.			
		Microcylleopus sp.			
		Ablabesmyia peleensis			
		Enallagma sp.			
		Odontomyia sp.			
		Oecetis sp.			
No. Taxa:	7	21	12	7	1
Percent of Total:	14.6%	43.8%	25.0%	14.6%	2.1%

Total No. Taxa = 48

Cellon Creek BI = 35

*Demotes a dominant taxa (occurring at more than 20% of stations/collections).

The Ekman grab diversity and equitability values were influenced by the low number of organisms collected at any given station. Composited replicate data often did not result in the collection of a sufficient number of organisms for a valid calculation (EPA, 1973). Therefore, a rigorous analysis or acceptance of the values is unwarranted. However, compositing resulting in a significant lowering of station equitability (Table 2.7-9) compared to replicate variability. Station diversity values, based on composited data, tended to be greater than the replicate mean. The diversity and equitability values for individual stations, the high scour subsystem, and the entire stream system indicated a lower diversity environment and a non-equitable distribution of organisms among the low number of species present. The equitability values are quite low and tend to confirm that the creek is significantly stressed.

Fish - Three fish species were collected from Cellon Creek (Table 2.7-10). These species are regarded as stress tolerant (McKee and Wolf, 1971). The mosquitofish is considered highly tolerant of a wide variety of materials and conditions. Absence of fish in the high gradient stream subsystem is considered to be due to: (1) high scour; (2) a lack of pools or deep water; (3) high water velocity; and (4) absence of organic substrate. Isolation of the stream from other lakes, streams or rivers also precludes the possibility of a diverse fishery. Cellon Creek has a very low standing crop of fish at a creek or subsystem level (Table 2.7-10) and the creek therefore has a low potential as a sport fishery.

Table 2.7-9 Cellon Creek Benthic Macroinvertebrate Shannon-Weaver Diversity and Equitability Based on Replicated Ekman Grabs

Sta. No.	No. Species	Shannon-Weaver Diversity DBAR	Equitability	
41	5	1.95	1.01	
42	4	0.95	0.57	
43	10	2.99	1.12	CP-4
44	7	2.33	0.97	
45	15	2.79	0.64	
51	3	0.45	0.52	
52	1	0.0	1.00	
53	6	1.53	0.61	CP-5
54	2	0.32	0.70	
55	10	1.17	0.27	
81	2	0.47	0.79	
82	3	0.55	0.56	
84	3	0.92	0.74	CP-8
85	4	0.68	0.46	
111	11	1.53	0.33	
112	10	0.53	0.17	
113	3	0.10	0.37	CP-11
114	4	0.29	0.34	
115	17	0.72	0.11	
131	3	0.23	0.43	
132	2	0.16	0.60	
133	3	0.51	0.54	CP-13
134	3	0.14	0.39	
135	7	0.27	0.19	
141	3	0.16	0.40	
142	5	2.20	1.23	
143	2	1.00	1.19	CP-14
144	4	1.35	0.79	
145	10	1.18	0.28	
991	10	1.57	0.38	
992	5	0.86	0.42	Subsystem
993	12	2.59	0.69	CP-4, 5, 8
994	9	1.77	0.49	
995	20	2.06	0.28	
1001	18	1.71	0.23	
1002	18	0.95	0.13	Subsystem
1003	19	0.96	0.12	CP-4, 5, 8,
1004	15	0.81	0.13	11, 13, 14
1005	37	1.48	0.10	

Notes:

1) Nos. 1-4 in unit position of Sta. No. column are replicates.

2) No. 5 in unit position of Sta. No. column is a station diversity calcualted from composited replicate data.

3) Nos. 96-100 represent subsystems composed of indicated stations.

4) Number of organisms collected was usually <100 at replicate level.

Table 2.7-10 Fish Standing Crop in Cellon Creek Based on Block Seine Samples

Sta. No.	Species	Fish No.	Fish Wt.(g)	Area Sampled Ha.	Area Sampled A.	Station Standing Crop kg/Ha.	Station Standing Crop lb/A	Subsystem	Sample Area Standing Crop kg/Ha.	Sample Area Standing Crop lb/A	Subsystem Standing Crop kg	Subsystem Standing Crop lbs	Creek System Standing Crop kg	Creek System Standing Crop lbs
CP-5	*Gambusia affinis*	1	0.0131	0.010	0.024	0.0013	0.0015							
CP-6	NONE			0.008	0.018	0	0							
								Scoured Stream	0.0013	0.0012	0.0011	0.0024		
CP-14	*Gambusia affinis*	40	10.0879	0.006	0.014	1.6813	1.4996							
	Heterandria formosa	8	0.3071	0.006	0.014	0.0512	0.0457							
CP-20	*Gambusia affinis*	15	6.7991	0.006	0.015	1.1332	1.0107							
	Heterandria formosa	6	0.7780	0.006	0.015	0.1297	0.1157							
	Lepomis macrochirus	5	19.1650	0.006	0.015	3.1942	2.8489							
								Weedy, Deep Subsystem	6.1896	5.5205	0.3714	0.8187		
								CELLON CREEK STANDING CROP					7.4142	16.3453

Reptiles and Amphibians - The marsh area at CP-11 and the A. W. Lee Sink provide suitable habitat for some of the amphibians and reptiles listed in Tables A48 through 61. However, observations to date suggest a herptile fauna of low diversity and numbers. A bronze frog tadpole (Rana clamitans clamitans) was collected at Station CP-4 which is above the General Electric plant discharge. A southern leopard frog tadpole (Rana utricularia) and a squirrel tree frog (Hyla squirella) were collected at Station CP-8. Other herptiles sighted included young alligators (Alligator mississippiensis), a banded watersnake (Natrix sipedon fasciata), and an unidentified turtle. The alligators were observed in the discharge ditch immediately downstream of the battery plant outfall; the banded watersnake was found in a hollow stump adjacent to Station CP-4; and the turtle was spotted within the creek channel between Station CP-5 and CP-8.

Rare and Endangered Species - Herptiles expected to occur in this portion of Alachua County which are endangered (E), threatened (T), rare (R), of special concern (SC), or status undetermined (SU) (Florida Audubon Society, 1974) are listed in Table 2.7-2. With the exception of the alligator, none of these classified species were either collected or sighted during the field reconnaissance and surveys of this creek. Of those species listed, the following could occur in suitable habitat adjacent to or within the Cellon Creek drainage: the indigo snake (T) - in drier upland areas; the spotted turtle (R) - in the marsh area; and the striped newt (R) - in the sinkhole ponds. The gopher tortoise (T) and the Florida gopher frog (T) are also possible inhabitants of this drainage; however, since no burrows were observed and the mixed hardwood areas adjacent to the creek are suboptimal habitat, the probability of present use is low.

The alligators in the General Electric discharge ditch are probably part of a population in an adjacent pond. The alligator is classified as endangered by the USDI (1976) (threatened in three Louisiana Parishes), as threatened by the FGFWFC (1975), and as a species of special concern by the Florida Committee on Rare and Endangered Animals (1974). In Florida, however, populations have recovered and the alligator is in neither a threatened nor endangered status.

2.7.3.3 Rocky Creek

Rocky Creek drainage basin is a comparatively large watershed for small streams in central Florida. The northeastern portion of the Deerhaven site is in the watershed although no process waters from Deerhaven Unit 1 are connected to the creek. Figures 2.7-10, 2.7-11, and 2.7-12 show the ecological subsystems and channel profile for Rocky Creek. The headwaters are located within pine flatwoods interspersed with cypress heads. The creek flows northeast enroute to the Santa Fe River through a mixture of flatwoods, mixed hardwoods and agricultural lands. Most of the creek is contained within a well-defined channel; stream gradients are higher in the upper reaches and moderate in the lower reaches.

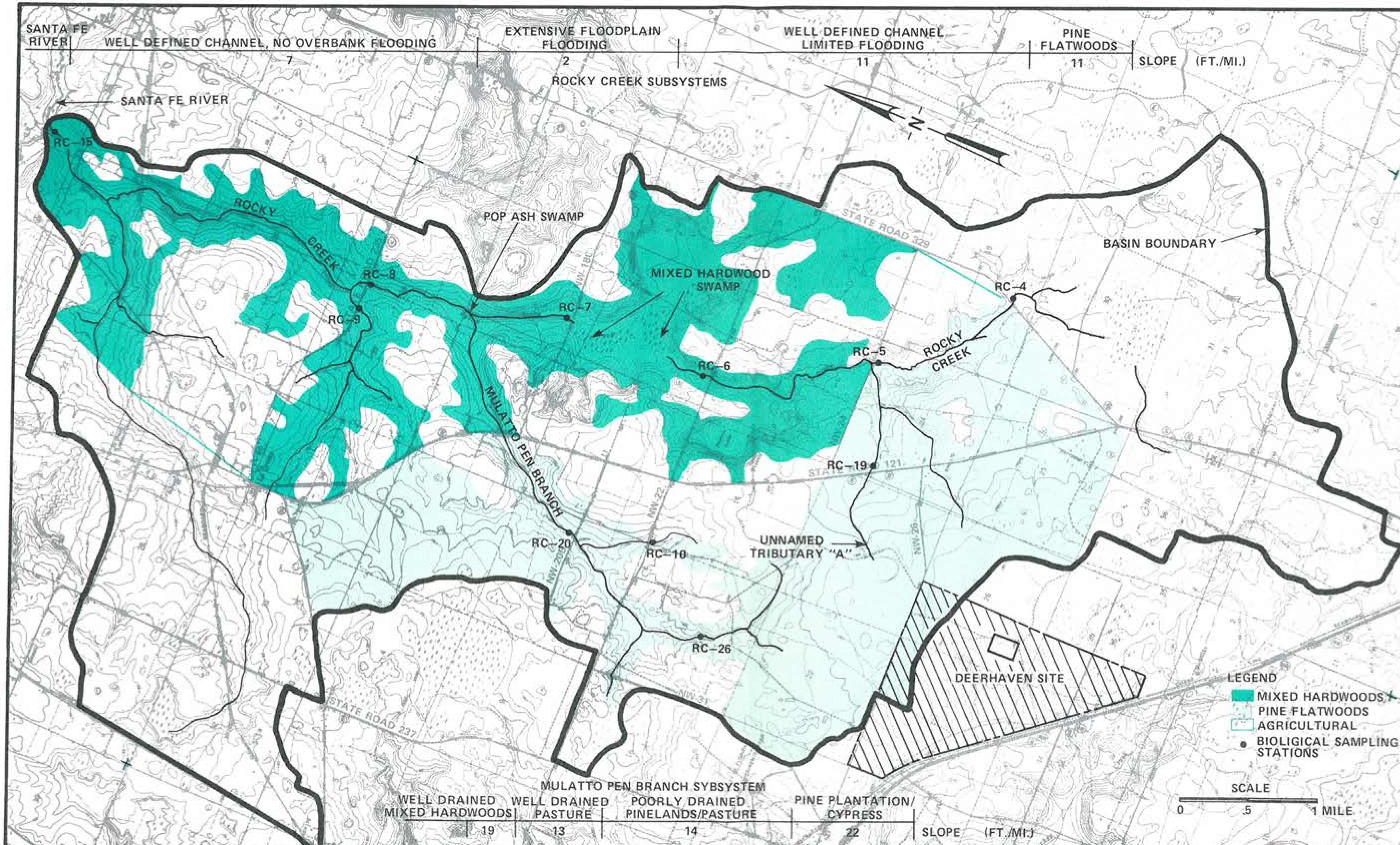


FIGURE 2.7-10 ROCKY CREEK AND MULATTO PEN BRANCH ECOLOGICAL SUBSYSTEMS AND VEGETATION ASSOCIATIONS.

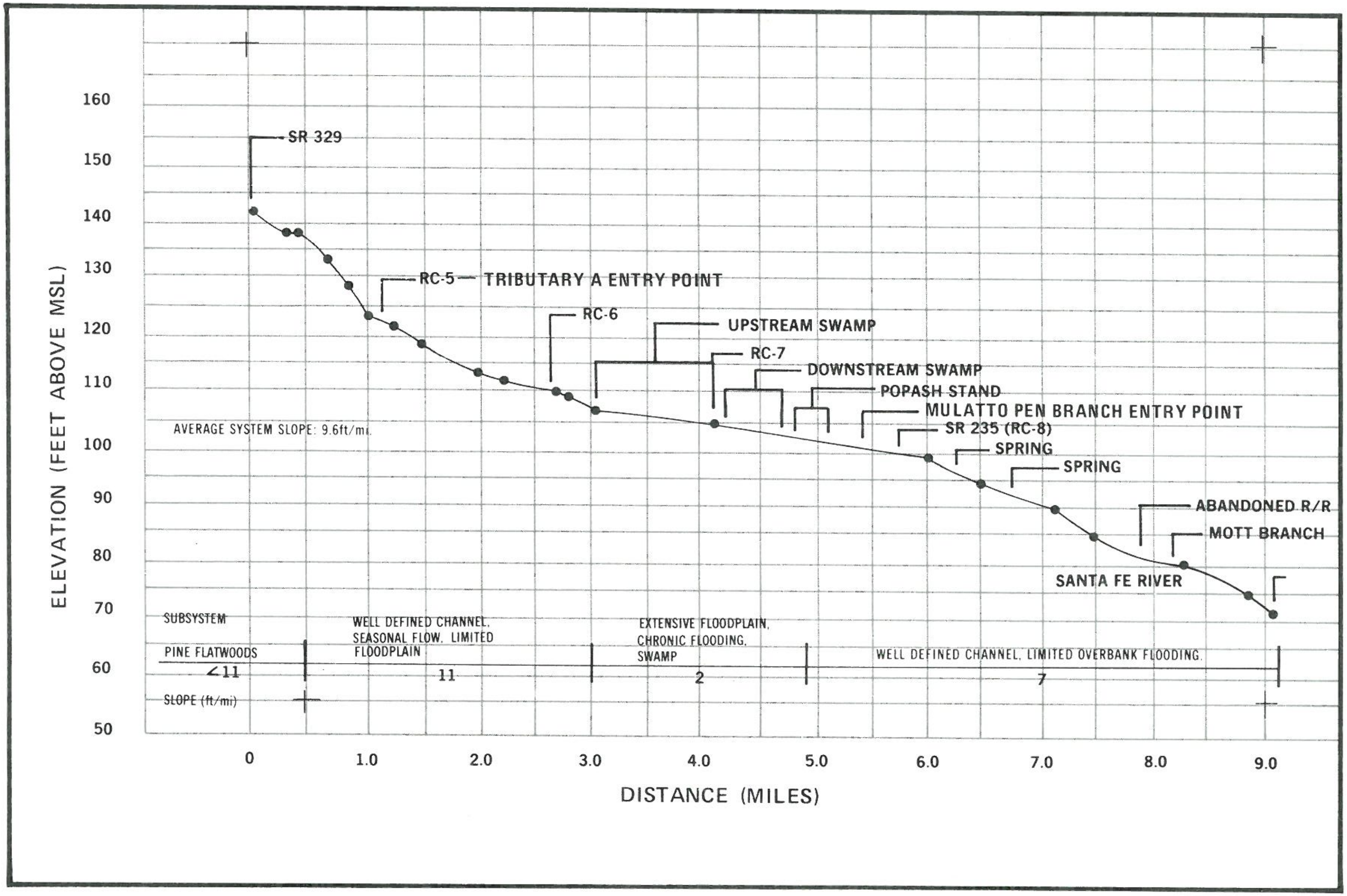


FIGURE 2.7-11 ROCKY CREEK CHANNEL PROFILE, ASSOCIATED ECOLOGICAL SUBSYSTEMS AND SLOPES.

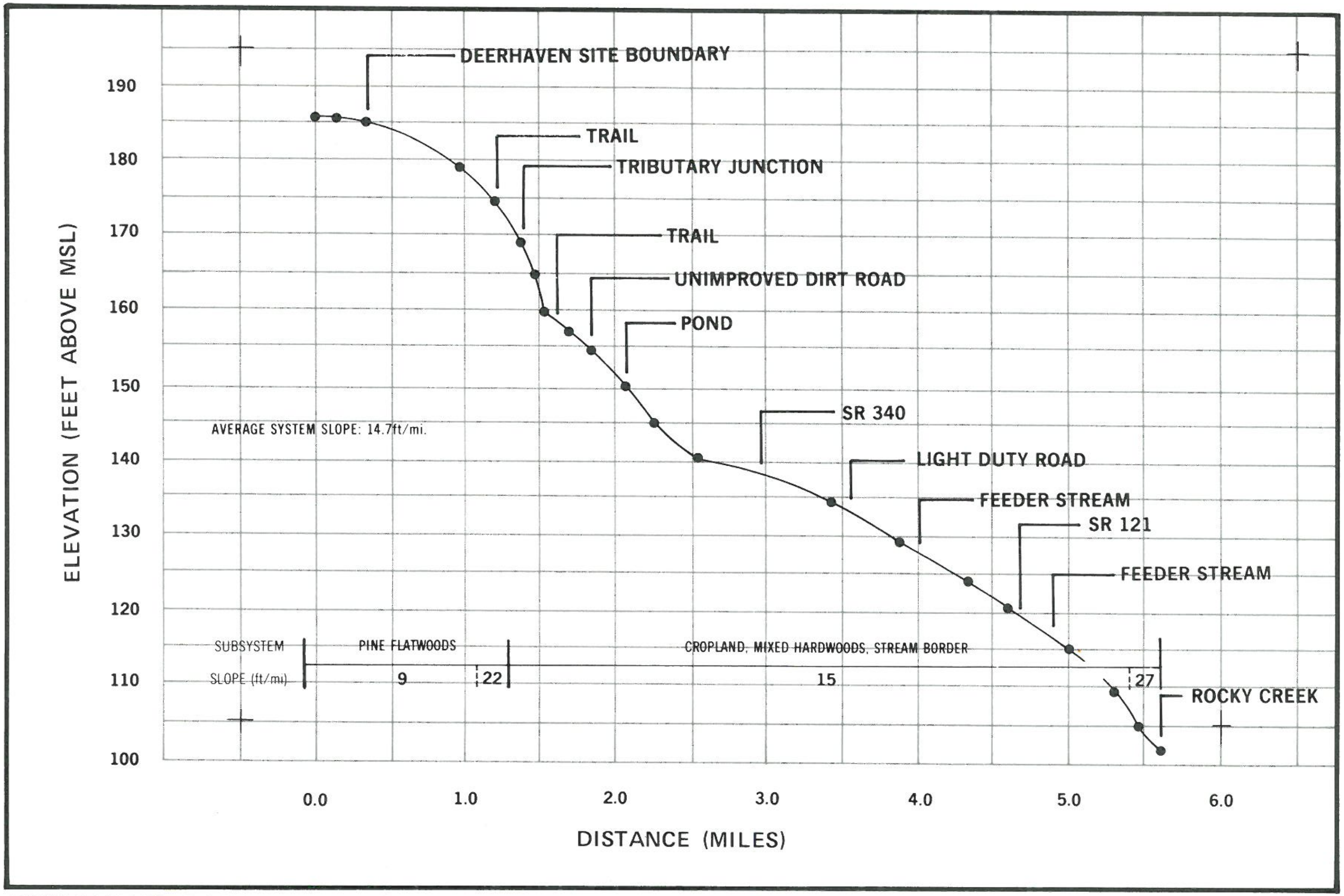


FIGURE 2.7-12 ROCKY CREEK DISCHARGE UNNAMED TRIBUTARY "A" CHANNEL PROFILE, ASSOCIATED ECOLOGICAL SUBSYSTEMS AND SLOPES.

During previous investigations (Breedlove, 1977), two tributaries to Rocky Creek were considered as discharge alternatives for Deerhaven blowdown. These were Mulatto Pen Branch and an unnamed tributary (Rocky Creek Unnamed Tributary "A") (Figure 2.7-10). Ecological subsystems and channel profiles for these tributaries are shown in Figures 2.7-12 and 2.7-13.

Aquatic Subsystems and Forcing Functions

Rocky Creek, Mulatto Pen Branch and unnamed tributary headwaters are derived from cypress heads, bayheads and pine flatwoods (Figure 2.7-10). Much of the headwater area is in commercial pine production and, therefore, has been extensively channelized to promote drainage. The major forcing function to the aquatic environment in this area is the widely fluctuating water level. During normal and dry conditions discharge is zero, whereas under heavy rainfall events considerable water is discharged from the cypress heads and surrounding area.

Below the cypress/pine headwater area of Rocky Creek and its two principal tributaries exist the following subsystems: (1) a shaded intermittent stream (Rocky Creek); (2) a poorly drained pineland/pasture stream (Mulatto Pen Branch); and (3) a shaded intermittent stream (Tributary "A") (Figures 2.7-11, 2.7-12 and 2.7-13). The shaded intermittent stream segments have a narrow floodplain area with mixed hardwood vegetation. The pineland/pasture segment of Mulatto Pen Branch contains a meandering channel interspersed with remnant cypress and blackgum.

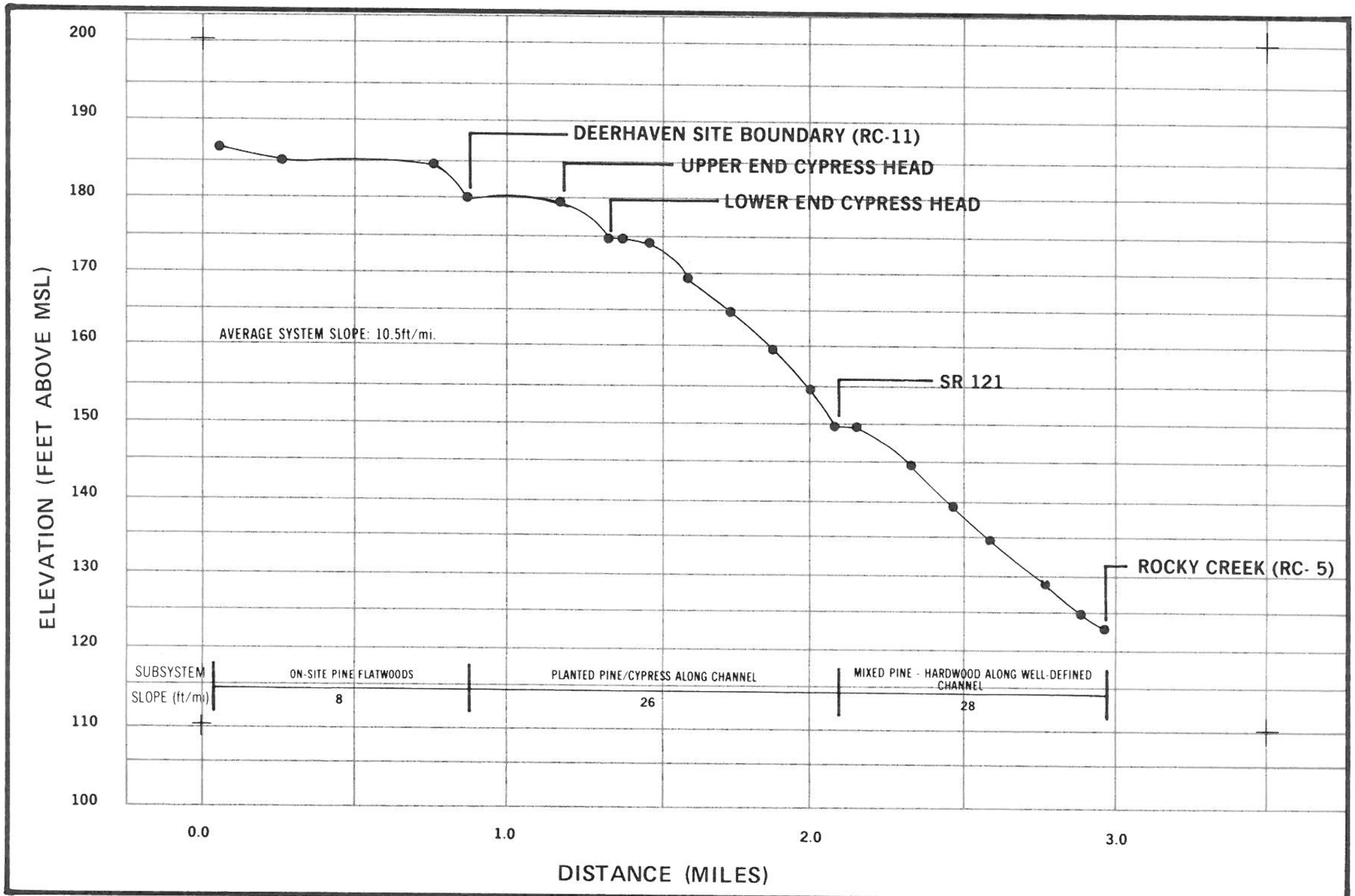


FIGURE 2.7-13 MULATTO PEN BRANCH CHANNEL PROFILE, ASSOCIATED ECOLOGICAL SUBSYSTEMS AND SLOPES.

The channel is open and has numerous pool and riffle areas which support streamside herbaceous vegetation. Each of these segments is strongly pulsed by seasonal drainage. Most of the streams in these areas dry completely during certain times of the year, but pool areas and seeps may remain wet and provide habitat for mobile aquatic species.

The final reach of Mulatto Pen Branch is well shaded by mixed hardwoods and contains occasional pool areas. This subsystem is also strongly pulsed by seasonal drainage. A pop ash swamp occurs just above the confluence with the main channel of Rocky Creek (Figure 2.7-13). The Mulatto Pen channel becomes braided, forming a delta. An accumulation of woody debris and muddy soil and the absence of a main channel indicate that this is a sedimentation area.

Two mixed hardwood swamps occur on the main stem of Rocky Creek above the confluence of Mulatto Pen Branch (Figures 2.7-10 and 2.7-14). The swamps are separated by a constriction on which the Antioch Baptist Church Road was constructed. The swamps are encircled by a thin fringe of southern mixed hardwood forest and by crop and partureland. The vegetative composition of the mised hardwood creek swamps is comparable to that of mixed hardwood swamps of northern Florida described by Monk (1966). Black gum, bald cypress, sweet gum, and red maple are common. The floristic composition of the surrounding mixed hardwood community is somewhat variable, whereas that of the swamp is fairly constant. Generally, the steeper-sloped, drier portions of this mixed hardwood community

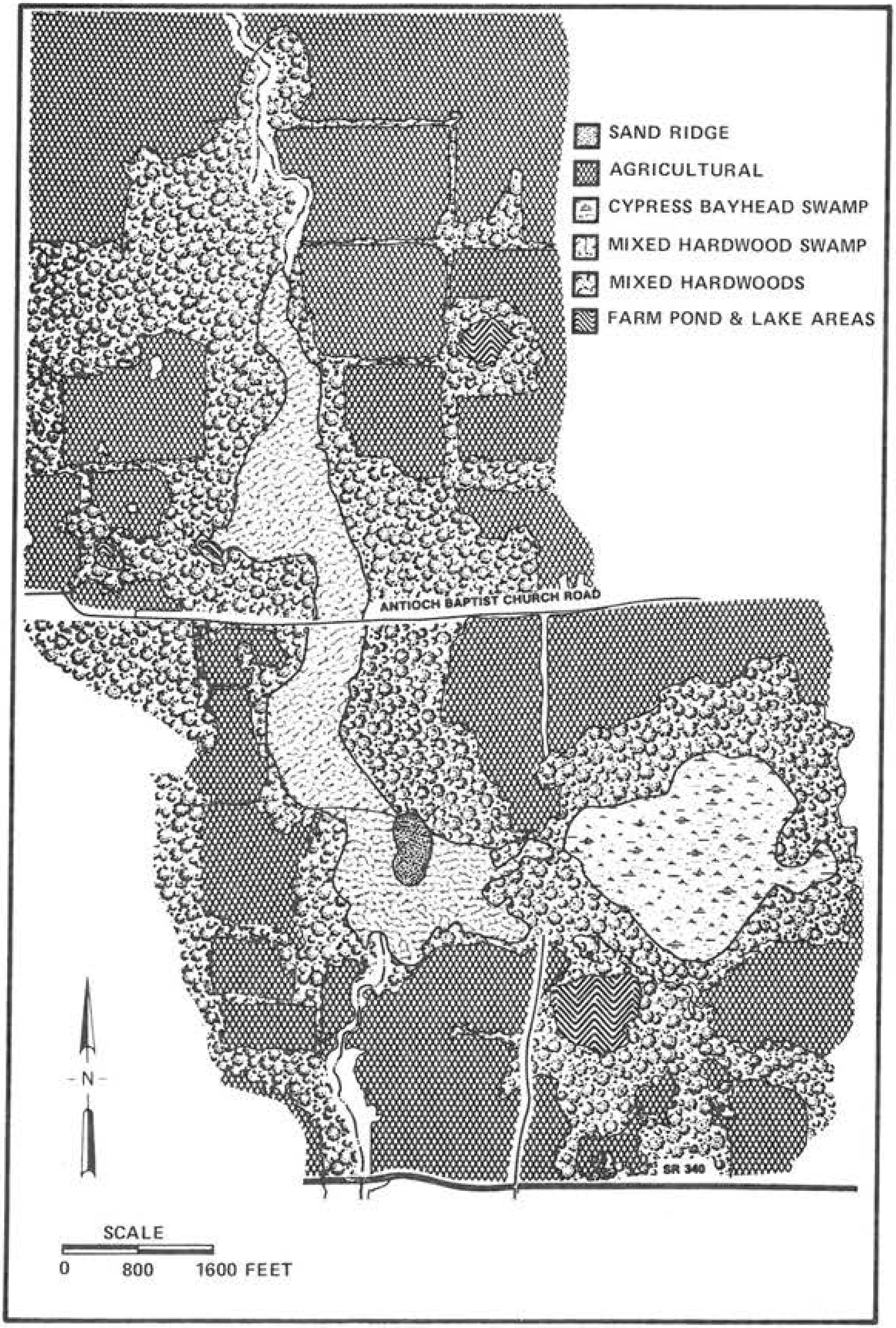


FIGURE 2.7-14 ROCKY CREEK SWAMPS VEGETATION ASSOCIATIONS.

support a greater percentage of live oak, laurel oak, magnolia, and loblolly pine, while the flatter and wetter portions support a higher percentage of sweet gum, red maple, and water oak.

The transition zone between the mixed hardwood swamp and forest is dominated by red maple, sweet gum, water oak, and laurel oak. Buttonbush, bald cypress, pop ash, black gum, magnolia, palmetto, wax myrtle, dahoon, loblolly pine, spruce pine and Florida elm are common associates. The floristic composition of the transition zone is more similar to that of the mixed hardwood forest than to that of the swamp.

Each swamp has a central area which is always flooded, and therefore provides excellent aquatic habitat. The water is usually 1.0-1.5 feet deep. Bottom substrate is relatively firm in both swamps; however, the downstream swamp has areas in which the organic material is 4 feet deep.

Below Mulatto Pen Branch, Rocky Creek is essentially a shaded, small woodland stream with a strong seasonal flow and seepage input during dry seasons. Several small, clear tributaries entering from the east provide base flow. The channel is well defined and it appears that overbank flooding occurs infrequently. No floodplain or hydric hammock vegetation occurs adjacent to the stream. Below the abandoned railroad (Figure 2.7-10) most of the land has been cleared and converted to pasture.

Prior to the confluence with the Santa Fe River, Rocky Creek changes into a deeper, slow flowing pool system.

Animal Life

Macroinvertebrates (Rocky Creek) - Figure 2.7-10 shows the station locations for macroinvertebrate collections. Tables A2-48 through 61 present the summary data for organisms collected at these stations. Table 2.7-11 presents summary data for the creek as a whole.

Rocky Creek, which may be dry over much of its length during part of the year, has pool areas which appear stagnant (Station RC-6) during the dry season; a swamp pool area (Station RC-7) which is weedy, deep and apparently wet at all times; a seep-fed section which generally has water and appears to contain a diverse fauna (Station RC-8); and a section within the Santa Fe River flood zone (Station RC-15). The five dominant species of the 67 collected macroinvertebrate taxa were distributed among the intolerant, facultative and tolerant classifications. Half of the taxa were classified as intolerant or facultative. Species not characterized for stress tolerance accounted for 19.4% of the taxa, with intolerant and air-breathing species comprising 13.4% and 16.4% of the taxa, respectively. More taxa were collected from Rocky Creek than from either Cellon or Turkey Creeks.

The fauna of Rocky Creek is typical of brown water streams in the north-central Florida region. Expected in such streams are crustaceans

Table 2.7-11 Benthic Macroinvertebrate Taxa Collected From Rocky Creek Ranked According to Beck's Tolerance Classifications

	Class I (Intolerant)	Class II (Facultative)	Class III (Tolerant)	Class IV (Air-breathing)	Class V
	Stictochironomus sp.	*Dubiraphia sp.	*Oligochaeta	Chrysops sp.	Elliptio sp.
	Acarina	Lampsilis sp.	Sphaerium sp.	Hydaticus sp.	Corbicula manilensis
	Macromis sp.	Cheumatopsyche sp.	Helobdella sp.	Notonecta sp.	Sialis sp.
	Polypedilum halterale	Stenelmis sp.	*Bezzia sp.	Pelocoris sp.	Phylocentropus sp.
	*Tribelos sp.	Nematoda	Caenis diminuta	Dineutus sp.	Cordulagaster sp.
	Agria sp.	*Palaemontes paludosus	Physa sp.	Tipulidae sp.	Psychodidae sp.
	Asellus sp.	Procambarus sp.	Polypedilum scalaenum	Trichocorixa sp.	Paratendipes sp.
	Corydalus cornutus	Gomphus sp.	Chironomus attenuatus	Belostoma sp.	Lauterborniella sp.
	Progomphus obscurus	Clinotanypus sp.	Palpomyia tibialis	Peltodytes sp.	Boyeria sp.
	Ablabesmyia aspera	Hyalella azteca		Gerris sp.	Tetragoneuria sp.
	Stenochironomus hilaris	Calopteryx sp.		Hexatoma sp.	Limnephilus sp.
		Ablabesmyia peleensis			Tauriphila sp.
		Microcylleopus sp.			Aeschna sp.
		Polypedilum illinoense			
		Cladotanytarsus sp.			
		Procladius sp.			
		Pachudiplax longipennis			
		Parachironomus sp.			
		Polypedilum tritum			
		Placobdella sp.			
		Rheotanytarsus sp.			
		Dicrotendipes sp.			
		Agrion sp.			
No. Taxa:	11	23	9	11	13
Percent of Total:	16.4%	34.3%	13.4%	16.4%	19.4%

Total No. Taxa = 67

Rocky Creek BI = 45

*Demotes a dominant taxa (occurring at more than 20% of stations/collections).

(Hyalella azteca, Palaemontes paludosus, Asellus, and Procambarus), odonates (Progomphus, Gomphus sp., Pachydiplax, Macromia, and Calopteryx), air-breathing hemipterans and beetles, elmids (Dubiraphia, Stenelmis, and Microcylloepus), megalopterans (Corydalus cornutus and Sialis), caddis larvae (Phylocentropus placidus and Cheumatopsyche), and mayflies (Caenis diminuta, Callibaetis, Stenomena, Paraleptophlebia, Leptophlebia, and Baetis). All expected taxa were collected in late 1976 except for mayflies, only one of which, the tolerant Caenis diminuta, was found.

Oligochaetes were numerically dominant in Ekman grabs, with Palaemontes paludosus, Bezzia sp., Dubiaphia sp., and Tribelos sp. also occurring frequently enough to be considered important.

Replicate values for the number of species collected, Shannon-Weaver diversity, and equitability were highly variable within station collections, as well as among stations, due to the relatively low number of organisms collected (Table 2.7-12). Stations RC-4 and RC-8, located in the pine flatwoods and below the swamp, respectively, had generally higher diversity values and more species than other stations. The swamp system had relatively low values for each parameter.

Composited values for diversity and equitability indicated that the Rocky Creek system and subsystems were of higher quality than either Cellon or Turkey Creeks.

Table 2.7-12 Rocky Creek Benthic Macroinvertebrate Shannon-Weaver Diversity and Equitability Based on Replicated Ekman Grabs

Sta. No.	No. Species	Shannon-Weaver Diversity DBAR	Equitability	
41	8	1.73	0.53	
42	11	2.46	0.68	
43	11	1.90	0.44	RC-4
44	9	1.81	0.50	
45	21	2.42	0.35	
51	6	1.22	0.47	
52	6	2.02	0.90	
53	5	0.94	0.45	RC-5
54	1	0.0	1.00	
55	11	1.52	0.33	
61	14	3.50	1.17	
62	6	0.96	0.39	
63	9	2.61	0.93	RC-6
64	7	2.32	0.96	
65	20	3.18	0.64	
71	7	1.89	0.69	
72	2	0.48	0.80	
73	6	1.63	0.65	RC-7
74	4	0.69	0.46	
75	10	1.59	0.38	
81	7	2.61	1.20	
82	9	2.02	0.59	
83	15	3.20	0.87	RC-8
84	13	3.46	1.21	
85	26	3.61	0.68	
151	5	1.25	0.58	
152	3	1.29	0.99	
153	5	1.52	0.73	RC-15
154	5	2.01	1.06	
155	12	2.26	0.54	
961	9	2.31	0.74	Subsystem
962	11	2.59	0.75	RC-8, 15
963	18	3.22	0.74	Alternative B
964	14	3.46	1.13	Blowdown
965	31	3.73	0.62	Discharge

Notes:

1) Nos. 1-4 in unit position of Sta. No. column are replicates.

2) No. 5 in unit position of Sta. No. column is a station diversity calculated from composited replicate data.

3) Nos. 96-100 represent subsystems composed of indicated stations.

4) Number of organisms collected was usually <100 at replicate level.

Table 2.7-12 Rocky Creek Benthic Macroinvertebrate Shannon-Weaver Diversity and Equitability Based on Replicated Ekman Grabs (continued)

Sta. No.	No. Species	Shannon-Weaver Diversity DBAR	Equitability	
971	23	3.10	0.53	Subsystem
972	19	2.77	0.50	RC-5, 6, 8, 15
973	21	3.07	0.57	Alternative A
974	17	3.42	0.90	Stream Sub-
975	39	3.61	0.45	systems only
981	27	3.08	0.44	Subsystem RC-5,
982	20	2.62	0.42	5, 7A, 8, 15
983	23	3.03	0.50	Alternative A
984	21	3.08	0.57	Blowdown
985	42	3.41	0.36	Discharge
991	24	2.69	0.37	
992	23	2.85	0.44	Subsystem
993	28	3.11	0.44	RC-4, 5, 6,
994	21	3.29	0.66	8, 15
995	43	3.40	0.35	
1001	28	2.87	0.36	Subsystem
1002	22	2.83	0.45	RC-4, 5, 6,
1003	30	3.14	0.42	8, 15, 7A
1004	22	2.83	0.45	All Rocky
1005	48	3.36	0.31	Creek Stations

Macroinvertebrates (Mulatto Pen Branch) - Macroinvertebrate composition in Mulatto Pen Branch is primarily influenced by seasonal drying of much of the channel length, the presence of sandy substrates with adequate detritus, and the relatively high water quality. The dense aquatic weed growth and open sunlit channel also contributed to the large number of taxa found at Station RC-20.

Approximately 12% of the taxa collected from Mulatto Pen Branch are classified as stress intolerant, 47% as faculatative and 24% as stress tolerant (Table 2.7-13). Collections were taxonomically dominated by Oligochaetes, which are considered highly tolerant of stress.

The collected fauna are typical of small, sandy bottomed, low energy streams. The numerical dominance of Oligochaetes is probably due to the seasonal drying of most of the stream channel. During zero flow, Oligochaetes follow the waterline and exist under a relatively high oxygen stress. Other species indicative of these stream conditions include: the elmid bettles - Dubiraphia sp. and Stenelmis sp. - which are typically found in sandy bottomed flowing streams; the mayfly - Caenis diminuta - which is a tolerant, slow water species; the dragonfly - Progomphus sp. - which burrows in flowing areas near stream margins; and other Odonata - Gomphus sp. and Pachydiplax sp. - which are usually found in slower flowing areas. Other collected scour intolerant taxa included: Polypedilum sp., Rheotanytarsus sp., and Tanytarsus sp.

Table 2.7-13 Benthic Macroinvertebrate Taxa Collected From Mulatto Pen Branch and Ranked According to Beck's Tolerance Classifications

	Class I (Intolerant)	Class II (Facultative)	Class III (Tolerant)	Class IV (Air-breathing)	Class V
	Cricotopus bicintus **Polypedilum halterale* *Progomphus obscurus* *Rheotanytarsus exiguus*	*Agrion* sp. *Cladotanytarsus* sp. *Clinotanypus pinguis* *Dicrotendipes* sp. *Dubiraphia* sp. *Endochironomus* sp. *Gomphus* sp. *Hyalella azteca* *Pachydiplax longipennis* *Polypedilum illinoense* *Polypendilum tritum* *Procambarus* sp. *Procladius* sp. *Rheotanytarsus* sp. *Stenelmis* sp. **Tanytarsus* sp.	*Oligochaeta **Bezzia* sp. *Caenis diminuta* *Chironomus crassicaudatus* *Cryptochironomus fulvus* *Helobdella* sp. *Palpomyia tibialis* *Physa* sp. *Sphaerium* sp.	*Agabus johannis* *Chrysops* sp. *Dytiscidae* sp. *Hexatoma* sp. *Holorusia* sp.	*Elliptio* sp.
No. Taxa:	4	16	9	5	1
Percent of Total:	11.4%	45.7%	25.7%	14.3%	2.9%

Total No. Taxa = 35

Mulatto Pen Branch BI = 24

*Denotes a dominant taxa.

Due to the relatively low number of organisms collected, Shannon-Weaver diversity and equitability values were highly variable and a rigorous analysis of these values is not warranted (Table 2.7-14 and Tables A2-48 through 61). Stations RC-20 and RC-21, which are located in the northern half of the basin, are less prone to channel drying and had higher diversity values and an equitable (even) distribution of species. Station RC-26, which is located in the headwaters area and is more prone to channel drying than Stations RC-20 and RC-21, had low diversity values and an overabundance of Oligochaetes (93%). In comparison, Stations RC-20 and RC-21 had 35% and 19% Oligochaetes, respectively. The overabundance of Oligochaetes, especially at Station RC-26, is probably most indicative of stress from channel drying.

Fish - Rocky Creek - Twenty fish species were collected from Rocky Creek (Table 2.7-15). Three species caught on trot lines (bowfin, bullhead and redfin pickerel) are not presented in Table 2.7-15. The mosquitofish was the numerical dominant. Species typical of warm, slow-moving, brown water systems, e.g. Heterandria formosa, Notropis sp., and Lepomis auritus, were prominant in collections at all stations. The pool area within the downstream swamp (Figure 2.7-11) was the only point in the system deep enough to be considered a significant habitat for the larger fish species. Because this habitat was atypical for the system but represented the only area containing a recreational fishery, it was considered important to sample for species not likely to be caught during block or sweep seining.

Table 2.7-14 Mulatto Pen Branch Benthic Macroinvertebrate Shannon-Weaver Diversity and Equitability Based on Replicated Ekman Grabs

Sta. No.	No. Species	Shannon-Weaver Diversity DBAR	Equitability	
201	16	3.29	0.88	
202	17	3.42	0.92	
203	11	2.56	0.73	RC-20
204	11	2.68	0.81	
205	10	3.64	0.60	
211	7	2.60	1.24	
212	12	3.29	1.17	
213	7	2.44	1.10	RC-21
214	10	2.98	1.10	
215	22	3.91	1.00	
261	3	0.67	0.55	
262	1	0.0	1.00	
263	4	0.39	0.24	RC-26
264	7	0.58	0.21	
265	30	0.55	0.14	

Notes:

1) Nos. 1-4 in unit position in Sta. No. column are replicates.

2) No. 5 in unit position of Sta. No. column is a station diversity calculated from composited replicate data.

3) Number of organisms collected was usually <100 at replicate level.

Table 2.7-15 Fish Standing Crop in Rocky Creek Based on Block Seine Samples

Sta. No.	Species	Fish No.	Fish Wt.(g)	Area Sampled Ha.	Area Sampled A.	Station Standing Crop kg/Ha.	Station Standing Crop lb/A.	Subsystem	Sample Area Standing Crop kg/Ha.	Sample Area Standing Crop lg/A.	Subsystem Standing Crop kg	Subsystem Standing Crop lbs	Creek System Standing Crop kg	Creek System Standing Crop lbs.
RC-4 (A&B)	Gambusia affinis	4	0.5385	0.013	0.033	0.0414	0.0369							
	Aphredoderus sayanus	1	1.2602	0.013	0.033	0.0969	0.0865							
	Lepomis auritus	1	3.7707	0.013	0.033	0.2901	0.2587							
RC-5	None			0.009	0.022	0.0	0.0							
RC-6	Ictalurus natalis	1	0.0709	0.013	0.033	0.0055	0.0049							
	Gambusia affinis	24	2.5791	0.013	0.033	0.1984	0.1770							
	Heterandria formosa	4	0.0946	0.013	0.033	0.0073	0.0065							
	Aphredoderus sayanus	1	1.1040	0.013	0.033	0.0849	0.0757							
	Lepomis auritus	1	3.1280	0.013	0.033	0.2406	0.2146							
	Elassoma okefenokee	1	0.0319	0.013	0.033	0.0025	0.0022							
	Labidesthes sicculus	11	1.9739	0.013	0.033	0.1518	0.1354							
RC-8 (A&B)	Lepomis auritus	1	4.4707	0.011	0.028	0.4064	0.3625							
	Notropis hypselopterus	3	1.1277	0.011	0.028	0.1025	0.0914							
	Notropis chalybaeus	2	0.6027	0.011	0.028	0.0548	0.0489							
	Gambusia affinis	1	0.0796	0.011	0.028	0.0072	0.0064							
	Labidesthes sicculus	1	0.3322	0.011	0.028	0.0302	0.0269							
RC-15A	Notemigonus crysoleucas	1	0.0852	0.014	0.034	0.0061	0.0054							
	Gambusia affinis	1	0.0525	0.014	0.034	0.0038	0.0034							
	Etheostoma edwini	1	0.1422	0.014	0.034	0.0102	0.0091							

Table 2.7-15 Fish Standing Crop in Rocky Creek Based on Block Seine Samples (continued)

Sta. No.	Species	Fish No.	Fish Wt.(g)	Area Sampled Ha.	Area Sampled A.	Station Standing Crop kg/Ha.	Station Standing Crop lb/A.	Subsystem	Sample Area Standing Crop kg/Ha.	Sample Area Standing Crop lg/A.	Subsystem Standing Crop kg	Subsystem Standing Crop lbs	Creek System Standing Crop kg	Creek System Standing Crop lbs
RC-15B	Notropis petersoni	1	1.1168	0.016	0.040	0.0698	0.0623							
	Notropis chalybaeus	1	0.4647	0.016	0.040	0.0290	0.0259							
	Fundulus crysotus	1	0.8684	0.016	0.040	0.0541	0.0482							
	Gambusia affinis	6	1.2848	0.016	0.040	0.0803	0.0716							
	Lepomis	7	12.8374	0.016	0.040	0.8023	0.7156							
								3.35 Ha. Shaded Stream	2.7761	2.4760	9.2999	20.5026		
RC-7A	Gambusia affinis	4	0.2502	0.031	0.077	0.0081	0.0072							
	Aphredoderus sayanus	2	2.9609	0.031	0.077	0.0955	0.0852							
	Etheostoma fusiforme	2	0.6128	0.031	0.077	0.0198	0.0176							
RC-7B	Gambusia affinis	29	5.4353	0.001	0.002	5.4353	4.8477							
	Heterandria formosa	6	0.3642	0.001	0.002	0.3642	0.3248							
RC-7C	Gambusia affinis	91	10.6879	0.001	0.003	10.6879	9.5325							
	Heterandria formosa	78	2.1924	0.001	0.003	2.1924	1.9554							
	Aphredoderus sayanus	1	0.5627	0.001	0.003	0.5627	0.5019							
	Micropterus salmoides	2	1.9423	0.001	0.003	1.9423	1.7323							
	Lepomis gulosus	1	1.8868	0.001	0.003	1.8868	1.6828							
	Enneacanthus gloriosus	1	0.5044	0.001	0.003	0.5044	0.4499							
								38.77 Ha. Swamp	23.6994	21.1375	918.8257	2025.6432		
									ROCKY CREEK STANDING CROP				928.1256	2046.1457

Table 2.7-15 Fish Standing Crop in Rocky Creek Based on Block Seine Samples (continued)

Sta. No.	Species	Fish No.	Fish Wt.(g)	Area Sampled Ha.	Area Sampled A.	Station Standing Crop kg/Ha.	Station Standing Crop lb/A.	Subsystem	Sample Area Standing Crop kg/Ha.	Sample Area Standing Crop lg/A.	Subsystem Standing Crop kg	Subsystem Standing Crop lbs	Creek System Standing Crop kg	Creek System Standing Crop lbs
Alternative A (Northeast - Blowdown passes through the Rocky Creek swamps)														
	RC-5 to Santa Fe Area Standing Crop:					928.0607 kg	2046.0026 lbs							
	DH to RC-5 Area Stading Crop:					1.6233 kg	3.5787 lbs							
	(Based upon stream width at DH-9 and SC figures from DH-9 & DH-10 combination.)													
	Total--												929.6840	2049.5813
Alternative B (North - Blowdown bypasses Rocky Creek swamp.)														
	Jct. of creek to Santa Fe ASC:					1.6567 kg	3.6524 lbs							
	DH to RC ASC:					3.1038 kg	6.8426 lbs							
	(Based upon stream width at DH-9 and SC figures from DH-9 and DH-10 combination.)													
	Total--												4.7605	10.4950

The shaded stream subsystem was the dominant habitat type in Rocky Creek. It consisted of pools along cut banks, sandy bottomed riffles, and occasional long pools. The low scour subsystem retains much of the leafy and woody detritus which passes into it. However, the cross-sectional area was generally too shallow to maintain larger fish species. The pool areas were also relatively small. Therefore, the subsystem was dominated by smaller fish species. The total subsystem standing crop was 20.5 lbs. (9.3 kg) (Table 2.7-15). Rocky Creek has been observed to not flow or to flow only slightly at certain times of the year (Breedlove, 1976b). Pool areas were significantly smaller and some probably dried up during such periods, which would further limit the subsystem's ability to support a standing crop of larger fish.

In contrast, the weedy swamp pool areas (Station RC-7) supported a standing crop of 21.1 lbs./ac. (23.7 kg/ha). Because swamp interior areas contained Cabomba and Utricularia, submersed aquatic vegetation in open areas, and because small fish were noted in these areas, the chronically flooded swamp subsystem was considered a suitable fishery habitat. Therefore, the swamp area was estimated to contain 2,026 lbs. (919 kg) of these smaller fish species. Although the extrapolation probably results in figures that are high, the station standing crop indicates that the weedy pool areas have a much higher standing crop than does the Rocky Creek shaded stream subsystem or any of the Turkey Creek stations.

Fish (Mulatto Pen Branch) - Fish sampling has not been conducted on Mulatto Pen Branch. However, it is expected to have a similar assemblage of fish due to comparable water quality, land use, terrestrial vegetation, and its connection with Rocky Creek. As such, Mulatto Pen Branch should be characterized by species typical of warm, slow moving, shallow, brown water systems.

Reptiles and Amphibians (Rocky Creek) - Herptiles collected from Rocky Creek consisted primarily of tadpoles of the southern leopard frog, the bronze frog, the river frog (*Rana heckscheri*), and a bull frog (*Rana catesbeiana*) (Table 2.7-16). Central newts (*Notaophthalmus viridescens*), two-toed amphiuma (*Amphiuma means*), greater siren (*Siren lacertina*), and a loggerhead mush turtle (*Sternothaerus minor minor*) were collected from Rocky Creek swamp, and an eastern cottonmouth (*Agkistrodon piscivorus*) and banded watersnake (*Natrix sipedon fasciata*) were observed.

Collected upland herptile forms included the green anole (*Anolis carolinensis*), the southern black racer (*Coluber constrictor priapus*) and the yellow rat snake (*Elaphe obsoleta quadrivittata*).

The majority of the aquatic herptiles were collected in pool areas having silty or loose sediments and in streamside or aquatic vegetation. The others were collected in slow-moving water areas, puddles, or debris along or within the stream channel (Table 2.7-16).

Table 2.7-16 Location, Species, Number Collected, and Habitat of Herptiles Collected Within Rocky Creek and Rocky Creek Swamp

Sta. No.	Species	Number Collected	Habitat
RC-4	Unidentified Frog	0	Puddle
RC-5	Rana clamitans (Bronze frog)	3 (Tadpoles)	Pools
	Rana catesbeiana (Bull frog)	1	Puddle
RC-6	Amphiuma means (Two-toed amphiuma)	2*	Pool
	Sternothaerus minor (Loggerhead musk turtle)	1*	Pool
	Rana utricularia (Southern leopard frog)	2 (Tadpoles)	Standing water
	Notophthalmus viridescens (Central newt)	1	Pool sediments
	Anolis carolinensis (Green anole)	1	Brush near creek
RC-7	Amphiuma means (Three-toed amphiuma)	5*	Pool area cypress swamp
	Siren lacertina (Greater siren)	1*	Pool area cypress swamp
	Rana utricularia (Southern leopard frog)	2 (Tadpoles)	Pool area cypress swamp
	Rana clamitans (Bronze frog)	4 (Tadpoles)	Pool area cypress swamp
	Notophthalmus viridescens (Central newt)	2	Sediments cypress swamp
RC-8	Rana heckscheri (River frog)	21 (Tadpoles)	Pool area near highway bridge
RC-15	Rana clamitans (Bronze frog)	7	Low flow areas of creek channel
	Rana heckscheri (River frog)	1	Low flow areas of creek channel
	Unidentified frog	0	Low flow areas of creek channel
RC-19	Rana utricularia 9Southern leopard frog)	5	Puddles and low flow areas of creek channel

*Taken on trot line during fishing effort.

All but two of the species of turtles, none of the lizards, and about two-thirds of the snakes expected to occur in Alachua County (Tables A2-10 through 47) are either aquatic or semiaquatic forms and could be expected to utilize portions of the Rocky Creek drainage.

Endangered Species - Herptiles expected to occur in this portion of Alachua County which are endangered (E), threatened (T), rare (R), of special concern (SC) or status undetermined (SU) are: the eastern indigo snake (T), mole snake (R), alligator (E, T, SC), spotted turtle (R), and striped newt (R). These species probably occur in suitable habitats adjacent to or within Rocky Creek and its tributaries. The remaining species are less likely to occur in these areas for the following reasons: suboptimal habitat - gopher tortoise (T, SC) and associated gopher frog (T); on fringe of known range - Gulf hammock dwarf siren (SU); or low creek flow and shallow depth - the Suwannee cooter (T) and alligator snapping turtle (SU). None of the above listed species were either collected or sighted during the field surveys.

Reptiles and Amphibians (Mulatto Pen Branch) - Reptiles and amphibians found along Mulatto Pen Branch would be the same species collected or expected to occur along Rocky Creek.

Rare and Endangered Species (Mulatto Pen Branch) - Rare and endangered species expected to occur along Mulatto Pen Branch are the same species expected to occur along Rocky Creek.

2.7.3.4 Santa Fe River

Because Rocky Creek drains into the Santa Fe River the following overview of the ecology of the Santa Fe River is presented.

The Santa Fe River watershed displays distinct differences in character between the upper and lower portions. The upper portion, above O'Leno State Park, drains flatland areas through numerous surface streams. Vegetation surrounding the upper Santa Fe River is virtually unbroken floodplain forest (hydric hammock) containing bald cypress, water tupelo, water ash, water elm, red maple, and river birch. The river bed is sandy with pockets of deep organic muck in sluggish reaches.

A combination of factors in the upper portion tend to maintain low primary production within the river's aquatic system. Among these are: (1) shading by the surrounding forest; (2) dark staining of the water by tannins leached from decaying vegetation; and (3) the accumulation of organic material on the bottom which tends to cover substrata that could otherwise be colonized by aquatic plants. As a result, the aquatic system is predominately heterotrophic, deriving most of its biological energy from outside sources such as detritus from terrestrial vegetation.

In the lower portion of the river there is a noticeable absence of surface streams. Banks become steeper and the surrounding floodplain forest is replaced in many areas by upland southern mixed hardwoods. This vegetation community is dominated by oaks and interspersed with pines and other hardwoods (Section 2.7.2.1). Throughout much of this section the river bed cuts through limestone. In several areas the limestone creates small shoals and shallow riffles. Below High Springs, numerous clear springs discharge into the river, clarifying its waters, especially during periods of low flow.

The lower portion of the river has a more autotrophic character than the upper portion, as evidenced by beds of freshwater eel grass (_Sagittaria_ sp.) and other macrophytes which exist along shallow banks and in riffle areas, and a coating of attached epiphytes over the limestone outcroppings in the river bed. Light intensity is greater as a result of greater channel width and water clarity. The extensive limestone bed which provides a suitable permanent substrate for epiphytes and the improved lighting are the principal factors responsible for the increased autotrophic activity.

Energy flow in the river community is primarily through a detritus food chain similar to that described in Section 2.7.3. Another important food chain in the lower portion of the river is the herbivore pathway based on the consumption of aufwuchs by small invertebrates and turtles. Unlike the smaller streams in the region, however, the river system provides a more stable environment capable of supporting a higher diversity of organisms. It also provides refuge for aquatic organisms during periods of low flow.

The river's vertebrate fauna includes all of the fish and aquatic amphibians, reptiles, birds and mammals listed in Tables A2-48 through 61. In addition, the heavily forested banks and surrounding areas provide excellent habitat for upland species including game animals. Rare and endangered vertebrates expected to utilize aquatic habitats along the Santa Fe River are the wood stork, southern bald eagle, osprey, Louisiana waterthrush, little blue heron, snowy egret, Louisiana heron, black crowned night heron, yellow crowned night heron, least bittern, white ibis, round-tailed muskrat, American alligator, Suwannee cooter, spotted turtle, alligator snapping turtle, mud sunfish and Suwannee bass (Section 2.7.2.2.1, Table 2.7-2).

2.7.3.5 Other Basins Within the Area

A number of other creek basins either are contained or originate within the project area. While in the project area, none of these creek basins has been considered as discharge alternatives, therefore they have not been studied in as great detail as those previously mentioned.

Monteocha Creek arises in a pine flatwoods-cypress dome association east of the Rocky Creek drainage and about five miles east of the Deerhaven station. Land use in this basin parallels that of the Rocky Creek basin. It flows generally northward through an area of small farms and croplands to join Little Monteocha Creek. From there it passes through a hardwood floodplain forest, and then empties into the Santa Fe River. The stream probably has little flow except in times of heavy rain.

Hatchett Creek originates in swamps about five miles east-southeast of Deerhaven. Its watershed is entirely wooded, with a high percentage of swampland. Access to Hatchett Creek is extremely limited. It drains into Newnan's Lake and eventually the St. Johns River system.

Blue's Creek arises just east of the University of Florida Agricultural Experiment Station on S-232 southwest of Deerhaven. The upper watershed is in hardwood forest, with some limited pine flatwoods. A considerable part of the upper watershed is now a large lot residential area. It flows within well-defined banks west-northwest into San Felasco Hammock, where it goes underground in Big Otter Ravine.

Burnette's Lake Branch drains a small watershed and flows into Burnette's Lake on the outskirts of Alachua, five miles northwest of Deerhaven. Hogtown Creek, Sweetwater Branch, and Little Hatchett Creek drain urbanized watersheds within the City of Gainesville and empty into Lake Kanapaha, Alachua Sink on Payne's Prairie, and Newnan's Lake, respectively.

2.8 Ambient Air

The ambient air quality at the site, as it currently exists, is defined in terms of:

* Total suspended particulate matter (TSP),
* Sulfur dioxide (SO_2),
* Nitrogen oxides (NO_x),
* Oxidants (O_x),
* Hydrocarbons (HC), and
* Carbon monoxide (CO);

the criteria pollutants defined by Chapter 17-2 of the Florida Administrative Code. In the case of NO_x, O_x, HC, and CO a qualitative description of air quality will be presented since no reliable measured air quality data nor reliable emission data exist for these pollutants. This shortcoming is offset by the fact that the emission rates of these pollutants, from the proposed source are minor, with the exception of NO_x.

Existing and baseline levels of TSP and SO_2 have been determined for the site by air quality modeling techniques. Baseline air quality is as defined in Chapter 17-2.03(4)(b)(v) of the Florida Administrative Code. It is defined as the maximum concentration of pollutants in the ambient air measured or estimates in the area of the proposed source. For sources other than fossil fuel steam generators, 1973 emission data are used. For fossil fuel steam generators, 1972 emission data are used, except that natural gas is converted to a heat equivalent of 2.5% sulfur oil for establishing baseline emission data. Actual annual emission data are used for establishing annual existing and baseline air quality. Maximum design operating conditions are used to establish short-term (twenty-four hour and three hour) existing and baseline air quality.

The meteorological data used in conjunction with the above defined emission data are from Jacksonville, Florida. For annual average modeling, the wind/stability data record for the period 1970-1974 was used. The mixing depth used was 1,000 meters; the ambient temperature, 20° C (68° F); and the ambient pressure, 1,000 millibars. The wind speed/wind direction/stability data are listed in Table 2.6-5.

For short-term air quality modeling, the meteorological data were derived from 1964 Jacksonville data. These Jacksonville data were input to the CRSTER air quality model and the "worst-case" twenty-four hour and three hour conditions selected. The "worst-case" conditions were used rather than those creating the "highest second high" since only one year of meteorological data were analyzed. The twenty-four hour and three hour meteorological conditions are listed in Tables 2.8-1 and 2.8-2, respectively.

The air quality models used for simulating various conditions are:

* AQDM with the Brigg's plume rise equation and a calibration factor of 1.0 for annual TSP and SO_2

* PTMTPW with a calibration of 1.0 for three hour and twenty-four hour SO_2 and twenty-four hour TSP

2.8.1 Total Suspended Particulate Matter

Total suspended particulate matter levels in Alachua County have been measured by the Alachua County Pollution Control District for quite some time. The data are collected in accordance with the Federal Reference Method (40 CFR 50, Appendix B). It was determined that these data could be used to establish annual and twenty-four hour background TSP levels.

One site (SAROAD 10-0020-010), located approximately 1.9 miles (3 km) southeast of Deerhaven, was selected to establish TSP background levels. The AQDM predicts a current Deerhaven TSP impact at the site of zero. The site is remote from all other point and fugitive sources of par-

Table 2.8-1 24-Hour Meteorological Conditions Representative of "Worst-Case" Air Pollutant Dispersion Conditions (Day 096/1964 Jacksonville, Florida Data)

Hour of Day	Wind Dir. (DEG)	Wind Vel. (M/Sec)	Stability Class	Mix. Ht. (M)	Amb. Temp. (DEG-K)	Press (MB)
1	288.	4.10	4	589.	290.	1000.00
2	264.	5.10	4	567.	290.	1000.00
3	271.	5.10	4	544.	290.	1000.00
4	270.	5.10	4	521.	290.	1000.00
5	271.	4.10	4	499.	290.	1000.00
6	272.	5.10	4	476.	290.	1000.00
7	269.	5.10	4	454.	290.	1000.00
8	272.	3.10	4	431.	290.	1000.00
9	252.	5.10	4	409.	290.	1000.00
10	270.	6.20	4	386.	290.	1000.00
11	271.	5.10	4	364.	290.	1000.00
12	273.	5.10	4	341.	290.	1000.00
13	279.	5.10	4	319.	290.	1000.00
14	275.	7.70	4	296.	290.	1000.00
15	271.	8.20	4	296.	290.	1000.00
16	273.	7.20	4	296.	290.	1000.00
17	266.	5.10	4	296.	290.	1000.00
18	272.	5.10	4	296.	290.	1000.00
19	262.	4.10	4	320.	290.	1000.00
20	265.	5.60	4	402.	290.	1000.00
21	258.	5.10	4	484.	290.	1000.00
22	267.	4.10	4	566.	290.	1000.00
23	282.	3.60	4	648.	290.	1000.00
24	272.	2.60	4	730.	290.	1000.00

Table 2.8-2 3-Hour Meteorological Conditions Representative of "Worst-Case" Air Pollutant Dispersion Conditions (Day 096/1964 Jacksonville, Florida Data)

Hour of Day	Wind Dir. (DEG)	Wind Vel. (M/Sec.)	Stability Class	Mix. Ht. (M)	Amb. Temp. (DEG-K)	Press (MB)
1	151.	3.60	2	1100.	303.	1000.00
2	151.	2.60	1	1600.	305.	1000.00
3	154.	4.10	2	1400.	304.	1000.00

ticulate matter. The long-term (1/1976-8/1977) geometric mean TSP level of 29 $\mu g/m^3$ was therefore selected as the annual TSP background level for the study.

The 95 percentile TSP level at this site was 60 $\mu g/m^3$. Assuming that in 5% of the twenty-four hour periods, the station could have been influenced by particulate matter emissions from Deerhaven, the 95 percentile TSP level was selected as the twenty-four hour background level. This is not an unreasonable assumption in that the wind blows from Deerhaven toward the monitoring site approximately 6% of the time (Figure 2.6-1).

Several situations were simulated with the air quality models AQDM and PTMTPW in establishing TSP levels for various periods of time. These conditions, and the figure number in which the data are graphically presented, are listed in Table 2.8-3. The modeling data are also summarized in Table 2.8-4. The particulate matter emission inventories used are summarized in Table 2.8-5.

The baseline and 1977 TSP levels for the annual period at the Deerhaven site were at background level; 29 $\mu g/m^3$. The maximum annual average TSP level predicted for the Gainesville area for both time periods, exclusive of fugitive dust, was 32 $\mu g/m^3$; 3 $\mu g/m^3$ above background (Figures 2.8-1 and 2.8-2).

The maximum expected twenty-four hour TSP level in the vicinity of the Deerhaven site for the baseline period was 62 μg/m^3 (Figure 2.8-1). This concentration occurred approximately 5.3 miles (8.5 km) northeast of the power plant. The maximum twenty-four hour TSP level predicted for 1977 was 61 μg/m^3. This occurs at the same location the baseline maximum occurred. Both include a twenty-four hour TSP background concentration of 60 μg/m^3 (Figure 2.8-2).

2.8.2 Sulfur Dioxide

Sulfur dioxide levels have been measured in Alachua County at a nine station monitoring network for several years. The monitoring has been conducted by the federal reference method (40 CFR 50, Appendix A), however, no steps were taken until quite recently to control the temperature on any of the samplers. Since EPA has taken the position that there is no acceptable means of making temperature corrections on historic data (Burch, EPA, 1977), baseline and existing (1977) SO_2 levels were estimated with air quality models. The background concentration of SO_2 for all averaging times was assigned a value of zero.

The conditions simulated to establish baseline and existing SO_2 levels for various time periods are tabulated in Table 2.8-6. Levels of SO_2 for the baseline and existing periods are summarized in Table 2.8-4. The SO_2 emission inventories are presented in Table 2.8-7.

Table 2.8-3 Conditions Simulated with Air Quality Models to Establish Baseline and Existing Total Suspended Particulate Matter Levels - Gainesville, Florida

Conditions	Model	Figure
Baseline - 1972 emissions from fossil fuel steam generators; 1973 emissions from other sources		
24-hour - Jacksonville day 096/1964 meteorology	PTMTPW	2.8-1
Annual - Jacksonville 1970-1974 meteorology	AQDM, w/ Briggs	2.8-1
Existing (1977) - Current emission data from all existing or permitted sources		
24-hour - Jacksonville day 096/1964 meteorology	PTMTPW	2.8-2
Annual - Jacksonville 1970-1974 meteorology	AQDM, w/ Briggs	2.8-2

Table 2.8-4 Summary of Baseline and Existing (1977) Total Suspended Particulate Matter and SO_2 Levels - Gainesville, Florida

	Annual ($\mu g/m^3$) Maximum	24-Hour ($\mu g/m^3$) Maximum	3-Hour ($\mu g/m^3$) Maximum
Particulate Matter			
1972-73	32	62	N/A
1977	31	62	N/A
Sulfur Dioxide			
1972-73	4	73	241
1977	3	63	207

Table 2.8-5 Particulate Matter Emission Inventory - Alachua County, Florida (Emission Rate in Tons Per Day)

Source Name	1972/73	1977	1981	1985	1989	Max. 24-Hour Emissions
Deerhaven No. 1	0.06	0.18	0.07	0.07	0.11	0.63
Deerhaven No. 2	---	---	1.68	1.77	2.15	2.9
Deerhaven GT 1	---	0.005	0.007	0.007	0.01	0.15
Deerhaven GT 2	---	0.005	0.006	0.008	0.01	0.15
J.R. Kelly No. 5	0.01	---	---	---	---	0.1
J.R. Kelly No. 6	0.23	0.003	---	---	---	0.1
J.R. Kelly No. 7 & 8	0.35	0.05	0.025	0.044	0.04	0.5
J.R. Kelly GT 1	0.04	0.0006	0.003	0.004	0.009	0.15
J.R. Kelly GT 2	0.04	0.0001	0.003	0.003	0.01	0.15
J.R. Kelly GT 3	0.03	0.0007	0.005	0.005	0.01	0.15
Franklin Crates	0.1	0.1	0.1	0.1	0.1	0.1
Whitehurst Construction	0.1	0.1	0.1	0.1	0.1	0.1
Maas Brothers	0.1	---	---	---	---	---
Baggett Construction	0.4	0.4	0.4	0.4	0.4	0.4
Maddox Foundry	---	0.001	0.001	0.001	0.001	0.001
U of F Boiler	---	0.22	0.22	0.22	0.22	0.22
D & H Construction	---	0.04	0.04	0.04	0.04	0.04
Thomas Concrete	---	0.05	0.05	0.05	0.05	0.05
Sunland No. 1	0.01	0.01	0.01	0.01	0.01	0.01
Sunland No. 2	0.01	0.01	0.01	0.01	0.01	0.01
Sunland No. 3	0.01	0.01	0.01	0.01	0.01	0.01
Wall Construction	0.1	---	---	---	---	---
Koppers	---	0.003	0.003	0.003	0.003	0.003

Table 2.8-6 Conditions Simulated with Air Quality Models to Establish Baseline and Existing Sulfur Dioxide Levels - Gainesville, Florida

Condition	Model	Figure
Baseline - 1972 emissions from fossil fuel steam generators; 1973 emissions from other sources		
3-hour - See Table 2.8-2 for meteorology	PTMTPW	2.8-3
24-hour - Jacksonville day 096/1964 meteorology	PTMTPW	2.8-3
Annual - Jacksonville 1970-1974 meteorology	AQDM, w/ Briggs	2.8-3
Existing (1977) - Current emission data from all existing or permitted sources		
3-hour - See Table 2.8-2 for meteorology	PTMTPW	2.8-4
24-hour - Jacksonville day 096/1964 meteorology	PTMTPW	2.8-4
Annual - Jacksonville 1970-1974 meteorology	AQDM, w/ Briggs	2.8-4

Table 2.8-7 Sulfur Dioxide Emission Inventory - Alachua County, Florida (Emission Rate in Tons Per Day)

Source Name	1972/73	1977	1981	1985	1989	Max. 24-Hour Emissions
Deerhaven No. 1	3.3	1.75	2.8	3.0	4.8	12.5 x S
Deerhaven No. 2	---	---	20.0	21.6	25.6	34.1
Deerhaven GT 1	---	0.04	0.028	0.03	0.06	0.6
Deerhaven GT 2	---	0.04	0.028	0.036	0.06	0.6
J.R. Kelly No. 5	0.5	---	---	---	---	4.7 x S
J.R. Kelly No. 6	1.8	0.27	---	---	---	2.4 x S
J.R. Kelly No. 7 & 8	16.8	3.72	1.04	2.0	1.6	10.3
J.R. Kelly GT 1	0.2	0.004	0.014	0.017	0.04	0.6
J.R. Kelly GT 2	0.2	0.004	0.015	0.015	0.04	0.6
J.R. Kelly GT 3	0.2	0.005	0.019	0.02	0.05	0.6
Whitehurst Construction	0.3	0.3	0.3	0.3	0.3	0.3
Baggett Construction	0.1	0.1	0.1	0.1	0.1	0.1
U of F Boiler	---	2.2	2.2	2.2	2.2	2.2

S = % of sulfur

The annual average SO_2 level for the baseline period near the Deerhaven site is 1 to 2 $\mu g/m^3$ and the maximum in the Gainesville area is 4 $\mu g/m^3$ (Figure 2.8-3). For the 1977 period, the annual average SO_2 levels near Deerhaven and at the point of maximum concentration are 1 to 2 $\mu g/m^3$ and 3 $\mu g/m^3$, respectively (Figure 2.8-4).

The maximum twenty-four hour SO_2 concentration for the baseline period was predicted to be 73 $\mu g/m^3$ at a point 5.3 miles (8.5 km) northwest of the Deerhaven site (Figure 2.8-3). The maximum twenty-four hour SO_2 concentration for the 1977 period is 63 $\mu g/m^3$; occurring at the same point (Figure 2.8-4).

The maximum SO_2 levels for a three hour period for the baseline and 1977 period were predicted to be 241 $\mu g/m^3$ and 207 $\mu g/m^3$, respectively. In both cases the maximum was predicted to occur 1 km northwest of the Deerhaven site.

2.8.3 Other Criteria Pollutants

The other criteria pollutants are NO_x, O_x, HC, and CO. The only one of these emitted from the existing or proposed sources in any quantity is NO_x. The annual average impact of NO_x emissions was evaluated and found to be in the order of 1 $\mu g/m^3$ at the point of maximum concentration. The only Florida air quality standard for this pollutant is 100 $\mu g/m^3$.

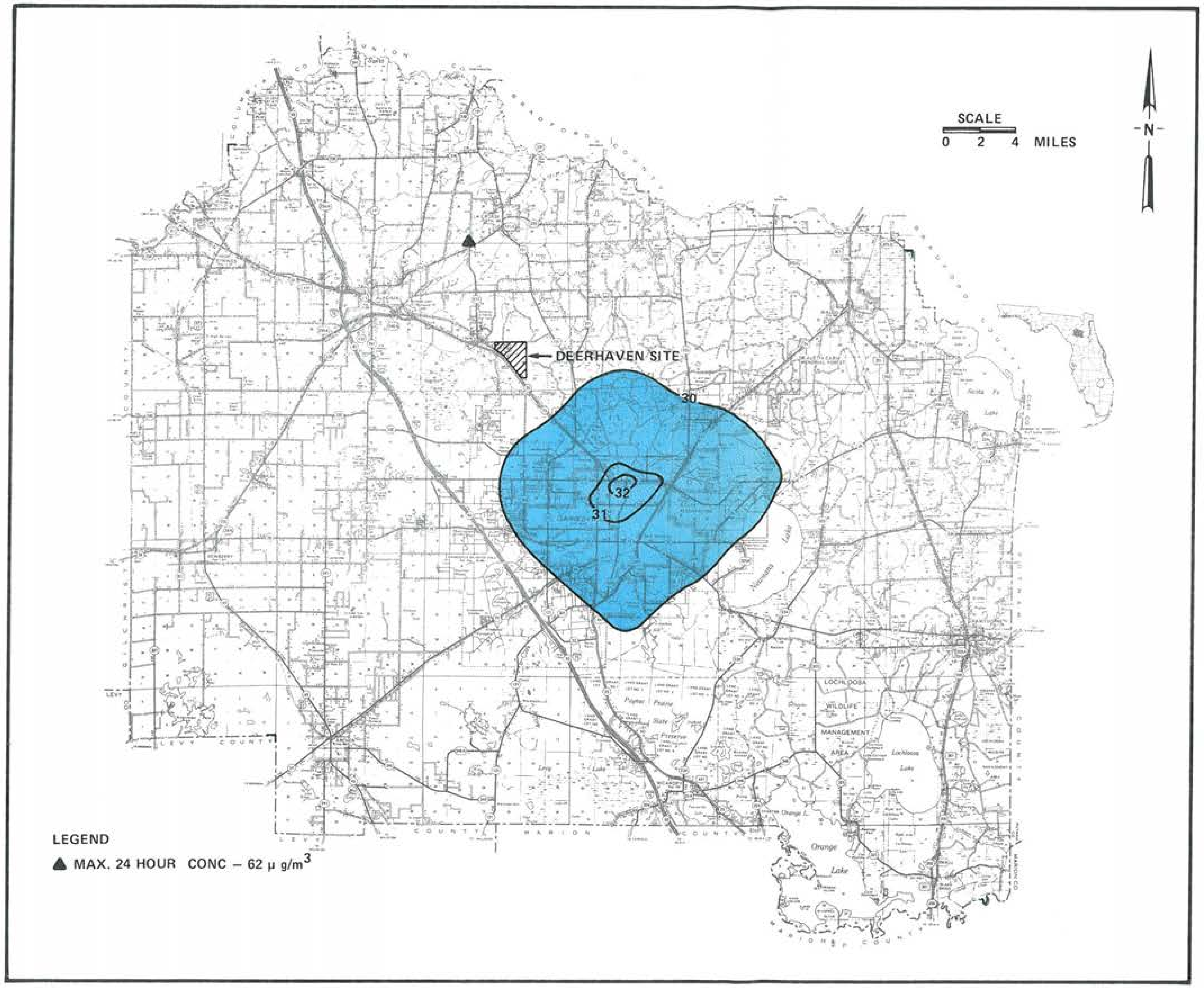


FIGURE 2.8-1 ANNUAL AVERAGE AND 24 HOUR AVERAGE BASELINE (1972/1973) TOTAL SUSPENDED PARTICULATE MATTER CONCENTRATION, ALACHUA COUNTY, FLORIDA.

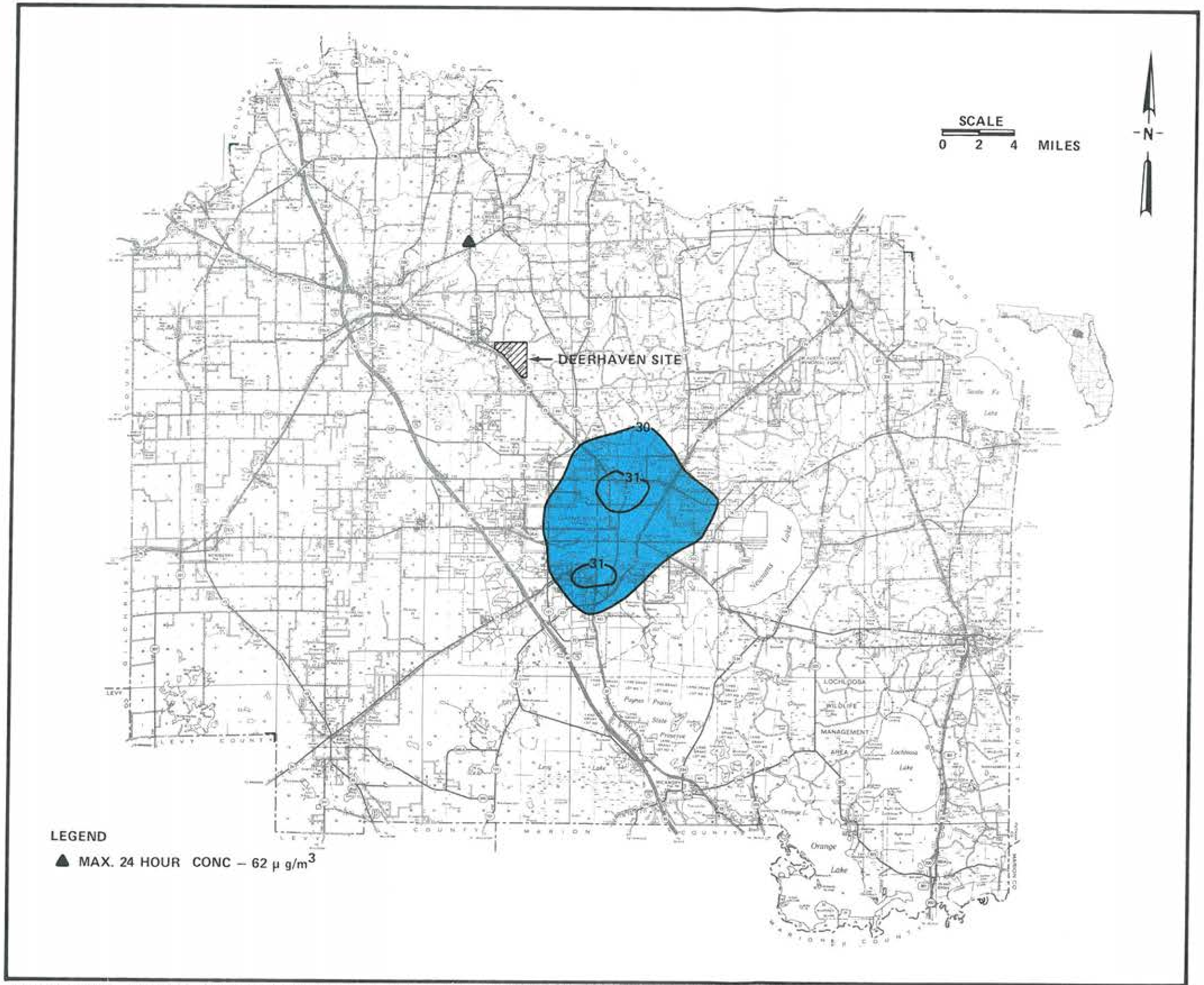


FIGURE 2.8-2 ANNUAL AVERAGE AND 24 HOUR AVERAGE 1977 TOTAL SUSPENDED PARTICULATE MATTER CONCENTRATION, ALACHUA COUNTY, FLORIDA.

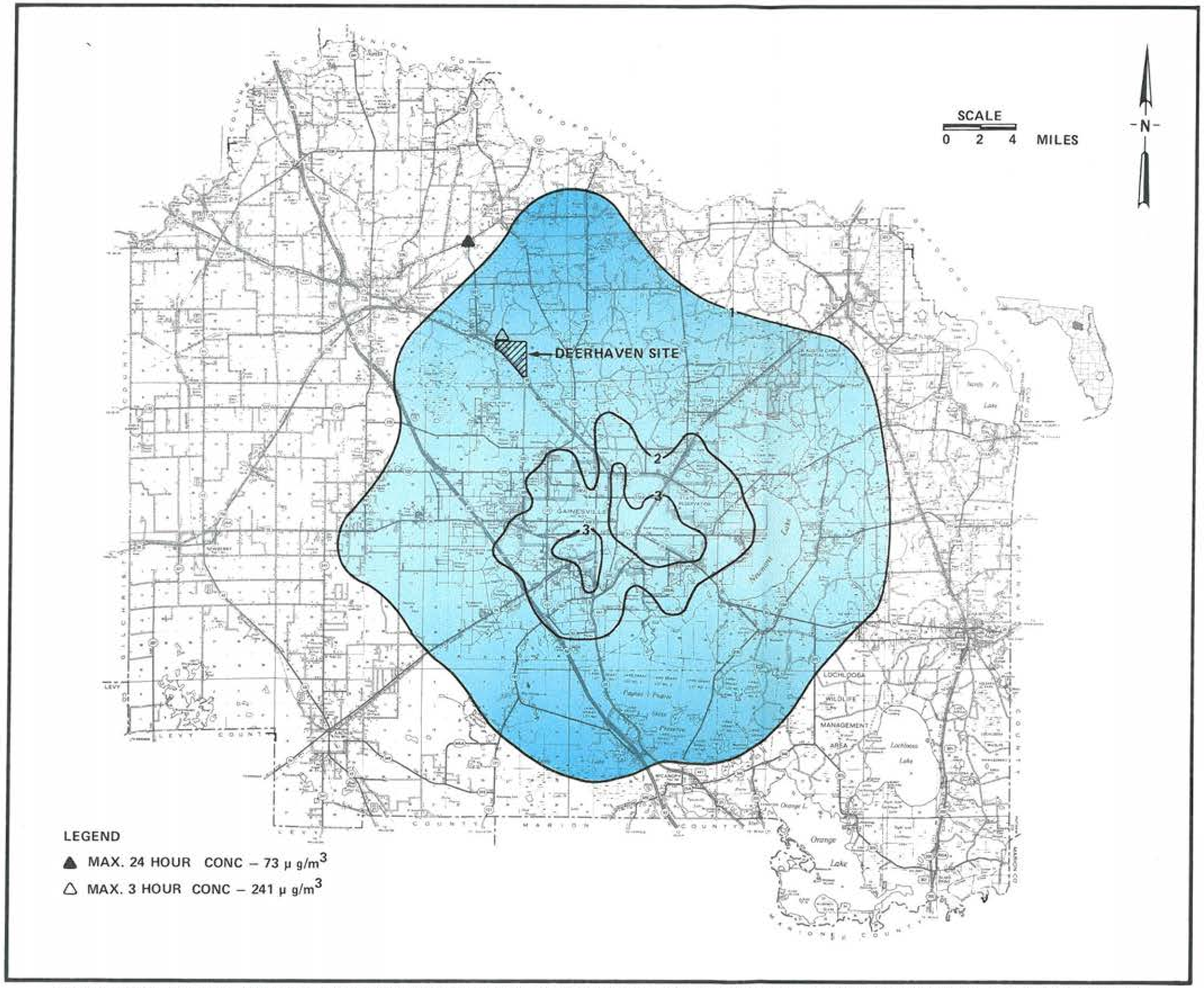


FIGURE 2.8-3 ANNUAL 24 HOUR AND 3 HOUR BASELINE (1972/1973) SULFUR DIOXIDE CONCENTRATION, ALACHUA COUNTY, FLORIDA.

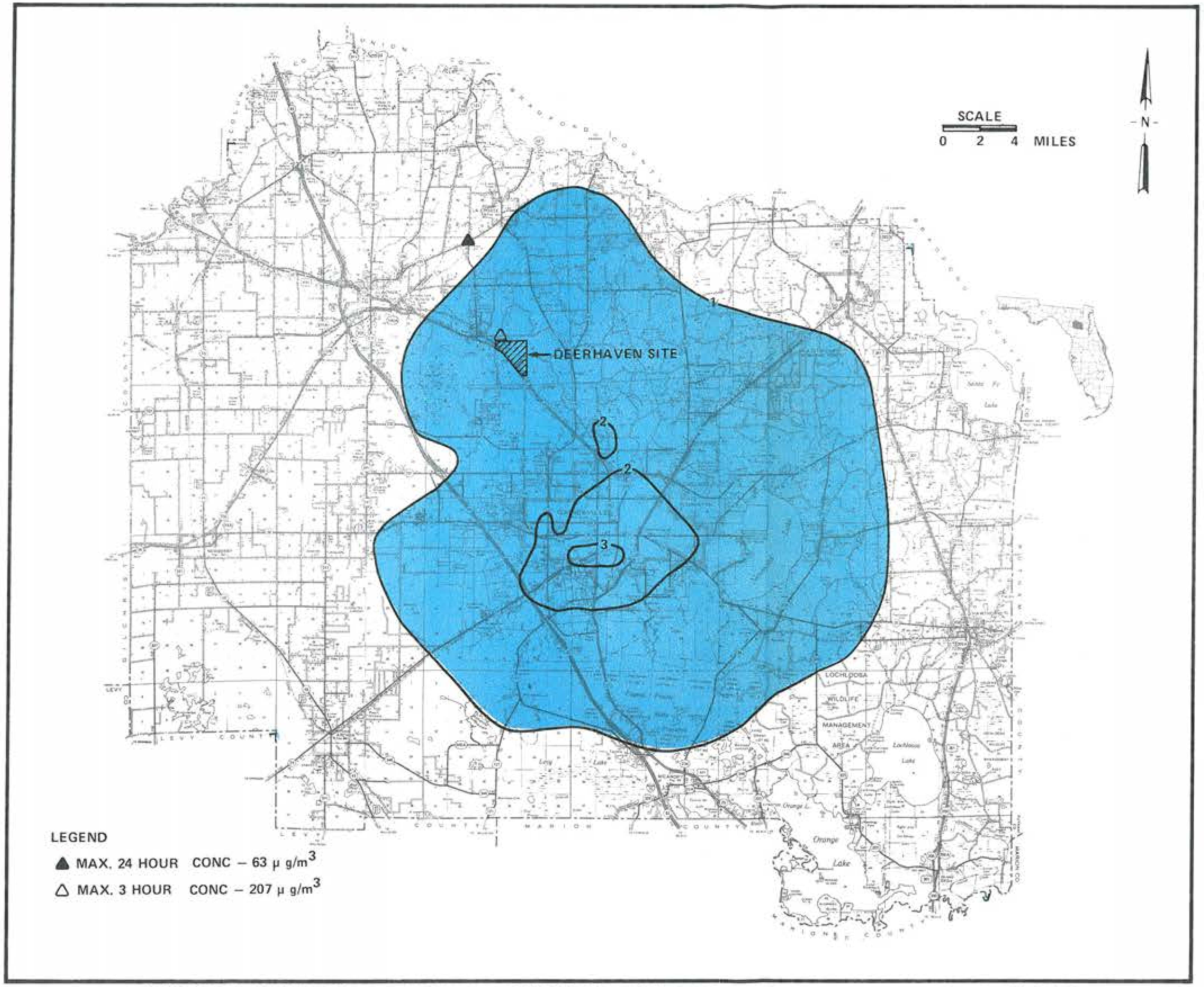


FIGURE 2.8-4 ANNUAL 24 HOUR AND 3 HOUR 1977 SULFUR DIOXIDE CONCENTRATION, ALACHUA COUNTY, FLORIDA.

CHAPTER 3

THE PLANT

The operating plant and directly associated facilities are described in this chapter. Although design has not been finalized, best estimates of plant effluents and performance of related systems have been developed.

Detailed descriptions of the major component operations which may affect the environment, such as fuel handling and storage, process water use, solid waste control and disposal, and air pollution control are provided. Process water use is described for both normal and peak plant use based upon average and peak load conditions respectively. Consumptive water use is also provided for the plant as a whole as well as each major component operating within the process water balance. Estimations of the chemical and physical characteristics of certain major effluents are also discussed.

This application is based upon the use of a zero discharge system for the disposal of plant effluents for both Units 1 and 2. This system consists of taking all process wastes and treating them in a brine concentrator for dissolved solids removal via forced evaporation with reuse of the condensate and landfilling of the remaining sludge or dry residue.

3.1 Facilities Description

3.1.1 Existing Facilities

The existing facilities consist of an 81,000 kW steam electric generating unit (Deerhaven Unit 1) and two 20,000 kW combustion turbines. The steam unit is fired both by No. 6 oil and natural gas, while the turbines are fired with No. 2 oil and natural gas. Fuel storage facilities consist of two 55,000 barrel tanks for No. 6 oil and a 20,000 barrel storage tank for No. 2 oil along with the necessary unloading equipment.

Deerhaven Unit 1 is served by a six cell, mechanical draft wet cooling tower, a 300 foot stack and such ancillary equipment as 3 deep water supply wells and a 500,000 gallon elevated storage tank, demineralizers, electrical switch yard and 138 kV transmission line, rail spur and gas yard.

Fuel gas is supplied by the Florida Gas Transmission Company via pipeline. No. 6 oil is presently trucked to the site by the Amerada Hess Corporation from their fuel oil storage facilities at Jacksonville, Florida while No. 2 oil is trucked by the Belcher Oil from its facilities in Tampa.

3.1.2 New Facilities

The Project consists of the addition of a coal-fired, 235,000 kW, steam electric generating unit and related facilities to the 1,116 acre Deerhaven Station. The project will include a modern steam generator, an electrostatic precipitator and reheat turbine generator, a 350 foot stack, one additional deep water supply well, a multi-cell, mechanical draft wet cooling tower, ash handling, fuel storage and handling facilities, a brine concentrator for effluent treatment, a side-stream treatment facility for softening of cooling tower blowdown for reuse, complete auxiliary equipment, instrumentation, controls, step-up transformers, 138 kV overhead connection to the on-site transmission substation, associated equipment and initial fuel supply inventory (Figure 3.1-1 and 3.1-2).

Steam Generator (Boiler)

The boiler will be a reheat turbo-fired furnace of balanced draft operation for semi-outdoor service. It will be fired by pulverized eastern, low sulfur coal. It will be capable of delivering 1,788,000 lbs. of steam per hour continuously at 1,980 psig and 1,005° F at the superheater outlet.

The unit will be capable of meeting all specification requirements including steam capacity, NO_x production and other environmental regulations, while burning the design coal as specified below.

Design Coal Specifications

Moisture as received, maximum	16%
Ash, dry basis, maximum	8%
Grindability, Hardgrove, minimum	50
Size 1 1/4" x 0	
Btu/lb.-dry basis, preferred minimum	12,000
Sulfur (dry basis) maximum	.72%

Electrostatic Precipitator

A hot side precipitator, with a guaranteed particulate removal efficiency of 99.5%, when generating with a gas volume of 1,346,000 acfm (actual cubic feet per minute) or less; and inlet gas temperatures 650° to 760° F will be utilized to meet U.S. EPA and Florida Department of Environmental

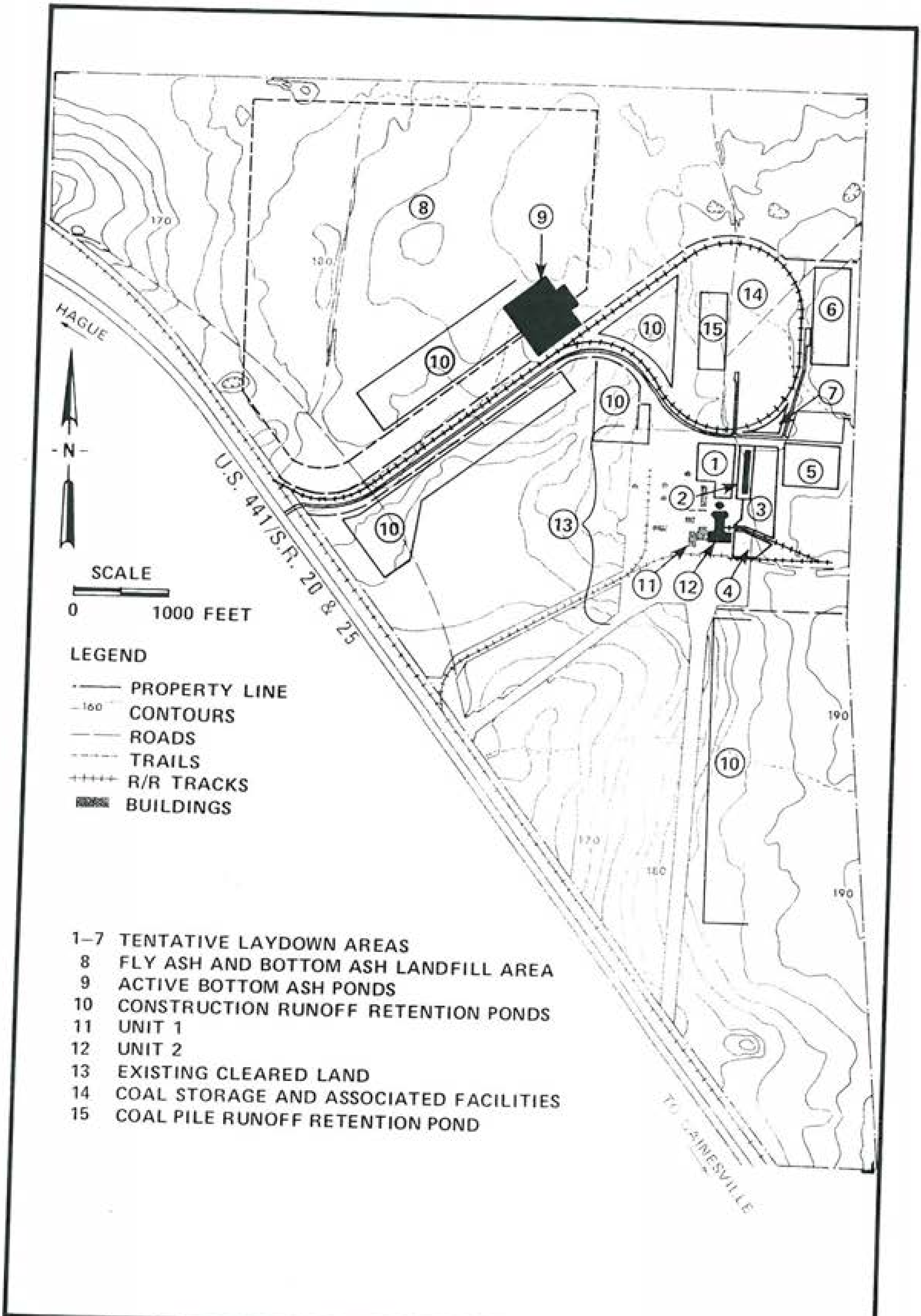


FIGURE 3.1-1 PROPOSED SITE PLAN OF THE DEERHAVEN SITE.

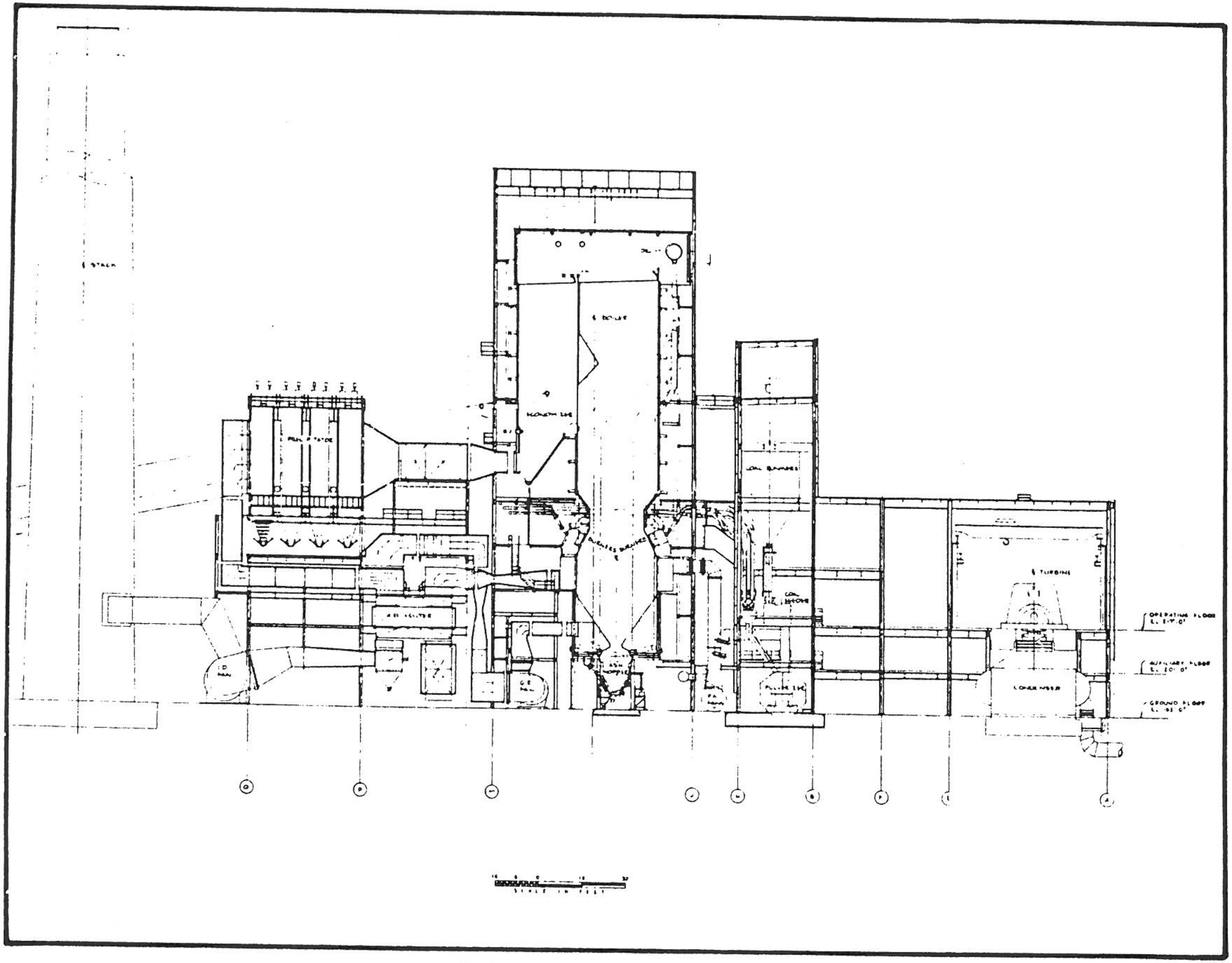


FIGURE 3.1-2 PLANT CROSS SECTION.

Regulation New Source Performance Standards for particulate emissions. The maximum particulate emission from the precipitator for any load on the steam generator down to 20% of maximum rating, will not exceed 0.1 lbs./10^6 Btu heat input (during any normal operating condition, including soot blowing).

Boiler Stack

The flue gas stack will be a concrete reinforced stack with either a steel liner or an acid brick liner, all resting on a reinforced concrete foundation. The stack will be 350 feet above grade with a 17 3/4 foot inside diameter.

The flue gases exiting the stack will be 2.7 million lbs./hr. at 275° F with a velocity of 50 feet per second at design load. Flue gas analysis in pounds per pound of fuel at total air for anticipated low sulfur compliance coal is:

$$CO_2 = 2.4$$
$$H_2O = .63$$
$$SO_2 = .01$$
$$O_2 = .5$$
$$N_2 = 8.4$$

Circulating Cooling Water

Circulating water for condenser cooling will be provided through the use of a mechanical draft cooling tower. The tower will be multi-celled and of the cross-flow, induced draft type.

Concentration of hardness causing ions will be controlled by treating a side-stream of the circulating water with lime-soda ash softening (side-stream treatment). Concentration of those ions not removed in side-stream treatment will be controlled by blowdown from the treatment plant clarifiers to the bottom ash pond (see Section 3.3 for a more detailed explanation). Shock chlorine addition will be used for algae growth control within the system. Sulfuric acid will be added to the system to control condenser tube scaling.

Coal Handling System

At present, a 90 day reserve supply of coal is anticipated for the Deerhaven site. This will require a maximum storage area of 11.0 acres at a maximum depth of 20 feet. It is anticipated that facilities for one ready pile over the hoppers and one pile of inactive storage will be utilized. The active pile will be conical in shape with a diameter of approximately 90 feet and a height of approximately 30 feet. Thus, the total area covered by the coal will be approximately 11.3 acres.

The interior of the on-site rail loop will be the location of both coal storage and coal handling facilities, including the coal-pile runoff retention pond (Figure 3.1-1). The enclosed loop area comprises approximately 57 acres. Within this area will be located approximately 11.3 acres of coal pile storage area and approximately 3.4 acres of coal-pile runoff retention pond area.

All runoff from the coal storage area will be captured and drained to a coal pile retention pond with a surface area of approximately 3.4 acres and with depth sufficient to retain totally the runoff from the ten year, twenty-four hour storm. Throughout a storm, a pump will transfer stormwater from the retention pond to the ash handling pond at a constant rate designed to empty the retention pond within twenty-four hours of rainfall cessation. This water will then be used for consumptive and industrial processes, and will eventually be evaporated or treated for reuse through a vapor compression evaporator. A sump system will keep the pond drained of coal-pile baseflow, groundwater seepage, and flows induced by the diurnal heating and cooling of the coal pile. Water pumped to the ash pond will help in neutralizing the alkaline runoff from the ash landfill disposal area. After treatment and blending, this water will be used in the ash sluicing system.

Ash Handling System

The major solid waste product of a coal-fired generating plant is ash. The quantity of ash produced depends upon the size of the plant, the generating load factor, the heat content of the coal (in Btu/lb.) and the ash content of the coal, where ash is the incombustible residue which remains after the combustion process. Ash content for the design coal is from approximately 2% to 10% of total weight of coal. Two types of ash are produced by coal-fired generating plants. Bottom ash (including boiler slag) is the residual ash and other inorganic material which remains after the coal is burned. Particle sizes range from coarse gravel to fine sand and readily settle in water. Bottom ash has low solubility and, because of its coarseness, high permeability.

Bottom ash from Unit 2 will fall from the furnace to the ash hopper and be cooled by recirculating slurry water. The cooled bottom ash will then be sluiced to the active bottom ash ponds where, because of its coarseness, it will settle. Two active bottom ash ponds, each 400 feet long by 300 feet wide by 18 feet deep (including 3 foot freeboard) are anticipated, resulting in a capacity for each pond of 39.9 acre-feet. While sluiced bottom ash is entering one pond, the other will be emptied of ash sediment. The pH adjustment and any other necessary water treatment will be performed in these ponds. Ash sluicing make-up water will come from boiler blowdown, coal-pile runoff, ash pile runoff, and groundwater and plant drains when necessary. A smaller adjacent pumping pond, 200 feet long by 100 feet wide by 18 feet deep (3 foot freeboard) will be used to hold clear decant water for pumping back into the ash sluicing system.

Fly ash will be removed from stack gases by electrostatic precipitation, and disposed of in the on-site landfill. Disposal of fly ash through commercial marketing to construction materials manufacturers for use in concrete and concrete blocks is currently being investigated. If these investigations prove to be fruitful, substantial quantities of ash may be disposed of through this method.

Both bottom ash and fly ash will be disposed of on-site in above-ground landfill cells. On-site disposal could require up to 220 acres of landfilling capability. Phasing will be developed so that only a small portion of the 220 acres would be active for landfilling at any one time. Preliminary site layouts indicate that approximately one-third of the site on the northern end will be used for ash disposal. Each cell will be from 5 to 25 feet deep and have a final side slope of not more than 25%. Each cell will be covered with soil and revegetated to within 10 feet of its working face. Each cell is expected to be filled in about 5 years, depending upon the quantity of ash produced. Rainfall and other water running off the active landfill cell will be retained in a storage ditch and pumped back to the ash ponds for treatment. Other surface runoff will be permitted to drain naturally.

3.1.3 Visual Considerations

View of the power plant building is extremely limited because of the flat topography and the surrounding growth of tall trees on the site and throughout the area. The building can only be seen from U.S. 441 which passes about 3,000 feet southwest of the building site. The new building, like the existing power plant building, will be oriented facing toward the highway.

3.1.4 Exterior Appearance of the Power Plant Building

The new addition will be compatible with the existing power plant building. Prominent design features in the existing building, such as color, pattern of windows and siding materials, will be continued in the design of the new addition, which in general will match and line up with the existing building.

3.2 Fuel

Deerhaven Unit 2 will be fired with pulverized coal as the primary fuel. At the present time RUB is negotiating with several prospective suppliers in efforts to secure a long-term coal supply. This fuel will be a compliance coal and is anticipated to be eastern bituminous (Section 3.1.2). No. 2 oil will be used for ignition and flame stabilization purposes only.

Throughout the first 10 years of plant operation, it is projected that approximately 660,000 tons/year of coal will be burned. The coal consumption rate after the first 10 years will drop as newer and more efficient generating units are placed into service. Depending on the number of unit startups, load factor and quality of coal, it is anticipated that about 600,000 gallons per year of No. 2 oil will be consumed.

Coal will be delivered by unit train to the plant by commercial railroad, while No. 2 oil will be trucked in from area suppliers. RUB is currently evaluating the feasibility of purchasing its own cars for unit train delivery of coal. This will enhance fuel supply reliability and may result in lower cost of fuel as delivered.

Bulk storage of coal will be provided by ground level storage piles. Coal handling facilities will be constructed to unload coal from the rail cars and convey it to a ground level ready pile and reclaim hopper. Coal will then be moved by conveyor to the crusher house and the storage bunkers in the powerhouse. Additional coal preparation equipment will be located in the powerhouse to grind and transport coal fuel suitable for firing the new steam generator.

Fuel oil storage tanks and pumping equipment will comprise the additional equipment needed for ignitor fuel. Retaining walls will contain any spillage from the fuel oil storage tank.

RUB has examined the feasibility of utilizing processed municipal refuse (refuse-derived fuel) produced within Alachua County as a supplementary fuel for the project. It was determined that firing refuse-derived fuel (RDF) would not be economically feasible in the 1981 timeframe. However, based on the assumptions made in the study, RDF would prove to be economically feasible when compared with disposal by sanitary landfill by 1991. For this reason RUB has determined that it will proceed on the basis of making minimum expenditures for provisions to use RDF in the future. In other words, allowances will be made in the design and construction of the project so as not to economically preclude future RDF firing.

3.3 Plant Water Use

Figure 3.3-1 shows schematically the manner in which all plant water is to be used. The operation of the project (new and existing units combined) will result in an average withdrawal of approximately 3.84 million gallons per day (mgd) from the Floridan Aquifer via on-site wells. This water will be used for cooling tower makeup, equipment cooling and cleaning, and as a supplemental makeup source for bottom ash handling.

Water for domestic use will come from the RUB's water system. This average flow will be approximately 0.01 mgd.

Flyash will be removed from the precipitator and conveyed to the ash silo pneumatically. From the ash silo, it can be sold or wet with cooling tower blowdown and landfilled on-site. Bottom ash will be handled wet with recycling techniques to reduce the total makeup water requirements. Makeup water for the bottom ash handling system will come from coal pile runoff, ash landfill runoff, boiler blowdown, plant drains, cooling tower side-stream treatment plant blowdown and groundwater.

3.3.1 Sources of Water

Makeup water to the plant will come from ground water, precipitation, and the RUB water system.

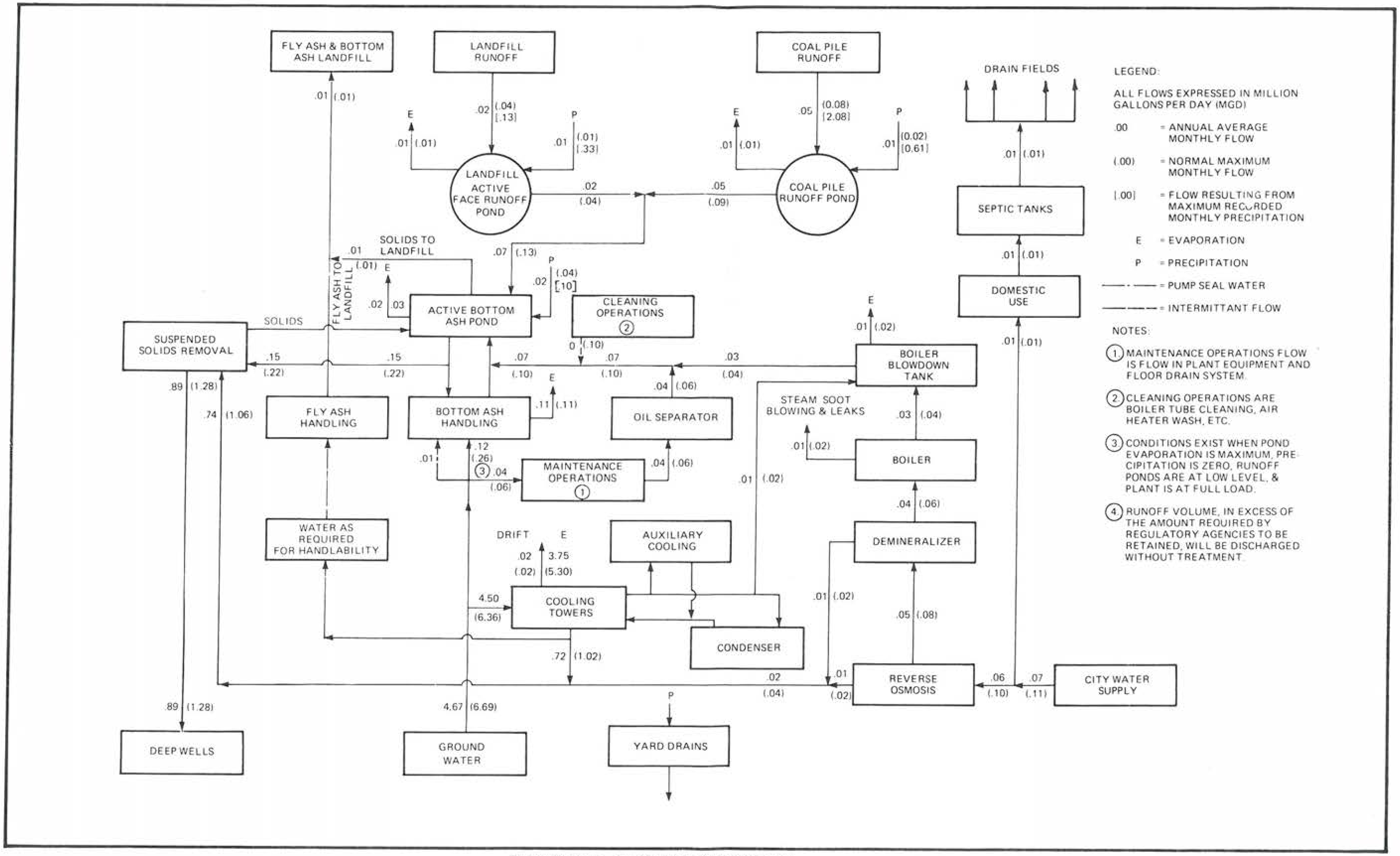


FIGURE 3.3-1 PROCESS FLOW DIAGRAM.

Groundwater will be pumped from the Floridan Aquifer via on-site wells. This water will be used as makeup to the cooling water system, as pump seal water for the bottom ash sluice pumps, as makeup to the bottom ash handling system and as wash water for air heater wash and miscellaneous nonchemical cleaning operations.

Precipitation which falls directly on the coal pile and the ash landfill active face will be collected for use as makeup to the bottom ash handling system.

Water for domestic use will come from the RUB water distribution system.

3.3.2 Water Withdrawal

The quantity of water withdrawn from the Floridan Aquifer via on-site wells is estimated to range from 3.84 mgd during average annual operation to 5.51 mgd during normal maximum monthly operation.

The quantity of water withdrawn from the Floridan Aquifer via RUB water system is estimated to be approximately 0.01 mgd throughout the year.

The total groundwater withdrawal from the Floridan Aquifer via on-site wells and the RUB system is therefore expected to range from 3.85 mgd to 5.52 mgd depending upon plant load and precipitation. Figure 3.3-1 describes the manner in which this water will be used.

3.3.3 Normal and Peak Load Water Use

Figure 3.3-1 represents the normal and peak plant water use based upon average and peak load conditions respectively. More cooling tower makeup will be required during periods of high ambient temperatures (increased tower evaporation) and high plant load (more cooling required because of higher heat load). Maximum cooling tower blowdown as shown on Figure 3.3-1 is indicative of high ambient temperature and high plant load occurring simultaneously, a condition which is expected to occur 1% to 2% of the time.

Boiler makeup, water to plant drains, ash handling makeup, and cooling tower blowdown used to mix with fly ash for dust suppression during landfilling will vary according to plant load.

Coal pile and landfill runoff available for ash handling makeup will vary with the rainfall. Figure 3.3-1 indicates maximum flows resulting from an average maximum month's rainfall.

The amount of groundwater required for ash handling makeup will vary according to the amount of makeup available from runoff ponds, plant drains, and boiler blowdown and according to the amount of ash produced, which is a function of plant load factor. The flow of groundwater for ash handling makeup, as shown in Figure 3.3-1, is indicative of no makeup water being available from runoff collection ponds and the plant operating at full load.

3.3.4 Water Use for Various Plant Conditions

During periods of maximum power production, all process water systems will be operating with their respective expected maximums of process water throughout, with exception of the cleaning operations. The expected process water flows for these systems during full plant load are as presented in Figure 3.3-1. These are per day averages which would occur if the power station were to operate at full load for approximately one month. Intermediate fluctuations will occur for certain systems (e.g. demineralizer waste, domestic use, etc.).

During periods of average power production, most of the process water systems will use proportionally less water than during extended periods of full power production. Process streams not expected to decline with plant load are domestic use and bottom ash handling evaporation. Expected process water flows for the plant during periods of average plant load are as shown in Figure 3.3-1.

3.3.5 Water Flows for Plant Systems

Figure 3.3-1 indicates the flow scheme for all water associated with plant operation and maintenance.

Cooling Water

The cooling water system employs side-stream treatment for softening of the cooling water. This enables the system to operate at a higher number of concentrations than can a conventional cooling cycle which does not have treatment or which has only front-end treatment, thus reducing the quantity of blowdown.

With this scheme, a side-stream from the cooling towers (Units 1 and 2) is treated in a side-stream treatment plant. The flow rate of this stream is based on 5.3 concentrations in the cooling cycle. The lime-soda ash softening water treatment plant is capable of reducing the concentration of hardness causing ions (e.g. Ca^{++}, Mg^{++}, etc.) to their respective groundwater concentrations. The product water from the treatment plant is combined with raw groundwater for cooling tower makeup. Therefore, the concentration of hardness causing ions in the cooling water will be approximately 5.3 times their concentration in the groundwater. The sludge generated by the treatment plant will be disposed of in the active bottom ash pond, from which it will be incorporated into the ash landfill.

The quantity of blowdown from the entire cooling system, including the water treatment plant, will be that quantity of water required for landfilling fly ash, sludge removal from the clarifiers and the amount required to quench boiler blowdown. It is expected that the quantity to transport sludge will be 0.06 to 0.10 mgd and the quantity required to quench boiler blowdown will be .01 to .02 mgd. The amount required to landfill fly ash will be less than .01 mgd (see Figure 3.3-1). This will result in the cooling system as a whole being operated at approximately 40-50 concentrations, thus concentrating the nonhardness causing constituents to approximately 40-50 times their respective concentrations in the raw groundwater.

Makeup water for the cooling towers will come directly from the Floridan Aquifer. The cooling tower makeup flow will range from 3.67 mgd to 5.18 mgd depending upon blowdown requirements and cooling tower evaporation.

Demineralizer

The water utilized for steam generation must be of high purity to prevent scaling and fouling of the boiler, steam lines, turbine, and accessories. To accomplish this, vapor compression evaporator (brine concentrator) product water will receive final demineralization through the use of acid-base ion exchange equipment. Periodically, the exchange media will be regenerated through the use of acid and basic solutions. The waste products of regeneration are relatively high concentrations of dissolved salts of the regeneration agents. These acid-base wastes will be mixed for pH neutralization and treated for reuse through the brine concentrator.

The flow of product water from the demineralizer will range from 0.04 mgd to 0.06 mgd depending upon plant load. The flow of demineralizer wastewater to the brine concentrator will vary from 0.01 mgd to 0.02 mgd depending upon plant load.

Boiler

Although demineralized water is being used for boiler makeup, impurities still exist. To prevent a buildup of these impurities, a small percentage of water is withdrawn from the system. The flow of boiler blowdown will range from .03 mgd to .04 mgd depending upon plant load. This water, although not desirable for boiler water makeup, is still quite good, having a total dissolved solids concentration of approximately 100 mg/l and will be routed to the active bottom ash pond for use as ash handling makeup water.

High pressure steam will be used for soot blowing inside the boiler and will go up the stack with the flue gas. The amount of water used for soot blowing and loss in leakage will range from 0.01 mgd to 0.02 mgd depending upon coal ash characteristics and plant load.

Some loss of the boiler water is expected. This leakage should amount to approximately 0.2% of the steam flow rate.

Equipment Cleaning Wastes

Drains will be provided throughout the plant to collect waste waters from metal cleaning and air heater wash operations. Wastes collected by these drains will be routed to the active bottom ash pond for self-neutralization and sedimentation prior to treatment in the brine concentrator. This flow will range from .01 mgd to 0.1 mgd depending upon the specific cleaning operation in progress.

Miscellaneous Equipment and Floor Drains

Drains will be provided throughout the plant to collect miscellaneous equipment drainage (e.g. packing gland leakage, etc.) and floor drainage. Water collected by this drain system will be routed through an oil separator where waste oil particles greater than 50 microns will be skimmed from the surface and burned in the boiler. The water will then be routed to the active bottom ash pond for ash handling makeup. This flow will range from 0.04 mgd to 0.06 mgd depending upon plant load and specific maintenance operations.

Bottom Ash Handling Water

Bottom ash from the boiler for Unit 2 will be hydraulically conveyed to the active bottom ash pond for settling. Approximately 80% of the water sluiced to the pond will be recirculated to the ash collecting system for reuse. The other 20% will be blowdown and treated for reuse through the brine concentrator.

The active ash pond will be sealed, as described in Section 3.4, to prevent groundwater contamination. Makeup to the system will be in the form of coal pile and ash landfill runoff, boiler blowdown, cooling tower blowdown, miscellaneous plant drain water and groundwater.

The blowdown from the pond will vary depending upon the amount required to maintain a dissolved solids concentration in the ash sluice water which will not promote scaling or fouling in the ash handling system and as required to maintain suitable pond levels in the runoff ponds.

The blowdown rate from the ash pond will range from .21 mgd to .32 mgd depending upon plant load and pond levels.

Fly Ash Mixing Water

Fly ash from the precipitator will be pneumatically conveyed to an ash silo for storage prior to landfilling. The ash will be removed from the silo by means of a dustless unloader and moistened with cooling tower blowdown to minimize fugitive dust. The ash is then conveyed to the landfill area for ultimate disposal as described in Section 3.8.

The amount of water added to the ash at the dustless unloader is expected to be approximately 15% to 20% by weight of the dry fly ash. The flow of mix water to the dustless unloader will be less than 0.01 mgd.

Coal Pile Runoff

The coal pile runoff will be that which results from rainfall directly on the coal pile. This runoff will be collected and treated as described in Section 3.7, and used for makeup to the bottom ash handling system. The flow of water from the pond will range from .05 mgd to .09 mgd depending upon plant load and pond levels.

Ash Landfill Runoff

The ash landfill runoff will be that which results from rainfall directly upon the ash landfill active face area and will be used for makeup to the bottom ash handling system and be collected and treated as described in Section 3.7.

The flow of water from this pond and from the brine landfill runoff pond will range from .02 mgd to .04 mgd depending upon plant load and pond levels.

Vapor Compression Evaporator

Product Water - The blowdown from the bottom ash handling system and the regeneration waste from the demineralizer are treated for suspended solids removal and then are routed to the vapor compression evaporator for dissolved solids removal. The unit evaporates the water from the waste, converts the vapor to condensation and recovers the condensate as a product water. This product water is used as cooling system and and boiler makeup.

Brine - The brine from the vapor compression evaporator will be dried to a solid condition, hereafter referred to as brine residue, whereby it can be handled with minimal dusting or free water. This residue will then be put in a secure landfill located on-site in the general area of the ash landfill, but kept separate from the ash landfill. The approximate landfill area for brine residue and ash disposal will be 220 acres.

Brine Residue Landfill Runoff - The brine residue landfill will normally be operated one to three shifts per week and at such times to minimize landfilling during inclement weather. The exposed residue will be covered with soil at the end of each shift. A runoff collection and storage facility consisting of ditches and a pond will be constructed to collect runoff from the general area of the landfill working face (i.e. those areas where final cover has not been placed). This runoff will be pumped to the bottom ash pond for use as bottom ash sluice makeup water. The quantity of this runoff, which is quite small due to the small size of the active face, is included in the .02 to .04 mgd indicated in Figure 3.3-1.

Domestic Use

Water for domestic use will come from the RUB water distribution system. The sanitary wastewater will be treated in a septic tank. Treated wastewater will be routed to a drain field for disposal. It is anticipated that sanitary sewer service will be extended to the general area of the plant site in the future. Sanitary sewers from the site will be connected to the RUB system at that time.

3.3.6 Consumptive Water Use

Total consumptive use of water by the plant will range from 3.82 mgd during extended periods of average operation to 5.49 mgd during extended periods of full plant load and high evaporation. This consumptive use will be in the form of evaporation from the cooling tower and ash handling system, brine and water retained in the ash landfill as discussed below.

Water Retained in Ash

Water will be added to fly ash as required for dust suppression during handling. This amount of water is expected to be 15% to 20% by weight of the dry fly ash. Water will be retained in the bottom ash as the bottom ash ponds are cleaned out and the bottom ash landfilled. The amount of water retained is expected to be approximately 10% by weight of the bottom ash solids. The water retained in the fly ash and bottom ash, will be either mechanically occluded in the landfill or evaporated during landfill operations.

Evaporation and Losses

The total amount of water evaporated from the plant and plant site is expected to range from 3.92 mgd during extended periods of average operation to 5.50 mgd during extended periods of full plant load. The amount of evaporation will vary depending upon boiler operation, ambient temperature, ambient humidity, ground temperature, etc. Evaporation from the site and plant equipment will be in the following forms:

Material Storage Runoff and Bottom Ash Pond Evaporation - Average evaporation from the coal pile and landfill runoff ponds and the bottom ash pond will be approximately 0.04 mgd. The normal maximum monthly evaporation is expected to be approximately .05 mgd; however, data are not available from which to estimate accurately the peak or normal maximum monthly evaporation rates.

Boiler System Evaporation Losses - Water losses from the boiler will result from steam soot blowing, leaks, and evaporation from the boiler blowdown tank. Steam soot blowing is required for soot removal inside the boiler and leakage is due to valves not seating, flange gaskets leaking, etc. This flow is expected to be 0.01 mgd to 0.02 mgd depending upon plant load. However this rate varies between different boiler manufacturers and with boiler operation and age. Steam soot blowing will result in water lost up the stack and leaks will result in water lost to the atmosphere.

Evaporation from the boiler blowdown tank is the result of quenching the boiler blowdown. This evaporation is expected to range from .01 mgd to .02 mgd depending upon boiler load and boiler operation.

Bottom Ash Handling System Evaporation - Evaporation from the bottom ash handling system will occur in the bottom ash hopper located directly below the furnace the result of water being used to cool the refractories in the bottom ash hopper and to quench the bottom ash. The rate of evaporation from the hopper cannot be accurately calculated as it depends upon boiler temperatures, furnace humidity, water temperature, etc. However, it is expected that this rate of evaporation will be in the range of .07 mgd to .14 mgd. This lost water will go up the stack.

Cooling Tower Evaporation - Evaporation of a portion of the circulating water will be necessary to provide a circulating water of suitable temperature for proper operation of the condenser and heat exchanger equipment. This evaporation will be accomplished by use of a mechanical draft cooling tower as described in Section 3.4.

The rate of evaporation from the cooling tower will be dependent upon atmospheric conditions and the amount of heat to be dissipated from the incoming circulating water, which is dependent upon plant load. The expected rate of evaporation is from 3.75 mgd during periods of average plant load to 5.30 mgd during periods of full plant load.

The amount of water evaporated from the brine in drying procedures will be less than .01 mgd with the exact amount fluctuating with brine production which is a function of plant load.

3.3.7 Physical and Chemical Characteristics of Towers and Ponds

Cooling Tower

The major chemical and physical characteristics of the circulating water are estimated to be as follows:

Specific Gravity (S.G.)	1.0
pH	7-8 pH units
Total Dissolved Solids (TDS)	14,000 mg/l
Sulfates ($SO_4^{=}$)	8,900 mg/l
Chlorides (Cl^-)	460 mg/l
Calcium (Ca^{++})	334 mg/l
Magnesium (Mg^{++})	270 mg/l
Sodium (Na^+)	3,700 mg/l
Silica (SiO_2)	130 mg/l

Ash Landfill Runoff Pond

The chemical constituents in the ash landfill runoff pond will be those which are dissolved from the active face of the ash landfill. These constituents will depend upon leachable constituents in the ash (e.g. iron, manganese, zinc, copper, etc.), lime and silica content of the ash (influences fixability of the leachates), ash pH, ash particle size, rain water pH and dissolved solids content, and volume of runoff.

The specific chemical characteristics of the runoff pond cannot be predicted as no runoff is available for testing since the coal source is not presently known, and there are no data available from any similar operation. However, published information (Chu, T. J., 1976) on existing fly ash sluicing systems shows that once-through fly ash sluice water would be acceptable for ponding. Since fly ash sluice water will have more particle contact time and contact more particles than will the landfill runoff, the landfill runoff will not contain dissolved constituent concentrations higher than sluice water for the same fly ash. Since such fly ash sluice water would be acceptable for ponding, ash landfill runoff should likewise be acceptable.

Brine Residue Landfill Runoff Pond

The chemical constituents in the brine residue landfill runoff will be those which dissolve in the active face of the landfill and those which are picked up from the intermediate cover. As it is intended to minimize landfilling during inclement weather, the runoff should seldom contain constituents from the brine residue. The main constituents should therefore, be the result of what is picked up from the intermediate cover. Assuming the cover to be of soil origin, the constituents should be predominantly soil particles or dissolved solids from the soil. If the runoff does contain constituents from the brine residue then those constituents will be dissolved heavy metals and salts.

The runoff pond will be sealed as required to prevent groundwater contamination. Therefore, the runoff should be acceptable for ponding.

Coal Pile Runoff Pond

The chemical constituents in the coal pile runoff pond water will be the result of erosion of fines and as result of those constituents which are dissolved from the coal particles by acids formed from further oxidation of metal oxides in the coal. The makeup of these acids is highly unpredictable without sampling and testing of the actual runoff. The chemical characteristics will vary depending upon coal source, volume of runoff, area of contact of coal with air and chemical characteristics of the rain water.

Because of this, only rough approximations of certain chemical characteristics can be made. These approximations are as follows:

pH	4-8 pH units
Acidity	0-2,000 mg/l $CaCO_3$
Total Dissolved Solids (TDS)	100-10,000 mg/l
Sulfates ($SO_4^=$)	0-1,000 mg/l

Bottom Ash Pond

The chemical constituents in the bottom ash pond water will be those which erode or dissolve from the bottom ash particles during collection, transport, and storage.

The bottom ash handling system will be a closed loop system as described in Section 3.3. No currently published information indicates chemical constituent concentrations for such a system. The only data available are for a once-through type of sluicing operation for specific coals. It is therefore impossible to list any specific chemical characteristics for the bottom ash pond. Even if such data were available, chemical constituent concentrations still cannot be estimated since the source of coal, ash fusion temperature, quality of ash sluice water, and performance of the settling pond all have influence of unknown impact upon the quality of the pond water. All that can be said is that the pond water should have a pH of 6 to 10 and a total dissolved solids concentration of 100-5,000 mg/l.

3.4 Heat Dissipation System

The exhaust steam from the steam turbine will be condensed by approximately 140,000 gpm of circulating water. Circulating water is then cooled by a wet mechanical draft cooling tower. Thus the circulating water will be a closed system consuming only the amount lost to evaporation, drift, and blowdown. The system is composed of the surface condenser, cooling tower, circulating water pumps, interconnecting piping and provisions for makeup and blowdown and side-stream treatment.

Makeup water for the system will come from the system of deep water wells on the site. Makeup water will be introduced into the cooling system by pumping well water directly into the cooling tower basin. Evaporation and drift losses are expelled to the atmosphere from the cooling tower discharge plenum. A side-stream of the circulating water will be directed to equipment designed to soften the water and then will be sent to the cooling tower basins (see Section 3.3.5 for a more thorough description). Blowdown from the cooling system will be in the form of water used to transport sludge from the side-stream treatment clarifiers, water used to quench boiler blowdown and water mixed with the fly ash during landfilling. The water which finds its way into the bottom ash pond by transporting sludge will eventually go to the vapor compression evaporator for treatment as cooling tower and boiler makeup.

Design parameters for the heat dissipation system are:

Unit 1 and Unit 2 Combined:	
Heat rejected, Btu/hour	1.84×10^9
Makeup flow, MGD	5.18
Drift and evaporation, MGD	5.32
Blowdown flow, MGD	0.12
Maximum cold water temperature, °F	90
Maximum hot water temperature, °F	109
Cooling water flow, MGD	282.2
Travel time through condenser, seconds	7.75
Unit 2 Only:	
Heat rejected, Btu/hour	1.39×10^9
Makeup flow, MGD	4.09
Drift and evaporation rate, MGD	4.02
Blowdown flow, MGD	0.07
Maximum cold water temperature, °F	90
Maximum hot water temperature, °F	109
Cooling water flow, MGD	201.6
Travel time through condenser, seconds	4.5

Design of the heat dissipation system will include injection of a chlorine/ water solution into the cooling tower basin for control of algal growths. Control of pH will be facilitated by injection of concentrated sulfuric acid into the cooling water system.

3.5 Air Pollution Control

To comply with applicable New Source Performance Standards for air emissions from new coal-fired power plants, this unit will burn low sulfur coal and utilize an electrostatic precipitator. Coal with a maximum .72% sulfur content and a heat content of 12,000 Btu/lb. will be utilized to meet the emission limitations for sulfur dioxide (Section 3.1.2). An electrostatic precipitator will be needed to clean the fly ash from the flue gas (Section 3.1.2). Oxides of nitrogen will be minimized through controlling various combustion parameters such as flame temperature and excess air. The boiler manufacturer guarantees that the average concentration of NO_x in the flue gas leaving the air-heater gas outlet shall not exceed 0.7/lbs. per million Btu heat input, measured as 525 ppm dry and adjusted to 3% O_2, at a boiler output of 1,788,000 lbs. of steam per hour. The manufacturer achieves this with a furnace which utilizes a proprietary venturi shaped cross section and directional flame burners. Air and fuel are fired downward toward the furnace bottom below the venturi throat. The directional flame burners are uniformly spaced across opposed furnace walls and develop a diffusion type flame with gradual and thorough mixing in the lower furnace. The flame propagates slowly, reversing and passing vertically to the upper furnace where combustion is completed. This swirling action results in uniform flame development across the full width of the furnace without the occurrence of excessively high temperatures. As a result NO_x, formation is of such low order that, for most fuels, neither gas recirculation nor sophisticated off-stoichiometric firing methods are required to meet EPA New Performance Standards for NO_x.

No flue gas scrubbing equipment will be utilized on this unit since low sulfur coal will be burned to control sulfur dioxide emissions. However, certain features such as space, flue gas ducts and the stack will be taken into account in the design and construction so as not to preclude the installation of flue gas desulfurization equipment at a later date should they be required.

As mentioned in Section 3.1.2 a 350 foot above grade stack will be utilized. It has been determined through various modeling techniques that this stack height will ensure that the Ambient Air Quality Standards of the U.S. EPA and Florida Department of Environmental Regulation and DER's Significant Degradation Standard will be met.

3.6 Oil Spill Prevention Plan

Drainage from Dikes and Curbed Retention Areas

The areas within the dikes which surround each of the existing fuel oil storage tanks are sloped to a low point where a drain pipe passes through the dike to the outside. This drain pipe will have a normally closed gate valve which will be opened to drain the diked area of excess precipitation. In the event of an oil spill, the spilled oil will be reused if possible. The remaining portion will be put on the coal pile.

The existing substation is encompassed by a concrete dike, approximately 6 inches in height above grade with drain outlets. The ground within the diked area is covered with gravel. In the event of an oil spill the interior gravel will be removed and replaced with clean material. The material contaminated with oil will be disposed of in an environmentally acceptable manner.

The existing fuel oil truck unloading station is in a paved area, where the surrounding grade slopes toward the pumps, except for one side. This low side will be raised by the construction of a dike to confine the oil from a spill.

Both the existing and new step-up transformers will be surrounded by a concrete curb separate from the existing pad and the area between the pad and curb filled with crushed rock. A drainage pipe will be installed as well as an overflow and an oil separator and oil containment vessel. If spill occurs, the oil will drain to the sump and the oil contaminated limestone in the sump will be removed for disposal by an environmentally acceptable method and the sump then refilled with new material.

Drainage from Undiked Areas

Inside both the existing and new unit, plant operating personnel will monitor plant operation on a 24-hour-per-day basis by visual inspections and from the main control room. Unit 1 has floor drains which will be connected to an oil separator. Any oil leakage within the units will be contained within the powerhouse by use of the oil separator. In case of an uncontrolled spill, above the capacity of the oil separator, the oil will be routed to a surge pond or tank prior to entering the oil separator.

Oil pans used to collect leaking oil from the various equipment and machinery at the plant will be emptied into oil drums.

No oil will be stored in any area without a secondary containment structure.

The precipitator transformer areas will be surrounded by a gutter to collect any oil spills from this equipment. The downspouts from this gutter will be connected to the plant oil separator.

3.7 On-Site Drainage

Construction runoff from grading, foundation and other earth moving activities will be handled to prevent silt runoff onto the adjacent areas. To accomplish this, dikes and ditches (both natural and constructed) will be used to direct this runoff to retention ponds which will be located on the site. These ponds will be constructed to allow for the containment of the anticipated volume of runoff that can be expected from a ten year, twenty-four hour storm plus a minimum of 2 feet of freeboard. This volume will be retained in the pond, until the level of suspended solids is below that required for discharge. Any volume of runoff exceeding that which can be anticipated from the design storm will be discharged immediately to natural drainage.

Plant site runoff after construction will consist of three basic areas of concern. These areas are the coal storage area (coal yard), the plant drains (both inside and immediately outside areas adjacent to the building) and the other external plant areas.

The coal yard runoff will be retained inside the diked area created by the construction of the railroad loop embankment, which will direct this flow to a retention pond also located inside the loop. Solids (grit) will be allowed to settle out in this retention pond and the supernatant will be pumped to the active bottom ash ponds for use as makeup in the ash sluice system. Any volume of flow exceeding the referenced ten year, twenty-four hour storm will be discharged to natural drainage after passing through the pond.

The flow that can be expected from the plant floor drains and that expected in the immediate plant area will be collected in a central area and pumped to the active bottom ash pond.

Any runoff from the other external plant areas which is not contaminated will be dispersed via swales and berms to allow spreading and percolation downward.

3.8 Directly Associated Facilities

The new railroad spur will be used to deliver the coal required for the new unit. This spur will be connected to the mainline track of the Seaboard Coastline Railroad by a new switch, so positioned as to allow direct access only from the north. This spur will run from the mainline into the plant in a loop pattern. The land utilized for this facility consists of approximately 30 acres of tree covered woodland. The level of noise and fugitive dust from this facility, that will reach beyond the project property lines, will be negligible as it will be a unit train type system where the road locomotive will handle the unit train while it moves at a constant speed over the site. The visual effect of this system will be minimal as it will be at ground level and will not be visible from off the plant site except when a train arrives, which should cause no problems as the mainline of the Seaboard is far more visible than this proposed new spur.

The proposed coal handling facility will basically consist of at least three conveyors, a below grade unloading hopper, an aboveground stacking system with storage area, an underground reclaiming unit, and an above-ground crushing system. The stacking conveyor will be equipped with a telescopic chute and dust control system (water and wetting agent spray system). Transfer points will also be provided with dust control systems and the conveyors will be enclosed through their length. The coal bunkers within the plant will be fully enclosed type, fitted with a filtered ventilation system to eliminate dust discharge. These systems will require the use of approximately 13 acres of land. The area is approximately three-quarters covered with trees and other vegetation, with the remaining part already having been cleared, grubbed and reseeded. The visual effect of this facility will be undetectable as it will be shielded from offsite view by the existing trees and other vegetation. The emission of noise from this system beyond the project property lines is expected to be minimal. Present land uses of the property adjoining the site are mainly agricultural and woodlands.

The ash disposal facility will consist of two active bottom ash ponds to be used for bottom ash dewatering with a small pond to collect this water for reuse and a landfill operation for the disposal of fly ash and bottom ash. This facility will require the use of approximately 220 acres. All of the area needed is presently tree covered. The visual effect and the anticipated noise level of this facility will be of minimal concern as a 200-foot barrier of existing trees and vegetation will be left around the area as a permanent feature. Access to this facility will be along the new railroad spur and will be entirely on the present site.