# PSD APPLICATION
# FOR
# REPLACEMENT OF THE BARK HOG

# GEORGIA-PACIFIC CORPORATION
# PALATKA MILL

**Prepared For:**
**Georgia-Pacific Corporation**

**Prepared By:**
**Golder Associates Inc.**
**6241 NW 23rd Street, Suite 500**
**Gainesville, Florida 32653-1500**

**July 2004**

**0437562**

# PSD APPLICATION
# FOR
# REPLACEMENT OF THE BARK HOG

**GEORGIA-PACIFIC CORPORATION**
**PALATKA MILL**

**Prepared For:**
**Georgia-Pacific Corporation**
**P.O. Box 919**
**Palatka, Florida 32178**

**Prepared By:**
**Golder Associates Inc.**
**6241 NW 23rd Street, Suite 500**
**Gainesville, Florida 32653-1500**

**July 2004**
**0437562**

**DISTRIBUTION:**
**7 Copies – FDEP**
**5 Copies – GP**
**2 Copies – Golder Associates Inc.**

# Department of Environmental Protection

Jeb Bush
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Colleen M. Castille
Secretary


July 20, 2004

Mr. John Bunyak, Chief
Policy, Planning & Permit Review Branch
NPS – Air Quality Division
Post Office Box 25287
Denver, Colorado 80225

RE: Georgia-Pacific Corporation
Bark Hog Replacement, Palatka Mill
1070005-028-AC, PSD-FL-341

Dear Mr. Bunyak:

Enclosed for your review and comment is a PSD application submitted by Georgia-Pacific Corporation to replace the bark hog at the company's Palatka Mill in Putnam County, Florida.

Your comments may be forwarded to my attention at the letterhead address or faxed to the Bureau of Air Regulation at 850/921-9533. If you have any questions, please contact Bruce Mitchell, review engineer, at 850/413-9198.

Sincerely,

for Patty Adams

James K. Pennington, P.E.
Administrator
North Permitting Section

AAL/pa

Enclosure

cc: B. Mitchell

Georgia-Pacific

Palatka Pulp and Paper Operations
*Consumer Products Division*

P.O. Box 919
Palatka, FL 32178-0919
(386) 325-2001



July 12, 2004



Mr. Christopher L. Kirts, P.E.
State of Florida
Department of Environmental Protection
7825 Baymeadows Way, Suite B200
Jacksonville, Florida 32256-7590

RE: Georgia-Pacific, Palatka Operations
Bark Hog Application

Dear Mr. Kirts:

Please find enclosed seven (7) copies of the PSD Application for replacement of the Bark Hog and also a check in the amount of $7,500.

If further information is needed, please contact me at (386) 329-0027.

Sincerely,

Edward S. Jamro
Sr. Environmental Engineer

tk

Enclosure

cc: W. M. Jernigan, w/o enc.
Scott Matchett, w/o enc.

# Department of Environmental Protection

Jeb Bush
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Colleen M. Castille
Secretary


July 20, 2004

Mr. Gregg M. Worley, Chief
Air Permits Section
U.S. EPA, Region 4
61 Forsyth Street
Atlanta, Georgia 30303-8960

RE: Georgia-Pacific Corporation
Bark Hog Replacement, Palatka Mill
1070005-028-AC, PSD-FL-341

Dear Mr. Worley:

Enclosed for your review and comment is a PSD application submitted by Georgia-Pacific Corporation to replace the bark hog at the company's Palatka Mill in Putnam County, Florida.

Your comments may be forwarded to my attention at the letterhead address or faxed to the Bureau of Air Regulation at 850/921-9533. If you have any questions, please contact Bruce Mitchell, review engineer, at 850/413-9198.

Sincerely,

Patty Adams
for James K. Pennington, P.E.
Administrator
North Permitting Section

AAL/pa

Enclosure

cc: B. Mitchell

## APPLICATION INFORMATION

**Scope of Application**

| Emissions Unit ID Number | Description of Emissions Unit | Air Permit Type | Air Permit Proc. Fee |
|---|---|---|---|
| | Bark Handling System | | $7,500 |
| | Check # 0905336614 | | |
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STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
2004 JUL 13 P 3:36
NORTHEAST DISTRICT JACKSONVILLE

**Application Processing Fee**

Check one: ☒ Attached - Amount: $7,500 ☐ Not Applicable

# APPLICATION FOR AIR PERMIT – LONG FORM

# Department of
# Environmental Protection

## Division of Air Resource Management

## APPLICATION FOR AIR PERMIT - LONG FORM

### I. APPLICATION INFORMATION

**Air Construction Permit** – Use this form to apply for an air construction permit for a proposed project:
- subject to prevention of significant deterioration (PSD) review, nonattainment area (NAA) new source review, or maximum achievable control technology (MACT) review; or
- where the applicant proposes to assume a restriction on the potential emissions of one or more pollutants to escape a federal program requirement such as PSD review, NAA new source review, Title V, or MACT; or
- at an existing federally enforceable state air operation permit (FESOP) or Title V permitted facility.

**Air Operation Permit** – Use this form to apply for:
- an initial federally enforceable state air operation permit (FESOP); or
- an initial/revised/renewal Title V air operation permit.

**Air Construction Permit & Revised/Renewal Title V Air Operation Permit (Concurrent Processing Option)** – Use this form to apply for both an air construction permit and a revised or renewal Title V air operation permit incorporating the proposed project.

**To ensure accuracy, please see form instructions.**

**Identification of Facility**

| | |
|---|---|
| 1. Facility Owner/Company Name: **Georgia-Pacific Corporation** | |
| 2. Site Name: **Palatka Mill** | |
| 3. Facility Identification Number: **1070005** | |
| 4. Facility Location...:<br>Street Address or Other Locator: **North of CR 216; West of US 17**<br>City: **Palatka** County: **Putnam** Zip Code: **32177** | |
| 5. Relocatable Facility?<br>☐ Yes ☒ No | 6. Existing Title V Permitted Facility?<br>☒ Yes ☐ No |

**Application Contact**

| |
|---|
| 1. Application Contact Name: **Myra Carpenter, Superintendent of Environmental Affairs** |
| 2. Application Contact Mailing Address...<br>Organization/Firm: **Georgia-Pacific Corporation**<br>Street Address: **P.O. Box 919**<br>City: **Palatka** State: **FL** Zip Code: **32178-0919** |
| 3. Application Contact Telephone Numbers...<br>Telephone: **(386) 325-2001** ext. Fax: **(386) 328-0014** |
| 4. Application Contact Email Address: **myra.carpenter@gapac.com** |

**Application Processing Information (DEP Use)**

| | |
|---|---|
| 1. Date of Receipt of Application: | 7-13-04 |
| 2. Project Number(s): | 1070005-028-AC |
| 3. PSD Number (if applicable): | PSD-FL-341 |
| 4. Siting Number (if applicable): | |

## APPLICATION INFORMATION

**Purpose of Application**

**This application for air permit is submitted to obtain: (Check one)**

**Air Construction Permit**

☒ Air construction permit.

**Air Operation Permit**

☐ Initial Title V air operation permit.

☐ Title V air operation permit revision.

☐ Title V air operation permit renewal.

☐ Initial federally enforceable state air operation permit (FESOP) where professional engineer (PE) certification is required.

☐ Initial federally enforceable state air operation permit (FESOP) where professional engineer (PE) certification is not required.

**Air Construction Permit and Revised/Renewal Title V Air Operation Permit (Concurrent Processing)**

☐ Air construction permit and Title V permit revision, incorporating the proposed project.

☐ Air construction permit and Title V permit renewal, incorporating the proposed project.

**Note: By checking one of the above two boxes, you, the applicant, are requesting concurrent processing pursuant to Rule 62-213.405, F.A.C. In such case, you must also check the following box:**

☐ I hereby request that the department waive the processing time requirements of the air construction permit to accommodate the processing time frames of the Title V air operation permit.

**Application Comment**

This application is for the installation of a new bark hog in the Bark Handling System.

APPLICATION INFORMATION

**Scope of Application**

| Emissions Unit ID Number | Description of Emissions Unit | Air Permit Type | Air Permit Proc. Fee |
|---|---|---|---|
| | Bark Handling System | | $7,500 |
| | | | |
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**Application Processing Fee**

Check one: ☒ Attached - Amount: $7,500 ☐ Not Applicable

## APPLICATION INFORMATION

**Owner/Authorized Representative Statement**

**Complete if applying for an air construction permit or an initial FESOP.**

| | |
|---|---|
| 1. | Owner/Authorized Representative Name :<br>**Theodore D. Kennedy, Vice President, Georgia-Pacific, Palatka Operations** |
| 2. | Owner/Authorized Representative Mailing Address...<br>Organization/Firm: **Georgia-Pacific Corporation**<br>Street Address: **P.O. Box 919**<br>City: **Palatka** State: **FL** Zip Code: **32178** |
| 3. | Owner/Authorized Representative Telephone Numbers...<br>Telephone: **(386) 325-2001** ext. Fax: **(386) 328-0014** |
| 4. | Owner/Authorized Representative Email Address: **Ted.Kennedy@gapac.com** |
| 5. | Owner/Authorized Representative Statement:<br>*I, the undersigned, am the owner or authorized representative of the facility addressed in this air permit application. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof and all other requirements identified in this application to which the facility is subject. I understand that a permit, if granted by the department, cannot be transferred without authorization from the department, and I will promptly notify the department upon sale or legal transfer of the facility or any permitted emissions unit.*<br>Theodore D Kennedy<br>Signature 7/12/04<br>Date |

## APPLICATION INFORMATION

**Application Responsible Official Certification**

**Complete if applying for an initial/revised/renewal Title V permit or concurrent processing of an air construction permit and a revised/renewal Title V permit. If there are multiple responsible officials, the "application responsible official" need not be the "primary responsible official."**

| | |
|---|---|
| 1. | Application Responsible Official Name: |
| 2. | Application Responsible Official Qualification (Check one or more of the following options, as applicable):<br>☐ For a corporation, the president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit under Chapter 62-213, F.A.C.<br>☐ For a partnership or sole proprietorship, a general partner or the proprietor, respectively.<br>☐ For a municipality, county, state, federal, or other public agency, either a principal executive officer or ranking elected official.<br>☐ The designated representative at an Acid Rain source. |
| 3. | Application Responsible Official Mailing Address...<br>Organization/Firm:<br>Street Address:<br>City: State: Zip Code: |
| 4. | Application Responsible Official Telephone Numbers...<br>Telephone: ( ) - ext. Fax: ( ) - |
| 5. | Application Responsible Official Email Address: |
| 6. | Application Responsible Official Certification:<br>*I, the undersigned, am a responsible official of the Title V source addressed in this air permit application. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof and all other applicable requirements identified in this application to which the Title V source is subject. I understand that a permit, if granted by the department, cannot be transferred without authorization from the department, and I will promptly notify the department upon sale or legal transfer of the facility or any permitted emissions unit. Finally, I certify that the facility and each emissions unit are in compliance with all applicable requirements to which they are subject, except as identified in compliance plan(s) submitted with this application.*<br><br>________________ ____________<br>Signature Date |

## APPLICATION INFORMATION

**Professional Engineer Certification**

1. Professional Engineer Name: **David A. Buff**
   Registration Number: **19011**
2. Professional Engineer Mailing Address...
   Organization/Firm: **Golder Associates Inc.****
   Street Address: **6241 NW 23rd Street, Suite 500**
   City: **Gainesville** State: **FL** Zip Code: **32653**
3. Professional Engineer Telephone Numbers...
   Telephone: **(352) 336-5600** ext.**545** Fax: **(352) 336-6603**
4. Professional Engineer Email Address: **dbuff@golder.com**
5. Professional Engineer Statement:

*I, the undersigned, hereby certify, except as particularly noted herein*, that:*

*(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this application for air permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and*

*(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.*

*(3) If the purpose of this application is to obtain a Title V air operation permit (check here ☐, if so), I further certify that each emissions unit described in this application for air permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance plan and schedule is submitted with this application.*

*(4) If the purpose of this application is to obtain an air construction permit (check here ☒, if so) or concurrently process and obtain an air construction permit and a Title V air operation permit revision or renewal for one or more proposed new or modified emissions units (check here ☐, if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.*

*(5) If the purpose of this application is to obtain an initial air operation permit or operation permit revision or renewal for one or more newly constructed or modified emissions units (check here ☐, if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.*

David A. Buff — 7/08/04

Signature — Date

(seal)

* Attach any exception to certification statement.
****Board of Professional Engineers Certificate of Authorization #00001670**

## II. FACILITY INFORMATION

### A. GENERAL FACILITY INFORMATION

**Facility Location and Type**

| | | | |
|---|---|---|---|
| 1. Facility UTM Coordinates...<br>Zone 17 East (km) 434.0<br>North (km) 3283.4 | | 2. Facility Latitude/Longitude...<br>Latitude (DD/MM/SS) 29/41/0<br>Longitude (DD/MM/SS) 81/40/45 | |
| 3. Governmental Facility Code:<br>0 | 4. Facility Status Code:<br>A | 5. Facility Major Group SIC Code:<br>26 | 6. Facility SIC(s):<br>2611, 2621 |
| 7. Facility Comment : | | | |

**Facility Contact**

| |
|---|
| 1. Facility Contact Name:<br>Myra Carpenter, Superintendent of Environmental Affairs |
| 2. Facility Contact Mailing Address...<br>Organization/Firm: Georgia-Pacific Corporation<br>Street Address: P.O. Box 919<br>City: Palatka State: FL Zip Code: 32178-0919 |
| 3. Facility Contact Telephone Numbers:<br>Telephone: (386) 325-2001 ext. Fax: (386) 328-0014 |
| 4. Facility Contact Email Address: myra.carpenter@gapac.com |

**Facility Primary Responsible Official**

**Complete if an "application responsible official" is identified in Section I. that is not the facility "primary responsible official."**

| |
|---|
| 1. Facility Primary Responsible Official Name: |
| 2. Facility Primary Responsible Official Mailing Address...<br>Organization/Firm:<br>Street Address:<br>City: State: Zip Code: |
| 3. Facility Primary Responsible Official Telephone Numbers...<br>Telephone: ( ) - ext. Fax: ( ) - |
| 4. Facility Primary Responsible Official Email Address: |

## Facility Regulatory Classifications

**Check all that would apply *following* completion of all projects and implementation of all other changes proposed in this application for air permit. Refer to instructions to distinguish between a "major source" and a "synthetic minor source."**

| | |
|---|---|
| 1. ☐ Small Business Stationary Source | ☐ Unknown |
| 2. ☐ Synthetic Non-Title V Source | |
| 3. ☒ Title V Source | |
| 4. ☒ Major Source of Air Pollutants, Other than Hazardous Air Pollutants (HAPs) | |
| 5. ☐ Synthetic Minor Source of Air Pollutants, Other than HAPs | |
| 6. ☒ Major Source of Hazardous Air Pollutants (HAPs) | |
| 7. ☐ Synthetic Minor Source of HAPs | |
| 8. ☒ One or More Emissions Units Subject to NSPS (40 CFR Part 60) | |
| 9. ☐ One or More Emissions Units Subject to Emission Guidelines (40 CFR Part 60) | |
| 10. ☒ One or More Emissions Units Subject to NESHAP (40 CFR Part 61 or Part 63) | |
| 11. ☐ Title V Source Solely by EPA Designation (40 CFR 70.3(a)(5)) | |
| 12. Facility Regulatory Classifications Comment: | |

## FACILITY INFORMATION

**List of Pollutants Emitted by Facility**

| 1. Pollutant Emitted | 2. Pollutant Classification | 3. Emissions Cap [Y or N]? |
|---|---|---|
| **PM (Particulate Matter - Total)** | **A** | **N** |
| **$PM_{10}$ (Particulate Matter - PM)** | **A** | **N** |
| **$SO_2$ (Sulfur Dioxide)** | **A** | **N** |
| **$NO_x$ (Nitrogen Oxides)** | **A** | **N** |
| **CO (Carbon Monoxide)** | **A** | **N** |
| **VOC (Volatile Organic Compounds)** | **A** | **N** |
| **SAM (Sulfuric Acid Mist)** | **A** | **N** |
| **TRS (Total Reduced Sulfur)** | **A** | **N** |
| **H001 (Acetaldehyde)** | **A** | **N** |
| **H021 (Beryllium Compounds)** | **B** | **N** |
| **H043 (Chloroform)** | **A** | **N** |
| **H095 (Formaldehyde)** | **A** | **N** |
| **H106 (Hydrochloric Acid)** | **A** | **N** |
| **H115 (Methanol)** | **A** | **N** |
| **HAPs (Total Hazardous Air Pollutants)** | **A** | **N** |
| | | |
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## B. EMISSIONS CAPS

**Facility-Wide or Multi-Unit Emissions Caps**

| 1. Pollutant Subject to Emissions Cap | 2. Facility Wide Cap [Y or N]? (all units) | 3. Emissions Unit ID No.s Under Cap (if not all units) | 4. Hourly Cap (lb/hr) | 5. Annual Cap (ton/yr) | 6. Basis for Emissions Cap |
|---|---|---|---|---|---|
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7. Facility-Wide or Multi-Unit Emissions Cap Comment:

## C. FACILITY ADDITIONAL INFORMATION

**Additional Requirements for All Applications, Except as Otherwise Stated**

| | |
|---|---|
| 1. | Facility Plot Plan: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)<br>☒ Attached, Document ID: **GP-FI-C1** ☐ Previously Submitted, Date:____ |
| 2. | Process Flow Diagram(s): (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)<br>☒ Attached, Document ID: **GP-FI-C2** ☐ Previously Submitted, Date:____ |
| 3. | Precautions to Prevent Emissions of Unconfined Particulate Matter: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)<br>☒ Attached, Document ID: **Part B** ☐ Previously Submitted, Date:____ |

**Additional Requirements for Air Construction Permit Applications**

| | |
|---|---|
| 1. | Area Map Showing Facility Location:<br>☒ Attached, Document ID: **GP-FI-CC1** ☐ Not Applicable (existing permitted facility) |
| 2. | Description of Proposed Construction or Modification:<br>☒ Attached, Document ID: **Part B** |
| 3. | Rule Applicability Analysis:<br>☒ Attached, Document ID: **Part B** |
| 4. | List of Exempt Emissions Units (Rule 62-210.300(3)(a) or (b)1., F.A.C.):<br>☒ Attached, Document ID: **Part B** ☐ Not Applicable (no exempt units at facility) |
| 5. | Fugitive Emissions Identification (Rule 62-212.400(2), F.A.C.):<br>☒ Attached, Document ID: **Part B** ☐ Not Applicable |
| 6. | Preconstruction Air Quality Monitoring and Analysis (Rule 62-212.400(5)(f), F.A.C.):<br>☒ Attached, Document ID: **Part B** ☐ Not Applicable |
| 7. | Ambient Impact Analysis (Rule 62-212.400(5)(d), F.A.C.):<br>☒ Attached, Document ID: **Part B** ☐ Not Applicable |
| 8. | Air Quality Impact since 1977 (Rule 62-212.400(5)(h)5., F.A.C.):<br>☒ Attached, Document ID: **Part B** ☐ Not Applicable |
| 9. | Additional Impact Analyses (Rules 62-212.400(5)(e)1. and 62-212.500(4)(e), F.A.C.):<br>☒ Attached, Document ID: **Part B** ☐ Not Applicable |
| 10. | Alternative Analysis Requirement (Rule 62-212.500(4)(g), F.A.C.):<br>☐ Attached, Document ID:____ ☒ Not Applicable |

## FACILITY INFORMATION

**Additional Requirements for FESOP Applications**

| | |
|---|---|
| 1. List of Exempt Emissions Units (Rule 62-210.300(3)(a) or (b)1., F.A.C.):<br>☐ Attached, Document ID:_____ ☐ Not Applicable (no exempt units at facility) | |

**Additional Requirements for Title V Air Operation Permit Applications**

| |
|---|
| 1. List of Insignificant Activities (Required for initial/renewal applications only):<br>☐ Attached, Document ID:_____ ☐ Not Applicable (revision application) |
| 2. Identification of Applicable Requirements (Required for initial/renewal applications, and for revision applications if this information would be changed as a result of the revision being sought):<br>☐ Attached, Document ID:_____<br>☐ Not Applicable (revision application with no change in applicable requirements) |
| 3. Compliance Report and Plan (Required for all initial/revision/renewal applications):<br>☐ Attached, Document ID:_____<br>Note: A compliance plan must be submitted for each emissions unit that is not in compliance with all applicable requirements at the time of application and/or at any time during application processing. The department must be notified of any changes in compliance status during application processing. |
| 4. List of Equipment/Activities Regulated under Title VI (If applicable, required for initial/renewal applications only):<br>☐ Attached, Document ID:_____<br>☐ Equipment/Activities On site but Not Required to be Individually Listed<br>☐ Not Applicable |
| 5. Verification of Risk Management Plan Submission to EPA (If applicable, required for initial/renewal applications only) :<br>☐ Attached, Document ID:_____ ☐ Not Applicable |
| 6. Requested Changes to Current Title V Air Operation Permit:<br>☐ Attached, Document ID:_____ ☐ Not Applicable |

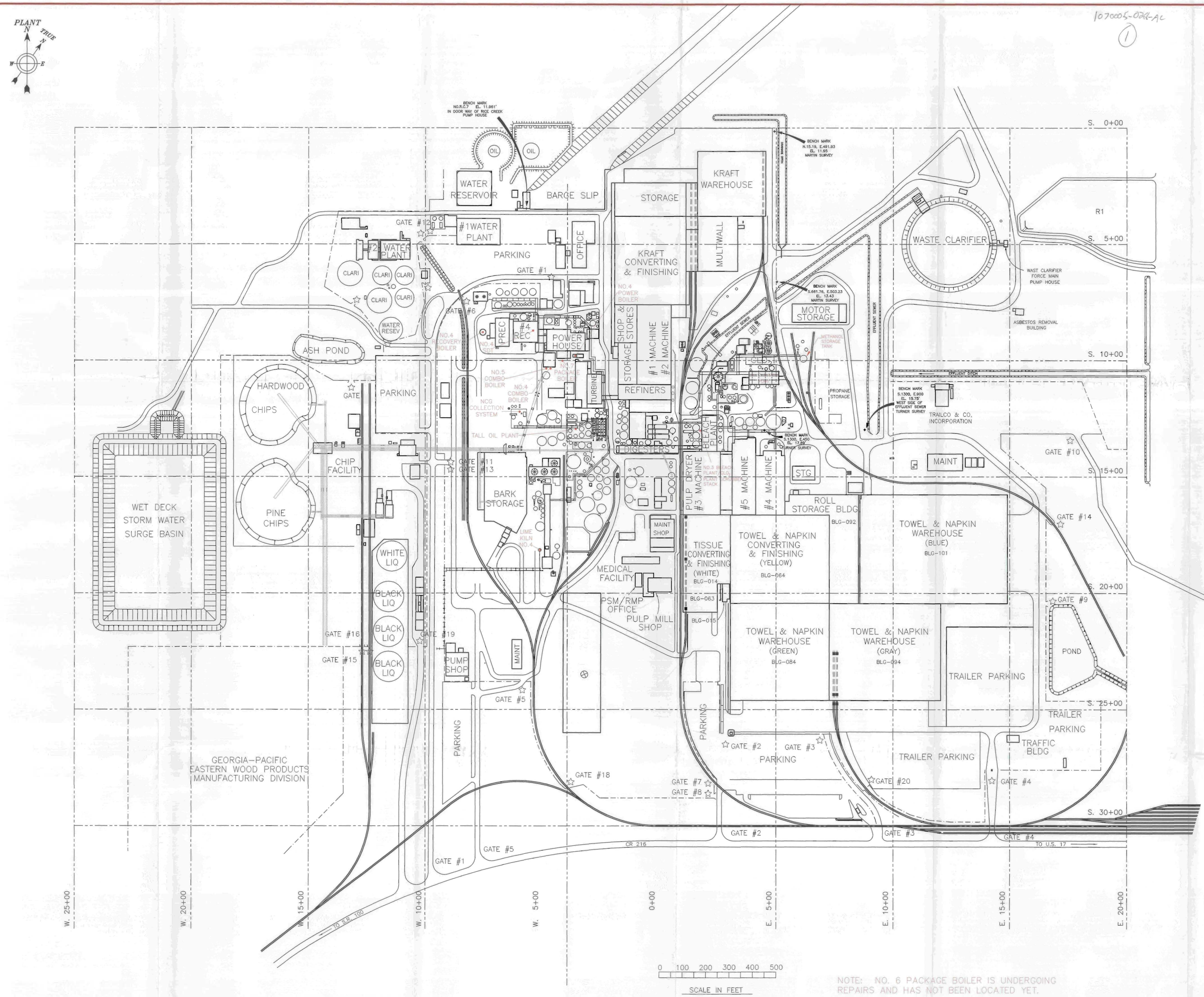
**Additional Requirements Comment**

| |
|---|
| |

**ATTACHMENT GP-FI-C1**

**FACILITY PLOT PLAN**

1070005-028-AL
(1)




## NOTES

LEGEND & INFORMATION

| | |
|---|---|
| ☆ | GATE |
| ═══ | RAILROAD TRACK |
| — - — | FENCE |

| GATE # | DESCRIPTION |
|---|---|
| 1 | MAIN GATE |
| 2 | EAST GATE |
| 3 | OLD CONSTRUCTION GATE |
| 4 | TRUCK TRAFFIC GATE |
| 5 | CONSTRUCTION GATE |
| 6 | R.R. GATE |
| 7 | R.R. GATE |
| 8 | PERIMETER GATE |
| 9 | PERIMETER GATE |
| 10 | CONSTRUCTION GATE |
| 11 | INNER MILL VEHICLE GATE |
| 12 | PERSONNEL GATE |
| 13 | PERSONNEL GATE |
| 14 | R.R. GATE |
| 15 | R.R. GATE |
| 16 | R.R. GATE |
| 17 | CONSTRUCTION GATE |
| 18 | R.R. GATE |
| 19 | CHIP TRUCK SCALE |
| 20 | R.R. GATE |

| REV. | DATE | DESCRIPTION | DRN. / CH'D. | AP'D |
|---|---|---|---|---|
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| . | . | . | . / . | . |
| 3 | 05/04/04 | GOLDER TITLE V REVISION | NAV / DAB | DAB |
| 2 | 12/02/02 | GOLDER TITLE V REVISION | DTL / FWH | DAB |
| 1 | 11/27/02 | GOLDER TITLE V REVISION | DTL / FWH | DAB |

CROSS-REFERENCE NO.
E-290-8469-1-0105-001

HUDSON NO.

**Georgia-Pacific**

THE GROWTH COMPANY

**PALATKA OPERATIONS**

ATTACHMENT GP-FI-C1.
FACILITY PLOT PLAN, PALATKA MILL
0437562\4\4.4\Plot Plan.dwg

| | | |
|---|---|---|
| DRAWN H. Trujillo | 11/25/02 | SCALE 1" = 150' |
| CHECKED . | . | AFE NO. . |
| APPROVED . | . | PROJ NO. . |
| APPROVED . | . | AREA . |

G-P DRAWING NO.
290-8464MI -000-0009-006

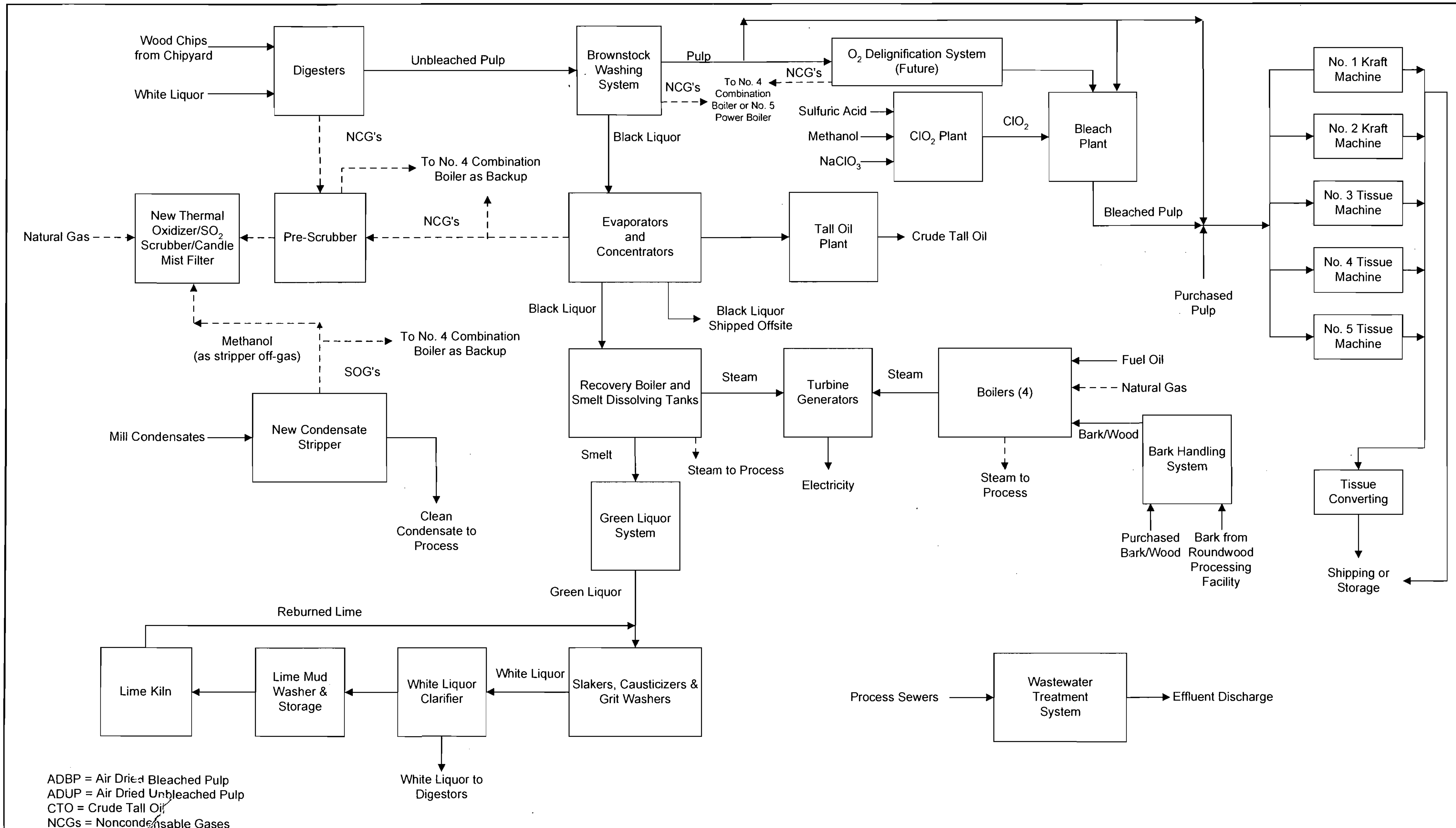
CONSULTANT: REV: 0

CONSULTANT NO.
.

Revised APR, 1997; E-size

**ATTACHMENT GP-FI-C2**

**PROCESS FLOW DIAGRAM**




Attachment GP-FI-C2
Facility Process Flow Diagram
Georgia-Pacific Palatka Operations
Palatka, Florida

**Process Flow Legend**

Solid/Liquid ————▶
Gas - - - - - ▶

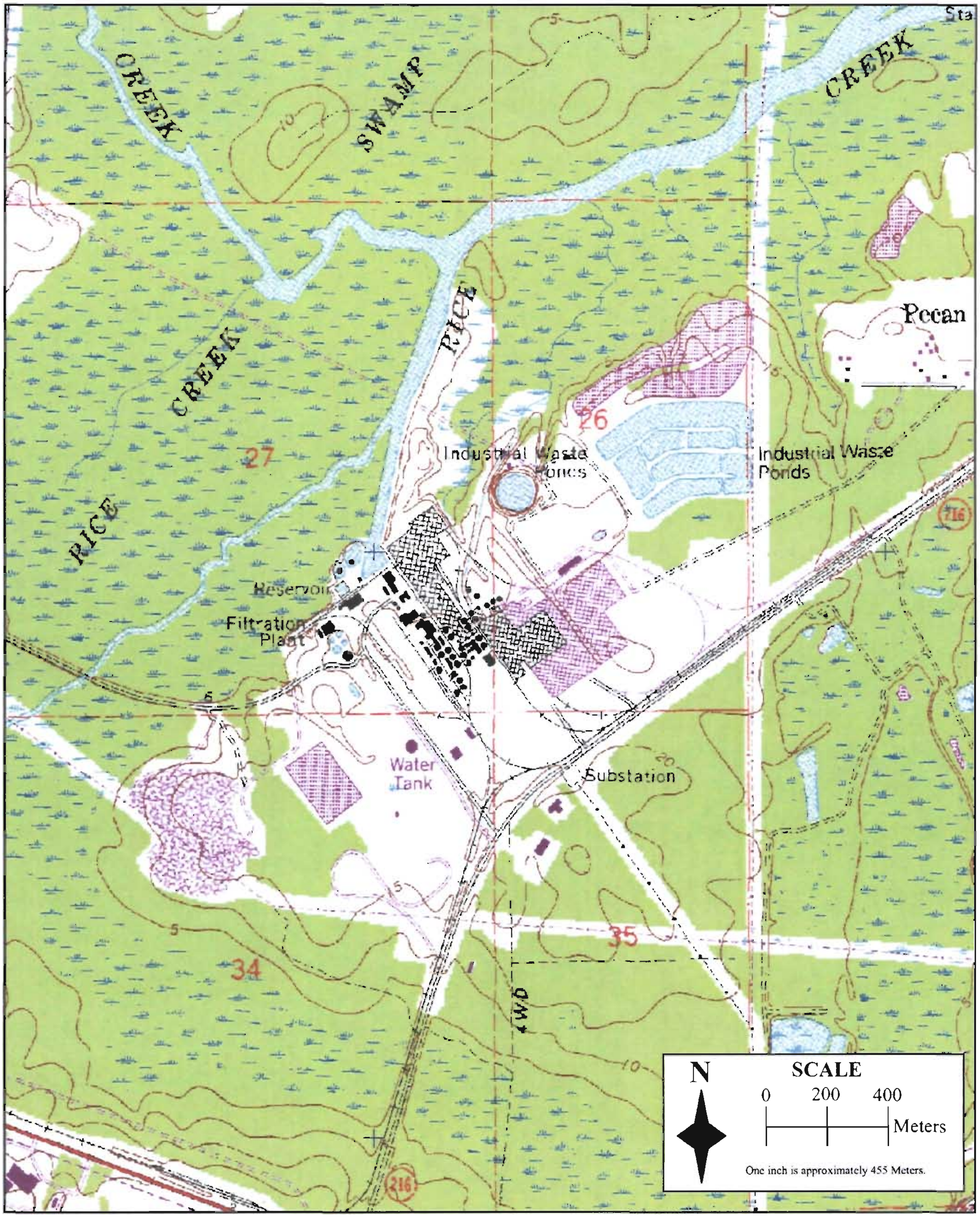
Filename: 0437562/4/4.4/GP-F1-C2.VSD

Date: 7/8/04

Golder Associates

# ATTACHMENT GP-FI-CC1

# AREA MAP SHOWING FACILITY LOCATION




Attachment GP-FI-CC1
Area Map
Georgia-Pacific Corporation, Palatka Mill

Source: Golder, 2004.

## III. EMISSIONS UNIT INFORMATION

**Title V Air Operation Permit Application** - For Title V air operation permitting only, emissions units are classified as regulated, unregulated, or insignificant. If this is an application for Title V air operation permit, a separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each regulated and unregulated emissions unit addressed in this application for air permit. Some of the subsections comprising the Emissions Unit Information Section of the form are optional for unregulated emissions units. Each such subsection is appropriately marked. Insignificant emissions units are required to be listed at Section II, Subsection C.

**Air Construction Permit or FESOP Application** - For air construction permitting or federally enforceable state air operation permitting, emissions units are classified as either subject to air permitting or exempt from air permitting. The concept of an "unregulated emissions unit" does not apply. If this is an application for air construction permit or FESOP, a separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each emissions unit subject to air permitting addressed in this application for air permit. Emissions units exempt from air permitting are required to be listed at Section II, Subsection C.

**Air Construction Permit and Revised/Renewal Title V Air Operation Permit Application** – Where this application is used to apply for both an air construction permit and a revised/renewal Title V air operation permit, each emissions unit is classified as either subject to air permitting or exempt from air permitting for air construction permitting purposes and as regulated, unregulated, or insignificant for Title V air operation permitting purposes. **The air construction permitting classification must be used to complete the Emissions Unit Information Section of this application for air permit.** A separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each emissions unit subject to air permitting addressed in this application for air permit. Emissions units exempt from air construction permitting and insignificant emissions units are required to be listed at Section II, Subsection C.

If submitting the application form in hard copy, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application must be indicated in the space provided at the top of each page.

## A. GENERAL EMISSIONS UNIT INFORMATION

**Title V Air Operation Permit Emissions Unit Classification**

1. Regulated or Unregulated Emissions Unit? (Check one, if applying for an initial, revised or renewal Title V air operation permit. Skip this item if applying for an air construction permit or FESOP only.)

   ☐ The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.

   ☒ The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

**Emissions Unit Description and Status**

1. Type of Emissions Unit Addressed in this Section: (Check one)

   ☐ This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

   ☐ This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

   ☒ This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Description of Emissions Unit Addressed in this Section: **Bark Handling System, including storage, handling, conveying, and hogging operations.**

3. Emissions Unit Identification Number:

| 4. Emissions Unit Status Code: | 5. Commence Construction Date: | 6. Initial Startup Date: | 7. Emissions Unit Major Group SIC Code: | 8. Acid Rain Unit? |
|---|---|---|---|---|
| **A** | | | **26** | ☐ Yes<br>☒ No |

9. Package Unit:
   Manufacturer: Model Number:

10. Generator Nameplate Rating: MW

11. Emissions Unit Comment: **This emission unit consists of the Bark Handling System, including the storage pile, conveyors, transfer chutes, screen, silo, cyclone, and the Bark Hog.**

**Emissions Unit Control Equipment**

| | |
|---|---|
| 1. | Control Equipment/Method(s) Description: **Enclosures** |
| 2. | Control Device or Method Code(s): **054** |

## B. EMISSIONS UNIT CAPACITY INFORMATION

**(Optional for unregulated emissions units.)**

**Emissions Unit Operating Capacity and Schedule**

| | |
|---|---|
| 1. Maximum Process or Throughput Rate: **499,320 TPY** | |
| 2. Maximum Production Rate: | |
| 3. Maximum Heat Input Rate: | million Btu/hr |
| 4. Maximum Incineration Rate: | pounds/hr<br>tons/day |
| 5. Requested Maximum Operating Schedule: | **24** hours/day   **7** days/week<br>**52** weeks/year   **8,760** hours/year |
| 6. Operating Capacity/Schedule Comment:<br>**The maximum throughput rate of 499,320 TPY represents the maximum amount of wood/bark that can be fed to the No. 4 Combination Boiler. This number is based on 512.7 MMBtu/hr, a minimum heating value of 4,500 Btu/lb*, and 8,760 hr/yr operation. The typical heating value of bark/wood is 4,750 Btu/lb.**<br><br>***Minimum used in order to estimate the maximum worst-case throughput.** | |

## C. EMISSION POINT (STACK/VENT) INFORMATION
## (Optional for unregulated emissions units.)

**Emission Point Description and Type**

| | | |
|---|---|---|
| 1. Identification of Point on Plot Plan or Flow Diagram: **Bark Storage** | 2. Emission Point Type Code: **4** | |
| 3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking: | | |
| 4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common: | | |
| 5. Discharge Type Code: **F** | 6. Stack Height: feet | 7. Exit Diameter: feet |
| 8. Exit Temperature: **77** °F | 9. Actual Volumetric Flow Rate: acfm | 10. Water Vapor: % |
| 11. Maximum Dry Standard Flow Rate: dscfm | 12. Nonstack Emission Point Height: **0** feet | |
| 13. Emission Point UTM Coordinates... Zone: East (km): North (km): | 14. Emission Point Latitude/Longitude... Latitude (DD/MM/SS) Longitude (DD/MM/SS) | |
| 15. Emission Point Comment: | | |

## D. SEGMENT (PROCESS/FUEL) INFORMATION

**Segment Description and Rate:** Segment 1 of 1

| | | |
|---|---|---|
| 1. Segment Description (Process/Fuel Type): **Industrial Processes; Pulp and Paper and Wood Products; Bark Handling and Storage - Wood/Bark; Conveyors** | | |
| 2. Source Classification Code (SCC): **3-07-040-05** | 3. SCC Units: **Tons Material Processed** | |
| 4. Maximum Hourly Rate: | 5. Maximum Annual Rate: **499,320** | 6. Estimated Annual Activity Factor: |
| 7. Maximum % Sulfur: | 8. Maximum % Ash: | 9. Million Btu per SCC Unit: **9** |
| 10. Segment Comment: **Maximum annual rate represents the maximum daily average amount of bark/wood that can be fired in the No. 4 Combination Boiler assuming a minimum heating value of 4,500 Btu/lb*.** ***Minimum used in order to estimate the maximum worst-case throughput.** | | |

**Segment Description and Rate:** Segment _____ of _____

| | | |
|---|---|---|
| 1. Segment Description (Process/Fuel Type): | | |
| 2. Source Classification Code (SCC): | 3. SCC Units: | |
| 4. Maximum Hourly Rate: | 5. Maximum Annual Rate: | 6. Estimated Annual Activity Factor: |
| 7. Maximum % Sulfur: | 8. Maximum % Ash: | 9. Million Btu per SCC Unit: |
| 10. Segment Comment: | | |

## E. EMISSIONS UNIT POLLUTANTS

**List of Pollutants Emitted by Emissions Unit**

| 1. Pollutant Emitted | 2. Primary Control Device Code | 3. Secondary Control Device Code | 4. Pollutant Regulatory Code |
|---|---|---|---|
| PM | 054 | | NS |
| $PM_{10}$ | 054 | | NS |
| VOC | | | NS |
| | | | |
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## F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL/ESTIMATED FUGITIVE EMISSIONS

**(Optional for unregulated emissions units.)**

**Potential/Estimated Fugitive Emissions**

**Complete for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.**

| | |
|---|---|
| 1. Pollutant Emitted: **PM** | 2. Total Percent Efficiency of Control: |
| 3. Potential Emissions: **5.21** lb/hour **22.81** tons/year | 4. Synthetically Limited? ☐ Yes ☒ No |
| 5. Range of Estimated Fugitive Emissions (as applicable): to tons/year | |
| 6. Emission Factor: Reference: **Table 2-1 of PSD Report** | 7. Emissions Method Code: **3** |
| 8. Calculation of Emissions: **Refer to Table 2-1 of the PSD report. Hourly emissions based on annual emissions and 8,760 hr/yr.** | |
| 9. Pollutant Potential/Estimated Fugitive Emissions Comment: | |

## F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

**Complete if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.**

**Allowable Emissions** Allowable Emissions _____ of _____

| | |
|---|---|
| 1. Basis for Allowable Emissions Code: | 2. Future Effective Date of Allowable Emissions: |
| 3. Allowable Emissions and Units: | 4. Equivalent Allowable Emissions: lb/hour tons/year |
| 5. Method of Compliance: | |
| 6. Allowable Emissions Comment (Description of Operating Method): | |

**Allowable Emissions** Allowable Emissions _____ of _____

| | |
|---|---|
| 1. Basis for Allowable Emissions Code: | 2. Future Effective Date of Allowable Emissions: |
| 3. Allowable Emissions and Units: | 4. Equivalent Allowable Emissions: lb/hour tons/year |
| 5. Method of Compliance: | |
| 6. Allowable Emissions Comment (Description of Operating Method): | |

**Allowable Emissions** Allowable Emissions _____ of _____

| | |
|---|---|
| 1. Basis for Allowable Emissions Code: | 2. Future Effective Date of Allowable Emissions: |
| 3. Allowable Emissions and Units: | 4. Equivalent Allowable Emissions: lb/hour tons/year |
| 5. Method of Compliance: | |
| 6. Allowable Emissions Comment (Description of Operating Method): | |

## F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL/ESTIMATED FUGITIVE EMISSIONS

**(Optional for unregulated emissions units.)**

**Potential/Estimated Fugitive Emissions**

**Complete for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.**

| | |
|---|---|
| 1. Pollutant Emitted: $PM_{10}$ | 2. Total Percent Efficiency of Control: |
| 3. Potential Emissions: 3.16 lb/hour 13.85 tons/year | 4. Synthetically Limited? ☐ Yes ☒ No |
| 5. Range of Estimated Fugitive Emissions (as applicable): to tons/year | |
| 6. Emission Factor: Reference: Table 2-1 of the PSD report | 7. Emissions Method Code: 3 |
| 8. Calculation of Emissions: Refer to Table 2-1 of the PSD report. Hourly emissions based on annual emissions and 8,760 hr/yr. | |
| 9. Pollutant Potential/Estimated Fugitive Emissions Comment: | |

## F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

**Complete if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.**

**Allowable Emissions** Allowable Emissions _____ of _____

| | |
|---|---|
| 1. Basis for Allowable Emissions Code: | 2. Future Effective Date of Allowable Emissions: |
| 3. Allowable Emissions and Units: | 4. Equivalent Allowable Emissions: lb/hour tons/year |
| 5. Method of Compliance: | |
| 6. Allowable Emissions Comment (Description of Operating Method): | |

**Allowable Emissions** Allowable Emissions _____ of _____

| | |
|---|---|
| 1. Basis for Allowable Emissions Code: | 2. Future Effective Date of Allowable Emissions: |
| 3. Allowable Emissions and Units: | 4. Equivalent Allowable Emissions: lb/hour tons/year |
| 5. Method of Compliance: | |
| 6. Allowable Emissions Comment (Description of Operating Method): | |

**Allowable Emissions** Allowable Emissions _____ of _____

| | |
|---|---|
| 1. Basis for Allowable Emissions Code: | 2. Future Effective Date of Allowable Emissions: |
| 3. Allowable Emissions and Units: | 4. Equivalent Allowable Emissions: lb/hour tons/year |
| 5. Method of Compliance: | |
| 6. Allowable Emissions Comment (Description of Operating Method): | |

## F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL/ESTIMATED FUGITIVE EMISSIONS

**(Optional for unregulated emissions units.)**

**Potential/Estimated Fugitive Emissions**

**Complete for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.**

| | |
|---|---|
| 1. Pollutant Emitted: **VOC** | 2. Total Percent Efficiency of Control: |
| 3. Potential Emissions: **108.64** lb/hour **475.84** tons/year | 4. Synthetically Limited? ☐ Yes ☒ No |
| 5. Range of Estimated Fugitive Emissions (as applicable): to tons/year | |
| 6. Emission Factor: Reference: **Table 2-3 of PSD Report** | 7. Emissions Method Code: **3** |
| 8. Calculation of Emissions: **Refer to Table 2-3 of the PSD report.** | |
| 9. Pollutant Potential/Estimated Fugitive Emissions Comment: | |

## F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

**Complete if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.**

**Allowable Emissions** Allowable Emissions _____ of _____

| | |
|---|---|
| 1. Basis for Allowable Emissions Code: | 2. Future Effective Date of Allowable Emissions: |
| 3. Allowable Emissions and Units: | 4. Equivalent Allowable Emissions: lb/hour tons/year |
| 5. Method of Compliance: | |
| 6. Allowable Emissions Comment (Description of Operating Method): | |

**Allowable Emissions** Allowable Emissions _____ of _____

| | |
|---|---|
| 1. Basis for Allowable Emissions Code: | 2. Future Effective Date of Allowable Emissions: |
| 3. Allowable Emissions and Units: | 4. Equivalent Allowable Emissions: lb/hour tons/year |
| 5. Method of Compliance: | |
| 6. Allowable Emissions Comment (Description of Operating Method): | |

**Allowable Emissions** Allowable Emissions _____ of _____

| | |
|---|---|
| 1. Basis for Allowable Emissions Code: | 2. Future Effective Date of Allowable Emissions: |
| 3. Allowable Emissions and Units: | 4. Equivalent Allowable Emissions: lb/hour tons/year |
| 5. Method of Compliance: | |
| 6. Allowable Emissions Comment (Description of Operating Method): | |

## G. VISIBLE EMISSIONS INFORMATION

**Complete if this emissions unit is or would be subject to a unit-specific visible emissions limitation.**

**Visible Emissions Limitation:** Visible Emissions Limitation 1 of 1

| | |
|---|---|
| 1. Visible Emissions Subtype: **VE20** | 2. Basis for Allowable Opacity: ☒ Rule ☐ Other |
| 3. Allowable Opacity: Normal Conditions: **20** % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour | |
| 4. Method of Compliance: **DEP Method 9** | |
| 5. Visible Emissions Comment: **Rule 62-296.320(4)(b), F.A.C.** | |

**Visible Emissions Limitation:** Visible Emissions Limitation _____ of _____

| | |
|---|---|
| 1. Visible Emissions Subtype: | 2. Basis for Allowable Opacity: ☐ Rule ☐ Other |
| 3. Allowable Opacity: Normal Conditions: % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour | |
| 4. Method of Compliance: | |
| 5. Visible Emissions Comment: | |

## H. CONTINUOUS MONITOR INFORMATION

**Complete if this emissions unit is or would be subject to continuous monitoring.**

**Continuous Monitoring System:** Continuous Monitor _____ of _____

| | |
|---|---|
| 1. Parameter Code: | 2. Pollutant(s): |
| 3. CMS Requirement: ☐ Rule ☐ Other | |
| 4. Monitor Information...<br>Manufacturer:<br>Model Number: Serial Number: | |
| 5. Installation Date: | 6. Performance Specification Test Date: |
| 7. Continuous Monitor Comment: | |

**Continuous Monitoring System:** Continuous Monitor _____ of _____

| | |
|---|---|
| 1. Parameter Code: | 2. Pollutant(s): |
| 3. CMS Requirement: ☐ Rule ☐ Other | |
| 4. Monitor Information...<br>Manufacturer:<br>Model Number: Serial Number: | |
| 5. Installation Date: | 6. Performance Specification Test Date: |
| 7. Continuous Monitor Comment: | |

# I. EMISSIONS UNIT ADDITIONAL INFORMATION

**Additional Requirements for All Applications, Except as Otherwise Stated**

| |
|---|
| 1. Process Flow Diagram (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)<br>☒ Attached, Document ID: GP-EU1-I1 ☐ Previously Submitted, Date _____ |
| 2. Fuel Analysis or Specification (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)<br>☐ Attached, Document ID: _____ ☐ Previously Submitted, Date _____ |
| 3. Detailed Description of Control Equipment (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)<br>☐ Attached, Document ID: _____ ☐ Previously Submitted, Date _____ |
| 4. Procedures for Startup and Shutdown (Required for all operation permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)<br>☐ Attached, Document ID: _____ ☐ Previously Submitted, Date _____<br>☒ Not Applicable (construction application) |
| 5. Operation and Maintenance Plan (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)<br>☐ Attached, Document ID: _____ ☐ Previously Submitted, Date _____<br>☒ Not Applicable |
| 6. Compliance Demonstration Reports/Records<br>☐ Attached, Document ID: _____<br>Test Date(s)/Pollutant(s) Tested: _____<br>☐ Previously Submitted, Date: _____<br>Test Date(s)/Pollutant(s) Tested: _____<br>☐ To be Submitted, Date (if known): _____<br>Test Date(s)/Pollutant(s) Tested: _____<br>☒ Not Applicable<br>Note: For FESOP applications, all required compliance demonstration records/reports must be submitted at the time of application. For Title V air operation permit applications, all required compliance demonstration reports/records must be submitted at the time of application, or a compliance plan must be submitted at the time of application. |
| 7. Other Information Required by Rule or Statute<br>☐ Attached, Document ID: _____ ☒ Not Applicable |

**Additional Requirements for Air Construction Permit Applications**

| | |
|---|---|
| 1. Control Technology Review and Analysis (Rules 62-212.400(6) and 62-212.500(7), F.A.C.; 40 CFR 63.43(d) and (e))<br>☒ Attached, Document ID: Part B ☐ Not Applicable | |
| 2. Good Engineering Practice Stack Height Analysis (Rule 62-212.400(5)(h)6., F.A.C., and Rule 62-212.500(4)(f), F.A.C.)<br>☒ Attached, Document ID: Part B ☐ Not Applicable | |
| 3. Description of Stack Sampling Facilities (Required for proposed new stack sampling facilities only)<br>☐ Attached, Document ID: ____ ☒ Not Applicable | |

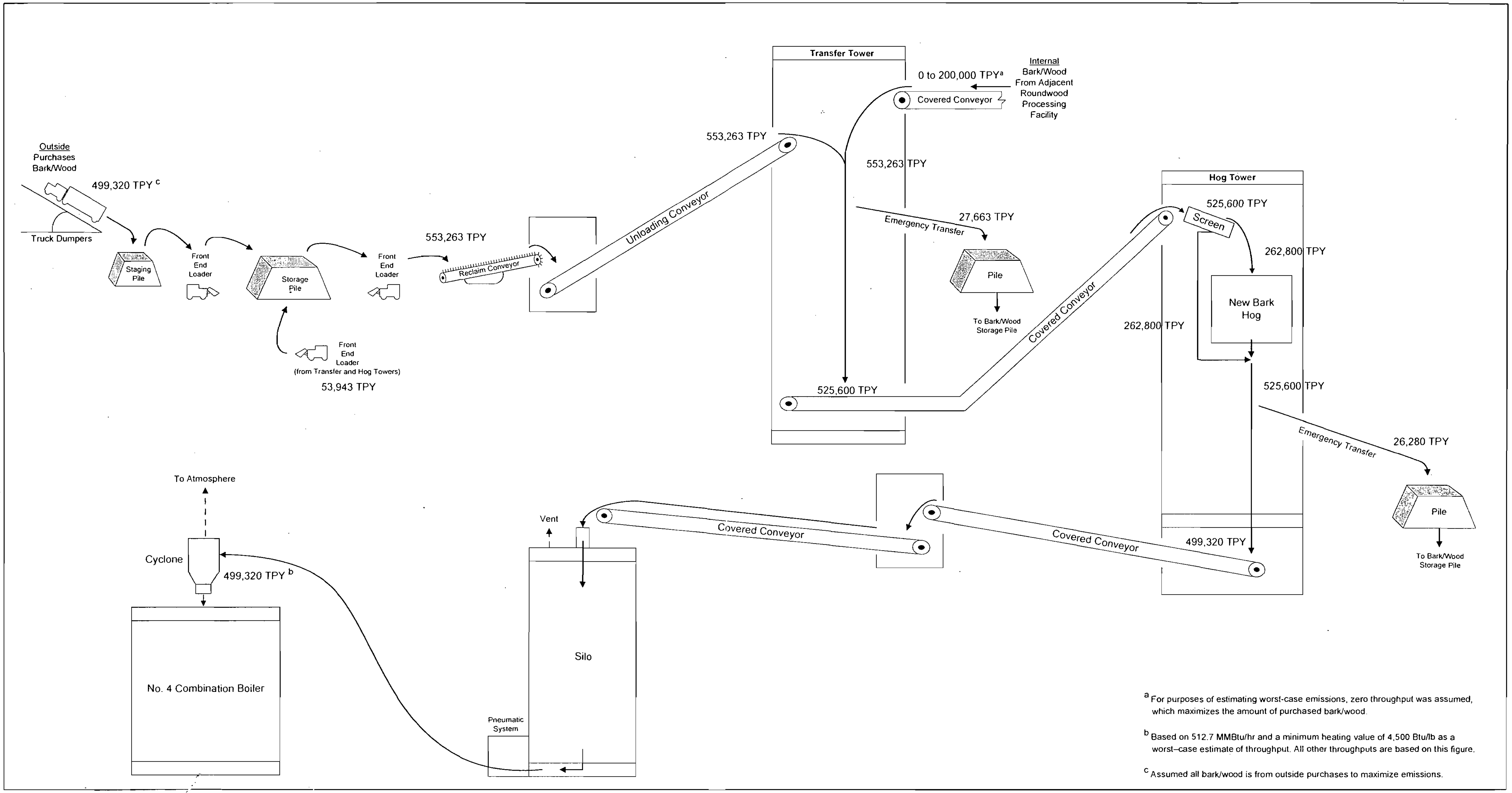
**Additional Requirements for Title V Air Operation Permit Applications**

| | |
|---|---|
| 1. Identification of Applicable Requirements<br>☒ Attached, Document ID: GP-EU1-IV1 ☐ Not Applicable | |
| 2. Compliance Assurance Monitoring<br>☐ Attached, Document ID: ____ ☒ Not Applicable | |
| 3. Alternative Methods of Operation<br>☐ Attached, Document ID: ____ ☒ Not Applicable | |
| 4. Alternative Modes of Operation (Emissions Trading)<br>☐ Attached, Document ID: ____ ☒ Not Applicable | |
| 5. Acid Rain Part Application<br>☐ Certificate of Representation (EPA Form No. 7610-1)<br>☐ Copy Attached, Document ID: ____<br>☐ Acid Rain Part (Form No. 62-210.900(1)(a))<br>☐ Attached, Document ID: ____<br>☐ Previously Submitted, Date: ____<br>☐ Repowering Extension Plan (Form No. 62-210.900(1)(a)1.)<br>☐ Attached, Document ID: ____<br>☐ Previously Submitted, Date: ____<br>☐ New Unit Exemption (Form No. 62-210.900(1)(a)2.)<br>☐ Attached, Document ID: ____<br>☐ Previously Submitted, Date: ____<br>☐ Retired Unit Exemption (Form No. 62-210.900(1)(a)3.)<br>☐ Attached, Document ID: ____<br>☐ Previously Submitted, Date: ____<br>☐ Phase II NOx Compliance Plan (Form No. 62-210.900(1)(a)4.)<br>☐ Attached, Document ID: ____<br>☐ Previously Submitted, Date: ____<br>☐ Phase II NOx Averaging Plan (Form No. 62-210.900(1)(a)5.)<br>☐ Attached, Document ID: ____<br>☐ Previously Submitted, Date: ____<br>☒ Not Applicable | |

## Additional Requirements Comment

ATTACHMENT GP-EU1-I1

PROCESS FLOW DIAGRAM




a For purposes of estimating worst-case emissions, zero throughput was assumed, which maximizes the amount of purchased bark/wood.

b Based on 512.7 MMBtu/hr and a minimum heating value of 4,500 Btu/lb as a worst–case estimate of throughput. All other throughputs are based on this figure.

c Assumed all bark/wood is from outside purchases to maximize emissions.

Attachment GP-EU1-I1. Future Bark Handling System Process Flow Diagram
Georgia-Pacific Corporation
Palatka Mill

| Legend | |
|---|---|
| Bark/Wood | → |

Golder Associates

# ATTACHMENT GP-EU1-IV1

# IDENTIFICATION OF APPLICABLE REQUIREMENTS

# ATTACHMENT GP-EU1-IV1

## IDENTIFICATION OF APPLICABLE REQUIREMENTS

Rule 62-296.320(4)(b), F.A.C. – General Visible Emissions Standard

Rule 62-296.320(4)(c), F.A.C. – Unconfined Emissions of Particulate Matter

# PART B

# PSD REPORT

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LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AAQS | Ambient Air Quality Standards |
| AQRV | air quality related value |
| ATP | adenosine triphosphate |
| BACT | Best Available Control Technology |
| Btu/gal | British thermal units per gallon |
| Btu/lb | British thermal units per pound |
| CAA | Clean Air Act |
| CFR | Code of Federal Regulations |
| CO | carbon monoxide |
| DAT | deposition analysis threshold |
| DNCG | dilute non-condensable gas |
| EPA | U.S. Environmental Protection Agency |
| F.A.C. | Florida Administrative Code |
| FDEP | Florida Department of Environmental Protection |
| gal/hr | gallons per hour |
| g/s | grams per second |
| GEP | Good Engineering Practice |
| HAP | hazardous air pollutant |
| $HNO_3$ | nitric acid |
| HSH | highest, second-highest |
| kg/ha/yr | kilograms per hectare per year |
| lb/hr | pounds per hour |
| MACT | Maximum Achievable Control Technology |
| MMBtu/hr | million British thermal units per hour |
| NCASI | National Council for Air and Stream Improvement |
| NCG | non-condensable gas |
| $NO_2$ | nitrogen dioxide |
| $NO_3$ | nitric oxide |
| $NO_x$ | nitrogen oxides |
| NSPS | New Source Performance Standards |
| NSR | new source review |
| NWA | National Wilderness Area |

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LIST OF ACRONYMS AND ABBREVIATIONS (cont'd)

| | |
|---|---|
| $O_3$ | ozone |
| PCP | pollution control project |
| PM | particulate matter |
| $PM_{10}$ | particulate matter with an aerodynamic diameter equal to or less than 10 micrometers |
| ppm | parts per million |
| PSD | prevention of significant deterioration |
| RACT | Reasonably Available Control Technology |
| SAM | sulfuric acid mist |
| SIP | State Implementation Plan |
| SOG | stripper off gas |
| $SO_2$ | sulfur dioxide |
| $SO_4$ | sulfate |
| SR | State Road |
| TPH | tons per hour |
| TPY | tons per year |
| TRS | total reduced sulfur |
| TSP | total suspended particulates |
| $\mu g/m^3$ | micrograms per cubic meter |
| $\mu g/m^2/s$ | micrograms per square meter per second |
| VE | visible emissions |
| VMT | vehicle miles traveled |
| VOC | volatile organic compounds |

# 1.0 INTRODUCTION

Georgia-Pacific Corporation (GP) is proposing changes to its Kraft pulp and paper mill located in Palatka, Putnam County, Florida. The GP Palatka Mill consists of the following major plant areas: chipyard, digester system, brown stock washing system, bleaching system, chemical recovery area, paper drying/converting/warehousing, and power/utilities area.

GP currently operates the Bark Handling System, which provides bark/wood fuel to the No. 4 Combination Boiler. The Bark Handling System includes a Bark "Hog" which crushes oversized pieces of wood chips/bark before being fed to the boiler. GP is proposing to replace the existing Bark Hog. The new Bark Hog will more effectively cut and size the bark/wood fuel, which will minimize downtime of the Bark Hog and could increase the actual amount of bark being fired in the No. 4 Combination Boiler over the course of an average month. This in turn could increase the actual annual emissions of certain regulated air pollutants from the No. 4 Combination Boiler.

Based on the potential increase in actual emissions of sulfur dioxide ($SO_2$), nitrogen oxides ($NO_x$), carbon monoxide (CO), particulate matter (PM), particulate matter with an aerodynamic diameter less than 10 micrometers ($PM_{10}$), and sulfuric acid mist (SAM), the proposed project will constitute a major modification to a major stationary source, and thus trigger new source review (NSR) under the provisions of the prevention of significant deterioration (PSD) regulations.

For each pollutant subject to PSD review, the following analyses are required:

1. Ambient monitoring analysis, unless the net increase in emissions due to the modification causes impacts that are below specified significant impact levels;
2. Application of best available control technology (BACT) for each new or modified emissions unit;
3. Air quality impact analysis, unless the net increase in emissions due to the modification causes impacts which are below specified significant impact levels; and
4. Additional impact analysis (impact on soils, vegetation, visibility), including impacts on PSD Class I areas.

This PSD permit application addresses these requirements and is organized into six additional sections, followed by appendices. A description of the project, including air emission sources and pollution control equipment, is presented in Section 2.0. A regulatory applicability analysis of the proposed project is presented in Section 3.0. An ambient air monitoring analysis is presented in Section 4.0. The BACT analysis is presented in Section 5.0. The air quality impact analysis for the project is contained in Section 6.0. The additional impact analysis required by PSD rules is presented in Sections 7.0 through 9.0. Supporting documentation is presented in the Appendices.

# 2.0 PROJECT DESCRIPTION

GP is proposing to modify the Bark Handling System operation by replacing the existing Bark Hog with a new, improved Bark Hog. The facility is currently operating under Permit No. 1070005-023-AV, issued May 11, 2004. The facility is located west of U.S. Hwy 17, on State Road (SR) 216, north of Palatka, Putnam County. A plot plan of the facility, showing stack locations, is presented in Figure 2-1 (for greater detail, see Attachment GP-FI-C1 in the Permit Application). The following sections describe the proposed project in more detail.

## 2.1 EXISTING OPERATIONS

A flow diagram of the existing Bark Handling System at the GP Palatka Mill is presented in Figure 2-2. Bark/wood is transferred to the No. 4 Combination Boiler through the Bark Handling System. Bark/wood is delivered to the Bark Handling System by two different means. The first is by transfer via conveyor from an adjacent roundwood processing facility. The second method is via truck through purchasing bark/wood from offsite sources.

Bark/wood is transferred from the adjacent roundwood processing facility to the Transfer Tower by a covered conveyor. The material is then conveyed by covered conveyor to the Hog Tower. In the Hog Tower, the material is screened. The oversized, large pieces of bark/wood are fed to the existing Bark Hog, which crushes the bark/wood into smaller particles. On-size material bypasses the Bark Hog.

The purchased bark/wood is delivered by trucks, and dumped onto a staging area by means of a hydraulic truck dumper. A front-end loader then transfers the material to the bark/wood storage pile. The bark/wood is then transferred to the Transfer Tower and then to the Hog Tower through a series of conveyors and chutes. This material is also sent through the screen, where oversized material is separated from on-size material, and the oversize material is routed to the existing Bark Hog.

The bark/wood from the Bark Hog is then transferred by conveyor to a storage silo, and is then pneumatically conveyed to the No. 4 Combination Boiler. A cyclone is used in the pneumatic conveying system in order to separate the bark/wood from the conveying air stream. This cyclone is located on top of the No. 4 Combination Boiler building.

The existing Bark Hog, installed during the 1970s, is a "swing hammer" type of crusher. It crushes or pulverizes the bark/wood material. Because a portion of the material can be derived from hardwood, which is more resistant to being crushed, choking or plugging of the Bark Hog can occur, causing downtime.

Bark/wood process rates through the Bark Handling System, representative of past actual conditions (i.e., average of 2002 and 2003 actual rates), are shown in Figure 2-2.

GP operates the No. 4 Combination Boiler to provide steam to the process and the turbine generators that provide electricity for the facility. The No. 4 Combination Boiler is permitted to burn the following fuels and gases:

- Carbonaceous fuel, such as tree bark and wood fuel (supplied from the Bark Handling System).
- No. 6 fuel oil with a sulfur content that is not allowed to exceed 2.35 percent by weight, and on-spec used oil.
- Natural gas as a startup fuel. The natural gas may be kept on pilot for flame safety.
- Non-condensable gases (NCGs) and/or stripper off-gases (SOGs) during periods when the boiler is being utilized for their destruction. Also, once the new Brown Stock Washer and Oxygen Delignification System are installed (permit issued July 2, 2004), dilute non-condensable gases (DNCGs) from these systems will be burned in the Boiler. The NCGs, SOGs, and DNCGs were all permitted as part of pollution control projects (PCPs).

The No. 4 Combination Boiler is currently permitted to operate up to a maximum heat input rate of 564.0 million British thermal units per hour (MMBtu/hr) for carbonaceous fuel burning (1-hour maximum) and 512.7 MMBtu/hr as a daily 24-hour average. Based on a minimum heat content of 4,500 British thermal units per pound (Btu/lb), this heat input rate is equivalent to a maximum bark/wood burning rate of 62.67 tons per hour (TPH), 57.0 TPH as a daily 24-hour average, and 499,320 tons per year (TPY). The maximum heat input for the Boiler when firing No. 6 fuel oil is 418.6 MMBtu/hr. Based on a heating value for No. 6 fuel oil of 150,000 British thermal units per gallon (Btu/gal), this heat input rate is equivalent to 2,791 gal/hr of fuel oil.

## 2.2 PROPOSED MODIFICATIONS

GP is proposing to replace the existing Bark Hog. The new Bark Hog will be a Montgomery stationary-style bark hog that utilizes a round wheel with chisels and slicers. It will cut the chips, rather than crushing them, allowing for larger, denser chips to be reduced to appropriate size in an efficient manner. The new Bark Hog will be able to process a greater amount of bark/wood because of its improved design and reduced maintenance downtime. The new Bark Hog will more effectively cut the bark/wood, which will also minimize downtime of the Bark Hog Conveying System and could increase the actual amount of bark being fired in the Boiler.

A flow diagram of the modified Bark Handling System is presented in Figure 2-3. The diagram is the same as the existing Bark Handling System (Figure 2-2), except for the inclusion of the new Bark Hog. Bark/wood process rates reflect the maximum potential bark/wood burning rate for the No. 4 Combination Boiler. Although bark/wood from the adjacent roundwood processing facility and outside sources may vary in the future, maximum outside purchases are reflected in the diagram in order to estimate worst-case emissions (see Section 2.3).

GP is not requesting an increase in the maximum heat input when firing bark/wood in the No. 4 Combination Boiler (564.0 MMBtu/hr 1-hour max, and 512.7 MMBtu/hr as a daily 24-hour average). Although the actual annual amount of bark/wood burned in the No. 4 Combination Boiler may increase as part of this project, the maximum hourly or daily bark/wood burning rate will not increase as a result of the Bark Hog project. The maximum heat input rate when firing fuel oil (418.6 MMBtu/hr) will also not be affected by the proposed project, although it is likely that the project will result in a reduction in annual fuel oil usage in the boiler, since the preferred fuel is bark/wood.

## 2.3 AIR EMISSION ESTIMATES AND POLLUTION CONTROL EQUIPMENT

### 2.3.1 PM/$PM_{10}$ EMISSIONS

The Bark Handling System produces fugitive PM/$PM_{10}$ emissions. These emissions are minimized by covering the conveyors; enclosing the conveyor transfer points and the bark/wood silo; and total enclosure of the screen, the Bark Hog, and the pneumatic conveying system.

The estimated potential PM/$PM_{10}$ emissions from the future Bark Handling System are presented in Table 2-1. The emissions include fugitive PM/$PM_{10}$ emissions due to the transfer and processing of bark/wood through the storage pile, conveyor system, transfer chutes, screen, Bark Hog, and the cyclone serving the No. 4 Combination Boiler bark/wood feed system. The potential emissions are based on the bark/wood throughputs shown in Figure 2-3. Examination of Figure 2-3 and Table 2-1 leads to the conclusion that maximizing outside purchased bark/wood will result in the highest potential emissions, since the bark/wood is subject to greater handling as compared to bark/wood received from the adjacent roundwood processing facility. As a result, bark/wood received from this facility was assumed to be zero.

Emission factor and control efficiency references for PM/$PM_{10}$ emissions are included in Table 2-1. Supporting information is provided in Appendix A.

For truck dumping, conveyor transfer points, and front end loader dumping, emission factors are based on U.S. Environmental Protection Agency (EPA) publication AP-42 equations for batch and/or continuous material drop operations (Section 13.2.4). Emission factors for front-end loader travel over unpaved roads are based on AP-42 equations for vehicular traffic over unpaved roads (Section 13.2.2 of AP-42).

No emission factor for bark/wood hogging or crushing was found in AP-42. As a result, an analogous emission factor in AP-42 for primary crushing of high moisture (*i.e.*, greater than 3 percent moisture) metallic minerals was used (Section 11.24). Bark/wood typically has a moisture content of greater than 40 percent.

Also, no emission factor could be found in the current version of AP-42 for cyclones used in bark/wood handling systems. However, an older version of AP-42 (Section 10.4, February 1980) contained emission factors for cyclones used in woodworking operations, and therefore this factor (2 lb/hr PM) was used.

GP employs several control techniques for controlling PM/$PM_{10}$ emissions from the Bark Handling System. These include covering of conveyors, and enclosure of conveyor transfer points, the screen, the Bark Hog, and the bark silo. Control efficiencies were obtained from the publication "Workbook on Estimation of Emissions and Dispersion Modeling for Fugitive Particulate Sources" (ERT, 1981).

As shown in Table 2-1, the estimated future potential annual PM emissions due to the Bark Handling System are 22.81 TPY. The future potential annual $PM_{10}$ emissions are estimated at 13.85 TPY. The potential emissions are based on the maximum bark/wood throughput for the system and the No. 4 Combination Boiler, as shown in Figure 2-3.

The past actual average emissions for 2002-2003 from the Bark Handling System are presented in Table 2-2. The emission factors and control efficiencies are the same as used in Table 2-1. Material throughputs are based on actual throughputs taken from GP operating records, and are portrayed in Figure 2-2. As shown in Table 2-2, the past actual annual PM and $PM_{10}$ emissions are 14.59 TPY and 10.59 TPY, respectively.

### 2.3.2 VOC EMISSIONS

The National Council for Air and Stream Improvement (NCASI) has performed laboratory studies that indicate that bark and wood chips in storage release VOC emissions to the atmosphere. Limited field measurements were also conducted which confirmed these releases. The results of their study were published in Technical Bulletin No. 723 in 1996. The amount of VOC released from bark/wood were dependent on a number of factors, including the bark/wood species, the time of year, and the duration of the material in storage. VOCs emitted from softwood bark/wood were generally much higher than VOCs released from hardwood materials. Although the data are limited and are based primarily on laboratory data, the results of the study can be used to provide an order of magnitude estimate of VOC emissions from GP's Bark Handling System.

To estimate future potential VOC emissions from the Bark Handling System, the future maximum bark/wood throughput, as shown in Figure 2-3 (499,320 TPY) was utilized. It was also assumed that the entire throughput was derived from softwood, since softwood produces higher VOC emissions than hardwood. The calculation of future potential VOC emissions is presented in Table 2-3. As shown, the future potential emissions are estimated to be 475.8 TPY.

The past actual average VOC emissions for 2002-2003 from the Bark Handling System are shown in Table 2-3. The actual average bark/wood throughputs (298,778 TPY) were used, as shown in Figure 2-2, and the average mix of material was estimated to be 70 percent softwood and 30 percent hardwood. The estimated past actual VOC emissions area estimated at 175.4 TPY.

## 2.4 EFFECTS ON OTHER EMISSION UNITS

Only one other emission unit may potentially be affected (*i.e.*, increased process rates or increased actual air emission rates) due to the proposed modification of the Bark Handling System. The following section describes the other emission unit at GP with the potential to be affected by the proposed project.

### 2.4.1 NO. 4 COMBINATION BOILER

The No. 4 Combination Boiler combusts bark/wood, residual oil, and NCGs/SOGs, and will burn DNCGs after startup of the Brown Stock Washer and Oxygen Delignification Systems. The No. 4 Combination Boiler is a base-loaded boiler at the GP Palatka Mill, and already is operated to the maximum extent possible to generate steam for the Mill. When bark/wood is not available, or sufficient bark/wood cannot be fed to the boiler to meet steam demands, fuel oil is fired.

Since the actual amount of bark/wood throughput may increase after the replacement of the Bark Hog, the actual emissions due to bark/wood burning in the No. 4 Combination Boiler may increase as part of this project. Therefore, the No. 4 Combination Boiler is potentially affected by the proposed project.

The burning of NCGs, SOGs, and DNCGs in the No. 4 Combination Boiler should not be affected in any manner by the proposed project. The Boiler serves as the backup to the Thermal Oxidizer for the destruction of total reduced sulfur/hazardous air pollutants (TRS/HAPs) contained in these gases. The Boiler will continue to serve in this manner, and will not be affected by increased operation of the Boiler on bark/wood. Emissions of $SO_2$, SAM, TRS, and other pollutants due to NCG/SOG/DNCG burning in the Boiler have been addressed previously through construction permits and PCP exemptions. GP believes that emissions from the Boiler due to NCG/SOG/DNCG destruction should not be included in the determination of PSD applicability for the Bark Hog project, for the following reasons:

- The destruction of NCG/SOG/DNCG gases is required by federal regulations [Code of Federal Regulations, Title 40, Part 63 (40 CFR 63), Subpart S];
- The No. 4 Combination Boiler serves as the backup control device for the destruction of these gases;
- The process units which generate these gases will be unaffected by the Bark Hog project;

- As a result, the Boiler's emissions due to NCG/SOG/DNCG destruction will remain unaffected by the Bark Hog project;
- These emissions have previously been approved through air construction permits and a PCP exclusion from PSD requirements, including a modeling demonstration of compliance with ambient standards and PSD increments;
- Requiring these same emissions to now undergo PSD review would penalize GP for meeting the federal requirements, and negate the effect of the PCP in its entirety; and
- EPA rules or guidance do not include a specific requirement to include such emissions in the PSD applicability determination.

Since the No. 4 Combination Boiler will be affected by the proposed project, the past actual emissions and the future potential emissions from the Boiler must be included in the PSD applicability analysis. However, as discussed above, emissions due to NCG/SOG/DNCG burning in the Boiler will be excluded. The future potential annual emissions from the boiler are presented in Appendix B. The past actual emissions (average of 2002 and 2003) are also presented in Appendix B. The past actual emissions are based on actual 2002-2003 operating data (i.e., Annual Operating Report submitted to FDEP). These emissions are reflective of wood/bark and fuel oil burning in the Boiler, but exclude emissions due to NCG/SOG/DNCG burning.

Table 2-1. Future Potential Emissions From the Bark Handling System at Georgia-Pacific, Palatka Mill

| Source | Type of Operation | M Moisture Content[a] (%) | U Wind Speed[b] (MPH) | Uncontrolled PM Emission Factor[c] | Uncontrolled $PM_{10}$ Emission Factor[c] | Type of Control | Control Efficiency (%) | Activity Factor | Future Maximum Emissions PM (TPY) | $PM_{10}$ (TPY) |
|---|---|---|---|---|---|---|---|---|---|---|
| Truck Dump to Staging Pile | Batch Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | None | 0 | 499,320 TPY [d] | 0.034 | 0.016 |
| Front-end Loader Drop to Storage Pile | Batch Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | None | 0 | 553,263 TPY [e] | 0.038 | 0.018 |
| Front-end Loader Drop to Reclaim Drag Chain | Batch Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | None | 0 | 553,263 TPY [e] | 0.038 | 0.018 |
| Front-end Loader Traffic | Vehicular Traffic | 30 | -- | 0.76 lb/VMT | 0.27 lb/VMT | None | 0 | 33,600 VMT/yr [g] | 12.77 | 4.46 |
| Transfer from Reclaim Drag Chain to Conveyor | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | None | 0 | 553,263 TPY [e] | 0.038 | 0.018 |
| Drop from Conveyor to Transfer Tower Chute | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | Enclosed | 80 | 553,263 TPY [e] | 0.008 | 0.004 |
| Drop from Chipyard Conveyor to Transfer Tower Chute | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | Enclosed | 80 | 0 TPY [h] | 0.000 | 0.000 |
| Drop from Transfer Tower Chute to Conveyor | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | Enclosed | 80 | 525,600 TPY [i] | 0.007 | 0.003 |
| Drop from Transfer Tower Chute to Emergency Transfer Pile | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | None | 0 | 27,663 TPY [j] | 0.002 | 0.001 |
| Drop from Conveyor to Hog Tower Chute | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | Enclosed | 80 | 525,600 TPY [i] | 0.007 | 0.003 |
| Screening [n] | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | Enclosed | 80 | 525,600 TPY [i] | 0.007 | 0.003 |
| Oversize Drop from Screen to Bark Hog | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | Enclosed | 80 | 262,800 TPY [i, k] | 0.004 | 0.002 |
| Undersize Drop from Screen to Conveyor | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | Enclosed | 80 | 262,800 TPY [i, k] | 0.0036 | 0.0017 |
| Bark Hog (bark cutter) | Crushing | -- | -- | 0.02 lb/ton | 0.01 lb/ton | Enclosed | 80 | 525,600 TPY [i] | 1.051 | 0.526 |
| Drop from Bark Hog to Conveyor | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | Enclosed | 80 | 499,320 TPY [l] | 0.007 | 0.003 |
| Drop from Bark Hog Tower to Emergency Transfer Chute | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | Enclosed | 80 | 26,280 TPY [j] | 0.0004 | 0.0002 |
| Drop from Emergency Transfer Chute to Pile | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | None | 0 | 26,280 TPY [j] | 0.0018 | 0.0008 |
| Drop from Conveyor to Conveyor | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | Enclosed | 80 | 499,320 TPY [l] | 0.007 | 0.003 |
| Drop from Conveyor to Bark Silo | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | Partial Enclosure | 50 | 499,320 TPY [l] | 0.017 | 0.008 |
| Bark Silo Cyclone | Cyclone Vent | -- | -- | 2 lb/hr [m] | 2 lb/hr [m] | None | 0 | 8,760 hr/yr | 8.76 | 8.76 |
| Drop from Cyclone to No. 4 Combination Boiler | Continuous Drop | 30 | 10.3 | 0.00014 lb/ton | 0.000065 lb/ton | Enclosed | 80 | 499,320 TPY [l] | 0.007 | 0.003 |
| ***Total =*** | | | | | | | | | **22.81** | **13.85** |

Notes:

[a] Conservatively, moisture content based on estimated minimum moisture content of bark/wood. See footnote c.

[b] Wind speed is based on average wind speed for Gainesville, FL (the nearest, representative station for which data is available).

[c] Emission factors for batch and continuous drop operations based on AP-42 Section 13.2.4, Aggregate Handling and Storage Piles: $E = k (0.0032) * (U/5)^{1.3} / (M/2)^{1.4}$, where k = 0.74 for PM and k = 0.35 for $PM_{10}$.
Emission factors for vehicular traffic are based on AP-42 Section 13.2.2, Unpaved Roads: $E = S/15 * k * (s/12)^a * (W/3)^b / (M/0.2)^c$, where S= 4 mph, k = 10, a =0.8, b = 0.5, c = 0.4 for PM and k = 2.6, a = 0.8, b = 0.4, c = 0.3 for $PM_{10}$; s = 8.4% (based on Table 13.2.2-1 for Lumber Sawmills), W = 23.75 tons (47,500 lbs, based on weight of front-end loader), and M = 30%.
Emission factors for the bark/wood crushing operation based on AP-42 Table 11.24-2, Metallic Minerals Processing, primary crushing for high moisture ore.

[d] Based on the maximum expected wood/bark purchased to support the No. 4 Combination Boiler.

[e] Based on the amount of purchased bark/wood plus emergency overflow from the Transfer and Hog Towers.

[f] See Appendix C for derivation.

[g] Based on front-end loader operation of 24 hours/day, 350 days/year, and 4 miles/hour. VMT = vehicle miles travelled.

[h] Based upon the minimum amount of wood/bark from the chipyard, in order to maximize potential emissions. Assumed zero in the future as the worst-case (i.e., all of wood/bark transferred truck dump).

[i] Based on the total amount of purchased wood/bark plus the total amount received from the chipyard.

[j] Based on 5% of total material being transferred.

[k] Assumed 50% of total transfer (525,600 TPY) split between the undersize and oversize. Based on observation.

[l] Based on the maximum wood/bark throughput for the No. 4 Combination Boiler: maximum heat input rate of 512.7 MMBtu/hr, heating value of 4,500 Btu/lb for wood/bark, and 8,760 hr/yr operation.

[m] Based on AP-42, Section 10.4 (February 1980). The cyclone $PM_{10}$ emissions are assumed to equal the PM emissions.

[n] Assumed equivalent to a continuous drop operation.

Table 2-2. Estimated Past Actual Emissions from the Bark Handling System at Georgia-Pacific, Palatka Mill

| Source | Type of Operation | M Moisture Content [a] (%) | U Wind Speed [b] (MPH) | Uncontrolled PM Emission Factor [c] | Uncontrolled $PM_{10}$ Emission Factor [c] | Type of Control | Control Efficiency (%) | Activity Factor | Past Actual Emissions PM (TPY) | Past Actual Emissions $PM_{10}$ (TPY) |
|---|---|---|---|---|---|---|---|---|---|---|
| Truck Dump to Staging Pile | Batch Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | None | 0 | 106,443 TPY [d] | 0.005 | 0.002 |
| Front-end Loader Drop to Storage Pile | Batch Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | None | 0 | 172,788 TPY [e] | 0.008 | 0.004 |
| Front-end Loader Drop to Reclaim Drag Chain | Batch Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | None | 0 | 172,788 TPY [e] | 0.008 | 0.004 |
| Front-end Loader Traffic | Vehicular Traffic | 40 | -- | 0.68 lb/VMT | 0.24 lb/VMT | None | 0 | 16,800 VMT/yr [g] | 5.691 | 2.044 |
| Transfer from Reclaim Drag Chain to Conveyor | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | None | 0 | 172,788 TPY [e] | 0.008 | 0.004 |
| Drop from Conveyor to Transfer Tower Chute | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | Enclosed | 80 | 172,788 TPY [e] | 0.002 | 0.001 |
| Drop from Chipyard Conveyor to Transfer Tower Chute | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | Enclosed | 80 | 158,268 TPY [h] | 0.001 | 0.001 |
| Drop from Transfer Tower Chute to Conveyor | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | Enclosed | 80 | 331,056 TPY [i] | 0.003 | 0.001 |
| Drop from Transfer Tower Chute to Emergency Transfer Pile | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | None | 0 | 16,553 TPY [j] | 0.001 | 0.000 |
| Drop from Conveyor to Hog Tower Chute | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | Enclosed | 80 | 314,503 TPY [i] | 0.003 | 0.001 |
| Screening [n] | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | Enclosed | 80 | 314,503 TPY [i] | 0.003 | 0.001 |
| Oversize Drop from Screen to Bark Hog | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | Enclosed | 80 | 157,252 TPY [o] | 0.001 | 0.001 |
| Undersize Drop from Screen to Conveyor | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | Enclosed | 80 | 157,252 TPY [o] | 0.001 | 0.001 |
| Bark Hog (bark crusher) | Crushing | -- | -- | 0.02 lb/ton | 0.01 lb/ton | Enclosed | 80 | 314,503 TPY [i] | 0.629 | 0.315 |
| Drop from Bark Hog to Conveyor | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | Enclosed | 80 | 298,778 TPY [k] | 0.003 | 0.001 |
| Drop from Bark Hog to Emergency Transfer Chute | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | Enclosed | 80 | 15,725 TPY [j] | 0.0001 | 0.0001 |
| Drop from Emergency Transfer Chute to Pile | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | None | 0 | 15,725 TPY [j] | 0.0007 | 0.0003 |
| Drop from Conveyor to Conveyor | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | Enclosed | 80 | 298,778 TPY [k] | 0.003 | 0.001 |
| Drop from Conveyor to Bark Silo | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | Partial Enclosure | 50 | 298,778 TPY [k] | 0.007 | 0.003 |
| Bark Silo Cyclone | Cyclone Vent | -- | -- | 2 lb/hr [m] | 2 lb/hr [m] | None | 0 | 8,206 hr/yr [l] | 8.206 | 8.206 |
| Drop from Cyclone to No. 4 Combination Boiler | Continuous Drop | 40 | 10.3 | 0.00009 lb/ton | 0.000043 lb/ton | Enclosed | 80 | 298,778 TPY [k] | 0.003 | 0.001 |
| ***Total =*** | | | | | | | | | **14.59** | **10.59** |

Notes:

[a] Moisture content based on estimated actual moisture content of bark/wood.

[b] Wind speed is based on average wind speed for Gainesville, FL (the nearest, representative station for which data is available).

[c] Emission factors for batch and continuous drop operations based on AP-42 Section 13.2.4, Aggregate Handling and Storage Piles: $E = k (0.0032) * (U/5)^{1.3} / (M/2)^{1.4}$, where k = 0.74 for PM and k = 0.35 for $PM_{10}$.
Emission factors for vehicular traffic are based on AP-42 Section 13.2.2, Unpaved Roads: $E = S/15 * k * (s/12)^a * (W/3)^b / (M/0.2)^c$, where S= 4 mph, k = 10, a =0.8, b = 0.5, c = 0.4 for PM and k = 2.6, a = 0.8, b = 0.4, c = 0.3 for $PM_{10}$; s = 8.4% (based on Table 13.2.2-1 for Lumber Sawmills), W = 23.75 tons (47,500 lbs, based on weight of front-end loader), and M = 30%.
Emission factors for the bark/wood crushing operation based on AP-42 Table 11.24-2, Metallic Minerals Processing, primary crushing for high moisture ore.

[d] Based on the average purchased amount of bark (103,642 tons in 2002; 109,243 tons in 2003).

[e] Based on the amount of purchased bark/wood plus emergency overflow from the Transfer and Hog Towers.

[f] See Appendix C for derivation.

[g] Based on current front-end loader operation of 12 hours/day, 350 days/year, and 4 miles/hour. VMT = vehicle miles travelled.

[h] Based on the average actual amount of bark received from the chipyard (146,935 tons in 2002; 170,143 tons in 2003).

[i] Based on the total amount of purchased wood/bark and the total amount received from the chipyard.

[j] Based on 5% of total material being transferred.

[k] Based on the average wood/bark burned in the No. 4 Combination Boiler (304,281 tons in 2002; 293,274 tons in 2003).

[l] Based on the average operating hours for the No. 4 Combination Boiler (8,109 hrs in 2002; 8,302 hrs in 2003).

[m] Based on AP-42, Section 10.4 (February 1980). The cyclone $PM_{10}$ emissions are assumed to equal the PM emissions.

[n] Assumed equivalent to a continuous drop operation.

[o] Assumed 50% of total transfer (314,503 TPY) split between undersize and oversize. Based on observation.

Table 2-3. Past Actual and Future Potential VOC Emissions from the Bark/Wood Storage Pile, Georgia-Pacific Palatka Mill

| Wood/Bark Type | Throughput [a] (TPY) | VOC Emissions lb/ton dw | lb/ton ww [e] | TPY | lbs/hr [f] |
|---|---|---|---|---|---|
| **Past Actual Emissions** | | | | | |
| Softwood--Slash Pine | 171,499 | 2.73 [b] | 1.64 | 140.46 | 32.07 |
| Softwood--Loblolly Pine | 37,646 | 2.69 [c] | 1.61 | 30.38 | 6.94 |
| Hardwood--Southern | 89,633 | 0.17 [d] | 0.10 | 4.57 | 1.04 |
| ***Total Past Actual =*** | **298,778** | **5.59** | **3.35** | **175.41** | **40.05** |
| **Future Potential Emissions** | | | | | |
| Softwood--Slash Pine | 409,442 | 2.73 [b] | 1.91 | 391.22 | 89.32 |
| Softwood--Loblolly Pine | 89,878 | 2.69 [c] | 1.88 | 84.62 | 19.32 |
| Hardwood--Southern | 0 | 0.17 [d] | 0.12 | 0.00 | 0.00 |
| ***Total Future Potential =*** | **499,320** | **5.59** | **3.91** | **475.84** | **108.64** |

Note: TPY = tons per year; dw = dry wood; ww = wet wood

[a] Past actual (2002-2003) throughput was 70% softwood, of which 82% is slash pine and 18% is loblolly pine. Past actual hardwood (southern hardwood) is 30% of total throughput.
Future potential throughput assumed as 100% softwood, of which 82% is slash pine and 18% is loblolly pine.

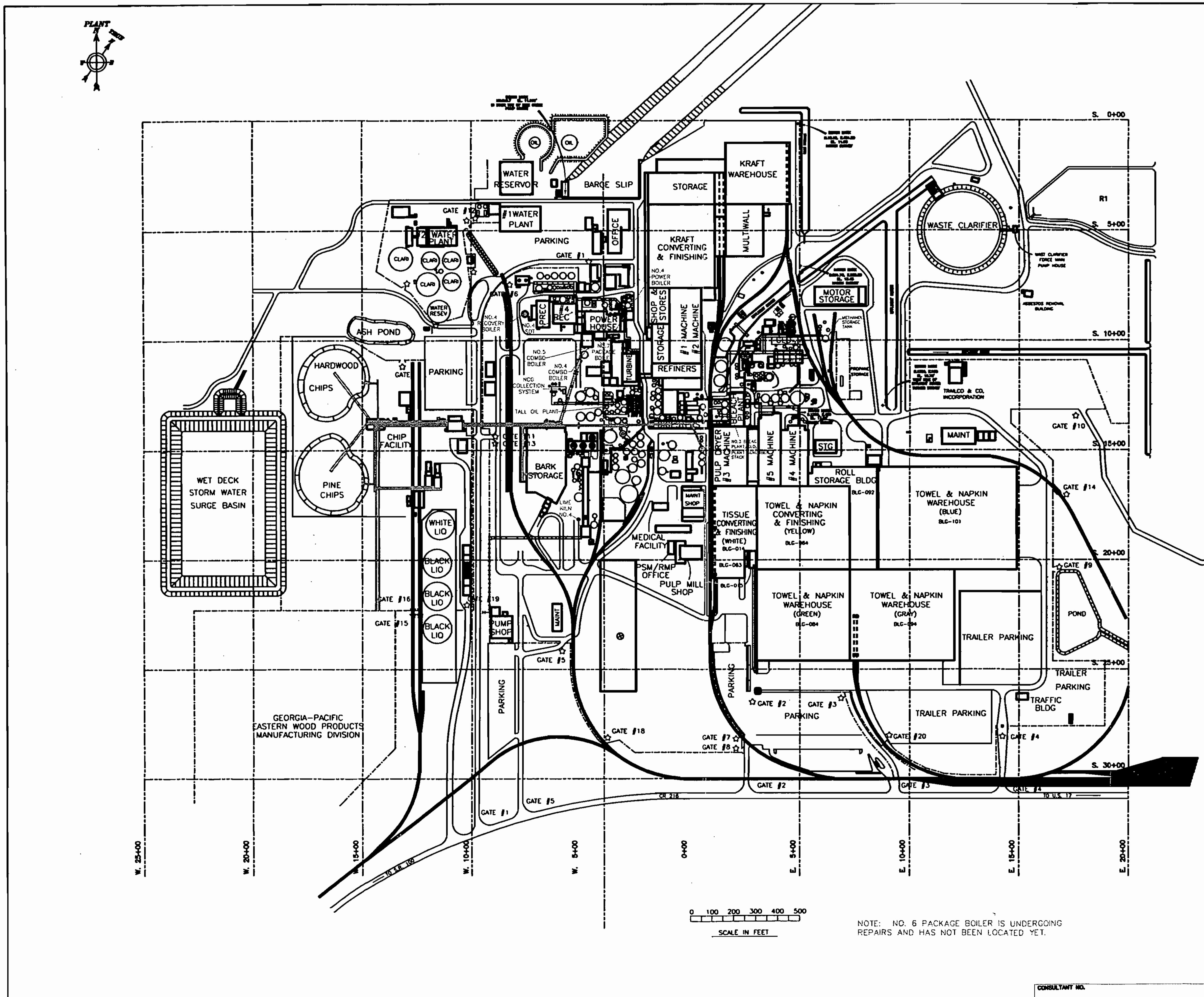
[b] Emission factor based on NCASI Technical Bulletin No. 723 (9/96), Table 4: VOC Emission Rates from Softwood Residuals. Emission factor for slash pine based on average of factors for chips and bark and are based on winter harvested logs (only available data).

[c] Emission factor based on NCASI Technical Bulletin No. 723 (9/96), Table 4: VOC Emission Rates from Softwood Residuals. Emission factor for loblolly pine based on average of factors for sawdust, shavings, chips, and bark and are based on the average of winter and spring harvested logs or winter harvested logs (depending on available data).

[d] Emission factor based on NCASI Technical Bulletin No. 723 (9/96), Page 8, Hardwood Residuals. Emission factor based on the average of southern hardwood chips and southern hardwood bark.

[e] Emission factors converted from pounds per ton of dry wood (lb/ton dw) to pounds per ton of wet wood (lb/ton ww) based on the moisture content of the wood (40% for past actual and 30% for future).

[f] Assumes 8,760 hr/yr, i.e., storage pile is continuously exposed to the atmosphere.




## NOTES

LEGEND & INFORMATION

| | |
|---|---|
| ☆ | GATE |
| ▬ | RAILROAD TRACK |
| — - — | FENCE |

| GATE # | DESCRIPTION |
|---|---|
| 1 | MAIN GATE |
| 2 | EAST GATE |
| 3 | OLD CONSTRUCTION GATE |
| 4 | TRUCK TRAFFIC GATE |
| 5 | CONSTRUCTION GATE |
| 6 | R.R. GATE |
| 7 | R.R. GATE |
| 8 | PERIMETER GATE |
| 9 | PERIMETER GATE |
| 10 | CONSTRUCTION GATE |
| 11 | INNER MILL VEHICLE GATE |
| 12 | PERSONNEL GATE |
| 13 | PERSONNEL GATE |
| 14 | R.R. GATE |
| 15 | R.R. GATE |
| 16 | R.R. GATE |
| 17 | CONSTRUCTION GATE |
| 18 | R.R. GATE |
| 19 | CHIP TRUCK SCALE |
| 20 | R.R. GATE |

CROSS-REFERENCE NO.
E-290-8469-1-0105-001

Georgia-Pacific
THE GROWTH COMPANY
PALATKA OPERATION

FIGURE 2-1. FACILITY PLOT PLAN
PALATKA MILL
0437562\4\4.4\Plot Plan. dwg

DRAWN H. Trujillo 11/25/02 SCALE 1" = 150'

G-P DRAWING NO.
290-8464MI -000-0009-006
REV. 0

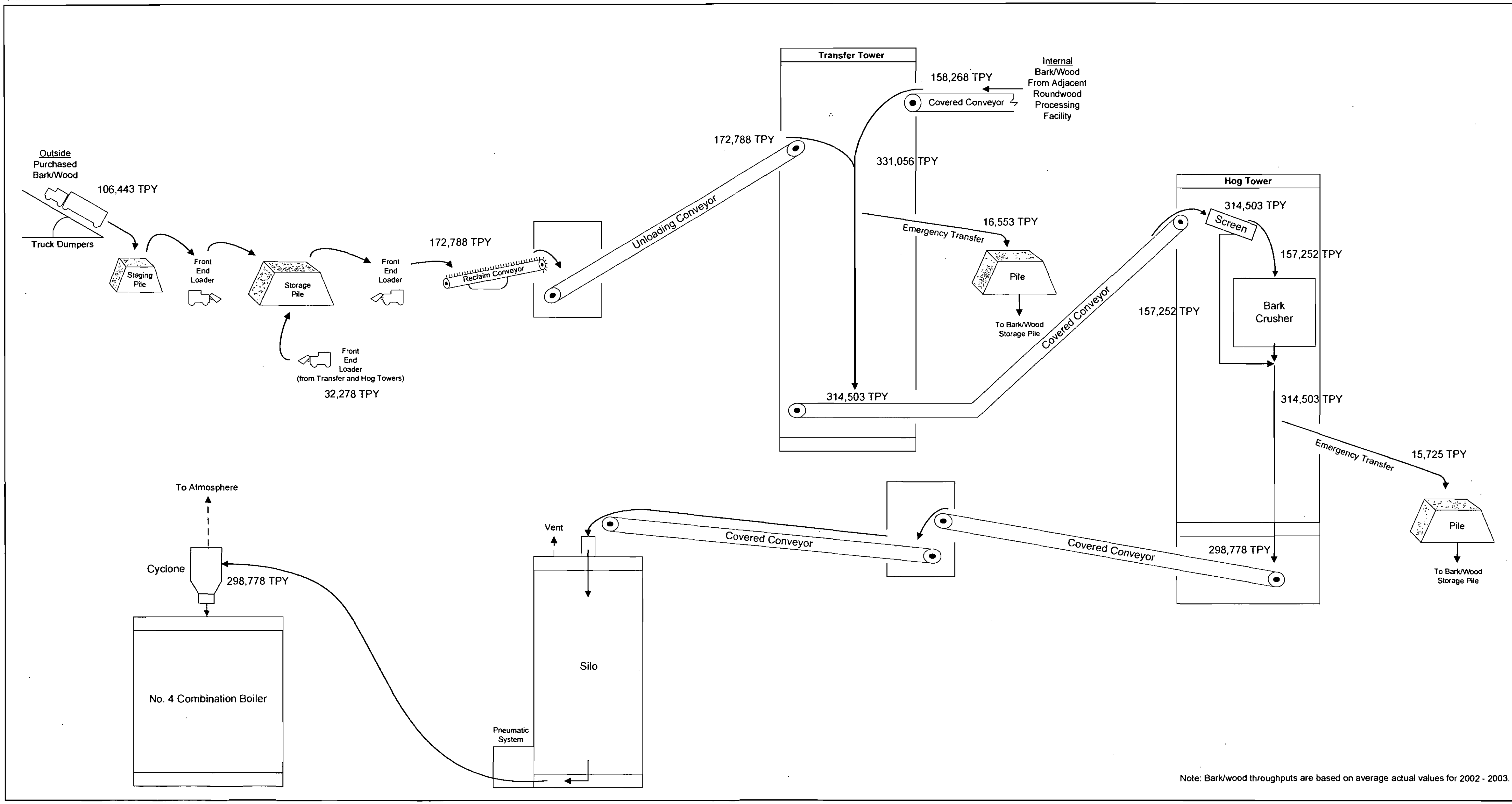
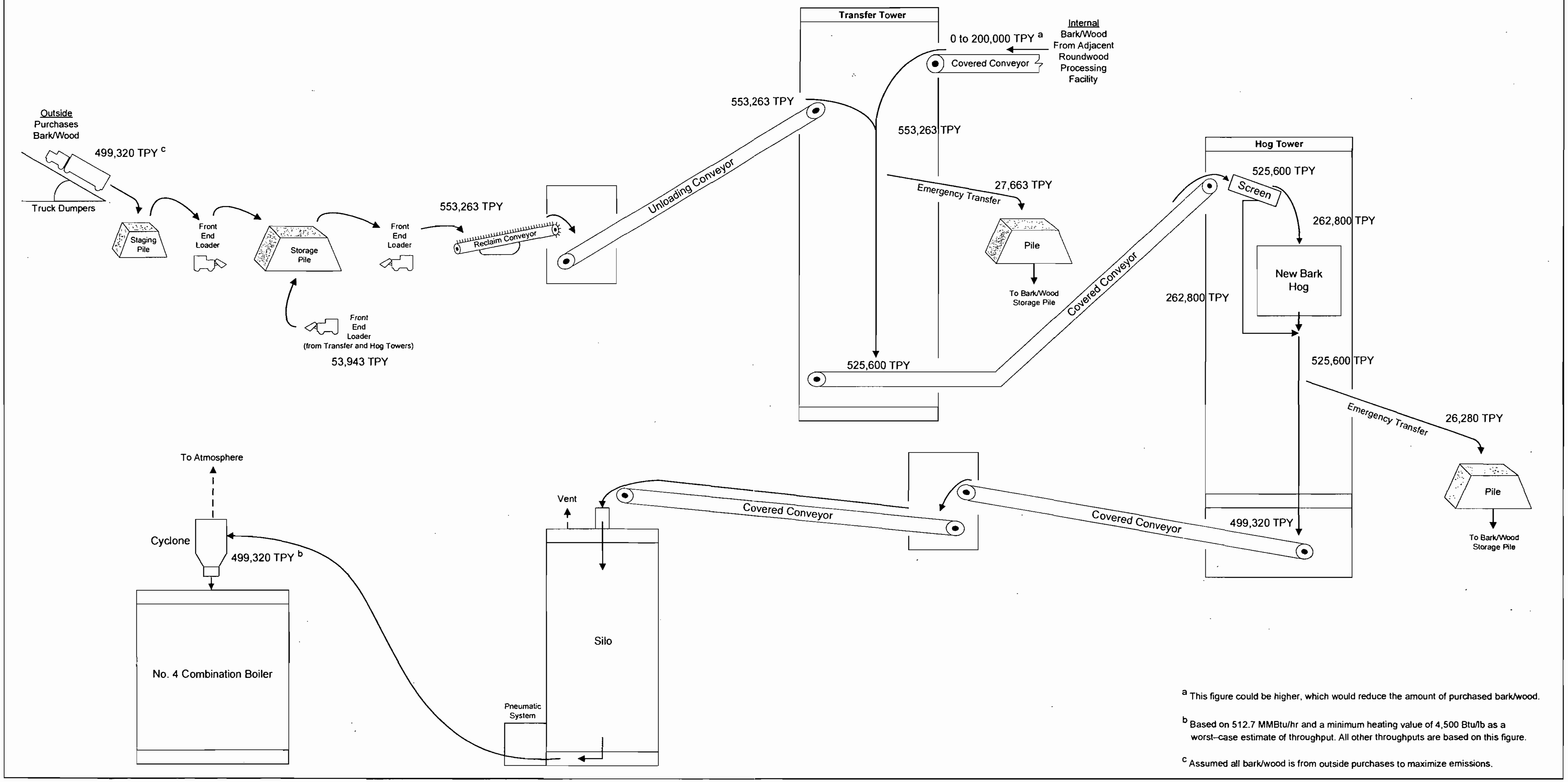



Figure 2-2. Existing Bark Handling System Process Flow Diagram
Georgia-Pacific Corporation
Palatka Mill

Golder Associates




a This figure could be higher, which would reduce the amount of purchased bark/wood.

b Based on 512.7 MMBtu/hr and a minimum heating value of 4,500 Btu/lb as a worst-case estimate of throughput. All other throughputs are based on this figure.

c Assumed all bark/wood is from outside purchases to maximize emissions.

Figure 2-3. Future Bark Handling System Process Flow Diagram
Georgia-Pacific Corporation
Palatka Mill

Golder Associates

# 3.0 AIR QUALITY REVIEW REQUIREMENTS

Federal and state air regulatory requirements for a major new or modified source of air pollution are discussed in Sections 3.1 through 3.3. The applicability of these regulations to the proposed GP modification is presented in Section 3.4. These regulations must be satisfied before the proposed project can be approved.

## 3.1 NATIONAL AND STATE AMBIENT AIR QUALITY STANDARDS (AAQS)

The existing applicable national and Florida Ambient Air Quality Standards (AAQS) are presented in Table 3-1. Primary national AAQS were promulgated to protect the public health, and secondary national AAQS were promulgated to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air. Areas of the country in violation of AAQS are designated as nonattainment areas, and new sources to be located in or near these areas may be subject to more stringent air permitting requirements.

Florida has adopted State AAQS in Rule 62-204.240, Florida Administrative Code (F.A.C.). These standards are the same as the national AAQS, except in the case of $SO_2$. For $SO_2$, Florida has adopted the former 24-hour secondary standard of 260 micrograms per cubic meter ($\mu g/m^3$) and former annual average secondary standard of 60 $\mu g/m^3$.

## 3.2 PSD REQUIREMENTS

### 3.2.1 GENERAL REQUIREMENTS

Under federal and State of Florida PSD review requirements, all major new or modified sources of air pollutants regulated under the Clean Air Act (CAA) must be reviewed and a pre-construction permit issued. Florida's State Implementation Plan (SIP), which contains PSD regulations, has been approved by the EPA. Therefore, PSD approval authority has been granted to the Florida Department of Environmental Protection (FDEP).

For Kraft pulp mills, a "major facility" is defined as any one of 28 named source categories that has the potential-to-emit 100 TPY or more of any pollutant regulated under CAA. "Potential-to-emit" means the capability, at maximum design capacity, to emit a pollutant after the application of control equipment. Once a new source is determined to be a "major facility" for a particular pollutant, any pollutant emitted in amounts greater than the PSD significant emission rates is subject to PSD review. For an existing source for which a modification is proposed, the modification is subject to PSD review if the net increase in emissions due to the modification is greater than the PSD significant emission rates. The PSD significant emission rates are listed in Table 3-2.

The EPA class designation and allowable PSD increments are presented in Table 3-1. The magnitude of the allowable increment depends on the classification of the area in which a new source (or modification) will be located or have an impact. Three classifications are designated based on criteria established in the 1990 CAA Amendments. Congress promulgated areas as Class I (international parks, national wilderness areas, and memorial parks larger than 5,000 acres and national parks larger than 6,000 acres) or as Class II (all areas not designated as Class I). No Class III areas, which would be allowed greater deterioration than Class II areas, were designated. The State of Florida has adopted the EPA class designations and allowable PSD increments for $SO_2$, $PM_{10}$, and $NO_2$.

PSD review is used to determine whether significant air quality deterioration will result from the new or modified facility. Federal PSD requirements are contained in Title 40 of the Code of Federal Regulations (CFR), Section 52.21 (Prevention of Significant Deterioration of Air Quality). The State of Florida has adopted PSD regulations that are equivalent to the federal PSD regulations (Rule 62-212.400, F.A.C.). Major facilities and major modifications are required to undergo the following analyses related to PSD for each pollutant emitted in significant amounts:

- Control technology review,
- Source impact analysis,
- Air quality analysis (monitoring), and
- Additional impact analyses.

In addition to these analyses, a new or modified facility must also be reviewed with respect to Good Engineering Practice (GEP) stack height regulations. Discussions concerning each of these requirements are presented in the following sections.

### 3.2.2 CONTROL TECHNOLOGY REVIEW

The control technology review requirements of the federal and state PSD regulations require that all applicable federal and state emission-limiting standards be met, and that BACT be applied to control emissions from the source. The BACT requirements are applicable to all regulated pollutants for which the increase in emissions from the facility exceeds the significant emission rate (see Table 3-2).

BACT is defined in 40 CFR 52.21(b)(12), as:

> *An emissions limitation (including a visible emission standard) based on the maximum degree of reduction of each pollutant subject to regulation under the Act which would be emitted by any proposed major stationary source of major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant, which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular part of a source or facility would make the imposition of an emission standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reductions achievable by implementation of such design, equipment, work practice, or operation and shall provide for compliance by means which achieve equivalent results.*

BACT was promulgated within the framework of the PSD requirements in the 1977 amendments of the CAA [Public Law 95-95; Part C, Section 165(a)(4)]. The primary purpose of BACT is to optimize consumption of PSD air quality increments and thereby enlarge the potential for future economic growth without significantly degrading air quality (EPA, 1978; 1980). Guidelines for the evaluation of BACT can be found in EPA's Guidelines for Determining Best Available Control Technology (BACT) (EPA, 1978) and in the PSD Workshop Manual (EPA, 1980). These guidelines were promulgated by EPA to provide a consistent approach to BACT and to ensure that the impacts of alternative emission control systems are measured by the same set of parameters. In addition, through implementation of these guidelines, BACT in one area may not be identical to BACT in another area. According to EPA (1980), "BACT analyses for the same types of emissions unit and the same pollutants in different locations or situations may determine that different control strategies should be applied to the different sites, depending on site-specific factors. Therefore, BACT analyses must be conducted on a case-by-case basis."

The BACT requirements are intended to ensure that the control systems incorporated in the design of a proposed or modified facility reflect the latest in control technologies used in a particular industry and take into consideration existing and future air quality in the vicinity of the proposed facility. BACT must, as a minimum, demonstrate compliance with New Source Performance Standards (NSPS) for a source (if applicable). An evaluation of the air pollution control techniques and systems, including a cost-benefit analysis of alternative control technologies capable of achieving a higher degree of emission reduction than the proposed control technology, is required. The cost-benefit analysis requires the documentation of the materials, energy, and economic penalties associated with the proposed and alternative control systems, as well as the environmental benefits derived from these systems. A decision on BACT is to be based on sound judgment, balancing environmental benefits with energy, economic, and other impacts (EPA, 1978).

### 3.2.3 SOURCE IMPACT ANALYSIS

A source impact analysis must be performed for a proposed major source or major modification subject to PSD review and for each pollutant for which the increase in emissions exceeds the PSD significant emission rate (Table 3-2). The PSD regulations specifically provide for the use of atmospheric dispersion models in performing impact analyses, estimating baseline and future air quality levels, and determining compliance with AAQS and allowable PSD increments. Designated EPA models normally must be used in performing the impact analysis. Specific applications for other than EPA-approved models require EPA's consultation and prior approval. Guidance for the use and application of dispersion models is presented in the EPA publication *Guideline on Air Quality Models* (EPA, 1980).

To address compliance with AAQS and PSD Class I and II increments, a source impact analysis must be performed for the criteria pollutants. However, this analysis is not required for a specific pollutant if the net increase in impacts as a result of the new source or modification is below significant impact levels, as presented in Table 3-1. The significant impact levels are threshold levels that are used to determine the level of air impact analyses needed for the project. If the new or modified source's impacts are predicted to be less than significant, then the source's impacts are assumed not to have a significant adverse affect on air quality. Additional modeling, taking into account other emission sources, is not required. However, if the source's impacts are predicted to be greater than the significant impact levels, additional modeling, including other emission sources, is required in order to demonstrate compliance with AAQS and PSD increments.

EPA has proposed significant impact levels for Class I areas as follows:

| Pollutant | Averaging Time | Significant Impact Level |
|---|---|---|
| $SO_2$ | 3-hour | 1 µg/m$^3$ |
| | 24-hour | 0.2 µg/m$^3$ |
| | Annual | 0.1 µg/m$^3$ |
| $PM_{10}$ | 24-hour | 0.3 µg/m$^3$ |
| | Annual | 0.2 µg/m$^3$ |
| $NO_2$ | Annual | 0.1 µg/m$^3$ |

Although these levels have not been officially promulgated as part of the PSD review process and may not be binding for states in performing PSD reviews, the proposed levels serve as a guideline in assessing a source's impact in a Class I area. The EPA action to incorporate Class I significant impact levels into the PSD process is part of implementing the NSR provisions of the 1990 CAA Amendments. Because the process of developing the regulations will be lengthy, EPA believes that the proposed rules concerning the significant impact levels is appropriate to assist states in implementing the PSD permit process.

Various lengths of record for meteorological data can be used for impact analyses. A 5-year period is normally used with corresponding evaluation of highest, second-highest short-term concentrations for comparison to AAQS or PSD increments. The meteorological data are selected based on an evaluation of measured weather data from a nearby weather station that represents weather conditions at the project site. The criteria used in this evaluation includes: determining the distance of the project site to the weather station; comparing topographical and land use features between the locations; and determining availability of necessary weather parameters.

The term "highest, second-highest" (HSH) refers to the highest of the second-highest concentrations at all receptors (*i.e.*, the highest concentration at each receptor is discarded). The second-highest concentration is important because short-term AAQS specify that the standard should not be exceeded at any location more than once a year. If fewer than 5 years of meteorological data are used in the modeling analysis, the highest concentration at each receptor normally must be used for comparison to air quality standards.

The term "baseline concentration" evolves from federal and state PSD regulations and refers to a concentration level corresponding to a specified baseline date and certain additional baseline sources. By definition, in the PSD regulations as amended August 7, 1980, baseline concentration means the ambient concentration level that exists in the baseline area at the time of the applicable baseline date. A baseline concentration is determined for each pollutant for which a baseline date is established and includes:

- The actual emissions representative of facilities in existence on the applicable baseline date; and
- The allowable emissions of major stationary facilities that commenced construction before January 6, 1975, for $SO_2$ and $PM_{10}$ concentrations, or February 8, 1988, for $NO_2$ concentrations, but that were not in operation by the applicable baseline date.

The following emissions are not included in the baseline concentration, and therefore, affect PSD increment consumption:

- Actual emissions from any major stationary facility on which construction commenced after January 6, 1975, for $SO_2$ and $PM_{10}$ concentrations, and after February 8, 1988, for $NO_2$ concentrations; and
- Actual emission increases and decreases at any stationary facility occurring after the baseline date.

In reference to the baseline concentration, the term "baseline date" actually includes three different dates:

- The major facility baseline date, which is January 6, 1975, in the cases of $SO_2$ and $PM_{10}$, and February 8, 1988, in the case of $NO_2$;
- The minor facility baseline date, which is the earliest date after the trigger date on which a major stationary facility or major modification subject to PSD regulations submits a complete PSD application; and
- The trigger date, which is August 7, 1977, for $SO_2$ and $PM_{10}$, and February 8, 1988, for $NO_2$.

### 3.2.4 AIR QUALITY MONITORING REQUIREMENTS

In accordance with requirements of 40 CFR 52.21(m), any application for a PSD permit must contain an analysis of continuous ambient air quality data in the area affected by the proposed major stationary facility or major modification. For a new major facility, the affected pollutants are those that the facility potentially would emit in significant amounts. For a major modification, the pollutants are those for which the net emissions increase exceeds the significant emission rate (see Table 3-2).

Ambient air monitoring for a period of up to 1 year generally is appropriate to satisfy the PSD monitoring requirements. A minimum of 4 months of data is required. Existing data from the vicinity of the proposed source may be used if the data meet certain quality assurance requirements; otherwise, additional data may need to be gathered. Guidance in designing a PSD monitoring network is provided in EPA's *Ambient Monitoring Guidelines for Prevention of Significant Deterioration* (EPA, 1987a).

The regulations include an exemption that excludes or limits the pollutants for which an air quality monitoring analysis must be conducted. This exemption states that FDEP may exempt a proposed major stationary facility or major modification from the monitoring requirements, with respect to a particular pollutant, if the emissions increase of the pollutant from the facility or modification would cause, in any area, air quality impacts less than the *de minimis* levels presented in Table 3-2.

### 3.2.5 SOURCE INFORMATION/GEP STACK HEIGHT

Source information must be provided to adequately describe the proposed project. The general type of information required for this project is presented in Section 2.0.

The 1977 CAA Amendments require that the degree of emission limitation required for control of any pollutant not be affected by a stack height that exceeds GEP or any other dispersion technique. On July 8, 1985, EPA promulgated final stack height regulations (EPA, 1985a). The FDEP has adopted identical regulations (Rule 62-210.550, F.A.C.). GEP stack height is defined as the highest of:

- 65 meters (m); or
- A height established by applying the formula:

  $$Hg = H + 1.5L$$

  where: Hg = GEP stack height,

  H = Height of the structure or nearby structure, and

  L = Lesser dimension (height or projected width) of nearby structure(s); or
- A height demonstrated by a fluid model or field study.

"Nearby" is defined as a distance up to five times the lesser of the height or width dimensions of a structure or terrain feature, but not greater than 0.8 kilometer (km). Although GEP stack height regulations require that the stack height used in modeling for determining compliance with AAQS and PSD increments not exceed the GEP stack height, the actual stack height may be greater.

The stack height regulations also allow increased GEP stack height beyond that resulting from the above formula in cases where plume impaction occurs. Plume impaction is defined as concentrations measured or predicted to occur when the plume interacts with elevated terrain. Elevated terrain is defined as terrain that exceeds the height calculated by the GEP stack height formula.

#### 3.2.6 ADDITIONAL IMPACT ANALYSIS

In addition to air quality impact analyses, federal and State of Florida regulations require analyses of the impairment to visibility and the impacts on soils and vegetation that would occur as a result of the proposed source [40 CFR 52.21(o) and Rule 62-212.400, F.A.C.]. These analyses are to be conducted primarily for PSD Class I areas. Impacts as a result of general commercial, residential, industrial, and other growth associated with the source also must be addressed. These analyses are required for each pollutant emitted in significant amounts (Table 3-2).

### 3.3 POTENTIALLY APPLICABLE EMISSION STANDARDS

#### 3.3.1 NEW SOURCE PERFORMANCE STANDARDS

The NSPS are a set of national emission standards that apply to specific categories of new sources. As stated in the CAA Amendments of 1977, these standards "shall reflect the degree of emission limitation and the percentage reduction achievable through application of the best technological system of continuous emission reduction the Administrator determines has been adequately demonstrated."

There are no federal NSPS for bark/wood handling systems. Currently, the No. 4 Combination Boiler is not subject to NSPS. Since the Boiler will not be undergoing any physical change or change in the method of operation, NSPS will not be triggered by the proposed project.

#### 3.3.2 NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

Maximum Achievable Control Technology (MACT) standards, codified in 40 CFR 63, do not apply to bark/wood handling systems. The No. 4 Combination Boiler will be subject to 40 CFR 63, Subpart DDDDD for Industrial Boilers, when promulgated by EPA.

### 3.3.3 FLORIDA RULES

The emission limitations contained in Rule 62-296.320 F.A.C., pertain to visible emissions and reasonable precautions to prevent fugitive PM emissions.

## 3.4 SOURCE APPLICABILITY

### 3.4.1 AREA CLASSIFICATION

The project site is located in Putnam County, which has been designated by EPA and FDEP as an attainment or maintenance area for all criteria pollutants. Putnam County and surrounding counties are designated as PSD Class II areas for all criteria pollutants. The GP Palatka Mill is located within 200 km of three PSD Class I areas—Okefenokee National Wilderness Area (NWA), Wolf Island NWA, and Chassahowitzka NWA.

### 3.4.2 PSD REVIEW

#### 3.4.2.1 Pollutant Applicability

The GP Palatka Mill is considered to be an existing major stationary facility because potential emissions of at least one PSD-regulated pollutant exceeds 100 TPY (for example, potential $SO_2$ emissions currently exceeds 100 TPY). Therefore, PSD review is required for any pollutant for which the net increase in emissions due to the modification is greater than the PSD significant emission rates (see Table 3-2).

The net increase in emissions due to the proposed modification at the GP Palatka Mill is summarized in Table 3-3. For the Bark Handling System, the future potential and past actual emissions are based on information from Section 2.0. The future potential and past actual emissions from the No. 4 Combination Boiler are also included in the table, since this source is potentially "affected" by the proposed modification. As described in Section 2.4.1, the future potential and past actual emissions from the Boiler due to NCG/SOG/DNCG destruction have been excluded from this analysis.

As shown in Table 3-3, the "project only" results in an increase in emissions of several PSD pollutants. For these pollutants, the PSD regulations require that all contemporaneous emissions increases and decreases be included in a netting analysis to determine PSD applicability. These emission changes are included at the bottom of Table 3-3. Also presented is the total net increase in emissions, considering the contemporaneous emission changes.

As shown in Table 3-3, the net increase in emissions exceeds the PSD significant emission rates for $SO_2$, $NO_x$, CO, PM, $PM_{10}$, VOC, and SAM. As a result, PSD review applies for these pollutants.

#### 3.4.2.2 Source Impact Analysis

A source impact analysis was performed for $SO_2$, $NO_x$, CO, PM, $PM_{10}$, and SAM emissions resulting from the proposed modification. This analysis is presented in Section 6.0.

#### 3.4.2.3 Ambient Monitoring

Based on the increase in emissions from the proposed modification (see Table 3-3), a pre-construction ambient monitoring analysis would be required for $SO_2$, $NO_x$, CO, SAM, and $PM_{10}$ and monitoring data would be required to be submitted as part of the application. However, if the net increase in impacts of a pollutant is less than the applicable *de minimis* monitoring concentration, then an exemption from submittal of pre-construction ambient monitoring data may be obtained [40 CFR 52.21(i)(8)]. In addition, if EPA has not established an acceptable ambient monitoring method for the pollutant, monitoring is not required.

Pre-construction monitoring data for $SO_2$, $PM_{10}$, $NO_x$, and CO is exempted for this project because, as shown in Table 3-4 and Section 6.0, the proposed modification's impacts are predicted to be below the applicable *de minimis* monitoring concentrations for these pollutants. In addition, no air monitoring data are presented for SAM since AAQS have not been established for this pollutant. Since the proposed modification's VOC emission increase is predicted to be above the applicable *de minimis* monitoring level for VOC (100 TPY), a pre-construction monitoring analysis was performed for ozone ($O_3$). This analysis is presented in Section 4.0.

#### 3.4.2.4 GEP Stack Height Impact Analysis

All existing stacks at the GP facility currently comply with GEP stack height regulations. In addition, no new stacks are proposed as part of this project. Therefore, the proposed modification will comply with the GEP stack height regulations.

### 3.4.3 EMISSION STANDARDS

#### 3.4.3.1 New Source Performance Standards

There are no NSPS that apply to the Bark Handling System. In addition, the No. 4 Combination Boiler is not being modified as part of this project; therefore, the project does not subject the boiler to NSPS.

#### 3.4.3.2 NESHAPs for Source Categories

MACT standards applicable to the GP Palatka Mill are codified in Subparts S and MM of 40 CFR Part 63. Since the MACT does not apply to the Bark Handling System, the MACT standards are not discussed further in this application. EPA will soon promulgate the Industrial Boiler MACT (40 CFR 63, Subpart DDDDD), and the No. 4 Combination Boiler will be subject to this MACT.

#### 3.4.3.3 State of Florida Standards

The general visible emission (VE) limitation of 20 percent opacity, contained in Rule 62-296.320(4), F.A.C., applies to the Bark Handling System. The GP facility is subject to the emission limitations of Rule 62-296.404, F.A.C., pertaining to PM and TRS emissions from Kraft pulp mills. However, only the Bark Handling System is being modified as part of this project and Rule 62-296.404, F.A.C., does not contain specific requirements for this type of operation.

Table 3-1. National and State AAQS, Allowable PSD Increments, and Significant Impact Levels ($\mu g/m^3$)

| Pollutant | Averaging Time | AAQS National Primary Standard | AAQS National Secondary Standard | AAQS State of Florida | PSD Increments Class I | PSD Increments Class II | Class II Significant Impact Levels[d] |
|---|---|---|---|---|---|---|---|
| Particulate Matter[a] | Annual Arithmetic Mean | 50 | 50 | 50 | 4 | 17 | 1 |
| ($PM_{10}$) | 24-Hour Maximum[b] | 150[b] | 150[b] | 150[b] | 8 | 30 | 5 |
| Sulfur Dioxide | Annual Arithmetic Mean | 80 | NA | 60 | 2 | 20 | 1 |
| | 24-Hour Maximum[e] | 365[b] | NA | 260[b] | 5 | 91 | 5 |
| | 3-Hour Maximum[b] | NA | 1,300[b] | 1,300[b] | 25 | 512 | 25 |
| Carbon Monoxide | 8-Hour Maximum[b] | 10,000[b] | 10,000[b] | 10,000[b] | NA | NA | 500 |
| | 1-Hour Maximum[b] | 40,000[b] | 40,000[b] | 40,000[b] | NA | NA | 2,000 |
| Nitrogen Dioxide | Annual Arithmetic Mean | 100 | 100 | 100 | 2.5 | 25 | 1 |
| Ozone[a] | 1-Hour Maximum | 235[c] | 235[c] | 235[c] | NA | NA | NA |
| | 1-Hour Maximum | 235 | 235 | NA | NA | NA | NA |
| Lead | Calendar Quarter Arithmetic Mean | 1.5 | 1.5 | 1.5 | NA | NA | NA |

Note: NA = Not applicable, *i.e.*, no standard exists.

$PM_{10}$ = particulate matter with aerodynamic diameter less than or equal to 10 micrometers.

[a] On July 18, 1997, EPA promulgated revised AAQS for particulate matter and ozone. For particulate matter, $PM_{2.5}$ standards were introduced with a 24-hour standard of 65 $\mu g/m^3$ (3-year average of 98th percentile) and an annual standard of 15 $\mu g/m^3$ (3-year average at community monitors). Implementation of these standards could be many years away. The ozone standard was modified to be 0.08 ppm for 8-hour average; achieved when 3-year average of 99th percentile is 0.08 ppm or less. FDEP has not yet adopted either of these standards.

[b] Short-term maximum concentrations are not to be exceeded more than once per year except for the $PM_{10}$ AAQS (these do not apply to significant impact levels). The $PM_{10}$ 24-hour AAQS is attained when the expected number of days per year with a 24-hour concentration above 150 $\mu g/m^3$ is equal to or less than 1. For modeling purposes, compliance is based on the sixth-highest 24-hour average value over a 5-year period.

[c] Achieved when the expected number of days per year with concentrations above the standard is fewer than 1.

[d] Maximum concentrations.

Sources: Federal Register, Vol. 43, No. 118, June 19, 1978; 40 CFR 50; 40 CFR 52.21; Rule 62-204, F.A.C.

Table 3-2. PSD Significant Emission Rates and *De Minimis* Monitoring Concentrations

| Pollutant | Significant Emission Rate (TPY) | De Minimis Monitoring Concentration[a] ($\mu g/m^3$) |
|---|---|---|
| Sulfur Dioxide | 40 | 13, 24-hour |
| Particulate Matter [PM(TSP)] | 25 | NA |
| Particulate Matter ($PM_{10}$) | 15 | 10, 24-hour |
| Nitrogen Dioxide | 40 | 14, annual |
| Carbon Monoxide | 100 | 575, 8-hour |
| Volatile Organic Compounds (Ozone) | 40 | 100 TPY[b] |
| Lead | 0.6 | 0.1, 3-month |
| Sulfuric Acid Mist | 7 | NM |
| Total Fluorides | 3 | 0.25, 24-hour |
| Total Reduced Sulfur | 10 | 10, 1-hour |
| Reduced Sulfur Compounds | 10 | 10, 1-hour |
| Hydrogen Sulfide | 10 | 0.2, 1-hour |
| Mercury | 0.1 | 0.25, 24-hour |
| Asbestos | 0.007 | NM |
| Vinyl Chloride | 1 | 15, 24-hour |
| MWC Organics | $3.5x10^{-6}$ | NM |
| MWC Metals | 15 | NM |
| MWC Acid Gases | 40 | NM |
| MSW Landfill Gases | 50 | NM |

Note: Ambient monitoring requirements for any pollutant may be exempted if the impact of the increase in emissions is below *de minimis* monitoring concentrations.

NA = Not applicable.
NM = No ambient measurement method established; therefore, no *de minimis* concentration has been established.
$\mu g/m^3$ = Micrograms per cubic meter.
MWC = Municipal waste combustor
MSW = Municipal solid waste

[a] Short-term concentrations are not to be exceeded.
[b] No *de minimis* concentration; an increase in VOC emissions of 100 TPY or more will require monitoring analysis for ozone.

Sources: 40 CFR 52.21.
Rule 62-212.400

Table 3-3. Contemporaneous and Debottlenecking Emissions Analysis and PSD Applicability, GP Bark Hog Project

| Source Description | Pollutant Emission Rate (TPY) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $SO_2$ | $NO_x$ | CO | PM | $PM_{10}$ | VOC | TRS | SAM |
| **Potential Increases**[a] | | | | | | | | |
| Bark Handling System | -- | -- | -- | 22.8 | 13.9 | 475.8 | -- | -- |
| No. 4 Combination Boiler[b] | 4,711.4 | 574.6 | 1,483.0 | 550.1 | 407.1 | 33.0 | -- | 207.3 |
| ***Total Proposed Increases*** | **4,711.4** | **574.6** | **1,483.0** | **572.9** | **420.9** | **508.8** | **0.0** | **207.3** |
| **Past Actual Emissions**[c] | | | | | | | | |
| Bark Handling System | -- | -- | -- | 14.6 | 10.6 | 175.4 | -- | -- |
| No. 4 Combination Boiler[b] | 818.5 | 398.7 | 817.7 | 40.3 | 35.9 | 18.1 | -- | 36.0 |
| ***Total Past Actual Emissions*** | **818.5** | **398.7** | **817.7** | **54.8** | **46.5** | **193.5** | **0.0** | **36.0** |
| **Total Net Change - Project Only** | **3,892.8** | **175.8** | **665.3** | **518.1** | **374.5** | **315.3** | **0.0** | **171.3** |
| **Contemporaneous Emission Changes** | | | | | | | | |
| New Bleach Plant (6/99) (Permit Nos. 1070005-010-AC and 019-AC) | | | | | | | | |
| --Increase Due to New No. 3 Bleach Plant | -- | -- | e | -- | -- | 80.7 | d | -- |
| --Decrease from Nos. 1 and 2 Bleach Plants | -- | -- | e | -- | -- | -144.7 | d | -- |
| New Package Boiler (9/02) (Permit No. 1070005-018-AC) | | | | | | | | |
| --Increase Due to New Package Boiler (EU 044) | 0.1 | 39.4 | 16.5 | 1.5 | 1.5 | 1.1 | -- | -- |
| --Decrease from old No. 6 Package Boiler | -0.07 | 9.2 | 2.1 | 0.15 | 1.5 | 0.26 | -- | -- |
| Brown Stock Washer and Oxygen Delignification System (6/04) (Permit No. 1070005-024-AC) | e | -- | 0.3 | -- | -- | -61.4 | d | e |
| *Total Contemporaneous Emission Changes* | **0.03** | **48.60** | **18.90** | **1.65** | **3.00** | **-124.0** | d | **0.0** |
| **TOTAL NET CHANGE** | **3,892.8** | **224.4** | **684.2** | **519.8** | **377.5** | **191.3** | **0.0** | **171.3** |
| **PSD SIGNIFICANT EMISSION RATE** | 40 | 40 | 100 | 25 | 15 | 40 | 10 | 7 |
| **PSD REVIEW TRIGGERED?** | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |

**Footnotes:**

[a] Total future potential emissions from Tables 2-1, 2-3, and B-2.

[b] Debottlenecking analysis revealed that actual emissions from this source could potentially increase as part of this project.

[c] Based on actual emissions for 2003 and 2002 from Tables 2-2, 2-3 and B-4.

[d] Since project increase does not exceed PSD significant emission rate, netting is not performed for this pollutant; at any rate, no creditable decreases are available for this pollutant for this project.

[e] Denotes that PSD review was triggered for this pollutant; therefore any previous contemporaneous increases/decreases are wiped clean.

Table 3-4. Predicted Impacts Due to the Proposed Project Compared to Ambient Monitoring *De Minimis* Levels

| Pollutant | Averaging Time | Maximum Concentration[a] (μg/m³) | *De Minimis* Monitoring Concentration (μg/m³) | Ambient Monitoring Review Applies? |
|---|---|---|---|---|
| Sulfur Dioxide | 24-hour | 10.1 | 13 | No |
| Particulate Matter ($PM_{10}$) | 24-hour | 4.9 | 10 | No |
| Nitrogen Oxides | Annual | 0.1 | 14 | No |
| Carbon Monoxide | 8-hour | 6.5 | 575 | No |
| Volatile Organic Compounds (Ozone) | Annual | 315.3 TPY | 100 TPY[b] | Yes |

[a] Highest concentration from significant impact analysis (see Section 6.0).

[b] No *de minimis* concentrations; an increase in VOC emissions of 100 TPY or more will require a monitoring analysis for ozone.

Note: NA = Not Applicable

# 4.0 AMBIENT MONITORING ANALYSIS

## 4.1 MONITORING REQUIREMENTS

In accordance with requirements of 40 CFR 52.21(m) and Rule 62-212.400(5)(f), F.A.C., any application for a PSD permit must contain an analysis of continuous ambient air quality data in the area affected by the proposed major stationary facility or major modification. For a new major facility, the affected pollutants are those that the facility potentially would emit in significant amounts. For a major modification, the pollutants are those for which the net emissions increase exceeds the significant emission rate (see Table 3-1). As discussed in Section 3.1, $SO_2$, $PM_{10}$, CO, VOC, SAM, and $NO_x$ require an air quality analysis to meet PSD pre-construction monitoring requirements for the proposed GP modification.

Ambient air monitoring for a period of up to 1 year is generally appropriate to satisfy the PSD monitoring requirements. A minimum of 4 months of data is required. Existing data from the vicinity of the proposed source may be used if the data meet certain quality assurance requirements; otherwise, additional data may need to be gathered. Guidance in designing a PSD monitoring network is provided in EPA's *Ambient Monitoring Guidelines for Prevention of Significant Deterioration* (1987).

An exemption from the pre-construction ambient monitoring requirements is also available if certain criteria are met. If the predicted increase in ambient concentrations, due to the proposed modification, is less than specified *de minimis* concentrations, then the modification can be exempted from the pre-construction air monitoring requirements for that pollutant.

The PSD *de minimis* monitoring concentration for $SO_2$ is 13 $\mu g/m^3$, 24-hour average, for $NO_x$ is 14 $\mu g/m^3$, annual average, for $PM_{10}$ is 10 $\mu g/m^3$, 24-hour average, and for CO is 575 $\mu g/m^3$, 8-hour average. The predicted increase in $SO_2$, $PM_{10}$, CO, and $NO_2$ concentrations due to the proposed modification only are presented in Table 3-4 and in Section 6.0. Since the predicted increase in impacts for these pollutants due to the proposed modification are less than *de minimis* monitoring concentration levels, a pre-construction air monitoring analysis is not required for these pollutants. In addition, no air monitoring data is presented for SAM since AAQS have not been established for this pollutant.

For $O_3$, the *de minimis* monitoring level is set at 100 TPY of VOC emissions. Since the proposed GP project will increase VOC emissions by greater than 100 TPY, an air monitoring analysis for $O_3$ is required. This analysis is presented in the following section.

## 4.2 OZONE AMBIENT MONITORING ANALYSIS

Ambient $O_3$ monitoring data from existing monitoring stations operated by FDEP are included in this application to satisfy the preconstruction monitoring requirements for VOC (see Table 4-1). Putnam County and adjacent counties are classified as attainment or maintenance areas for $O_3$. The nearest monitors to the GP Palatka Mill that measure $O_3$ concentrations are located in Gainesville in Alachua County.

Since $O_3$ is a regional pollutant, $O_3$ monitoring data collected in Alachua County are considered to be representative of $O_3$ concentrations for the region and are used to satisfy this requirement. These stations are operated by the FDEP and measure concentrations according to EPA procedures.

From 2001 through 2003, the second-highest 1-hr average $O_3$ concentration measured in Gainesville was 0.096 parts per million (ppm). This maximum concentration is less than the existing 1-hour average $O_3$ AAQS of 0.12 ppm. In addition, the 3-year average of the $4^{th}$ highest 8-hour average $O_3$ concentrations was 0.074 ppm, and is below the revised 8-hour average $O_3$ AAQS of 0.08 ppm. These $O_3$ monitoring data are proposed as part of this construction permit application to satisfy the preconstruction monitoring requirement for the project.

Table 4-1. Summary of Maximum Ambient Ozone Concentrations Measured Near GP Palatka Mill

| | | | | Concentration (ppm) | | |
|---|---|---|---|---|---|---|
| | | | | 1-Hour | | 8-Hour |
| County | AIRS No. | Location | Year | Highest | 2nd Highest | 3-year Average 4th Highest |
| **Florida AAQS** [a] | | | | **NA** | **0.12** | **0.08** |
| Alachua | 12-001-0025 | 2821 NW 143rd Street | 2003 | 0.089 | 0.086 | N/A |
| Alachua | 12-001-3011 | 200 Savannah | 2003 | 0.089 | 0.087 | 0.074 |
| | | | 2002 | 0.090 | 0.085 | |
| | | | 2001 | 0.096 | 0.096 | |

Note: NA = not applicable.
AAQS = ambient air quality standard.

[a] On July 18, 1997, EPA promulgated revised AAQS for $O_3$. The $O_3$ standard was modified to be 0.08 ppm for the 8-hour average; achieved when the 3-year average of 99$^{th}$ percentile values is 0.08 ppm or less. Until recently, the courts had stayed these standards but they will now be implemented by the states in the next several years. FDEP has not yet adopted the revised standards.

Source: EPA; 2003, 2002 (Quick Look Report, Air Quality Subsystem).

# 5.0 BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

## 5.1 REQUIREMENTS

The 1977 CAA Amendments established requirements for the approval of pre-construction permit applications under the PSD program. As discussed in Section 3.2.2, one of these requirements is that BACT be installed for applicable pollutants. BACT determinations must be made on a case-by-case basis considering technical, economic, energy, and environmental impacts for various BACT alternatives. To bring consistency to the BACT process, the EPA developed the "top-down" approach to BACT determinations.

The first step in a top-down BACT analysis is to determine, for each applicable pollutant, the most stringent control alternative available for a similar source or source category. If it can be shown that this level of control is not feasible on the basis of technical, economic, energy, or environmental impacts for the source in question, then the next most stringent level of control is identified and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any technical, economic, energy, or environmental consideration.

In the case of the proposed project, only the Bark Hog within the Bark Handling System is being modified. The No. 4 Combination Boiler is not being physically modified or undergoing a change in the method of operation. As a result, BACT only applies to the Bark Handling System. The Bark Handling System only emits PM/$PM_{10}$ and VOC. As a result, only PM/$PM_{10}$ and VOC emissions from the Bark Handling System require a BACT analysis. The BACT analysis is presented in the following sections.

## 5.2 BARK HANDLING SYSTEM

The Bark Handling System does not currently have emissions limits. However, the proposed project is subject to BACT for PM/$PM_{10}$ and VOCs, which are emitted from the Bark Handling System. Therefore, this section presents a BACT analysis for PM/$PM_{10}$ and VOC emissions from the Bark Handling System.

### 5.2.1 $PM/PM_{10}$

The Bark Handling System currently utilizes the following measures to control and minimize fugitive $PM/PM_{10}$ emissions:

- Covers on most conveyors;
- Enclosure of all conveyor transfer points;
- Limits on front end loader speeds when operating in the storage pile area;
- Enclosure of the screen and Bark Hog;
- Use of an enclosed storage silo for bark/wood; and
- A pneumatic system with a cyclone, used to transfer bark/wood from the silo to the No. 4 Combination Boiler.

The only change to the Bark Handling System will be the replacement of the existing Bark Hog with a new Bark Hog. The existing Bark Hog is totally enclosed, and no $PM/PM_{10}$ emissions were observed from the Bark Hog during a recent site visit. The new Bark Hog will be totally enclosed and will slice and cut the wood/bark, as opposed to crushing the material as is done currently. This should reduce the already minimal emissions.

The maximum estimated potential $PM/PM_{10}$ emissions from the entire Bark Handling System are only 22.8 and 13.8 TPY, respectively. These emissions are already low, and are by themselves less than the PSD significant emission rates. Any additional or add-on control devices would result in significant capital costs to GP to control an insignificant amount of emissions. Therefore, add-on $PM/PM_{10}$ control devices were not considered further.

GP is currently using the best control techniques for control of woodyard fugitive dust emissions. The proposed BACT for $PM/PM_{10}$ is the continued use of these control techniques, and use of a total enclosure for the new Bark Hog.

### 5.2.2 VOC EMISSIONS

VOC emissions occur from the outside storage of bark and wood chips (NCASI, 1996). Due to the nature of these emissions and the characteristics of the Bark Handling System, it is not feasible to control these VOC emissions. Controlling these emissions would require complete enclosure of the entire Bark Handling System, including bark/wood storage pile, and venting the emissions to a VOC control device. This would be impractical and cost-prohibitive. The only feasible control technique is to minimize the storage time of the bark/wood to the extent practical. This is implemented by woodyard management practices.

# 6.0 AIR QUALITY IMPACT ANALYSIS

## 6.1 GENERAL APPROACH

The general modeling approach followed EPA and FDEP modeling guidelines for determining compliance with AAQS and PSD increments. For all criteria pollutants that will be emitted in excess of the PSD significant emission rate due to a proposed project, a significant impact analysis is performed to determine whether the emission and/or stack configuration changes due to the project alone will result in predicted impacts that are in excess of the EPA significant impact levels at any location beyond the plant's restricted boundaries.

Generally, if the facility undergoing the modification is within 200 kilometers of a PSD Class I area, then a significant impact analysis is also performed to evaluate the impact due to the project alone at the PSD Class I area. Because the Okefenokee and Chassahowitzka NWAs are PSD Class I areas that are located within 200 km of the proposed project, the maximum predicted impacts due to the project at the Okefenokee and Chassahowitzka NWAs are compared to EPA's proposed significant impact levels for PSD Class I areas. Although another PSD Class I area, the Wolf Island NWA, is located about 186 km north of the GP Palatka Mill, this application does not address impacts at this PSD Class I area because the maximum impacts are expected to occur at the Okefenokee NWA, located about 108 km north of the mill. These recommended levels have never been promulgated as rules, but are the currently accepted criteria for determining whether a proposed project will incur a significant impact on a PSD Class I area.

If the project-only impacts are above the significant impact levels in the vicinity of the facility, then two additional and more detailed air modeling analyses are required. The first analysis demonstrates compliance with federal and Florida ambient air quality standards (AAQS), and the second analysis demonstrates compliance with allowable PSD Class II increments.

If the project-only impacts at the PSD Class I area are above the proposed EPA PSD Class I significant impact levels, then an analysis is performed to demonstrate compliance with allowable PSD Class I impacts at the PSD Class I area. The proposed project's maximum emission increases are also evaluated at the PSD Class I area to support the air quality related values (AQRV) analysis, which includes an evaluation of regional haze degradation.

Generally, when using 5 years of meteorological data for the analysis, the highest annual and the highest, second-highest (HSH) short-term (*i.e.*, 24 hours or less) concentrations are compared to the applicable AAQS and allowable PSD increments. [Note that for determining compliance with the 24-hour AAQS for PM, the sixth highest predicted concentration in 5 years (*i.e.*, H6H), instead of the HSH, is used to compare to the applicable 24-hour AAQS.]

The HSH concentration is calculated for a receptor field by:

1. Eliminating the highest concentration predicted at each receptor,
2. Identifying the second-highest concentration at each receptor, and
3. Selecting the highest concentration among these second-highest concentrations.

The HSH approach is consistent with AAQS and allowable PSD increments, which permit a short-term average concentration to be exceeded once per year at each receptor.

To develop the maximum short-term concentrations for the proposed project, the modeling approach was divided into screening and refined phases to reduce the computation time required to perform the modeling analysis. For this study, the only difference between the two modeling phases is the density of the receptor grid spacing employed when predicting concentrations. Concentrations are predicted for the screening phase using a coarse receptor grid and a 5-year meteorological data record.

If the original screening analysis indicates that the highest concentrations are occurring in a selected area(s) of the grid and, if the area's total coverage is too vast to directly apply a refined receptor grid, then an additional screening grid(s) will be used over that area. The additional screening grid(s) will employ a greater receptor density than the original screening grid.

Refinements of the maximum predicted concentrations are typically performed for the receptors of the screening receptor grid at which the highest and/or HSH concentrations occurred over the 5-year period. Generally, if the maximum concentrations from other years in the screening analysis are within 10 percent of the overall maximum concentration, then those other concentrations are refined as well. Typically, if the highest and HSH concentrations occur in different locations, concentrations in both areas are refined.

A more detailed description of the model, along with the emission inventory, meteorological data, and receptor grids, is presented in the following sections.

## 6.2 SIGNIFICANT IMPACT ANALYSIS

FDEP policies stipulate that the highest annual average and highest short-term concentrations are to be compared to the applicable significant impact levels both in the vicinity of the project and at the PSD Class I area. Based on the screening modeling analysis results in the vicinity of the project, additional modeling refinements are performed, if necessary, to obtain the maximum concentration with a receptor grid spacing of 100 meters (m) or less.

## 6.3 AAQS AND PSD CLASS II ANALYSES

For each pollutant for which a significant impact is predicted in the vicinity of the project, AAQS and PSD Class II analyses are required. The AAQS analysis is a cumulative source analysis that evaluates whether the post-project concentrations from all sources will comply with the AAQS. All sources include the post-project source configuration at the project site, the impacts from other nearby facility sources, plus a background concentration to account for sources not included in the modeling analysis.

The PSD Class II analysis is a cumulative source analysis that evaluates whether the post-project PSD increment concentrations for all increment-affecting sources will comply with the allowable PSD Class II increments. This includes the post-project PSD increment-affecting sources at the project site, plus the impacts from all nearby PSD increment-affecting sources at other facilities.

## 6.4 PSD CLASS I ANALYSIS

For each pollutant for which a significant impact is predicted at the PSD Class I area, a PSD Class I analysis is required. The PSD Class I analysis is a cumulative source analysis that evaluates whether the post-project PSD increment concentrations for all increment-affecting sources within the impact distance of the PSD Class I area will comply with the allowable PSD Class I increments. This includes the post-project PSD increment-affecting sources at the project site, plus the impacts from all PSD increment-affecting sources at other facilities that are within the impact distance of the PSD Class I area.

## 6.5 MODEL SELECTION

The Industrial Source Complex Short-term (ISCST3, Version 02035) dispersion model (EPA, 2002) was used to evaluate the pollutant impacts due to the proposed project in areas within 50 km of the GP Palatka Mill. This model is maintained by EPA on its Internet website, Support Center for Regulatory Air Models (SCRAM), within the Technical Transfer Network (TTN). A listing of

ISCST3 model features is presented in Table 6-1. The ISCST3 model is designed to calculate hourly concentrations based on hourly meteorological data (*i.e.*, wind direction, windspeed, atmospheric stability, ambient temperature, and mixing heights). The ISCST3 model is applicable to sources located in either flat or rolling terrain where terrain heights do not exceed stack heights. These areas are referred to as simple terrain. The model can also be applied in areas where the terrain exceeds the stack heights. These areas are referred to as complex terrain.

In this analysis, the EPA regulatory default options were used to predict all maximum impacts. The ISCST3 model can be executed in the rural or urban land use mode. The land use mode affects stability, dispersion coefficients, windspeed profiles, and mixing heights. Land use can be characterized based on a scheme recommended by EPA (Auer, 1978). If more than 50 percent land use within a 3-km radius around a project site is classified as industrial or commercial, or high-density residential, then the urban option should be selected. Otherwise, the rural option is appropriate. Based on the land-use within a 3-km radius of the GP Palatka Mill site, the rural dispersion coefficients were used in the modeling analysis. Also, since the terrain around the facility is flat to gently rolling, the simple terrain feature of the model was selected.

The ISCST3 model was used to provide maximum concentrations for the annual, 24-, 8-, 3-, and 1-hour averaging times.

For predicting maximum impacts at the Okefenokee and Chassahowitzka NWA PSD Class I areas, the California Puff (CALPUFF) modeling system was used. CALPUFF, Version 5.5 (EPA, 2002), is a Lagrangian puff model that is recommended by the FDEP, in coordination with the Federal Land Manager (FLM) for the NWA, for predicting pollutant impacts at PSD Class I areas that are beyond 50 km from a project site. A description of the CALPUFF model is presented in Appendix C. A listing of CALPUFF model features is presented in Table 6-2.

## 6.6 METEOROLOGICAL DATA

Meteorological data used in the ISCST3 model to determine air quality impacts consisted of a concurrent 5-year period of hourly surface weather observations and twice-daily upper air soundings from the National Weather Service (NWS) stations located at the Jacksonville International Airport and Waycross, Georgia, respectively. Concentrations were predicted using the 5-year period, 1984 through 1988. These data have been approved by FDEP for modeling applications in the Putnam County area. The NWS station at Jacksonville is located approximately 91 km (56 miles) north of the site and is the closest primary weather station to the study area considered to have meteorological data representative of the project site. The meteorological data from this station have been used for previous air modeling studies for the GP Palatka Mill.

The surface observations included wind direction, windspeed, temperature, cloud cover, and cloud ceiling height. The windspeed, cloud cover, and cloud ceiling values were used in the ISCST3 meteorological preprocessor program to determine atmospheric stability using the Turner stability scheme. Based on the temperature measurements at morning and afternoon, mixing heights were calculated from the radiosonde data at Waycross using the Holzworth approach (Holzworth, 1972). Hourly mixing heights were derived from the morning and afternoon mixing heights using the interpolation method developed by EPA (Holzworth, 1972). The hourly surface data and mixing heights were used to develop a sequential, hourly meteorological data set (*i.e.*, wind direction, windspeed, temperature, stability, and mixing heights). Because the observed hourly wind directions at the NWS stations are classified into one of thirty-six 10-degree sectors, the wind directions were randomized within each sector to account for the expected variability in air flow. These calculations were performed using the EPA RAMMET meteorological preprocessor program.

A detailed discussion on meteorological data used in the CALPUFF model is presented in Appendix C.

## 6.7 EMISSION INVENTORY

### 6.7.1 SIGNIFICANT IMPACT ANALYSIS

The $PM_{10}$, $SO_2$, CO, $NO_x$, and SAM emission rates, and the physical and operational stack parameters for all project-modified and/or affected sources, are summarized in Tables 6-3 and 6-4. The current actual and future potential $PM_{10}$, $SO_2$, CO, $NO_x$, and SAM emissions for all GP Palatka Mill sources affected by the project are presented in Table 6-3. Emission rates are based on information presented in Section 2.0 and Appendix B. The current and future stack and operating parameters for all project-affected GP sources are included in Table 6-4. All sources were modeled at locations that are relative to the old TRS Incinerator stack location.

The $SO_2$, CO, and $NO_x$ impacts were predicted using a generic modeling approach. The proposed project included a single source, the No. 4 Combination Boiler, modeled using a 10-gram-per-second (g/s) emission rate. Specific pollutant impacts were calculated from the predicted impacts from the generic modeling analysis and the net (future minus past actual) pollutant emission rates.

The $PM_{10}$ modeling analysis was performed separately, using the specific emission rates since this analysis included three sources: the No. 4 Combination Boiler, the Bark Handling System, and the Bark Handling Cyclone.

The Bark Handling Cyclone has a rain cap on its stack, and was therefore modeled with an exit velocity of 0.01 m/s. The Bark Handling System was modeled as a volume source with height, length, and width of 30, 350, and 215 ft, respectively. A diagonal of 412 ft (125.42 m), based on the length and width of the area, was used to determine the initial dispersion horizontal and vertical parameters. A diagonal was used to account for enhanced dispersion due to the storage area and other structures and conveyors in the area. The initial dispersion horizontal and vertical parameters were determined to be 29.16 m (based on the diagonal divided by 4.3) and 4.23 m (based on a release height of 30 ft or 9.1 m divided by 2.15). This approach was based on the *User's Guide for the Industrial Source Complex (ISC3) Dispersion Models* (EPA, 1995).

The proposed project's $PM_{10}$, $NO_2$, and CO impacts were predicted to be below the PSD Class II significant impact levels. As such, AAQS and PSD Class II increment consumption analyses with background emission sources were not required. However, the proposed project's $SO_2$ impacts were predicted to be above the PSD Class II significant impact levels. Detailed $SO_2$ modeling analyses, including AAQS and PSD Class II increment consumption analyses, are included in a separate modeling report (Golder, 2004).

### 6.7.2 PSD CLASS I ANALYSIS

The pollutant emissions and modeling parameters used to address the project's impacts at the PSD Class I areas were the same as those used to determine the project's impacts in the vicinity of the GP Palatka Mill. Because the change in the $PM_{10}$ emissions from the Bark Handling Cyclone will be minimal (no increase on an hourly basis and 0.55 TPY on an annual basis), the emissions are released at low heights (9.1 m), and the distances to the Class I areas are more than 100 km, the $PM/PM_{10}$ emissions from only the No. 4 Combination Boiler and Bark Handling System were considered in the modeling.

The proposed project's $SO_2$, $NO_x$, and $PM_{10}$ impacts were predicted to be below the applicable PSD Class I significant impact levels at the Okefenokee and Chassahowitzka NWA PSD Class I areas, except for $SO_2$ impacts at the Okefenokee NWA. Therefore, PSD Class I increment consumption analyses were not required for these pollutants, except for $SO_2$ impacts at the Okefenokee NWA.

Detailed $SO_2$ modeling analyses for PSD Class I increment consumption at the Okefenokee NWA are presented in a separate modeling report (Golder, 2004). In addition, the proposed project's emissions of $SO_2$, $NO_x$, $PM_{10}$, and SAM were evaluated at the Class I areas to support the AQRV analysis, the regional haze analysis, and the sulfur (S) and nitrogen (N) deposition analyses. The AQRV, regional haze, and deposition analyses for the Okefenokee and Chassahowitzka NWAs are presented in Sections 8.0 and 9.0, respectively.

## 6.8 RECEPTOR LOCATIONS

### 6.8.1 SITE VICINITY

The screening receptor grid used for the site vicinity was comprised of Cartesian receptors, and consisted of the following:

- Property boundary receptors, spaced at 50-m intervals;
- Receptors from the property boundary out to 2.0 km, spaced at 150-m intervals;
- Receptors from 2 to 3.5 km, spaced at 250-m intervals; and
- Receptors from 3.5 to 10 km, spaced at 500-m intervals.

The modeling origin of the receptor grid was the old TRS incinerator stack location, and all source and receptor locations are relative to this location.

A summary of the property boundary receptors used in the modeling analysis is summarized in Table 6-5. The receptor locations in the vicinity of the plant, as well as the current sources and building locations, are shown in Figures 6-1 and 6-2.

### 6.8.2 PSD CLASS I AREAS

Maximum $SO_2$, $NO_x$, $PM_{10}$, and SAM concentrations were predicted at the Okefenokee and Chassahowitzka NWAs with the CALPUFF model using 161 discrete receptors located at the Okefenokee NWA PSD Class I area and 13 discrete receptors located along the border of the Chassahowitzka NWA PSD Class I area. A listing of the Class I receptors at the Okefenokee and Chassahowitzka NWAs are provided in Tables 6-6 and 6-7, respectively.

Impacts for the proposed project only were compared to both the proposed EPA PSD Class I significance levels for $SO_2$ and $NO_2$, the regional haze degradation criteria of 5 percent, and the S and N deposition criteria of 0.01 kilograms per hectare per year (kg/ha/yr).

The SAM impacts were also used to assess the proposed project's impacts on the NWAs' AQRVs.

## 6.9 BUILDING DOWNWASH EFFECTS

All significant building structures within GP's existing plant area were determined by a site plot plan. The plot plan of the GP site was presented in Section 2.0 (Figure 2-1). A total of 12 building structures were evaluated. All structures were processed in the EPA Building Input Profile (BPIP, Version 95086) program to determine direction-specific building heights and projected widths for each 10-degree azimuth direction for each source that was included in the modeling analysis. A listing of dimensions for each structure is presented in Table 6-8.

## 6.10 MODEL RESULTS

### 6.10.1 SIGNIFICANT IMPACT ANALYSIS

A summary of the maximum $SO_2$, $NO_x$, and CO concentrations predicted for the proposed project only is presented in Table 6-9. A summary of the maximum $PM_{10}$ concentrations predicted for the proposed project only is presented in Table 6-10. As shown in these tables, the maximum $NO_x$, CO, and $PM_{10}$ concentrations are predicted to be below the respective significant impact levels. As a result, detailed modeling analyses were not performed for $NO_x$, CO, and $PM_{10}$.

For $SO_2$, the project's impacts were predicted to be above the significant impact levels. A detailed $SO_2$ modeling analysis, including AAQS and PSD Class II increment consumption analyses, is included in a separate modeling report (Golder, 2004). Those results demonstrate that the $SO_2$ impacts from the modeled sources comply with the AAQS and PSD Class II increments.

### 6.10.2 SAM IMPACT ANALYSIS

The maximum annual, 24-, 8-, 3-, and 1-hour average SAM concentrations predicted for the proposed project are presented in Table 6-11. There are no AAQS or PSD increments for SAM concentrations. However, SAM impacts are required for the additional impact analyses presented in Sections 7.0 through 9.0.

### 6.10.3 PSD CLASS I ANALYSIS

The maximum $SO_2$, $PM_{10}$, and $NO_x$ concentrations predicted for the proposed project only at the Okefenokee and Chassahowitzka PSD Class I areas are compared with the EPA's proposed PSD Class I significance levels in Tables 6-12 and 6-13, respectively. The maximum $SO_2$, $PM_{10}$, and $NO_2$ concentrations were predicted to be below the significant impact levels at the PSD Class I areas, except for SO2 impacts at the Okefenokee NWA. Therefore, a full PSD Class I increment analysis was not required for these pollutants, except for $SO_2$ impacts at the Okefenokee NWA. Detailed $SO_2$ modeling analyses for PSD Class I increment consumption at the Okefenokee NWA are presented in a separate modeling report (Golder, 2004). Those results demonstrate that the PSD increment consumption from the modeled sources complies with the PSD Class I increments.

Table 6-1. Major Features of the ISCST3 Model

| ISCST3 Model Features[a] |
|---|
| • Polar or Cartesian coordinate systems for receptor locations |
| • Rural or one of three urban options which affect wind speed profile exponent, dispersion rates, and mixing height calculations |
| • Plume rise due to momentum and buoyancy as a function of downwind distance for stack emissions (Briggs, 1969, 1971, 1972, and 1975; Bowers, et al., 1979). |
| • Procedures suggested by Huber and Snyder (1976); Huber (1977); and Schulman and Scire (1980) for evaluating building wake effects |
| • Procedures suggested by Briggs (1974) for evaluating stack-tip downwash |
| • Separation of multiple emission sources |
| • Consideration of the effects of gravitational settling and dry deposition on ambient particulate concentrations |
| • Capability of simulating point, line, volume, area, and open pit sources |
| • Capability to calculate dry and wet deposition, including both gaseous and particulate precipitation scavenging for wet deposition |
| • Variation of wind speed with height (wind speed-profile exponent law) |
| • Concentration estimates for 1 hour to annual average times |
| • Terrain-adjustment procedures for elevated terrain including a terrain truncation algorithm for ISCST3; a built-in algorithm for predicting concentrations in complex terrain |
| • Consideration of time-dependent exponential decay of pollutants |
| • The method of Pasquill (1976) to account for buoyancy-induced dispersion |
| • A regulatory default option to set various model options and parameters to EPA recommended values (see text for regulatory options used) |
| • Procedure for calm-wind processing including setting wind speeds less than 1 m/s to 1 m/s. |

Note: ISCST3 = Industrial Source Complex Short-Term.

References:

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Briggs, G.A. 1969. Plume Rise, USAEC Critical Review Series, TID-25075. National Technical Information Service, Springfield, Virginia 22161.

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Briggs, G.A. 1974. Diffusion Estimation for Small Emissions. *In*: ERL, ARL USAEC Report ATDL-106. U.S. Atomic Energy Commission, Oak Ridge, Tennessee.

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Briggs, G.A. 1979. Some Recent Analyses of Plume Rise Observations. *In*: Proceedings of the Second International Clean Air Congress. Academic Press, New York.

Huber, A.H. 1977. Incorporating Building/Terrain Wake Effects on Stack Effluents. Preprint Volume for the Joint Conference on Applications of Air Pollution Meteorology, American Meteorological Society, Boston, Massachusetts.

Huber, A.H. and W.H. Snyder. 1976. Building Wake Effects on Short Stack Effluents. Preprint Volume for the Third Symposium on Atmospheric Diffusion and Air Quality, American Meteorological Society, Boston, Massachusetts.

Pasquill, F. 1976. Atmospheric Dispersion Parameters in Gaussian Plume Modeling - Part II. Possible Requirements for Change in the Turner Workbook Values. EPA-600/4-76-030b, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

Schulman, L.L. and J.S. Scire. 1980. Buoyant Line and Point Source (BLP) Dispersion Model User's Guide. Document P-7304B, Environmental Research and Technology, Inc., Concord, MA.

Table 6-2. Major Features of the CALPUFF Model, Version 5.5

| CALPUFF Model Features |
|---|
| • Source types: Point, line (including buoyancy effects), volume, area (buoyant, non-buoyant) |
| • Non-steady-state emissions and meteorological conditions (time-dependent source and emission data; gridded 3-dimensional wind and temperature fields; spatially-variable fields of mixing heights, friction velocity, precipitation, Monin-Obukhov length; vertically and horizontally-varying turbulence and dispersion rates; time-dependent source and emission data for point, area, and volume sources; temporal or wind-dependent scaling factors for emission rates) |
| • Efficient sampling function (integrated puff formulation; elongated puff (slug) formation) |
| • Dispersion coefficient options (Pasquill-Gifford (PG) values for rural areas; McElroy-Pooler values (MP) for urban areas; CTDM values for neutral/stable; direct measurements or estimated values) |
| • Vertical wind shear (puff splitting; differential advection and dispersion) |
| • Plume rise (buoyant and momentum rise; stack-tip effects; building downwash effects; partial plume penetration above mixing layer) |
| • Building downwash effects (Huber-Snyder method; Schulman-Scire method) |
| • Complex terrain effects (steering effects in CALMET wind field; puff height adjustments using ISC model method or plume path coefficient; enhanced vertical dispersion used in CTDMPLUS) |
| • Subgrid scale complex terrain (CTSG option) (CTDM flow module; dividing streamline as in CTDMPLUS) |
| • Dry deposition (gases and particles; options for diurnal cycle per pollutant, space and time variations with a resistance model, or none) |
| • Overwater and coastal interaction effects (overwater boundary layer parameters; abrupt change in meteorological conditions, plume dispersion at coastal boundary; fumigation; option to use Thermal Internal Boundary Layers (TIBL) into coastal grid cells) |
| • Chemical transformation options (Pseudo-first-order chemical mechanisms for $SO_2$, $SO_4$, $HNO_3$, and $NO_3$; Pseudo-first-order chemical mechanisms for $SO_2$, $SO_4$, NO, $NO_2$, $HNO_3$, and $NO_3$ (RIVAD/ARM3 method); user-specified diurnal cycles of transformation rates; no chemical conversions) |
| • Wet removal (scavenging coefficient approach; removal rate as a function of precipitation intensity and type) |
| • Graphical user interface |
| • Interface utilities (scan ISCST3 and AUSPLUME meteorological data files for problems; translate ISCST3 and AUSPLUME input files to CALPUFF input files |

Note: CALPUFF = California Puff Model

Source: EPA, 2001.

Table 6-3. Summary of Past Actual and Future Potential Emissions Used in the Significant Impact Modeling Analysis, Georgia-Pacific, Palatka

| Pollutant/ Averaging Time | No. 4 Combination Boiler | | | | Bark Handling System | | | | Bark Handling Cyclone | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hourly | | Annual | | Hourly | | Annual | | Hourly | | Annual | |
| | lb/hr | g/s | TPY | g/s | lb/hr | g/s | TPY | g/s | lb/hr | g/s | TPY | g/s |
| | | | | | PAST ACTUAL EMISSIONS [a] | | | | | | | |
| $SO_2$--3-Hour | 934.62 | 117.76 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| --24-Hour | 831.75 | 104.80 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| --Annual | -- | -- | 818.54 | 23.55 | -- | -- | -- | -- | -- | -- | -- | -- |
| $NO_x$--24-Hour | 114.36 | 14.41 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| --Annual | -- | -- | 398.75 | 11.47 | -- | -- | -- | -- | -- | -- | -- | -- |
| CO--1-Hour | 255.52 | 32.20 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| --8-Hour | 255.52 | 32.20 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| $PM_{10}$--24-Hour | 24.20 | 3.05 | -- | -- | 0.54 [b] | 0.07 | -- | -- | 2.00 | 0.25 | -- | -- |
| --Annual | -- | -- | 35.87 | 1.03 | -- | -- | 2.38 | 0.07 | -- | -- | 8.21 | 0.24 |
| SAM--3-Hour | 41.12 | 5.18 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| --24-Hour | 36.60 | 4.61 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| --Annual | -- | -- | 36.02 | 1.04 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | FUTURE POTENTIAL EMISSIONS [c] | | | | | | | |
| $SO_2$--3-Hour | 1,183.18 | 149.08 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| --24-Hour | 1,075.65 | 135.53 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| --Annual | -- | -- | 4,711.35 | 135.53 | -- | -- | -- | -- | -- | -- | -- | -- |
| $NO_x$--24-Hour | 131.18 | 16.53 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| --Annual | -- | -- | 574.56 | 16.53 | -- | -- | -- | -- | -- | -- | -- | -- |
| CO--1-Hour | 338.58 | 42.66 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| --8-Hour | 338.58 | 42.66 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| $PM_{10}$--24-Hour | 92.94 | 11.71 | -- | -- | 1.16 [b] | 0.15 | -- | -- | 2.00 | 0.25 | -- | -- |
| --Annual | -- | -- | 407.09 | 11.71 | -- | -- | 5.09 | 0.15 | -- | -- | 8.76 | 0.25 |
| SAM--3-Hour | 52.06 | 6.56 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| --24-Hour | 47.33 | 5.96 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| --Annual | -- | -- | 207.30 | 5.96 | -- | -- | -- | -- | -- | -- | -- | -- |

[a] Current actual emissions from Tables B-4, B-5, B-6, and B-7.

[b] Hourly emissions based on annual emissions and 8,760 hr/yr operation.

[c] Future potential emissions from Tables B-1 and B-2.

Table 6-4. Stack and Operating Parameters and Locations for No. 4 Combination Boiler and the Bark Handling Area Used in the Significant Impact Modeling Analysis for Georgia-Pacific, Palatka

| | | Relative Location [a] | | | | Stack Parameters | | | | Operating Parameters | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unit | x | | y | | Height | | Diameter | | Temperature | | Flow Rate | Velocity | |
| Emission Unit | ID | (ft) | (m) | (ft) | (m) | (ft) | (m) | (ft) | (m) | (°F) | (K) | (acfm) | (ft/s) | (m/s) |
| No. 4 Combination Boiler | CB4 | -331.9 | -101.2 | 337.6 | 102.9 | 237 | 72.2 | 8.0 | 2.44 | 466 | 514 | 278,400 | 92.3 | 28.1 |
| Bark Handling Area | BARK | -379.9 | -115.8 | -138.7 | -42.3 | 30 | 9.1 | [c] | [c] | [c] | [c] | [c] | [c] | [c] |
| Bark Handling Cyclone | BCYCL | -383.8 | -117.0 | 451.6 | 137.6 | 118 | 35.9 | 3.0 | 0.91 | 77 | 298 | 10,000 | 23.6 | 7.2 |
| Old TRS Incinerator [b] | TRS | 0 | 0 | 0 | 0 | 250 | 76.2 | 3.1 | 0.94 | 500 | 533 | 8,246 | 105.1 | 32.0 |

[a] Relative to old TRS Incinerator stack location and true north.

[b] The old TRS Incinerator will not be operational in the future, but stack parameters were incorporated into the modeling since it is used as the modeling origin.

[c] The volume source parameters for the Bark Handling Area are:

| Source | Release Height | $s_{y0}$ | $s_{z0}$ |
|---|---|---|---|
| Bark Handling Area | 9.1 m | 29.16 m | 4.23 m |

Table 6-5. Property Boundary Receptors Used in the Modeling Analysis, Georgia-Pacific, Palatka

| Coordinates (m) | | Coordinates (m) | | Coordinates (m) | | Coordinates (m) | | Coordinates (m) | | Coordinates (m) | | Coordinates (m) | | Coordinates (m) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | y | x | y | x | y | x | y | x | y | x | y | x | y | x | y |
| -311.0 | -1781.0 | -3231.4 | -279.6 | -4162.2 | 2413.6 | -3944.5 | 3977.0 | -1217.8 | 4808.0 | 1914.3 | 4492.0 | 1574.6 | 2851.9 | 1248.5 | 842.0 |
| -402.0 | -1739.6 | -3331.4 | -276.3 | -4168.3 | 2513.4 | -4044.5 | 3977.0 | -1117.8 | 4808.6 | 1911.6 | 4392.0 | 1527.7 | 2763.6 | 1348.5 | 842.0 |
| -493.1 | -1698.2 | -3431.3 | -273.0 | -4174.5 | 2613.3 | -4144.5 | 3977.0 | -1017.8 | 4809.3 | 1908.9 | 4292.0 | 1480.8 | 2675.3 | 1448.5 | 842.0 |
| -584.1 | -1656.9 | -3531.3 | -269.7 | -4180.6 | 2713.1 | -4185.0 | 4036.5 | -917.8 | 4809.9 | 1906.3 | 4192.1 | 1433.9 | 2587.0 | 1548.5 | 842.0 |
| -675.1 | -1615.5 | -3631.2 | -266.4 | -4186.8 | 2812.9 | -4185.0 | 4136.5 | -817.8 | 4810.5 | 1903.6 | 4092.1 | 1341.7 | 2574.0 | 1648.5 | 842.0 |
| -766.2 | -1574.1 | -3731.1 | -263.1 | -4193.0 | 2912.7 | -4185.0 | 4236.5 | -717.8 | 4811.2 | 1826.1 | 4069.0 | 1241.7 | 2574.0 | 1740.2 | 832.5 |
| -857.2 | -1532.7 | -3831.1 | -259.8 | -4199.1 | 3012.5 | -4161.5 | 4313.4 | -617.8 | 4811.8 | 1739.0 | 4081.9 | 1141.7 | 2574.0 | 1737.6 | 740.0 |
| -948.3 | -1491.3 | -3931.0 | -256.5 | -4205.3 | 3112.3 | -4061.5 | 4315.0 | -517.8 | 4812.5 | 1739.0 | 4181.9 | 1116.1 | 2482.6 | 1657.5 | 680.0 |
| -1039.3 | -1450.0 | -3894.6 | -190.3 | -4211.4 | 3212.1 | -3961.5 | 4316.6 | -417.8 | 4813.1 | 1739.0 | 4281.9 | 1095.9 | 2384.7 | 1577.5 | 620.1 |
| -1130.3 | -1408.6 | -3832.3 | -112.1 | -4217.6 | 3311.9 | -3861.6 | 4318.3 | -317.8 | 4813.7 | 1739.0 | 4381.9 | 1075.6 | 2286.8 | 1497.4 | 560.2 |
| -1221.4 | -1367.2 | -3769.9 | -33.9 | -4176.6 | 3360.5 | -3761.6 | 4319.9 | -217.8 | 4814.4 | 1739.0 | 4481.9 | 1055.4 | 2188.8 | 1417.4 | 500.2 |
| -1312.4 | -1325.8 | -3707.6 | 44.3 | -4077.7 | 3346.0 | -3661.6 | 4321.5 | -117.8 | 4815.0 | 1739.0 | 4581.9 | 1035.1 | 2090.9 | 1337.3 | 440.3 |
| -1403.4 | -1284.4 | -3651.2 | 125.9 | -3978.8 | 3331.6 | -3561.6 | 4323.2 | -17.9 | 4815.7 | 1739.0 | 4681.9 | 1033.7 | 2027.3 | 1257.3 | 380.4 |
| -1494.5 | -1243.1 | -3613.9 | 218.7 | -3879.8 | 3317.1 | -3461.6 | 4324.8 | 82.1 | 4816.3 | 1642.1 | 4685.0 | 1105.3 | 2097.0 | 1177.2 | 320.4 |
| -1585.5 | -1201.7 | -3576.7 | 311.5 | -3780.9 | 3302.6 | -3361.6 | 4326.4 | 182.1 | 4816.9 | 1542.1 | 4685.0 | 1177.0 | 2166.7 | 1097.2 | 260.5 |
| -1676.5 | -1160.3 | -3562.9 | 403.3 | -3681.9 | 3288.1 | -3261.6 | 4328.1 | 282.1 | 4817.6 | 1442.1 | 4685.0 | 1248.7 | 2236.4 | 1017.1 | 200.6 |
| -1767.6 | -1118.9 | -3608.6 | 492.2 | -3583.0 | 3273.7 | -3161.6 | 4329.7 | 382.1 | 4818.2 | 1410.0 | 4624.5 | 1320.4 | 2306.2 | 937.1 | 140.6 |
| -1858.6 | -1077.5 | -3654.2 | 581.2 | -3484.0 | 3259.2 | -3087.4 | 4349.2 | 482.1 | 4818.9 | 1421.4 | 4525.2 | 1392.1 | 2375.9 | 857.0 | 80.7 |
| -1949.7 | -1036.2 | -3732.9 | 616.0 | -3385.1 | 3244.7 | -3120.8 | 4443.5 | 582.1 | 4819.5 | 1432.8 | 4425.8 | 1466.0 | 2440.6 | 777.0 | 20.7 |
| -2040.7 | -994.8 | -3832.9 | 616.0 | -3286.1 | 3230.2 | -3154.1 | 4537.8 | 682.1 | 4820.1 | 1444.3 | 4326.5 | 1565.7 | 2448.5 | 696.9 | -39.2 |
| -2131.7 | -953.4 | -3924.1 | 634.0 | -3187.2 | 3215.8 | -3187.4 | 4632.1 | 782.1 | 4820.8 | 1455.7 | 4227.1 | 1615.7 | 2396.7 | 616.9 | -99.1 |
| -2222.8 | -912.0 | -3985.8 | 712.8 | -3088.2 | 3201.3 | -3220.7 | 4726.4 | 882.1 | 4821.4 | 1467.2 | 4127.8 | 1625.9 | 2297.2 | 536.8 | -159.1 |
| -2313.8 | -870.6 | -4039.0 | 789.7 | -2989.3 | 3186.8 | -3217.8 | 4795.2 | 982.1 | 4822.1 | 1478.6 | 4028.4 | 1636.0 | 2197.8 | 456.8 | -219.0 |
| -2404.8 | -829.3 | -3951.2 | 837.5 | -2890.3 | 3172.3 | -3117.8 | 4795.8 | 1082.1 | 4822.7 | 1490.0 | 3929.1 | 1646.2 | 2098.3 | 376.7 | -278.9 |
| -2495.9 | -787.9 | -3863.4 | 885.4 | -2806.0 | 3174.8 | -3017.8 | 4796.5 | 1182.1 | 4823.3 | 1551.6 | 3886.0 | 1656.4 | 1998.8 | 296.7 | -338.9 |
| -2586.9 | -746.5 | -3831.0 | 966.1 | -2806.0 | 3274.8 | -2917.8 | 4797.1 | 1282.1 | 4824.0 | 1651.6 | 3886.0 | 1666.6 | 1899.3 | 216.6 | -398.8 |
| -2678.0 | -705.1 | -3831.0 | 1066.1 | -2806.0 | 3374.8 | -2817.8 | 4797.7 | 1382.1 | 4824.6 | 1751.6 | 3886.0 | 1676.8 | 1799.8 | 169.7 | -483.4 |
| -2769.0 | -663.7 | -3899.1 | 1098.0 | -2806.0 | 3474.8 | -2717.8 | 4798.4 | 1482.1 | 4825.3 | 1851.6 | 3886.0 | 1687.0 | 1700.4 | 134.9 | -577.2 |
| -2860.0 | -622.4 | -3999.1 | 1098.0 | -2806.0 | 3574.8 | -2617.8 | 4799.0 | 1582.1 | 4825.9 | 1951.6 | 3886.0 | 1625.4 | 1642.7 | 100.2 | -671.0 |
| -2940.6 | -573.9 | -4082.1 | 1116.1 | -2806.0 | 3674.8 | -2517.8 | 4799.7 | 1682.1 | 4826.5 | 2051.6 | 3886.0 | 1537.4 | 1600.6 | 65.5 | -764.7 |
| -2945.1 | -474.0 | -4088.3 | 1215.9 | -2806.0 | 3774.8 | -2417.8 | 4800.3 | 1782.1 | 4827.2 | 2076.0 | 3837.1 | 1549.7 | 1501.3 | 30.7 | -858.5 |
| -2949.7 | -374.1 | -4094.4 | 1315.7 | -2860.4 | 3831.0 | -2317.8 | 4800.9 | 1882.1 | 4827.8 | 2034.9 | 3745.9 | 1562.0 | 1402.1 | -4.0 | -952.3 |
| -2954.3 | -274.2 | -4100.6 | 1415.5 | -2958.1 | 3852.7 | -2217.8 | 4801.6 | 1982.1 | 4828.5 | 1993.9 | 3654.8 | 1617.3 | 1369.0 | -38.8 | -1046.1 |
| -2958.8 | -174.3 | -4106.8 | 1515.3 | -3055.7 | 3874.3 | -2117.8 | 4802.2 | 2082.1 | 4829.1 | 1952.8 | 3563.6 | 1696.5 | 1367.8 | -73.5 | -1139.8 |
| -2963.4 | -74.4 | -4112.9 | 1615.2 | -3153.4 | 3895.9 | -2017.8 | 4802.9 | 2182.1 | 4829.7 | 1911.7 | 3472.4 | 1723.6 | 1271.6 | -108.2 | -1233.6 |
| -2968.0 | 25.5 | -4119.1 | 1715.0 | -3251.0 | 3917.5 | -1917.8 | 4803.5 | 2282.1 | 4830.4 | 1940.0 | 3383.5 | 1641.3 | 1229.4 | -143.0 | -1327.4 |
| -3004.4 | 92.0 | -4125.2 | 1814.8 | -3348.6 | 3939.1 | -1817.8 | 4804.1 | 2376.0 | 4830.1 | 1924.8 | 3291.7 | 1548.4 | 1192.5 | -177.7 | -1421.1 |
| -3104.4 | 92.0 | -4131.4 | 1914.6 | -3446.3 | 3960.7 | -1717.8 | 4804.8 | 2280.4 | 4801.0 | 1875.8 | 3209.6 | 1457.8 | 1152.2 | -212.4 | -1514.9 |
| -3190.0 | 77.6 | -4137.5 | 2014.4 | -3544.5 | 3977.0 | -1617.8 | 4805.4 | 2184.7 | 4771.8 | 1787.8 | 3162.1 | 1389.9 | 1078.8 | -247.2 | -1608.7 |
| -3190.0 | -22.4 | -4143.7 | 2114.2 | -3644.5 | 3977.0 | -1517.8 | 4806.1 | 2107.3 | 4712.3 | 1699.8 | 3114.6 | 1322.0 | 1005.4 | -281.9 | -1702.5 |
| -3190.0 | -122.4 | -4149.9 | 2214.0 | -3744.5 | 3977.0 | -1417.8 | 4806.7 | 2036.6 | 4641.6 | 1654.9 | 3033.7 | 1254.1 | 931.9 | | |
| -3190.0 | -222.4 | -4156.0 | 2313.8 | -3844.5 | 3977.0 | -1317.8 | 4807.3 | 1965.9 | 4570.9 | 1621.5 | 2940.2 | 1186.2 | 858.5 | | |

Note: All coordinates are relative to old TRS incinerator stack location.

Table 6-6. Okefenokee NWA Receptors Used in the Modeling Analysis

| Receptor No. | UTM Coordinates (m) East | UTM Coordinates (m) North | Receptor No. | UTM Coordinates (m) East | UTM Coordinates (m) North |
|---|---|---|---|---|---|
| 1 | 388.75 | 3,430.00 | 81 | 358.60 | 3,392.00 |
| 2 | 390.30 | 3,429.15 | 82 | 360.00 | 3,392.20 |
| 3 | 391.70 | 3,428.00 | 83 | 359.25 | 3,394.10 |
| 4 | 391.90 | 3,426.25 | 84 | 359.80 | 3,394.45 |
| 5 | 391.25 | 3,423.75 | 85 | 361.15 | 3,394.45 |
| 6 | 391.60 | 3,422.00 | 86 | 361.25 | 3,395.80 |
| 7 | 391.15 | 3,420.00 | 87 | 360.40 | 3,396.30 |
| 8 | 391.80 | 3,418.65 | 88 | 358.30 | 3,396.30 |
| 9 | 391.65 | 3,416.50 | 89 | 357.65 | 3,398.10 |
| 10 | 391.70 | 3,414.90 | 90 | 359.00 | 3,398.10 |
| 11 | 391.50 | 3,412.85 | 91 | 359.00 | 3,398.85 |
| 12 | 391.55 | 3,413.00 | 92 | 360.00 | 3,398.85 |
| 13 | 391.50 | 3,410.00 | 93 | 361.30 | 3,398.80 |
| 14 | 391.10 | 3,408.50 | 94 | 362.50 | 3,398.80 |
| 15 | 390.80 | 3,407.00 | 95 | 362.50 | 3,400.30 |
| 16 | 390.90 | 3,406.00 | 96 | 362.50 | 3,401.55 |
| 17 | 391.40 | 3,406.05 | 97 | 361.50 | 3,402.10 |
| 18 | 391.10 | 3,403.40 | 98 | 361.20 | 3,403.35 |
| 19 | 391.05 | 3,401.80 | 99 | 362.55 | 3,403.85 |
| 20 | 391.35 | 3,400.20 | 100 | 363.40 | 3,404.45 |
| 21 | 390.85 | 3,398.30 | 101 | 362.55 | 3,404.95 |
| 22 | 390.30 | 3,396.40 | 102 | 362.60 | 3,406.45 |
| 23 | 389.80 | 3,394.80 | 103 | 362.60 | 3,408.80 |
| 24 | 391.20 | 3,394.40 | 104 | 359.80 | 3,408.85 |
| 25 | 390.80 | 3,393.05 | 105 | 359.80 | 3,413.00 |
| 26 | 389.50 | 3,393.40 | 106 | 358.00 | 3,413.00 |
| 27 | 389.15 | 3,392.00 | 107 | 355.70 | 3,413.50 |
| 28 | 391.80 | 3,391.25 | 108 | 353.80 | 3,413.50 |
| 29 | 391.45 | 3,389.90 | 109 | 351.65 | 3,414.00 |
| 30 | 388.70 | 3,390.60 | 110 | 351.65 | 3,412.45 |
| 31 | 388.35 | 3,389.25 | 111 | 351.65 | 3,414.40 |
| 32 | 389.70 | 3,388.90 | 112 | 351.65 | 3,416.10 |
| 33 | 389.30 | 3,387.50 | 113 | 353.00 | 3,416.15 |
| 34 | 388.90 | 3,386.15 | 114 | 352.95 | 3,417.65 |
| 35 | 390.35 | 3,385.80 | 115 | 354.45 | 3,417.65 |
| 36 | 389.80 | 3,383.90 | 116 | 354.55 | 3,419.00 |
| 37 | 389.20 | 3,381.70 | 117 | 356.05 | 3,419.05 |
| 38 | 387.75 | 3,382.05 | 118 | 356.10 | 3,420.60 |
| 39 | 387.50 | 3,380.70 | 119 | 356.10 | 3,421.90 |
| 40 | 386.05 | 3,381.05 | 120 | 357.45 | 3,421.90 |
| 41 | 385.70 | 3,379.70 | 121 | 357.50 | 3,423.30 |
| 42 | 384.40 | 3,380.00 | 122 | 359.00 | 3,423.30 |
| 43 | 384.80 | 3,381.40 | 123 | 360.45 | 3,423.30 |
| 44 | 383.55 | 3,381.70 | 124 | 360.45 | 3,424.20 |
| 45 | 383.45 | 3,382.20 | 125 | 360.70 | 3,424.75 |
| 46 | 381.30 | 3,382.40 | 126 | 363.35 | 3,424.75 |
| 47 | 378.50 | 3,382.65 | 127 | 364.80 | 3,425.10 |
| 48 | 376.50 | 3,382.80 | 128 | 364.80 | 3,427.00 |
| 49 | 376.30 | 3,381.60 | 129 | 365.50 | 3,427.70 |
| 50 | 374.75 | 3,381.60 | 130 | 366.25 | 3,427.70 |
| 51 | 373.35 | 3,381.60 | 131 | 366.25 | 3,427.00 |
| 52 | 371.50 | 3,381.60 | 132 | 367.65 | 3,427.00 |

Table 6-6. Okefenokee NWA Receptors Used in the Modeling Analysis

| Receptor No. | UTM Coordinates (m) East | UTM Coordinates (m) North | Receptor No. | UTM Coordinates (m) East | UTM Coordinates (m) North |
|---|---|---|---|---|---|
| 53 | 371.50 | 3,380.70 | 133 | 367.65 | 3,428.35 |
| 54 | 370.65 | 3,380.40 | 134 | 366.25 | 3,428.35 |
| 55 | 369.85 | 3,380.50 | 135 | 366.25 | 3,429.10 |
| 56 | 369.85 | 3,381.80 | 136 | 367.70 | 3,429.10 |
| 57 | 369.85 | 3,383.00 | 137 | 367.60 | 3,430.20 |
| 58 | 367.90 | 3,383.15 | 138 | 367.50 | 3,430.45 |
| 59 | 365.90 | 3,383.40 | 139 | 368.85 | 3,430.35 |
| 60 | 363.90 | 3,383.50 | 140 | 368.85 | 3,431.70 |
| 61 | 363.90 | 3,385.40 | 141 | 369.70 | 3,431.70 |
| 62 | 363.90 | 3,387.40 | 142 | 369.70 | 3,433.10 |
| 63 | 362.80 | 3,387.30 | 143 | 371.30 | 3,433.10 |
| 64 | 362.80 | 3,385.30 | 144 | 372.70 | 3,433.10 |
| 65 | 362.80 | 3,384.00 | 145 | 372.70 | 3,434.60 |
| 66 | 360.85 | 3,384.15 | 146 | 372.70 | 3,436.10 |
| 67 | 358.85 | 3,384.30 | 147 | 374.20 | 3,436.10 |
| 68 | 359.55 | 3,385.85 | 148 | 375.45 | 3,436.10 |
| 69 | 359.35 | 3,387.90 | 149 | 375.45 | 3,437.50 |
| 70 | 358.60 | 3,387.90 | 150 | 377.45 | 3,437.50 |
| 71 | 358.45 | 3,389.40 | 151 | 378.90 | 3,437.20 |
| 72 | 356.95 | 3,388.70 | 152 | 380.60 | 3,437.15 |
| 73 | 356.95 | 3,387.50 | 153 | 382.00 | 3,437.10 |
| 74 | 356.50 | 3,387.50 | 154 | 381.95 | 3,435.50 |
| 75 | 356.45 | 3,389.00 | 155 | 383.95 | 3,434.35 |
| 76 | 355.75 | 3,389.55 | 156 | 383.90 | 3,433.50 |
| 77 | 357.20 | 3,390.40 | 157 | 384.70 | 3,433.70 |
| 78 | 357.25 | 3,391.70 | 158 | 386.35 | 3,433.00 |
| 79 | 356.80 | 3,391.70 | 159 | 387.50 | 3,431.50 |
| 80 | 357.20 | 3,393.10 | 160 | 388.55 | 3,431.20 |
| | | | 161 | 389.40 | 3,430.60 |

Table 6-7. Chassahowitzka NWA Receptors Used in the Modeling Analysis

| UTM Coordinates, Zone 17 | |
|---|---|
| East (km) | North (km) |
| 340.3 | 3,165.7 |
| 340.3 | 3,167.7 |
| 340.3 | 3,169.8 |
| 340.7 | 3,171.9 |
| 342.0 | 3,174.0 |
| 343.0 | 3,176.2 |
| 343.7 | 3,178.3 |
| 342.4 | 3,180.6 |
| 341.1 | 3,183.4 |
| 339.0 | 3,183.4 |
| 336.5 | 3,183.4 |
| 334.0 | 3,183.4 |
| 331.5 | 3,183.4 |

Table 6-8. Structure Dimensions Used in the Modeling Analysis, Georgia-Pacific, Palatka

| Structure | Height (ft) | Height (m) | Length (ft) | Length (m) | Width (ft) | Width (m) |
|---|---|---|---|---|---|---|
| RB4 Precipitator | 85 | 25.9 | 123 | 37.5 | 58 | 17.6 |
| RB4 Boiler Building | 193.7 | 59.0 | 104 | 31.7 | 90 | 27.4 |
| Power Plant Building | 107.6 | 32.8 | 101 | 30.8 | 92 | 28.0 |
| Pulp Dryer No. 3 | 84.5 | 25.8 | 275 | 83.7 | 157 | 47.9 |
| Pulp Dryer No. 5 | 70.5 | 21.5 | 328 | 99.9 | 99 | 30.3 |
| Pulp Dryer No. 4 | 73 | 22.3 | 265 | 80.7 | 125 | 38.2 |
| Warehouse Complex 1 | 62.67 | 19.1 | 1,394 | 424.9 | 377 | 114.8 |
| Warehouse Complex 2 | 46.8 | 14.3 | 924 | 281.5 | 425 | 129.5 |
| Nos. 1 and 2 Machines, Storage | 71.16 | 21.7 | 225 | 68.6 | 407 | 124.2 |
| Kraft Converting and Storing | 60.75 | 18.5 | 310 | 94.4 | 524 | 159.9 |
| Kraft Warehouse and Multi-Wall | 56.7 | 17.3 | 290 | 88.4 | 521 | 158.7 |
| Digester | 62.2 | 19.0 | 264 | 80.4 | 33 | 10.1 |
| No. 3 RB Building [a] | 100 | 30.5 | 61 | 18.6 | 34 | 10.4 |
| No. 2 RB Building [a] | 100 | 30.5 | 58 | 17.7 | 73 | 22.3 |

[a] 1974 Baseline Only

Table 6-9. Maximum $SO_2$, $NO_x$, and CO Concentrations Predicted for the Project Compared to the EPA PSD Class II Significant Impact Levels

| Pollutant | Averaging Period | Emission Rate [a] (g/s) | Predicted Concentration [b] ($\mu g/m^3$) | Significant Impact Level ($\mu g/m^3$) |
|---|---|---|---|---|
| $SO_2$ | Annual | 111.98 | 2.11 | 1 |
| | 24-Hour | 30.73 | 10.07 | 5 |
| | 3-Hour | 31.32 | 31.37 | 25 |
| $NO_x$ | Annual | 5.06 | 0.10 | 1 |
| CO | 8-Hour | 10.46 | 6.56 | 500 |
| | 1-Hour | 10.46 | 16.45 | 2,000 |

[a] Refer to Tables 6-3 and 6-4 for emissions and modeling parameters for the No. 4 Combination Boiler. The emissions presented represent the net (future - actual) emissions.

[b] Based on the following highest concentrations predicted from the generic modeling analysis (modeled using 10 g/s emissions) and the 5-year surface and upper air meteorological data for 1984 to 1988 from the National Weather Service Stations in Jacksonville and Waycross, respectively:

| Averaging Period | Impact ($\mu g/m^3$) | Receptor Location [c] x (m) | y (m) | Period (YYMMDDHH) [d] |
|---|---|---|---|---|
| Annual | 0.134 | 2,150.0 | -229.7 | 84123124 |
| | 0.131 | 2,300.0 | -229.7 | 85123124 |
| | 0.121 | 1,900.0 | -900.0 | 86123124 |
| | 0.188 | 1,900.0 | -1,100.0 | 87123124 |
| | 0.145 | 1,900.0 | -1,000.0 | 88123124 |
| 24-Hour | 2.722 | 2,000.0 | -200.0 | 84022924 |
| | 3.276 | 1,800.0 | -300.0 | 85021224 |
| | 2.219 | -3,187.2 | 3,215.8 | 86030924 |
| | 2.377 | 2,000.0 | -1,300.0 | 87013124 |
| | 2.092 | 456.8 | -219.0 | 88040724 |
| 8-Hour | 5.443 | 1,600.0 | -800.0 | 84040616 |
| | 5.396 | 696.9 | -39.2 | 85021208 |
| | 4.119 | 1,500.0 | 400.0 | 86060816 |
| | 5.628 | 536.8 | -159.1 | 87120416 |
| | 6.271 | 456.8 | -219.0 | 88040716 |
| 3-Hour | 8.042 | 500.0 | -300.0 | 84022912 |
| | 7.241 | 2,000.0 | -300.0 | 85021206 |
| | 8.693 | 400.0 | -300.0 | 86052415 |
| | 7.712 | 536.8 | -159.1 | 87120412 |
| | 10.015 | 500.0 | -300.0 | 88040715 |
| 1-Hour | 15.067 | 400.0 | -300.0 | 84052412 |
| | 15.633 | 456.8 | -219.0 | 85091013 |
| | 15.73 | 456.8 | -219.0 | 86060212 |
| | 14.724 | 500.0 | -200.0 | 87012302 |
| | 15.558 | 500.0 | -200.0 | 88080712 |

[c] Relative to the old TRS Incinerator stack.

[d] YYMMDDHH = Year, Month, Day, Hour Ending

Table 6-10. Maximum Predicted $PM_{10}$ Impacts for the Project Compared to the EPA PSD Class II Significant Impact Levels

| Pollutant/ Averaging Time | Concentration [a] (ug/m$^3$) | Receptor Location [b] x (m) | y (m) | Time Period (YYMMDDHH) [c] | EPA Significant Impact Level (ug/m$^3$) |
|---|---|---|---|---|---|
| Annual | 0.38 | 296.7 | -338.9 | 84123124 | 1 |
| | 0.37 | 456.8 | -219.0 | 85123124 | |
| | 0.38 | 216.6 | -398.8 | 86123124 | |
| | 0.50 | 296.7 | -338.9 | 87123124 | |
| | 0.49 | 216.6 | -398.8 | 88123124 | |
| 24-Hour | 4.66 | 216.6 | -398.8 | 84013124 | 5 |
| | 4.82 | 216.6 | -398.8 | 85121924 | |
| | 3.74 | 696.9 | -39.2 | 86052224 | |
| | 4.40 | 296.7 | -338.9 | 87112024 | |
| | 4.86 | 376.7 | -278.9 | 88101724 | |

[a] Based on 5-year surface and upper air meteorological data for 1984 to 1988 from the National Weather Servic in Jacksonville and Waycross, respectively.
Refer to Tables 6-3 and 6-4 for emissions and modeling parameters for the No. 4 Combination Boiler and Bark Handling System and Cyclone. The emissions presented represent the net (future - actual) emissions.

[b] Relative to the old TRS Incinerator stack.

[c] YYMMDDHH = Year, Month, Day, Hour Ending

Table 6-11. Maximum SAM Concentrations Predicted for the GP Palatka Mill Project

| Pollutant | Averaging Period | Emission Rate [a] (g/s) | Predicted Concentration [b] ($\mu g/m^3$) |
|---|---|---|---|
| SAM | 1-Hour | 1.38 | 2.17 |
| | 3-Hour | 1.38 | 1.38 |
| | 8-Hour | 1.35 | 0.85 |
| | 24-Hour | 1.35 | 0.44 |
| | Annual | 4.92 | 0.09 |

[a] Refer to Table 6-3 for derivation. The emissions presented represent the net (future - actual) emissions..

[b] Refer to Table 6-9 for derivation of predicted concentrations.

Table 6-12. Summary of Maximum Pollutant Concentrations Predicted for the Project at the Okefenokee NWA PSD Class I Area Compared to the EPA Class I Significant Impact Levels

| Pollutant and Averaging Time | Highest Concentration [a] (µg/m³) | Receptor UTM Location (km) East | Receptor UTM Location (km) North | Time Period [b] YYMMDDHH | Proposed EPA Class I Significant Impact Level (µg/m³) |
|---|---|---|---|---|---|
| $SO_2$ | | | | | |
| Annual | 0.031 | 385.70 | 3379.70 | 90123124 | 0.1 |
| | 0.027 | 385.70 | 3379.70 | 92123124 | |
| | 0.045 | 385.70 | 3379.70 | 96123124 | |
| 24-hour | 0.15 | 371.50 | 3380.70 | 90050324 | 0.2 |
| | 0.18 | 384.40 | 3380.00 | 92112424 | |
| | 0.23 | 384.40 | 3380.00 | 96042224 | |
| 3-hour | 0.59 | 360.85 | 3384.15 | 90123006 | 1.0 |
| | 0.84 | 378.50 | 3382.65 | 92112406 | |
| | 0.77 | 385.70 | 3379.70 | 96032506 | |
| $PM_{10}$ | | | | | |
| Annual | 0.0037 | 385.70 | 3379.70 | 90123124 | 0.1 |
| | 0.0031 | 385.70 | 3379.70 | 92123124 | |
| | 0.0049 | 385.70 | 3379.70 | 96123124 | |
| 24-hour | 0.050 | 371.50 | 3380.70 | 90050324 | 0.2 |
| | 0.055 | 381.30 | 3382.40 | 92112424 | |
| | 0.073 | 376.30 | 3381.60 | 96050924 | |
| $NO_2$ | | | | | |
| Annual | 0.0007 | 385.70 | 3379.70 | 90123124 | 0.1 |
| | 0.0005 | 385.70 | 3379.70 | 92123124 | |
| | 0.0012 | 385.70 | 3379.70 | 96123124 | |

Note: UTM = Universal Transverse Mercator.

[a] Based on the CALPUFF model using 1990, 1992, and 1996 surface and upper air meteorological data developed with the CALMET program. UTM coordinates relative to Zone 17.

[b] YY = Year; MM = Month; DD = Day; HH = Hour ending.

Table 6-13. Summary of Maximum Pollutant Concentrations Predicted for the Project at the Chassahowitzka NWA PSD Class I Area Compared to the EPA Class I Significant Impact Levels

| Pollutant and Averaging Time | Highest Concentration [a] ($\mu g/m^3$) | Receptor UTM Location (km) East | Receptor UTM Location (km) North | Time Period [b] YYMMDDHH | Proposed EPA Class I Significant Impact Level ($\mu g/m^3$) |
|---|---|---|---|---|---|
| $SO_2$ | | | | | |
| Annual | 0.021 | 341.10 | 3183.40 | 90123124 | 0.1 |
| | 0.022 | 331.50 | 3183.40 | 92123124 | |
| | 0.021 | 341.10 | 3183.40 | 96123124 | |
| 24-hour | 0.12 | 340.30 | 3165.70 | 90103024 | 0.2 |
| | 0.11 | 331.50 | 3183.40 | 92111824 | |
| | 0.18 | 342.00 | 3174.00 | 96111424 | |
| 3-hour | 0.35 | 339.00 | 3183.40 | 90102003 | 1.0 |
| | 0.36 | 334.00 | 3183.40 | 92021009 | |
| | 0.53 | 343.70 | 3178.30 | 96122709 | |
| $PM_{10}$ | | | | | |
| Annual | 0.0027 | 341.10 | 3183.40 | 90123124 | 0.1 |
| | 0.0026 | 331.50 | 3183.40 | 92123124 | |
| | 0.0025 | 341.10 | 3183.40 | 96123124 | |
| 24-hour | 0.041 | 340.30 | 3165.70 | 90103024 | 0.2 |
| | 0.040 | 343.00 | 3176.20 | 92020324 | |
| | 0.057 | 341.10 | 3183.40 | 96122724 | |
| $NO_2$ | | | | | |
| Annual | 0.00024 | 343.70 | 3178.30 | 90123124 | 0.1 |
| | 0.00048 | 331.50 | 3183.40 | 92123124 | |
| | 0.00048 | 341.10 | 3183.40 | 96123124 | |

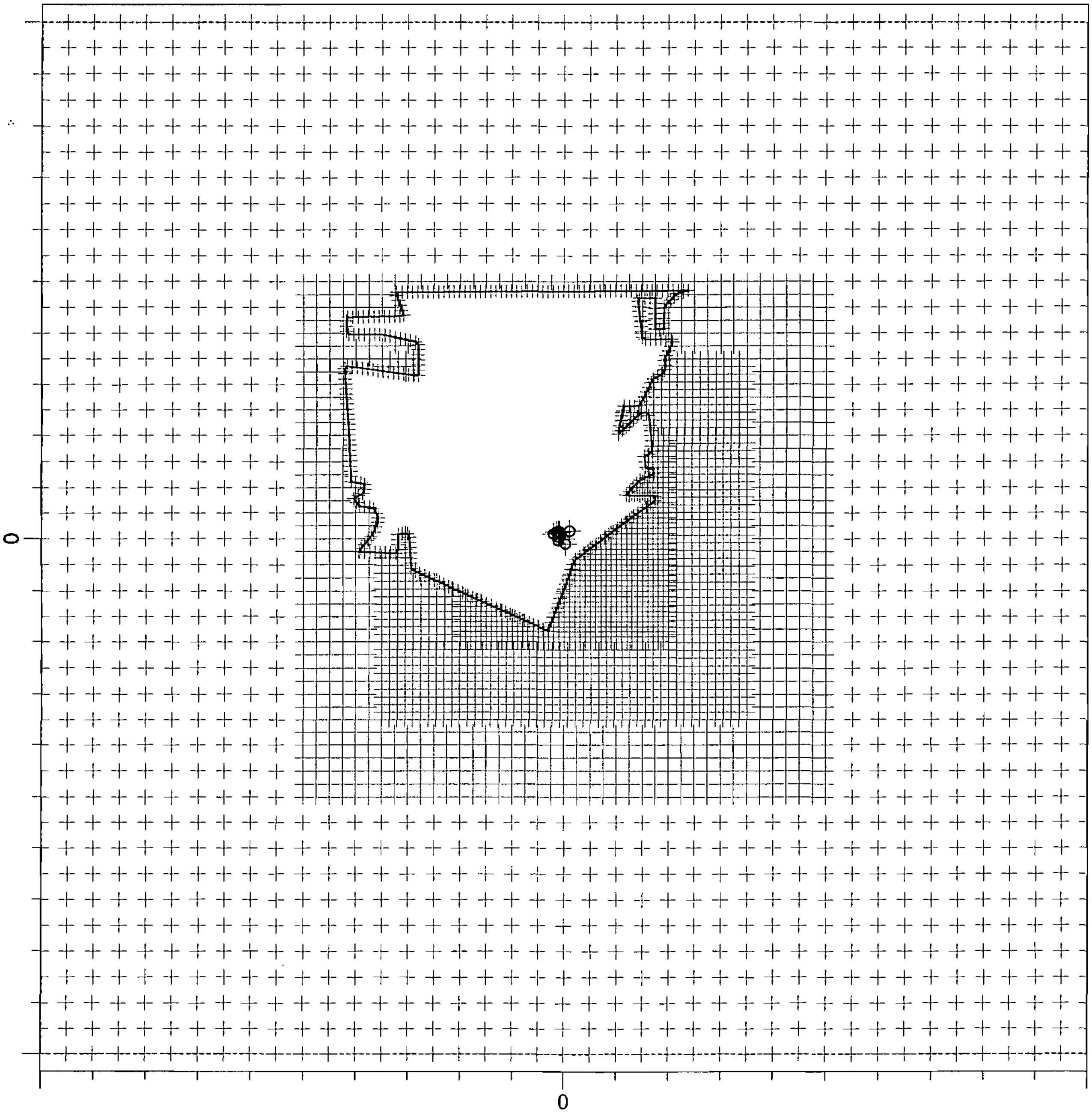
Note: UTM = Universal Transverse Mercator.

[a] Based on the CALPUFF model using 1990, 1992, and 1996 surface and upper air meteorological data developed with the CALMET program. UTM coordinates relative to Zone 17.

[b] YY = Year; MM = Month; DD = Day; HH = Hour ending.

PROJECT TITLE:

**Figure 6-1. Property Boundary and Off-Site Receptior Locations**
**Georgia-Pacific Palatka, Bark Hog PSD**




| COMMENTS: | SOURCES : 12 | COMPANY NAME: Golder Associates Inc. | |
|---|---|---|---|
| | RECEPTORS : 3952 | | SCALE: 0 — 4 km |
| | | DATE: 4/29/2004 | PROJECT NO.: 043-7562 |

# 7.0 ADDITIONAL IMPACT ANALYSIS FOR THE VICINITY OF THE GP PALATKA MILL

## 7.1 IMPACTS TO SOILS, VEGETATION, AND VISIBILITY IN THE VICINITY OF THE GP PALATKA MILL

### 7.1.1 PREDICTED AIR QUALITY IMPACTS

The results of the ambient air quality modeling for the proposed GP modification, in the vicinity of the plant, are presented in Table 7-1. The predicted maximum increase in pollutant concentrations due to the proposed project are presented for the annual, 24-hour, 8-hour, 3-hour, and 1-hour averaging times.

### 7.1.2 IMPACTS TO SOILS

Air contaminants can affect soils through fumigation by gaseous forms, accumulation of compounds transformed from the gaseous state, or by the direct deposition of PM or PM to which certain contaminants are absorbed. According to the Putnam County Soil Survey (1990), the soils in the vicinity of the GP Palatka Mill are dominated by Terra Ceia muck, with Cassia fine sand and Pamona fine sand also present. The Terra Ceia muck, Cassia fine sand, and Pomona fine sand series are described in the Putnam County Soil Survey as follows:

**Terra Ceia muck, frequently flooded** – This soil is nearly level and very poorly drained, found on broad to narrow plains along the St. Johns River and its tributaries. Typically the upper part of this organic soil is dark reddish brown muck approximately 28 inches thick, while the lower portion to a depth of approximately 80 inches is black muck. This soil has a high water table at the surface except during extended dry periods. The available water capacity is very high, permeability is rapid, and natural fertility is moderate. Typical vegetation includes wetlands forested with sweetgum, red maple, cypress, bay, and cabbage palm. The soil reaction for Terra Ceia muck is classified as slightly acid within the top 28 inches, and mildly alkaline between 28 and 80 inches below the surface.

**Pomona fine sand** – This soil is nearly level and poorly drained, found in broad flatwoods areas. Typically this soil has a surface layer of black fine sand approximately 6 inches thick underlain by a subsurface layer of gray and light gray fine sand to a depth of 20 inches. In most years this soil has a high water table at a depth of less than 12 inches for 1 to 3 months. The available water capacity is very low, permeability is rapid, and natural fertility is low. Typical vegetation is pine flatwoods. The soil reaction for Pomona fine sand is classified as extremely acid within the top 6 inches, very strongly acidic between 6 to 10 inches, and strongly acidic between 10 and 20 inches below the surface.

**Cassia fine sand** – This soil is nearly level and somewhat poorly drained, found on small knolls within flatwoods and in low positions on uplands. Typically, this soil has a surface layer of gray fine sand approximately 4 inches thick, and a subsurface layer of light gray fine sand to a depth of 28 inches. In most years, this soil has a water table at a depth of 15 to 40 inches for about 6 months. The available water capacity is very low, permeability is rapid, and natural fertility is low. Natural vegetation includes pine flatwoods and oak. Cassia fine sand is classified as extremely acid within the top 4 inches, very strongly acidic between 4 to 9 inches, and strongly acidic between 9 and 24 inches below the surface.

The dominant soil in the vicinity of the GP facility, Terra Ceia muck, is a highly organic wetland soil and has an extremely high buffering capacity based on the cation exchange capacity, base saturation, and bulk density. Therefore, this soil would be relatively insensitive to atmospheric inputs. The maximum predicted $NO_2$, $PM_{10}$, and CO concentrations in the vicinity of the site as a result of the proposed project are below the significant impact levels. The maximum predicted $SO_2$ concentrations in the vicinity of the site are below the AAQS. Since the AAQS are designed to protect the public welfare, including effects on soils and vegetation, no detrimental effects on soils should occur in the vicinity of the GP Palatka Mill due to the proposed project.

### 7.1.3 IMPACTS TO VEGETATION

#### 7.1.3.1 Vegetation Analysis

In general, the effects of air pollutants on vegetation occur primarily from $SO_2$, $NO_2$, $O_3$, and PM. Effects from minor air contaminants such as fluoride, chlorine, hydrogen chloride, ethylene, ammonia, hydrogen sulfide, CO, and pesticides have also been reported in the literature. The effects of air pollutants are dependent both on the concentration of the contaminant and the duration of the exposure. The term "injury," as opposed to damage, is commonly used to describe all plant responses to air contaminants and will be used in the context of this analysis. Air contaminants are thought to interact primarily with plant foliage which is considered to be the major pathway of exposure. For purposes of this analysis, it was assumed that 100 percent of each air contaminant of concern is accessible to the plants.

Injury to vegetation from exposure to various levels or air contaminants can be termed acute, physiological, or chronic. Acute injury occurs as a result of a short-term exposure to a high contaminant concentration and is typically manifested by visible injury symptoms ranging from chlorosis (discoloration) to necrosis (dead areas). Physiological or latent injury occurs as the result of a long-term exposure to contaminant concentrations below that which results in acute injury symptoms. Chronic injury results from repeated exposure to low concentrations over extended periods of time, often without any visible symptoms, but with some effect on the overall growth and productivity of the plant. In this assessment, 100 percent of the particular air pollutant in the ambient air was assumed to interact with the vegetation. This is a conservative approach.

**Sulfur Dioxide**

Sulfur is an essential plant nutrient usually taken up as sulfate ions by the roots from the soil solution. When $SO_2$ in the atmosphere enters the foliage through pores in the leaves, it reacts with water in the leaf interior to form sulfite ions. Sulfite ions are highly toxic. They interact with enzymes, compete with normal metabolites, and interfere with a variety of cellular functions (Horsman and Wellburn, 1976). However, within the leaf, sulfite is oxidized to sulfate ions, which can then be used by the plant as a nutrient. Small amounts of sulfite may be oxidized before they prove harmful.

$SO_2$ gas at elevated levels has long been known to cause injury to plants. Acute $SO_2$ injury usually develops within a few hours or days of exposure, and symptoms include marginal, flecked, and/or intercoastal necrotic areas that appear water-soaked and dullish green initially. This injury generally occurs to younger leaves. Chronic injury usually is evident by signs of chlorosis, bronzing, premature senescence, reduced growth, and possible tissue necrosis (EPA, 1982). Observed $SO_2$ effect levels for several plant species and plant sensitivity groupings are presented in Tables 7-2 and 7-3, respectively.

Many studies have been conducted to determine the effects of high-concentration, short-term $SO_2$ exposure on natural community vegetation. Sensitive plants include ragweed, legumes, blackberry, southern pine, and red and black oak. These species are injured by exposure to 3-hour average $SO_2$ concentrations of 790 to 1,570 $\mu g/m^3$. Intermediate plants include locust and sweetgum. These species are injured by exposure to 3-hour average $SO_2$ concentrations of 1,570 to 2,100 $\mu g/m^3$. Resistant species (injured at concentrations above 2,100 $\mu g/m^3$ for 3 hours) include white oak and dogwood (EPA, 1982).

A study of native Floridian species (Woltz and Howe, 1981) demonstrated that cypress, slash pine, live oak, and mangrove exposed to 1,300 μg/m$^3$ $SO_2$ for 8 hours were not visibly damaged. This finding supports the levels cited by other researchers on the effects of $SO_2$ on vegetation. A corroborative study (McLaughlin and Lee, 1974) demonstrated that approximately 20 percent of a cross-section of plants ranging from sensitive to tolerant was visibly injured at 3-hour average $SO_2$ concentrations of 920 μg/m$^3$.

Jack pine seedlings exposed to $SO_2$ concentrations of 470 to 520 μg/m$^3$ for 24 hours demonstrated inhibition of foliar lipid synthesis; however, this inhibition was reversible (Malhotra and Kahn, 1978). Black oak exposed to 1,310 μg/m$^3$ $SO_2$ for 24 hours a day for 1 week demonstrated a 48 percent reduction in photosynthesis (Carlson, 1979).

Two lichen species indigenous to Florida exhibited signs of $SO_2$ damage in the form of decreased biomass gain and photosynthetic rate as well as membrane leakage when exposed to concentrations of 200 to 400 μg/m$^3$ for 6 hours/week for 10 weeks (Hart et al., 1988).

The predicted maximum 3- and 24-hour average $SO_2$ concentrations due to the proposed project are 31.4 and 10.1 $\mu$g/m$^3$, respectively, which are well below the injury threshold of sensitive species of vegetation.

**Nitrogen Dioxide**

A review of the literature indicates great variability in $NO_2$ dose-response relationship in vegetation. Acute $NO_2$ injury symptoms are manifested as water-soaked lesions, which first appear on the upper surface, followed by rapid tissue collapse. Low-concentration, long-term exposures as frequently encountered in polluted atmospheres often do not induce the lesions associated with acute exposures but may still result in some growth suppression. Citrus trees exposed to 470 $\mu$g/m$^3$ of $NO_2$ for 290 days showed injury (Thompson *et al.*, 1970). Sphagnum exposed for 18 months at an average concentration of 11.7 $\mu$g/m$^3$ showed reduced growth (Press *et al.*, 1986)

The maximum increase in ground-level 1-hour and annual average $NO_2$ concentrations predicted to occur in the vicinity of the plant during the operation of the proposed project are 3.3 and 0.10 $\mu$g/m$^3$, respectively (see Table 7-1). These maximum predicted concentrations are well below reported effects levels.

**Carbon Monoxide**

Concentrations of CO even in polluted atmospheres are not detrimental to vegetation (EPA, 1976). CO has not been found to produce detrimental effects on plants at concentrations below 100 ppm (114,500 $\mu g/m^3$) for exposures from 1 to 3 weeks (EPA, 1976). The predicted maximum concentrations shown in Table 7-1 are well below levels reported to cause detrimental effects.

**Particulate Matter ($PM_{10}$)**

Although information pertaining to the effects of particulate matter on plants is scarce, some threshold concentrations are available. Mandoli and Dubey (1998) exposed ten species of native Indian plants to levels of particulate matter ranging from 210 to 366 $\mu g/m^3$ for an 8-hour averaging period. Damage in the form of a higher leaf area/dry weight ratio was observed at varying degrees for most plants tested. Concentrations of particulate matter lower than 163 $\mu g/m^3$ did not appear to be injurious to the tested plants. The maximum predicted 24-hour and annual average $PM_{10}$ concentrations due to the proposed project of 4.86 and 0.50 $\mu g/m^3$, respectively, are well below the injury thresholds reported in the literature.

**VOC Emissions and Impacts on Ozone**

It is difficult to predict what effect the proposed project's emissions of VOC will have on ambient $O_3$ concentrations from either a local or regional scale. VOC and $NO_x$ emissions are precursors to the formation of $O_3$. $O_3$ is formed down-wind from emission sources when VOC, and $NO_x$ emissions from the facility react in the presence of sunlight. Background (without man-made sources) ambient concentrations of $O_3$ are normally in the range of 20 to 39 $\mu g/m^3$ (0.01 to 0.02 ppm) (Heath, 1975).

$O_3$ can cause various damage to broad-leaved plants including: tissue collapse, interveinal necrosis and markings on the upper surface of leaves known as stippling (pigmented yellow, light tan, red brown, dark brown, red, or purple), flecking (silver or bleached straw white), mottling, chlorosis or bronzing, and bleaching. $O_3$ can also stunt plant growth and bud formation. On certain plants such as citrus, grape, and tobacco, it is common for leaves to wither and drop early. A literature review suggests that exposure for 4 hours at levels of 0.04 to 11.0 ppm of $O_3$ will result in plant injury for sensitive plants. The extent of the injury depends on the plant species and environmental conditions prior to and during exposure.

Given that the $O_3$ measurements in the region comply with the AAQS (see Sections 4.0 and 7.2.5) and the increase in VOC emissions for the project represents less than a 1-percent change in regional VOC emissions, no adverse effects on vegetation due to the project's VOC emissions are expected.

**Sulfuric Acid Mist**

Acidic precipitation or acid rain is coupled to $SO_2$ emissions mainly formed during the burning of fossil fuels. This pollutant is oxidized in the atmosphere and dissolves in rain forming SAM, which falls as acidic precipitation (Ravera, 1989). Although concentration data are not available, SAM has been reported to yield necrotic spotting on the upper surfaces of leaves (Middleton *et al.*, 1950).

No significant adverse effects on vegetation are expected from the project's emissions because $SO_2$ concentrations, which lead directly to the formation of SAM concentrations, are predicted to be well below levels that have been documented as negatively affecting vegetation.

### 7.1.4 IMPACTS UPON VISIBILITY

All air emission sources affected by the proposed modification are existing sources. No increase in permitted emissions is requested, although actual emissions are predicted to increase. All these sources are in compliance with opacity regulations and should remain in compliance after the modification. As a result, no adverse impacts upon visibility are expected.

## 7.2 IMPACTS DUE TO ASSOCIATED DIRECT GROWTH

### 7.2.1 INTRODUCTION

Rule 62-212.400(3)(h)(5), F.A.C., states that an application must include information relating to the air quality impacts of, and the nature and extent of all general, residential, commercial, industrial and other growth which has occurred since August 7, 1977, in the area the facility or modification would affect. This growth analysis considers air quality impacts due to emissions resulting from the industrial, commercial, and residential growth associated with the proposed expansion at the GP Palatka Mill. This information is consistent with the EPA Guidance related to this requirement in the *Draft New Source Review Workshop Manual* (EPA, 1990).

In general, there has been minimal growth in the GP Palatka Mill area since 1977. Putnam County is surrounded by Marion County to the south and west, Alachua County to the west, Clay County to the north, St. John's County to the north and east, Flagler County to the east, and Volusia County to the south. Putnam County encompasses an 827-square mile area including 733-square miles of land area.

The Bark Hog is being replaced to improve bark/wood burning in the No. 4 Combination Boiler and to reduce fuel oil consumption. Additional growth as a direct result of the proposed modification is not expected.

Construction of the project (replacement of the Bark Hog) will occur over a 1-month period, requiring an average of approximately 5 workers during that time. It is anticipated that many of these construction personnel will commute to the site.

The project will not require any additional operational workers once the project is completed.

There are also expected to be no air quality impacts due to associated commercial and industrial growth given the location of the existing GP Palatka Mill. The existing commercial and industrial infrastructure should be adequate to provide any support services that the project might require and would not increase with the operation of the project.

The following discussion presents general trends in residential, commercial, industrial, and other growth that has occurred since August 7, 1977, in Putnam County. As such, the information presents information available from a variety of sources (*i.e.*, Florida Statistical Abstract, FDEP, etc.) that characterize Putnam County as a whole.

### 7.2.2 RESIDENTIAL GROWTH

#### 7.2.2.1 Population and Household Trends

As an indicator of residential growth, the trend in the population and number of household units in Putnam County since 1977 are shown in Figure 7-1. The county experienced a 47-percent increase in population for the years 1977 through 2000. During this period, there was an increase in population of about 22,600. Similarly, the number of households in the county increased by about 12,000, or 73 percent, since 1977.

#### 7.2.2.2 Growth Associated with the Operation of the Project

Because there will be no additional workers needed to operate the project, there will be no residential growth due to the project.

### 7.2.3 COMMERCIAL GROWTH

#### 7.2.3.1 Retail Trade and Wholesale Trade

As an indicator of commercial growth in Putnam County, the trends in the number of commercial facilities and employees involved in retail and wholesale trade are presented in Figure 7-2. The retail trade sector comprises establishments engaged in retailing merchandise. The retailing process is the final step in the distribution of merchandise. Retailers are, therefore, organized to sell merchandise in small quantities to the general public. The wholesale trade sector comprises establishments engaged in wholesaling merchandise. This sector includes merchant wholesalers who buy and own the goods they sell; manufacturers' sales branches and offices that sell products manufactured domestically by their own company; and agents and brokers who collect a commission or fee for arranging the sale of merchandise owned by others.

Since 1977, retail trade has increased by about 14 establishments and 2,000 employees or 6 and 118 percent, respectively. For the same period, wholesale trade has increased by 28 establishments and 346 employees, or 82 and 126 percent, respectively.

#### 7.2.3.2 Labor Force

The trend in the labor force in Putnam County since 1977 is shown in Figure 7-3. The greatest number of persons employed in Putnam County has been in the manufacturing, government, and retail trade sectors. Between 1977 and 1999, approximately 5,000 persons were added to the available work force, for an increase of 34 percent.

#### 7.2.3.3 Tourism

Another indicator of commercial growth in Putnam County is the tourism industry. As an indicator of tourism growth in the county, the trend in the number of hotels and motels and the number of units at the hotels and motels are presented in Figure 7-4.

This industry comprises establishments primarily engaged in marketing and promoting communities and facilities to businesses and leisure travelers through a range of activities, such as assisting organizations in locating meeting and convention sites; providing travel information on area attractions, lodging accommodations, restaurants; providing maps; and organizing group tours of local historical, recreational, and cultural attractions.

Between 1978 and 2000, there was a decrease of 12 percent in the number of hotels and motels, and an increase of 14 percent in the number of units at those establishments in the county.

#### 7.2.3.4 Transportation

As an indicator of transportation growth, the trend in the number of vehicle miles traveled (VMT) by motor vehicles on major roadways in Putnam County is presented in Figure 7-5. The county's main roadways are U.S. Route 17 and SR 100.

Between 1977 and 2001, there was an increase of about 1,560,000 VMT, or 113 percent, on major roadways in the county.

#### 7.2.3.5 Growth Associated with the Operation of the Project

The existing commercial and transportation infrastructure should be adequate to provide any support services that might be required during construction and operation of the project. The workforce needed to operate the proposed project represents a small fraction of the labor force present in the immediate and surrounding areas.

### 7.2.4 INDUSTRIAL GROWTH

#### 7.2.4.1 Manufacturing and Agricultural Industries

As an indicator of industrial growth, the trend in the number of employees in the manufacturing industry in Putnam County since 1977 is shown in Figure 7-6. As shown, the manufacturing industry experienced a slight decrease in employees from 1977 through 2000.

As another indicator of industrial growth, the trend in the number of employees reported in the agricultural industry in Putnam County since 1977 is also shown in Figure 7-6. As shown, the agricultural industry experienced an increase of about 400 employees from 1977 through 2000.

#### 7.2.4.2 Utilities

Existing power plants in Putnam County include the following:

- Florida Power & Light's Putnam Plant;
- Seminole Electric Cooperative, Inc.'s Seminole Power Plant; and
- Georgia-Pacific Corporation's Palatka Operations.

Together, these power plants have an electrical nameplate generating capacity of over 1,800 megawatts (MW).

As an indicator of electrical utility growth, the electrical nameplate generating capacity in Putnam County since 1977 is shown in Figure 7-7. As shown, the electrical nameplate generating capacity has increased by 1,585 MW, or 521 percent since 1977.

#### 7.2.4.3 Growth Associated with the Operation of the Project

Since the PSD baseline date of August 7, 1977, there has been only one major facility built within a 35-km radius of the GP Palatka Mill site. This was the Seminole Electric Power Plant. There are a limited number of facilities located throughout the 35-km radius area surrounding the site. Based on the locations of nearby air emission sources, there has not been a concentration of industrial and commercial growth in the vicinity of the GP Palatka Mill site.

### 7.2.5 AIR QUALITY DISCUSSION

#### 7.2.5.1 Air Emissions and Spatial Distribution of Major Facilities

The locations of major air pollutant facilities in Putnam County are presented in Tables 6-3 and 6-4. Based on actual emissions reported for 1999 (latest year of available data) by EPA on its AIRSdata website, total emissions from stationary sources in the county are as follows:

| | |
|---|---|
| $SO_2$: | 43,000 TPY |
| $PM_{10}$: | 1,700 TPY |
| $NO_x$: | 28,900 TPY |
| CO: | 4,640 TPY |
| VOC: | 800 TPY |

#### 7.2.5.2 Air Emissions from Mobile Sources

The trends in the air emissions of CO, VOC, and $NO_x$ from mobile sources in Putnam County are presented in Figure 7-8. Between 1977 and 2002, there were significant decreases in CO and VOC emissions, and there was only a slight increase in $NO_x$ emissions during that same time period. The decrease in CO and VOC emissions were about 41 and 5 tons per day, respectively, which represent decreases from 1977 emissions of 48 and 42 percent, respectively. The increase in $NO_x$ emissions was less than one half of a ton per day, which represents an increase of about 5 percent since 1977.

#### 7.2.5.3 Air Monitoring Data

Since 1977, Putnam County has been classified as attainment for all criteria pollutants. Air quality monitoring data have been collected in Putnam County, primarily in the central portion of the county in and around the city of Palatka. For this evaluation, the air quality monitoring data collected at the monitoring station nearest to the GP Palatka Mill were used to assess air quality trends since 1977. Air quality monitoring data were based on the following monitoring stations:

- $SO_2$ and $PM_{10}$ concentrations – Palatka,
- $NO_2$ concentrations – Palatka and Jacksonville,
- CO concentrations – Jacksonville, and
- $O_3$ concentrations – Gainesville and Jacksonville.

Data collected from these stations are considered to be generally representative of air quality in Putnam County. Because the monitoring stations in Jacksonville ($NO_2$, CO, and $O_3$) are located in more urbanized areas than the GP Palatka Mill, the reported concentrations for those stations are likely to be higher than that experienced at the site.

The air monitoring data indicate that the maximum air quality concentrations currently measured in the region comply with and are well below the applicable AAQS. These monitoring stations are located in areas where the highest concentrations of a measured pollutant are expected due to the combined effect of emissions from stationary and mobile sources, as well as the effects of meteorology. Therefore, the ambient concentrations in areas not monitored should have pollutant concentrations less than the monitored concentrations from these sites.

In addition, since 1988, PM in the form of $PM_{10}$ has been collected at the air monitoring stations due to the promulgation of the $PM_{10}$ AAQS. Prior to 1989, the AAQS for PM was in the form of total suspended particulates (TSP) concentrations, and this form was measured at the stations.

#### 7.2.5.4 $SO_2$ Concentrations

The trends in the 3-hour, 24-hour, and annual average $SO_2$ concentrations measured in Putnam County since 1977 are presented in Figures 7-9 through 7-11, respectively. As shown in these figures, measured $SO_2$ concentrations have been and continue to be well below the AAQS.

#### 7.2.5.5 $PM_{10}$/TSP Concentrations

The trends in the 24-hour and annual average $PM_{10}$ and TSP concentrations since 1977 are presented in Figures 7-12 and 7-13, respectively. TSP concentrations are presented through 1988 since the AAQS was based on TSP concentrations through that year. In 1988, the TSP AAQS was revoked and the PM standard was revised to $PM_{10}$.

As shown in these figures, measured TSP concentrations were generally below the TSP AAQS. Since 1988 when $PM_{10}$ concentrations have been measured, the $PM_{10}$ concentrations have been and continue to be below the AAQS.

#### 7.2.5.6 $NO_2$ Concentrations

The trends in the annual average $NO_2$ concentrations measured at the nearest monitors to the GP Palatka Mill are presented in Figure 7-14. As shown in this figure, measured $NO_2$ concentrations have been well below the AAQS.

#### 7.2.5.7 CO Concentrations

The trends in the 1-hour and 8-hour average CO concentrations measured since 1977 in Jacksonville are presented in Figures 7-15 and 7-16, respectively. As shown in these figures, measured CO concentrations have been well below the AAQS for the past several years.

#### 7.2.5.8 Ozone Concentrations

The trends in the 1-hour average $O_3$ concentrations since 1977 are presented in Figure 7-17. The trends in the 8-hour average $O_3$ concentrations since 1995 are presented in Figure 7-18. As shown in these figures, even in the more urbanized areas of Jacksonville and Gainesville, the measured $O_3$ concentrations have primarily been below the 1-hour average AAQS and the new 8-hour average AAQS.

#### 7.2.5.9 Air Quality Associated with the Operation of the Project

The air quality data measured in the region of the GP Palatka Mill indicate that the maximum air quality concentrations are well below and comply with the AAQS. Also, based on the trends presented of these maximum concentrations, the air quality has generally improved in the region since the baseline date of August 7, 1977. Because the maximum concentrations for the proposed modification at the Mill are predicted to be below the significant impact levels except for $SO_2$, air quality concentrations in the region are expected to remain below and comply with the AAQS when the project becomes operational. For $SO_2$, the accompanying modeling report demonstrates compliance with AAQS.

Table 7-1. Summary of Maximum Pollutant Concentrations Predicted for the Project to Address Impacts to Soils and Vegetation in the GP Mill Vicinity

| Pollutant and Averaging Time | Emission Rate [a] (g/s) | Concentration [b] ($\mu g/m^3$) | Receptor Location [c] x (m) | Receptor Location [c] y (m) | Time Period [d] YYMMYYHH |
|---|---|---|---|---|---|
| $SO_2$ | | | | | |
| Annual | 111.98 | 2.11 | 1,900.0 | -1,100.0 | 87123124 |
| 24-hour | 30.73 | 10.1 | 1,800.0 | -300.0 | 85021224 |
| 8-hour | 30.73 | 19.3 | 456.8 | -219.0 | 88040716 |
| 3-hour | 31.32 | 31.4 | 500.0 | -300.0 | 88040715 |
| 1-hour | 31.32 | 49.3 | 456.8 | -219.0 | 86060212 |
| $PM_{10}$ | | | | | |
| Annual | [a] | 0.50 | 296.7 | -338.9 | 87123124 |
| 24-hour | [a] | 4.86 | 376.7 | -278.9 | 88101724 |
| $NO_2$ | | | | | |
| Annual | 5.06 | 0.10 | 1,900.0 | -1,100.0 | 87123124 |
| 24-hour | 2.12 | 0.69 | 1,800.0 | -300.0 | 85021224 |
| 8-hour | 2.12 | 1.33 | 456.8 | -219.0 | 88040716 |
| 3-hour | 2.12 | 2.12 | 500.0 | -300.0 | 88040715 |
| 1-hour | 2.12 | 3.33 | 456.8 | -219.0 | 86060212 |
| CO | | | | | |
| Annual | 10.46 | 0.20 | 1,900.0 | -1,100.0 | 87123124 |
| 24-hour | 10.46 | 3.43 | 1,800.0 | -300.0 | 85021224 |
| 8-hour | 10.46 | 6.56 | 456.8 | -219.0 | 88040716 |
| 3-hour | 10.46 | 10.5 | 500.0 | -300.0 | 88040715 |
| 1-hour | 10.46 | 16.5 | 456.8 | -219.0 | 86060212 |
| SAM | | | | | |
| Annual | 4.92 | 0.09 | 1,900.0 | -1,100.0 | 87123124 |
| 24-hour | 1.35 | 0.44 | 1,800.0 | -300.0 | 85021224 |
| 8-hour | 1.35 | 0.85 | 456.8 | -219.0 | 88040716 |
| 3-hour | 1.38 | 1.38 | 500.0 | -300.0 | 88040715 |
| 1-hour | 1.38 | 2.17 | 456.8 | -219.0 | 86060212 |

[a] For all pollutants, except $PM_{10}$, based on modeling the No. 4 Combination Boiler only. For $PM_{10}$, based on modeling the No. 4 Combination Boiler and Bark Handling System and Cyclone. See Tables 6-3 and 6-4 for emissions and modeling parameters.

[b] Based on the highest concentrations predicted from the generic modeling analysis (modeled using 10 g/s emi: from Table 6-9 and $PM_{10}$ results from Table 6-10 for the 5-year period of 1984to1988.

[c] Relative to the old TRS Incinerator stack.

[d] YY = Year; MM = Month; DD = Day; HH = Hour ending.

Table 7-2. $SO_2$ Effects Levels for Various Plant Species

| Plant Species | Observed Effect Level (μg/m$^3$) | Exposure (Time) | Reference |
|---|---|---|---|
| Sensitive to tolerant | 920 (20 percent displayed visible injury) | 3 hours | McLaughlin and Lee, 1974 |
| Lichens | 200-400 | 6 hr/wk for 10 weeks | Hart *et al.*, 1988 |
| Cypress, slash pine, live oak, mangrove | 1,300 | 8 hours | Woltz and Howe, 1981 |
| Jack pine seedlings | 470-520 | 24 hours | Malhotra and Kahn, 1978 |
| Black oak | 1,310 | Continuously for 1 week | Carlson, 1979 |

Table 7-3. Sensitivity Groupings of Vegetation Based on Visible Injury at Different $SO_2$ Exposures[a]

| Sensitivity Grouping | $SO_2$ Concentration | | Plants |
|---|---|---|---|
| | 1-Hour | 3-Hour | |
| Sensitive | 1,310 - 2,620 µg/m$^3$ (0.5 - 1.0 ppm) | 790 - 1,570 µg/m$^3$ (0.3 - 0.6 ppm) | Ragweeds<br>Legumes<br>Blackberry<br>Southern pines<br>Red and black oaks<br>White ash<br>Sumacs |
| Intermediate | 2,620 - 5,240 µg/m$^3$ (1.0 - 2.0 ppm) | 1,570 - 2,100 µg/m$^3$ (0.6 - 0.8 ppm) | Maples<br>Locust<br>Sweetgum<br>Cherry<br>Elms<br>Tuliptree<br>Many crop and garden species. |
| Resistant | >5,240 µg/m$^3$ (>2.0 ppm) | >2,100 µg/m$^3$ (>0.8 ppm) | White oaks<br>Potato<br>Upland cotton<br>Corn<br>Dogwood<br>Peach |

[a] Based on observations over a 20-year period of visible injury occurring on over 120 species growing in the vicinities of coal-fired power plants in the southeastern United States.

Source: EPA, 1982a.

**Figure 7-1. Population and Household Unit Trends in Putnam County**

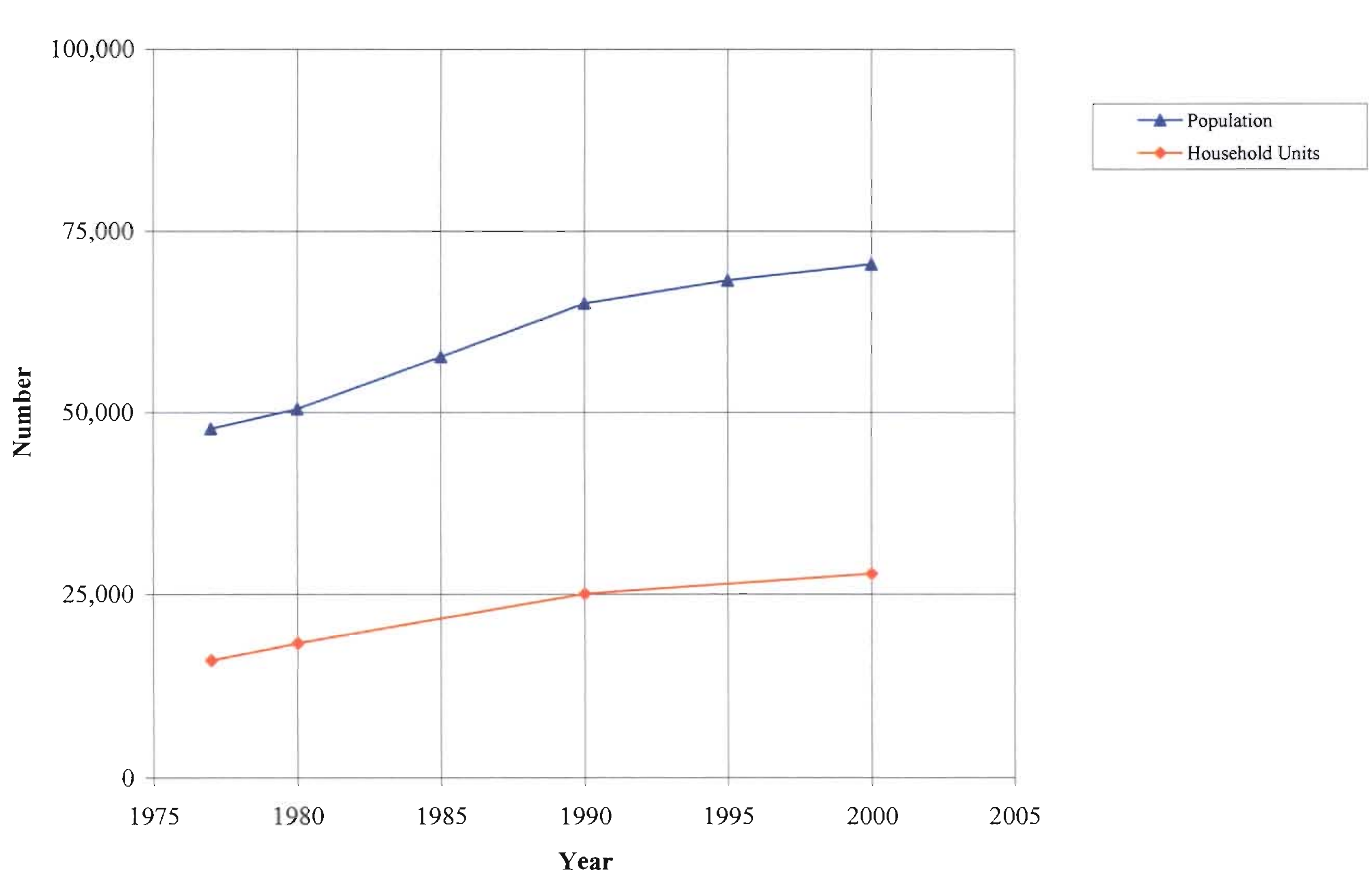


**Figure 7-2. Retail and Wholesale Trade Trends in Putnam County**

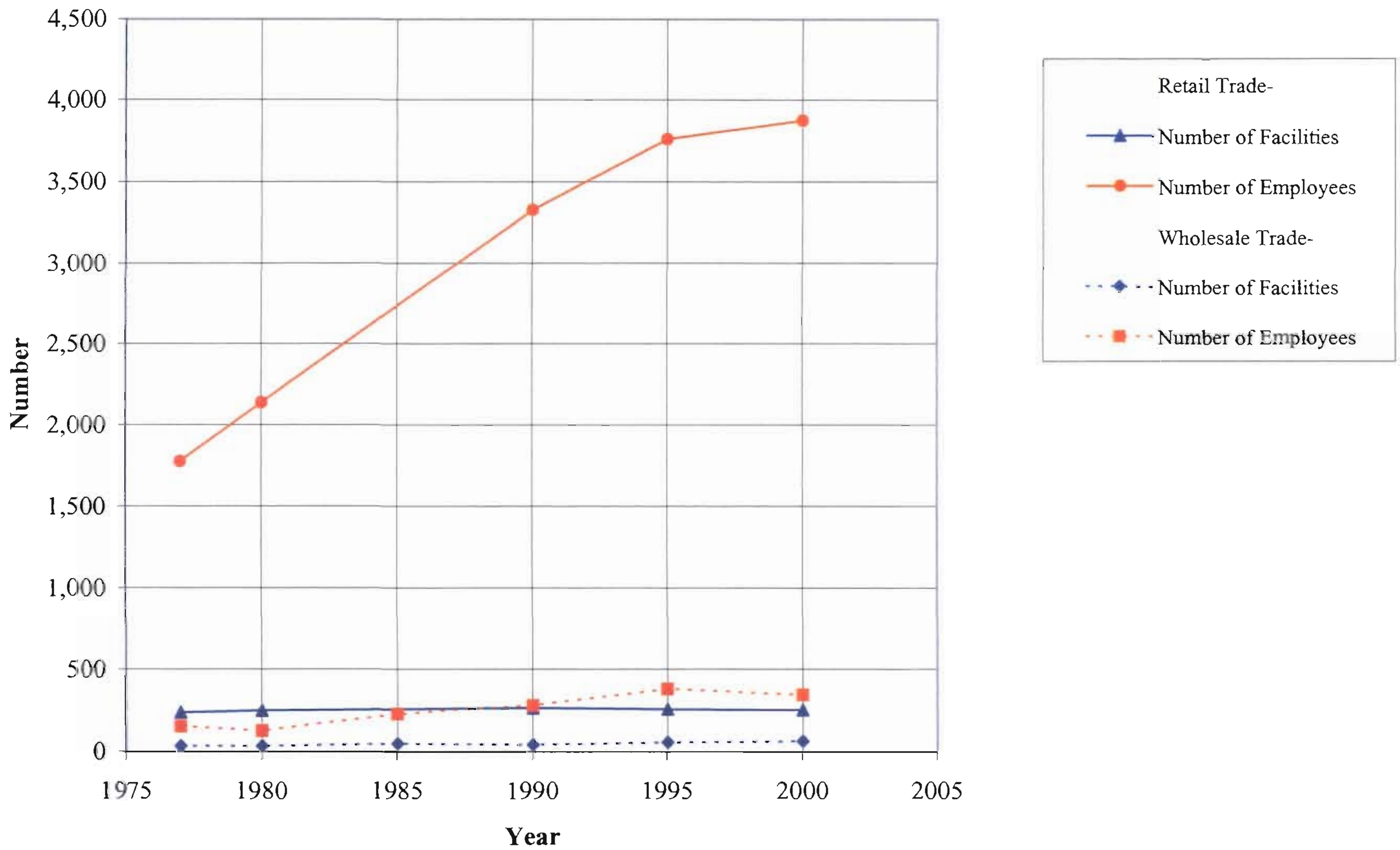


**Figure 7-3. Labor Force Trend in Putnam County**

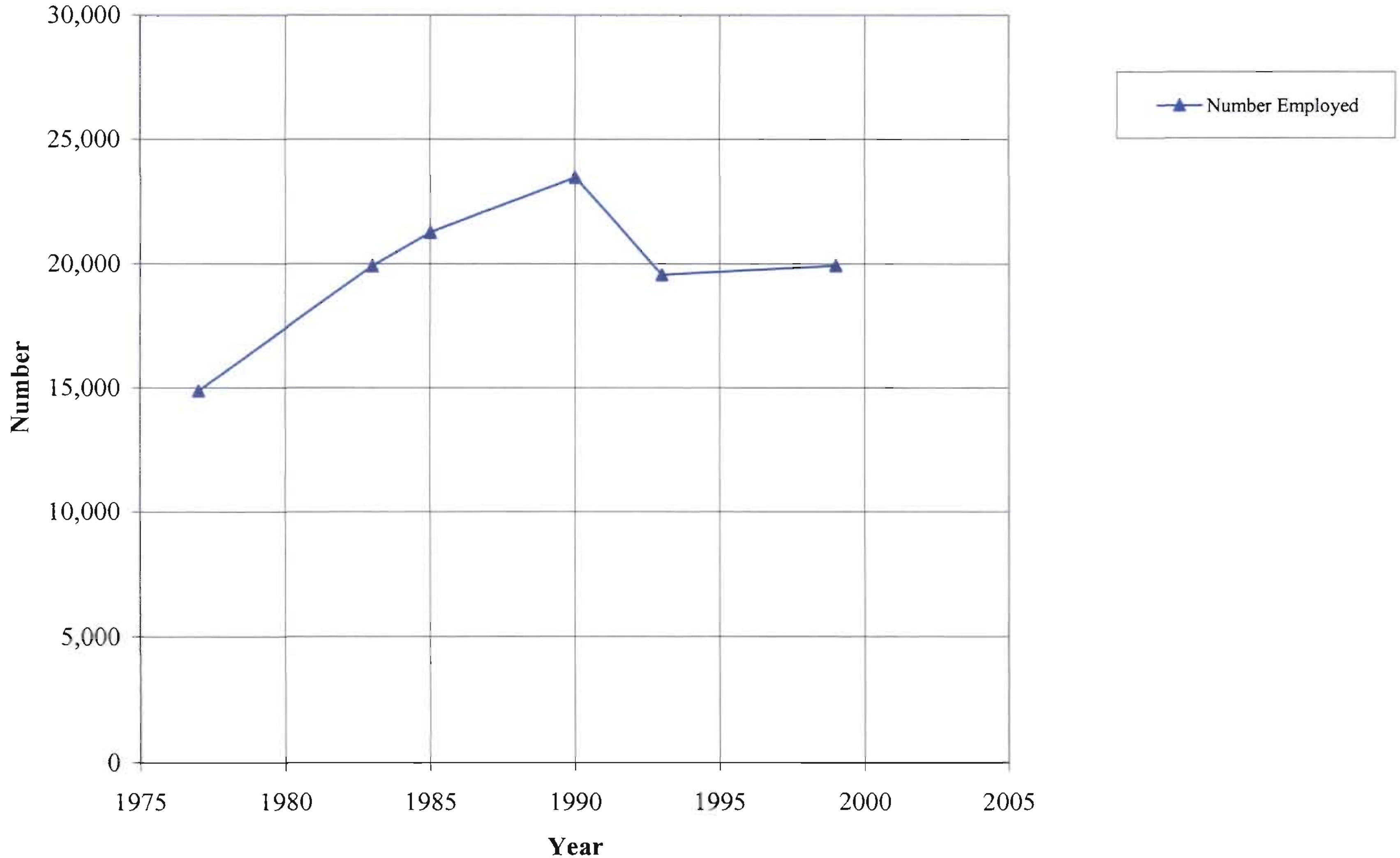


**Figure 7-4. Hotel and Motel Trend in Putnam County**

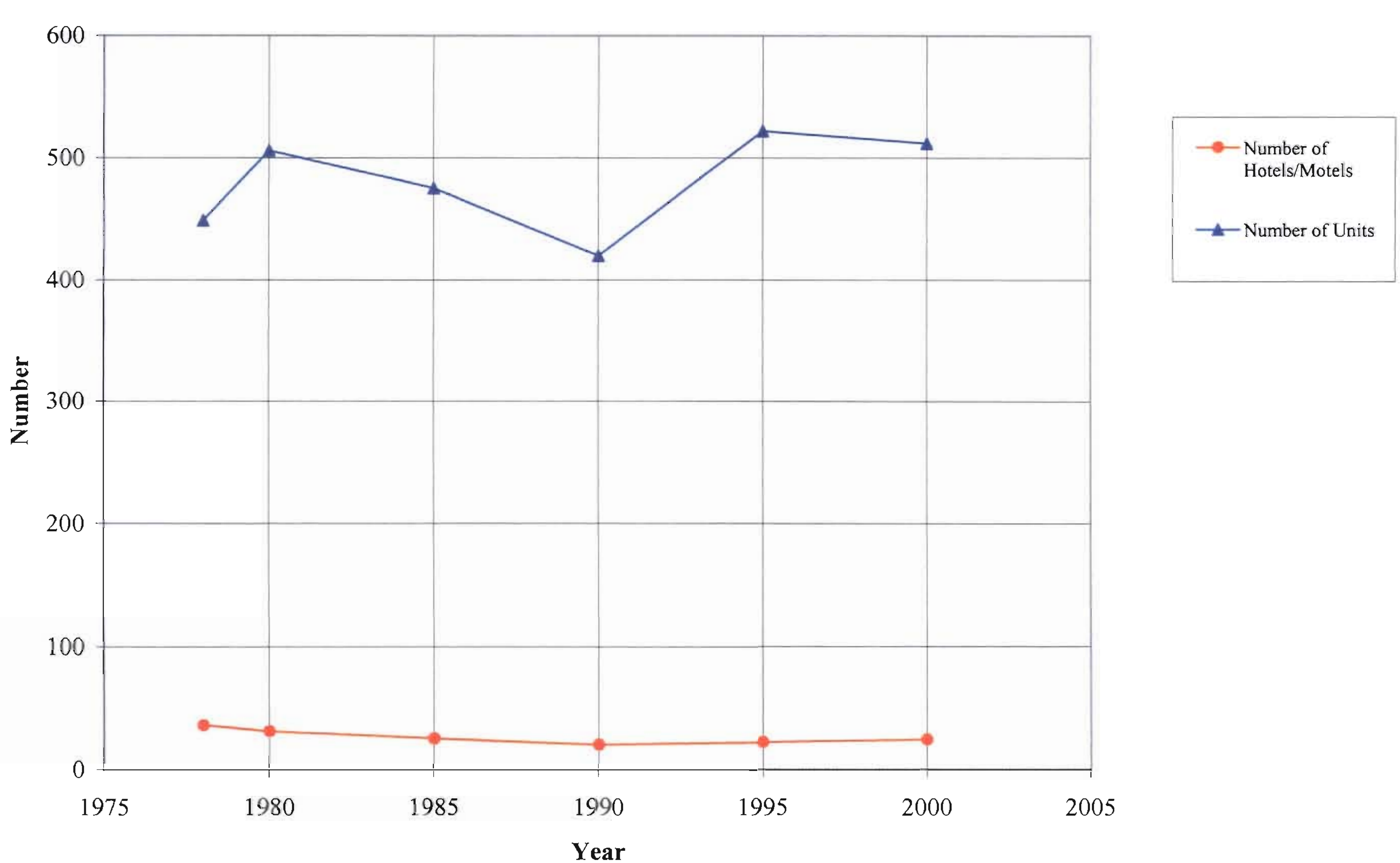


**Figure 7-5. Vehicle Miles Traveled (VMT) Estimates for Motor Vehicles for Putnam County**

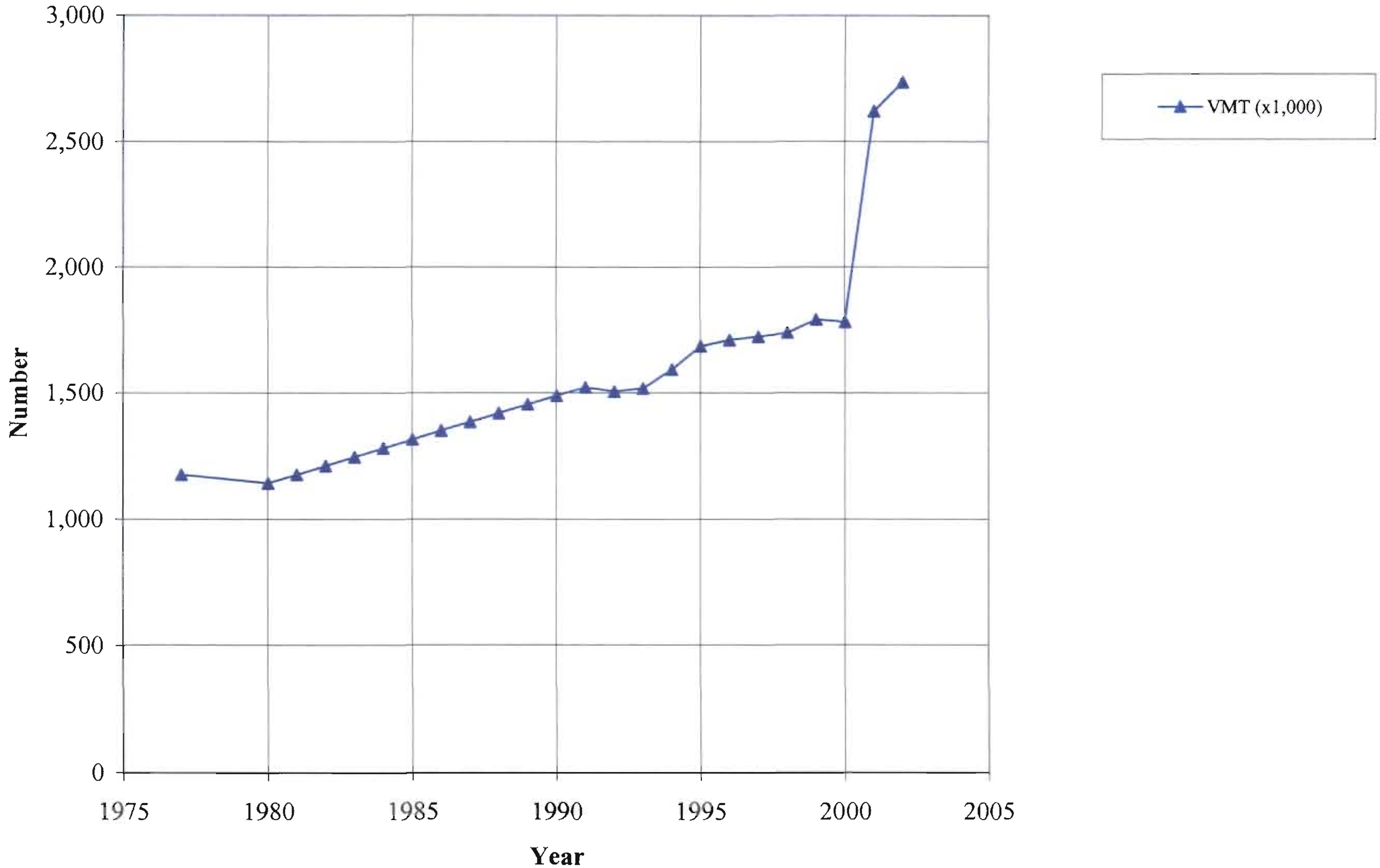


**Figure 7-6. Manufacturing and Agriculture Trends in Putnam County**

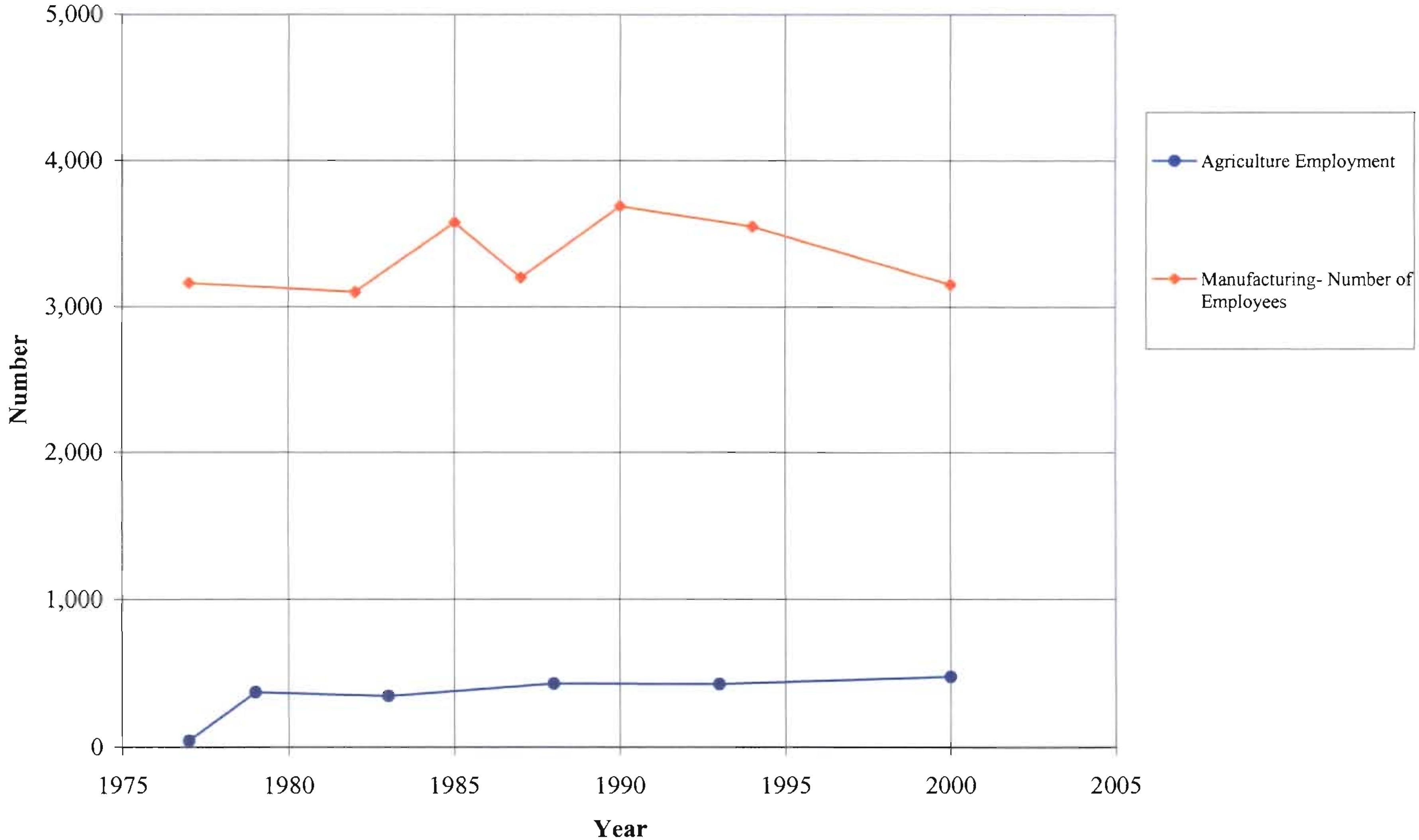


**Figure 7-7. Electrical Power Generation Capacity in Putnam County**

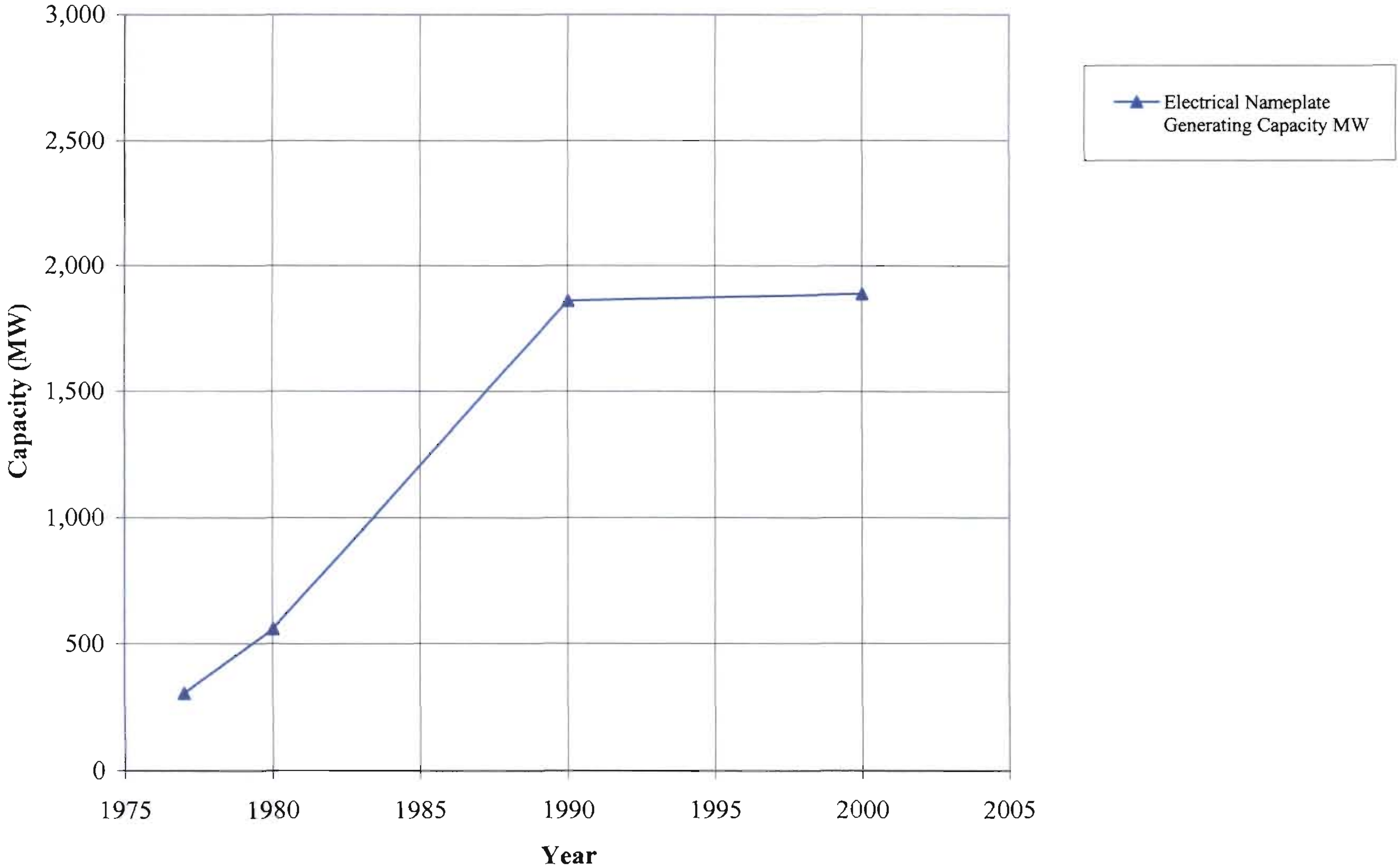


**Figure 7-8. Mobile Source Emissions (Tons per Day) of CO, VOC, and $NO_x$ in Putnam County**

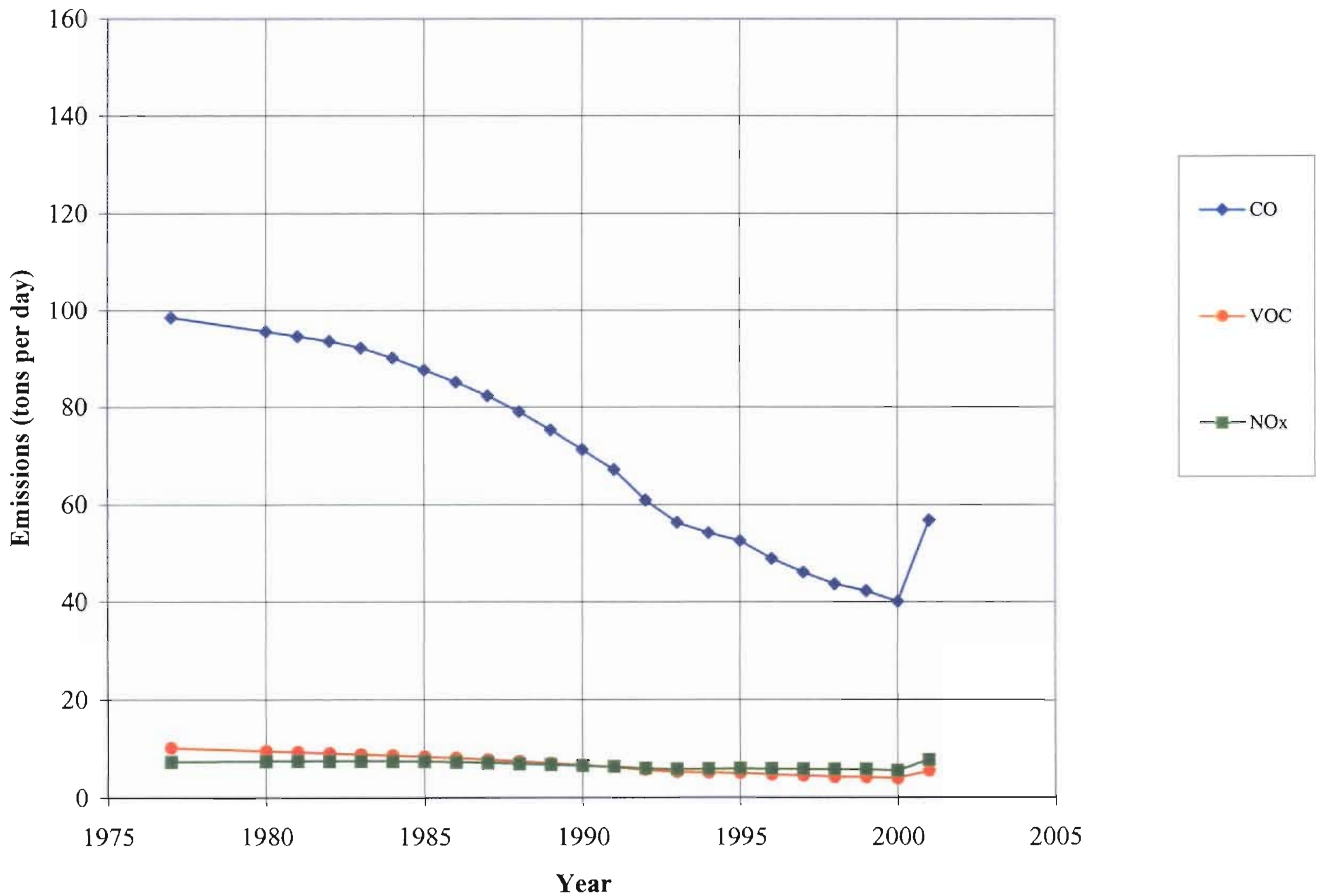


**Figure 7-9. Measured 3-Hour Average Sulfur Dioxide Concentrations (2nd Highest Values) from 1984 to 2002- Putnam County**

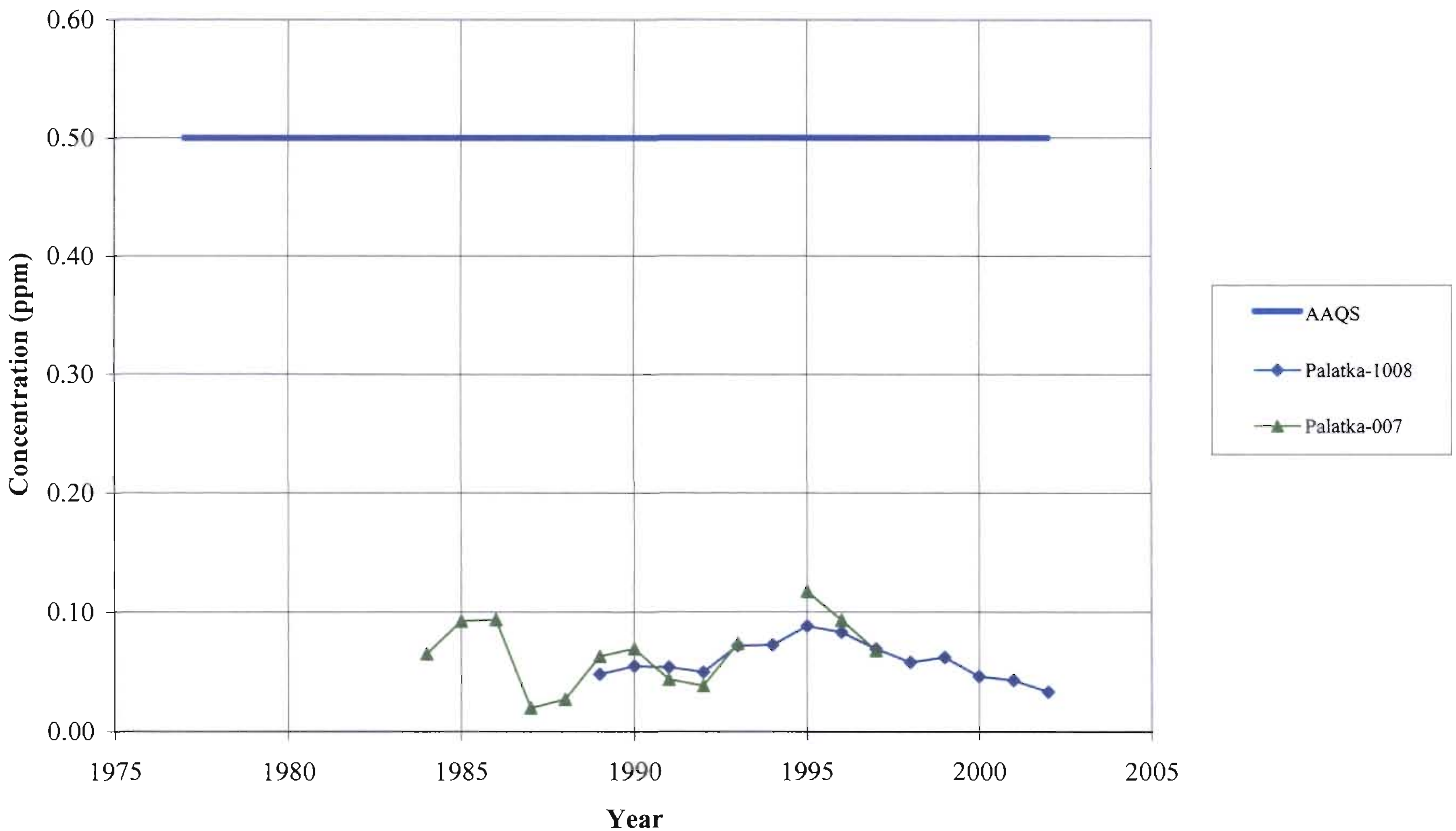


**Figure 7-10. Measured 24-Hour Average Sulfur Dioxide Concentrations (2nd Highest Values) from 1984 to 2002- PutnamCounty**

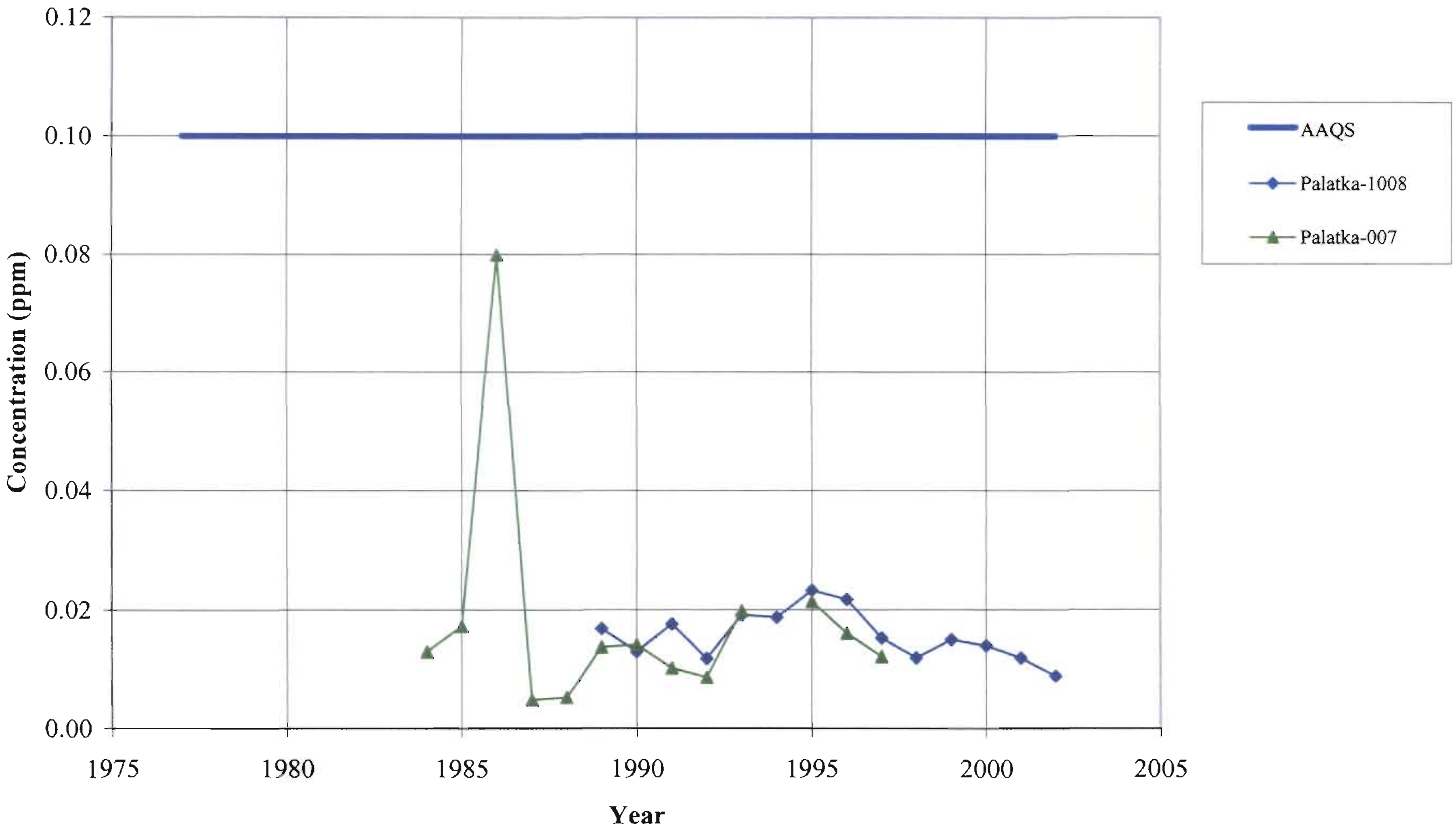


**Figure 7-11. Measured Annual Average Sulfur Dioxide Concentrations from 1984 to 2002- Putnam County**

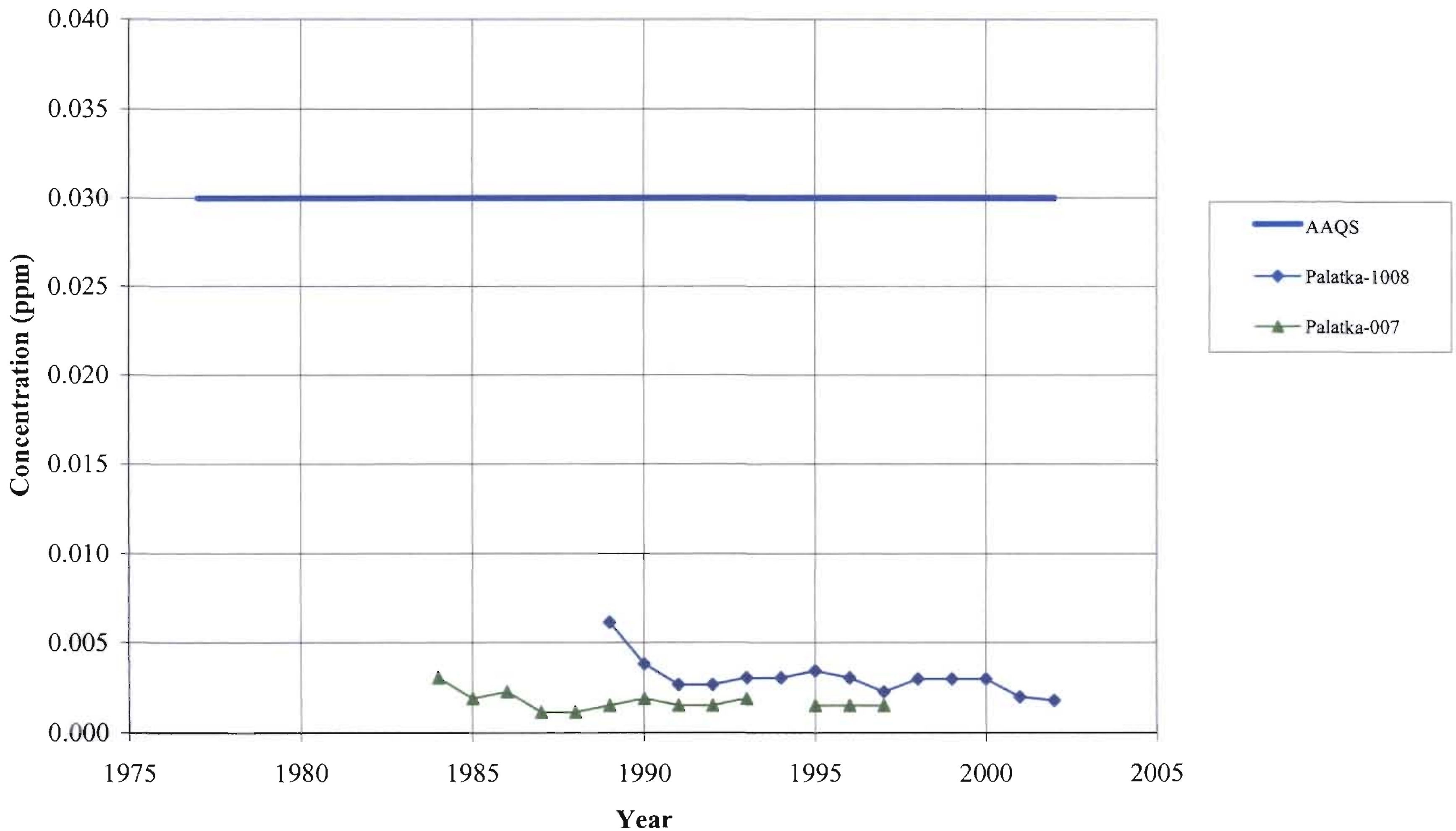


**Figure 7-12. Measured 24-Hour Average $PM_{10}$ Concentrations (1988 to 2002) and Total Suspended Particulate Concentrations (1981 to 1987) (2nd Highest Values) - Putnam County**

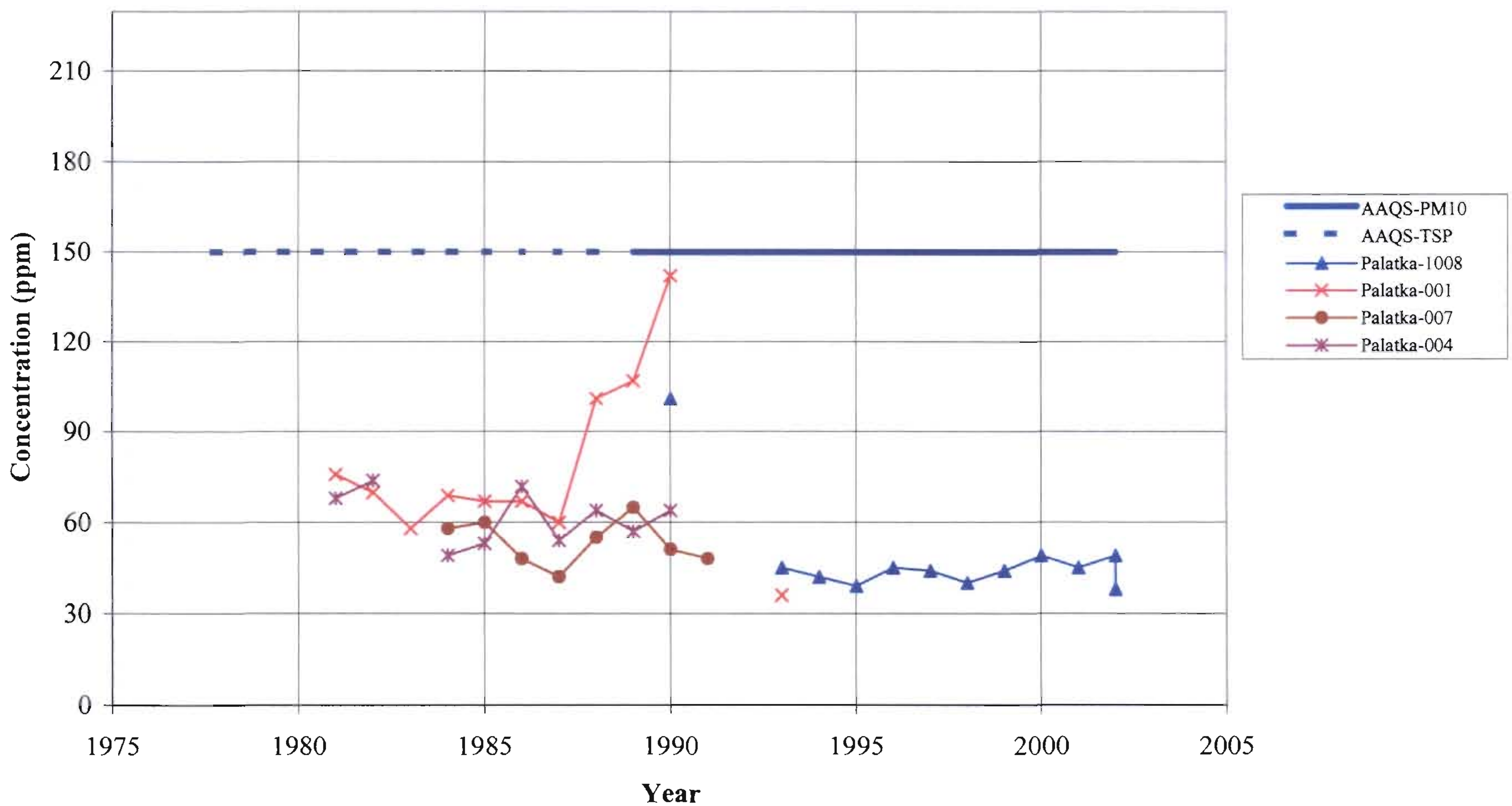


**Figure 7-13. Measured Annual Average $PM_{10}$ Concentrations (1988 to 2002) and Total Suspended Particulate Concentrations (1981 to 1987) - Putnam County**

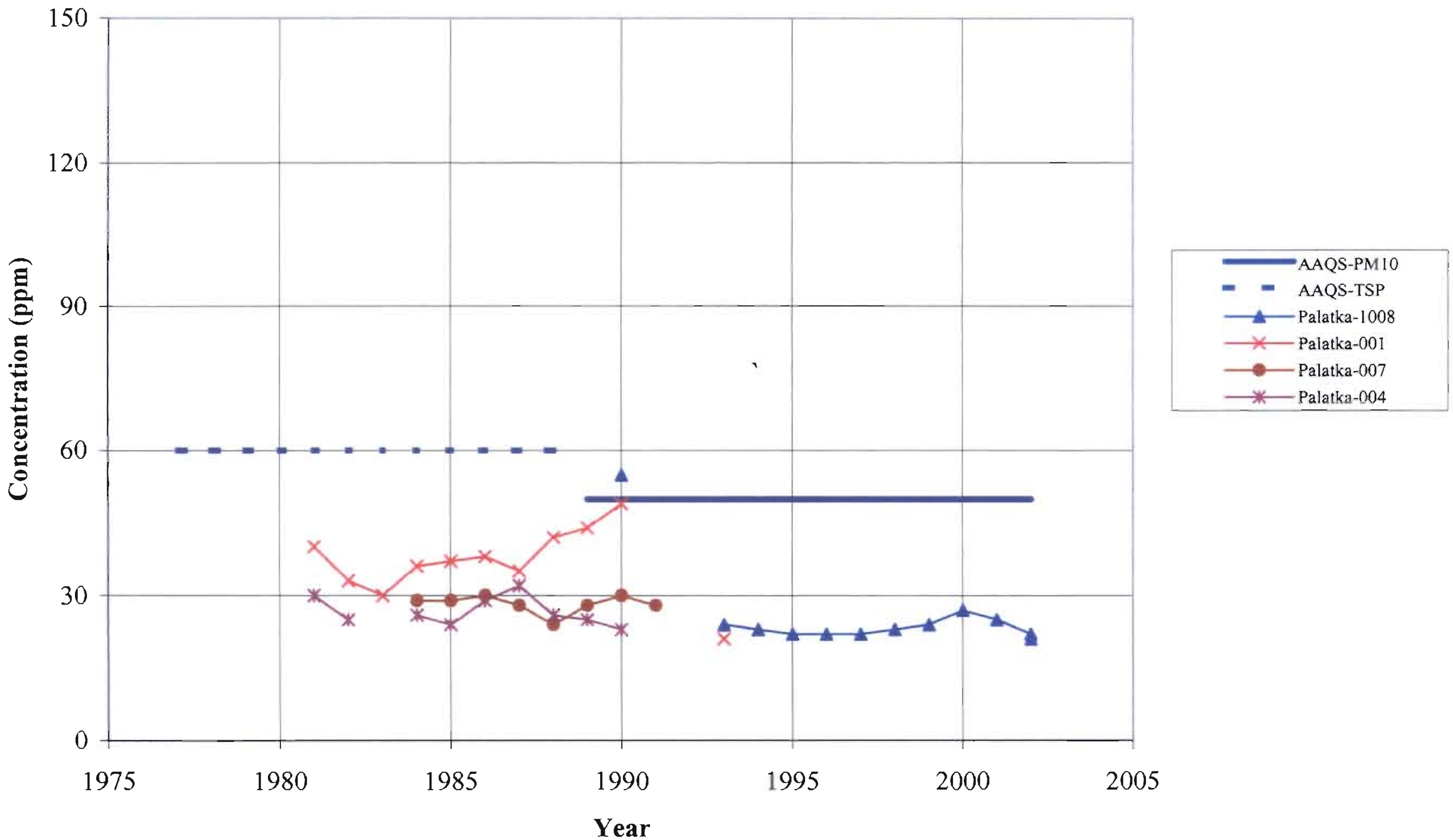


**Figure 7-14. Measured Annual Average Nitrogen Dioxide Concentrations from 1981 to 2002 - Putnam County**

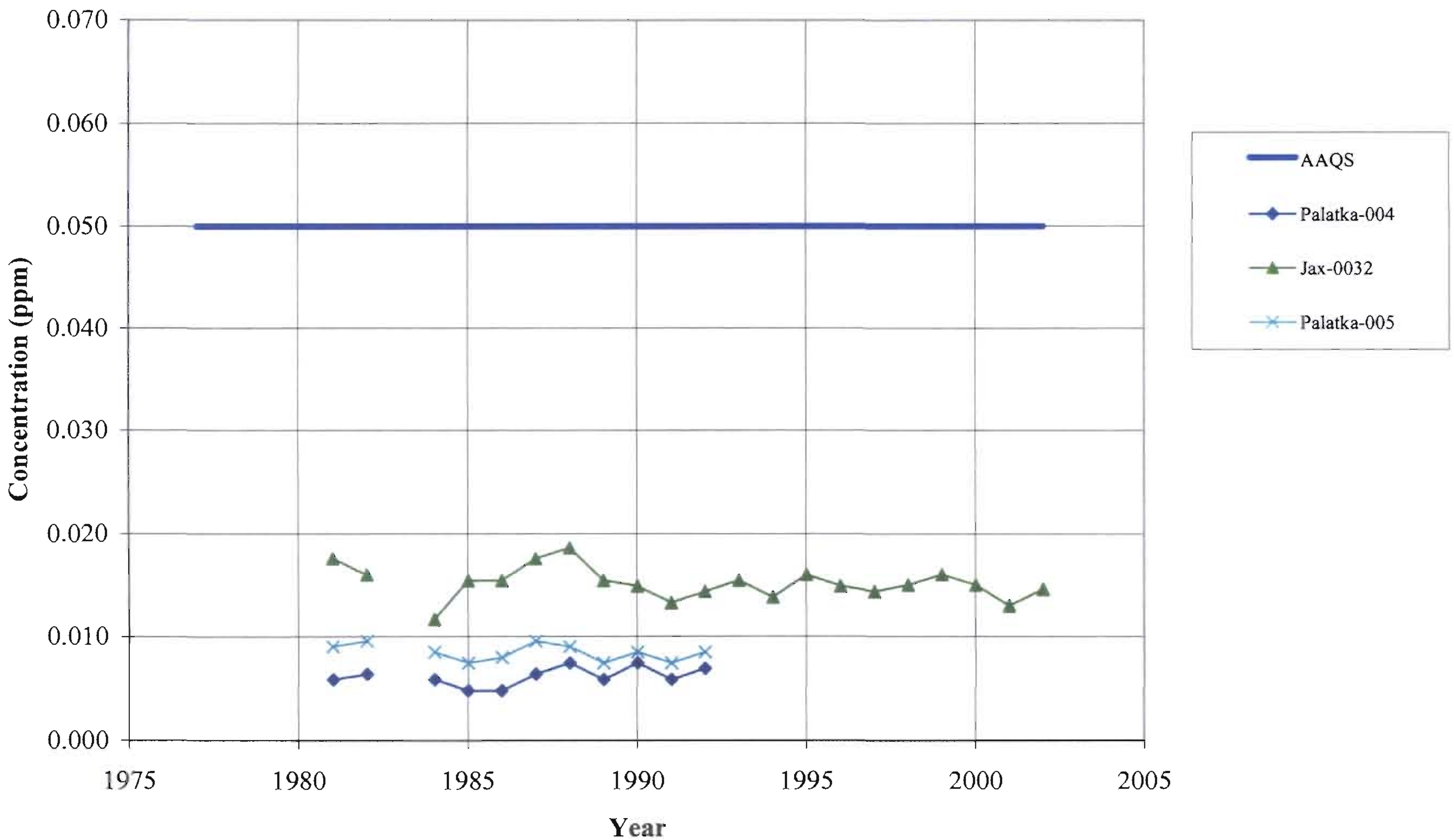


**Figure 7-15. Measured 1-Hour Average Carbon Monoxide Concentrations (2nd Highest Values) from 1981 to 2002 - Putnam County**

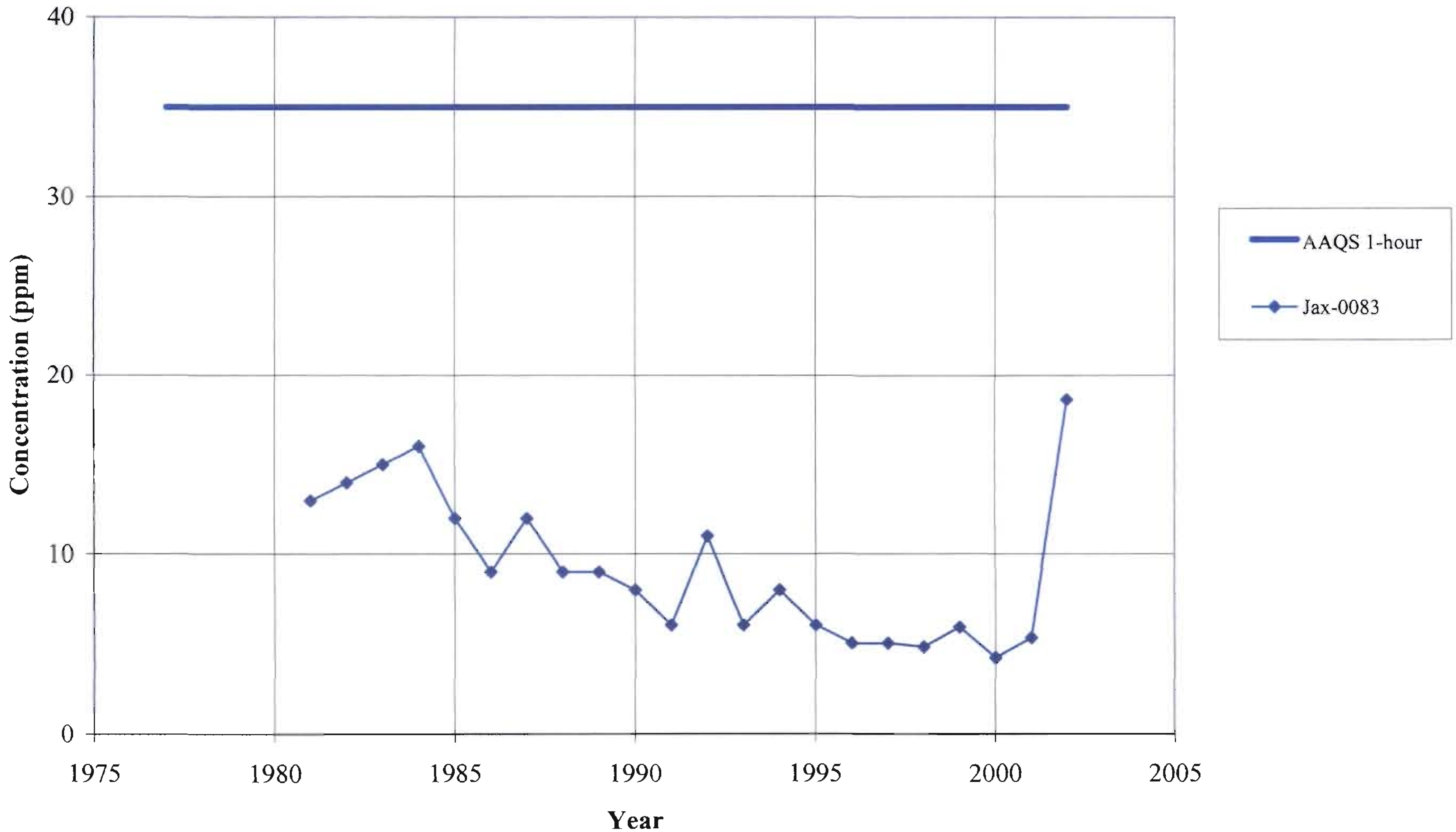


**Figure 7-16. Measured 8-Hour Average Carbon Monoxide Concentrations (2nd Highest Values) from 1981 to 2002 - Putnam County**

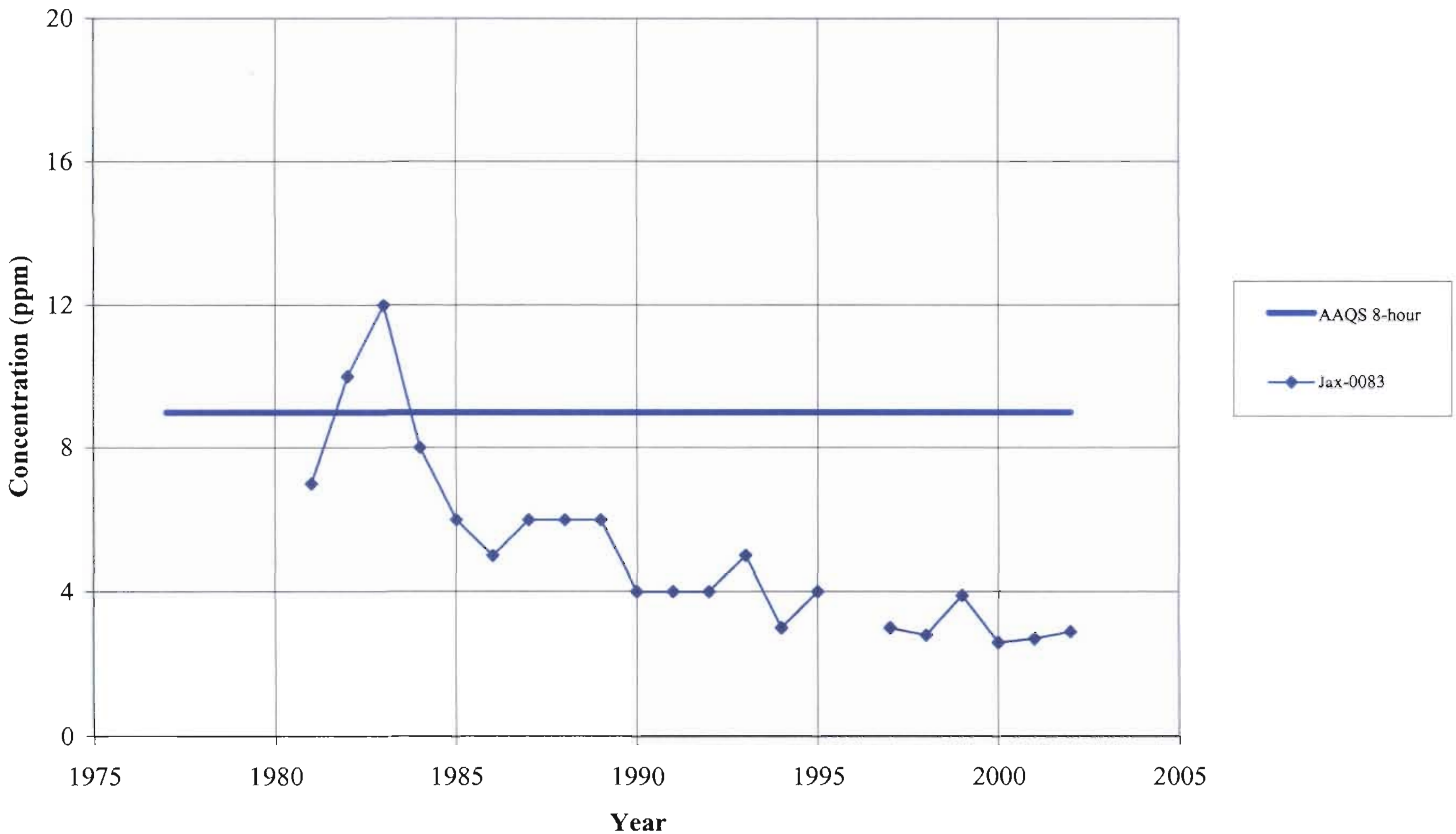


**Figure 7-17. Measured 1-Hour Average Ozone Concentrations (2nd Highest Values) from 1981 to 2002 - Putnam County**

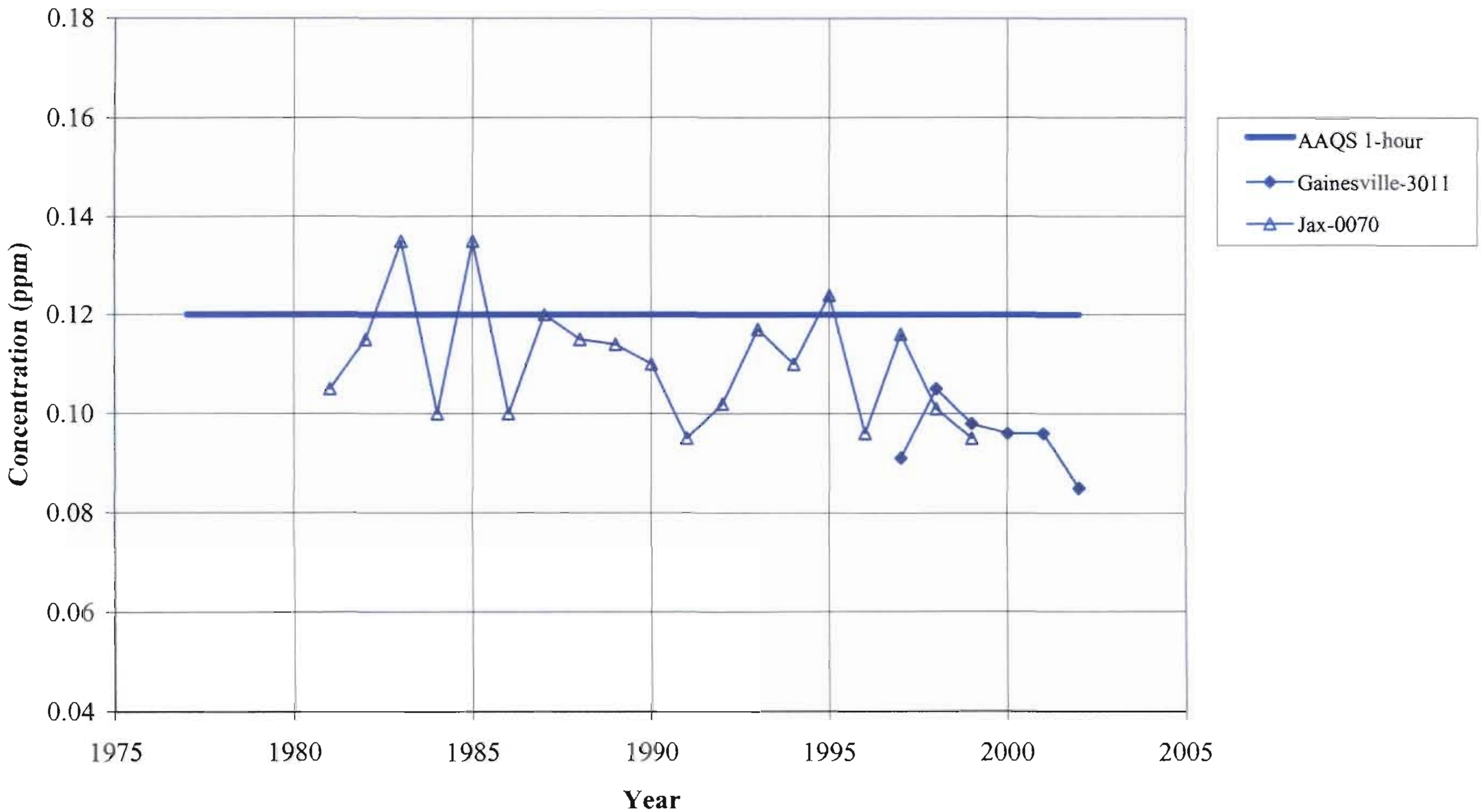
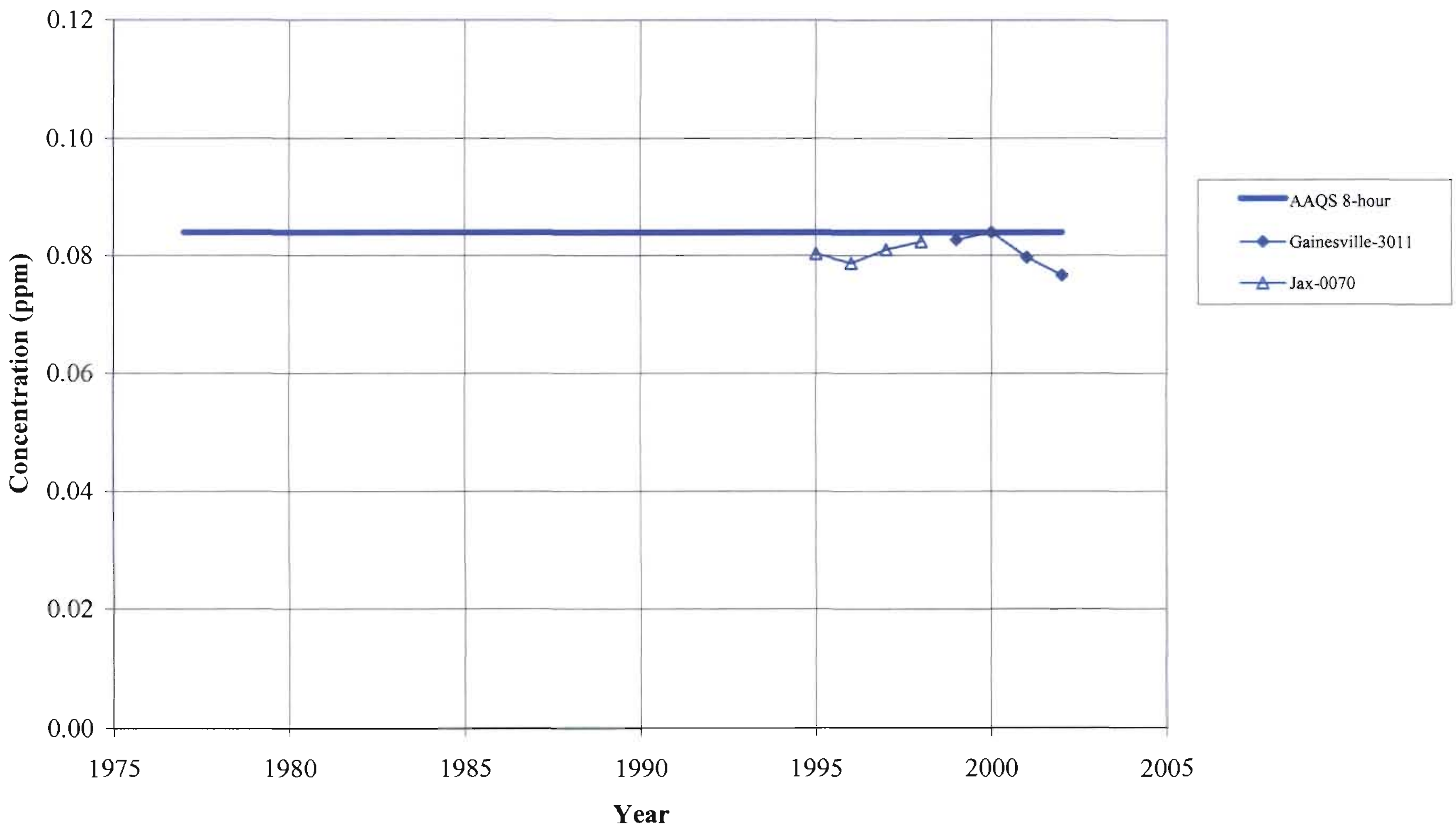


**Figure 7-18. Measured 8-Hour Average Ozone Concentrations (3-Year Average of the 4th Highest Values) from 1995 to 2002 - Putnam County**



# 8.0 ADDITIONAL IMPACT ANALYSIS ON THE OFKEFENOKEE CLASS I AREA

## 8.1 INTRODUCTION

GP has proposed changes to its pulp mill located in Putnam County, near Palatka, Florida. The changes were described in Section 2.0. The facility is subject to the PSD new source review requirements for $SO_2$, $NO_x$, PM, $PM_{10}$, CO, VOC, and SAM. The Class I area analysis addresses these pollutants.

The analysis addresses the potential impacts on vegetation, soils, and wildlife of the Okefenokee NWA Class I area due to the proposed project. In addition, potential impacts upon visibility resulting from the proposed project are assessed. The Okefenokee NWA Class I area is located approximately 108 km north of the GP Palatka Mill. Although the Wolf Island NWA Class I area is located approximately 186 km north of the GP Palatka Mill, only the Okefenokee NWA Class I area was evaluated since it is much closer to the Mill than Wolf Island, and both have similar AQRVs.

The analysis demonstrates that the increase in impacts due to the proposed project is extremely low. Regardless of the existing conditions in the vicinity of the Class I area, the proposed project will not cause any significant adverse effects due to the predicted low impacts upon that area.

## 8.2 SOILS, VEGETATION, AND AQRV ANALYSIS METHODOLOGY

This analysis uses the maximum air quality impacts predicted to occur in the Class I area due to the proposed increase in emissions. These impacts are summarized in Section 6.0 and Table 8-1, based on the modeling described in Section 6.0.

The analysis involved predicting worst-case maximum short- and long-term concentrations of pollutants in the Class I area and comparing the maximum predicted concentrations to lowest observed effect levels for AQRVs or analogous organisms. In conducting the assessment, several assumptions were made as to how pollutants interact with the different matrices, *i.e.*, vegetation, soils, wildlife, and aquatic environment.

A screening approach was used to evaluate potential effects by comparison of the maximum predicted ambient concentrations with effect threshold limits for the pollutants of concern, for both vegetation and wildlife, as reported in the scientific literature. A literature search was conducted which specifically addressed the effects of air contaminants on plant species reported to occur in the vicinity of the plant and the Class I area. It is recognized that effects threshold information is not available for all species found in the Okefenokee NWA, although studies have been performed on other similar species that may be used as models.

## 8.3 IDENTIFICATION OF AQRVS AND METHODOLOGY

An AQRV analysis was conducted to assess the potential risk to AQRVs of the Okefenokee NWA due to the proposed GP project. The U.S. Department of the Interior in 1978 administratively defined AQRVs to be:

> *All those values possessed by an area except those that are not affected by changes in air quality and include all those assets of an area whose vitality, significance, or integrity is dependent in some way upon the air environment. These values include visibility and those scenic, cultural, biological, and recreational resources of an area that are affected by air quality.*
>
> *Important attributes of an area are those values or assets that make an area significant as a national monument, preserve, or primitive area. They are the assets that are to be preserved if the area is to achieve the purposes for which it was set aside (Federal Register 1978).*

Except for visibility, AQRVs were not specifically defined. However, odor, soil, flora, fauna, cultural resources, geological features, water, and climate generally have been identified by land managers as AQRVs. Since specific AQRVs have not been identified for the Okefenokee NWA, this AQRV analysis evaluates the effects of air quality on general vegetation types and wildlife found in the Class I area.

Vegetation type AQRVs and their representative species types have been defined as:

- Freshwater Marsh - sawgrass, pickerelweed, and sand cordgrass
- Marsh Islands - cabbage palm and eastern red cedar
- Estuarine Habitat - black needlerush, salt marsh cordgrass, and wax myrtle
- Hardwood Swamp - red maple, red bay, sweet bay, and cabbage palm
- Upland Forests - live oak, scrub oak, longleaf pine, slash pine, wax myrtle, and saw palmetto

Wildlife AQRVs have been identified as endangered species, waterfowl, wading birds, shorebirds, reptiles, and mammals.

The maximum pollutant concentrations predicted for the project in the Okefenokee NWA are presented in Table 8-1. These results were compared with effect threshold limits for both vegetation and wildlife as reported in the scientific literature. While the literature search focused on such species as cabbage palm, eastern red cedar, lichens, and species of the hardwood swamplands and mangrove forest, no specific citations that addressed these species were found. Threshold information is not available for all species found in the Class I area, although studies have been performed on a few of the common species and on other similar species that can be used as indicators of effects.

## 8.4 IMPACTS TO SOILS

For soils, the potential and hypothesized effects of atmospheric deposition include:

- Increased soil acidification,
- Alteration in cation exchange,
- Loss of base cations, and
- Mobilization of trace metals.

The potential sensitivity of specific soils to atmospheric inputs is related to two factors. First, the physical ability of a soil to conduct water vertically through the soil profile is important in influencing the interaction with deposition. Second, the ability of the soil to resist chemical changes, as measured in terms of pH and soil cation exchange capacity (CEC), is important in determining how a soil responds to atmospheric inputs.

The soils of the Okefenokee NWA are generally classified as histosols. Histosols (peat soils) are organic and have extremely high buffering capacities based on their CEC, base saturation, and bulk density. Therefore, they would be relatively insensitive to atmospheric inputs.

The relatively low sensitivity of the soils to atmospheric inputs coupled with the extremely low ground-level pollutant concentrations due to the project for the Okefenokee NWA precludes any significant impact on soils.

## 8.5 IMPACTS TO VEGETATION

In general, the effects of air pollutants on vegetation occur primarily from $SO_2$, $NO_2$, $O_3$, and $PM_{10}$. Effects from minor air contaminants such as fluoride, chlorine, hydrogen chloride, ethylene, ammonia, hydrogen sulfide, CO, and pesticides have also been reported in the literature. The effects of air pollutants are dependent both on the concentration of the contaminant and the duration of the exposure. The term "injury," as opposed to damage, is commonly used to describe all plant responses to air contaminants and will be used in the context of this analysis. Air contaminants are thought to interact primarily with plant foliage, which is considered to be the major pathway of exposure.

Injury to vegetation from exposure to various levels or air contaminants can be termed acute, physiological, or chronic. Acute injury occurs as a result of a short-term exposure to a high contaminant concentration and is typically manifested by visible injury symptoms ranging from chlorosis (discoloration) to necrosis (dead areas). Physiological or latent injury occurs as the result of a long-term exposure to contaminant concentrations below that which results in acute injury symptoms. Chronic injury results from repeated exposure to low concentrations over extended periods of time, often without any visible symptoms, but with some effect on the overall growth and productivity of the plant. In this assessment, 100 percent of the particular air pollutant in the ambient air was assumed to interact with the vegetation. This is a conservative approach.

The response of vegetation and wildlife to atmospheric pollutants is influenced by the concentration of the pollutant, duration of exposure, and frequency of exposures. The pattern of pollutant exposure expected from the facility is that of a few episodes of relatively high ground-level concentration which occur during certain meteorological conditions interspersed with long periods of extremely low ground-level concentrations. If there are any effects of stack emissions on plants or animals, they will likely arise from the short-term, higher doses. A dose is the product of the concentration of the pollutant and duration of the exposure.

### 8.5.1 NITROGEN DIOXIDE

$NO_2$ can injure plant tissue with symptoms usually appearing as irregular white to brown collapsed lesions between the leaf veins and near the margins. Conversely, non-injurious levels of $NO_2$ can be absorbed by plants, enzymatically transformed into ammonia, and incorporated into plant constituents such as amino acids (Matsumaru *et al.*, 1979).

Plant damage can occur through either acute (short-term, high concentration) or chronic (long-term, relatively low concentration) exposure. For plants that have been determined to be more sensitive to $NO_2$ exposure than others, acute (1-, 4-, and 8-hour) exposure caused 5 percent predicted foliar injury at concentrations ranging from 3,800 to 15,000 $\mu g/m^3$ (Heck and Tingey, 1979). Chronic exposure of selected plants (some considered $NO_2$-sensitive) to $NO_2$ concentrations of 2,000 to 4,000 $\mu g/m^3$ for 213 to 1,900 hours caused reductions in yield of up to 37 percent and some chlorosis (Zahn, 1975).

The maximum 8-hour average $NO_2$ concentration due to the increase in emissions resulting from the proposed project in the Okefenokee Class I area is predicted to be 0.033 $\mu g/m^3$ (Table 8-1). This concentration is 0.001 percent or less of the levels that cause foliage injury in acute exposure scenarios. By comparison of published toxicity values for $NO_2$ exposure to long-term (annual averaging time) modeled concentrations, the possibility of plant damage in the Class I areas can be examined for chronic exposure situations. For a chronic exposure, the maximum annual average $NO_2$ concentration due to the proposed project in the Okefenokee NWA Class I area is 0.0012 $\mu g/m^3$.

### 8.5.2 SULFUR DIOXIDE

Sulfur is an essential plant nutrient usually taken up as sulfate ions by the roots from the soil solution. When sulfur dioxide in the atmosphere enters the foliage through pores in the leaves, it reacts with water in the leaf interior to form sulfite ions. Sulfite ions are highly toxic. They interact with enzymes, compete with normal metabolites, and interfere with a variety of cellular functions (Horsman and Wellburn, 1976). However, within the leaf, sulfite is oxidized to sulfate ions, which can then be used by the plant as a nutrient. Small amounts of sulfite may be oxidized before they prove harmful.

$SO_2$ gas at elevated levels has long been known to cause injury to plants. Acute $SO_2$ injury usually develops within a few hours or days of exposure, and symptoms include marginal, flecked, and/or intercoastal necrotic areas that appear water-soaked and dullish green initially. This injury generally occurs to younger leaves. Chronic injury usually is evident by signs of chlorosis, bronzing, premature senescence, reduced growth, and possible tissue necrosis (EPA, 1982). Observed $SO_2$ effect levels for several plant species and plant sensitivity groupings are presented in Tables 7-2 and 7-3, respectively.

Many studies have been conducted to determine the effects of high-concentration, short-term $SO_2$ exposure on natural community vegetation. Sensitive plants include ragweed, legumes, blackberry, southern pine, and red and black oak. These species are injured by exposure to 3-hour average $SO_2$

concentrations of 790 to 1,570 μg/m$^3$. Intermediate plants include locust and sweetgum. These species are injured by exposure to 3-hour average $SO_2$ concentrations of 1,570 to 2,100 μg/m$^3$. Resistant species (injured at concentrations above 2,100 μg/m$^3$ for 3 hours) include white oak and dogwood (EPA, 1982).

A study of native Floridian species (Woltz and Howe, 1981) demonstrated that cypress, slash pine, live oak, and mangrove exposed to 1,300 μg/m$^3$ $SO_2$ for 8 hours were not visibly damaged. This finding supports the levels cited by other researchers on the effects of $SO_2$ on vegetation. A corroborative study (McLaughlin and Lee, 1974) demonstrated that approximately 20 percent of a cross-section of plants ranging from sensitive to tolerant was visibly injured at 3-hour average $SO_2$ concentrations of 920 μg/m$^3$. Jack pine seedlings exposed to $SO_2$ concentrations of 470 to 520 μg/m$^3$ for 24 hours demonstrated inhibition of foliar lipid synthesis; however, this inhibition was reversible (Malhotra and Kahn, 1978). Black oak exposed to 1,310 μg/m$^3$ $SO_2$ for 24 hours a day for 1 week demonstrated a 48 percent reduction in photosynthesis (Carlson, 1979). Two species of lichens exhibited signs of $SO_2$ damage in the form of decreased biomass gain and photosynthetic rate as well as membrane leakage when exposed to concentrations of 200 to 400 μg/m$^3$ for 6 hours/week for 10 weeks (Hart *et al.*, 1988).

The maximum 24-hour average $SO_2$ concentration due to the increase in emissions resulting from the proposed project at the Okefenokee NWA Class I area is 0.23 μg/m$^3$ (Table 8-1). The maximum 24-hour average $SO_2$ concentration is predicted for the project at the Class I area is only 0.06 to 0.12 percent of those that caused damage to the most sensitive lichens. The modeled annual incremental increase in $SO_2$ adds slightly to background levels of this gas and poses only a minimal threat to area vegetation.

### 8.5.3 PARTICULATE MATTER ($PM_{10}$)

Although information pertaining to the effects of PM on plants is scarce, some threshold concentrations are available. Mandoli and Dubey (1998) exposed ten species of native Indian plants to levels of PM ranging from 210 to 366 μg/m$^3$ for an 8-hour averaging period. Damage in the form of a higher leaf area/dry weight ratio was observed at varying degrees for most plants tested. Concentrations of PM lower than 163 μg/m$^3$ did not appear to be injurious to the tested plants.

By comparison of these published toxicity values for PM exposure (*i.e.*, concentrations for an 8-hour averaging time), the possibility of plant damage in the Okefenokee NWA can be determined. The maximum predicted 8-hour $PM_{10}$ concentration due to the increase in emissions resulting from the proposed project at the Class I area is 0.17 µg/$m^3$ (Table 8-1). These concentrations are only 0.05 to 0.1 percent of the lower threshold value that reportedly affects plant foliage. As a result, no effects to vegetative AQRVs are expected from the project's emissions.

### 8.5.4 CARBON MONOXIDE

As with $PM_{10}$, information pertaining to the effects of CO on plants is scarce. The main effect of high concentrations of CO is the inhibition of cytochrome *c* oxidase, the terminal oxidase in the mitochondrial electron transfer chain. Inhibition of cytochrome *c* oxidase depletes the supply of adenosine triphosphate (ATP), the principal donor of free energy required for cell functions. However, this inhibition only occurs at extremely high concentrations of CO. Pollok *et al.* (1989) reported that exposure to $CO:O_2$ ratio of 25 (equivalent to an ambient CO concentration of $6.85 \times 10^6$ µg/$m^3$) resulted in stomatal closure in the leaves of the sunflower (*Helianthus annuus*). Naik *et al.* (1992) reported cytochrome *c* oxidase inhibition in corn, sorghum, millet, and Guinea grass at $CO:O_2$ ratios of 2.5 (equivalent to an ambient CO concentration of $6.85 \times 10^5$ µg/$m^3$). These plants were considered the species most sensitive to CO-induced inhibition of cytochrome *c* oxidase.

By comparison of published effect values for CO exposure, the possibility of plant damage in the Class I area can be determined. The maximum 1-hour (most conservative) estimated CO concentration due to the increase in emissions resulting from the proposed project in the Okefenokee NWA Class I area is 0.28 µg/$m^3$. This concentration is less than 0.00001 percent of the value that caused inhibition in laboratory studies. The amount of damage sustained at this level (if any) for 1 hour would have negligible effects over an entire growing season. The predicted maximum annual CO concentration of 0.002 µg/$m^3$ reflects a more realistic (yet conservative) CO level for the Class I area. This concentration is less than 0.000001 percent of the value that caused cytochrome *c* oxidase inhibition.

### 8.5.5 SULFURIC ACID MIST

Acidic precipitation or acid rain is coupled to $SO_2$ emissions mainly formed during the burning of fossil fuels. This pollutant is oxidized in the atmosphere and dissolves in rain forming SAM, which falls as acidic precipitation (Ravera, 1989). Although concentration data are not available, SAM has been reported to yield necrotic spotting on the upper surfaces of leaves (Middleton *et al.*, 1950).

No significant adverse effects on vegetation are expected from the project's emissions because $SO_2$ concentrations, which lead directly to the formation of SAM concentrations, are predicted to be well below levels which have been documented as negatively affecting vegetation. During the last decade, much attention has been focused on acid rain. Acidic deposition is an ecosystem-level problem that affects vegetation because of some alterations of soil conditions such as increased leaching of essential base cations or elevated concentrations of aluminum in the soil water (Goldstein *et al.*, 1985). Although effects of acid rain in eastern North America have been well published and publicized, detrimental effects of acid rain on Florida vegetation are lacking documentation.

### 8.5.6 VOC EMISSIONS AND IMPACTS ON OZONE

It is difficult to predict what effect the proposed increase in emissions of VOC will have on ambient $O_3$ concentrations on a regional scale. VOC and $NO_x$ emissions are precursors to the formation of $O_3$. $O_3$ is not directly emitted from fuel combustion, but is formed down-wind from emission sources when VOC and $NO_x$ emissions react in the presence of sunlight. Natural (without man-made sources) ambient concentrations of $O_3$ are normally in the range of 20 to 39 $\mu g/m^3$ (0.01 to 0.02 ppm) (Heath, 1975).

The nearest monitors to the GP Palatka Mill that measure $O_3$ concentrations are located in Gainesville (AIRS No. 12-001-0025 and 12-001-3011). These stations measure concentrations according to EPA procedures. Based on the $O_3$ monitoring concentrations measured over the last several years in Gainesville (see Table 4-1), the region is in attainment of the existing 1-hour $O_3$ AAQS as well as the new 8-hour $O_3$ AAQS.

$O_3$ can cause various damage to broad-leaved plants including: tissue collapse, interveinal necrosis and markings on the upper surface leaves know as stippling (pigmented yellow, light tan, red brown, dark brown, red, or purple), flecking (silver or bleached straw white), mottling, chlorosis or bronzing, and bleaching. $O_3$ can also stunt plant growth and bud formation. On certain plants such as citrus, grape, and tobacco, it is common for leaves to wither and drop early.

As described in Section 7.3.1, the VOC emissions due to the proposed GP project represents less than a 1-percent increase in regional VOC emissions. Therefore, the effects of $O_3$, as a result of VOC emissions from the project, are expected to be insignificant.

### 8.5.7 SUMMARY

In summary, the phytotoxic effects from the project's emissions are minimal. It is important to note that the elements were conservatively modeled with the assumption that 100 percent was available for plant uptake. This is rarely the case in a natural ecosystem.

## 8.6 IMPACTS TO WILDLIFE

The major air quality risk to wildlife in the United States is from continuous exposure to pollutants above the National AAQS. This occurs in non-attainment areas, *e.g.*, Los Angeles Basin. Risks to wildlife also may occur for wildlife living in the vicinity of an emission source that experiences frequent upsets or episodic conditions resulting from malfunctioning equipment, unique meteorological conditions, or startup operations (Newman and Schreiber, 1988). Under these conditions, chronic effects (*e.g.*, particulate contamination) and acute effects (*e.g.*, injury to health) have been observed (Newman, 1981).

A wide range of physiological and ecological effects to fauna has been reported for gaseous and particulate pollutants (Newman, 1981; Newman and Schreiber, 1988). The most severe of these effects have been observed at concentrations above the secondary AAQS. Physiological and behavioral effects have been observed in experimental animals at or below these standards.

For impacts on wildlife, the lowest threshold values of $NO_2$, $PM_{10}$, and $SO_2$ that are reported to cause physiological changes are shown in Table 8-2. These values are up to orders of magnitude larger than maximum concentrations predicted due to the GP project in the Okefenokee NWA Class I area. No effects on wildlife AQRVs from $SO_2$, $NO_2$, and particulates are expected. The proposed project's contribution to cumulative impacts is expected to be negligible.

Research with primates shows that $O_3$ penetrates deeper into non-ciliated peripheral pathways and can cause lesions in the respiratory bronchioles and alveolar ducts as concentrations increase from 0.2 to 0.8 ppm (Paterson, 1997). These bronchioles are the most common site for severe damage. In rats, the Type I cells in the proximal alveoli (where gas exchange occurs) were the primary site of action at concentrations between 0.5 and 0.9 ppm (Paterson, 1997). Work with rats and rabbits suggest that the mucus layer that lines the large airways does not protect completely against the effects of $O_3$, and desquamated cells were found from acute exposures at 0.25, 0.5, and 1.0 ppm. In animal research, $O_3$ has been found to increase the susceptibility to bacterial pneumonia (Paterson, 1997). During the last decade, there has also been growing concern with the possibility that repeated or long-term exposure to elevated $O_3$ concentrations may be causing or contributing to irreversible chronic lung injury.

The project's contribution to ground level $O_3$ is expected to be very low and dispersed over a large area. Coupled with the historical ambient data, mobility of wildlife, the potential for exposure of wildlife to the facility's impacts that lead to high concentration is extremely unlikely.

## 8.7 IMPACTS ON VISIBILITY

### 8.7.1 GENERAL

The CAA Amendments of 1977 provide for implementation of guidelines to prevent visibility impairment in mandatory Class I area. The guidelines are intended to protect the aesthetic quality of these pristine areas from reduction in visual range and atmospheric discoloration due to various pollutants. Sources of air pollution can cause visible plumes if emissions of $PM_{10}$ and $NO_x$ are sufficiently large. A plume will be visible if its constituents scatter or absorb sufficient light so that the plume is brighter or darker than its viewing background (e.g., the sky or a terrain feature, such as a mountain). PSD Class I areas, such as national parks and wilderness areas, are afforded special visibility protection designed to prevent plume visual impacts to observers within a Class I area.

Visibility is an AQRV for the Okefenokee NWA. Visibility can take the form of plume blight for nearby areas, or regional haze for long distances (e.g., distances beyond 50 km). Because the Okefenokee NWA lies more than 50 km from the GP Palatka Mill, the change in visibility is analyzed as regional haze.

Currently, there are several air quality modeling approaches recommended by the Interagency Workgroup on Air Quality Models (IWAQM) to perform these analyses. The IWAQM consists of EPA and Federal Land Managers (FLM) of Class I areas responsible for ensuring that AQRVs are not adversely impacted by new and existing sources. These recommendations have been summarized in two documents:

- *Interagency Workgroup on Air Quality Models (IWAQM), Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts* (EPA, 1998), referred to as the IWAQM Phase 2 report.
- *Federal Land Managers' Air Quality Related Values Workgroup (FLAG), Phase I Report;* U.S. Forestry Service (USFS), National Park Service (NPS), and U.S. Fish and Wildlife Service (USFWS) (December 2000); referred to as the FLAG document.

The methods and assumptions recommended in these documents were used to assess visibility impairment due to the project.

### 8.7.2 METHODOLOGY

Based on the FLAG document, current regional haze guidelines characterize a change in visibility by the change in the light-extinction coefficient ($b_{ext}$). The $b_{ext}$ is the attenuation of light per unit distance due to the scattering and absorption by gases and particles in the atmosphere. A change in the extinction coefficient produces a perceived visual change. An index that simply quantifies the percent change in visibility due to the operation of a source is calculated as:

$$\Delta\% = (b_{exts} / b_{extb}) \times 100$$

where: $b_{exts}$ is the extinction coefficient calculated for the source, and
$b_{extb}$ is the background extinction coefficient.

The purpose of the visibility analysis is to calculate the extinction at each receptor for each day (24-hour period) of the year due to the proposed project. The criteria to determine if the project's impacts are potentially significant are based on a change in extinction of 5 percent or greater for any day of the year.

Processing of visibility impairment for this study was performed with the CALPUFF model (see Appendix C) and the CALPUFF post-processing program CALPOST. The analysis was conducted in accordance with the most recent guidance from the FLAG report (December 2000). The CALPUFF postprocessor model CALPOST is used to calculate the combined visibility effects from the different pollutants that are emitted from the proposed project. Daily background extinction coefficients are calculated on an hour-by-hour basis using hourly relative humidity data from CALMET and hygroscopic and non-hygroscopic extinction components specified in the FLAG document. For the Okefenokee NWA, the hygroscopic and non-hygroscopic components are 0.9 and 8.5 inverse megameter ($Mm^{-1}$). CALPOST then calculates the percent extinction change for each day of the year.

### 8.7.3 RESULTS

The results of the refined analysis for regional haze are presented in Table 8-3. As shown in this table, the project's maximum visibility impairment is predicted to be 2.8 percent at Okefenokee NWA, which is below the FLM's screening criteria of 5 percent change. As a result, since the proposed project's regional haze maximum impacts are below the FLM's screening criteria at the PSD Class I area, it is expected the proposed project would not have an adverse impact on the existing regional haze at the PSD Class I area of the Okefenokee NWA.

## 8.8 NITROGEN AND SULFUR DEPOSITION

### 8.8.1 GENERAL METHODS

As part of the AQRV analyses, total nitrogen (N) and sulfur (S) deposition rates were predicted for the proposed project at the Okefenokee NWA. The deposition analysis criterion is based on the annual averaging period. The total N and S deposition is estimated in units of kilogram per hectare per year (kg/ha/yr). The CALPUFF model is used to predict wet and dry deposition fluxes of various oxides of these elements.

For N deposition, the species include:

- Particulate ammonium nitrate (from species $NO_3$), wet and dry deposition;
- Nitric acid (species $HNO_3$), wet and dry deposition;
- $NO_x$ dry deposition; and
- Ammonium sulfate (species $SO_4$), wet and dry deposition.

For S deposition, the species include:

- $SO_2$ wet and dry deposition, and
- $SO_4$ wet and dry deposition.

The CALPUFF model produces results in units of micrograms per square meter per second ($\mu g/m^2/s$). The modeled deposition rates are then converted to N and S deposition in kilograms per hectare, respectively, by using a multiplier equal to the ratio of the molecular weights of the substances (refer to the IWAQM Phase 2 report, Section 3.3).

The deposition analysis threshold (DAT) for N of 0.01 kg/ha/yr was provided by the USFWS (January 2002). A DAT is the additional amount of N or S deposition within a Class I area, below which estimated impacts from a proposed new or modified source are considered insignificant. The maximum N and S deposition predicted for the proposed GP project is, therefore, compared to these DAT or significant impact levels.

### 8.8.2 RESULTS

The maximum predicted N and S depositions predicted for the project in the PSD Class I area of the Okefenokee NWA are summarized in Table 8-4. The maximum N and S deposition rates for the project are predicted to be 0.0078 and 0.054 kg/ha/yr, respectively. The maximum N deposition rate is predicted to be below the DAT of 0.01 kg/ha/yr, while the maximum S deposition rate is predicted to be above the DAT of 0.01 kg/ha/yr.

The predicted deposition rates for the proposed project are determined by modeling the difference between the future potential and current actual emission rates. The difference that was modeled for the project was very high due to the fact that GP Palatka Mill burned moderate amounts of fuel oil in the No. 4 Combination Boiler in the last 2 years compared to the permitted fuel burning limits. Although the predicted deposition rates are above the recommended significant impact levels, this maximum fuel burning case is not expected to occur, and therefore, the actual deposition rates would be much lower than predicted.

In addition, although the project's impacts are predicted to be above the DAT for S deposition at the Class I area, the soils and vegetation are not sensitive to the very low deposition rates predicted for the project. As discussed in Section 8.4, the dominant soil of the Okefenokee NWA is the organic histosols with extremely high buffering capacities. This soil is resistant to acidic atmospheric inputs. The average buffering capacity of histosols is 765,000 equivalence per hectare (eq/ha) [Florida Acid Deposition Study (FADS), 1986]. As acid inputs (*e.g.*, $HNO_3^{-1}$ and $H_2SO_4^{-2}$), the maximum predicted N and S deposition rates of 0.0078 and 0.054 kg/ha/yr, respectively, are equivalent to 0.56 and 3.4 equivalence per hectare per year (eq/ha/yr), respectively. The deposition in eq/ha/yr is calculated by dividing the deposition rate in g/ha/yr by the molecular weight of N (*i.e.*, 14) or S (*i.e.*, 32) and multiplying by the valence of the acid input (*i.e.*, 1 $HNO_3^{-1}$; 2 for $H_2SO_4^{-2}$ ). These deposition rates are extremely small compared to the buffering capacity of the soils in the Okefenokee NWA. These deposition rates are also small compared to the observed N and S deposition obtained from the FADS. Measurements taken at a rural site in Jefferson County, about 120 miles west-southwest of the Okefenokee NWA, found total (*i.e.*, wet and dry) N and S deposition rates of 304 and 474 eq/ha/yr, respectively, over a 3-year period (FADS, 1986).

The relatively low sensitivity of the soils to acid inputs coupled with the extremely low ground level concentrations of contaminants projected for the Okefenokee NWA from the project emissions precludes any significant impact on soils. Similarly, the total annual N and S deposition rates at the

Okefenokee NWA as a result of the project are not expected to alter soil and/or groundwater pH that may result in adverse effects on vegetation.

Table 8-1. Summary of Maximum Pollutant Concentrations Predicted for the Project at the Okefenokee NWA PSD Class I Area

| Pollutant and Averaging Time | Highest Concentration [a] (μg/m³) | Receptor UTM Location (km) East | Receptor UTM Location (km) North | Time Period [b] YYMMDDHH |
|---|---|---|---|---|
| $SO_2$ | | | | |
| Annual | 0.031 | 385.70 | 3379.70 | 90123124 |
| | 0.027 | 385.70 | 3379.70 | 92123124 |
| | 0.045 | 385.70 | 3379.70 | 96123124 |
| 24-hour | 0.15 | 371.50 | 3380.70 | 90050324 |
| | 0.18 | 384.40 | 3380.00 | 92112424 |
| | 0.23 | 384.40 | 3380.00 | 96042224 |
| 8-hour | 0.37 | 360.85 | 3384.15 | 90123008 |
| | 0.52 | 378.50 | 3382.65 | 92112408 |
| | 0.55 | 376.30 | 3381.60 | 96050908 |
| 3-hour | 0.59 | 360.85 | 3384.15 | 90123006 |
| | 0.84 | 378.50 | 3382.65 | 92112406 |
| | 0.77 | 385.70 | 3379.70 | 96032506 |
| 1-hour | 0.89 | 385.70 | 3379.70 | 90123008 |
| | 0.96 | 378.50 | 3382.65 | 92112405 |
| | 0.88 | 386.05 | 3381.05 | 96050803 |
| $PM_{10}$ | | | | |
| Annual | 0.0037 | 385.70 | 3379.70 | 90123124 |
| | 0.0031 | 385.70 | 3379.70 | 92123124 |
| | 0.0049 | 385.70 | 3379.70 | 96123124 |
| 24-hour | 0.050 | 371.50 | 3380.70 | 90050324 |
| | 0.055 | 381.30 | 3382.40 | 92112424 |
| | 0.073 | 376.30 | 3381.60 | 96050924 |
| 8-hour | 0.117 | 360.85 | 3384.15 | 90123008 |
| | 0.161 | 378.50 | 3382.65 | 92112408 |
| | 0.174 | 376.30 | 3381.60 | 96050908 |
| 3-hour | 0.189 | 369.85 | 3380.50 | 90050306 |
| | 0.253 | 378.50 | 3382.65 | 92112406 |
| | 0.228 | 385.70 | 3379.70 | 96032506 |
| 1-hour | 0.281 | 385.70 | 3379.70 | 90123008 |
| | 0.286 | 378.50 | 3382.65 | 92112405 |
| | 0.290 | 369.85 | 3380.50 | 96092504 |
| $NO_2$ | | | | |
| Annual | 0.00072 | 385.70 | 3379.70 | 90123124 |
| | 0.00048 | 385.70 | 3379.70 | 92123124 |
| | 0.00119 | 385.70 | 3379.70 | 96123124 |
| 24-hour | 0.0076 | 385.70 | 3379.70 | 90021524 |
| | 0.0107 | 384.40 | 3380.00 | 92112424 |
| | 0.0119 | 384.40 | 3380.00 | 96042224 |
| 8-hour | 0.023 | 385.70 | 3379.70 | 90021508 |
| | 0.032 | 378.50 | 3382.65 | 92112408 |
| | 0.033 | 376.30 | 3381.60 | 96050908 |

Table 8-1. Summary of Maximum Pollutant Concentrations Predicted for the Project at the Okefenokee NWA PSD Class I Area

| Pollutant and Averaging Time | Highest Concentration [a] (μg/m³) | Receptor UTM Location (km) East | North | Time Period [b] YYMMDDHH |
|---|---|---|---|---|
| NO₂ (con't) | | | | |
| 3-hour | 0.036 | 360.85 | 3384.15 | 90123006 |
| | 0.051 | 378.50 | 3382.65 | 92112406 |
| | 0.049 | 385.70 | 3379.70 | 96032506 |
| 1-hour | 0.054 | 385.70 | 3379.70 | 90123008 |
| | 0.058 | 378.50 | 3382.65 | 92112405 |
| | 0.055 | 385.70 | 3379.70 | 96050803 |
| CO | | | | |
| Annual | 0.00148 | 385.70 | 3379.70 | 90123124 |
| | 0.00099 | 385.70 | 3379.70 | 92123124 |
| | 0.00247 | 385.70 | 3379.70 | 96123124 |
| 24-hour | 0.0375 | 385.70 | 3379.70 | 90021524 |
| | 0.0528 | 384.40 | 3380.00 | 92112424 |
| | 0.0587 | 384.40 | 3380.00 | 96042224 |
| 8-hour | 0.1115 | 385.70 | 3379.70 | 90021508 |
| | 0.1559 | 378.50 | 3382.65 | 92112408 |
| | 0.1608 | 376.30 | 3381.60 | 96050908 |
| 3-hour | 0.175 | 360.85 | 3384.15 | 90123006 |
| | 0.251 | 378.50 | 3382.65 | 92112406 |
| | 0.243 | 385.70 | 3379.70 | 96032506 |
| 1-hour | 0.267 | 385.70 | 3379.70 | 90123008 |
| | 0.284 | 378.50 | 3382.65 | 92112405 |
| | 0.269 | 385.70 | 3379.70 | 96050803 |
| SAM | | | | |
| Annual | 0.00070 | 385.70 | 3379.70 | 90123124 |
| | 0.00046 | 385.70 | 3379.70 | 92123124 |
| | 0.00116 | 385.70 | 3379.70 | 96123124 |
| 24-hour | 0.005 | 385.70 | 3379.70 | 90021524 |
| | 0.007 | 384.40 | 3380.00 | 92112424 |
| | 0.008 | 384.40 | 3380.00 | 96042224 |
| 8-hour | 0.014 | 385.70 | 3379.70 | 90021508 |
| | 0.020 | 378.50 | 3382.65 | 92112408 |
| | 0.021 | 376.30 | 3381.60 | 96050908 |
| 3-hour | 0.023 | 360.85 | 3384.15 | 90123006 |
| | 0.033 | 378.50 | 3382.65 | 92112406 |
| | 0.032 | 385.70 | 3379.70 | 96032506 |
| 1-hour | 0.035 | 385.70 | 3379.70 | 90123008 |
| | 0.037 | 378.50 | 3382.65 | 92112405 |
| | 0.035 | 385.70 | 3379.70 | 96050803 |

Note: UTM = Universal Transverse Mercator.

[a] Based on the CALPUFF model using 1990, 1992, and 1996 surface and upper air meteorological data developed with the CALMET program. UTM coordinates relative to Zone 17.

[b] YY = Year; MM = Month; DD = Day; HH = Hour ending.

Table 8-2. Examples of Reported Effects of Air Pollutants at Concentrations Below National Secondary Ambient Air Quality Standards

| Pollutant | Reported Effect | Concentration ($\mu g/m^3$) | Exposure |
|---|---|---|---|
| $SO_2$[1] | Respiratory stress in guinea pigs. | 427 to 854 | 1 hour |
| | Respiratory stress in rats. | 267 | 7 hours/day; 5 day/week for 10 weeks |
| | Decreased abundance in deer mice. | 13 to 157 | Continually for 5 months |
| $NO_2$[2,3] | Respiratory stress in mice. | 1,917 | 3 hours |
| | Respiratory stress in guinea pigs. | 96 to 958 | 8 hours/day for 122 days |
| Particulates[1] | Respiratory stress, reduced respiratory disease defenses. | 120 $PbO_3$ | Continually for 2 months |
| | Decreased respiratory disease defenses in rats, same with hamsters. | 100 $NiCl_2$ | 2 hours |

Sources: [1]Newman and Schreiber, 1988.

[2]Gardner and Graham, 1976.

[3]Trzeciak *et al.*, 1977.

Table 8-3. Maximum 24-hour Average Visibility Impairment Predicted for the Project at the PSD Class I Area of the Okefenokee NWA

| Rank | Visibility Impairment (%) [a] | Time Period (Year) | Number of Visibility Impairment Occurrences > 5%/ 10 % Criteria |
|---|---|---|---|
| Highest | 2.49 | 1990 | 0/0 |
| Highest | 2.59 | 1992 | 0/0 |
| Highest | 2.84 | 1996 | 0/0 |

[a] Based on the CALPUFF model using 1990, 1992, and 1996 surface and upper air meteorologic: developed with the CALMET program. UTM coordinates relative to Zone 17. Maximum relative humidity set to 95%.

Table 8-4. Maximum Annual Sulfur and Nitrogen Deposition Predicted for the Project at the PSD Class I Area of the Okefenokee NWA

| Species | Total Deposition (Wet & Dry) | | Receptor UTM Location (km) | | Year | Deposition Analysis Threshold [b] (kg/ha/yr) |
|---|---|---|---|---|---|---|
| | ($g/m^2/s$) | (kg/ha/yr)[a] | East | North | | |
| Sulfur (S) Deposition | 1.14E-10 | 0.0360 | 385.7 | 3,379.7 | 1990 | 0.01 |
| | 1.71E-10 | 0.0540 | 371.5 | 3,380.7 | 1992 | |
| | 1.37E-10 | 0.0433 | 389.2 | 3,381.7 | 1996 | |
| Nitrogen (N) Deposition | 1.43E-11 | 0.0045 | 387.5 | 3,380.7 | 1990 | 0.01 |
| | 2.48E-11 | 0.0078 | 370.7 | 3,380.4 | 1992 | |
| | 1.38E-11 | 0.0044 | 389.2 | 3,381.7 | 1996 | |

[a] Conversion factor is used to convert $g/m^2/s$ to kg/hectare (ha)/yr with the following units:

$g/m^2/s$ x 0.001 kg/g
x 10,000 $m^2$/hectare
x 3,600 sec/hr
x 8,760 hr/yr = kg/ha/yr
or
$g/m^2/s$ x 3.154E+08 = kg/ha/yr

[b] Deposition analysis thresholds (DAT) for nitrogen and sulfur deposition provided by the U.S. Fish and Wildlife Service, January, 2002. A DAT is the additional amount of N or S deposition within a Class I area, below which estimated impacts from a proposed modified source are considered insignificant.

# 9.0 ADDITIONAL IMPACT ANALYSIS ON THE CHASSAHOWITZKA NWA CLASS I AREA

## 9.1 INTRODUCTION

As discussed in Section 7.0, the GP Palatka Mill is subject to the PSD new source review requirements for $SO_2$, $NO_x$, PM, $PM_{10}$, CO, VOC, and SAM. The analysis presented in this section addresses the potential impacts on vegetation, soils, and wildlife of the Chassahowitzka NWA Class I area due to the proposed GP Palatka Mill project. The Chassahowitzka NWA is located approximately 137 km southwest of the GP Palatka Mill. In addition, potential impacts upon visibility resulting from the proposal modification are assessed.

The analysis demonstrates that the increase in impacts due to the proposed project is extremely low. Regardless of the existing conditions in the vicinity of the Class I area, the proposed project will not cause any significant adverse effects due to the predicted low impacts upon these areas.

## 9.2 SOIL, VEGETATION, AND AQRV ANALYSIS METHODOLOGY

This analysis uses the maximum air quality impacts predicted to occur in the Chassahowitzka NWA Class I area due to the increase in the proposed project's emissions. These impacts are summarized in Section 6.0 and Table 9-1, based on the modeling described in Section 6.0.

The analysis involved predicting worst-case maximum short- and long-term concentrations of pollutants in the Class I area and comparing the maximum predicted concentrations to lowest observed effect levels for AQRVs or analogous organisms. In conducting the assessment, several assumptions were made as to how pollutants interact with the different matrices, *i.e.*, vegetation, soils, wildlife, and aquatic environment.

A screening approach was used to evaluate potential effects by comparison of the maximum predicted ambient concentrations with effect threshold limits for the pollutant of concern, for vegetation and wildlife, as reported in the scientific literature. A literature search was conducted which specifically addressed the effects of air contaminants on plant species reported to occur in the Class I area. It was recognized that effects threshold information is not available for all species found in the Chassahowitzka NWA, although studies have been performed on a few of the common species and on other similar species, which can be used as models.

## 9.3 IDENTIFICATION OF AQRVS AND METHODOLOGY

An AQRV analysis was conducted to assess the potential risk to AQRVs of the Chassahowitzka NWA due to the proposed emissions from the GP project. The U.S. Department of the Interior in 1978 administratively defined AQRVs to be:

> *All those values possessed by an area except those that are not affected by changes in air quality and include all those assets of an area whose vitality, significance, or integrity is dependent in some way upon the air environment. These values include visibility and those scenic, cultural, biological, and recreational resources of an area that are affected by air quality.*
>
> *Important attributes of an area are those values or assets that make an area significant as a national monument, preserve, or primitive area. They are the assets that are to be preserved if the area is to achieve the purposes for which it was set aside (Federal Register, 1978).*

Except for visibility, AQRVs were not specifically defined. However, odor, soil, flora, fauna, cultural resources, geological features, water, and climate generally have been identified by land managers as AQRVs. Since specific AQRVs have not been identified for the Chassahowitzka NWA, this AQRV analysis evaluates the effects of air quality on general vegetation types and wildlife found in the Chassahowitzka NWA.

Vegetation type AQRVs and their representative species types have been defined by the USFWS as:

- Marshlands - black needlerush, saw grass, salt grass, and salt marsh cordgrass
- Marsh Islands - cabbage palm and eastern red cedar
- Estuarine Habitat - black needlerush, salt marsh cordgrass, and wax myrtle
- Hardwood Swamp - red maple, red bay, sweet bay, and cabbage palm
- Upland Forests - live oak, scrub oak, longleaf pine, slash pine, wax myrtle, and saw palmetto
- Mangrove Swamp - red, white, and black mangrove

Wildlife AQRVs have been identified as endangered species, waterfowl, marsh and waterbirds, shorebirds, reptiles, and mammals.

The maximum pollutant concentrations predicted for the project in the Chassahowitzka NWA are presented in Table 9-1. These results were compared with effect threshold limits for both vegetation and wildlife as reported in the scientific literature. A literature search was conducted that specifically addressed the effects of air contaminants on plant species reported to occur in the Chassahowitzka NWA. While the literature search focused on such species as cabbage palm, eastern red cedar, lichens, and species of the hardwood swamplands and mangrove forest, no specific citations that addressed these species were found. It is recognized that effect threshold information is not available for all species found in the Chassahowitzka NWA, although studies have been performed on a few of the common species and on other similar species that can be used as indicators of effects.

## 9.4 IMPACTS TO SOILS

For soils, the potential and hypothesized effects of atmospheric deposition include:

- Increased soil acidification,
- Alteration in cation exchange,
- Loss of base cations, and
- Mobilization of trace metals.

The potential sensitivity of specific soils to atmospheric inputs is related to two factors. First, the physical ability of a soil to conduct water vertically through the soil profile is important in influencing the interaction with deposition. Second, the ability of the soil to resist chemical changes, as measured in terms of pH and soil cation exchange capacity (CEC), is important in determining how a soil responds to atmospheric inputs.

The soils of the Chassahowitzka NWA are generally classified as histosols. According to the U.S. Department of Agriculture (USDA) Soil Surveys of Citrus and Hernando Counties, nine soil complexes are found in the Chassahowitzka NWA. These include Aripeka fine sand, Aripeka-Okeelanta-Lauderhill, Hallendale-Rock outcrop, Homosassa mucky fine sandy loam, Lacooche, Okeelanta mucks, Okeelanta-Lauderdale-Terra Ceia mucks, Rock outcrop-Homosassa-Lacoochee, and Weekiwachee-Durbin mucks (Porter, 1996). The majority of the soil complexes found in the Chassahowitzka NWA are inundated by tidal waters, contain a relatively high organic matter content, and have high buffering capacities based on their CEC, base saturation, and bulk density. The regular flooding of these soils by the Gulf of Mexico regulates the pH and any change in acidity in the soil would be buffered by this activity. Therefore, they would be relatively insensitive to atmospheric inputs. However, Terra Ceia, Okeelanta, and Lauderdale freshwater mucks are present along the eastern border of the Chassahowitzka NWA, and may be more sensitive to atmospheric sulfur deposition (Porter, 1996). Although not tidally influenced, these freshwater mucks are highly organic and, therefore, have a relatively high intrinsic buffering capacity.

The relatively low sensitivity of the soils to atmospheric inputs coupled with the extremely low ground-level pollutant concentrations due to the project at the Chassahowitzka NWA precludes any significant impact on soils.

## 9.5 IMPACTS TO VEGETATION

In general, the effects of air pollutants on vegetation occur primarily from $SO_2$, $NO_2$, $O_3$, and PM. Effects from minor air contaminants, such as fluoride (F), chlorine, hydrogen chloride, ethylene, ammonia, hydrogen sulfide, CO, and pesticides, have also been reported in the literature. The effects of air pollutants are dependent both on the concentration of the contaminant and the duration of the exposure. The term "injury," as opposed to damage, is commonly used to describe all plant responses to air contaminants and will be used in the context of this analysis. Air contaminants are thought to interact primarily with plant foliage, which is considered to be the major pathway of exposure. For purposes of this analysis, it was assumed that 100 percent of each air contaminant of concern is accessible to the plants.

Injury to vegetation from exposure to various levels or air contaminants can be termed acute, physiological, or chronic. Acute injury occurs as a result of a short-term exposure to a high contaminant concentration and is typically manifested by visible injury symptoms ranging from chlorosis (discoloration) to necrosis (dead areas). Physiological or latent injury occurs as the result of a long-term exposure to contaminant concentrations below that which results in acute injury symptoms. Chronic injury results from repeated exposure to low concentrations over extended periods of time, often without any visible symptoms, but with some effect on the overall growth and productivity of the plant. In this assessment, 100 percent of the particular air pollutant in the ambient air was assumed to interact with the vegetation. This is a conservative approach.

The concentrations of the pollutants, duration of exposure and frequency of exposures influence the response of vegetation and wildlife to atmospheric pollutants. The pattern of pollutant exposure expected from the facility is that of a few episodes of relatively high ground-level concentrations, which occur during certain meteorological conditions interspersed with long periods of extremely low ground-level concentrations. If there are any effects of stack emissions on plants and animals they will be from the short-term, higher doses. A dose is the product of the concentration of the pollutant and duration of the exposure.

### 9.5.1 NITROGEN DIOXIDE

$NO_2$ can injure plant tissue with symptoms usually appearing as irregular white to brown collapsed lesions between the leaf veins and near the margins. Conversely, non-injurious levels of $NO_2$ can be absorbed by plants, enzymatically transformed into ammonia, and incorporated into plant constituents such as amino acids (Matsumaru *et al.*, 1979).

Plant damage can occur through either acute (short-term, high concentration) or chronic (long-term, relatively low concentration) exposure. For plants that have been determined to be more sensitive to $NO_2$ exposure than others, acute (1, 4, 8 hours) exposure caused 5 percent predicted foliar injury at concentrations ranging from 3,800 to 15,000 $\mu g/m^3$ (Heck and Tingey, 1979). Chronic exposure of selected plants (some considered $NO_2$-sensitive) to $NO_2$ concentrations of 2,000 to 4,000 $\mu g/m^3$ for 213 to 1,900 hours caused reductions in yield of up to 37 percent and some chlorosis (Zahn, 1975).

The maximum 8-hour average $NO_2$ concentration due to the increase in emissions from the GP project is predicted to be 0.019 $\mu g/m^3$ in the Chassahowitzka NWA (Table 9-1). This concentration is less than 0.001 percent of the levels that cause foliar injury in acute exposure scenarios. By comparison of published toxicity values for $NO_2$ exposure to long-term (annual averaging time) modeled concentrations, the possibility of plant damage in the Chassahowitzka NWA Class I area can be examined for chronic exposure situations. For a chronic exposure, the maximum annual average $NO_2$ concentration due to the project in the Chassahowitzka NWA Class I area is 0.0005 $\mu g/m^3$. This value is less than 0.0001 percent of the levels that caused minimal yield loss and chlorosis in plant tissue. Average and maximum background 24-hour average concentrations of $NO_2$ reported in the Chassahowitzka NWA are 0.006 and 0.104 $\mu g/m^3$, respectively.

Although it has been shown that simultaneous exposure to $SO_2$ and $NO_2$ results in synergistic plant injury (Ashenden and Williams, 1980), the magnitude of this response is generally only 3 to 4 times greater than either gas alone and usually occurs at unnaturally high levels of each gas. Therefore, the concentrations within the Chassahowitzka NWA are still far below the levels that potentially cause plant injury for either acute or chronic exposure.

### 9.5.2 SULFUR DIOXIDE

Sulfur is an essential plant nutrient usually taken up as sulfate ions by the roots from the soil solution. When sulfur dioxide in the atmosphere enters the foliage through pores in the leaves, it reacts with water in the leaf interior to form sulfite ions. Sulfite ions are highly toxic. They interact with enzymes, compete with normal metabolites, and interfere with a variety of cellular functions (Horsman and Wellburn, 1976). However, within the leaf, sulfite is oxidized to sulfate ions, which can then be used by the plant as a nutrient. Small amounts of sulfite may be oxidized before they prove harmful.

$SO_2$ gas at sufficiently elevated levels has long been known to cause injury to plants. Acute $SO_2$ injury usually develops within a few hours or days of exposure, and symptoms include marginal, flecked, and/or intercoastal necrotic areas that appear water-soaked and dullish green initially. This injury generally occurs to younger leaves. Chronic injury usually is evident by signs of chlorosis, bronzing, premature senescence, reduced growth, and possible tissue necrosis (EPA, 1982). Background levels of $SO_2$ in the Chassahowitzka NWA average 1.3 $\mu g/m^3$, with a maximum 24-hour average concentration of 14.5 $\mu g/m^3$ (IMPROVE, 2002). Observed $SO_2$ effect levels for several plant species and plant sensitivity groupings are presented in Tables 7-2 and 7-3, respectively.

Many studies have been conducted to determine the effects of high-concentration, short-term $SO_2$ exposure on natural community vegetation. Sensitive plants include ragweed, legumes, blackberry, southern pine, and red and black oak. These species are injured by exposure to 3-hour average $SO_2$ concentrations of 790 to 1,570 $\mu g/m^3$. Intermediate plants include locust and sweetgum. These species are injured by exposure to 3-hour average $SO_2$ concentrations of 1,570 to 2,100 $\mu g/m^3$. Resistant species (injured at concentrations above 2,100 $\mu g/m^3$ for 3 hours) include white oak and dogwood (EPA, 1982).

A study of native Floridian species (Woltz and Howe, 1981) demonstrated that cypress, slash pine, live oak, and mangrove exposed to 1,300 $\mu g/m^3$ $SO_2$ for 8 hours were not visibly damaged. This finding supports the levels cited by other researchers on the effects of $SO_2$ on vegetation. A corroborative study (McLaughlin and Lee, 1974) demonstrated that approximately 20 percent of a cross-section of plants ranging from sensitive to tolerant was visibly injured at 3-hour average $SO_2$ concentrations of 920 $\mu g/m^3$.

Jack pine seedlings exposed to $SO_2$ concentrations of 470 to 520 μg/m$^3$ for 24 hours demonstrated inhibition of foliar lipid synthesis; however, this inhibition was reversible (Malhotra and Kahn, 1978). Black oak exposed to 1,310 μg/m$^3$ $SO_2$ for 24 hours a day for 1 week demonstrated a 48 percent reduction in photosynthesis (Carlson, 1979).

Two lichen species indigenous to Florida exhibited signs of $SO_2$ damage in the form of decreased biomass gain and photosynthetic rate as well as membrane leakage when exposed to concentrations of 200 to 400 μg/m$^3$ for 6 hours/week for 10 weeks (Hart *et al.*, 1988).

The maximum 24-hour average $SO_2$ concentration increase that is predicted for the proposed project at the Chassahowitzka NWA Class I area is 0.18 μg/m$^3$ (see Table 9-1). When added to the average background concentration of 1.3 μg/m$^3$, the total $SO_2$ impact is 1.48 μg/m$^3$. When added to the maximum 24-hour average background concentration of 14.5 μg/m$^3$ at the Chassahowitzka NWA, the maximum worst-case total $SO_2$ concentration is 14.7 μg/m$^3$, which is much lower than those known to cause damage to test species. The maximum total 24-hour average $SO_2$ concentration predicted for the project at the Chassahowitzka NWA Class I area is only 7 percent of those that caused damage to the most sensitive lichens. The modeled annual incremental increase in $SO_2$ adds slightly to background levels of this gas and poses only a minimal threat to area vegetation.

### 9.5.3 PARTICULATE MATTER ($PM_{10}$)

Although information pertaining to the effects of PM on plants is scarce, some threshold concentrations are available. Mandoli and Dubey (1998) exposed ten species of native Indian plants to levels of PM ranging from 210 to 366 μg/m$^3$ for an 8-hour averaging period. Damage in the form of a higher leaf area/dry weight ratio was observed at varying degrees for most plants tested. Concentrations of PM lower than 163 μg/m$^3$ did not appear to be injurious to the tested plants.

By comparison of these published toxicity values for PM exposure (*i.e.*, concentrations for an 8-hour averaging time), the possibility of plant damage in the Chassahowitzka NWA can be determined. The maximum predicted 8-hour $PM_{10}$ concentration due to the increase in emissions resulting from the proposed project at the Chassahowitzka NWA Class I area is 0.096 μg/m$^3$ (Table 9-1). This concentration is only 0.04 to 0.07 percent of the lower threshold value that reportedly affects plant foliage. As a result, no effects to vegetative AQRVs are expected from the project's emissions.

### 9.5.4 CARBON MONOXIDE

As with $PM_{10}$, information pertaining to the effects of CO on plants is scarce. The main effect of high concentrations of CO is the inhibition of cytochrome *c* oxidase, the terminal oxidase in the mitochondrial electron transfer chain. Inhibition of cytochrome *c* oxidase depletes the supply of ATP, the principal donor of free energy required for cell functions. However, this inhibition only occurs at extremely high concentrations of CO. Pollok *et al.* (1989) reported that exposure to $CO:O_2$ ratio of 25 (equivalent to an ambient CO concentration of $6.85 \times 10^6$ µg/m$^3$) resulted in stomatal closure in the leaves of the sunflower (*Helianthus annuus*). Naik *et al.* (1992) reported cytochrome *c* oxidase inhibition in corn, sorghum, millet, and Guinea grass at $CO:O_2$ ratios of 2.5 (equivalent to an ambient CO concentration of $6.85 \times 10^5$ µg/m$^3$). These plants were considered the species most sensitive to CO-induced inhibition of cytochrome *c* oxidase.

By comparison of published effect values for CO exposure, the possibility of plant damage in the Class I area can be determined. The maximum 1-hour (most conservative) estimated CO concentration due to the increase in emissions resulting from the proposed project in the Chassahowitzka NWA Class I area is 0.18 µg/m$^3$ (see Table 9-1). This concentration is less than 0.00001 percent of the value that caused inhibition in laboratory studies. The amount of damage sustained at this level (if any) for 1 hour would have negligible effects over an entire growing season. The predicted maximum annual CO concentration of 0.00068 µg/m$^3$ reflects a more realistic (yet conservative) CO level for the Class I area. This concentration is less than 0.000001 percent of the value that caused cytochrome *c* oxidase inhibition.

### 9.5.5 SULFURIC ACID MIST

Acidic precipitation or acid rain is coupled to $SO_2$ emissions mainly formed during the burning of fossil fuels. This pollutant is oxidized in the atmosphere and dissolves in rain forming SAM, which falls as acidic precipitation (Ravera, 1989). Although concentration data are not available, SAM has been reported to yield necrotic spotting on the upper surfaces of leaves (Middleton *et al.*, 1950).

No significant adverse effects on vegetation are expected from the project's emissions because $SO_2$ concentrations, which lead directly to the formation of SAM concentrations, are predicted to be well below levels that have been documented as negatively affecting vegetation. During the last decade, much attention has been focused on acid rain. Acidic deposition is an ecosystem-level problem that affects vegetation because of some alterations of soil conditions such as increased leaching of essential base cations or elevated concentrations of aluminum in the soil water (Goldstein *et al.*, 1985). Although effects of acid rain in eastern North America have been well published and publicized, detrimental effects of acid rain on Florida vegetation are lacking documentation.

### 9.5.6 VOC EMISSIONS AND IMPACTS ON OZONE

It is difficult to predict what effect the proposed increase in emissions of VOC will have on ambient $O_3$ concentrations on a regional scale. VOC and $NO_x$ emissions are precursors to the formation of $O_3$. $O_3$ is not directly emitted from fuel combustion, but is formed down-wind from emission sources when VOC and $NO_x$ emissions react in the presence of sunlight. Natural (without man-made sources) ambient concentrations of $O_3$ are normally in the range of 20 to 39 $\mu g/m^3$ (0.01 to 0.02 ppm) (Heath, 1975).

The nearest monitors to the GP Palatka Mill that measure $O_3$ concentrations are located in Gainesville (AIRS No. 12-001-0025 and 12-001-3011). These stations measure concentrations according to EPA procedures. Based on the $O_3$ monitoring concentrations measured over the last several years in Gainesville (see Table 4-1), the region is in attainment of the existing 1-hour $O_3$ AAQS as well as the new 8-hour $O_3$ AAQS.

$O_3$ can cause various damage to broad-leaved plants including: tissue collapse, interveinal necrosis and markings on the upper surface leaves know as stippling (pigmented yellow, light tan, red brown, dark brown, red, or purple), flecking (silver or bleached straw white), mottling, chlorosis or bronzing, and bleaching. $O_3$ can also stunt plant growth and bud formation. On certain plants such as citrus, grape, and tobacco, it is common for leaves to wither and drop early.

As described in subsection 7.3.1, the VOC emissions due to the proposed GP project represent less than 1-percent increase in regional VOC emissions. Therefore, the effects of $O_3$, as a result of VOC emissions from the project, are expected to be insignificant.

### 9.5.7 SUMMARY

In summary, the phytotoxic effects from the project's emissions are minimal. It is important to note that the emissions were conservatively modeled with the assumption that 100 percent was available for plant uptake. This is rarely the case in a natural ecosystem.

## 9.6 IMPACTS TO WILDLIFE

The major air quality risk to wildlife in the United States is from continuous exposure to pollutants above the NAAQS. This occurs in non-attainment areas, *e.g.*, Los Angeles Basin. Risks to wildlife also may occur for wildlife living in the vicinity of an emission source that experiences frequent upsets or episodic conditions resulting from malfunctioning equipment, unique meteorological conditions, or startup operations (Newman and Schreiber, 1988). Under these conditions, chronic effects (*e.g.*, particulate contamination) and acute effects (*e.g.*, injury to health) have been observed (Newman, 1981).

A wide range of physiological and ecological effects to fauna has been reported for gaseous and particulate pollutants (Newman, 1981; Newman and Schreiber, 1988). The most severe of these effects have been observed at concentrations above the secondary AAQS. Physiological and behavioral effects have been observed in experimental animals at or below these standards.

For impacts on wildlife, the lowest threshold values of $SO_2$, $NO_2$, and particulates that are reported to cause physiological changes are shown in Table 8-2. These values are orders of magnitude larger than maximum concentrations predicted for the GP project at the Chassahowitzka NWA Class I area. No effects on wildlife AQRVs from $SO_2$, $NO_2$, and particulates are expected. The proposed project's contribution to cumulative impacts is expected to be negligible.

## 9.7 IMPACTS ON VISIBILITY

### 9.7.1 INTRODUCTION

The CAA Amendments of 1977 provide for implementation of guidelines to prevent visibility impairment in mandatory Class I areas. The guidelines are intended to protect the aesthetic quality of these pristine areas from reduction in visual range and atmospheric discoloration due to various pollutants. Sources of air pollution can cause visible plumes if emissions of $PM_{10}$ and $NO_x$ are sufficiently large. A plume will be visible if its constituents scatter or absorb sufficient light so that the plume is brighter or darker than its viewing background (e.g., the sky or a terrain feature, such as a mountain). PSD Class I areas, such as national parks and wilderness areas, are afforded special visibility protection designed to prevent plume visual impacts to observers within a Class I area.

Visibility is an AQRV for the Chassahowitzka NWA. Visibility can take the form of plume blight for nearby areas or regional haze for long distances (e.g., distances beyond 50 km). Because the

Chassahowitzka NWA is more than 50 km from the GP Palatka Mill, the potential change in visibility is analyzed as regional haze.

Currently, there are several air quality modeling approaches recommended by the Interagency Workgroup on Air Quality Models (IWAQM) to perform these analyses. The IWAQM consists of EPA and FLM of Class I areas who are responsible for ensuring that AQRVs are not adversely impacted by new and existing sources. These recommendations have been summarized in two documents:

- *Interagency Workgroup on Air Quality Models (IWAQM), Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts* (EPA, 1998), referred to as the IWAQM Phase 2 report; and
- *Federal Land Managers' Air Quality Related Values Workgroup (FLAG), Phase I Report,* USFS, NPS, USFWS (December 2000), referred to as the FLAG document.

The methods and assumptions recommended in these documents were used to assess visibility impairment due to the project.

### 9.7.2 METHODOLOGY

Based on the FLAG document, current regional haze guidelines characterize a change in visibility by the change in the light-extinction coefficient ($b_{ext}$). The $b_{ext}$ is the attenuation of light per unit distance due to the scattering and absorption by gases and particles in the atmosphere. A change in the extinction coefficient produces a perceived visual change. An index that simply quantifies the percent change in visibility due to the operation of a source is calculated as:

$$\Delta\% = (b_{exts} / b_{extb}) \times 100$$

where: $b_{exts}$ is the extinction coefficient calculated for the source, and
$b_{extb}$ is the background extinction coefficient.

The purpose of the visibility analysis is to calculate the extinction at each receptor for each day (24-hour period) of the year due to the proposed project. The criteria to determine if the project's impacts are potentially significant are based on a change in extinction of 5 percent or greater for any day of the year.

Processing of visibility impairment for this study was performed with the CALPUFF model (see Appendix D) and the CALPUFF post-processing programs POSTUTIL and CALPOST. The analysis was conducted in accordance with the most recent guidance from the FLAG report (December 2000). The CALPUFF postprocessor model CALPOST is used to calculate the combined visibility effects from the different pollutants that are emitted from the project. Daily background extinction coefficients are calculated on an hour-by-hour basis using hourly relative humidity data from CALMET and hygroscopic and non-hygroscopic extinction components specified in the FLAG document. For the Chassahowitzka NWA Class I area evaluated, the hygroscopic and non-hygroscopic components are 0.9 and 8.5 inverse mega meter ($Mm^{-1}$). CALPOST then predicts the percent extinction change for each day of the year.

### 9.7.3 RESULTS

The results of the refined analysis for regional haze are presented in Table 9-2. As shown in this table, the project's maximum visibility impairment is predicted to be 3.6 percent at Chassahowitzka NWA, which is below the FLM's screening criteria of 5 percent change. As a result, since the proposed project's regional haze maximum impacts are below the FLM's screening criteria at the PSD Class I area, it is expected the proposed project would not have an adverse impact on the existing regional haze at the PSD Class I area of the Chassahowitzka NWA.

## 9.8 NITROGEN AND SULFUR DEPOSITION

### 9.8.1 GENERAL METHODS

As part of the AQRV analyses, total nitrogen (N) and total sulfur (S) deposition rates were predicted at the Chassahowitzka NWA Class I area. The deposition analysis threshold is based on the annual averaging period. The total nitrogen and sulfur deposition is estimated in units of kilogram per hectare per year (kg/ha/yr). The CALPUFF model is used to predict wet and dry deposition fluxes of various oxides of these elements.

For N deposition, the species include:

- Particulate ammonium nitrate (from species $NO_3$), wet and dry deposition;
- Nitric acid (species $HNO_3$), wet and dry deposition;
- $NO_x$, dry deposition; and
- Ammonium sulfate (species $SO_4$), wet and dry deposition.

For S deposition, the species include:

- $SO_2$, wet and dry deposition; and
- $SO_4$, wet and dry deposition.

The CALPUFF model produces results in units of $\mu g/m^2/s$. The modeled deposition rates are then converted to N and S deposition in kg/ha, respectively, by using a multiplier equal to the ratio of the molecular weights of the substances (refer to IWAQM Phase 2 report, Section 3.3).

The DAT for nitrogen of 0.01 kg/ha/yr was provided by the USFWS (January 2002). A DAT is the additional amount of N or S deposition within a Class I area, below which estimated impacts from a proposed new or modified source are considered insignificant. The maximum N and S deposition predicted for the proposed GP project is, therefore, compared to these DAT or significant impact levels.

### 9.8.2 RESULTS

The maximum predicted N and S depositions predicted for the Project in the PSD Class I area of the Chassahowitzka NWA are summarized in Table 9-3. The maximum N and S deposition rates for the project are predicted to be 0.0016 and 0.0157 kg/ha/yr, respectively. The maximum N deposition rate is predicted to be below the DAT of 0.01 kg/ha/yr while the maximum S deposition rate is predicted to be above the DAT of 0.01 kg/ha/yr. Although the project's impacts are predicted to be above the DAT for S deposition at the Class I area, the soils and vegetation are not sensitive to the very low deposition rates predicted for the project.

As discussed in Section 9.4, the dominant soil of Chassahowitzka NWA is the organic histosols with extremely high buffering capacities. This soil is resistant to acidic atmospheric inputs. The average buffering capacity of histosols is 765,000 eq/ha (FADS, 1986). As acid inputs (*e.g.*, $HNO_3^{-1}$ and $H_2SO_4^{-2}$), the maximum predicted N and S deposition rates of 0.0016 and 0.0157 kg/ha/yr, respectively, are equivalent to 0.11 and 0.98 eq/ha/yr, respectively. The deposition in eq/ha/yr is calculated by dividing the deposition rate in g/ha/yr by the molecular weight of nitrogen (*i.e.*, 14) or sulfur (32) and valence of the acid input (*i.e.*, 1 $HNO_3^{-1}$; 2 for $H_2SO_4^{-2}$ ).

These deposition rates are extremely small compared to the buffering capacity of the soils in the Chassahowitzka NWA. These deposition rates are also small compared to the observed N and S deposition obtained from the FADS. Measurements taken at a rural site in Pasco County, about

60 miles southeast of the Chassahowitzka NWA, found total (*i.e.*, wet and dry) N and S deposition rates of 366 and 491eq/ha/yr, respectively, over a 3-year period (FADS, 1986). The relatively low sensitivity of the soils to acid inputs coupled with the extremely low ground-level concentrations of contaminants projected for the Chassahowitzka NWA from the project emissions precludes any significant impact on soils. Similarly, the total annual N and S deposition rates as a result of the project at the Chassahowitzka NWA are not expected to alter soil and/or groundwater pH that may result in adverse effects on vegetation.

Table 9-1. Summary of Maximum Pollutant Concentrations Predicted for the Project at the Chassahowitzka NWA PSD Class I Area

| Pollutant and Averaging Time | Highest Concentration [a] ($\mu g/m^3$) | Receptor UTM Location (km) East | Receptor UTM Location (km) North | Time Period [b] YYMMDDHH |
|---|---|---|---|---|
| $SO_2$ | | | | |
| Annual | 0.021 | 341.10 | 3183.40 | 90123124 |
| | 0.022 | 331.50 | 3183.40 | 92123124 |
| | 0.021 | 341.10 | 3183.40 | 96123124 |
| 24-hour | 0.12 | 340.30 | 3165.70 | 90103024 |
| | 0.11 | 331.50 | 3183.40 | 92111824 |
| | 0.18 | 342.00 | 3174.00 | 96111424 |
| 8-hour | 0.27 | 343.70 | 3178.30 | 90111408 |
| | 0.23 | 334.00 | 3183.40 | 92111808 |
| | 0.30 | 340.30 | 3169.80 | 96111408 |
| 3-hour | 0.35 | 339.00 | 3183.40 | 90102003 |
| | 0.36 | 334.00 | 3183.40 | 92021009 |
| | 0.53 | 343.70 | 3178.30 | 96122709 |
| 1-hour | 0.42 | 331.50 | 3183.40 | 90102003 |
| | 0.48 | 342.40 | 3180.60 | 92052103 |
| | 0.60 | 341.10 | 3183.40 | 96121504 |
| $PM_{10}$ | | | | |
| Annual | 0.0027 | 341.10 | 3183.40 | 90123124 |
| | 0.0026 | 331.50 | 3183.40 | 92123124 |
| | 0.0025 | 341.10 | 3183.40 | 96123124 |
| 24-hour | 0.041 | 340.30 | 3165.70 | 90103024 |
| | 0.040 | 343.00 | 3176.20 | 92020324 |
| | 0.057 | 341.10 | 3183.40 | 96122724 |
| 8-hour | 0.086 | 340.30 | 3165.70 | 90103008 |
| | 0.070 | 334.00 | 3183.40 | 92111808 |
| | 0.097 | 341.10 | 3183.40 | 96012108 |
| 3-hour | 0.122 | 343.70 | 3178.30 | 90110812 |
| | 0.110 | 334.00 | 3183.40 | 92021009 |
| | 0.191 | 343.70 | 3178.30 | 96122709 |
| 1-hour | 0.131 | 331.50 | 3183.40 | 90102003 |
| | 0.147 | 342.40 | 3180.60 | 92052103 |
| | 0.201 | 343.70 | 3178.30 | 96122709 |
| $NO_2$ | | | | |
| Annual | 0.00024 | 343.70 | 3178.30 | 90123124 |
| | 0.00048 | 331.50 | 3183.40 | 92123124 |
| | 0.00048 | 341.10 | 3183.40 | 96123124 |
| 24-hour | 0.0061 | 343.70 | 3178.30 | 90111424 |
| | 0.0055 | 334.00 | 3183.40 | 92111824 |
| | 0.0101 | 342.00 | 3174.00 | 96111424 |
| 8-hour | 0.017 | 343.70 | 3178.30 | 90111408 |
| | 0.014 | 331.50 | 3183.40 | 92091408 |
| | 0.019 | 340.30 | 3169.80 | 96111408 |

Table 9-1. Summary of Maximum Pollutant Concentrations Predicted for the Project at the Chassahowitzka NWA PSD Class I Area

| Pollutant and Averaging Time | Highest Concentration [a] ($\mu g/m^3$) | Receptor UTM Location (km) East | North | Time Period [b] YYMMDDHH |
|---|---|---|---|---|
| $NO_2$ (con't) | | | | |
| 3-hour | 0.018 | 342.40 | 3180.60 | 90111406 |
| | 0.021 | 341.10 | 3183.40 | 92052103 |
| | 0.032 | 331.50 | 3183.40 | 96121506 |
| 1-hour | 0.025 | 336.50 | 3183.40 | 90032803 |
| | 0.029 | 342.40 | 3180.60 | 92052103 |
| | 0.037 | 341.10 | 3183.40 | 96121504 |
| CO | | | | |
| Annual | 0.00049 | 343.70 | 3178.30 | 90123124 |
| | 0.00099 | 331.50 | 3183.40 | 92123124 |
| | 0.00099 | 341.10 | 3183.40 | 96123124 |
| 24-hour | 0.0301 | 343.70 | 3178.30 | 90111424 |
| | 0.0271 | 334.00 | 3183.40 | 92111824 |
| | 0.0498 | 342.00 | 3174.00 | 96111424 |
| 8-hour | 0.0814 | 343.70 | 3178.30 | 90111408 |
| | 0.0706 | 331.50 | 3183.40 | 92091408 |
| | 0.0952 | 340.30 | 3169.80 | 96111408 |
| 3-hour | 0.091 | 342.40 | 3180.60 | 90111406 |
| | 0.106 | 341.10 | 3183.40 | 92052103 |
| | 0.160 | 331.50 | 3183.40 | 96121506 |
| 1-hour | 0.125 | 336.50 | 3183.40 | 90032803 |
| | 0.145 | 342.40 | 3180.60 | 92052103 |
| | 0.182 | 341.10 | 3183.40 | 96121504 |
| SAM | | | | |
| Annual | 0.00023 | 343.70 | 3178.30 | 90123124 |
| | 0.00046 | 331.50 | 3183.40 | 92123124 |
| | 0.00046 | 341.10 | 3183.40 | 96123124 |
| 24-hour | 0.004 | 343.70 | 3178.30 | 90111424 |
| | 0.004 | 334.00 | 3183.40 | 92111824 |
| | 0.006 | 342.00 | 3174.00 | 96111424 |
| 8-hour | 0.011 | 343.70 | 3178.30 | 90111408 |
| | 0.009 | 331.50 | 3183.40 | 92091408 |
| | 0.012 | 340.30 | 3169.80 | 96111408 |
| 3-hour | 0.012 | 342.40 | 3180.60 | 90111406 |
| | 0.014 | 341.10 | 3183.40 | 92052103 |
| | 0.021 | 331.50 | 3183.40 | 96121506 |
| 1-hour | 0.016 | 336.50 | 3183.40 | 90032803 |
| | 0.019 | 342.40 | 3180.60 | 92052103 |
| | 0.024 | 341.10 | 3183.40 | 96121504 |

Note: UTM = Universal Transverse Mercator.

[a] Based on the CALPUFF model using 1990, 1992, and 1996 surface and upper air meteorological data developed wit CALMET program. UTM coordinates relative to Zone 17.

[b] YY = Year; MM = Month; DD = Day; HH = Hour ending.

Table 9-2. Maximum 24-hour Average Visibility Impairment Predicted for the Project at the PSD Class I Area of the Chassahowitzka NWA

| Rank | Visibility Impairment (%) [a] | Time Period (Year) | Number of Visibility Impairment Occurrences > 5%/ 10 % Criteria |
|---|---|---|---|
| Highest | 2.43 | 1990 | 0/0 |
| Highest | 3.59 | 1992 | 0/0 |
| Highest | 3.27 | 1996 | 0/0 |

[a] Based on the CALPUFF model using 1990, 1992, and 1996 surface and upper air meteorological data developed with the CALMET program. UTM coordinates relative to Zone 17.
Maximum relative humidity set to 95%.

Table 9-3. Maximum Annual Sulfur and Nitrogen Deposition Predicted for the Project at the PSD Class I Area of the Chassahowitzka NWA

| Species | Total Deposition (Wet & Dry) | | Receptor UTM Location (km) | | Year | Deposition Analysis Threshold [b] |
|---|---|---|---|---|---|---|
| | ($g/m^2/s$) | (kg/ha/yr)[a] | East | North | | (kg/ha/yr) |
| Sulfur (S) Deposition | 4.72E-11 | 0.0149 | 341.1 | 3,183.4 | 1990 | 0.01 |
| | 4.74E-11 | 0.0149 | 331.5 | 3,183.4 | 1992 | |
| | 4.98E-11 | 0.0157 | 331.5 | 3,183.4 | 1996 | |
| Nitrogen (N) Deposition | 4.88E-12 | 0.0015 | 341.1 | 3,183.4 | 1990 | 0.01 |
| | 4.97E-12 | 0.0016 | 341.1 | 3,183.4 | 1992 | |
| | 4.85E-12 | 0.0015 | 341.1 | 3,183.4 | 1996 | |

[a] Conversion factor is used to convert $g/m^2/s$ to kg/hectare (ha)/yr with the following units:

$g/m^2/s$ x 0.001 kg/g
x 10,000 $m^2$/hectare
x 3,600 sec/hr
x 8,760 hr/yr = kg/ha/yr
or
$g/m^2/s$ x 3.154E+08 = kg/ha/yr

[b] Deposition analysis thresholds (DAT) for nitrogen and sulfur deposition provided by the U.S. Fish and Wildlife Service, January 2002. A DAT is the additional amount of N or S deposition within a Class I area, below which estimated impacts from a modified source are considered insignificant.

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# APPENDIX A

# EMISSION FACTOR AND CONTROL EFFICIENCY REFERENCES FOR THE BARK HANDLING SYSTEM

# AP-42 REFERENCES

Table 13.2.2-1. TYPICAL SILT CONTENT VALUES OF SURFACE MATERIAL ON INDUSTRIAL AND RURAL UNPAVED ROADS[a]

| Industry | Road Use Or Surface Material | Plant Sites | No. Of Samples | Silt Content (%) | |
|---|---|---|---|---|---|
| | | | | Range | Mean |
| Copper smelting | Plant road | 1 | 3 | 16 - 19 | 17 |
| Iron and steel production | Plant road | 19 | 135 | 0.2 - 19 | 6.0 |
| Sand and gravel processing | Plant road | 1 | 3 | 4.1 - 6.0 | 4.8 |
| | Material storage area | 1 | 1 | - | 7.1 |
| Stone quarrying and processing | Plant road | 2 | 10 | 2.4 - 16 | 10 |
| | Haul road to/from pit | 4 | 20 | 5.0-15 | 8.3 |
| Taconite mining and processing | Service road | 1 | 8 | 2.4 - 7.1 | 4.3 |
| | Haul road to/from pit | 1 | 12 | 3.9 - 9.7 | 5.8 |
| Western surface coal mining | Haul road to/from pit | 3 | 21 | 2.8 - 18 | 8.4 |
| | Plant road | 2 | 2 | 4.9 - 5.3 | 5.1 |
| | Scraper route | 3 | 10 | 7.2 - 25 | 17 |
| | Haul road (freshly graded) | 2 | 5 | 18 - 29 | 24 |
| Construction sites | Scraper routes | 7 | 20 | 0.56-23 | 8.5 |
| Lumber sawmills | Log yards | 2 | 2 | 4.8-12 | 8.4 |
| Municipal solid waste landfills | Disposal routes | 4 | 20 | 2.2 - 21 | 6.4 |
| Publicly accessible roads | Gravel/crushed limestone | 9 | 46 | 0.1-15 | 6.4 |
| | Dirt (i.e., local material compacted, bladed, and crowned) | 8 | 24 | 0.83-68 | 11 |

[a]References 1,5-16.

The quantity of particulate emissions generated by either type of drop operation, per kilogram (kg) (ton) of material transferred, may be estimated, with a rating of A, using the following empirical expression:[11]

$$E = k(0.0016) \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (kg/megagram [Mg])}$$

$$E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (pound [lb]/ton)} \qquad (1)$$

where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

| Aerodynamic Particle Size Multiplier (k) For Equation 1 | | | | |
|---|---|---|---|---|
| < 30 μm | < 15 μm | < 10 μm | < 5 μm | < 2.5 μm |
| 0.74 | 0.48 | 0.35 | 0.20 | 0.11 |

The equation retains the assigned quality rating if applied within the ranges of source conditions that were tested in developing the equation, as follows. Note that silt content is included, even though silt content does not appear as a correction parameter in the equation. While it is reasonable to expect that silt content and emission factors are interrelated, no significant correlation between the 2 was found during the derivation of the equation, probably because most tests with high silt contents were conducted under lower winds, and vice versa. It is recommended that estimates from the equation be reduced 1 quality rating level if the silt content used in a particular application falls outside the range given:

| Ranges Of Source Conditions For Equation 1 | | | |
|---|---|---|---|
| Silt Content (%) | Moisture Content (%) | Wind Speed | |
| | | m/s | mph |
| 0.44 - 19 | 0.25 - 4.8 | 0.6 - 6.7 | 1.3 - 15 |

Table 11.24-2 (English Units). EMISSION FACTORS FOR METALLIC MINERALS PROCESSING[a,b]

EMISSION FACTOR RATINGS: (A-E) Follow The Emission Factor

| Source | Filterable[b,c] | | | |
|---|---|---|---|---|
| | PM | RATING | PM-10 | RATING |
| Low-moisture ore[c] | | | | |
| Primary crushing (SCC 3-03-024-01)[d] | 0.5 | C | 0.05 | C |
| Secondary crushing (SCC 303-024-02)[d] | 1.2 | D | ND | |
| Tertiary crushing (SCC 3-03-024-03)[d] | 2.7 | E | 0.16 | E |
| Wet grinding | Neg | | Neg | |
| Dry grinding with air conveying and/or air classification (SCC 3-03-024-09)[e] | 28.8 | C | 26 | C |
| Dry grinding without air conveying and/or air classification (SCC 3-03-024-10)[e] | 2.4 | D | 0.31 | D |
| Drying--all minerals except titanium/zirconium sands (SCC 3-03-024-11)[f] | 19.7 | C | 12 | C |
| Drying--titanium/zirconium with cyclones (SCC 3-03-024-11)[f] | 0.5 | C | ND | C |
| Material handling and transfer--all minerals except bauxite (SCC 3-03-024-04)[g] | 0.12 | C | 0.06 | C |
| Material handling and transfer--bauxite/alumina (SCC 3-03-024-04)[g,h] | 1.1 | C | ND | |
| High-moisture ore[c] | | | | |
| Primary crushing (SCC 3-03-024-05)[d] | 0.02 | C | 0.009 | C |
| Secondary crushing (SCC 3-03-024-06)[d] | 0.05 | D | 0.02 | D |
| Tertiary crushing (SCC 3-03-024-07)[d] | 0.06 | E | 0.02 | E |
| Wet grinding | Neg | | Neg | |
| Dry grinding with air conveying and/or air classification (SCC 3-03-024-09)[e] | 28.8 | C | 26 | C |
| Dry grinding without air conveying and/or air classification (SCC 3-03-024-10)[e] | 2.4 | D | 0.31 | D |
| Drying--all minerals except titanium/zirconium sands (SCC 3-03-024-11)[f] | 19.7 | C | 12 | C |
| Drying--titanium/zirconium with cyclones (SCC 3-03-024-11)[f] | 0.5 | C | ND | |
| Material handling and transfer--all minerals except bauxite (SCC 3-03-024-08)[g] | 0.01 | C | 0.004 | C |
| Material handling and transfer--bauxite/alumina (SCC 3-03-024-08)[g,h] | ND | | ND | |

[a] References 9-12; factors represent uncontrolled emissions unless otherwise noted; controlled emission factors are discussed in Section 11.24.3. All emission factors are in lb/ton of material processed unless noted. SCC = Source Classification Code. Neg = negligible. ND = no data.
[b] Filterable PM is that PM collected on or prior to the filter of an EPA Method 5 (or equivalent) sampling train.
[c] Defined in Section 11.24.2.
[d] Based on weight of material entering primary crusher.
[e] Based on weight of material entering grinder; emission factors are the same for both low-moisture and high-moisture ore because material is usually dried before entering grinder.
[f] Based on weight of material exiting dryer; emission factors are the same for both high-moisture and low-moisture ores; $SO_x$ emissions are fuel dependent (see Chapter 1); $NO_x$ emissions depend on burner design and combustion temperature (see Chapter 1).
[g] Based on weight of material transferred; applies to each loading or unloading operation and to each conveyor belt transfer point.
[h] Bauxite with moisture content as high as 15 to 18% can exhibit the emission characteristics of low-moisture ore; use low-moisture ore emission factor for bauxite unless material exhibits obvious sticky, nondusting characteristics.

The following empirical expression may be used to estimate the quantity in pounds (lb) of size-specific particulate emissions from an unpaved road, per vehicle mile traveled (VMT):

$$E = \frac{k\ (s/12)^{a}\,(W/3)^{b}}{(M/0.2)^{c}} \tag{1}$$

where k, a, b and c are empirical constants (Reference 6) given below and

E = size-specific emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tons)
M = surface material moisture content (%)

The source characteristics s, W and M are referred to as correction parameters for adjusting the emission estimates to local conditions. The metric conversion from lb/VMT to grams (g) per vehicle kilometer traveled (VKT) is as follows:

1 lb/VMT = 281.9 g/VKT

The constants for Equation 1 based on the stated aerodynamic particle sizes are shown in Table 13.2.2-2.

Table 13.2.2-2. CONSTANTS FOR EQUATION 1

| Constant | PM-2.5 | PM-10 | PM-30[a] |
|---|---|---|---|
| k (lb/VMT) | 0.38 | 2.6 | 10 |
| a | 0.8 | 0.8 | 0.8 |
| b | 0.4 | 0.4 | 0.5 |
| c | 0.3 | 0.3 | 0.4 |
| Quality rating | C | B | B |

[a]Assumed equivalent to total suspended particulate (TSP).

Table 13.2.2-2 also contains the quality ratings for the various size-specific versions of Equation 1. The equation retains the assigned quality rating, if applied within the ranges of source conditions, shown in Table 13.2.2-3, that were tested in developing the equation:

Table 13.2.2-3. RANGE OF SOURCE CONDITIONS USED IN DEVELOPING EQUATION 1

| Surface Silt Content, % | Mean Vehicle Weight | | Mean Vehicle Speed | | Mean No. of Wheels | Surface Moisture Content, % |
|---|---|---|---|---|---|---|
| | Mg | ton | km/hr | mph | | |
| 1.2-35 | 1.4-260 | 1.5-290 | 8-88[a] | 5-55[a] | 4-7[a] | 0.03-20 |

[a] See discussion in text.

As noted earlier, Equation 1 was developed from tests of traffic on unpaved surfaces, either uncontrolled or watered. Unpaved roads have a hard, generally nonporous surface that usually dries quickly after a rainfall or watering, because of traffic-enhanced natural evaporation. (Factors influencing how fast a road dries are discussed in Section 13.2.2.3, below.) The quality ratings given above pertain to the mid-range of the measured source conditions for the equation. A higher mean vehicle weight and a higher than normal traffic rate may be justified when performing a worst-case analysis of emissions from unpaved roads.

It is important to note that the vehicle-related source conditions refer to the average weight, speed, and number of wheels for all vehicles traveling the road. For example, if 98 percent of traffic on the road are 2-ton cars and trucks while the remaining 2 percent consists of 20-ton trucks, then the mean weight is 2.4 tons. More specifically, Equation 1 is *not* intended to be used to calculate a separate emission factor for each vehicle class within a mix of traffic on a given unpaved road. That is, in the example, one should *not* determine one factor for the 2-ton vehicles and a second factor for the 20-ton trucks. Instead, only one emission factor should be calculated that represents the "fleet" average of 2.4 tons for all vehicles traveling the road.

Furthermore, although mean vehicle speed and the mean number of wheels do not explicitly appear in the predictive equation, these variables should be considered when determining quality ratings. During the validation of Equation 1, it was found that the predictive equation tends to overpredict emissions for very slow mean vehicle speeds.

The background document (Reference 6) discusses this tendency for very slow vehicles speeds. The background document further notes that no bias is evident for mean vehicle speeds of at least 15 mph.

In the case of a mean vehicle speed less than 15 mph, Equation 1 could be used to conservatively estimate the amount of emissions due to traffic over the unpaved surface. Should one wish to account for the tendency for Equation 1 to overestimate at low speeds, it is recommended that Equation 1 be multiplied by (S/15) where S is the average vehicle speed (mph) and $S \leq 15$ mph. Again, note that this applies only to situations in which the average vehicle speed is less than 15 mph. Furthermore, if Equation 1 is multiplied by (S/15), then the quality rating of the emission estimate should be downgraded by at least one letter.

Moreover, to retain the quality ratings when addressing a group of unpaved roads, it is necessary that reliable correction parameter values be determined for the road in question. The field and laboratory procedures for determining road surface silt and moisture contents are given in AP-42 Appendices C.1 and C.2. Vehicle-related parameters should be developed by recording visual observations of traffic. In some cases, vehicle parameters for industrial unpaved roads can be determined by reviewing maintenance records or other information sources at the facility.

In the event that site-specific values for correction parameters cannot be obtained, then default values may be used. A default value of 2.2 tons is recommended for the mean vehicle weight on publicly accessible unpaved roads. (It is assumed that readers addressing industrial roads have access to the information needed to develop average vehicle information for their facility.) In the absence of site-specific silt content information, an appropriate mean value from Table 13.2.2-1 may be used as a default value, but the quality rating of the equation is reduced by two letters. Because of significant differences found between different types of road surfaces and between different areas of the country, use of the default moisture content value of 0.2 percent for dry conditions is discouraged. The quality rating should be downgraded two letters when the default moisture content value is used.

The effect of routine watering to control emissions from unpaved roads is discussed below in Section 13.2.2.3, "Controls". However, all roads are subject to some natural mitigation because of rainfall and other precipitation. Equation 1 can be extrapolated to annual average uncontrolled conditions (but

# AP-42 REFERENCES
# (1980 VERSION)

## 10.3 PLYWOOD VENEER AND LAYOUT OPERATIONS

### 10.3.1 General[1-3]

Plywood is a building material consisting of veneers (thin wood layers or plies) bonded with an adhesive. The outer layers (faces) surround a core which is usually lumber, veneer or particle board. Plywood uses are many, including wall siding, sheathing, roof decking, concrete formboards, floors, and containers. Most plywood is made from Douglas Fir or other softwoods, and the majority of plants are in the Pacific Northwest. Hardwood veneers make up only a very small portion of total production.

In the manufacture of plywood, logs are sawed to the desired length, debarked and peeled into veneers of uniform thickness. Veneer thicknesses of less than one half inch or one centimeter are common. These veneers are then transported to veneer dryers with one or more decks, to reduce their moisture content. Dryer temperatures are held between about 300 and 400°F (150 - 200°C). After drying, the plies go through the veneer layout operation, where the veneers are sorted, patched and assembled in perpendicular layers, and a thermosetting resin adhesive applied. The veneer assembly is then transferred to a hot press where, under pressure and steam heat, the product is formed. Subsequently, all that remains is trimming, face sanding, and possibly some finishing treatment to enhance the usefulness of the product. Plywood veneer and layout operations are shown in Figure 10.3-1.

### 10.3.2 Emissions and Controls [2-8]

Emissions from the manufacture of plywood include particulate matter and organic compounds. The main source of emissions is the veneer dryer, with other sources producing negligible amounts of organic compound emissions or fugitive emissions. The log steaming and veneer drying operations produce combustion products, and these emissions depend entirely on the type of fuel and equipment used.

Uncontrolled fugitive particulate matter, in the form of sawdust and other small wood particles, comes primarily from the plywood cutting and sanding operations. To be considered additional sources of fugitive particulate emissions are log debarking, log sawing and sawdust handling. The dust that escapes into the air from sanding, sawing and other woodworking operations may be controlled by collection in an exhaust system and transport through duct work to a sized cyclone. Section 10.4 discusses emissions from such woodworking waste collection operations. Estimates of uncontrolled particulate emission factors for log debarking and sawing, sawdust pile handling, and plywood sanding and cutting are given in Table 10.3-1. From the veneer dryer, and at stack temperatures, the only particulate emissions are small amounts of wood fiber particles in concentrations of less than 0.002 grams per dry standard cubic foot.

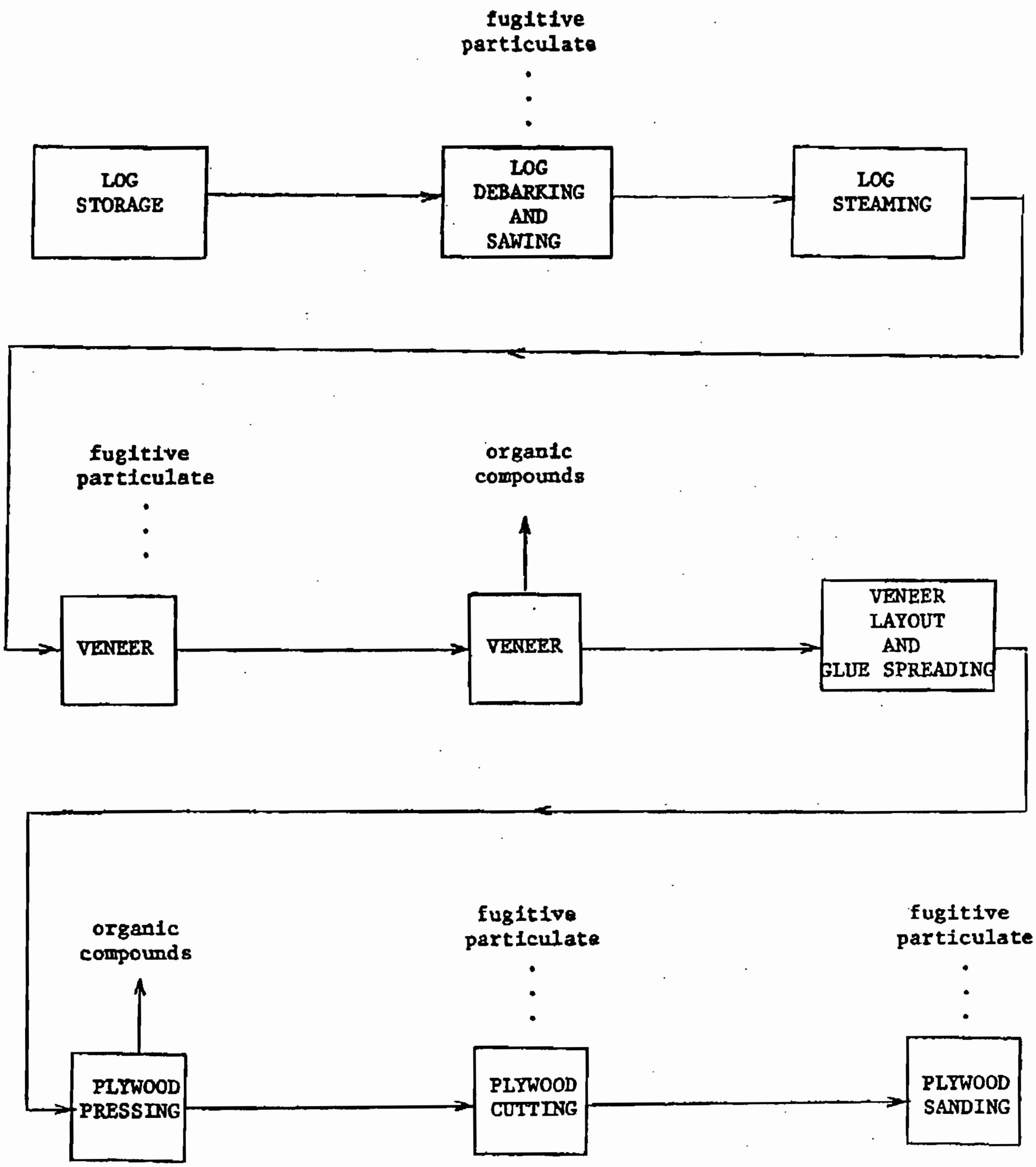


Figure 10.3-1. Plywood veneer and layout operations.[4,5]

Table 10.3-1. UNCONTROLLED FUGITIVE PARTICULATE EMISSION FACTORS FOR PLYWOOD VENEER AND LAYOUT OPERATONS

EMISSION FACTOR RATING: E

| Source | Particulates | |
|---|---|---|
| Log debarking[a] | 0.024 lb/ton | 0.012 kg/MT |
| Log sawing[a] | 0.350 lb/ton | 0.175 kg/MT |
| Sawdust handling[b] | 1.0 lb/ton | 0.5 kg/MT |
| Veneer lathing[c] | NA | NA |
| Plywood cutting and sanding[d] | 0.1 $lb/ft^2$ | 0.05 $kg/m^2$ |

[a]Reference 7. Emission factors are expressed as units per unit weight of logs processed.
[b]Reference 7. Emission factors are expressed as units per unit weight of sawdust handled, including sawdust pile loading, unloading and storage.
[c]Estimates not available.
[d]Reference 5. Emission factors are expressed as units per surface area of plywood produced. These factors are expressed as representative values for estimated values ranging from 0.066 to 0.132 $lb/ft^2$ (0.322 to 0.644 $kg/m^2$).

The major pollutants emitted from veneer dryers are organic compounds. The quantity and type of organics emitted vary, depending on the wood species and on the dryer type and its method of operation. There are two discernable fractions which are released, condensibles and volatiles. The condensible organic compounds consist largely of wood resins, resin acids and wood sugars, which cool outside the stack to temperatures below 70°F (21°C) and combine with water vapor to form a blue haze, a water plume or both. This blue haze may be eliminated by condensing the organic vapors in a finned tube matrix heat exhanger condenser. The other fraction, volatile organic compounds, is comprised of terpenes and natural gas components (such as unburned methane), the latter occurring only when gas fired dryers are used. The amounts of organic compounds released because of adhesive use during the plywood pressing operation are negligible. Uncontrolled organic process emission factors are given in Table 10.3-2.

Table 10.3-2. UNCONTROLLED ORGANIC COMPOUND PROCESS EMISSION FACTORS FOR PLYWOOD VENEER DRYERS[a]

EMISSION FACTOR RATING: B

| Species | Volatile Organic Compounds | | Condensible Organic Compounds | |
|---|---|---|---|---|
| | $lb/10^4\ ft^2$ | $kg/10^4\ m^2$ | $lb/10^4\ ft^2$ | $kg/10^4\ m^2$ |
| Douglas Fir | | | | |
| sapwood | | | | |
| steam fired | 0.45 | 2.3 | 4.64 | 23.8 |
| gas fired | 7.53 | 38.6 | 2.37 | 12.1 |
| heartwood | 1.30 | 6.7 | 3.18 | 16.3 |
| Larch | 0.19 | 1.0 | 4.14 | 21.2 |
| Southern pine | 2.94 | 15.1 | 3.70 | 18.9 |
| Other[b] | 0.03-3.00 | 0.15-15.4 | 0.5-8.00 | 2.56-41.0 |

[a]Reference 2. Emission factors are expressed in pounds of pollutant per 10,000 square feet of 3/8 inch thick veneer dried, and kilograms of pollutant per 10,000 square meters of 1 centimeter thick veneer dried. All dryers are steam fired unless otherwise specified.
[b]These ranges of factors represent results from one source test for each of the following species (in order from least to greatest emissions): Western Fir, Hemlock, Spruce, Western Pine and Ponderosa Pine.

References for Section 10.3


1. C.B. Hemming, "Plywood", Kirk-Othmer Encyclopedia of Chemical Technology, Second Edition, Volume 15, John Wiley & Sons, Inc., New York, NY, 1968, pp. 896-907.

2. F. L. Monroe, et al., Investigation of Emissions from Plywood Veneer Dryers, Washington State University, Pullman, WA, February 1972.

3. Theodore Baumeister, ed., "Plywood", Standard Handbook for Mechanical Engineers, Seventh Edition, McGraw-Hill, New York, NY, 1967, pp. 6-162 - 6-169.

4. Allen Mick and Dean McCargar, Air Pollution Problems in Plywood, Particleboard, and Hardboard Mills in the Mid-Willamette Valley, Mid-Willamette Valley Air Pollution Authority, Salem, OR, March 24, 1969.

5. Controlled and Uncontrolled Emission Rates and Applicable Limitations for Eighty Processes, Second Printing, EPA-340/1-78-004, U.S. Environmental Protection Agency, Research Triangle Park, NC, April 1978, pp. X-1 - X-6.

6. John A. Danielson, ed., Air Pollution Engineering Manual, AP-40, Second Edition, U.S. Environmental Protection Agency, Research Triangle Park, NC, May 1973, pp. 372-374.

7. Assessment of Fugitive Particulate Emission Factors for Industrial Processes, EPA-450/3-78-107, U.S. Environmental Protection Agency, Research Triangle Park, NC, September 1978.

8. C. Ted Van Decar, "Plywood Veneer Dryer Control Device", Journal of the Air Pollution Control Association, 22:968, December 1972.

## 10.4 WOODWORKING WASTE COLLECTION OPERATIONS

### 10.4.1 General[1-5]

Woodworking, as defined in this section, includes any operation that involves the generation of small wood waste particles (shavings, sanderdust, sawdust, etc.) by any kind of mechanical manipulation of wood, bark, or wood byproducts. Common woodworking operations include sawing, planing, chipping, shaping, moulding, hogging, lathing, and sanding. Woodworking operations are found in numerous industries, such as sawmills, plywood, particleboard, and hardboard plants, and furniture manufacturing plants.

Most plants engaged in woodworking employ pneumatic transfer systems to remove the generated wood waste from the immediate proximity of each woodworking operation. These systems are necessary as a housekeeping measure to eliminate the vast quantity of waste material that would otherwise accumulate. They are also a convenient means of transporting the waste material to common collection points for ultimate disposal. Large diameter cyclones have historically been the primary means of separating the waste material from the airstreams in the pneumatic transfer systems, although baghouses have recently been installed in some plants for this purpose.

The waste material collected in the cyclones or baghouses may be burned in wood waste boilers, utilized in the manufacture of other products (such as pulp or particleboard), or incinerated in conical (teepee/wigwam) burners. The latter practice is declining with the advent of more stringent air pollution control regulations and because of the economic attractiveness of utilizing wood waste as a resource.

### 10.4.2 Emissions[1-6]

The only pollutant of concern in woodworking waste collection operations is particulate matter. The major emission points are the cyclones utilized in the pneumatic transfer systems. The quantity of particulate emissions from a given cyclone will depend on the dimensions of the cyclone, the velocity of the airstream, and the nature of the operation generating the waste. Typical large diameter cyclones found in the industry will only effectively collect particles greater than 40 micrometers in diameter. Baghouses, when employed, collect essentially all of the waste material in the airstream. The wastes from numerous pieces of equipment often feed into the same cyclone, and it is common for the material collected in one or several cyclones to be conveyed to another cyclone. It is also possible for portions of the waste generated by a single operation to be directed to different cyclones.

Because of this complexity, it is useful when evaluating emissions from a given facility to consider the waste handling cyclones as air pollution sources instead of the various woodworking operations that actually generate the particulate matter. Emission factors for typical large diameter cyclones utilized for waste collection in woodworking operations are given in Table 10.4-1.

Emission factors for wood waste boilers, conical burners, and various drying operations—often found in facilities employing woodworking operations—are given in Sections 1.6, 2.3, 10.2, and 10.3.

Table 10.4-1. PARTICULATE EMISSION FACTORS FOR LARGE DIAMETER CYCLONES IN WOODWORKING WASTE COLLECTION SYSTEMS[a]

EMISSION FACTOR RATING: D

| Types of waste handled | Particulate emissions[b,c] | | | |
|---|---|---|---|---|
| | gr/scf | g/Nm³ | lb/hr | kg/hr |
| Sanderdust[d] | 0.055 (0.005-0.16) | 0.126 (0.0114-0.37) | 5 (0.2-30.0) | 2.3 (0.09-13.6) |
| Other[e] | 0.03 (0.001-0.16) | 0.07 (0.002-0.37) | 2 (0.03-24.0) | 0.91 (0.014-10.9) |

[a]Typical waste collection cyclones range from 4 to 16 feet (1.2 to 4.9 meters) in diameter and employ airflows ranging from 2,000 to 26,000 standard cubic feet (57 to 740 normal cubic meters) per minute. Note: If baghouses are used for waste collection, particulate emissions will be negligible.

[b]References 1 through 3.

[c]Observed value ranges are in parentheses.

[d]These factors should be used whenever waste from sanding operations is fed directly into the cyclone in question.

[e]These factors should be used for cyclones handling waste from all operations other than sanding. This includes cyclones that handle waste (including sanderdust) already collected by another cyclone.

## References for Section 10.4


1. Source test data supplied by Robert Harris, Oregon Department of Environmental Quality, Portland, OR, September 1975.

2. J.W. Walton, *et al.*, "Air Pollution in the Woodworking Industry", Presented at the 68th Annual Meeting of the Air Pollution Control Association, Boston, MA, June 1975.

3. J.D. Patton and J.W. Walton, "Applying the High Volume Stack Sampler To Measure Emissions from Cotton Gins, Woodworking Operations, and Feed and Grain Mills", Presented at 3rd Annual Industrial Air Pollution Control Conference, Knoxville, TN, March 29-30, 1973.

4. C.F. Sexton, "Control of Atmospheric Emissions from the Manufacturing of Furniture", Presented at 2nd Annual Industrial Air Pollution Control Conference, Knoxville, TN, April 20-21, 1972.

5. A. Mick and D. McCargar, "Air Pollution Problems in Plywood, Particleboard, and Hardboard Mills in the Mid-Willamette Valley", Mid-Williamette Valley Air Pollution Authority, Salem, OR, March 24, 1969.

6. Information supplied by the North Carolina Department of Natural and Economic Resources, Raleigh, NC, December 1975.

# CONTROL EFFICIENCY REFERENCES

D. Buff

# WORKBOOK ON ESTIMATION OF EMISSIONS AND DISPERSION MODELING FOR FUGITIVE PARTICULATE SOURCES

Document P-A867
September 1981

Prepared for

UTILITY AIR REGULATORY GROUP
1919 Pennsylvania Avenue N.W.
Washington, DC 20036

RONMENTAL RESEARCH & TECHNOLOGY, INC.
NTA · CHICAGO · CONCORD, MA · FORT COLLINS, CO
TON · LOS ANGELES · PITTSBURGH · WASHINGTON, DC

TABLE 3.2.17-2

TRANSFER POINTS:

EFFICIENCIES OF CONTROL TECHNIQUES AND METHODS

| Technique | Control Efficiency | Comments | Reference |
|---|---|---|---|
| Enclosure | 90%<br>70-99%* | | Szabo 1978<br>EPA 1978a |
| Enclosure with control device | 99(+)% | See Appendix A for calculating controlled emissions. | EPA 1978a |
| Spraying | 70-95% | | EPA 1978a |
| Telescopic chutes | 75% | | EPA 1978a |

*Lower value uses "weathertight" system; higher value utilizes dust collection system.

TABLE 3.2.19-2

SCREENING: EFFICIENCIES OF CONTROL TECHNIQUES AND METHODS

| Technique | Control Efficiency | Comments | Reference |
|---|---|---|---|
| Enclosure with control device | 99(+)% | See Appendix A for calculation of controlled emissions. | EPA 1976a |
| Enclosure | 60-80% | Derived by ERT from crushing (probably overestimates emissions). | EPA 1976a |

# APPENDIX B

# DETAILED EMISSION CALCULATIONS – PAST ACTUAL AND FUTURE POTENTIAL

Table B-1. Maximum Future 3-Hour, 24-Hour and Annual Emissions for Individual Fuels, No. 4 Combination Boiler, G-P Palatka

| Regulated Pollutant | No. 6 Fuel Oil: Emission Factor | Ref. | Activity Factors [a] | Hourly Emissions (lb/hr) | Annual Emissions (TPY) | Wood/Bark: Emission Factor | Ref. | Activity Factors [b] | Hourly Emissions (lb/hr) | Annual Emissions (TPY) | NCGs/SOGs/DNCGs: Emission Factor | Ref. | Activity Factors | Hourly Emissions (lb/hr) | Annual Emissions (TPY) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Particulate (PM) | 0.1 lb/MMBtu | 1 | 418.6 MMBtu/hr | 41.86 | 183.50 | 0.3 lb/MMBtu | 1 | 512.7 MMBtu/hr | 125.60 [c] | 550.13 [c] | -- | -- | -- | -- | -- |
| Particulate ($PM_{10}$) | 63 % of PM | 2 | -- | 26.37 | 115.51 | 74 % of PM | 6 | -- | 92.94 | 407.09 | -- | -- | -- | -- | -- |
| Sulfur dioxide: 3-hr | 0.164 (S) lb/gal | 3 | 3,070 gal/hr | 1,183.18 | -- | 0.225 lb/TWWF | 6 | 62.7 tons/hr, wet | 14.11 | -- | 1,041.5 lb/hr | 9 | -- | 1,041.50 | -- |
| Suflur dioxide: 24-hr | 0.164 (S) lb/gal | 3 | 2,791 gal/hr | 1,075.65 | -- | 0.225 lb/TWWF | 6 | 57.0 tons/hr, wet | 12.83 | -- | 845.9 lb/hr | 9 | -- | 845.9 | -- |
| Annual | 0.164 (S) lb/gal | 3 | 24,449,160 gal/yr | -- | 4,711.35 | 0.225 lb/TWWF | 6 | 499,320 tons/yr, wet | -- | 56.17 | 785.0 tons/yr | 9 | -- | -- | 785.0 |
| Nitrogen oxides | 47 lb/Mgal | 4 | 2.791 Mgal/hr | 131.18 | 574.56 | 1.98 lb/TWWF | 6 | 62.7 tons/hr, wet | 124.15 | 543.76 | 0.9 lb/1000 gal condensate | 10 | 48,000 gal/hr [c] | 43.20 | 37.84 |
| Carbon monoxide | 5 lb/Mgal | 4 | 2.791 Mgal/hr | 13.96 | 61.12 | 5.4 lb/TWWF | 6 | 62.7 tons/hr, wet | 338.58 | 1,482.98 | -- | -- | -- | -- | -- |
| VOC | 0.28 lb/Mgal | 4 | 2.791 Mgal/hr | 0.78 | 3.42 | 0.12 lb/TWWF | 7 | 62.7 tons/hr, wet | 7.52 | 32.96 | -- | -- | -- | -- | -- |
| Sulfuric acid mist: 3-hr | 4.4 % of $SO_2$ | 5 | -- | 52.06 | --- | 4.4 % of $SO_2$ | 5 | -- | 0.62 | -- | 4.4 % of $SO_2$ | 5 | -- | 45.83 | -- |
| 24-hr | 4.4 % of $SO_2$ | 5 | -- | 47.33 | -- | 4.4 % of $SO_2$ | 5 | -- | 0.56 | -- | 4.4 % of $SO_2$ | 5 | -- | 37.22 | -- |
| Annual | 4.4 % of $SO_2$ | 5 | -- | -- | 207.30 | 4.4 % of $SO_2$ | 5 | -- | -- | 2.47 | 4.4 % of $SO_2$ | 5 | -- | -- | 34.54 |
| Total reduced sulfur | -- | | -- | -- | -- | -- | -- | -- | -- | -- | 5 ppmvd @ 10% $O_2$ | 11 | -- | 3.60 | 15.70 |
| Lead | 1.51E-03 lb/Mgal | 4 | 2.791 Mgal/hr | 4.2E-03 | 1.8E-02 | 3.20E-04 lb/TWWF | 8 | 62.7 tons/hr, wet | 2.01E-02 | 8.79E-02 | -- | -- | -- | -- | -- |
| Mercury | 1.13E-04 lb/Mgal | 4 | 2.791 Mgal/hr | 3.2E-04 | 1.4E-03 | 5.15E-06 lb/TWWF | 6 | 62.7 tons/hr, wet | 3.23E-04 | 1.41E-03 | -- | -- | -- | -- | -- |
| Beryllium | 2.78E-05 lb/Mgal | 4 | 2.791 Mgal/hr | 7.8E-05 | 3.4E-04 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorides | 3.73E-02 lb/Mgal | 4 | 2.791 Mgal/hr | 1.0E-01 | 4.6E-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

Note: DNCGs= dilute NCGs; NCGs= non-condensable gases; SOGs= stripper off-gases; TWWF = tons of wet wood residue fuel.
All annual emissions for fuel oil and wood/bark burning based on 8,760 hr/yr operation.
Natural gas emissions not shown since it is a start up fuel only.

[a] Based on heat input limit of 418.6 MMBtu/hr in Permit No. 1070005-023-AV; or 2.791 Mgal/hr of fuel oil based on 150,000 Btu/gal.
[a] Based on heat input limit of 512.7 MMBtu/hr in Permit No. 1070005-023-AV; or 57.0 tons/hr, wet, based on 4,500 Btu/lb.
[c] Design rate of 800 gpm for condensate stripper.

References:
1. Based on Permit No. 1070005-023-AV.
2. Based on AP-42 Section 1.3, Table 1.3-4, for utility boilers firing residual oil with an ESP (no factor available for industrial boilers with an ESP).
3. Based on current permit condition (Permit No. 1070005-023-AV). Does not include emissions due to NCG/SOG/DNCG burning. S = 2.35%.
4. Emission Factors based on AP-42 Section 1.3 Table 1.3-1, 1.3-3, 1.3-4 and 1.3-11 for metals (assuming uncontrolled for metals) (9/98).
5. Based on similar derivation of sulfuric acid mist from AP-42 for fuel oil: 3.6% of $SO_2$ becomes $SO_3$ then take into account the ratio of sulfuric acid mist and sulfur trioxide molecular weights (98/80).
6. Emission Factors based on AP-42 Section 1.6 Tables 1.6-1, 1.6-2, 1.6-3 (3/02). Emission factors are converted from lb/MMBtu to lb/ton of wood/bark by multiplying by 9 MMBtu/ton ($NO_x$ = 0.22 lb/MMBtu, $SO_2$ = 0.025 lb/MMBtu, and CO = 0.60 lb/MMBtu). $PM_{10}$ estimated to be 74% of PM based on the ratio of individuals emission factors for PM and $PM_{10}$ from AP-42 Table 1.6-1 for wood-residue fired boilers with an ESP.
7. Emission Factor Based on NCASI TB 646 for an average Spreader Stoker Boilers with Scrubbers Tables 1, 2, and 3.
8. Emission factor from EPA's FIRE system for wood/bark burning with multiple cyclone with fly ash reinjection control.
9. Based on maximum emissions due to NCG/SOG/DNCG combustion in the No. 4 Combination Boiler.
10. Based on MACT I permit revision application (11/01).
11. Based on MACT Application for Brown Stock Washer/$O_2$ Delig. System (10/03).

Table B-2. Maximum Future 1-Hour Emissions for Individual Fuels, No. 4 Combination Boiler, G-P Palatka

| | No. 6 Fuel Oil | | | | Wood/Bark | | | | NCGs/SOGs/DNCGs | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Regulated Pollutant | Emission Factor | Ref. | Activity Factors [a] | 1-Hour Emissions (lb/hr) | Emission Factor | Ref. | Activity Factors [b] | 1-Hour Emissions (lb/hr) | Emission Factor | Ref. | Activity Factors | 1-Hour Emissions (lb/hr) |
| Particulate (PM) | 0.1 lb/MMBtu | 1 | 460.5 MMBtu/hr | 46.05 | 0.3 lb/MMBtu | 1 | 564.0 MMBtu/hr | 125.60 [c] | -- | -- | -- | -- |
| Particulate ($PM_{10}$) | 63 % of PM | 2 | -- | 29.01 | 74 % of PM | 6 | -- | 92.94 | -- | -- | -- | -- |
| Sulfur dioxide | 0.164 (S) lb/gal | 3 | 3,070 gal/hr | 1,183.18 | 0.225 lb/TWWF | 6 | 62.7 tons/hr, wet | 14.11 | 1,041.5 lb/hr | 9 | -- | 1,041.50 |
| Nitrogen oxides | 47 lb/Mgal | 4 | 3.07 Mgal/hr | 144.29 | 1.98 lb/TWWF | 6 | 62.7 tons/hr, wet | 124.15 | 0.9 lb/1000 gal condensate | 10 | 48,000 gal/hr [c] | 43.20 |
| Carbon monoxide | 5 lb/Mgal | 4 | 3.07 Mgal/hr | 15.35 | 5.4 lb/TWWF | 6 | 62.7 tons/hr, wet | 338.58 | -- | -- | -- | -- |
| VOC | 0.28 lb/Mgal | 4 | 3.07 Mgal/hr | 0.86 | 0.12 lb/TWWF | 7 | 62.7 tons/hr, wet | 7.52 | -- | -- | -- | -- |
| Sulfuric acid mist | 4.4 % of $SO_2$ | 5 | -- | 52.06 | 4.4 % of $SO_2$ | 5 | -- | 0.62 | 4.4 % of $SO_2$ | 5 | -- | 45.83 |
| Total reduced sulfur | -- | | -- | -- | -- | -- | -- | -- | 5 ppmvd @ 10% $O_2$ | 11 | -- | 3.60 |
| Lead | 1.51E-03 lb/Mgal | 4 | 3.07 Mgal/hr | 4.6E-03 | 3.20E-04 lb/TWWF | 8 | 62.7 tons/hr, wet | 2.01E-02 | -- | -- | -- | -- |
| Mercury | 1.13E-04 lb/Mgal | 4 | 3.07 Mgal/hr | 3.5E-04 | 5.15E-06 lb/TWWF | 6 | 62.7 tons/hr, wet | 3.23E-04 | -- | -- | -- | -- |
| Beryllium | 2.78E-05 lb/Mgal | 4 | 3.07 Mgal/hr | 8.5E-05 | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorides | 3.73E-02 lb/Mgal | 4 | 3.07 Mgal/hr | 1.1E-01 | -- | -- | -- | -- | -- | -- | -- | -- |

Note: DNCGs= dilute NCGs; NCGs= non-condensable gases; SOGs= stripper off-gases; TWWF = tons of wet wood residue fuel.

All annual emissions for fuel oil and wood/bark burning based on 8,760 hr/yr operation.
Natural gas emissions not shown since it is a start up fuel only.

[a] Based on heat input limit of 418.6 MMBtu/hr plus 10% (460.5 MMBtu/hr, maximum 1-hour) in Permit No. 1070005-023-AV; or 3.07 Mgal/hr of fuel oil based on 150,000 Btu/gal.

[a] Based on heat input limit of 512.7 MMBtu/hr plus 10% (564.0 MMBtu/hr, maximum 1-hour) in Permit No. 1070005-023-AV; or 62.7 tons/hr, wet, based on 4,500 Btu/lb.

[c] Design rate of 800 gpm for condensate stripper.

References:
1. Based on Permit No. 1070005-023-AV.
2. Based on AP-42 Section 1.3, Table 1.3-4, for utility boilers firing residual oil with an ESP (no factor available for industrial boilers with an ESP).
3. Based on current permit condition (Permit No. 1070005-023-AV). Does not include emissions due to NCG/SOG/DNCG burning. S = 2.35%.
4. Emission Factors based on AP-42 Section 1.3 Table 1.3-1, 1.3-3, 1.3-4 and 1.3-11 for metals (assuming uncontrolled for metals) (9/98).
5. Based on similar derivation of sulfuric acid mist from AP-42 for fuel oil: 3.6% of $SO_2$ becomes $SO_3$ then take into account the ratio of sulfuric acid mist and sulfur trioxide molecular weights (98/80).
6. Emission Factors based on AP-42 Section 1.6 Tables 1.6-1, 1.6-2, 1.6-3 (3/02). Emission factors are converted from lb/MMBtu to lb/ton of wood/bark by multiplying by 9 MMBtu/ton ($NO_x$ = 0.22 lb/MMBtu, $SO_2$ = 0.025 lb/MMBtu, and CO = 0.60 lb/MMBtu). $PM_{10}$ estimated to be 74% of PM based on the ratio of individuals emission factors for PM and $PM_{10}$ from AP-42 Table 1.6-1 for wood-residue fired boilers with an ESP.
7. Emission Factor Based on NCASI TB 646 for an average Spreader Stoker Boilers with Scrubbers Tables 1, 2, and 3.
8. Emission factor from EPA's FIRE system for wood/bark burning with multiple cyclone with fly ash reinjection control.
9. Based on maximum emissions due to NCG/SOG/DNCG combustion in the No. 4 Combination Boiler.
10. Based on MACT I permit revision application (11/01).
11. Based on MACT Application for Brown Stock Washer/$O_2$ Delig. System (10/03).

Table B-3. Maximum Future Emissions for Different Fuel Burning Scenarios, No. 4 Combination Boiler, G-P Palatka

| Regulated Pollutant | No. 6 Oil (lb/hr) | Wood/Bark (lb/hr) | Maximum Emissions For Any Fuel Combination [a] (lb/hr) |
|---|---|---|---|
| Particulate (PM)--24-Hour | 41.9 | 125.6 | 125.6 |
| Particulate ($PM_{10}$)--24-Hour | 26.4 | 92.9 | 92.9 |
| Sulfur dioxide--3-Hour | 1,183.2 | 14.1 | 1,183.2 |
| --24-Hour | 1,075.7 | 12.8 | 1,075.7 |
| Nitrogen oxides--24-Hour | 131.2 | 124.1 | 131.2 |
| Carbon monoxide--1-Hour | 15.4 | 338.6 | 338.6 |
| --8-Hour | 14.0 | 338.6 | 338.6 |
| VOC--1-Hour | 0.86 | 7.52 | 7.5 |
| Sulfuric acid mist--3-Hour | 52.1 | 0.6 | 52.1 |
| --24-Hour | 47.3 | 0.6 | 47.3 |
| Total reduced sulfur--1-Hour | -- | -- | -- |
| Lead--1-Hour | 4.64E-03 | 2.01E-02 | 2.01E-02 |
| Mercury--1-Hour | 3.47E-04 | 3.23E-04 | 3.47E-04 |
| Beryllium--1-Hour | 8.53E-05 | -- | 8.53E-05 |
| Fluorides--1-Hour | 1.15E-01 | -- | 1.15E-01 |

[a] These emissions do not include emissions due to NCG/SOG/DNCG combustion.

Reference: 3-Hour and 24-Hour emissions from Table B-1. 1-Hour emissions from Table B-2.

Table B-4. Maximum Future Annual Emissions for Different Fuel Burning Scenarios From No. 4 Combination Boiler, Georgia-Pacific, Palatka Mill

| Source Description | Pollutant Emission Rate (TPY) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $SO_2$ | $NO_x$ | CO | PM | $PM_{10}$ | VOC | TRS | SAM | Lead | Hg | Be | F |
| No. 4 Combination Boiler | | | | | | | | | | | | |
| *--No. 6 Fuel Oil Usage* | 4,711.4 | 574.6 | 61.1 | 183.5 | 115.5 | 3.4 | -- | 207.30 | 1.85E-02 | 1.38E-03 | 3.40E-04 | 4.56E-01 |
| *--Wood/Bark Usage* | 56.2 | 543.8 | 1,483.0 | 550.1 | 407.1 | 33.0 | -- | 2.47 | 8.79E-02 | 1.41E-03 | -- | -- |
| *--Maximum for any Fuel Combination* [a] | 4,711.4 | 574.6 | 1,483.0 | 550.1 | 407.1 | 33.0 | -- | 207.30 | 8.79E-02 | 1.41E-03 | 3.40E-04 | 4.56E-01 |

Note: TPY = tons per year.

[a] These emissions do not include emissions due to NCG/SOG/DNCG combustion.

Reference: 3-Hour and 24-Hour emissions from Table B-1. 1-Hour emissions from Table B-2.

Table B-5. Summary of 2002-2003 Past Actual Emissions From No. 4 Combination Boiler, Georgia-Pacific, Palatka Mill

| Source Description | EU ID | Pollutant Emission Rate (TPY) $SO_2$ | $NO_x$ | CO | PM | $PM_{10}$ | VOC | TRS | SAM[a] | Lead |
|---|---|---|---|---|---|---|---|---|---|---|
| 2002 Actual Emissions | | | | | | | | | | |
| No. 4 Combination Boiler | 016 | | | | | | | | | |
| *--Fuel Oil Usage* | | 848.78 | 104.08 | 11.07 | 2.76 | 2.37 | 0.62 | -- | 37.35 | 0.003 |
| *--Wood/Bark Usage* | | 34.23 | 301.24 | 821.56 | 38.34 | 34.23 | 17.80 | -- | 1.51 | 0.049 |
| *--NCG/SOG Burning* | | 470.76 | 64.20 | -- | -- | -- | -- | 0.47 | 20.71 | -- |
| ***--Total (Without NCG/SOG)*** | | **883.01** | **405.32** | **832.63** | **41.10** | **36.60** | **18.42** | **0.00** | **38.85** | **0.05** |
| 2003 Actual Emissions | | | | | | | | | | |
| No. 4 Combination Boiler | 016 | | | | | | | | | |
| *--Fuel Oil Usage* | | 721.07 | 101.83 | 10.83 | 2.46 | 2.13 | 0.61 | -- | 31.73 | 0.003 |
| *--Wood/Bark Usage* | | 32.99 | 290.34 | 791.84 | 36.95 | 32.99 | 17.16 | -- | 1.45 | 0.047 |
| *--NCG/SOG Burning* | | 317.71 | 22.68 | -- | -- | -- | -- | 0.47 | 13.98 | -- |
| ***--Total (Without NCG/SOG)*** | | **754.06** | **392.18** | **802.67** | **39.41** | **35.13** | **17.76** | **0.00** | **33.18** | **0.05** |
| 2002 and 2003 Average Actual Emissions | | | | | | | | | | |
| No. 4 Combination Boiler | 016 | | | | | | | | | |
| *--Fuel Oil Usage* | | 784.93 | 102.96 | 10.95 | 2.61 | 2.25 | 0.61 | -- | 34.54 | 0.003 |
| *--Wood/Bark Usage* | | 33.61 | 295.79 | 806.70 | 37.65 | 33.61 | 17.48 | -- | 1.48 | 0.048 |
| *--NCG/SOG Burning* | | 394.24 | 43.44 | -- | -- | -- | -- | 0.47 | 17.35 | -- |
| ***--Total (Without NCG/SOG)*** | | **818.54** | **398.75** | **817.65** | **40.26** | **35.87** | **18.09** | **0.00** | **36.02** | **0.051** |

Note: TPY = tons per year.

[a] Not reported on AOR. Based on similar derivation of sulfuric acid mist from AP-42 for fuel oil: 3.6% of $SO_2$ becomes $SO_3$, then take into account the ratio of sulfuric acid mist and sulfur trioxide molecular weights (98/80).

Source: Annual Operating Reports submitted to Florida DEP.

Table B-6. Past Actual (2002-2003) 24-Hour Emissions for Highest Bark/Wood Burning Day (March 11, 2004) for the No. 4 Combination Boiler, GP Palatka Mill

| | Wood/Bark | | | | No. 6 Fuel Oil | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Regulated Pollutant | Emission Factor | Ref. | 24-Hour Activity Factors | 24-Hr Average Emissions (lb/hr) | Emission Factor | Ref. | 24-Hour Activity Factors | 24-Hr Average Emissions (lb/hr) | Total Emissions (lb/hr) |
| Particulate (PM) | 0.075 lb/MMBtu | 1 | 47.1 tons bark/hr [a] | 31.81 [b] | 0.033 lb/MMBtu | 4 | 41,932 lbs/day [c] | 1.05 [d] | 32.86 |
| Particulate ($PM_{10}$) | 74 % of PM | 2 | -- | 23.54 | 63 % of PM | 5 | -- | 0.66 | 24.20 |
| Carbon monoxide | 5.4 lb/ton WWF | 3 | 47.1 tons bark/hr [a] | 254.46 [b] | 5 lb/1,000 gal | 6 | 41,932 lbs/day [c] | 1.07 [e] | 255.52 |
| Nitrogen oxides | 1.98 lb/ton WWF | 3 | 47.1 tons bark/hr [a] | 93.30 [b] | 47 lb/1,000 gal | 6 | 41,932 lbs/day [c] | 10.01 [e] | 103.32 |
| Sulfur dioxide | 0.225 lb $SO_2$/ton WWF | | 47.1 tons bark/hr [a] | 10.6 | 0.164 (S) lb/gal | | 41,932 lbs/day [c] | 76.9 [e] | 87.48 |
| Sulfuric acid mist | 4.4 % of $SO_2$ | | -- | 0.47 | 4.4 % of $SO_2$ | | -- | 3.38 | 3.85 |

Note: Highest 24-hour PM and CO emissions during 2002 through 2003 were determined to have occurred on March 11, 2004.

[a] Based on actual maximum daily bark usage (1,130.92 tons bark/day) on March 11, 2004.

[b] Hourly emissions based on emission factor, maximum tons of bark burned, and 9 MMBtu/ton of bark.

[c] Based on oil usage of 41,932 lbs/day on March 11, 2004.

[d] Hourly emissions based on oil usage of 41,932 lbs/day, 0.1 lb PM/MMBtu, 8.2 lb/gal, and 150,000 Btu/gal.

[e] Hourly emissions emissions based on oil usage of 41,932 lbs/day, emission factor, and 8.2 lbs/gal.

References:

1. Based on average of last two years of stack test data when buring bark/wood (1/8/03 and 1/8/04).
2. $PM_{10}$ estimated to be 74% of PM based on the ratio of individual emission factors for PM and $PM_{10}$ from AP-42 Table 1.6-1 for wood-residue fired boilers with an ESP.
3. Emission Factors based on AP-42 Section 1.6 Table 1.6-1 (3/02). Emission factors are converted from lb/MMBtu to lb/ton of wood/bark by multiplying by 9 MMBtu/ton (CO = 0.60 lb/MMBtu, $NO_x$ = 0.22 lb/MMBtu).
4. Emission factor based on last two years of stack test data when burning fuel oil only (1/8/03 and 1/8/04).
5. Based on AP-42 Section 1.3, Table 1.3-4, for utility boilers firing residual oil with an ESP (no factor available for industrial boilers with an ESP).
6. Emission factor based on AP-42 Section 1.3 Table 1.3-1 (9/98).

Table B-7. Past Actual (2002-2003) 24-Hour Emissions for Highest Fuel Oil Burning Day (March 14, 2003) for the No. 4 Combination Boiler, GP Palatka Mill

| | Wood/Bark | | | | No. 6 Fuel Oil | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| Regulated Pollutant | Emission Factor | Ref. | 24-Hour Activity Factors | 24-Hr Average Emissions (lb/hr) | Emission Factor | Ref. | 24-Hour Activity Factors | 24-Hr Average Emissions (lb/hr) | 24-Hour Emissions (lb/hr) |
| Sulfur dioxide | 0.225 lb $SO_2$/ton WWF | 1 | 73.95 tons/day [a] | 0.7 | 0.164 (S) lb/gal | 3 | 18,888 lbs oil/hr [b] | 831.1 [c] | 831.75 |
| Sulfuric acid mist | 4.4 % of $SO_2$ | 2 | -- | 0.03 | 4.4 % of $SO_2$ | 2 | -- | 36.57 | 36.60 |
| Nitrogen oxides | 1.98 lb/ton WWF | 4 | 73.95 tons/day [a] | 6.1 | 47 lb/1000 gal | 3 | 18,888 lbs oil/hr [b] | 108.26 [c] | 114.36 |
| Particulate (PM) | 0.075 lb/MMBtu | | 73.95 tons/day [a] | 2.08 [b] | 0.033 lb/MMBtu | | 18,888 lbs oil/hr [b] | 11.40 [d] | 13.48 |
| Particulate ($PM_{10}$) | 74 % of PM | | -- | 1.54 | 63 % of PM | | -- | 7.18 | 8.72 |
| Carbon monoxide | 5.4 lb/ton WWF | | 73.95 tons/day [a] | 16.64 [b] | 5 lb/1,000 gal | | 18,888 lbs oil/hr [b] | 11.52 [e] | 28.16 |

Note: Highest 24-hour $SO_2$ emissions during 2002 through 2003 were determined to have occurred on March 14, 2003.

[a] Bark usage rate of 73.95 tons/day based on 3/14/03 actual operation.
[b] Based on fuel oil usage of 453,301 lbs/day on 3/14/03 actual operation.
[c] Based on density of 8.2 lbs/gal and sulfur content of 2.2%.
[d] Based on density of 8.2 lbs/gal and heat content of 150,000 Btu/gal.
[e] Hourly emissions based on the daily emission rate and 24 hours/day.

References:

1. Emission factor based on AP-42 Section 1.6 Table 1.6-1 (3/02). Emission factor converted from lb/MMBtu to lb/ton of wood/bark by multiplying by 9 MMBtu/ton ($SO_2$ = 0.025 lb/MMBtu).
2. Based on similar derivation of sulfuric acid mist from AP-42 for fuel oil: 3.6% of $SO_2$ becomes $SO_3$ then take into account the ratio of sulfuric acid mist and sulfur trioxide molecular weights (98/80).
3. Emission Factors based on AP-42 Section 1.3 Table 1.3-1. S = 2.2 % (average actual sulfur content for 2002 and 2003).
4. Emission Factors based on AP-42 Section 1.6 Table 1.6-1 (3/02). Emission factors are converted from lb/MMBtu to lb/ton of wood/bark by multiplying by 9 MMBtu/ton ($NO_x$ = 0.22 lb/MMBtu).

# APPENDIX C

# CALPUFF MODEL DESCRIPTION AND METHODOLOGY

# TABLE OF CONTENTS

# CALPUFF MODEL DESCRIPTION AND METHODOLOGY

## C.1 INTRODUCTION

As part of the new source review requirements under Prevention of Significant Deterioration (PSD) regulations, new or modified sources are required to address air quality impacts at PSD Class I areas. As a result, the air quality impacts due to the potential emissions of the proposed project at the Georgia-Pacific (GP) Palatka Mill are required to be addressed at the PSD Class I areas of the Okefenokee National Wilderness Area (NWA), Wolf Island NWA, and Chassahowitzka NWA as part of the modeling report submitted to the Florida Department of Environmental Protection (FDEP). The Okefenokee NWA is located 108 kilometers (km) north of the GP Palatka Mill. The Wolf Island NWA is located 186 km north of the GP Palatka Mill. The Chassahowitzka NWA is located 137 km southwest of the GP Palatka Mill. Since Wolf Island NWA and Okefenokee NWA are both north of the GP Palatka Mill site, only the impacts of the closer Class I area, Okefenokee NWA, were evaluated.

Compliance with PSD Class I increments can be evaluated by determining if the source's impacts are less than the proposed U.S. Environmental Protection Agency (EPA) Class I significant impact levels. The significant impact levels are threshold levels that are used to determine the type of air impact analyses needed for the facility. If the new source's impacts are predicted to be less than significant, then the source's impacts are assumed not to have a significant adverse affect on air quality and additional modeling with other sources is not required. However, if the source's impacts are predicted to be greater than the significant impact levels, additional modeling with other sources is required to demonstrate compliance with Class I increments.

Currently, there are several air quality modeling approaches recommended by the Interagency Workgroup on Air Quality Models (IWAQM) to perform these analyses. The IWAQM consists of EPA and Federal Land Managers (FLM) of Class I areas that are responsible for ensuring that AQRVs are not adversely impacted by new and existing sources. These recommendations have been summarized in two documents:

- *Interagency Workgroup on Air Quality Models (IWAQM), Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts* (EPA, 1998), referred to as the IWAQM Phase 2 report.
- *Federal Land Managers' Air Quality Related Values Workgroup (FLAG), Phase I Report,* USFS, NPS, USFWS (December, 2000), referred to as the FLAG document.

For a project located within 50 km of a PSD Class I area, a short-range transport air dispersion model should be used to address air quality impacts. For a project located beyond 50 km of a PSD Class I area, a long-range air dispersion model should be used to address air quality impacts.

## C.2 GENERAL AIR MODELING APPROACH

The general modeling approach was based on using the long-range transport model, California Puff model (CALPUFF, Version 5.7). At distances beyond 50 km, the ISCST3 model is considered to over predict air quality impacts, because it is a steady-state model. At those distances, the CALPUFF model is recommended for use. The FLM have requested that air quality impacts for a source located more than 50 km from a Class I area be predicted using the CALPUFF model.

The methods and assumptions used in the CALPUFF model were based on the latest recommendations for a refined analysis as presented in the IWAQM Phase 2 Summary Report and the FLAG document.

The following sections present the methods and assumptions used to assess the impacts of the proposed project. The analysis is consistent with a "refined analysis" since it was performed using the detailed weather data from multiple surface and upper air stations as well as the MM4/MM5 prognostic with fields. The results of these analyses are presented in Section 5.0 of the modeling report.

## C.3 MODEL SELECTION AND SETTINGS

The California Puff (CALPUFF, version 5.7) air modeling system was used to model to assess the proposed project's impacts at the PSD Class I area for comparison to the PSD Class I significant impact levels. CALPUFF is a non-steady state Lagrangian Gaussian puff long-range transport model that includes algorithms for building downwash effects as well as chemical transformations (important for visibility controlling pollutants), and wet/dry deposition. The CALPUFF meteorological and geophysical data preprocessor (CALMET, Version 5.4), a preprocessor to CALPUFF, is a diagnostic meteorological model that produces a three-dimensional field of wind and temperature and a two-dimensional field of other meteorological parameters. CALMET was designed to process raw meteorological, terrain and land-use databases to be used in the air modeling analysis. The CALPUFF modeling system uses a number of FORTRAN preprocessor programs that extract data from large databases and converts the data into formats suitable for input to CALMET.

The processed data produced from CALMET was input to CALPUFF to assess the pollutant specific impact. Both CALMET and CALPUFF were used in a manner that is recommended by the IWAQM Phase 2 and FLAG reports.

### C.3.1 CALPUFF MODEL APPROACHES AND SETTINGS

The IWAQM has recommended approaches for performing a Phase 2 refined modeling analyses that are presented in Table C-1. These approaches involve use of meteorological data, selection of receptors and dispersion conditions, and processing of model output.

The specific settings used in the CALPUFF model are presented in Table C-2.

### C.3.2 EMISSION INVENTORY AND BUILDING WAKE EFFECTS

The CALPUFF model included the facility's emission, stack, and operating data as well as building dimensions to account for the effects of building-induced downwash on the emission sources. Dimensions for all significant building structures were processed with the Building Profile Input Program modified to process additional direction-specific building information (BPIP), Version 95039, and were included in the CALPUFF model input. The modeling presents a listing of the facility's emissions and structures included in the analysis.

## C.4 <u>RECEPTOR LOCATIONS</u>

For the refined analyses, pollutant concentrations were predicted in an array of 161 discrete receptors located at the Okefenokee NWA and 13 discrete receptors at Chassahowitzka NWA.

## C.5 <u>METEOROLOGICAL DATA</u>

Two wind field domains were developed to model the two PSD Class I areas that are described in the following sections.

### C.5.1 OKEFENOKEE NWA WIND FIELD DOMAINS

CALMET was used to develop the grid pattern for the parameter fields required for the refined modeling analyses for the Okefenokee NWA. The following sections discuss the specific data used and processed in the CALMET model.

### C.5.1.1 Calmet Settings

The CALMET settings contained in Table C-3 were used for the refined modeling analysis. All input data files needed for CALMET were developed by Golder staff.

### C.5.1.2 Modeling Domain

A rectangular modeling domain extending 316 km in the east-west (x) direction and 412 km in the north-south (y) direction was used for the refined modeling analysis. The southwest corner of the domain is the origin and is located at 29.25 degrees north latitude and 84.0 degrees west longitude (east and north UTM coordinates of 208.0 and 3239.0 km, respectively, zone 17). This location is in the Gulf of Mexico approximately 110 km west of Cedar Key, Florida. For the processing of meteorological and geophysical data, the domain contains 80 grid cells in the x-direction and 104 grid cells in the y-direction. The domain grid resolution is 4 km. The air modeling analysis was performed in the UTM coordinate system.

### C.5.1.3 Mesoscale Model – Generations 4 and 5 (MM4 and MM5) Data

Pennsylvania State University in conjunction with the NCAR Assessment Laboratory developed the MM4 and MM5 data set, a prognostic wind field or "guess" field, for the United States. The hourly meteorological variables used to create this data set (wind, temperature, dew point depression, and geopotential height for eight standard levels and up to 15 significant levels) are extensive and are available for 1990, 1992, and 1996. The analysis used the MM4 and MM5 data to initialize the CALMET wind field. The MM4 and MM5 data available for 1990 and 1992, respectively, have a horizontal spacing of 80 km and are used to simulate atmospheric variables within the modeling domain. The MM5 data are also available for 1996 and have a horizontal spacing of 36 km.

The MM4 and MM5 data used in the CALMET, although advanced, lacks the fine detail of specific temporal and spatial meteorological variables and geophysical data. These variables were processed into the appropriate format and introduced into the CALMET model through the additional data files obtained from the following sources.

### C.5.1.4 Surface Data Stations and processing

The surface station data processed for the CALPUFF analyses consisted of data from ten NWS stations or Federal Aviation Administration (FAA) Flight Service stations for Columbus, Macon, Savannah, Augusta, Athens, and Atlanta in Georgia; and Tampa, Jacksonville, Daytona Beach, Tallahassee, and Gainesville in Florida. A summary of the surface station information and locations are presented in Table C-4. The surface station parameters include wind speed, wind direction, cloud ceiling height, opaque cloud cover, dry bulb temperature, relative humidity, station pressure, and a precipitation code that is based on current weather conditions. The surface station data were processed into a SURF.DAT file format for CALMET input.

Because the modeling domain extends over water, three sea surface stations were used. Data were obtained from two C-Man stations from Folly Island, South Carolina, and Savannah Light, Georgia, and one buoy identified NOAA Buoy 41008. These data were processed into an over-water surface station format (i.e., SEA*.DAT) for input to CALMET. The over-water station data include wind direction, wind speed and air temperature.

#### C.5.1.5 Upper Air Data Stations and Processing

Upper air data from the following NWS stations, based on the availability of the upper air data, were used in the modeling analysis:

- Waycross, Georgia (1990, 1992);
- Athens, Georgia (1990, 1992);
- Charleston, South Carolina (1990, 1992, 1996);
- Apalachicola, Florida (1990);
- Ruskin, Florida (1990, 1992, 1996);
- Tallahassee, Florida (1992, 1996);
- Jacksonville, Florida (1996); and
- Peachtree City, Georgia (1996).

The data and locations for the upper air stations are presented in Table C-4.

#### C.5.1.6 Precipitation Data Stations and Processing

Precipitation data were processed from a network of hourly precipitation data files collected from primary and secondary NWS precipitation-recording stations located within the latitude and longitudinal limits of the modeling domain. Data for 19 stations in Georgia and 22 stations in Florida were obtained in NCDC TD-3240 variable format and converted into a fixed-length format. The utility programs PXTRACT and PMERGE were then used to process the data into the format for the PRECIP.DAT file that is used by CALMET. A listing of the precipitation stations used for the modeling analysis is presented in Table C-5.

#### C.5.1.7 Geophysical Data Processing

Terrain elevations for each grid cell of the modeling domain were obtained from 1-degree Digital Elevation Model (DEM) files obtained from the U.S. Geographical Survey (USGS) Internet website. The DEM data was extracted for the modeling domain grid using the utility program TERREL. Land-use data were also extracted from 1-degree USGS files and processed using utility programs CTGCOMP and CTGPROC. Both the terrain and land use files were combined into a GEO.DAT file for input to CALMET with the MAKEGEO utility program.

### C.5.2 CHASSAHOWITZKA NWA WIND FIELD DOMAINS

CALMET was used to develop the grid pattern for parameter fields required for the refined modeling analyses for the Chassahowitzka NWA. The follow sections discuss the specific data used and processed in the CALMET model.

#### C.5.2.1 Calmet Settings

The CALMET settings contained in Table C-6 were used for the refined modeling analysis. All input data files needed for CALMET were developed by Golder staff.

#### C.5.2.2 Modeling Domain

A rectangular modeling domain extending 348 km in the east-west (x) direction and 372 km in the north-south (y) direction was used for the refined modeling analysis. The southwest corner of the domain is the origin and is located at 27 degrees north latitude and 83.5 degrees west longitude (east and north UTM coordinates of 270.0 and 2990.0 km, respectively, zone 17). This location is in the Gulf of Mexico approximately 110 km west of Venice, Florida. For the processing of meteorological and geophysical data, the domain contains 88 grid cells in the x-direction and 94 grid cells in the y-direction. The domain grid resolution is 4 km. The air modeling analysis was performed in the UTM coordinate system.

#### C.5.2.3 Mesoscale Model – Generations 4 and 5 (MM4 and MM5) Data

Pennsylvania State University in conjunction with the NCAR Assessment Laboratory developed the MM4 and MM5 data set, a prognostic wind field or "guess" field, for the United States. The hourly meteorological variables used to create this data set (wind, temperature, dew point depression, and geopotential height for eight standard levels and up to 15 significant levels) are extensive and are available for 1990, 1992, and 1996. The analysis used the MM4 and MM5 data to initialize the CALMET wind field. The MM4 and MM5 data available for 1990 and 1992, respectively, have a horizontal spacing of 80 km and are used to simulate atmospheric variables within the modeling domain. The MM5 data are also available for 1996 and have a horizontal spacing of 36 km.

The MM4 and MM5 data used in the CALMET, although advanced, lacks the fine detail of specific temporal and spatial meteorological variables and geophysical data. These variables were processed into the appropriate format and introduced into the CALMET model through the additional data files obtained from the following sources.

#### C.5.2.4 Surface Data Stations and Processing

The surface station data processed for the CALPUFF analyses consisted of data from six NWS stations or Federal Aviation Administration (FAA) Flight Service stations for Gainesville, Tampa, Daytona Beach, Vero Beach, Fort Myers and Orlando. A summary of the surface station information and locations are presented in Table C-7. The surface station parameters include wind speed, wind direction, cloud ceiling height, opaque cloud cover, dry bulb temperature, relative humidity, station pressure, and a precipitation code that is based on current weather conditions. The surface station data were processed by FDEP into a SURF.DAT file format for CALMET input.

Because the modeling domain extends largely over water, C-Man station data from Venice was obtained. Florida DEP processed these data into an over-water surface station format (i.e., SEA*.DAT) for input to CALMET. The over-water station data include wind direction, wind speed and air temperature.

#### C.5.2.5 Upper Air Data Stations and Processing

Upper air data from the following NWS stations, based on the availability of the upper air data, were used in the modeling analysis:

- Ruskin, Florida (1990, 1992, 1996);
- West Palm Beach, Florida (1990, 1992);
- Apalachicola, Florida (1990);
- Tallahassee, Florida (1992, 1996);
- Jacksonville, Florida (1996); and
- Ft. Lauderdale, Florida (1996).

The data and locations for the upper air stations are presented in Table C-7.

### C.5.2.6 Precipitation Data stations and Processing

Precipitation data were processed from a network of hourly precipitation data files collected from primary and secondary NWS precipitation-recording stations located within the latitude and longitudinal limits of the modeling domain. Data for 14 stations were obtained in NCDC TD-3240 variable format and converted into a fixed-length format. The utility programs PXTRACT and PMERGE were then used to process the data into the format for the PRECIP.DAT file that is used by CALMET. A listing of the precipitation stations used for the modeling analysis is presented in Table C-8.

### C.5.2.7 Geophysical Data Processing

Terrain elevations for each grid cell of the modeling domain were derived from 1-degree Digital Elevation Model (DEM) files obtained from the U.S. Geographical Survey (USGS) internet website. The DEM data were extracted for the modeling domain grid using the utility program TERREL. Land-use data were also extracted from 1-degree USGS files and processed using utility programs CTGCOMP and CTGPROC. Both the terrain and land use files were combined into a GEO.DAT file for input to CALMET with the MAKEGEO utility program.

Table C-1. Refined Modeling Analyses Recommendations[a]

| Model Input/Output | Description |
|---|---|
| Meteorology | Use CALMET (minimum 6 to 10 layers in the vertical; top layer must extend above the maximum mixing depth expected); horizontal domain extends 50 to 80 km beyond outer receptors and sources being modeled; terrain elevation and land-use data is resolved for the situation. |
| Receptors | Within Class I area(s) of concern; obtain regulatory concurrence on coverage. |
| Dispersion | 1. CALPUFF with default dispersion settings.<br>2. Use MESOPUFF II chemistry with wet and dry deposition.<br>3. Define background values for ozone and ammonia for area. |
| Processing | 1. For PSD increments: use highest, second highest 3-hour and 24-hour average $SO_2$ concentrations; highest, second highest 24-hour average PM10 concentrations; and highest annual average $SO_2$, $PM_{10}$, and $NO_x$ concentrations.<br>2. For haze: process, on a 24-hour basis, compute the source extinction from the maximum increase in emissions of $SO_2$, $NO_x$, and $PM_{10}$; compute the daily relative humidity factor [f(RH)], provided from an external disk file; and compute the maximum percent change in extinction using the FLM supplied background extinction data in the FLAG document.<br>3. For significant impact analysis: use highest annual and highest short-term averaging time concentrations for $SO_2$, $PM_{10}$, and NOx. |

[a] IWAQM Phase II report (December, 1998) and FLAG document (December, 2000)

Table C-2. CALPUFF Model Settings

| Parameter | Setting |
|---|---|
| Pollutant Species | $SO_2$, $SO_4$, $NO_x$, $HNO_3$, $NO_3$, $PM_{10}$ |
| Chemical Transformation | MESOPUFF II scheme including hourly ozone data |
| Deposition | Include both dry and wet deposition, plume depletion |
| Meteorological/Land Use Input | CALMET |
| Plume Rise | Transitional, Stack-tip downwash, Partial plume penetration |
| Dispersion | Puff plume element, PG /MP coefficients, rural mode, ISC building downwash scheme |
| Terrain Effects | Partial plume path adjustment |
| Output | Create binary concentration file including output species for $SO_4$, $NO_3$, $PM_{10}$, $SO_2$, and $NO_x$; process for visibility change using Method 2 and FLAG background extinctions |
| Model Processing | For haze: highest predicted 24-hour extinction change (%) for the year |
| | For significant impact analysis: highest predicted annual and highest short-term averaging time concentrations for $SO_2$, $NO_x$, and $PM_{10}$. |
| Background Values | Ozone: 50 ppb; Ammonia: 1 ppb |

Table C-3. CALMET Settings, Okefenokee NWA PSD Class I Area Analysis

| Parameter | Setting |
|---|---|
| Horizontal Grid Dimensions | 316 by 412 km, 4 km grid resolution |
| Vertical Grid | 10 layers |
| Weather Station Data Inputs | Surface, upper air, and precipitation stations |
| Wind model options | Diagnostic wind model, no kinematic effects |
| Prognostic wind field model | 1990 MM4 and 1992 data, 80 km resolution; 1996 MM5 data, 36 km resolution; used for wind field initialization |
| Output | Binary hourly grid pattern for meteorological data file for CALPUFF input |

Table C-4. Surface and Upper Air Stations Used in the CALPUFF Analysis, Okefenokee NWA PSD Class I Area

| Station Name | Station Symbol | WBAN Number | UTM Coordinates Easting (km) | UTM Coordinates Northing (km) | Zone | Anemometer Height (m) |
|---|---|---|---|---|---|---|
| **Surface Stations** | | | | | | |
| Tampa, FL | TPA | 12842 | 349.17 | 3094.25 | 17 | 6.7 |
| Jacksonville, FL | JAX | 13889 | 432.82 | 3374.19 | 17 | 6.1 |
| Daytona Beach, FL | DAB | 12834 | 495.14 | 3228.09 | 17 | 9.1 |
| Tallahassee, FL | TLH | 93805 | 173.04[a] | 3363.99 | 16 | 7.6 |
| Columbus, GA | COL | 93842 | 112.57[a] | 3599.35 | 16 | 9.1 |
| Macon, GA | MCN | 3813 | 251.58 | 3620.93 | 17 | 7.0 |
| Savannah, GA | SAV | 3822 | 481.13 | 3555.03 | 17 | 9.1 |
| Gainesville, FL | GNV | 12816 | 377.43 | 3284.16 | 17 | 6.7 |
| Augusta, GA | AGS | 3820 | 410.25 | 3692.49 | 17 | 6.1 |
| Athens, GA | AHN | 13873 | 284.98 | 3758.67 | 17 | 7.6 |
| Atlanta, GA | ATL | 13874 | 158.65[a] | 3725.04 | 16 | 6.1 |
| **Sea Surface Stations** | | | | | | |
| NOAA Buoy 41008 | 41008 | - | 490.42 | 3396.12 | 17 | 4.0 |
| Folly Island (SC) C- Man | FBIS1 | - | 603.15 | 3618.33 | 17 | 6.7 |
| Savannah Light (GA) C-Man | SVLS1 | - | 528.37 | 3540.27 | 17 | 10.0 |
| **Upper Air Stations** | | | | | | |
| Ruskin, FL | TBW | 12842 | 361.95 | 3064.55 | 17 | NA |
| Waycross, GA | AYS | 13861 | 366.68 | 3457.95 | 17 | NA |
| Athens, GA | AHN | 13873 | 285.91 | 3758.83 | 17 | NA |
| Charleston, SC | CHS | 13880 | 590.42 | 3640.42 | 17 | NA |
| Apalachicola, FL | AQQ | 12832 | 110.22[a] | 3290.65 | 16 | NA |
| Tallahassee, FL | TLH | 93805 | 173.04[2] | 3363.99 | 17 | NA |
| Jacksonville, FL | JAX | 13889 | 459.61 | 3351.92 | 17 | NA |
| Peachtree, GA | FFC | 53819 | 188.65[2] | 3679.35 | 16 | na |

[a] Equivalent coordinate for Zone 17.

Table C-5. Hourly Precipitation Stations Used in the Okefenokee NWA CALPUFF Analysis

| Station Name | Station Number | UTM Coordinate Easting (km) | UTM Coordinate Northing (km) | UTM Coordinate Zone |
|---|---|---|---|---|
| **Florida** | | | | |
| Branford | 80975 | 315.61 | 3315.96 | 17 |
| Bristol | 81020 | 113.72[a] | 3366.47 | 16 |
| Brooksville 7 SSW | 81048 | 358.03 | 3149.55 | 17 |
| Cross city 2 WNW | 82008 | 290.27 | 3281.75 | 17 |
| Daytona Beach WSO AP | 82158 | 495.14 | 3228.09 | 17 |
| Deland 1 SSE | 82229 | 470.78 | 3209.66 | 17 |
| Dowling Park 1 W | 82391 | 283.51 | 3348.42 | 17 |
| Gainesville 11 WNW | 83322 | 354.85 | 3284.43 | 17 |
| Inglis 3 E | 84273 | 342.63 | 3211.65 | 17 |
| Jacksonville WSO AP | 84358 | 434.27 | 3372.40 | 17 |
| Lakeland | 84797 | 409.87 | 3099.18 | 17 |
| Lisbon | 85076 | 423.59 | 3193.26 | 17 |
| Lynne | 85237 | 409.26 | 3230.30 | 17 |
| Marineland | 85391 | 479.19 | 3282.03 | 17 |
| Melbourne WSO | 85612 | 534.38 | 3109.97 | 17 |
| Monticello 3 W | 85879 | 220.17 | 3381.29 | 17 |
| Orlando WSO McCoy | 86628 | 468.99 | 3146.88 | 17 |
| Panacea 3 s | 86828 | 172.45[a] | 3319.61 | 16 |
| Raiford State Prison | 87440 | 385.93 | 3326.55 | 17 |
| Saint Leo | 87851 | 376.48 | 3135.09 | 17 |
| Tallahassee WSO AP | 88758 | 173.04[a] | 3363.99 | 16 |
| Woodruff Dam | 89795 | 124.29[a] | 3399.94 | 16 |
| | | | | |
| **Georgia** | | | | |
| Abbeville 4 S | 90010 | 281.84 | 3535.69 | 17 |
| Bainbridge Intl Paper Co | 90586 | 144.85[a] | 3409.59 | 16 |
| Brunswick | 91340 | 452.34 | 3447.98 | 17 |
| Coolidge | 92238 | 226.34 | 3434.77 | 17 |
| Doles | 92728 | 226.73 | 3510.59 | 17 |
| Edison | 93028 | 135.13[a] | 3494.43 | 16 |
| Fargo | 93312 | 349.92 | 3395.35 | 17 |
| Folkston 3 SW | 93460 | 401.13 | 3407.69 | 17 |
| Hazlehurst | 94204 | 348.49 | 3526.08 | 17 |
| Jesup | 94671 | 416.21 | 3498.08 | 17 |
| Pearson | 96879 | 325.50 | 3464.09 | 17 |
| Richmond Hill | 97468 | 468.92 | 3535.69 | 17 |
| Valdosta 4 NW | 98974 | 276.90 | 3416.95 | 17 |
| Claxton | 91973 | 415.05 | 3559.19 | 17 |
| Dublin 2 | 92844 | 321.61 | 3603.71 | 17 |
| Lizella | 95249 | 235.94 | 3633.39 | 17 |
| Macon Middle Ga Regional | 95443 | 251.13 | 3619.58 | 17 |
| Savannah WSO Airport | 97847 | 480.92 | 3553.43 | 17 |
| Sylvania 2 SSE | 98517 | 442.11 | 3621.57 | 17 |

[a] Equivalent coordinate for Zone 17.

Table C-6. CALMET Settings, Chassahowitzka NWA PSD Class I Area Analysis

| Parameter | Setting |
|---|---|
| Horizontal Grid Dimensions | 348 by 372 km, 4 km grid resolution |
| Vertical Grid | 10 layers |
| Weather Station Data Inputs | Surface, upper air, and precipitation stations |
| Wind model options | Diagnostic wind model, no kinematic effects |
| Prognostic wind field model | 1990 MM4 and 1992 data, 80 km resolution; 1996 MM5 data, 36 km resolution; used for wind field initialization |
| Output | Binary hourly grid pattern for meteorological data file for CALPUFF input |

Table C-7. Surface and Upper Air Stations Used in the CALPUFF Analysis, Chassahowitzka NWA PSD Class I Area

| Station Name | Station Symbol | WBAN Number | UTM Coordinates Easting (km) | UTM Coordinates Northing (km) | Zone | Anemometer Height (m) |
|---|---|---|---|---|---|---|
| **Surface Stations** | | | | | | |
| Tampa | TPA | 12842 | 349.20 | 3094.25 | 17 | 6.7 |
| Daytona Beach | DAB | 12834 | 495.14 | 3228.05 | 17 | 9.1 |
| Orlando | ORL | 12815 | 468.96 | 3146.88 | 17 | 10.1 |
| Gainesville | GNV | 12816 | 377.40 | 3284.12 | 17 | 6.7 |
| Vero Beach | VER | 12843 | 557.52 | 3058.36 | 17 | 6.7 |
| Fort Myers | FMY | 12835 | 413.65 | 2940.38 | 17 | 6.1 |
| Venice Sea Surface | VENF1 | -- | 356.2[a] | 2994.8[a] | 17 | 6.1 |
| **Upper Air Stations** | | | | | | |
| Ruskin | TBW | 12842 | 349.20 | 3094.28 | 17 | NA |
| West Palm Beach | PBI | 12844 | 587.87 | 2951.42 | 17 | NA |
| Apalachicola | AQQ | 12832 | 110.00[a] | 3296.00 | 16 | NA |
| Tallahassee | TLH | 93805 | 173.04[a] | 3363.99 | 17 | NA |
| Jacksonville | JAX | 13809 | 459.61 | 3351.92 | 17 | NA |
| Ft. Lauderdale | MFL | 92803 | 562.18 | 2847.98 | 17 | NA |

[a] Equivalent coordinate for Zone 17; Zone 16 coordinate is 690.22 km.

Table C-8. Hourly Precipitation Stations Used in the Chassahowitzka NWA CALPUFF Analysis

| Station Name | Station Number | UTM Coordinate Easting (km) | UTM Coordinate Northing (km) | UTM Coordinate Zone |
|---|---|---|---|---|
| Belle Glade Hrcn Gt 4 | 80616 | 528.190 | 2953.034 | 17 |
| Branford | 80975 | 315.606 | 3315.955 | 17 |
| Brooksville 7 SSW | 81048 | 358.029 | 3149.545 | 17 |
| Canal Point Gate 5 | 81271 | 536.428 | 2971.514 | 17 |
| Daytona Beach WSO AP | 82158 | 494.165 | 3227.413 | 17 |
| Deland 1 SSE | 82229 | 470.780 | 3209.660 | 17 |
| Fort Myers FAA/AP | 83186 | 413.992 | 2940.710 | 17 |
| Gainesville 11 WNW | 83322 | 355.411 | 3284.205 | 17 |
| Inglis 3 E | 84273 | 342.631 | 3211.652 | 17 |
| Lakeland | 84797 | 409.871 | 3099.178 | 17 |
| Lisbon | 85076 | 423.594 | 3193.256 | 17 |
| Lynne | 85237 | 409.255 | 3230.295 | 17 |
| Marineland | 85391 | 479.193 | 3282.030 | 17 |
| Melbourne WSO | 85612 | 534.381 | 3109.967 | 17 |
| Moore Haven Lock 1 | 85895 | 491.608 | 2967.803 | 17 |
| Orlando Wso Mccoy | 86628 | 468.169 | 3145.102 | 17 |
| Ortona Lock 2 | 86657 | 470.174 | 2962.267 | 17 |
| Parrish | 86880 | 366.986 | 3054.394 | 17 |
| Port Mayaca S L Canal | 87293 | 538.044 | 2984.440 | 17 |
| Saint Leo | 87851 | 376.483 | 3135.086 | 17 |
| St Lucie New Lock 1 | 87859 | 571.042 | 2999.353 | 17 |
| St Petersburg | 87886 | 339.608 | 3071.991 | 17 |
| Tampa Wscmo AP | 88788 | 348.478 | 3093.670 | 17 |
| Venice | 89176 | 357.593 | 2998.178 | 17 |
| Venus | 89184 | 467.266 | 3001.224 | 17 |
| Vero Beach 4 W | 89219 | 554.268 | 3056.498 | 17 |
| West Palm Beach Int AP | 89525 | 589.611 | 2951.627 | 17 |