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RECEIVED

DEC 21 1992

Division of Air
Resources Management


December 21, 1992

Mr. Clair Fancy, Chief
Bureau of Air Regulation
Division Air Resources Management
Room 306F, 2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: PSD Permit Application for Proposed Pulp Mill
<u>Modifications - Champion International Corporation</u>

Dear Mr. Fancy:

Attached for filing and processing are seven copies of a PSD permit application for proposed pulp mill modifications at the Champion International Corporation, Pensacola, Florida mill. Also attached is a $15,000 application fee, a diskette containing air quality model results and a hard copy of the air quality modeling results.

If there are any questions regarding this, please call Kyle Moore at the Pensacola mill.

Sincerely,

Terry Cole

Terry Cole

c: Kyle Moore
Bruce Mitchell
C. Holladay
C. Middleswart (delivered 12/21)
J. Harper, EPA
B. Mitchell, NPS
R. Grusnick, ADEM
J. Glunn

Terry\Champion\Fancy1.221

# PSD Permit Application for Proposed Pulp Mill Modifications

# Champion International Corporation Pensacola Florida Mill

December 1992

0330042

**Prepared for:**
Champion International Corporation
Cantonment, Florida

**Submitted to:**
Florida Department of Environmental Regulation
Division of Air Resources Management
Tallahassee, Florida

**Prepared by:**
Roy F. Weston, Inc.
West Chester, Pennsylvania

## TABLE OF CONTENTS

# I. PERMIT APPLICATION

**STATE OF FLORIDA**
# DEPARTMENT OF ENVIRONMENTAL REGULATIONS

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

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

## APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: **Major stationary industrial** [ ] NEW[1] [X] Existing[1]

APPLICATION TYPE: [ ] CONSTRUCTION [ ] OPERATION [X] MODIFICATION

COMPANY NAME: **Champion International Corporation** COUNTY: **Escambia**

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) **Refer to Table 3-1 in attached narrative**

SOURCE LOCATION: Street **375 Muscogee Road** City **Cantonment**

UTM: East **469** North **3386**

Latitude **30** ° **36** ' **30** "N Longitude **87** ° **19** ' **13** "W

APPLICANT NAME AND TITLE: **Champion International Corp.**

APPLICANT ADDRESS: **P.O. Box 87 Cantonment, Florida 32533**

### SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of **Champion International**

I certify that the statements made in this application for a **modification** permit are true, correct and complete to the best of my knowledge and belief. Further I agree to maintain and operate the pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

Signed: F. D. Owenby

**F. Doug Owenby, Vice President/Operations Manager**
Name and Title (Please Type)

Date: 12/17/92 Telephone No. 904-968-2121

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F. S.)

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgement, that

[1]See Florida Administrative Code Rule 17-2.100(57) and (104)

the pollution control facilities, when properly maintained an operated, will discharge an effluent that complies with all applicable statues of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed ______________________

**DAN SMITH**
Name (Please Type)

**CORNERSTONE ENGINEERING**
Company Name (Please Type)

**125 S. ALCANIZE, ST., SUITE 2 PENSACOLA, FA 32501**
Mailing Address (Please Type)

Florida Registration No. **35633** Date: __________ Telephone No. **904-438-3449**

## SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

**Pulp mill modifications as described in the attached narrative text associated with the mills wastewater Consent order including; construction of new gas fired No. 6 Power Boiler, modification of existing Lime Kiln, modification of bleach plant operations, construction of a methanol storage tank and shut down of existing No. 1 and No. 2 Power Boilers.**

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction **March 1993** Completion of Construction **JUNE 1995**

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

**No. 6 Power Boiler - low $NO_x$ burner and flue gas recirculation - $400,000**

**Lime Kiln - Mud Dryer - electrostatic precipitator and scrubber - $1,500,000**

**Bleach Plant - $ClO_2$ generator and tail gas scrubber - $4,500,000**

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

**Lime Kiln - A017-181738; Issued 7/18/90, expires 7/1/95. Bleach Plant - A017-142570; Issued 2/8/88, expires 1/1/93. $ClO_2$ generator system - A017-142566; Issued 2/8/88, expires 1/1/93. No. 1 Power Boiler - A017-181-726; Issued 7/9/90, expires 6/1/95, No. 2 Power Boiler - A017-18127; Issued 7/9/90, expires 6/1/95. Salt unloading - A017-142572, Issued 2/8/88, expires 1/1/93.**

E. Requested permitted equipment operating time: hrs/day __24__; days/wk __7__; wks/yr __52__; if power plant, hrs/yr __8760__; if seasonal, describe:

F. If this is a new source or major modification, answer the following questions (Yes or No)

1. Is this source in a non-attainment area for a particular pollutant? **NO**

   a. If yes, has "offset" been applied? **NA**

   b. If yes, has "Lowest Achievable Emission Rate" been applied? **NA**

   c. If yes, list non-attainment pollutants. **NA**

2. Does best available control technology (BACT) apply to this source? **YES**

3. Does the State "Prevention of Significant Deterioration" (PSD) requirement apply to this source? If yes, see Section VI and VII. **YES**

4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? **YES**

5. Do "National Emission Standards or Hazardous Air Pollutants" (NESHAP) apply to this source? **NO**

H. Do "Reasonably Available control Technology" (RACT) requirements apply to this source? **NO**

   a. If yes, for what pollutants?

   b. If yes, in addition to the information required in this form, any information requested in Rule 17-2.650 must be submitted.

Attach all supportive information related to any answer of "Yes". Attach any justification for any answer of "No" that might be considered questionable.

**REFER TO DETAILS IN THE ATTACHED NARRATIVE TEXT**

**SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)**

A. Raw Materials and Chemicals Used in your Process, if applicable: **NA**

| Description | Contaminants | | Utilization Rate - lbs/hr | Relate to Flow Diagram |
|---|---|---|---|---|
| | Type | % Wt | | |
| | | | | |
| | | (NOT APPLICABLE) | | |
| | | | | |
| | | | | |
| | | | | |

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lb/hr): NA

2. Product Weight (lbs/hr): NA

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

| Name of Contaminant | Emission[1] | | Allowed[2] Emission Rate per Rule 17-2 | Allowable[3] Emission lbs/hr | Potential[4] Emission | | Relate to Flow Diagram |
|---|---|---|---|---|---|---|---|
| | Maximum lbs/hr | Actual T/yr | | | lbs/hr | T/yr | |
| PM/PM10 | 2.67 | 11.67 | NA | NA | 2.67 | 11.67 | 1-B |
| $NO_x$* | 32 24 HR AVG | 140.07 | NSPS - .1 lb/MMBTU | 53.3 30 DAY AVG | 32 24 HR AVG | 140.07 | 1-B |
| CO* | 53.3 | 233.45 | NA | NA | 53.3 | 233.45 | 1-B |
| $SO_2$* | 0.32 | 1.40 | NA | NA | 0.32 | 1.40 | 1-B |
| HYDROCARBONS* | 5.33 | 23.35 | NA | NA | 5.33 | 23.35 | 1-B |

*Emission rates are based upon 24 hour average.

**REFER TO ATTACHED NARRATIVE TEXT, SECTION 3.**

[1]See Section V, Item 2.

[2] Reference applicable emission standards and units (e.g. Rule 17-2.600 (5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3]Calculated from operating rate and applicable standard.

[4]Potential equals actual emission per DER direction.

## NO. 6 POWER BOILER

D. Control Devices: (See Section V, Item 4)

| Name and Type (Model and Serial No.) | Contaminant | Efficiency | Range of Particles Size Collected (in microns) (If applicable) | Basis for Efficiency (Section V Item 5) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | (NOT APPLICABLE) | | |
| | | | | |
| | | | | |
| | | | | |

E. Fuels

| Type (Be Specific) | Consumption* | | Maximum Heat Input (MMBTU/hr) |
|---|---|---|---|
| | avg/hr | max./hr | |
| Natural Gas | .533 MMCF/HR | .533 MMCF/HR | 533 MMBTU/HR |
| | | | |
| | | | |

*Units: Natural Gas–MMCF/hr; Fuel Oils–gallons/hr; Coal, wood, refuse, other–lbs/hr.

Fuel Analysis:

Percent Sulfur: **10.7 ppm typical** Percent Ash: **NEGLIGIBLE**

Density: **NA** lbs/gal Typical Percent Nitrogen: **1.1 to 3.2 (vol)**

Heat Capacity: **APPROX. 1000 BTU/C.F.** BTU/lb **NA** BTU/gal

Other Fuel Contaminants (which may cause air pollution): **(NA)**

F. If applicable, indicate the percent of fuel used for space heating.

Annual Average **NA** Maximum **NA**

G. Indicate liquid or solid wastes generated and method of disposal.

**BLOWDOWN FROM BOILER DISCHARGED TO WASTEWATER TREATMENT FACILITY.**

NO. 6 POWER BOILER

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: 125 ft. Stack Diameter: 8.5 ft.

Gas Flow Rate: 161,000 ACFM 87226 DSCFM Gas Exit Temperature: 350 °F.

Water Vapor Content: 17.2 % Velocity: 47.3 FPS

## SECTION IV: INCINERATOR INFORMATION

| Type of Waste | Type 0 (Plastics) | Type I (Rubbish) | Type II (Refuse) | Type III (Garbage) | Type IV (Patholog-ical) | Type V (Liq. & Gas By-prod.) | Type VI (Solid by-prod.) |
|---|---|---|---|---|---|---|---|
| Actual lb/hr Incinerated | | | (NOT APPLICABLE) | | | | |
| Uncon-trolled (lbs/hr) | | | | | | | |

Description of Waste ____

Total Weight Incinerated (lbs/hr) ____ Design Capacity (lbs/hr) ____

Approximate Number of Hours of Operation per day ____ day/wk ____ wks/yr. ____

Manufacturer ____

Date Constructed ____ Model No. ____

| | Volume $(ft)^3$ | Heat Release (BTU/hr) | Fuel | | Temperature (°F) |
|---|---|---|---|---|---|
| | | | Type | BTU/hr | |
| Primary Chamber | | | | | |
| Secondary Chamber | | | | | |

Stack Height: ____ ft. Stack Diameter: ____ Stack Temp. ____

Gas Flow Rate: ____ ACFM ____ DSCFM* Velocity: ____ FPS

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ____

* If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

## LIME KILN - MUD DRYER

**SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)**

A. Raw Materials and Chemicals Used in your Process, if applicable:

| Description | Contaminants | | Utilization Rate - lbs/hr | Relate to Flow Diagram |
|---|---|---|---|---|
| | Type | % Wt | | |
| LIME MUD | SULFUR | 0.1% | 893 ton/day | 2-A |
| NCG'S | SULFUR | 82% | 358 | 2-D |
| | | | | |
| | | | | |

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lb/hr): LIME MUD - 893 ton/day
2. Product Weight (lbs/hr): CaO - 500 ton/day

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

| Name of Contaminant | Emission[1] | | Allowed[2] Emission Rate per Rule 17-2 | Allowable[3] Emission lbs/hr | Potential[4] Emission | | Relate to Flow Diagram |
|---|---|---|---|---|---|---|---|
| | Maximum lbs/hr | Actual T/yr | | | lbs/hr | T/yr | |
| PM/PM10 | 10.9 | 47.74 | 17-2.610 | 23.6 | 10.9 | 47.74 | 2-E |
| $NO_x$* | 49.3 | 215.93 | NA | NA | 49.3 | 215.93 | 2-E |
| CO* | 6.75 | 29.57 | NA | NA | 6.75 | 29.57 | 2-E |
| $SO_2$* | 6.49 | 28.43 | NA | NA | 6.49 | 28.43 | 2-E |
| VOC* | 24.5 | 107.31 | NA | NA | 24.5 | 107.31 | 2-E |
| TRS* | 1.46 12 HR AVG | 6.39 | 20 PPM 12 HR AVG-FAC | 3.64 12 HR AVG | 1.46 12 HR AVG | 6.39 | 2-E |

*Emission rates are based upon 24 hour average.

**REFER TO ATTACHED NARRATIVE TEXT, SECTION 3.**

[1]See Section V, Item 2.

[2]Reference applicable emission standards and units (e.g. Rule 17-2.600 (5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3]Calculated from operating rate and applicable standard.

[4]Potential equals actual emission per DER direction.

D. Control Devices: (See Section V, Item 4)

| Name and Type (Model and Serial No.) | Contaminant | Efficiency | Range of Particles Size Collected (in microns) (If applicable) | Basis for Efficiency (Section V Item 5) |
|---|---|---|---|---|
| Multi-field Electrostatic Precipitator | PM/PM10 | 99.9%+ | NA | VENDOR |
| Packed Tower Scrubber | $SO_2$ | 95% | NA | VENDOR |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

E. Fuels

| Type (Be Specific) | Consumption* | | Maximum Heat Input (MMBTU/hr) |
|---|---|---|---|
| | avg/hr | max./hr | |
| NATURAL GAS | 0.144 | 0.144 | 144.2 |
| NO. 6 FUEL OIL | 1,000 | 1,000 | 150.0 |
| | | | |

*Units: Natural Gas–MMCF/hr; Fuel Oils–gallons/hr; Coal, wood, refuse, other–lbs/hr.

Fuel Analysis:

Percent Sulfur: **Gas -Trace; Oil - 2.5%** Percent Ash: **Gas - Trace; Oil - Trace**

Density: **Gas - 5.0, Oil - 8.1** lbs/gal Typical Percent Nitrogen: **Gas ~1.1-3.2%, Oil ~0.3 %**

Heat Capacity: **Gas - 1000 BTU/Ft³ ±** BTU/lb **Oil - 150,000 ±** BTU/gal

Other Fuel Contaminants (which may cause air pollution): ______

F. If applicable, indicate the percent of fuel used for space heating.

Annual Average **NA** Maximum **NA**

G. Indicate liquid or solid wastes generated and method of disposal.

**Scrubber Blowdown 5 gpm to Wastewater Treatment Facility** .

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: 136 ft. Stack Diameter: 6.5 ft.

Gas Flow Rate: 57208 ACFM 34383 DSCFM Gas Exit Temperature: 156.7 °F.

Water Vapor Content: SATURATED % Velocity: 28.73 FPS

## SECTION IV: INCINERATOR INFORMATION

| Type of Waste | Type 0 (Plastics) | Type I (Rubbish) | Type II (Refuse) | Type III (Garbage) | Type IV (Patholog-ical) | Type V (Liq. & Gas By-prod.) | Type VI (Solid by-prod.) |
|---|---|---|---|---|---|---|---|
| Actual lb/hr Incinerated | | | (NOT APPLICABLE) | | | | |
| Uncon-trolled (lbs/hr) | | | | | | | |

Description of Waste ______

Total Weight Incinerated (lbs/hr) ______ Design Capacity (lbs/hr) ______

Approximate Number of Hours of Operation per day ______ day/wk ______ wks/yr. ______

Manufacturer ______

Date Constructed ______ Model No. ______

| | Volume $(ft)^3$ | Heat Release (BTU/hr) | Fuel | | Temperature (°F) |
|---|---|---|---|---|---|
| | | | Type | BTU/hr | |
| Primary Chamber | | | | | |
| Secondary Chamber | | | | | |

Stack Height: ______ ft. Stack Diameter: ______ Stack Temp. ______

Gas Flow Rate: ______ ACFM ______ DSCFM* Velocity: ______ FPS

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ______

* If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

## ERCO R8/10 GENERATOR

**SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)**

A. Raw Materials and Chemicals Used in your Process, if applicable:

| Description | Contaminants | | Utilization Rate - lbs/hr | Relate to Flow Diagram |
|---|---|---|---|---|
| | Type | % Wt | | |
| METHANOL | NA | NA | 5.6 ton/day | 3-A |
| SULFURIC ACID | NA | NA | 29.6 ton/day | 3-B |
| SODIUM CHLORATE | NA | NA | 61.3 ton/day | 3-C |
| | | | | |
| | | | | |

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lb/hr): **96.5 ton/day**

2. Product Weight (lbs/hr): **37.4 ton/day**

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

| Name of Contaminant | Emission[1] | | Allowed[2] Emission Rate per Rule 17-2 | Allowable[3] Emission lbs/hr | Potential[4] Emission | | Relate to Flow Diagram |
|---|---|---|---|---|---|---|---|
| | Maximum lb/hr | Actual T/yr | | | lbs/hr | T/yr | |
| $Cl_2$ | 0.1 | 0.44 | NA | NA | 0.1 | 0.44 | 3-E |
| $ClO_2$ | 0.25 | 1.1 | NA | NA | 0.25 | 1.1 | 3-E |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**REFER TO ATTACHED NARRATIVE TEXT, SECTION 2, PAGES 2-15 AND 2-16 AND APPENDIX D.**

[1] See Section V, Item 2.

[2] Reference applicable emission standards and units (e.g. Rule 17-2.600 (5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3] Calculated from operating rate and applicable standard.

[4] Potential equals actual emission per DER direction.

D. Control Devices: (See Section V, Item 4)

| Name and Type (Model and Serial No.) | Contaminant | Efficiency | Range of Particles Size Collected (in microns) (If applicable) | Basis for Efficiency (Section V Item 5) |
|---|---|---|---|---|
| Tail Gas Scrubber | $Cl_2$, $ClO_2$ | 90%+ | NA | ESTIMATE |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

E. Fuels

| Type (Be Specific) | Consumption* | | Maximum Heat Input (MMBTU/hr) |
|---|---|---|---|
| | avg/hr | max./hr | |
| | | | |
| | (NOT APPLICABLE) | | |
| | | | |

*Units: Natural Gas–MMCF/hr; Fuel Oils–gallons/hr; Coal, wood, refuse, other–lbs/hr.

Fuel Analysis: **(NA)**

Percent Sulfur: ____________ Percent Ash: ____________

Density: ____________ lbs/gal Typical Percent Nitrogen: ____________

Heat Capacity: ____________ BTU/lb ____________ BTU/gal

Other Fuel Contaminants (which may cause air pollution): ____________

F. If applicable, indicate the percent of fuel used for space heating.

Annual Average **NA** Maximum **NA**

G. Indicate liquid or solid wastes generated and method of disposal.

**No waste, all scrubber liquor recycled to process.**

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: 60 ft. Stack Diameter: 0.7 ft.

Gas Flow Rate: 1321 ACFM 1250 DSCFM Gas Exit Temperature: 100 °F.

Water Vapor Content: SATURATED % Velocity: 57 FPS

## SECTION IV: INCINERATOR INFORMATION

| Type of Waste | Type 0 (Plastics) | Type I (Rubbish) | Type II (Refuse) | Type III (Garbage) | Type IV (Patholog-ical) | Type V (Liq. & Gas By-prod.) | Type VI (Solid by-prod.) |
|---|---|---|---|---|---|---|---|
| Actual lb/hr Incinerated | | | (NOT APPLICABLE) | | | | |
| Uncon-trolled (lbs/hr) | | | | | | | |

Description of Waste ______

Total Weight Incinerated (lbs/hr) ______ Design Capacity (lbs/hr) ______

Approximate Number of Hours of Operation per day ______ day/wk ______ wks/yr. ______

Manufacturer ______

Date Constructed ______ Model No. ______

| | Volume $(ft)^3$ | Heat Release (BTU/hr) | Fuel | | Temperature (°F) |
|---|---|---|---|---|---|
| | | | Type | BTU/hr | |
| Primary Chamber | | | | | |
| Secondary Chamber | | | | | |

Stack Height: ______ ft. Stack Diameter: ______ Stack Temp. ______

Gas Flow Rate: ______ ACFM ______ DSCFM* Velocity: ______ FPS

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ______

* If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

## BLEACH PLANTS (LINES A & B)

**SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)**

A. Raw Materials and Chemicals Used in your Process, if applicable:

| Description | Contaminants | | Utilization Rate - lbs/hr | | Relate to Flow Diagram |
|---|---|---|---|---|---|
| | Type | % Wt | A LINE | B LINE | |
| UNBLEACHED PULP | NA | NA | 910.8 ADT/day | 851.3 ADT/day | 4-A |
| CHLORINE DIOXIDE | NA | NA | 18.9 ton/day | 11.3 ton/day | 4-B |
| HYDROGEN PEROXIDE | NA | NA | 3.3 ton/day | 3.1 ton/day | 4-C |
| | | | | | |

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lb/hr): A-LINE 924.8 ton/day B-LINE 860.7 ton/day

2. Product Weight (lbs/hr): A-LINE 888 ADT/day B-LINE 830 ADT/day

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

| Bleach Line | Name of Contaminant | Emission[1] | | Allowed[2] Emission Rate per Rule 17-2 | Allowable[3] Emission lbs/hr | Potential[4] Emission | | Relate to Flow Diagram |
|---|---|---|---|---|---|---|---|---|
| | | Maximum lbs/hr | Actual T/yr | | | lbs/hr | T/yr | |
| A | $CHCl_3$[5] | .34 | 1.5 | NA | NA | .34 | 1.5 | 4-F |
| A | $Cl_2$[5] | 1.45 | 6.4 | NA | NA | 1.45 | 6.4 | 4-F |
| A | $ClO_2$[5] | .45 | 2.0 | NA | NA | .45 | 2.0 | 4-F |
| A | $CHCl_3$[6] | .04 | 0.18 | NA | NA | .04 | .018 | 4-E |

**REFER TO ATTACHED NARRATIVE TEXT, APPENDIX D.**

[1]See Section V, Item 2.

[2]Reference applicable emission standards and units (e.g. Rule 17-2.600 (5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3]Calculated from operating rate and applicable standard.

[4]Potential equals actual emission per DER direction.

[5]A Line Scrubber.

[6]A Line $E_o$ Washer.

## BLEACH PLANTS (LINES A & B)

C. Airborne Contaminants Emitted: (Continued)

| Bleach Line | Name of Contaminant | Emission[1] | | Allowed[2] Emission Rate per Rule 17-2 | Allowable[3] Emission lbs/hr | Potential[4] Emission | | Relate to Flow Diagram |
|---|---|---|---|---|---|---|---|---|
| | | Maximum lb/hr | Actual T/yr | | | lbs/hr | T/yr | |
| B | $CHCl_3$[5] | .34 | 1.5 | NA | NA | .34 | 1.5 | 4-F |
| B | $Cl_2$[5] | 1.0 | 4.38 | NA | NA | 1.0 | 4.38 | 4-F |
| B | $ClO_2$[5] | .45 | 2.0 | NA | NA | .45 | 2.0 | 4-F |
| B | $CHCl_3$[6] | .04 | 0.18 | NA | NA | .04 | 0.18 | 4-E |

**REFER TO ATTACHED NARRATIVE TEXT, APPENDIX D.**

[1]See Section V, Item 2.

[2]Reference applicable emission standards and units (e.g. Rule 17-2.600 (5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3]Calculated from operating rate and applicable standard.

[4]Potential equals actual emission per DER direction.

[5]B Line Scrubber.

[6]B Line $E_o$ Washer.

D. Control Devices: (See Section V, Item 4)

| Name and Type (Model and Serial No.) | Contaminant | Efficiency | Range of Particles Size Collected (in microns) (If applicable) | Basis for Efficiency (Section V Item 5) |
|---|---|---|---|---|
| A Line Scrubber | $Cl_2$, $ClO_2$ | 90%+ | NA | PREVIOUS TESTING |
| B Line Scrubber | $Cl_2$, $ClO_2$ | 90%+ | NA | PREVIOUS TESTING |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

E. Fuels

| Type (Be Specific) | Consumption* | | Maximum Heat Input (MMBTU/hr) |
|---|---|---|---|
| | avg/hr | max./hr | |
| | | | |
| | **(NOT APPLICABLE)** | | |
| | | | |

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, other--lbs/hr.

Fuel Analysis: **(NA)**

Percent Sulfur: ______ Percent Ash: ______

Density: ______ lbs/gal Typical Percent Nitrogen: ______

Heat Capacity: ______ BTU/lb ______ BTU/gal

Other Fuel Contaminants (which may cause air pollution): ______

F. If applicable, indicate the percent of fuel used for space heating. **(NA)**

Annual Average ______ Maximum ______

G. Indicate liquid or solid wastes generated and method of disposal.

**Acid and Alkaline Effluent Discharged to Wastewater Treatment Facility.**

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: **98** ft. Stack Diameter: **2.0** ft.

Gas Flow Rate: **10200** ACFM **9000** DSCFM Gas Exit Temperature: **100** °F.

Water Vapor Content: **SATURATED** % Velocity: **54.1** FPS

## SECTION IV: INCINERATOR INFORMATION

| Type of Waste | Type 0 (Plastics) | Type I (Rubbish) | Type II (Refuse) | Type III (Garbage) | Type IV (Patholog-ical) | Type V (Liq. & Gas By-prod.) | Type VI (Solid by-prod.) |
|---|---|---|---|---|---|---|---|
| Actual lb/hr Inciner-ated | | | **(NOT APPLICABLE)** | | | | |
| Uncon-trolled (lbs/hr) | | | | | | | |

Description of Waste ________

Total Weight Incinerated (lbs/hr) ________ Design Capacity (lbs/hr) ________

Approximate Number of Hours of Operation per day ______ day/wk ______ wks/yr. ______

Manufacturer ________

Date Constructed ______ Model No. ________

| | Volume $(ft)^3$ | Heat Release (BTU/hr) | Fuel | | Temperature (°F) |
|---|---|---|---|---|---|
| | | | Type | BTU/hr | |
| Primary Chamber | | | | | |
| Secondary Chamber | | | | | |

Stack Height: ______ ft. Stack Diameter: ______ Stack Temp. ______

Gas Flow Rate: ______ ACFM ______ DSCFM* Velocity: ______ FPS

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ________

* If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

## BLEACH PLANT - A LINE $E_o$ WASHER VENT

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: 67 ft. Stack Diameter: 2.3 ft.

Gas Flow Rate: 13812 ACFM 9932 DSCFM Gas Exit Temperature: 128 °F.

Water Vapor Content: SATURATED % Velocity: 55 FPS

### SECTION IV: INCINERATOR INFORMATION

| Type of Waste | Type 0 (Plastics) | Type I (Rubbish) | Type II (Refuse) | Type III (Garbage) | Type IV (Patholog-ical) | Type V (Liq. & Gas By-prod.) | Type VI (Solid by-prod.) |
|---|---|---|---|---|---|---|---|
| Actual lb/hr Inciner-ated | | | (NOT APPLICABLE) | | | | |
| Uncon-trolled (lbs/hr) | | | | | | | |

Description of Waste ______

Total Weight Incinerated (lbs/hr) ______ Design Capacity (lbs/hr) ______

Approximate Number of Hours of Operation per day ______ day/wk ______ wks/yr. ______

Manufacturer ______

Date Constructed ______ Model No. ______

| | Volume $(ft)^3$ | Heat Release (BTU/hr) | Fuel | | Temperature (°F) |
|---|---|---|---|---|---|
| | | | Type | BTU/hr | |
| Primary Chamber | | | | | |
| Secondary Chamber | | | | | |

Stack Height: ______ ft. Stack Diameter: ______ Stack Temp. ______

Gas Flow Rate: ______ ACFM ______ DSCFM* Velocity: ______ FPS

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ______

* If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

## BLEACH PLANT - B LINE SCRUBBER

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: 97 ft. Stack Diameter: 1.8 ft.

Gas Flow Rate: 7350 ACFM 6500 DSCFM Gas Exit Temperature: 100 °F.

Water Vapor Content: SATURATED % Velocity: 51 FPS

## SECTION IV: INCINERATOR INFORMATION

| Type of Waste | Type 0 (Plastics) | Type I (Rubbish) | Type II (Refuse) | Type III (Garbage) | Type IV (Patholog-ical) | Type V (Liq. & Gas By-prod.) | Type VI (Solid by-prod.) |
|---|---|---|---|---|---|---|---|
| Actual lb/hr Inciner-ated | | | (NOT APP | LICABLE) | | | |
| Uncon-trolled (lbs/hr) | | | | | | | |

Description of Waste ______

Total Weight Incinerated (lbs/hr) ______ Design Capacity (lbs/hr) ______

Approximate Number of Hours of Operation per day ______ day/wk ______ wks/yr. ______

Manufacturer ______

Date Constructed ______ Model No. ______

| | Volume $(ft)^3$ | Heat Release (BTU/hr) | Fuel | | Temperature (°F) |
|---|---|---|---|---|---|
| | | | Type | BTU/hr | |
| Primary Chamber | | | | | |
| Secondary Chamber | | | | | |

Stack Height: ______ ft. Stack Diameter: ______ Stack Temp. ______

Gas Flow Rate: ______ ACFM ______ DSCFM* Velocity: ______ FPS

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ______

* If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

## BLEACH PLANT - B LINE $E_o$ WASHER VENT

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: **67** ft. Stack Diameter: **1.5** ft.

Gas Flow Rate: **8227** ACFM **5633** DSCFM Gas Exit Temperature: **158** °F.

Water Vapor Content: **SATURATED** % Velocity: **78** FPS

## SECTION IV: INCINERATOR INFORMATION

| Type of Waste | Type 0 (Plastics) | Type I (Rubbish) | Type II (Refuse) | Type III (Garbage) | Type IV (Patholog-ical) | Type V (Liq. & Gas By-prod.) | Type VI (Solid by-prod.) |
|---|---|---|---|---|---|---|---|
| Actual lb/hr Inciner-ated | | | **(NOT APPLICABLE)** | | | | |
| Uncon-trolled (lbs/hr) | | | | | | | |

Description of Waste ______

Total Weight Incinerated (lbs/hr) ______ Design Capacity (lbs/hr) ______

Approximate Number of Hours of Operation per day ______ day/wk ______ wks/yr. ______

Manufacturer ______

Date Constructed ______ Model No. ______

| | Volume $(ft)^3$ | Heat Release (BTU/hr) | Fuel | | Temperature (°F) |
|---|---|---|---|---|---|
| | | | Type | BTU/hr | |
| Primary Chamber | | | | | |
| Secondary Chamber | | | | | |

Stack Height: ______ ft. Stack Diameter: ______ Stack Temp. ______

Gas Flow Rate: ______ ACFM ______ DSCFM* Velocity: ______ FPS

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ______

* If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

## SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable:

| Description | Contaminants Type | Contaminants % Wt | Utilization Rate - lbs/hr | Relate to Flow Diagram |
|---|---|---|---|---|
| METHANOL | NA | NA | 467 Max., 327.5 Avg. | NA |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lb/hr): **300 gpm Max Fill Rate**

2. Product Weight (lbs/hr): **467**

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

| Name of Contaminant | Emission[1] Maximum lb/hr | Emission[1] Actual T/yr | Allowed[2] Emission Rate per Rule 17-2 | Allowable[3] Emission lbs/hr | Potential[4] Emission lbs/hr | Potential[4] Emission T/yr | Relate to Flow Diagram |
|---|---|---|---|---|---|---|---|
| METHANOL | 0.073 | 0.32 | NA | NA | 0.073 | 0.32 | NA |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**REFER TO APPENDIX B PAGE B-19, B-20**

[1]See Section V, Item 2.

[2]Reference applicable emission standards and units (e.g. Rule 17-2.600 (5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3]Calculated from operating rate and applicable standard.

[4]Emission, if source operated without control (See Section V, Item 3).

## METHANOL STORAGE TANK

D. Control Devices: (See Section V, Item 4)

| Name and Type (Model and Serial No.) | Contaminant | Efficiency | Range of Particles Size Collected (in microns) (If applicable) | Basis for Efficiency (Section V Item 5) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | (NOT APPLICABLE) | | |
| | | | | |
| | | | | |
| | | | | |

E. Fuels NA

| Type (Be Specific) | Consumption* | | Maximum Heat Input (MMBTU/hr) |
|---|---|---|---|
| | avg/hr | max./hr | |
| | | | |
| | (NOT APPLICABLE) | | |
| | | | |

*Units: Natural Gas–MMCF/hr; Fuel Oils–gallons/hr; Coal, wood, refuse, other–lbs/hr.

Fuel Analysis: **(NA)**

Percent Sulfur: __________ Percent Ash: __________

Density: __________ lbs/gal Typical Percent Nitrogen: __________

Heat Capacity: __________ BTU/lb __________ BTU/gal

Other Fuel Contaminants (which may cause air pollution): __________

F. If applicable, indicate the percent of fuel used for space heating. **(NA)**

Annual Average **NA** Maximum **NA**

G. Indicate liquid or solid wastes generated and method of disposal.

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: 25 ft. Stack Diameter: .17 ft.

Gas Flow Rate: ________ ACFM ~50 DSCFM Gas Exit Temperature: AMBIENT °F.

Water Vapor Content: ____________ % Velocity: 38 FPS

## SECTION IV: INCINERATOR INFORMATION

| Type of Waste | Type 0 (Plastics) | Type I (Rubbish) | Type II (Refuse) | Type III (Garbage) | Type IV (Patholog-ical) | Type V (Liq. & Gas By-prod.) | Type VI (Solid by-prod.) |
|---|---|---|---|---|---|---|---|
| Actual lb/hr Incinerated | | | (NOT APPLICABLE) | | | | |
| Uncon-trolled (lbs/hr) | | | | | | | |

Description of Waste ____________

Total Weight Incinerated (lbs/hr) ____________ Design Capacity (lbs/hr) ____________

Approximate Number of Hours of Operation per day ________ day/wk ________ wks/yr. ________

Manufacturer ____________

Date Constructed ________ Model No. ____________

| | Volume $(ft)^3$ | Heat Release (BTU/hr) | Fuel | | Temperature (°F) |
|---|---|---|---|---|---|
| | | | Type | BTU/hr | |
| Primary Chamber | | | | | |
| Secondary Chamber | | | | | |

Stack Height: ________ ft. Stack Diameter: ________ Stack Temp. ________

Gas Flow Rate: ________ ACFM ________ DSCFM* Velocity: ________ FPS

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ____________

* If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Brief description of operating characteristics of control devices:

(NA)

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, etc.):

(NA)

NOTE: Items 2, 3, 4, 6, 7, 8, and 10 in Section V must be included where applicable.

## SECTION V: SUPPLEMENTAL REQUIREMENTS

*REFER TO ATTACHED NARRATIVE TEXT AND SUPPLEMENTAL INFORMATION AS NOTED*

Please provide the following supplements where required for this application.

1. Total process input rate and product weight -- show derivation [Rule 17-2.100(127)]

   *Refer to Part II, Process Flow Diagrams.*

2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.

   *Refer to attached Narrative, Section 3.*

3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).

   *Refer to attached Narrative, Section 3.*

4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.).

5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. items 2, 3 and 5 should be consistent: actual emissions = potential (1-efficiency).

   *Refer to attached Narrative, Section 3.*

6. An 8 1/2" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.

   *Refer to Part II, Process Flow Diagrams.*

7. An 8 1/2" x 11" plot plan showing the location of the establishment, and points if airborne emissions, in relation to the surrounding area, residences and other permanent structure and roadways (Example: Copy of relevant portion of USGS topographic map).

   *Refer to attached Narrative, Section 2, Figures 2-1, 2-2.*

8. An 8 1/2" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

   *Refer to attached Narrative, Section 2, Figure 2-1, 2-2.*

9. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.

10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

## SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

A. Are standards of performance for new stationary sources pursuant to 40 C.F. R. Part 60 applicable to the source?

[ X ] Yes [ ] No *REFER TO SECTIONS 4 OF TEXT, PAGES 4-1, 4-2*

| Contaminant | Rate or Concentration |
|---|---|
| **No. 6 Power Boiler - $NO_x$, Subpart Db** | **0.1 lbs/MMBtu, 30 day rolling average** |
| | |
| | |
| | |

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy)

[ ] Yes [ X ] No *REFER TO SECTION 5 OF TEXT*

| Contaminant | Rate or Concentration |
|---|---|
| | |
| | |
| | |
| | |

C. What emission levels do you propose as best available control technology?

*REFER TO SECTION 5, OF TEXT, PAGES 5-5 AND 5-26*

| Contaminant | Rate or Concentration |
|---|---|
| **No. 6 Power Boiler** | **$NO_x$ - 0.06 lb/MMBtu, CO - 0.1 lb** |
| | **MMBtu; VOC 0.01 lb/MMBtu - all 24 hr. avg.** |
| **Lime Kiln - Mud Dryer** | **$NO_x$ - 200 ppmv @ 10% $O_2$; CO - 45 ppmv @ 10%** |
| | **$O_2$; VOC - 104 ppmv - all 24 hr. avg.** |

D. Describe the existing control and treatment technology (if any). *REFER TO SECTION 5 OF TEXT*

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:

*Explain method of determining

5. Useful Life: 6. Operating Costs:

7. Energy: 8. Maintenance Cost:

9. Emissions:

| Contaminant | Rate or Concentration |
|---|---|
| | |
| | |
| | |
| | |

10. Stack Parameters

a. Height: ft. b. Diameter: ft.

c. Flow Rate: ACFM d. Temperature: °F

e. Velocity: FPS

E. Describe the control and treatment technology available (As many types as applicable use additional pages if necessary).

1. *REFER TO SECTION 5 OF TEXT*

a. Control Device: b. Operating Principles:

c. Efficiency:[1] d. Capital Cost:

e. Useful Life: f. Operating Costs:

g. Energy:[2] h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

2.

a. Control Device: b. Operating Principles:

c. Efficiency:[1] d. Capital Cost:

e. Useful Life: f. Operating Costs:

g. Energy:[2] h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

[1]Explain method of determining efficiency.

[2]Energy to be reported in units of electrical power - KWH design rate.

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

3.

a. Control Device:
b. Operating Principles:
c. Efficiency:[1]
d. Capital Cost:
e. Useful Life:
f. Operating Costs:
g. Energy:[2]
h. Maintenance Cost:
i. Availability of construction materials and process chemicals:
j. Applicability to manufacturing processes:
k. Ability to construct with control device, install in available space, and operate within proposed levels:

4.

a. Control Device:
b. Operating Principles:
c. Efficiency:[1]
d. Capital Cost:
e. Useful Life:
f. Operating Costs:
g. Energy:[2]
h. Maintenance Cost:
i. Availability of construction materials and process chemicals:
j. Applicability to manufacturing processes:
k. Ability to construct with control device, install in available space, and operate within proposed levels:

F. Describe the control technology selected: *REFER TO SECTION 5 OF TEXT; P. 5-20, 21 FOR NO. 6 POWER BOILER; P. 5-25, 26, 27 FOR LIME KILN - MUD DRYER*

1. Control Device:
2. Efficiency:[1]
3. Capital Cost:
4. Useful Life:
5. Operating Costs:
6. Energy:[2]
7. Maintenance Cost:
8. Manufacturer:
9. Other locations where employed on similar processes

a. (1) Company:

(2) Mailing address:

(3) City:
(4) State:

[1]Explain method of determining efficiency.

[2]Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

| Contaminant | Rate or Concentration |
| --- | --- |
| | |
| | |

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

| Contaminant | Rate or Concentration |
| --- | --- |
| | |
| | |

(8) Process Rate:[1]

10. Reason for selection and description of systems:

[1] Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

*REFER TO SECTION 5 OF TEXT*

## SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

A. Company Monitored Data *NOT APPLICABLE*

1. ________ no. sites ________ TSP ______( ) $SO_2$* ______ Wind spd/dir

Period of Monitoring ____/____/____ to ____/____/____
month day year month day year

Other data recorded ______________________________

Attach all data or statistical summaries to this application.

*Specify bubbler (B) or continuous (C).

2. Instrumentation, Field and Laboratory

a. Was instrumentation EPA referenced or its equivalent? [ ] Yes [ ] No

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling *REFER TO SECTION 6 OF TEXT*

1. **5** Year(s) of data from **01 / 01 / 85** (month / day / year) to **12 / 31 / 89** (month / day / year)

2. Surface data obtained from (location) **Pensacola, Florida**

3. Upper air (mixing height) data obtained from (location) **Pensacola, Florida**

4. Stability wind rose (STAR) data obtained from (location) **Pensacola, Florida**

C. Computer Models Used *REFER TO SECTION 6 OF TEXT*

1. **EPA-SCREEN** Modified? **NO** If yes, attach description.

2. **EPA ISCLT-2** Modified? **NO** If yes, attach description.

3. ______ Modified? If yes, attach description.

4. ______ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principle output tables.

D. Applicants Maximum Allowable Emission Data *REFER TO SECTION 6 OF TEXT, PAGE 6-9, TABLE 6-2*

| Pollutant | Source | Emission Rate | | Source | Emission Rate | |
|---|---|---|---|---|---|---|
| $NO_x$ | **No. 6 PB** | **4.03** | grams/sec; | **Lime Kiln - Mud Dryer** | **6.21** | grams/sec |
| CO | **No. 6 PB** | **6.72** | grams/sec; | **Lime Kiln - Mud Dryer** | **0.85** | grams/sec |

E. Emission Data Used in Modeling

Attach list of emission sources. Emission data required is source name, description of point source (or NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

*Refer to attached Narrative, pages 6-9, 6-12, 6-15, 6-17, 6-18 and 6-19.*

F. Attach all other information supportive to the PSD review.

*Refer to attached Narrative Text.*

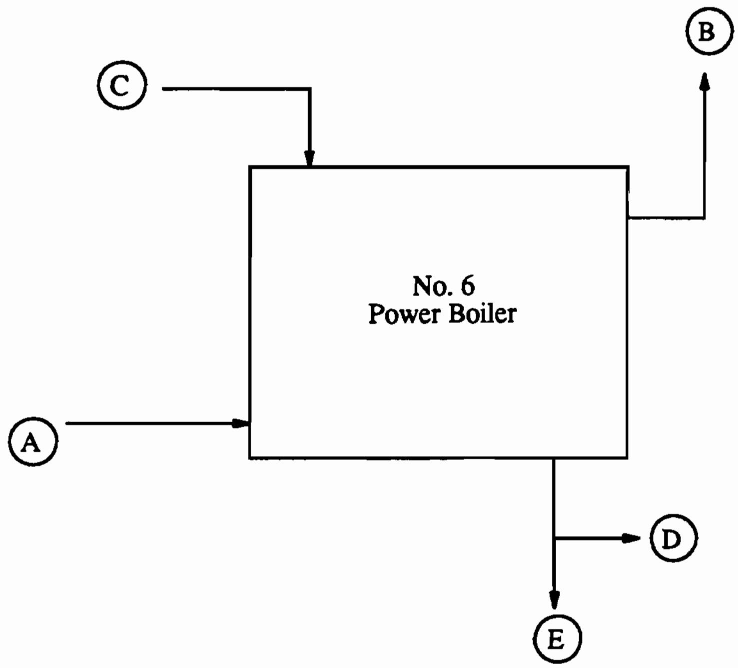
G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll , production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

*Refer to attached Narrative Text, Subsection 6.7, page 6-26.*

H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology.

*Refer to attached Narrative Text.*

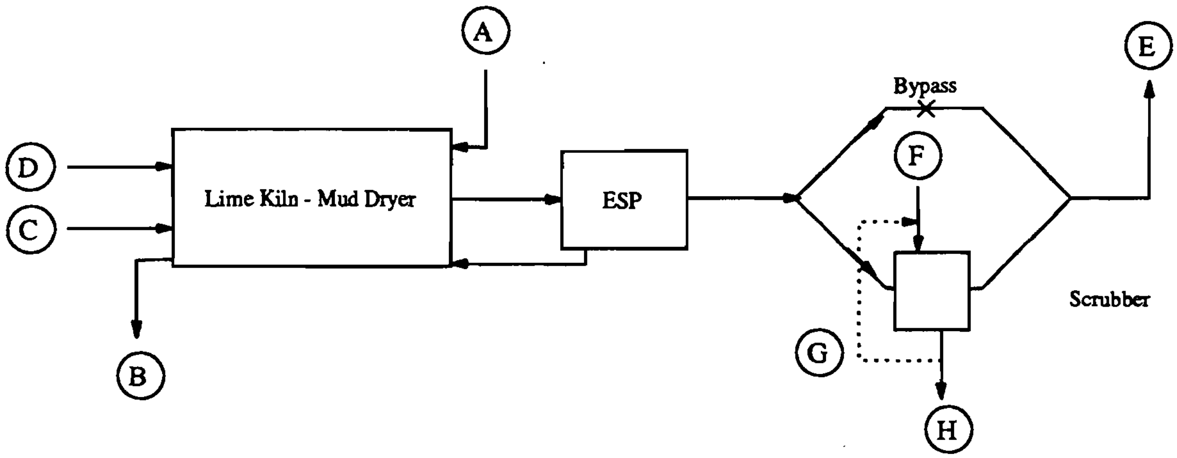
# II. PROCESS FLOW DIAGRAMS




| | | |
|---|---|---|
| A | Natural Gas | 533 MCFH |
| B | Stack Effluent | 161,000 ACFM |
| C | Feed Water | 6,667 lb/min |
| D | Steam | 384 KPPH |
| E | Blow Down | 266.7 lb/min |

**Process Flow Diagram 1**
**No. 6 Power Boiler**

Chmp01-D19

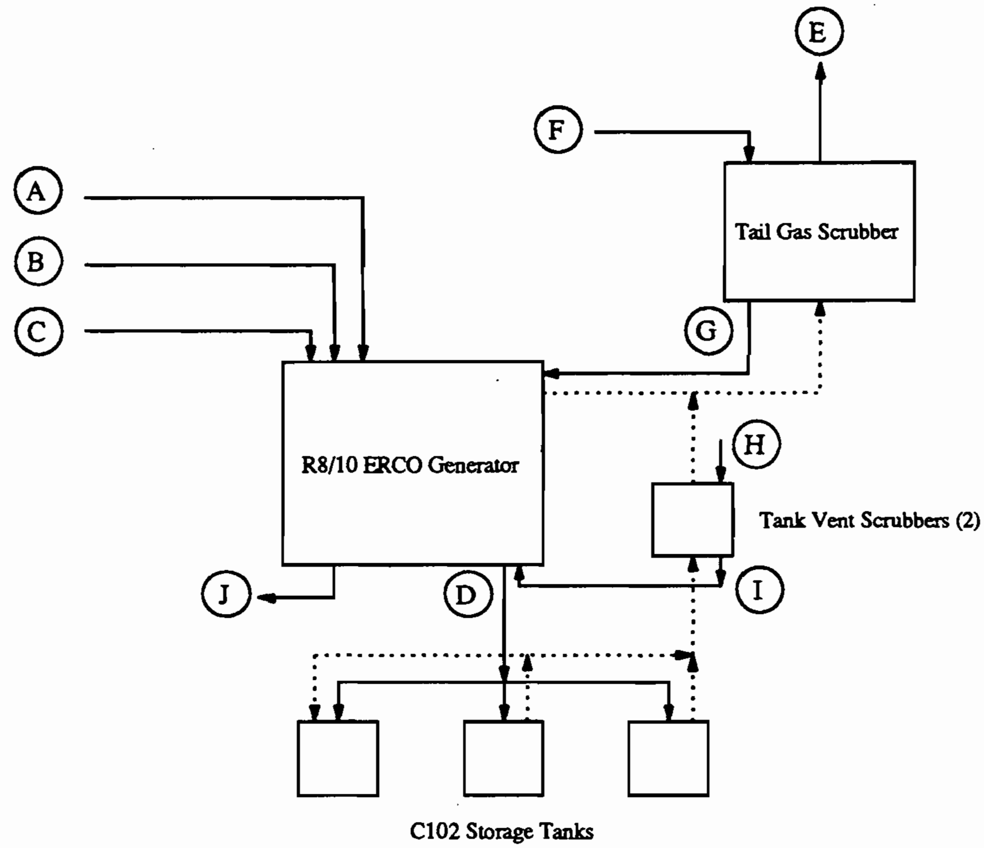



| | | |
|---|---|---|
| A | Lime Mud | 893 T/D |
| B | Product Lime | 500 T/D |
| C | Fuel - Natural Gas<br>- No. 6 Oil | 144.231 MCFH<br>1,000 GPH |
| D | NCGs | 358 lb/hr * |
| E | Stack Effluent | 57,208 ACFM |
| F | Scrubber Makeup | 25 GPM |
| G | Scrubber Recirculation | 1,700 GPM |
| H | Scrubber Blowdown | 5 GPM |

* Based on 1,718 ADBT/D

**Process Flow Diagram 2**
**Lime Kiln - Mud Dryer**

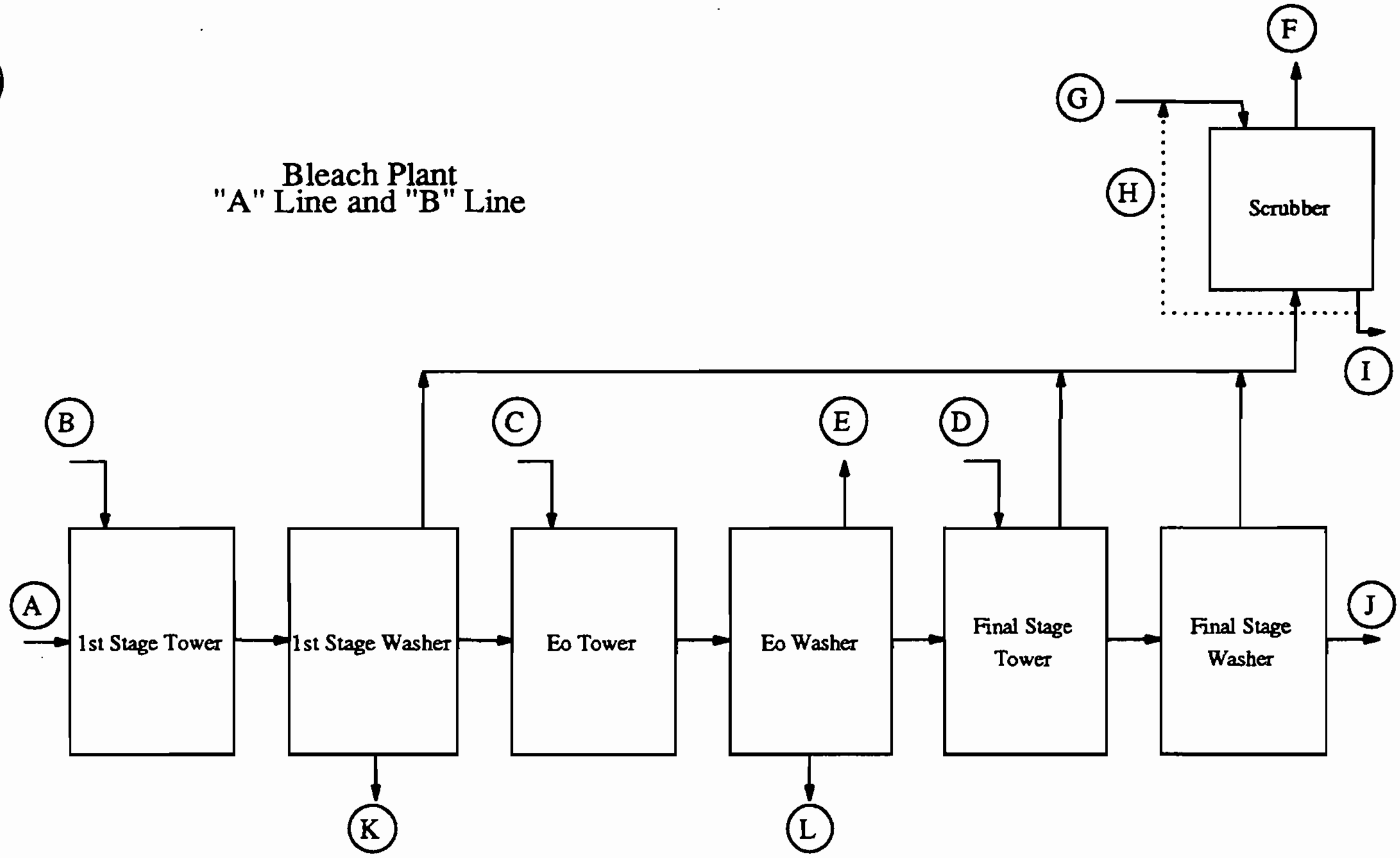
Chmp02-D19




| | | |
|---|---|---|
| A | Methanol | 5.6 T/D |
| B | Sulfuric Acid | 29.6 T/D |
| C | Sodium Chlorate | 61.3 T/D |
| D | Chlorine Dioxide | 37.4 T/D |
| E | Stack Effluent | 1,321.0 ACFM |
| F | Makeup White Liquor to Scrubber | <1.0 GPM |
| G | Scrubber Discharge | 1.0 GPM |
| H | Water to Tank Vent Scrubbers | 79.1 GPM |
| I | Tank Vent Scrubber Discharge | 79.1 GPM |
| J | Saltcake Generation | 33.6 T/D |

**Process Flow Diagram 3**
**Chlorine Dioxide Generator**

Clmp03-D19




| | | "A" Line | "B" Line |
|---|---|---|---|
| A | Unbleached Pulp | 910.8 ADT/D | 851.3 ADT/D |
| B | CLO2 | 10.7 T/D | 6.3 T/D |
| C | Peroxide | 3.3 T/D | 3.1 T/D |
| D | CLO2 | 8.2 T/D | 5.0 T/D |
| E | Eo Washer Vent Gas | 13,812 ACFM | 8,227 ACFM |
| F | Scrubber Vent Gas | 10,200 ACFM | 7,350 ACFM |
| G | Scrubber Makeup Flow | 1.1 GPM | .2 GPM |
| H | Scrubber Recirculation | 225 GPM | 190 GPM |
| I | Scrubber Blowdown | 2 GPM | 1 GPM |
| J | Bleached Pulp | 888 ADT/D | 830 ADT/D |
| K | Acidic Effluent | 3.5 MGD | 3.5 MGD |
| L | Alkaline Effluent | 2.3 MGD | 2.3 MGD |

**Process Flow Diagram 4**
**Bleach Plant**

Chmp04-D19

# III. APPLICATION NARRATIVE

**APPLICATION NARRATIVE**
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**(continued)**

**LIST OF TABLES**
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# SECTION 1
# INTRODUCTION AND SUMMARY

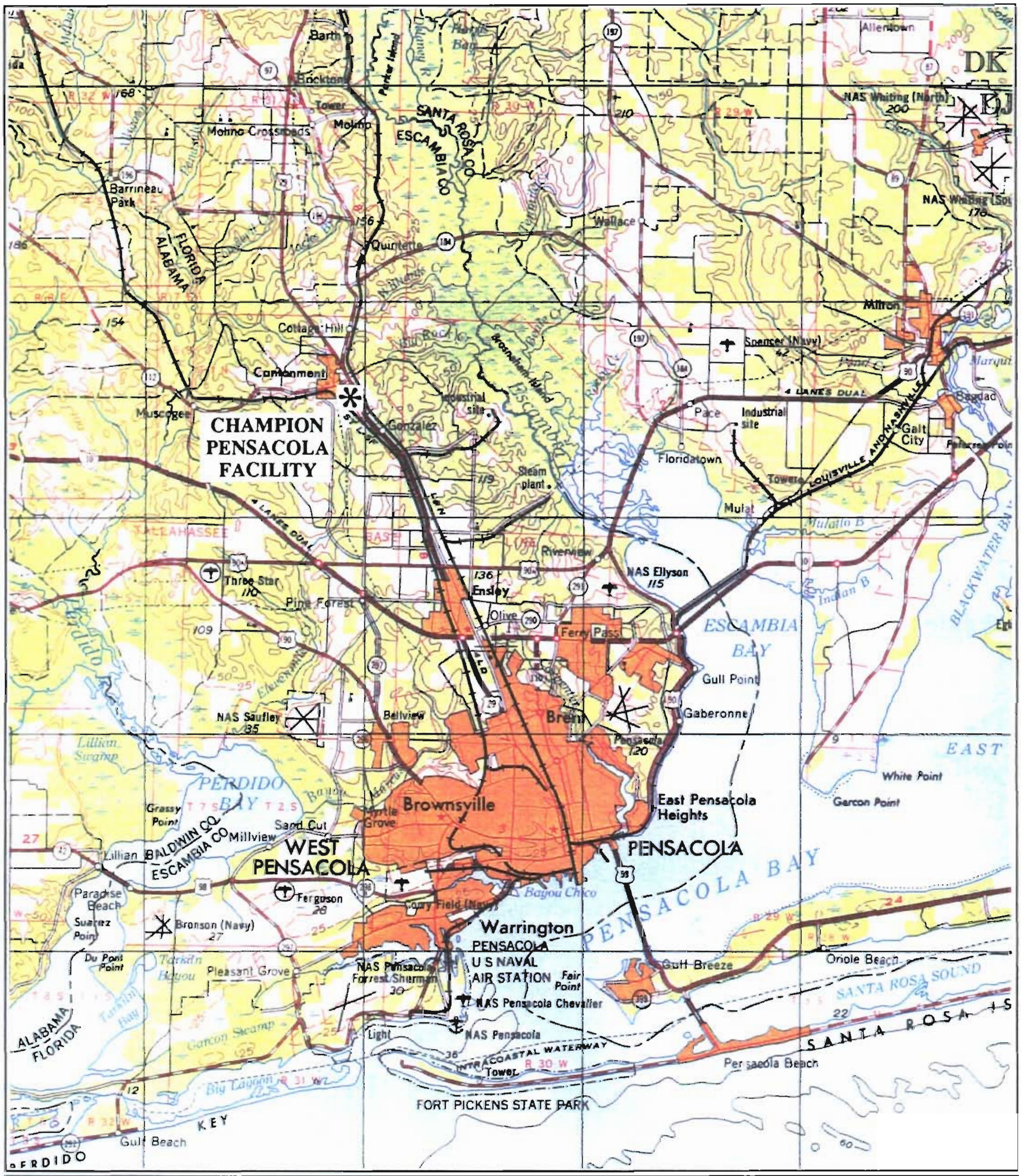
## 1.1 PROJECT DESCRIPTION

Champion International Corporation (CHAMPION) owns and operates a kraft pulp mill near Pensacola in Cantonment, Escambia County, Florida. The Mill produces bleached kraft pulp and fine paper. Figure 1-1 is a location map of CHAMPION's existing Pensacola Mill. The Mill is presently operating under a water permit consent order from the Florida Department of Environmental Regulation (DER). Under the terms of the consent order, the Mill must meet water quality standards by December, 1994. In order to meet the water quality standards, CHAMPION has developed a Mill strategy aimed at reducing wastewater loads and minimizing waste load constituents to the Mill's wastewater treatment system.

Certain aspects of the Mill's strategy for minimizing wastewater and waste loads to the treatment plant impact air emission sources at the Mill. Steam generating equipment, chemical recovery systems, and bleaching processes will be replaced or modified as part of the strategy. CHAMPION has compiled the necessary information and determined the air permitting requirements for the proposed air source changes.

This report provides all of the necessary supporting documentation to meet the information requirements of the Florida Department of Environmental Regulation for permits to construct the proposed mill modification. This report specifically addresses the Prevention of Significant Deterioration (PSD) and New Source Review Requirements. The Florida DER Permit Application Forms for the proposed mill modifications are appended.

The approach taken is extremely conservative in demonstrating compliance with all applicable state and Federal emission limitations and ambient air quality standards. More specifically, the




NORTH

0 5 10

SCALE IN MILES

SOURCE: BASE MAP ADAPTED FROM USGS 1:250,000 SERIES, PENSACOLA, FLA-ALA QUADRANGLE, 1957, REVISED 1970.

**CHAMPION INTERNATIONAL CORPORATION**
**PENSACOLA FACILITY**
**CANTONMENT, ESCAMBIA COUNTY**
**FLORIDA**

**FIGURE 1-1**
**GENERAL LOCATION MAP OF THE PENSACOLA FACILITY**

values selected for emission rates, the assumptions used in computer modeling analyses, and the interpretation of model results are all deliberately prejudiced on the side of demonstrating the maximum practical "worst-case" conditions.

CHAMPION is committed to achieving the stringent emission limitations identified in this report as Best Available Control Technology (BACT). The proposed BACT emission rates meet or exceed the most stringent applicable New Source Performance Standards (NSPS). The actual impacts of the proposed project on ambient air quality are expected to be lower than those presented.

## 1.2 APPLICATION ORGANIZATION

The permit application has been organized into the following sections:

- Section 2 - Description of Existing Mill and Proposed Modification presents site information; the proposed facility; the general plans and specifications for the proposed project.

- Section 3 - Summary of Emissions provides the baseline and proposed future emissions inventory for the mill modification. The basis for the development of the emissions inventory is also provided.

- Section 4 - Applicable Regulations identifies applicable Federal and state regulations including PSD regulations, and Florida emission and ambient air quality regulations.

- Section 5 - Best Available Control Technology identifies the proposed Best Available Control Technology (BACT), reviews alternative control technologies, and provides support for the selection of BACT using EPA's "Top Down" approach.

- Section 6 - Air Quality Impact Analysis presents an analysis of the incremental increases in ambient pollutant concentrations anticipated from the proposed mill modification. An analysis of other major sources with the proposed modification is included to demonstrate compliance with NAAQS. An ambient hazardous air pollutants (HAPs) analysis in accordance with Florida DER requirements is also included. A discussion is presented on the effects that the incremental increases in ambient pollutant concentrations are anticipated to have on air quality related values including visibility, acidification of rainfall and soils, aquatic and terrestrial ecology and associated growth.

## 1.3 SUMMARY

Based on the results of the BACT determination for the pollutant(s) of concern, the emissions from the proposed modifications will meet all applicable state and Federal emission regulations. The maximum "worst-case" contemporaneous emissions increase of criteria pollutants from the proposed mill modifications are:

| | Annual Emissions** (tons/yr) |
|---|---|
| TSP/PM-10* | -1.3 ✓ |
| $SO_2$ | 28.2 ✓ |
| $NO_x$ | 138.8 ✓ |
| CO | 189.8 ✓ |
| VOC | 85.5 ✓ |
| TRS | -1.9 ✓ |

* It was conservatively assumed that all particulate matter emissions are in the form of PM-10. ✓

** Emission rates are based upon maximum hourly emission rates and 8,760 total annual hours of operation.

The existing Pensacola Mill presently constitutes a major stationary source under the PSD regulations. Therefore, based upon the annual emission increases associated with the proposed modifications, a significant net emission increase is predicted for nitrogen dioxide, carbon monoxide, and volatile organic compounds.

Based on the ambient air quality impact analysis for $NO_x$ described in Section 6, the facility will have the following impacts on ambient air quality:

| PSD Increment | |
|---|---|
| Federal PSD Increment for $NO_x$ | 25 ug/m$^3$ |
| Proposed Mill Modification and No. 5 Package Boiler | 2.4 $\mu$g/m$^3$ |
| % of Federal Increment | 10% |

| National Ambient Air Quality Standards | |
|---|---|
| National Ambient Air Quality Standard for $NO_x$ | 100 $\mu$g/m$^3$ |
| All Major Sources Impact* | 42.0 $\mu$g/m$^3$ |
| Background Concentration | 22.5 $\mu$g/m$^3$ |
| Total Impact | 64.5 $\mu$g/m$^3$ |

* Includes the proposed mill modifications, the No. 5 Package Boiler, all other CHAMPION sources, and all other major sources in Escambia and Santa Rosa counties.

It is important to point out that the proposed project will result in a net air quality benefit. The PSD increment consumed and the ambient air quality impact associated with the proposed mill modification is predicted to be less than that predicted for CHAMPION's No. 5 Boiler Permit (February 1991 application). As shown in Section 6 of the application, the PSD increment consumption will be reduced from 4.9 $\mu g/m^3$ to 2.4 $\mu g/m^3$ and the impact from all sources will be reduced from 94.3 $\mu g/m^3$ to 64.5 $\mu g/m^3$ (NAAQS analysis). Hence, the proposed project will result in both air and water quality improvements in the Pensacola, Florida area.

# SECTION 2

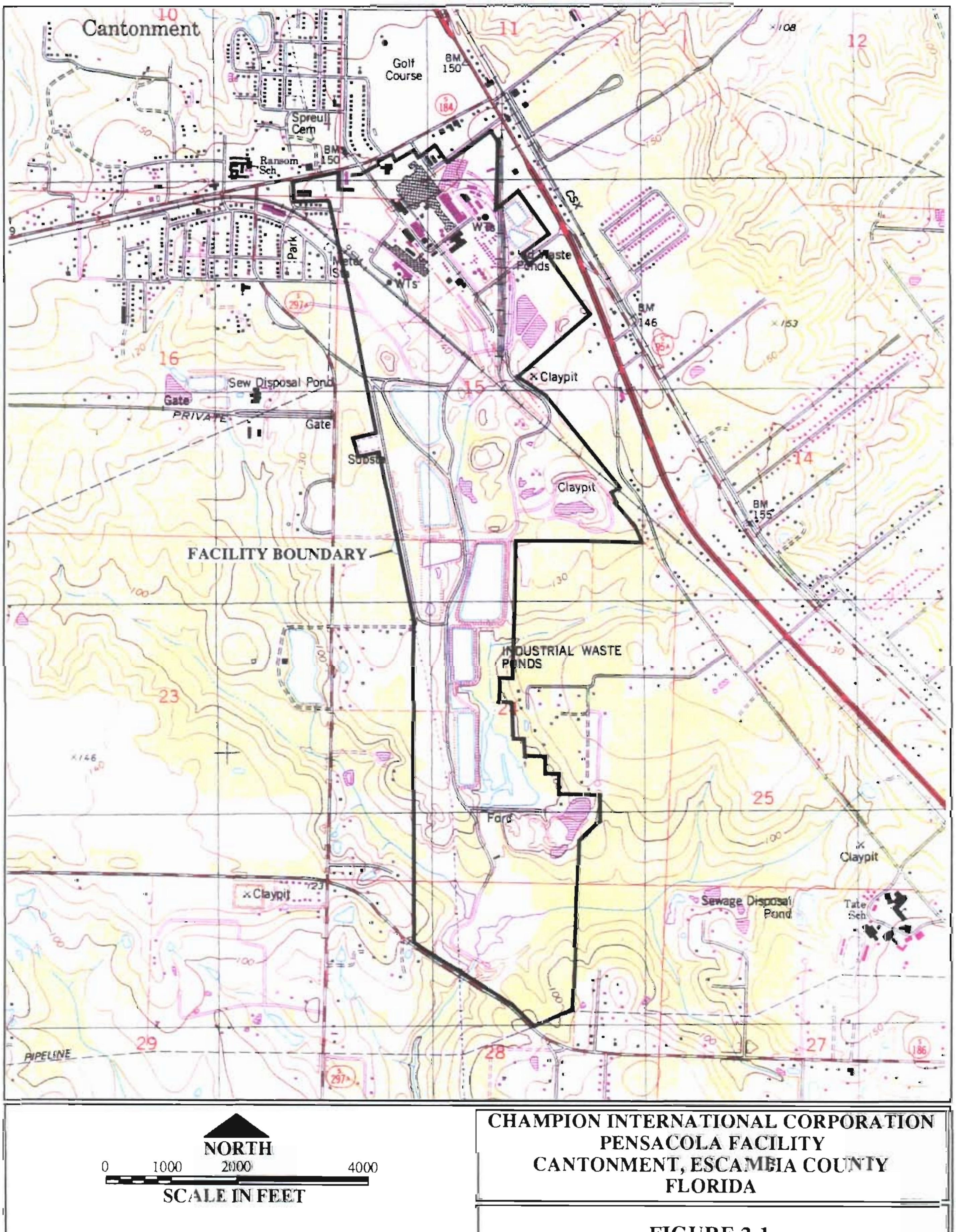
# DESCRIPTION OF EXISTING MILL AND PROPOSED MODIFICATION

## 2.1 INTRODUCTION

The CHAMPION Pensacola Mill is located in Escambia County, Florida, near the town of Cantonment. Figure 2-1 is a site location map showing the proximity of the facility to the town of Cantonment. The land area around the site is relatively flat terrain and would be classified as a rural land use pattern based on EPA's classification scheme. The air quality in the area has been designated as attainment or unclassifiable for all ambient air quality standards.

CHAMPION's existing pulp mill has been in operation since 1941. Major mill expansion projects were completed in 1981 and 1986. The 1986 expansion resulted in a complete conversion to production of bleached kraft fine paper. The existing facilities were permitted by the Florida Department of Environmental Regulation (DER) in 1985. In 1991 a PSD Permit application was submitted to Florida DER for a new package gas-fired boiler. The CHAMPION Pensacola Mill is currently permitted for 1400 air-dried, bleached tons of pulp per calendar day.

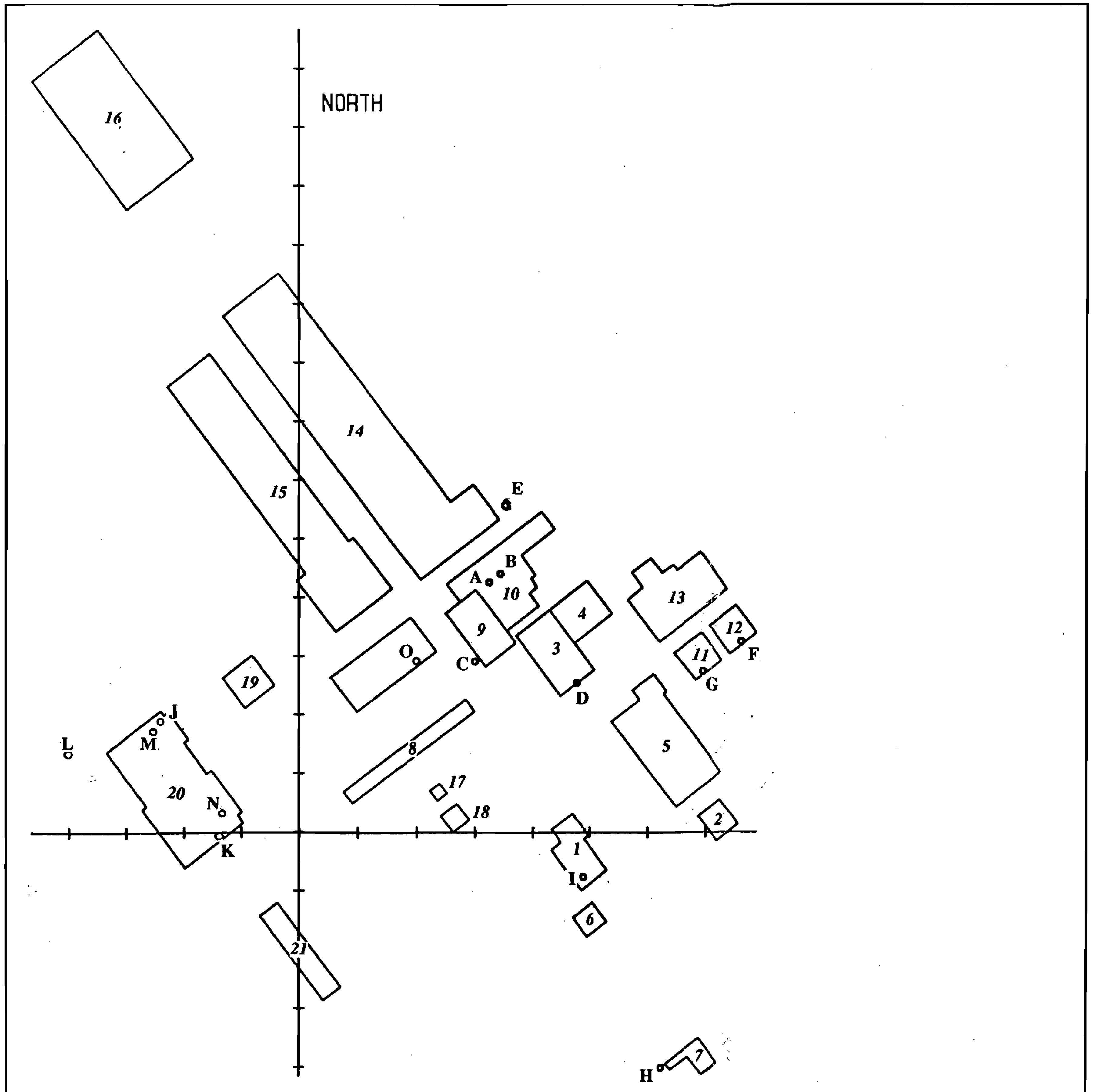
The existing bleached kraft pulp mill includes wood preparation and storage, coal/wood fuel handling and storage, batch digesters, a continuous digester, brown stock washing, oxygen delignification, pulp bleaching facilities, recovery furnaces, power boilers, black liquor evaporators, smelt dissolving tanks, a Lime Kiln and calciner, recausticizing facility, and tall oil and turpentine byproducts facilities. Figure 2-2 presents a plot plan of the facility identifying the location of major emission points.




SOURCE: BASE MAP ADAPTED FROM USGS 7.5 MINUTE SERIES, CANTONMENT, FLA. QUADRANGLE, 1978, PHOTOREVISED 1987.

CHAMPION INTERNATIONAL CORPORATION
PENSACOLA FACILITY
CANTONMENT, ESCAMBIA COUNTY
FLORIDA

FIGURE 2-1
LOCATION MAP OF THE PENSACOLA FACILITY




**BUILDING/STRUCTURE**

*1.* - LIME RECOVERY BUILDING
*2.* - COOLING TOWER
*3.* - NO. 4 POWER BOILER
*4.* - TURBINE GENERATOR BUILDING
*5.* - EVAPORATORS
*6.* - LIME KILN NORTH
*7.* - LIME KILN SOUTH
*8.* - BATCH DIGESTERS
*9.* - NO. 3 POWER BOILER
*10.* - NO.1 & 2 BOILER
*11.* - RECOVERY BOILER PRECIPITATOR 1
*12.* - RECOVERY BOILER PRECIPITATOR 2
*13.* - RECOVERY BOILERS
*14.* - PAPER MACHINE COMPLEX
*15.* - HIGH BAY STORAGE BUILDING
*16.* - WAREHOUSE
*17.* - KAMYR DIGESTER
*18.* - KAMYR DIFFUSER
*19.* - NO. 9 H. D. STORAGE
*20.* - BLEACH PLANT
*21.* - CHIP SILO

**SOURCES:**

A. - NO. 1 POWER BOILER STACK
B. - NO. 2 POWER BOILER STACK
C. - NO. 3 POWER BOILER STACK
D. - NO. 4 POWER BOILER STACK
E. - NO. 5 POWER BOILER STACK
F. - RECOVERY BOILER STACK 1
G. - RECOVERY BOILER STACK 2
H. - LIME KILN STACK
I. - CALCINER STACK
J. - BLEACH PLANT A (SOFT WOOD)
K. - BLEACH PLANT B (HARDWOOD)
L. - ERCO
M. - Eo WASHER (SOFTWOOD)
N. - Eo WASHER (HARDWOOD)
O. - NO. 6 POWER BOILER

NORTH

0 100 200 400

SCALE IN FEET

SOURCE: BASE MAP ADAPTED FROM DRAWINGS SUPPLIED BY CHAMPION IMTERNATIONAL CORPORATION

**CHAMPION INTERNATIONAL CORPORATION**
**PENSACOLA FACILITY**
**CANTONMENT, ESCAMBIA COUNTY**
**FLORIDA**

CHAMP202-G:/DM-12/92

**FIGURE 2-2**
**LOCATION OF STACKS AND PRIMARY BUILDINGS IDENTIFIED FOR SCHULMAN-SCIRE DOWNWASH ANALYSIS**

## 2.2 MILL CONSENT ORDER

The Pensacola Mill is currently operating under a water permit consent order from the Florida DER. Compliance with water quality standards must be attained by December 1994 to meet the schedule contained in the consent agreements. The proposed mill modifications, contained in this air permit application, involve process changes aimed at reducing wastewater loads or minimizing waste load constituents to CHAMPION's treatment system in order to meet the requirements of the consent order.

It is important to point out that the proposed modification would not be undertaken if not for the consent order. The changes are not aimed at increasing mill production, nor are they intended to increase throughput on individual units other than to handle additional materials generated as a result of the wastewater load reduction program. However, the modifications will increase pulp production through the bleach plant due to minimization of fiber losses and fiber degradation. The expected bleached pulp production which will result from the modifications is 1500 tons per day, annual average (based upon 24 hours per day, 365 days per year). The maximum daily bleached pulp production rate is 1718 tons (see Process Flow Diagram 4 presented in Part II of the Permit Application).

The proposed program can be characterized as follows:

- Modifications to the bleach plant operations to reduce effluent load to the wastewater treatment facilities.
- Process modifications to improve delignification in the pulping operation, and reduce bleach chemical requirements.
- Process modifications to minimize spills and leaks.
- Process modifications to reduce sewering of high concentration waste streams.

A description of the existing mill processes and the proposed modification to these processes follows.

## 2.3 EXISTING PROCESS DESCRIPTION

An even mix of hardwood and softwood pulp is produced from wood furnished by on-site and satellite chip mills. The wood chips are stored and screened in separate hardwood and softwood storage yards. The kraft cooking process is used to separate the lignin and wood fiber to produce brown pulp from wood chips. Softwood pulp is produced in a continuous digester, washed by a two-stage atmospheric diffusion washer, separated from wood knots by a disc knotter, and screened to separate rejects. Hardwood chips are cooked in twelve conventional direct steam batch digesters and discharged into two blow tanks common to all twelve digesters. The hardwood brown pulp is separated from wood knots by vibratory knotters and washed by two parallel lines of drum-type brown stock washers, and then screened to separate rejects. The softwood and hardwood pulps are further delignified in separate oxygen delignification reactors. After oxygen delignification, the hardwood and softwood pulps are further washed and bleached in a three-stage bleach plant. The hardwood and softwood bleach plants are identical and include:

- A chlorination stage with chlorine dioxide added;
- An oxidative caustic extraction stage; and
- A final chlorine dioxide bleaching stage.

The chlorine dioxide is generated on site in a unit designed to produce sixteen tons per day. Liquid chlorine, caustic soda, and liquid oxygen are all delivered to the site by rail or truck prior to use in the process. The chlorine and oxygen are vaporized prior to use.

The organic or lignin laden filtrates (black liquor) from the pulping, oxygen delignification, and washing processes are concentrated through two sets of evaporators. The No. 1 Evaporator Set mainly processes black liquor from the softwood pulp mill, while the No. 2 Evaporator Set processes hardwood black liquor. The black liquor is concentrated to about 65% solids and burned in two identical Babcock and Wilcox recovery furnaces (No. 1 and No. 2). The recovery furnaces produce steam for energy generation and heat for the pulp and paper making processes. The molten inorganic ash (smelt) from the recovery furnaces is dissolved in water to make green liquor which is then reprocessed into reusable cooking chemicals in the mill's causticizing plant. The causticizing process combines lime with the green liquor in a slaker reactor to produce a sodium hydroxide and sodium sulfide solution (white liquor), which is the principle wood chip cooking chemical. A by-product from the slaking reaction is calcium carbonate or lime mud. The lime mud is washed and then reburned in an Allis Chalmers type rotary kiln, and a Dorr-Oliver type fluidized bed calciner to produce reusable lime for the slaking reaction.

The mill utilizes five power boilers to produce steam for energy generation and provide heat for the pulping and paper making processes. Through cogeneration by utilization of two steam-driven turbines, the mill can produce nearly all of the electricity and steam required to run the mill operations. Power Boiler Nos. 1, 2, and 5 are natural gas fired. Power Boiler No. 3 is coal fired with natural gas as an alternate fuel. No. 4 Power Boiler is coal and bark fired with natural gas as an alternate fuel.

Product paper is produced from the pulp on two paper machines. Copy paper is produced on the No. 5 Paper Machine and is cut, sized, and packaged in a side processing plant for final sale. The paper produced on the No. 3 Paper Machine is shipped in either sheet or roll form to final customers. Market pulp is dried on a pulp drying machine as bales or rolls for final sale.

The mill utilizes sump systems in selected areas which are activated by conductivity to reclaim process losses into collection tanks. The reclaimed losses are reintroduced into the chemical recovery process. Distributed process control systems are used in nearly all the major process areas to improve process stability and control.

## 2.4 EXISTING MILL AIR SOURCES

The Pensacola Mill currently operates a total of twenty-nine (29) air sources which are covered by twenty-one (21) DER air permits. Table 2-1 is a summary list of the sources, the source ID number, and the permit number under which the source operates. The majority of the mill sources will not be impacted by the proposed consent order modifications. The sources which will be affected by the project include some sources which will be physically modified and will experience throughput increases, and other sources which will not be modified but will experience throughput increases.

The sources impacted by the project fall within three main areas of the mill pulping process as follows:

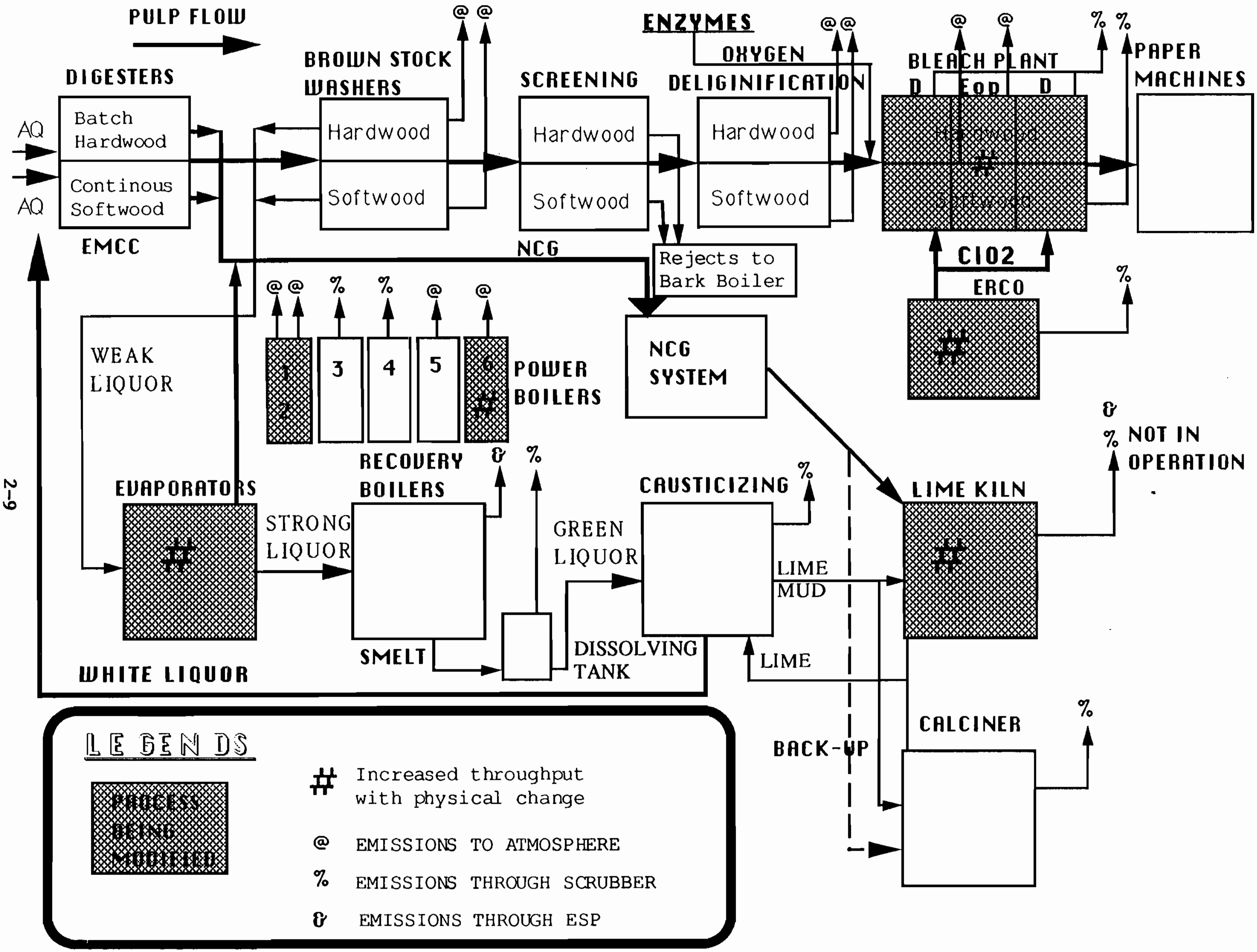
- Chemical cooking
- $O_2$ delignification and bleaching
- Chemical recovery and power generation

The existing sources in each area which will be affected by the project are depicted in Figure 2-3 and are discussed below.

**TABLE 2-1**
**CHAMPION INTERNATIONAL CORPORATION - PENSACOLA MILL**
**FLORIDA DER AIR PERMITS**

| SOURCE | PERMIT # | SOURCE ID # |
|---|---|---|
| Wooodyard | AO17170657 | 10PEN1700 4252 & 58 |
| Kamyr Digesters | AO17212422 | 10PEN1700 4254 |
| Kamyr Diffusion Washer | AO17212422 | 10PEN1700 4254 |
| Condensate Stripper | AO17212422 | 10PEN1700 4254 |
| Batch Digesters | AO17212422 | 10PEN1700 4253 |
| Brown Stock Washers | AO17212422 | 10PEN1700 4253 |
| A Line $0_2$ Delignification | AO17142570 | 10PEN1700 4250 |
| B Line $0_2$ Delignification | AO17142570 | 10PEN1700 4251 |
| A Line Bleach Plant | AO17142570 | 10PEN1700 4250 |
| B Line Bleach Plant | AO17142570 | 10PEN1700 4251 |
| Salt Unloading | AO17142572 | 10PEN1700 4256 & 57 |
| Chlorine Dioxide Generator | AO17142566 | 10PEN1700 4247, 48, & 49 |
| Multiple Effect Evaporators | AO17212422 | 10PEN1700 4255 |
| No. 1 Recovery Furnace | AO17181730 | 10PEN1700 4230 |
| No. 1 Smelt Dissolving Tank | AO17181734 | 10PEN1700 4232 |
| No. 2 Recovery Furnace | AO17181732 | 10PEN1700 4229 |
| No. 2 Smelt Dissolving Tank | AO17181735 | 10PEN1700 4238 |
| Lime Slaker | AO17137615 | 10PEN1700 4246 |
| Lime Kiln | AO17181738 | 10PEN1700 4228 |
| Fluo-Solids Unit (Calciner) | AO17151541 | 10PEN1700 4236 |
| Tall Oil Plant | AO17181741 | 10PEN1700 4201 |
| No. 1 Power Boiler | AO17181726 | 10PEN1700 4224 |
| No. 2 Power Boiler | AO17181727 | 10PEN1700 4214 |
| No. 3 Power Boiler | AO17146028 | 10PEN1700 4233 |
| No. 4 Power Boiler | AO17145038 | 10PEN1700 4237 |
| No. 5 Power Boiler | AO17203050 | 10PEN1700 4202 |
| Coal Crushing and Handling | AO17143517 | 10PEN1700 4239 & 40 |
| P5 Dry Additives | AO17213490 | 10PEN1700 4245 |
| P5 Starch | AO17213492 | 10PEN1700 4244 |

FIGURE 2-3: CONSENT ORDER AIR PERMITTING PLAN - MILL LAYOUT



## Chemical Cooking

The air emission sources in the chemical cooking area include the digesters, the brown stock washers, and the non-condensible gas (NCG) system. The digester systems on both the hardwood and softwood lines are closed systems which vent off-gases to the NCG system. Condensate from the cooking process is stripped to remove as much of the organic fraction as possible, and the off-gas from the condensate stripper is also vented to the NCG system. The NCG system itself vents to either the Lime Kiln or the lime calciner. The Lime Kiln is used as the primary control device for incinerating the NCGs with the calciner serving as backup.

The other sources in the cooking area include the diffusion washer on the softwood line and the brown stock washers on the hardwood line. The washers on both lines vent directly to the atmosphere.

## $O_2$ Delignification and Bleaching

The washed brown stock from the cooking processes are further delignified using oxygen in separate $O_2$ reactors on each line. The $O_2$ delignification systems on each line are identical and include three vents each, as follows:

- The pre-$O_2$ decker washer vent
- The $O_2$ blow tank vent
- The post-$O_2$ washer vent

Following $O_2$ delignification, the pulp is processed through the bleaching system. The existing Pensacola bleaching operations are similar for each line and include the following sources:

- $Cl/ClO_2$ scrubber - This scrubber uses white liquor to control the emissions from the chlorination stage and chlorine dioxide stage of the existing bleaching sequence.

- $E_o$ tower and washer vents - These sources are direct atmospheric vents from the oxidative extraction stages of the existing bleaching sequence.

$ClO_2$ for the existing mill bleaching sequence is generated on site in an ERCO R3H generator. The unit uses salt, sulfuric acid, and sodium chlorate to generate $ClO_2$ and $Cl_2$. The current bleaching sequence includes chlorine and chlorine dioxide in the first stage, an oxygen extractive stage, and chlorine dioxide in the final stage ($C_DE_OD$). There are five vent sources associated with the $ClO_2$ generator as follows:

- One tail gas scrubber - This scrubber uses sodium hydroxide to control $Cl_2$ and $ClO_2$ from the generator.

- Two $ClO_2$ storage tanks controlled by chilled water scrubbers.

- Two salt unloading/pneumatic transfer systems controlled by separate water spray towers.

**<u>Chemical Recovery and Power Generation Operations</u>**

The chemical recovery and power generation area includes the process equipment associated with recovering the cooking chemicals and the power boilers which generate the necessary process steam. Each of the sources affected by the proposed project are detailed below.

- *Multiple Effect Evaporators* - The evaporators are used to concentrate the weak black liquor prior to firing in the recovery furnaces. The off-gas from the evaporators is vented into the NCG system previously described and is ultimately combusted in the Lime Kiln or calciner.

- *Lime Kiln* - The Lime Kiln is used to calcine lime mud from the slaking process in the chemical recovery area. The kiln is permitted to burn natural gas and fuel oil. It is rated to produce up to 328 tons of CaO per day. It also serves as the primary control device for the NCGs generated in the pulping process. Particulate emissions from the kiln are controlled by a venturi scrubber and mist separator.

- *No. 1 Power Boiler* - This boiler is a natural gas-fired boiler originally rated to produce 140,000 pounds of steam per hour and having a derated heat input of 175mm BTU per hour.

- *No. 2 Power Boiler* - This boiler is a natural gas-fired boiler originally rated to produce 140,000 pounds of steam per hour and having a derated heat input of 170mm BTU per hour.

## 2.5 MODIFIED AND NEW AIR SOURCES

The project will affect the various air sources outlined in Section 2.4 on a source-specific basis. The following information is intended to provide details on the changes which each of the existing affected sources will experience, and also to provide information on the proposed new No. 6 Power Boiler which will replace the No. 1 and No. 2 Power Boilers as part of the project. The information is presented based upon the production area groupings previously identified in Section 2.4.

## Chemical Cooking

Improved delignification in the cooking processes will play a role in reducing the wastewater treatment load. CHAMPION has identified two potential changes to be made to the digester processes to improve delignification, including:

- Extended modified continuous cooking (EMCC)
- Anthraquinone cooking (AQ)

It is important to understand that these are both changes in the cooking process which should not impact air emissions from the system. Therefore, by themselves EMCC and AQ do not require air permitting. Both methods have undergone trial efforts at the Pensacola Mill and process feasibility continues to be evaluated.

EMCC can only be considered in the continuous digester serving the softwood line. It involves changes in feeding the cooking liquor into the digester in stages and different cooking conditions. If successfully implemented, it is expected to produce a pulp which is easier to wash, therefore, improving lignin extraction. While some changes in piping are required for the digester, it is a sealed unit with any emissions ultimately vented directly to the NCG system. No increase in throughput occurs in the digester as a result of EMCC.

Anthraquinone (AQ) is an organic catalyst which accelerates and increases the selectivity of the wood cooking chemicals in the delignification of the pulp fiber. It can potentially be used in both the batch digesters serving the hardwood line and the continuous digester serving the softwood line. The ultimate goal of applying AQ is a reduction in the organic loading, the color, and the conductivity in the bleach plant effluent.

The project will require the installation of storage and handling equipment for AQ. AQ is water soluble and, therefore, CHAMPION proposes to utilize a system designed for transporting and storing water-soluble anthraquinone (SAQ). AQ is not on the Clean Air List of 189 Hazardous Air Pollutants. It is a reportable substance under CERCLA and adequate containment of the storage and unloading facility will be provided.

While both EMCC and AQ are changes in the digester cooking processes, it is believed that there will be no changes resulting in the emissions from the digesters following implementation of these methods. Since feed rate to the digesters will not change, the material flow rate from the digesters to the brown stock washers will also be unchanged. The increase in black liquor solids from improved pulp delignification is offset by a reduction in solids due to improved digester selectivity and fiber preservation. Therefore no net change in liquor solids to recovery is anticipated. Furthermore, air emissions from the brown stock washers should be no different following implementation of the improved cooking methods.

**$O_2$ Delignification and Bleaching**

The washed brown pulp from the cooking processes goes through further delignification in $O_2$ reactors on each line. If these improvements in the digester cooking processes occur, less fiber may be wasted which could result in an increase in the fiber processed through the $O_2$ delignification systems. Since there could also be reduced levels of lignin in the brown pulp, the emissions from the pre- and post-$O_2$ washers and the $O_2$ blow tank are not expected to change as a result of the project, even if fiber throughput increases.

The most significant change in the pulp production process will be the conversion of the existing $C_DE_OD$ bleach plant. This will be accomplished by elimination of the existing chlorine gas handling system, the addition of a hydrogen peroxide handling system, and the modification of the chlorine dioxide generator. In addition, enzymes may be added to the high density storage tanks between the oxygen delignification systems and the bleach plants. Each of these changes is detailed below.

- *Enzyme Bleach Boosting* - Enzyme bleach boosting is a new technique which must still undergo field trials. It involves the application of xylanase enzyme prior to pulp bleaching with the purpose of modifying the chemical structure to make subsequent bleach stages more efficient. The high degree of specificity of action and mild working conditions generally result in fewer non-desirable byproducts. This tends to give a more efficient process and should lead to improved process yields. Significant reductions in chlorine dioxide required to bleach pulp are possible with no significant impact on pulp properties.

  From an environmental viewpoint, enzymes are safe and quite desirable. They are easy to handle, require mild conditions for reaction, are effective in small amounts, biodegradable, and non-toxic. The xylanase enzymes to be used in pulp bleaching are categorized as food grade products.

  The use of enzymes will require the installation of enzyme storage and handling facilities. Since enzymes are water soluble, there will be no air emission associated with this system.

- *Chlorine Dioxide Substitution for Chlorine* - The mill will eliminate the use of molecular chlorine as a bleaching agent, and the first stage of each bleach plant will be 100% chlorine dioxide. This will require a modification of the existing chlorine dioxide generator.

The existing generator is an ERCO R3H which uses salt, sulfuric acid, hydrochloric acid, and sodium chlorate to generate chlorine dioxide and chlorine. The generator will be modified to an R8/R10 process which uses methanol, sulfuric acid, and sodium chlorate to generate chlorine dioxide. The conversion to R8/R10 is necessary to eliminate the chlorine gas byproduct which is currently generated in the R3H process. The modified reactor capacity will be increased from the present 16 tons per day to 37.4 tons per day of chlorine dioxide. A third $ClO_2$ storage tank will be added and the existing chlorine absorption towers will be converted to chlorine dioxide absorption towers.

The existing storage tank scrubbers will continue to vent the existing two tanks and will also vent the new third tank. The exhaust from the two tank vent scrubbers will be rerouted to the tail gas scrubber. The tail gas scrubber will be modified by installing an extra 10 feet of tower and the scrubbing media will be changed from sodium hydroxide to white liquor (sodium hydroxide plus sodium sulfide), as depicted on Process Flow Diagram 3 presented in Part II of the permit application.

A new 21,000 gallon methanol storage tank will be installed as part of the project. The tank will be nitrogen blanketed and equipped with a conservation vent.

The existing salt unloading and storage system will be shut down and dismantled.

The existing bleach plant scrubbers are equally effective for chlorine and chlorine dioxide removal, and the scrubber systems have adequate capacity for the expected emissions. Therefore, no change in the bleach plant scrubber system is planned.

- *Peroxide Fortified Oxidative Caustic Extraction* - Hydrogen peroxide is an oxidizing agent that works optimally in alkaline conditions and is typically applied to the pulp in a 50% solution. The peroxide is applied in the oxidative extraction stage. The hydrogen peroxide is a non-specific oxidizer that reacts as readily with the extracted lignin as it does with the pulp. Because of the non-specificity, half of the peroxide decolorizes the extraction filtrate. The other half of the charge increases the brightness of the pulp leaving the extraction stage. Because of the higher brightness achievable, chlorine dioxide charged to either the first stage or the final bleaching stage is reduced.

  The use of hydrogen peroxide will require the installation of a storage and handling system for the chemical. The peroxide will completely react in the extraction tower. There are no air emissions associated with the use of hydrogen peroxide.

**Evaporators and Power Generation**

Mill improvements aimed at reducing the amount of wastewater generated by minimizing process losses will increase the overall liquid load to the multiple effect evaporators. Due to the increase in load, the evaporators will be upgraded. Other improvements to the existing facility associated with minimizing process losses include upgrading the evaporator foul condensate stripper and modifying the Lime Kiln. Each of the affected air emission sources are discussed below.

- *Evaporation Capacity Upgrade* - Reclaimed process chemicals are processed through the black liquor evaporators. These evaporators are currently at capacity. Any added volume for evaporating reclaimed sewer losses will require added capacity.

With the planned process loss containment project and pulp-mill process changes, it is estimated that a 50% increase in evaporation capacity of the No. 2 set evaporator will be needed. This will be accomplished by the addition of two new evaporator effects.

The primary purpose of this capacity upgrade is to evaporate the water contained in these streams. Although the color and B.O.D. reclaimed represents a significant portion of the waste water load, the associated solids contribution to the chemical recovery system is insignificant. The recovery boilers and associated equipment are not impacted.

- *Evaporator Foul Condensate Stripping Upgrade* - Various volatile organic compounds are released with digester steam after the cooking of wood chips. Some of the volatile compounds or non-condensible gases are piped to the Lime Kiln and burned. The remaining portion is dissolved and carried in the digester steam (contaminated) condensate to a heat recovery system. Condensates from the black liquor evaporation process are also rich in dissolved organic compounds. Most of the organic component in digester steam and evaporator condensates is methanol and other low molecular weight compounds. These compounds produce a very large biochemical oxygen demand on the wastewater treatment facility. The mill currently collects and steam strips most of the more concentrated or "foul" condensates. The liberated volatile organic compounds are then burned with the non-condensible gases in the Lime Kiln. However, a significant BOD load is discharged to the waste treatment plant due to an excess of less contaminated condensates and the lack of stripping capacity.

CHAMPION has evaluated the upgrade of the existing contaminated condensate stripper and the installation of an additional steam stripper. With added stripper capacity, initial estimates have shown that the mill effluent BOD load to the wastewater treatment plant could be reduced by as much as 15%. The evaluation is currently not completed, and the exact configuration has not been determined.

The installation of a stripper will not directly affect air emissions except to the extent these materials are being stripped in the wastewater treatment system. In that regard, a steam stripper will directly reduce the emissions of volatile compounds.

- *Lime Reburning Capacity - Lime Kiln-Mud Dryer Upgrade* - Currently, the Lime Kiln and calciner cannot process all of the lime mud produced by the causticizing process. The difference between the current lime reburning capability and the requirements to produce white liquor for the pulping process is made up with purchased fresh lime. The excess lime mud (calcium carbonate) produced in the causticizing operation is discharged to the sewer in a weak wash solution. The sewered lime mud flows to the waste treatment primary settling basin, is dredged with other mill settled sludge, and pumped to the decanting basins. The combined mud and mill sludge is reclaimed from the decanting basins and hauled to the landfill. The weak wash solution sewered with the lime mud is an alkaline solution that has to be neutralized in the settling basin by carbon dioxide injection. However, the alkaline solution increases the mill effluent conductivity.

An upgraded kiln capacity will supply the total lime requirements eliminating the sewering of lime mud in weak wash solution as part of daily operation. Initial estimates indicate that the required capacity increase will reduce daily landfill by approximately 100 tons and reduce the conductivity by about 20%.

The increase in Lime Kiln capacity will be accomplished by the installation of a lime mud dryer. The upgraded Lime Kiln-Mud Dryer system will be capable of producing up to 500 tons of CaO per day. A new multifield electrostatic precipitator will be added and the existing scrubber will be modified to provide $SO_2$ scrubbing capability. The separator will be physically modified as a packed column utilizing recirculating NaOH as the scrubbing medium. The scrubber will be used only on an as needed basis to meet the proposed $SO_2$ emission limits. Figure 2-4 shows a representation of the system.

The fluid bed calciner will not be changed, and the normal throughput will not change.

The amount of lime added to the green liquor in the slaker will not change. The additional reburned lime from the modified Lime Kiln will allow the reduction of purchased fresh lime.

There will be a slight increase in non-condensible gases (NCGs) burned in the Lime Kiln-Mud Dryer. The only impact will be to increase the amount of sulfur dioxide formed in the kiln due to the sulfur in the NCGs. Any increase in sulfur dioxide will be captured within the kiln and/or by the sulfur dioxide scrubber. The increase in sulfur dioxide emissions from the lime kiln-mud dryer is not PSD significant.

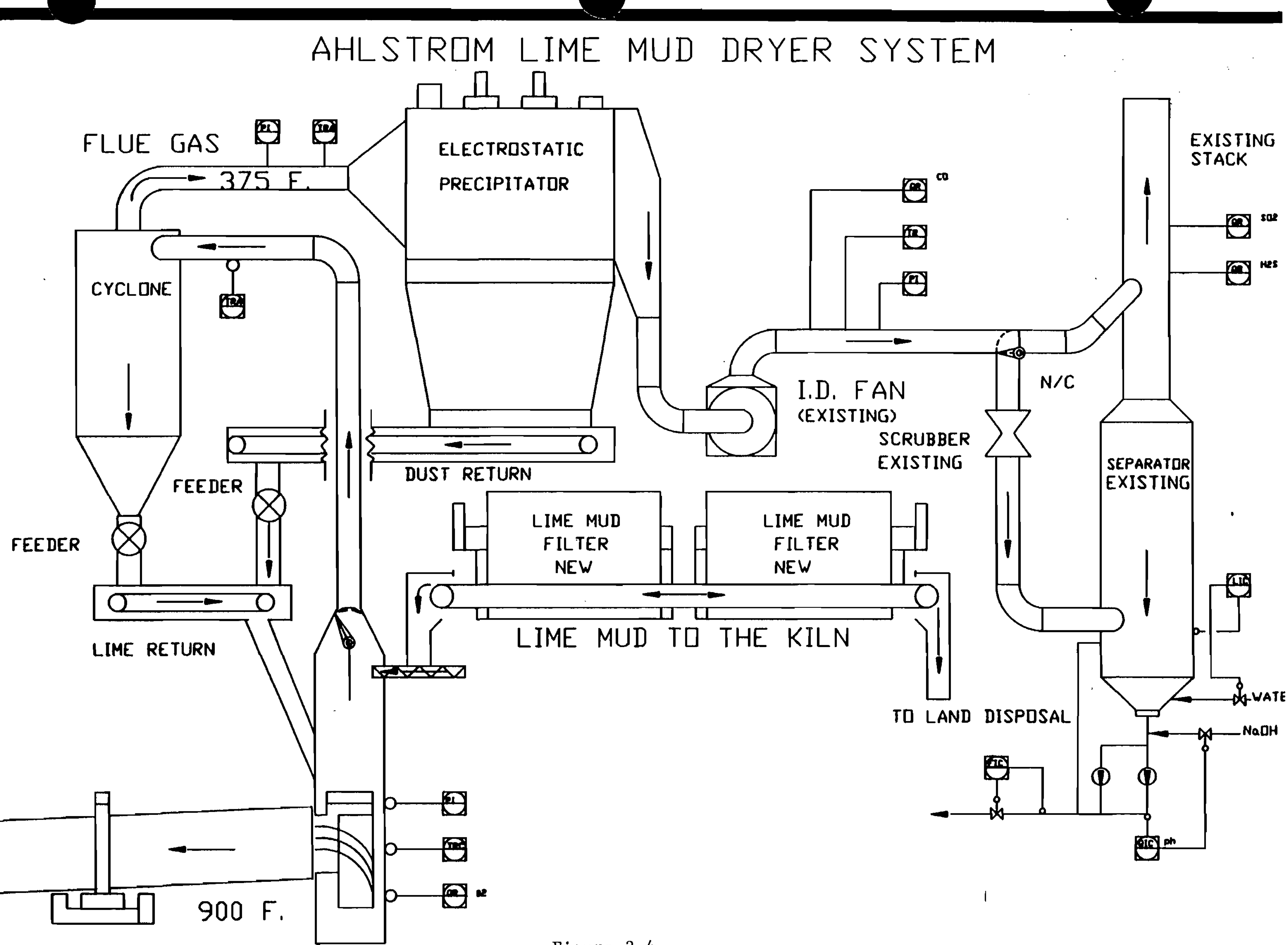

AHLSTROM LIME MUD DRYER SYSTEM
FLUE GAS
375 F.
ELECTROSTATIC
PRECIPITATOR
CYCLONE
I.D. FAN
(EXISTING)
SCRUBBER
EXISTING
N/C
EXISTING
STACK
SEPARATOR
EXISTING
DUST RETURN
FEEDER
FEEDER
LIME MUD
FILTER
NEW
LIME MUD
FILTER
NEW
LIME RETURN
LIME MUD TO THE KILN
TO LAND DISPOSAL
NaOH
900 F.

Figure 2-4

- *Steam Capacity Upgrade (No. 6 Package Boiler)* - Added steam capacity will be required to support the process modifications. The specific added steam demand will come from an increase in evaporation and contaminated condensate stripping capacity, black liquor heaters, the cooking modifications, and bleach plant load reduction technologies.

  With the addition of the No. 6 Power Boiler, CHAMPION will shut down No. 1 and No. 2 power boilers. These boilers, built in the early 50s, are in poor repair and poor efficiency.

  A new high pressure steam boiler to supply 350,000 pounds per hour additional steam load for consent order projects and replacement of the two obsolete power boilers will be installed.

## SECTION 3
## SUMMARY OF EMISSIONS

### 3.1 INTRODUCTION

A baseline and proposed future emissions inventory has been developed for the Pensacola mill sources affected by the proposed modifications. A list of the affected sources is included in Table 3-1. The inventory includes baseline emission rates from the existing affected sources and future emission rates for the proposed new and modified sources. A comparison of baseline and future emissions is presented in Table 3-2.

The baseline emission rates have been developed based on the two year period dating from July 1, 1990 through June 30, 1992. The baseline rates were determined using individual source operating information including: fuel use data, process throughput data, actual source operating hours, and continuous emission monitoring (CEM) data where available. For each affected source, emission factors were developed from available emission tests or CEM data or from applicable literature. The factors were then used with the operating data to calculate annual baseline emission rates. Future emissions were projected using vendor data or guarantees, where available.

Presently, there is very limited data available for determining VOC emissions from the Bleach Plant sources. However, a good data base is available for chloroform emissions including testing performed by the National Council of the Paper Industry for Air and Stream Improvement (NCASI) at the mill in 1990. Therefore, as discussed with Florida DER, CHAMPION is using chloroform as a surrogate for total VOC emissions from the Bleach Plant for the purposes of this application.

**TABLE 3-1**

**CHAMPION - PENSACOLA**
**SUMMARY OF AFFECTED SOURCES**

| | |
|---|---|
| **BASELINE SOURCES** | |
| | No. 1 Power Boiler |
| | No. 2 Power Boiler |
| | Lime Kiln |
| A-Line | Softwood Bleach Plant Scrubber<br>Softwood Bleach Plant $E_o$ Washer |
| B-Line | Hardwood Bleach Plant Scrubber<br>Hardwood Bleach Plant $E_o$ Washer |
| **FUTURE SOURCES** | |
| | No. 6 Power Boiler |
| | Lime Kiln-Mud Dryer |
| A-Line | Softwood Bleach Plant Scrubber<br>Softwood Bleach Plant $E_o$ Washer |
| B-Line | Hardwood Bleach Plant Scrubber<br>Hardwood Bleach Plant $E_o$ Washer |

CH233F.TAB

**TABLE 3-2**
**CHAMPION**
**PENSACOLA, FLA**
**SUMMARY OF BASELINE ANNUAL EMISSIONS VS FUTURE MAXIMUM ANNUAL EMISSIONS**

**(tons/yr)**

| SOURCE | $NO_x$ | | | $SO_2$ | | | CO | | |
|---|---|---|---|---|---|---|---|---|---|
| | ACTUAL | FUTURE | CHANGE | ACTUAL | FUTURE | CHANGE | ACTUAL | FUTURE | CHANGE |
| #6 POWER BOILER | NA | 140.07 | 140.07 | NA | 2.17 | 2.17 | NA | 233.45 | 233.45 |
| LIME KILN MUDDRYER(3) | 63.46 | 215.93 | 152.48 | 1.76 | 28.43 | 26.67 | 5.73 | 29.57 | 23.83 |
| #1 POWER BOILER | 40.57 | NA | -40.57 | 0.38 | NA | -0.38 | 40.57 | NA | -40.57 |
| #2 POWER BOILER | 113.20 | NA | -113.20 | 0.25 | NA | -0.25 | 26.95 | NA | -26.95 |
| LINE A- $Cl_2$ SCRUBBER(1) | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| LINE A- $E_o$ WASHER(1) | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| LINE B- $Cl_2$ SCRUBBER(2) | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| LINE B- $E_o$ WASHER(2) | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **TOTALS** | **217.23** | **356.01** | **138.78** | **2.39** | **30.60** | **28.21** | **73.26** | **263.02** | **189.76** |

| SOURCE | $PM/PM_{10}$ | | | VOC | | | TRS | | |
|---|---|---|---|---|---|---|---|---|---|
| | ACTUAL | FUTURE | CHANGE | ACTUAL | FUTURE | CHANGE | ACTUAL | FUTURE | CHANGE |
| #6 POWER BOILER | NA | 11.67 | 11.67 | NA | 23.35 | 23.35 | NA | NA | NA |
| LIME KILN MUDDRYER(3) | 57.32 | 47.74 | -9.58 | 1.68 | 107.31 | 105.63 | 8.27 | 6.39 | -1.88 |
| #1 POWER BOILER | 2.03 | NA | -2.03 | 10.84 | NA | -10.84 | NA | NA | NA |
| #2 POWER BOILER | 1.35 | NA | -1.35 | 6.72 | NA | -6.72 | NA | NA | NA |
| LINE A- $Cl_2$ SCRUBBER(1) | NA | NA | NA | 10.72 | 1.48 | -9.24 | NA | NA | NA |
| LINE A- $E_o$ WASHER(1) | NA | NA | NA | 1.16 | 0.16 | -1.00 | NA | NA | NA |
| LINE B- $Cl_2$ SCRUBBER(2) | NA | NA | NA | 15.30 | 1.48 | -13.82 | NA | NA | NA |
| LINE B- $E_o$ WASHER(2) | NA | NA | NA | 2.04 | 0.16 | -1.88 | NA | NA | NA |
| **TOTALS** | **60.69** | **59.41** | **-1.28** | **48.45** | **133.94** | **85.49** | **8.27** | **6.39** | **-1.88** |

(1) Softwood
(2) Hardwood
(3) 95% control efficiency is assumed for the future case $SO_2$ condition.

As a result of the proposed modifications, there may be a slight (1-2%) increase in fiber throughput in the oxygen delignification process on each line. However, available VOC emission data is extremely limited for this source. The variability in the available test data suggests that the actual difference between existing and future VOC emissions would likely not be measurable using the available test methods. CHAMPION will commit to testing these sources following the mill modifications to clearly identify future emission rates.

The following sections briefly identify the basis for each emission factor and source in the emissions inventory. The emission factor development calculations and sample emission rate calculations are included in Appendix A. Appendix B includes source test summary data and other information supporting the emission data. Appendix C includes the source operating data, fuel use data, and annual emission summaries for each of the baseline years.

## 3.2 BASELINE EMISSION RATES

A summary of the emission factors utilized for baseline emissions is presented in Table 3-3. The calculated baseline emission rates for the two year averaging period for the affected sources are presented in Table 3-4.

The following subsections provide a brief source-by-source description of the development of individual emission factors.

### 3.2.1 No. 1 Power Boiler

The No. 1 Power Boiler has a design heat input rating of 180 MMBtu per hour. The primary fuel fired in the boiler is natural gas. However, the boiler is also equipped to burn No. 6 fuel oil for emergency use. For the baseline period, natural gas was the only fuel fired and emissions are based on natural gas usage for the period. The following information presents the basis for the selected emission factors for each pollutant.

# TABLE 3-3
# CHAMPION
# PENSACOLA, FLA
# SUMMARY OF EMISSION FACTORS AND HOURLY EMISSION RATES

## BASELINE EMISSIONS

| SOURCE | $NO_x$ | | $SO_2$ | | CO | |
|---|---|---|---|---|---|---|
| | EMISSION FACTOR | HOURLY RATE (lb/hr)[5] | EMISSION FACTOR | HOURLY RATE (lb/hr)[5] | EMISSION FACTOR | HOURLY RATE (lb/hr)[5] |
| #1 POWER BOILER | 0.1 lb/MMBtu | 10.11 | 0.00093 lb/MMBtu | 0.09 | 0.1 lb/MMBtu | 10.11 |
| #2 POWER BOILER | 0.42 lb/MMBtu | 45.18 | 0.00093 lb/MMBtu | 0.10 | 0.1 lb/MMBtu | 10.76 |
| LIME KILN | 15.5 lb/hr | 15.5 | 0.43 lb/hr | 0.43 | 1.4 lb/hr | 1.4 |
| LINE A- $Cl_2$ SCRUBBER[1] | NA | NA | NA | NA | NA | NA |
| LINE A- $E_o$ WASHER[1] | NA | NA | NA | NA | NA | NA |
| LINE B- $Cl_2$ SCRUBBER[2] | NA | NA | NA | NA | NA | NA |
| LINE B- $E_o$ WASHER[2] | NA | NA | NA | NA | NA | NA |

| SOURCE | PM/$PM_{10}$ | | VOC | | TRS | |
|---|---|---|---|---|---|---|
| | EMISSION FACTOR | HOURLY RATE (lb/hr)[5] | EMISSION FACTOR | HOURLY RATE (lb/hr)[5] | EMISSION FACTOR | HOURLY RATE (lb/hr)[5] |
| #1 POWER BOILER | 0.005 lb/MMBtu | 0.51 | 2.70 lb/hr | 2.7 | NA | NA |
| #2 POWER BOILER | 0.005 lb/MMBtu | 0.54 | 2.68 lb/hr | 2.68 | NA | NA |
| LIME KILN | 14.0 lb/hr | 14 | 0.41 lb/hr | 0.41 | 2.02 lb/hr | 2.02 |
| LINE A- $Cl_2$ SCRUBBER[1] | NA | NA | 0.083 lb/ADTP | 2.77 [3] | NA | NA |
| LINE A- $E_o$ WASHER[1] | NA | NA | 0.009 lb/ADTP | 0.30 [3] | NA | NA |
| LINE B- $Cl_2$ SCRUBBER[2] | NA | NA | 0.120 lb/ADTP | 3.00 [4] | NA | NA |
| LINE B- $E_o$ WASHER[2] | NA | NA | 0.016 lb/ADTP | 0.40 [4] | NA | NA |

(1) Softwood
(2) Hardwood
(3) The hourly rate is based on the current annual average permit limit of 800 ADTP/day (softwood) and pulp production 24 hr/day.
(4) The hourly rate is based on the current annual average permit limit of 600 ADTP/day (hardwood) and pulp production 24 hr/day.
(5) The hourly emission rate is an average hourly emission rate for the two year period.

**TABLE 3-4**
**CHAMPION**
**PENSACOLA, FLA**
**SUMMARY OF BASELINE EMISSION RATES**
**JULY 1990 - JUNE 1992**
**(tons/year)**

| SOURCE | $NO_x$ | $SO_2$ | CO | $PM/PM_{10}$ | VOC | TRS |
|---|---|---|---|---|---|---|
| #1 POWER BOILER | 40.57 | 0.38 | 40.57 | 2.03 | 10.84 | NA |
| #2 POWER BOILER | 113.20 | 0.25 | 26.95 | 1.35 | 6.72 | NA |
| LIME KILN | 63.46 | 1.76 | 5.73 | 57.32 | 1.68 | 8.27 |
| LINE A- $Cl_2$ SCRUBBER(1) (3) | NA | NA | NA | NA | 10.72 | NA |
| LINE A- $E_o$ WASHER(1) (3) | NA | NA | NA | NA | 1.16 | NA |
| LINE B- $Cl_2$ SCRUBBER(2) (4) | NA | NA | NA | NA | 15.30 | NA |
| LINE B- $E_o$ WASHER(2) (4) | NA | NA | NA | NA | 2.04 | NA |
| TOTAL | 217.23 tons | 2.39 tons | 73.26 tons | 60.69 tons | 48.45 tons | 8.27 tons |

(1) Softwood
(2) Hardwood
(3) VOC emission rates are based on the lb/ADTP emission factor and actual softwood pulp (ADTP) production.
(4) VOC emission rates are based on the lb/ADTP emission factor and actual hardwood pulp (ADTP) production.

- Nitrogen Oxides ($NO_x$)

The $NO_x$ emission factor is based upon the average $NO_x$ mass emission rates and total heat input rates measured during a series of three test runs conducted on 8 February 1991. The $NO_x$ emission factor is 0.10 lb/MMBtu. The baseline $NO_x$ emission rate is 10.11 lb/hr.

- Sulfur Dioxide ($SO_2$)

The $SO_2$ emission factor is based upon the typical sulfur content of the natural gas burned in the No. 1 Power Boiler as supplied by the gas vendor and the assumption of 100% conversion to $SO_2$. The $SO_2$ emission factor is 0.00093 lbs/MMBtu. The baseline $SO_2$ emission rate is 0.09 lb/hr.

- Carbon Monoxide (CO)

The CO emission factor used is the same emission factor reported in CHAMPION's PSD permit application for the No. 5 Power Boiler submitted in February 1991. This factor was based on testing conducted on CHAMPION's No. 5 Power Boiler on 16-17 May 1989. The CO emission factor is 0.1 lb/MMBtu. The baseline CO emission rate is 10.11 lb/hr.

- Total Suspended Particulate Matter and Particulate Matter less than 10 microns ($PM/PM_{10}$)

  The $PM/PM_{10}$ emission factor is based on the AP-42 emission factor for natural gas (Table 1.4-1, utility boiler size). This factor is 5 lb/$10^6$ cf. Assuming a natural gas heating value of 1000 Btu/scf, the $PM/PM_{10}$ emission factor is 0.005 lb/MMBtu. The baseline $PM/PM_{10}$ emission rate is 0.51 lb/hr.

- Volatile Organic Compounds (VOC)

  The VOC emission factor used is based upon the same VOC concentration reported in CHAMPION's PSD permit application for the No. 5 Power Boiler submitted in February 1991. This concentration of 20 ppm (as carbon) was established by testing conducted on 16-17 May 1989 and is used in conjunction with volumetric flow rate data from the $NO_x$ testing on the No. 1 Power Boiler conducted on 8 February 1991. The baseline VOC emission rate is 2.70 lb/hr (as propane).

### 3.2.2 No. 2 Power Boiler

The No. 2 Power Boiler has a design heat input rating of 220 MMBtu per hour. The primary fuel fired in the boiler is natural gas. However, the boiler is also equipped to burn No. 6 fuel oil for emergency use. For the baseline period, natural gas was the only fuel fired and emissions are based on natural gas usage. The following information presents the basis for the selected emission factors for each pollutant.

- Nitrogen Oxides ($NO_x$)

The $NO_x$ emission factor is based upon the average $NO_x$ mass emission rates and total heat input rates measured during a series of three test runs conducted on 9 February 1991. The $NO_x$ emission factor is 0.42 lb/MMBtu. The baseline $NO_x$ emission rate is 45.18 lb/hr.

- Sulfur Dioxide ($SO_2$)

The $SO_2$ emission factor is based upon the typical sulfur content of the natural gas burned in the No. 2 Power Boiler as supplied by the gas vendor and the assumption of 100% conversion to $SO_2$. The $SO_2$ emission factor is .00093 lb/MMBtu. The baseline $SO_2$ emission rate is 0.10 lb/hr.

- Carbon Monoxide (CO)

The CO emission factor used is the same emission factor reported in CHAMPION's PSD permit application for the No. 5 Power Boiler submitted in February 1991. This factor was based on testing conducted on CHAMPION's No. 5 Power Boiler on 16-17 May 1989. The CO emission factor is 0.1 lb/MMBtu. The baseline CO emission rate is 10.76 lb/hr.

- Total Suspended Particulate Matter and Particulate Matter less than 10 microns ($PM/PM_{10}$)

  The $PM/PM_{10}$ emission factor is based on the AP-42 emission factor for natural gas (Table 1.4-1, utility boiler size). This factor is 5 $lb/10^6$ cf of natural gas. Assuming a natural gas heating value of 1000 Btu/scf, the $PM/PM_{10}$ emission factor is 0.005 lb/MMBtu. The baseline $PM/PM_{10}$ emission rate is 0.54 lb/hr.

- Volatile Organic Compounds (VOC)

  The VOC emission factor used is based upon the same VOC concentration reported in CHAMPION's PSD permit application for the No. 5 Power Boiler submitted in February 1991. This concentration of 20 ppm (as carbon) was established by testing conducted 16-17 May 1989 and is used in conjunction with volumetric flow rate data from the $NO_x$ testing on the No. 2 Power Boiler conducted on 9 February 1991. The baseline VOC emission rate is 2.68 lb/hr (as propane).

### 3.2.3 Lime Kiln

The Pensacola Lime Kiln is rated to produce approximately 328 tons of lime per day. The kiln fires natural gas and has a maximum heat input rate of approximately 123 MMBtu per hour. The kiln is also used to incinerate non-condensible gases (NCG) from the Kraft mill process.

- Nitrogen Oxides ($NO_x$)

  The $NO_x$ emission factor is based on the average of two series of tests conducted on 13 December 1989 and 11-12 April 1990. The baseline $NO_x$ emission rate is 15.5 lb/hr.

- Sulfur Dioxide ($SO_2$)

  The $SO_2$ emission factor is an average of four series of tests conducted 26 April, 16 May, 13 December 1989 and 11-12 April 1990. The 16 May 1989 test results included in the average only include the test runs during which all NCG streams were ducted to the Lime Kiln. The results included are the most representative of normal kiln operations. The baseline $SO_2$ emission rate is 0.43 lb/hr.

- Carbon Monoxide (CO)

  The CO emission factor is an average of two series of tests conducted on 13 December 1989 and 11-12 April 1990. The baseline CO emission rate is 1.4 lb/hr.

- Total Suspended Particulate Matter and Particulate Matter less than 10 microns ($PM/PM_{10}$)

  The $PM/PM_{10}$ emission factor is based on an average of four series of tests conducted 26 April 1989, 12 December 1989, 19 March 1991, and 27 March 1992. The baseline $PM/PM_{10}$ emission rate is 14.0 lb/hr.

- Volatile Organic Compounds (VOC)

  The VOC emission factor is based on an average of two series of tests conducted 13 December 1989 and 11-12 April 1990. The baseline VOC emission rate is 0.41 lb/hr (as propane).

- Total Reduced Sulfur Compounds (TRS)

  The TRS emission factor is based on the 2-year average CEM data and the average gas stream volumetric flow rate from the Lime Kiln particulate testing conducted 19 March 1991 and 27 March 1992. The TRS value is assumed to be 100% $H_2S$ for calculating a mass emission rate. The baseline TRS emission rate is 2.02 lb/hr.

### 3.2.4 Bleach Plant Sources

As previously discussed, there is very limited data available for determining emissions from the Bleach Plant sources identified in Table 3-1. Data is available, however, for chloroform emissions from these sources including testing by the National Council of the Paper Industry for Air and Stream Improvement (NCASI) at the mill in 1990. The proposed Pensacola Mill Bleach Plant modification entails 100% substitution of chlorine dioxide for molecular chlorine and is predicted to result in a 90% or greater reduction in the chloroform generation rate and subsequent emissions.

EPA is presently developing standard test methods and will be conducting extensive testing to identify and quantify VOC and hazardous air pollutant (HAP) emissions from pulp mill processes including Bleach Plants. This effort is intended to support the development over the next several years of industry MACT standards. However, there is presently no data available which CHAMPION can use to identify either baseline or future VOC emissions from the Pensacola bleaching processes other than the chloroform data. CHAMPION is therefore using chloroform as a surrogate for total VOC emissions from the Bleach Plant for the purposes of this application.

The Bleach Plant sources included in this analysis are the scrubber and the Eo washer for both the A-line (softwood) and B-line (hardwood). The VOC emissions are based on the NCASI testing at the Mill in 1990. A summary of the actual test results are included in Appendix D.

#### 3.2.4.1 A-Line Scrubber

- Volatile Organic Compounds (VOC)

  The VOC emissions factor is 0.083 lb/ADTP. The associated baseline VOC emission rate is 2.77 lb/hr.

#### 3.2.4.2 A-Line $E_o$ Washer

- Volatile Organic Compounds (VOC)

  The VOC emission factor is 0.009 lb/ADTP. This corresponds to a baseline VOC emission rate of 0.30 lb/hr.

#### 3.2.4.3 B-Line Scrubber

- Volatile Organic Compounds (VOC)

  The VOC emission factor is 0.120 lb/ADTP. The baseline VOC emission rate is 3.00 lb/hr.

#### 3.2.4.4 B-Line $E_o$ Washer

- Volatile Organic Compounds (VOC)

  The VOC emission factor is 0.016 lb/ADTP. This corresponds to a baseline VOC emission rate of 0.40 lb/hr.

### 3.3 FUTURE EMISSION RATES

A summary of the emission factors utilized for calculating future emissions and the projected hourly emission rates are presented in Table 3-5. The calculated annual future emission rates for the affected sources are presented in Table 3-6.

The following subsections provide a brief source-by-source description of the development of individual emission factors.

#### 3.3.1 Lime Kiln-Mud Dryer

The modified Lime Kiln-Mud Dryer is rated to produce 450 tons of lime per day and may be capable of achieving a production rate of up to 500 tons of lime per day. The kiln will fire natural gas or fuel oil and has a maximum heat input rate of 150 MMBtu/hr. The Lime Kiln-Mud Dryer will continue to be used to incinerate NCGs from the kraft mill process in the future. Projected emission rates are based upon the vendor's guaranteed production rate of 450 tons per day. CHAMPION will commit to meeting the emission limits based upon the rated capacity at peak production rates of up to 500 tons per day.

**TABLE 3-5**
**CHAMPION**
**PENSACOLA, FLA**
**SUMMARY OF EMISSION FACTORS AND HOURLY EMISSION RATES**

**FUTURE MAXIMUM ANNUAL EMISSIONS**

| SOURCE | $NO_x$ EMISSION FACTOR | $NO_x$ HOURLY RATE (lb/hr) | $SO_2$ EMISSION FACTOR | $SO_2$ HOURLY RATE (lb/hr) | CO EMISSION FACTOR | CO HOURLY RATE (lb/hr) |
|---|---|---|---|---|---|---|
| #6 POWER BOILER | 0.06 lb/MMBtu | 32.0 | 0.00093 lb/MMBtu | 0.50 | 0.1 lb/MMBtu | 53.3 |
| LIME KILN MUDDRYER | 49.3 lb/hr | 49.3 | 6.49 lb/hr | 6.49 | 6.75 lb/hr | 6.75 |
| LINE A- $Cl_2$ SCRUBBER(1) (3) | NA | NA | NA | NA | NA | NA |
| LINE A- $E_o$ WASHER(1) (3) | NA | NA | NA | NA | NA | NA |
| LINE B- $Cl_2$ SCRUBBER(2) (4) | NA | NA | NA | NA | NA | NA |
| LINE B- $E_o$ WASHER(2) (4) | NA | NA | NA | NA | NA | NA |

| SOURCE | $PM/PM_{10}$ EMISSION FACTOR | $PM/PM_{10}$ HOURLY RATE (lb/hr) | VOC EMISSION FACTOR | VOC HOURLY RATE (lb/hr) | TRS EMISSION FACTOR | TRS HOURLY RATE (lb/hr) |
|---|---|---|---|---|---|---|
| #6 POWER BOILER | 0.005 lb/MMBtu | 2.67 | 0.01 lb/MMBtu | 5.33 | NA | NA |
| LIME KILN MUDDRYER | 10.9 lb/hr | 10.9 | 24.5 lb/hr | 24.5 | 1.46 lb/hr | 1.46 |
| LINE A- $Cl_2$ SCRUBBER(1) (3) | NA | NA | 0.3375 lb/hr | 0.3375 | NA | NA |
| LINE A- $E_o$ WASHER(1) (3) | NA | NA | 0.0375 lb/hr | 0.0375 | NA | NA |
| LINE B- $Cl_2$ SCRUBBER(2) (4) | NA | NA | 0.3375 lb/hr | 0.3375 | NA | NA |
| LINE B- $E_o$ WASHER(2) (4) | NA | NA | 0.0375 lb/hr | 0.0375 | NA | NA |

(1) Softwood
(2) Hardwood
(3) The VOC emission factor is based on 750 ADTP/day (softwood) and pulp production 24 hr/day.
(4) The VOC emission factor is based on 750 ADTP/day (hardwood) and pulp production 24 hr/day.

**TABLE 3-6**
**CHAMPION**
**PENSACOLA, FLA**

**SUMMARY OF FUTURE MAXIMUM ANNUAL EMISSIONS**

| SOURCE | $NO_x$ | $SO_2$ | CO | PM/$PM_{10}$ | VOC | TRS |
|---|---|---|---|---|---|---|
| #6 POWER BOILER | 140.07 tons | 2.17 tons | 233.45 tons | 11.67 tons | 23.35 tons | NA |
| LIME KILN MUDDRYER | 215.93 tons | 28.43 tons | 29.57 tons | 47.74 tons | 107.31 tons | 6.39 tons |
| LINE A- $Cl_2$ SCRUBBER(1) | NA | NA | NA | NA | 1.48 tons | NA |
| LINE A- $E_o$ WASHER(1) | NA | NA | NA | NA | 0.16 tons | NA |
| LINE B- $Cl_2$ SCRUBBER(2) | NA | NA | NA | NA | 1.48 tons | NA |
| LINE B- $E_o$ WASHER(2) | NA | NA | NA | NA | 0.16 tons | NA |
| TOTAL | 356.01 tons | 30.60 tons | 263.02 tons | 59.41 tons | 133.94 tons | 6.39 tons |

(1) Softwood
(2) Hardwood

- Nitrogen Oxides ($NO_x$)

The $NO_x$ emission factor is based on the vendor guarantee of 200 ppm when firing fuel oil. The projected $NO_x$ emission rate is 49.3 lb/hr. When firing natural gas the vendor guarantees 175 ppm or 43.1 lbs/hr of $NO_x$.

- Sulfur Dioxide ($SO_2$)

$SO_2$ emissions from the Lime Kiln-Mud Dryer originate from several sources in the process. These sources include the lime mud which is fed to the kiln and the combustion of both fuel oil and NCG's. When combined the corresponding potential uncontrolled $SO_2$ emission rate is 130 lb/hr. The lime calcining process has been shown to remove a substantial portion of potential $SO_2$ emissions. However, CHAMPION is proposing to utilize a caustic scrubber when necessary to meet the proposed $SO_2$ emission rate. A scrubber $SO_2$ removal efficiency of 95% has been assumed for calculating the allowable $SO_2$ emission rate. The proposed $SO_2$ emission rate based upon the 95% reduction associated with the scrubber is 6.49 lb/hr.

- Carbon Monoxide (CO)

The CO emission factor is based on the vendor guarantee of 45 ppm. The CO emission rate is 6.75 lb/hr.

- Total Suspended Particulate Matter and Particulate Matter less than 10 microns ($PM/PM_{10}$)

  The $PM/PM_{10}$ emission factor is based upon meeting a grain loading of 0.037 gr/dscf per the vendor guarantee for the new control equipment. The $PM/PM_{10}$ emission rate is 10.90 lb/hr.

- Volatile Organic Compounds (VOC)

  The VOC emission factor is based on CHAMPION's anticipated "maximum load" condition at the Pensacola Mill. CHAMPION believes that the "maximum load" condition occurs when B-Condensate is used in the mud washer and on the mud filter. This leads to the highest VOC concentrations in the lime mud and consequently the Lime Kiln-Mud Dryer, as this lime mud is comprised of materials from both the mud washer and the mud filter. CHAMPION has analyzed the B-Condensate for VOCs and has determined a "maximum load" VOC concentration of 104 ppm as propane in the Lime Kiln-Mud Dryer. The VOC emission rate is 24.5 lb/hr.

- Total Reduced Sulfur Compounds (TRS)

  The TRS emission factor is based on the vendor guarantee of 8 ppm at 10% $O_2$. The TRS emission rate is 1.46 lb/hr.

### 3.3.2 No. 6 Power Boiler

The No. 6 Power Boiler has a design heat input rating of 533 MMBtu/hr. The designated fuel fired in the boiler is natural gas. The emission factors are based upon vendor guarantees except for $PM/PM_{10}$ which is based on AP-42.

- Nitrogen Oxides ($NO_x$)

  The $NO_x$ emission factor of 0.06 lb/MMBtu is based on the BACT analysis. The $NO_x$ emission rate is 32.0 lb/hr.

- Sulfur Dioxide ($SO_2$)

  The $SO_2$ emission factor is based on the sulfur content of natural gas (Table 1.4-1, utility size boiler). This factor is .00093 lb/MMBtu of natural gas. Assuming a natural gas heating value of 1000 Btu/scf, the sulfur dioxide emission rate is 0.5 lb/hr.

- Carbon Monoxide (CO)

  The CO emission factor of 0.1 lb/MMBtu is based on the BACT analysis. The CO emission rate is 53.3 lb/hr.

- Total Suspended Particulate Matter and Particulate Matter less than 10 microns ($PM/PM_{10}$)

  The $PM/PM_{10}$ emission factor is based on the AP-42 emission factor for natural gas (Table 1.4-1, Utility Boiler Size). This factor is 5 lb/$10^6$ cf of natural gas. Assuming a natural gas heating value of 1000 Btu/scf, the $PM/PM_{10}$ emission factor is 0.005 lb/MMBtu. The $PM/PM_{10}$ emission rate is 2.67 lb/hr.

- Volatile Organic Compounds (VOC)

  The VOC emission factor of 0.01 lb/MMBtu is based on the BACT analysis. The VOC emission rate is 5.33 lb/hr.

### 3.3.3 Bleach Plant Sources

The total future emission factors are based upon laboratory tests at 100% substitution of chlorine dioxide for molecular chlorine in the Bleach Plant process. These laboratory results were then apportioned between the Bleach Plant sources according to relationships established from the NCASI 1990 test program. A detailed presentation of the methodology used to develop these factors is presented in Appendix D.

#### 3.3.3.1 A-Line Scrubber

- Volatile Organic Compounds (VOC)

  The emission rate is based upon the laboratory test of 100% substitution of chlorine dioxide for molecular chlorine. The VOC emission rate is 0.3375 lb/hr.

#### 3.3.3.2 A-Line $E_o$ Washer

- Volatile Organic Compounds (VOC)

  The emission rate is based upon the laboratory test of 100% substitution of chlorine dioxide for molecular chlorine. The VOC emission rate is 0.0375 lb/hr.

#### 3.3.3.3 B-Line Scrubber

- Volatile Organic Compounds (VOC)

  The emission rate is based upon the laboratory test of 100% substitution of chlorine dioxide for molecular chlorine. The VOC emission rate is 0.3375 lb/hr.

### 3.3.3.4 B-Line $E_o$ Washer

- Volatile Organic Compounds (VOC)

The emission rate is based upon the laboratory test of 100% substitution of chlorine dioxide for molecular chlorine. The VOC emission rate is 0.0375 lb/hr.

# SECTION 4
# APPLICABLE REGULATIONS

The following subsections contain a summary of applicable Federal and State of Florida air regulations effecting the proposed project.

## 4.1 FEDERAL STANDARDS

The proposed project is potentially subject to the following Federal Regulations. These include:

- New Source Performance Standards (NSPS)
- Prevention of Significant Deterioration (PSD) Regulations
- New Source Review (NSR) which includes a demonstration of compliance with National Ambient Air Quality Standards (NAAQS)

These regulations are discussed below.

### 4.1.1 New Source Performance Standards (NSPS) - Emission Standards

#### 4.1.1.1 Industrial - Commercial - Institutional Steam Generating Units

The United States Environmental Protection Agency (U.S. EPA) has promulgated standards of performance for industrial - commercial - institutional steam generating units at 40 CFR 60.40b, Subpart Db. These NSPS regulations apply to steam generating units on which construction, modification, or reconstruction commenced after June 19, 1984 and that have a heat input capacity from fuels combusted in the steam generating unit of greater than 100 million Btu/hour.

The maximum heat input capacity to the No. 6 Power Boiler is 533 million Btu's per hour. The boiler is a new ABB/CE boiler which will be field erected at the Pensacola facility. This boiler is subject to the NSPS Subpart Db requirements and will meet the emission limits contained within the NSPS for $NO_x$. The NSPS $NO_x$ limit for a natural gas fired boiler is based on whether the heat release rate is equal to or less than 70,000 Btu/hr-$ft^3$ or greater than 70,000 Btu/hr-$ft^3$. The proposed CHAMPION boiler has a heat release rate of approximately 61,000 Btu/hr-$ft^3$, therefore, the NSPS $NO_x$ limit is 0.1 lb/MMBtu. CHAMPION's proposed boiler is designed to meet a $NO_x$ emission rate of 0.06 lb/MMBtu. No other emission limits for natural gas fired boilers are specified as NSPS requirements.

#### 4.1.1.2 Kraft Pulp Mills

Standards of performance have also been established for Kraft Pulp Mill Lime Kilns at 40 CFR 60.280 Subpart BB. Standards have been established for both particulate matter emissions and total reduced sulfur compounds (TRS).

CHAMPION is proposing to modify the Lime Kiln and convert it to a Lime Kiln - Mud Dryer as previously described in Section 2. The proposed modification will result in a decrease in both particulate matter emissions as well as TRS emissions, the two pollutants regulated by the NSPS. Therefore the modified Lime Kiln - Mud Dryer will not be subject ot the Subpart BB of the NSPS for Kraft Pulp Mills.

#### 4.1.1.3 Volatile Organic Liquid Storage Vessels for which Construction, Reconstruction, or Modification Commenced after 23 July 1984.

Standards of performance for volatile organic liquid (VOL) storage results have been established at 40 CFR 60.110b, Subpart Kb. These NSPS set forth requirements for VOC emission limits, recordkeeping and reporting, based upon the capacity of the storage vessel and the vapor pressure of the organic liquid stored. For storage vessels located outdoors, the vapor pressure to be used to determine the applicable standards is that corresponding to the highest average monthly temperature to which the tank is exposed. CHAMPION will be constructing a 21,000 gallon methanol storage tank (79.5 cubic meters) as part of the Pulp Mill modifications. From the National Oceanic and Atmospheric Administration publication, "Comparative Climatic Data for the United States through 1982", the highest average monthly temperature for Pensacola, Florida occurs during both July and August and is 81.8°F. The vapor pressure of methanol at the temperature, using Antoines Equation is 144 mmHg or 19.2 kPa. Under those conditions for a 79.5 cubic meter vessel, no emissions standards apply, however, recordkeeping is required as follows:

- Maintain a permanent readily accessible record showing the dimensions of the storage vessel and an analysis showing the capacity of the storage vessel.

- Maintain a rolling two year record of the liquid stored, the period of the storage and the maximum true vapor pressure of the liquid during the respective storage period.

### 4.1.2 Prevention of Significant Deterioration (PSD) and New Source Review (NSR)

The only sources subject to the PSD regulations are "major stationary sources" and "major modifications" located in areas designated as attainment or unclassifiable for NAAQS. Escambia County, Florida is designated as unclassifiable or in attainment for all the criteria pollutants.

CHAMPION's Pensacola mill already qualifies as a major stationary source. It is a kraft pulp mill, one of the 28 major source categories listed in the regulations, and emits more than 100 tons per year of a criteria pollutant. Therefore the task at hand is to determine whether the proposed mill modifications will constitute a major modification under the regulations. Major modification is defined in the regulations as:

"any physical change in or change in the method of operation of a major stationary source that would result in a significant net emissions increase of any pollutant subject to the regulations under the Act."

Table 4-1 identifies the significant net emissions increase levels for the PSD pollutants and compares them to the estimated emissions increases from the modified mill sources which were detailed in Section 3. As shown in the table, there will be significant net emission increases for $NO_x$, CO, and VOC resulting from the proposed mill modifications. Therefore, the proposed project constitutes a major modification and is subject to PSD review.

Under PSD, each pollutant for which a significant net emission increase occurs must undergo a PSD analysis. This involves the following:

- Best Available Control Technology (BACT) analysis.
- PSD Increment Consumption Analysis, including other increment consuming sources in the area.
- National Ambient Air Quality Standards (NAAQS) impact analysis.
- Impacts on Class I areas analysis.
- Additional impact analysis.

BACT Analysis

The PSD regulations require that a BACT analysis be conducted for each emissions unit at which a net emissions increase in the pollutant will occur as a result of a physical change or change on the method of operation in the unit. As described in Section 3, for the proposed Pensacola

## TABLE 4-1

## PSD POLLUTANT SIGNIFICANCE LEVELS[1]

| POLLUTANT | PSD SIGNIFICANT INCREASE LEVEL (ton/yr) | PROPOSED NET EMISSION RATE CHANGES (ton/yr)[2] | CHAMPION'S PROPOSED CHANGES SIGNIFICANT (yes/no) |
|---|---|---|---|
| $PM_{10}$ | 15 | -1.3 ✓ | no |
| Total Suspended Particulate | 25 | -1.3 ✓ | no |
| Sulfur Dioxide | 40 | 27.4 ✓ | no |
| Nitrogen Oxides | 40 | 138.8 ✓ | yes |
| Volatile Organic Compound | 40 | 85.5 ✓ | yes |
| Carbon Monoxide | 100 | 189.8 ✓ | yes |
| Total Reduced Sulfur Compounds | 10 | -1.9 ✓ | no |

1 From EPA PSD regulations.

2 The proposed emission rate changes are based upon the addition of the No. 6 Power Boiler, modification of the Lime Kiln-Mud Dryer and the deletion of the No. 1 Power Boiler, and No. 2 Power Boilers.

mill modifications, both the new No. 6 Power Boiler and the modified Lime Kiln-Mud Dryer will require BACT analysis for $NO_x$, CO and VOC. While the Bleach Plant sources will undergo modifications there will be a net reduction in VOC emissions from these sources and, therefore, a BACT analysis will not be required.

For the new No. 6 Power Boiler and the modified Lime Kiln-Mud Dryer a control technology must be selected and defended that will result in the maximum reduction in pollutant emissions considered achievable using current technology while considering energy requirements, environmental impacts, and economic impacts. The methodology used in this study to determine BACT follows the "Top Down" approach previously recommended by the EPA. However, it should be noted that pursuant to a settlement of litigation between EPA and industry trade groups, the "Top Down" requirements are not legally enforceable until established by a formal rulemaking procedure (56F.R. 34202 26, July 1991).

The "Top Down" methodology requires beginning the technology evaluation by looking at the control technology which results in the maximum level of emission reduction for a similar source which is currently available. If it is demonstrated that this level of control is not technically or economically feasible for the source under evaluation then the next most stringent level of control is evaluated. The process continues until an acceptable level is identified.

## PSD Increment Consumption

Federal PSD increments are established only for TSP, $SO_2$, and $NO_x$ as shown in Table 4-2. An ambient air quality analysis will be required to demonstrate that the PSD increments for $NO_x$ will not be exceeded by the mill modification project. Other PSD sources of $NO_x$ in the area must also be considered in the increment analysis. As previously detailed this is the only pollutant of the three for which a significant emission increase is predicted. The CHAMPION Pensacola Mill is located in a Class II area. Hence, the Class II increment for $NO_x$ must be met by the proposed project.

## National Ambient Air Quality Standards

An ambient air quality analysis must be conducted to demonstrate that the project's air quality impact plus applicable background levels do not exceed the NAAQS shown in Table 4-3. The only pollutants for which this demonstration is required are the criteria pollutants emitted in excess of the PSD significance levels identified in Table 4-1. Therefore, for this project, the NAAQS analysis is required for nitrogen dioxide, carbon monoxide, and volatile organic compounds. Florida has adopted the NAAQS for these pollutants; hence, by complying with the Federal standards, the state standards are also met.

## Impacts on Class I Areas

Any source within 100 kilometers of a Class I area must also comply with the significant levels for air quality impacts. Since the proposed facility is not within 100 kilometers of any Class I area, (see Figure 4-1) and no significant impact is anticipated at any Class I area, the proposed modification is not subject to this provision of the PSD review process. Furthermore, Florida DER discussions with the National Park Service indicated that the National Park Service will not require any additional air quality input analysis since the projected increase in emission is small and the distance to the nearest Class I area is so great.

## TABLE 4-2

## ALLOWABLE PSD INCREMENTS[1]
**($\mu g/m^3$)**

| | CLASS I | CLASS II | CLASS III |
|---|---|---|---|
| **SULFUR DIOXIDE** | | | |
| • Annual[2] | 2 | 20 | 40 |
| • 24-hour[3] | 5 | 91 | 182 |
| • 3-hour[3] | 25 | 512 | 700 |
| **TOTAL SUSPENDED PARTICULATE MATTER AND $PM_{10}$** | | | |
| • Annual[2] | 5 | 19 | 37 |
| • 24-hour[3] | 10 | 37 | 75 |
| **NITROGEN DIOXIDE** | | | |
| • Annual[2] | 2.5 | 25 | 50 |

[1] From EPA PSD Regulations

[2] Never to be exceeded.

[3] Not to be exceeded more than once per year.

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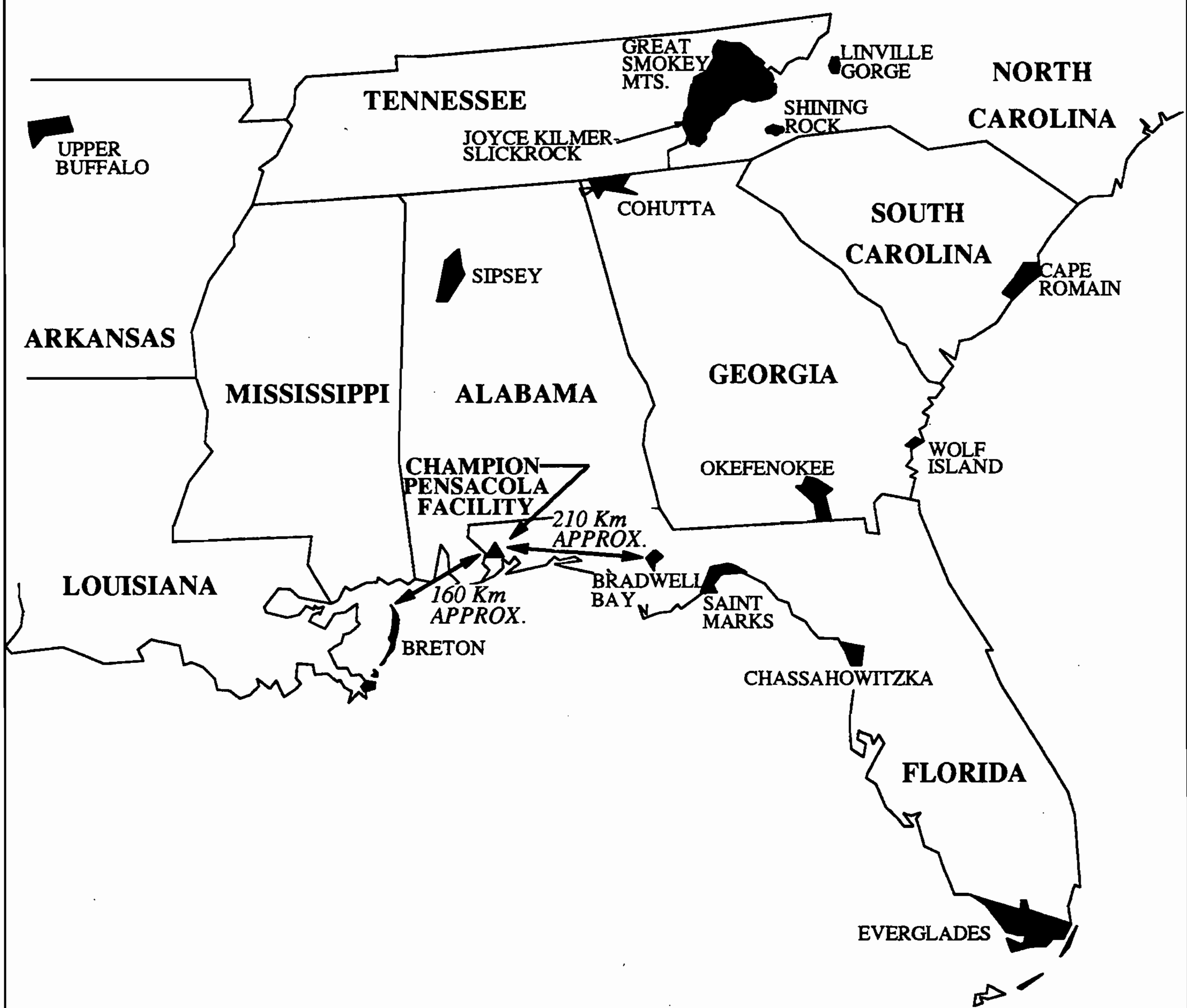
## TABLE 4-3

## FEDERAL NATIONAL PRIMARY AND SECONDARY AMBIENT AIR QUALITY STANDARDS

| POLLUTANT | TYPE OF STANDARD | AVERAGING TIME | COMPLIANCE FREQUENCY PARAMTER | CONCENTRATION | |
|---|---|---|---|---|---|
| | | | | $\mu g/m^3$ | ppm |
| Sulfur Oxides (as sulfur dioxide) | Primary | 24 hour<br>1 hour | Annual Maximum<br>Arithmetic Mean | 365 ~~367~~<br>80 | 0.14<br>0.03 |
| | Secondary | 3 hour | Annual Maximum | 1,300 | 0.5 |
| $PM_{10}$ | Primary and<br>Secondary | 24 hour<br>24 hour | Annual Maximum<br>Annual Arithmetic Average | 150<br>60 | ---<br>--- |
| Carbon Monoxide | Primary and<br>Secondary | 1 hour<br>8 hour | Annual Maximum<br>Annual Maximum | 40,000<br>10,000 | 35<br>9 |
| Ozone | Primary and Secondary | 1 hour | Annual Maximum | 235 | 0.12 |
| Nitrogen Dioxide | Primary and Secondary | 1 year | Arithmetic Mean | 100 | 0.05 |
| Lead | Primary and Secondary | 3 months | Arithmetic Mean | 1.5 | --- |




MAP IS NOT TO SCALE AND IS MEANT TO BE REPRESENTATIONAL OF DISTANCES ONLY

SOURCE:BASE MAP ADAPTED FROM U.S. EPA

**CHAMPION INTERNATIONAL CORPORATION**
**PENSACOLA FACILITY**
**CANTONMENT, ESCAMBIA COUNTY**
**FLORIDA**

**FIGURE 4-1**
**FEDERAL MANDATORY CLASS I AREAS IN THE VICINITY OF THE FACILITY**

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Additional PSD Impacts Analysis

Any source subject to PSD must also provide an analysis of any adverse impacts that might occur due to the project on:

- Visibility
- Soils
- Vegetation
- Growth

This analysis must be conducted for the area in which the proposed facility will have an impact.

## 4.2 FLORIDA DER REGULATIONS

### 4.2.1 Part II General Provisions

Section 17-2.210 requires that a permit be obtained prior to construction of an air emissions source unless specifically exempted. The proposed CHAMPION modifications are not exempted.

### 4.2.2 Part III Ambient Air Quality

The State of Florida Section at 17-2.300, has adopted ambient air quality standards that are equivalent to the NAAQS requirements for TSP, $PM_{10}$, Carbon Monoxide, Ozone, Lead, and $NO_x$. The 24-hour and annual standards for $SO_2$ are lower than those required by the NAAQS. A summary of the Florida Ambient Air Quality Standards for $SO_2$ are shown in Table 4-4.

**TABLE 4-4**

**FLORIDA DER SULFUR DIOXIDE AMBIENT AIR QUALITY STANDARDS**

| POLLUTANT | TYPE OF STANDARD | AVERAGING TIME | COMPLIANCE FREQUENCY PARAMETER | CONCENTRATION | |
|---|---|---|---|---|---|
| | | | | $\mu g/m^3$ | ppm |
| Sulfur Oxides (as sulfur dioxide) | Primary | 24-hour | Annual Maximum | 260 | 0.10 |
| | | 1-year | Arithmetic Mean | 60 | 0.02 |
| | Secondary | 3-hour | Annual Maximum | 1300 | 0.5 |



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#### 4.2.3 Part IV Area Designation and Attainment Dates

This part establishes areas in Florida that are not in attainment with ambient air quality standards presented in Part III of the state regulations. In addition, Class I, II, and III areas are established. The Pensacola Florida area is not considered to be in nonattainment of the ambient air standards and is designated as a Class II area.

#### 4.2.4 Part V New and Modified Source Review Requirements

Section 17-2.510 details PSD regulations which are equivalent to the Federal program described in Section 4.1 of this report.

#### 4.2.5 Part VI Emission Limiting and Performance Standards

Section 17-2.600 sets emissions limits for specific sources. The standards applicable to the CHAMPION mill modifications follow.

17-2.600 paragraph (4)(c)5 establishes a total reduced sulfur (TRS) limit of 20 ppm by volume on a dry basis at standard conditions corrected to 10% oxygen on a 12-hour average for the Lime Kiln. Further a TRS continuous emission monitor (CEM) will be required. Specific information for the TRS CEM is provided at 17-2.710 of the state regulations.

17-2.600 paragraph (5)(b)1-4 establishes limits for visible emissions, particulate matter, sulfur dioxide, and nitrogen oxides for new fossil fuel steam generators with more than 250 million Btu per hour heat input. The limits are in the form of specific references to the appropriate NSPS discussed in Section 4-1 of this report.

17-2.620 makes provisions that any storing, pumping handling, processing, loading, unloading or use in any process or installation of VOC shall have vapor emission control devices or systems deemed necessary by the agency. The methanol storage vessels will be equipped with a conservation vent and nitrogen blanketing.

17-2.630 establishes guidelines for Best Available Control Technology (BACT) analysis for sources required to report such an analysis (e.g., the proposed CHAMPION mill modifications subject to PSD). The state gives consideration to the following in its review of BACT determinations:

- Any US EPA BACT determination for the applicable source category.
- New Source Performance Standards.
- All scientific, engineering, and technical information available to DER.
- Emission limits on BACT determinations for applicable source categories of other states.
- The social and economic impact of the application of such technology.

17-2.660 makes provisions to adopt all Federal NSPS.

# SECTION 5
# DETERMINATION OF BEST AVAILABLE CONTROL TECHNOLOGY

## 5.1 BEST AVAILABLE CONTROL TECHNOLOGY

The Clean Air Act, as amended in 1977 and 1990, prescribes several technology-based limitations affecting new or modified sources of air pollutant emissions. One such limitation is that of the New Source Performance Standards (NSPS) set by the United States EPA and adopted by the Florida DER. NSPS require that specific categories of new or modified stationary sources meet uniform national standards for specific pollutants based on the degree of emission limitation achievable through utilization of the best demonstrated technology available at the time of their promulgation.

In addition to the technology-specific requirements, as presented in the NSPS, overall facility emissions of criteria pollutants, of significant quantity, from any pollutant source will be regulated under provisions found in the Prevention of Significant Deterioration (PSD) regulation. The PSD regulation requires that the Best Available Control Technology (BACT) be used to control triggering pollutant emissions. 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 for each pollutant subject to regulation under the Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions

allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions 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 reduction achievable by implementation of such design, equipment, work practice, or operation, and shall provide for compliance by means which achieve equivalent results.

Basically, a BACT determination is a case-by-case analysis that addresses the technological question of whether a proposed control technique can be considered BACT for the particular application or whether a more stringent level of emission control should be used. This determination involves an assessment of the availability of applicable technologies capable of sufficiently reducing a specific pollutant emission, as well as weighing the economic, energy, and environmental impacts of using each technology.

The methodology used in this study to determine BACT follows the "top-down" approach previously recommended by the EPA. However, it should be noted that pursuant to a settlement of litigation between EPA and industry trade groups, the "top-down" BACT requirements are not legally enforceable until established by a formal rulemaking procedure (56 F.R. 34202 26, July 1991). The "top-down" BACT contains the following elements:

- Determination of the most stringent control alternatives potentially available.

- Discussion of the technical and economic feasibility of each alternative.

- Assessment of energy and environmental impacts, including toxic and hazardous pollutant impacts, of feasible alternatives.

- Selection of the most stringent control alternative that is technically and economically feasible and that provides the best overall control of all pollutants.

The selected BACT must be at least as stringent as NSPS and State Implementation Plan limits for the source.

This BACT review is presented for each pollutant emitted in amounts that exceed the PSD significance levels. BACT applies to each emissions unit at which a net emissions increase in the pollutant would occur as a result of a physical change or change in the method of operation in the unit. Therefore, the BACT analysis for the proposed CHAMPION Pensacola mill modifications considers emission controls for nitrogen oxides ($NO_x$), carbon monoxide (CO), and volatile organic compounds (VOC) from specific sources. A listing of the sources required to undergo a BACT analysis and the PSD affected pollutants is presented below:

- No. 6 Power Boiler
  - Nitrogen Dioxide
  - Carbon Monoxide
  - Volatile Organic Compounds

- Lime Kiln - Mud Dryer
  - Nitrogen Dioxide
  - Carbon Monoxide
  - Volatile Organic Compounds

## 5.2 BACT ANALYSIS FOR THE NO. 6 POWER BOILER

BACT analyses on the new No. 6 Power Boiler are required for the following PSD affected pollutants: $NO_x$, CO, and VOC. A review of the BACT/LAER clearinghouse for natural gas fired boilers was conducted and is included in Table 5-1. The clearinghouse entries include boilers with add-on controls as well as boilers utilizing good combustion practice to minimize $NO_x$, CO and VOC emissions. It is important to note that emissions of these pollutants are interrelated and that combustion modifications which are directed at minimizing one pollutant (e.g., $NO_x$) can, alternatively, result in an increase in other pollutant emissions (e.g., VOC and/or CO). Therefore, in evaluating BACT for a combustion source without add-on controls, it is important to recognize this relationship and to develop a control strategy that results in a reasonable overall emissions control plan. It is not reasonable to expect that the lowest emission rates reported for each pollutant by any source can be met by the proposed No. 6 Power Boiler.

Based upon the information supplied in the BACT/LAER Clearinghouse and subsequent investigation it appears that none of the listed boilers incorporate add-on controls for CO or VOC. Only one of the sixteen BACT/LAER Clearinghouse entries included in Table 5-1 had add-on controls for nitrogen dioxide emissions (Westinghouse Electric, California). All other sources utilized low $NO_x$ burners and good combustion control to meet the BACT levels identified.

However, in order to follow the "Top Down" BACT analysis procedure, Champion has evaluated add-on controls to determine if such process could be considered BACT for the proposed No. 6 Power Boiler. The applicable technologies are discussed and the cost associated with their application to the proposed No. 6 boiler is included in the following subsections.

## TABLE 5-1

## BACT/LAER CLEARINGHOUSE
## SUMMARY OF NATURAL GAS FIRED BOILERS

| FACILITY | DATE PERMIT ISSUED | BOILER HEAT INPUT (MMBtu/hr) | $NO_x$ | CO | VOC |
|---|---|---|---|---|---|
| | | | (LB/MMBtu) | | |
| Hopewell Cogen, VA | 07/01/88 | 197 | 0.1 | 0.09 | 0.005 |
| Kamine Carthage, NY | 07/01/88 | 113 | 0.10 | 0.16 | 0.1 |
| Westinghouse Elect., CA | 08/17/88 | 380 | .015[c] | ----[a] | ----[a] |
| Kamine South Glens Falls, NY | 09/01/88 | 113 | 0.10 | 0.16 | 0.10 |
| Willamette Ind., Bennettsville, SC | 09/29/88 | 305 | 0.12 (LAER) | 0.04 | ----[a] |
| Boise Cascade, International Falls, MN | 05/12/89 | #1 373<br>#2 205 | 0.05[b]<br>0.05 | 0.09<br>0.09 | 0.009<br>0.009 |
| Newsprint South, Genada Ms. | 08/08/89<br>08/08/89 | 227.4<br>176.5 | 0.2<br>0.2 | 0.04<br>0.04 | 0.0014<br>0.0014 |
| Dupont, MS | 11/28/89 | 231 | 0.12 | 0.065 | 0.0078 |
| Consolidated Paper, WI | 01/26/90 | 566.5 | 0.05 | 0.12 | 0.0018 |
| Clark County Industrial Council, AR | 04/23/90 | 154.7 | 0.1 | 0.04 | 0.0014 |
| Nekoosa WI Region V | 05/09/90 | 150 | 0.05 | ----[a] | -----[a] |
| Gaylord Cont., Bolyolusa, LA | 07/11/90 | 235 | 0.12 | ----[a] | ----[a] |
| Willamette Campti, LA | 02/04/91 | 335 | 0.12 | 0.04 | 0.003 |
| Minn. Corn Processing | 06/25/91 | 178.7 | 0.125 (24/hr avg.) | ----[a] | ----[a] |
| James River, MI | 09/17/91 | 226.7 | 0.06 | 0.09 | 0.025 |
| Champion, Pensacola | NA | 533 | 0.06 | 0.1 | 0.01 |

(a) No data provided for this pollutant.
(b) Visibility impact on Class 1 area.
(c) Lo-$NO_x$, FGR, SCR

### 5.2.1 BACT for Nitrogen Oxides

Nitrogen oxides are products of all conventional combustion processes. Nitric oxide (NO) is the predominant form of $NO_x$ emitted by such sources with lesser amounts of nitrogen dioxide ($NO_2$) and nitrous oxide ($N_2O$). The NO can further oxidize in the atmosphere to $NO_2$. The aforementioned nitrogen oxides are referred to collectively as $NO_x$. The generation of $NO_x$ from fuel combustion is a result of two formation mechanisms. Fuel $NO_x$ is formed by the reaction of chemically bound nitrogen in the fuel and oxygen in the combustion air at high temperature in the combustion zone. Thermal $NO_x$ is produced by the reaction of the molecular nitrogen and oxygen contained in the combustion air at high temperature in the combustion zone. The main factors influencing the $NO_x$ reaction are combustion temperature, residence time within the combustion zone, amount of fuel-bound nitrogen, and oxygen levels present in the combustion zone. Since the No. 6 boiler is fueled with natural gas which is inherently low in fuel-bound nitrogen, only thermal $NO_x$ formation is important.

A number of control techniques have been used to reduce $NO_x$ emissions from combustion processes. Selective catalytic reduction of $NO_x$ by ammonia ($NH_3$) was identified as the most stringent method of $NO_x$ control for certain combustion processes because of the relatively high removal efficiencies that can be achieved under proper operating conditions. Selective catalytic reduction is an add-on control most commonly used in the United States on gas-fired industrial and utility boilers and combustion turbines. Relatively high $NO_x$ removal efficiencies approaching 90 percent can be obtained with selective catalytic reduction under ideal conditions. Flue gas denitrification (FGDN) is another add-on $NO_x$ control technology that can also approach 90 percent removal efficiency by using a wet scrubbing method.

Selective noncatalytic reduction was the next most stringent control technology identified. It is also an add-on control technology that utilizes ammonia, urea, or other reducing compounds without a catalyst present. Selective noncatalytic reduction is normally capable of attaining $NO_x$ removal efficiencies in the range of 35 to 55 percent.

Combustion modification techniques, such as low $NO_x$ burners, combustion controls, and flue gas recirculation can also be used to reduce $NO_x$ emissions from natural gas firing by limiting thermal $NO_x$ formation. Such techniques limit excess air and reduce peak flame temperatures and are more aptly described as process modifications rather than add-on (post-combustion) controls. The aforementioned technologies are generally capable of reducing $NO_x$ emissions by up to 50 percent compared to a combustion unit without such controls.

#### 5.2.1.1 Selective Catalytic Reduction (SCR)

In the selective catalytic reduction (SCR) process, $NO_x$ is reduced to $N_2$ and $H_2O$ by ammonia ($NH_3$) within a temperature range of approximately 540-840°F in the presence of a catalyst, usually a base metal. The lower end of the operating temperature range is feasible when the acid gas impurity level is relatively low. $NH_3$ has been used as an acceptable reducing agent for $NO_x$ in combustion gases because it selectively reacts with $NO_x$ while other reducing agents such as $H_2$, CO, and $CH_4$ also readily react with $O_2$ in the gases. In a typical configuration, flue gas from the combustion source is passed through a reactor which contains the catalyst bed. Parallel flow catalyst beds may be used in which the combustion exhaust gas flows through channels rather than pores to minimize blinding of the catalyst by particulate matter. Ammonia in vapor phase is injected into the flue gas downstream of the other control equipment that may be required for the particular combustion process for removal of pollutants such as particulate matter and sulfur dioxide. The ammonia is normally injected at a 1:1 molar ratio based upon the $NO_x$ concentration in the flue gas. Major capital equipment for SCR consists of the reactor and catalyst, ammonia storage tanks, and an ammonia injection system using either compressed air or steam as a carrier gas. Because of the toxic characteristics of $NH_3$, appropriate storage and handling safety features must be provided if anhydrous $NH_3$ is used. $NO_x$ removal efficiencies approaching 90 percent have been reported when using SCR systems for boiler and gas turbine applications.

Table 5-2 lists the total capital investment for an SCR system based upon information received from Engelhard for treatment of a 13,000 scfm gas stream. Basic equipment cost was then scaled up using the six-tenths factor rule based upon the 105,190 scfm flue gas flow rate from the CHAMPION Power Boiler. Total purchased equipment cost, direct installation costs, and indirect costs were based upon factors given in the U.S. EPA OAQPS Control Cost Manual. Ammonia handling and safety design costs were scaled down from an estimate for a resource recovery facility based upon the facility uncontrolled $NO_x$ emission rates (which are directly proportional to $NH_3$ consumption rates) and the six-tenths factor rule. Annualized cost information is presented in Table 5-3 based upon direct and indirect operating cost factors given in the OAQPS Control Cost Manual for other types of control equipment. These factors were deemed to be the most appropriate ones to use for SCR system. Operating costs include a cost for natural gas reheat of the boiler exhaust gas from the 350°F discharge temperature to the 540°F lower limit of the SCR operating temperature range. Catalyst replacement cost was based upon a three year life given in the vendor warranty. Cost effectiveness was calculated based upon a $NO_x$ inlet emission rate of 140 tons per year (equivalent to a flue gas concentration of approximately 50 ppmdv) to the SCR system and a vendor estimated removal efficiency of 85.5 percent. A baseline emission rate of 140 tons per year was used (0.06 lb/MM Btu @ 533 MM Btu/hr) since the power boiler is a new unit that is equipped with low $NO_x$ burners and flue gas recirculation.

The calculated cost effectiveness of more than $7,200 per ton of $NO_x$ removed is higher than any guidelines provided by the U.S. EPA.

This cost effectiveness value can be compared with EPA's calculated cost effectiveness values associated with the $NO_x$ limitations contained in the NSPS for Industrial Boilers, 40 CFR 60, Subpart Db. These standards promulgated in 1986, considered an incremental cost effectiveness

# Table 5-2
# Champion- Pensacola Power Boiler
# Capital Costs for NOx Control
# Engelhard SCR System

| | | | |
|---|---|---|---|
| Vendor Quote: | 1.15 *(A)* | | $1,575,519 [a] |
| Purchased Equipment Cost: | | | |
| Control device and auxillary equipment | 1.00 *(A)* [b] | | $1,370,000 *(A)* |
| Instruments and controls | 0.10 *(A)* | x 1.5 (for CEM, feedback)[c] | $205,500 |
| Taxes | 0.03 *(A)* | | $41,100 |
| Freight | 0.05 *(A)* | | $68,500 |
| Total purchased equipment cost : | | | $1,685,100 *(B)* |
| Direct Installation Cost: | | | |
| Foundations and supports | 0.08 *(B)* | | $134,800 |
| Erection and handling | 0.14 *(B)* | | $235,900 |
| Electrical | 0.04 *(B)* | | $67,400 |
| Piping | 0.02 *(B)* | | $33,700 |
| Insulation | 0.01 *(B)* | | $16,900 |
| Painting | 0.01 *(B)* | | $16,900 |
| Total direct installation costs: | | | $505,600 |
| Total direct costs: | | | $2,190,700 |
| Indirect Costs: | | | |
| Engineering and supervision | 0.10 *(B)* | | $168,500 |
| Construction and field expenses | 0.05 *(B)* | | $84,300 |
| Construction fee | 0.10 *(B)* | | $168,500 |
| Startup | 0.02 *(B)* | | $33,700 |
| Performance test | 0.01 *(B)* | | $16,900 |
| Contingencies | 0.03 *(B)* | | $50,600 |
| Total indirect costs: | | | $522,500 |
| Ammonia Handling & Safety Design Cost [d] = | $300,000 x (0.5 x 140.2 tons/year of NOx / 455.2 tons/year of NOx)^0.6 = | | $97,600 |
| Total Installed Capital Costs : | | | $2,810,800 |

[a] *Based on a July, 1990 vendor cost estimate ($450,000 for 13,000 scfm) that includes auxillary equipment, instruments and controls. Six-tenth factor scaleup was used based on 13,000 scfm quote basis vs. 105,190 scfm power boiler flue gas flow rate. The costs are also scaled to present day figures by utilizing the CE cost index. Sept 1992 CE index= 357.1, 1990 CE index= 357.6.*
[b] *Factors in this column taken from U.S. EPA OAQPS Control Cost Manual, EPA 450/3-90-006A, January 1990 for thermal and catalytic incinerators, and carbon adsorbers.*
[c] *Multiplier from Capital and Operating Costs of Selected Air Pollution Control Systems, EPA 450/5-80-002, December 1978 (GARD Manual).*
[d] *Scaled down from cost estimate for the Pennsauken Resource Recovery Project BACT Assessment for Control of NOx Emissions Top-Down Technology Consideration. Ogden Martin Systems of Pennsauken, Inc., Dec.15, 1988, adjusted to current $ and reflecting half (0.5) of the NH3 consumption of Exxon DeNOx.*

# Table 5-3
## Champion- Pensacola Power Boiler
## Annualized Costs for NOx Control
## Engelhard SCR System

| Cost item | Computation method | | Cost, dollars | |
|---|---|---|---|---|
| Direct operating costs | | | | |
| Operating Labor | | | | |
| Operator | $15.97 /hr x 3 shifts/day x 0.5 hrs/shift x 365 days/yr | | $8,744 | |
| Supervision | 15% of operator labor cost | | $1,312 | |
| Maintenance (general) | | | | |
| Labor | $15.97 /hr x 3 shifts/day x 0.5 hrs/shift x 365 days/yr | | $8,744 | |
| Materials | 100% of maintenance labor | | $8,744 | |
| Utilities | | | | |
| Electricity | $0.0420 /kWh x 287,497 kWh/yr | | $12,075 | |
| Gas | $3.070 /M ft.^3 x 52,735 M ft^3/yr | | $161,897 | |
| Ammonia | $350.000 /ton x 51.8 tons/yr | | $18,129 | |
| Total Direct Operating Costs (A) | Subtotal of above | | | $219,600 *(A)* |
| Indirect operating (fixed) costs | | | | |
| Overhead | 60% of operating and maintenance labor & materials | $27,542 | $16,525 | |
| Property Tax | 1% of total installed capital costs, | $2,810,800 | $28,108 | |
| Insurance | 1% of total installed capital costs, | $2,810,800 | $28,108 | |
| Administration | 2% of total installed capital costs, | $2,810,800 | $56,216 | |
| Capital Recovery | SCR Unit<br>CRF, 0.1627 x (total installed capital costs - catalyst costs)<br>(catalyst costs = $259,440 x 1.08 (including taxes & freight))<br>(at 10% interest & 10 years) | | $411,844 | |
| | Catalyst<br>CRF, 0.4021 x (catalyst costs = $259440)<br>(at 10% interest & 3 years) | | $104,325 | |
| Total Fixed Costs (B) | Subtotal of above | | | $645,100 *(B)* |
| Total Annualized Costs (C) | (A+B) | | | $864,700 *(C)* |

| Cost Effectiveness | | | |
|---|---|---|---|
| | NOx Emissions (TPY) | 140.16 | |
| | NOx Removal, % | 85.5 | |
| | Cost, $/ton NOx Removed | | $7,200 |

of \$4,000/ton unreasonable. Also considered unreasonable was an incremental cost effectiveness of \$2,500/ton when switching from residual oil to natural gas. The NSPS for small industrial boilers, subpart Dc,. proposed in 1989, considered a cost of \$6,000/ton unreasonable for national $NO_x$ standards.

Hence, based upon the analysis given above, SCR is discounted as BACT for $NO_x$ control on the power boiler.

#### 5.2.1.2 Flue Gas Denitrification (FGDN)

Flue gas denitrification (FGDN) systems use wet scrubbing technology to react absorbed $SO_2$ with $NO_x$ to form molecular nitrogen and can achieve $NO_x$ removal efficiencies approaching 90 percent. Consequently, FGDN systems are designed for combustion sources that burn relatively high sulfur fuel. However, since the power boiler under consideration is fired with essentially sulfur-free natural gas fuel, there is no source of $SO_2$ for absorption into the scrubbing liquid. Thus, FGDN is dismissed as BACT for $NO_x$ control on the power boiler because of technical infeasibility.

#### 5.2.1.3 Selective Noncatalytic Reduction (SNCR)

Selective non-catalytic reduction (SNCR) involves ammonia or urea injection, but not in the presence of a catalyst. Two major SNCR systems are commercially available: the Exxon Thermal $DeNO_x$ ammonia injection system and the Nalco Fuel Tech $NO_x$OUT urea injection system. A third system, the Noell (formerly the Emcotek) Two-Stage $DeNO_x$ urea/methanol injection system, has undergone extensive pilot testing and a full scale demonstration on one MSW incinerator line in Switzerland.

#### 5.2.1.4 Exxon Thermal $DeNO_x$

Exxon Thermal $DeNO_x$ ammonia injection, like SCR, uses the $NO_x$/ammonia reaction to convert $NO_x$ to molecular nitrogen. However, without catalyst use or supplemental hydrogen injection, $NO_x$ reduction reaction temperatures must be tightly controlled between 1,600 and 2,200°F (between 1600 and 1800°F, for higher efficiency). Below 1,600°F and without hydrogen also being injected, ammonia will not fully react, resulting in what is called ammonia breakthrough or slip. If the temperature rises above 1,800°F, a competing reaction begins to predominate:

$$NH_3 + \frac{5}{4} O_2 \longrightarrow NO + \frac{3}{2} H_2O$$

As indicated above, this reaction increases NO emissions. Therefore, the region within the boiler where ammonia is injected must be carefully selected to ensure the optimum reduction reaction temperature will be maintained.

Thermal $DeNO_x$ is an available technology that has been used on gas-fired boilers and gas turbines and commonly achieves $NO_x$ removals up to 50 to 60% within the narrow temperature range noted previously. However, since ammonia is injected at a 2:1 molar ratio based upon the flue gas $NO_x$ concentration, there is generally some "slip" of ammonia which does not react completely and that can potentially cause odors. At the power boiler flue gas flow rate of 105,190 scfm and a "slip" concentration of 20 ppmv, ammonia emissions could amount to 24 tons per year. The potential ammonia "slip" concentration of 20 ppmv is almost one-half the uncontrolled $NO_x$ concentration of 50 ppmv.

Tables 5-4 and 5-5 summarize capital costs and annualized costs respectively, for an Exxon Thermal $DeNO_x$ SNCR system installed on the CHAMPION boiler. It was assumed that the ammonia injection would occur within the boiler configuration at a point where the combustion

# Table 5-4
# Capital Costs for Exxon Thermal DeNOx
# Champion- Pensacola

| | | | | Included in Exxon cost | |
|---|---|---|---|---|---|
| Volumetric Flow Rate, acfm | | | | | 161,000 |
| Purchased Equipment Cost: | | | | | |
| Control device and auxillary equipment (tank, vaporizer, etc) | | (provided by Exxon) | | 1.0 | $183,200 *(A)*[a] |
| Instruments and controls | 0.10 *(A)* | x | 1.5 (CEM, feedback) | 0.1 | $27,500 |
| Taxes | 0.03 *(A)* | | | --- | $5,500 |
| Freight | 0.08 *(A)* | | | --- | $14,700 |
| Total purchased equipment cost : | | | | 1.1 *(A)* | $230,900 *(B)* |
| Direct Installation Cost: | | | | | |
| Foundations and supports | 0.06 *(B)* | (venturi scrubber, incinerator) | | 0.06 *(B)* | $13,900 |
| Erection and handling | 0.40 *(B)* | (absorber) | | 0.40 *(B)* | $92,400 |
| Electrical | 0.04 *(B)* | (incinerator, adsorber) | | 0.04 *(B)* | $9,200 |
| Piping | 0.03 *(B)* | (adsorber, incinerator) | | 0.03 *(B)* | $6,900 |
| Insulation | 0.01 *(B)* | (absorber/adsorber) | | 0.01 *(B)* | $2,300 |
| Painting | 0.01 *(B)* | (absorber/adsorber) | | 0.01 *(B)* | $2,300 |
| Total direct installation costs: | | | | 0.55 *(B)* | $127,000 |
| Total direct costs: | | | | | $357,900 |
| Indirect Costs: | $324,300 (per Exxon quote) | | | | $324,300 [b] |
| Engineering and supervision | 0.10 (B) | (all except ESP) | Exxon Estimate | | ----- |
| Exxon engineering | | | Exxon Estimate | | ----- |
| Construction and field expenses | 0.10 *(B)* | (absorber, venturi scrubber) | Exxon Estimate | | ----- |
| Construction fee | 0.10 *(B)* | | Exxon Estimate | | ----- |
| Startup | 0.01 *(B)* | (absorber, venturi scrubber) | | | $2,300 |
| Performance test | 0.01 *(B)* | | | | $2,300 |
| Contingencies | 0.03 *(B)* | x | 5 (efficiency guarantee) | | ----- |
| Total indirect costs: | | | | | $328,900 |
| Total installed capital costs : | | | | | $686,800 |
| Exxon Licensing Fee: | ( per Exxon quote ) | | | | $80,000 |

[a] *Installed equipment cost (euipment + field labor)*[b]*: ( $192,200 + $120,100* ) = 0.55(B) + 1.10(A) = 0.55(1.100(A)) + 1.10(A) = $312,300
*solving for A : 312300 /(1.10 x 0.55 + 1.10) = $183,200*

[b] *These values are scaled up using the six-tenths factor rule..*

# Table 5-5
## Annualized Costs for Exxon Thermal DeNOx
## Champion- Pensacola

| Cost item | Computation method | Cost, dollars |
|---|---|---|
| Direct operating costs | | |
| Operating Labor | | |
| Operator | $15.97 /hr x 3 hrs/shift x 3 shifts/day x 365 days/yr | $52,460 |
| Supervision | 15% of operator labor cost | $7,870 |
| Operating materials | As required, ( 0.0% of total installed capital costs) | $0 |
| Maintenance (general) | | |
| Labor | $15.97 /hr x 1 hr/shift x 3 shifts/day x 365 days/yr | $17,490 |
| Materials | 100% of maintenance labor | $17,490 |
| Replacement parts | | |
| Materials | As required, ( 2.0% of total installed capital costs) | $13,740 |
| Labor | 100% of replacement materials | $13,740 |
| Utilities | | |
| Electricity | $0.042 /kWh x 10,193 kWh/yr | $430 |
| Steam | $4.130 /M lb x 11,213 M lb/yr | $46,310 |
| Ammonia | $350.000 /ton x 33.1 ton/yr | $11,600 |
| Total Direct Operating Costs (A) | Subtotal of above | $181,130 (A) |
| Indirect operating (fixed) costs | | |
| Overhead | 60% of operating and maintenance labor and materials, $95,310 | $57,190 |
| Property Tax | 1% of total installed capital costs, $686,800 | $6,870 |
| Insurance | 1% of total installed capital costs, $686,800 | $6,870 |
| Administration | 2% of total installed capital costs, $686,800 | $13,740 |
| Capital Recovery | CRF, 0.1627 x (total installed capital costs + licensing fee) (at 10% interest and 10 years) | $124,790 |
| Total Fixed Costs (B) | Subtotal of above | $209,460 (B) |
| Total Annualized Costs (C) | (A+B) | $390,590 (C) |

*Tons Of NOx Emitted:* *140.2*

*Cost Effectiveness At Emission Reduction, $/Ton Of NOx Reduced*

*50%* = *$5,570*

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gases are maintained in a temperature range of 1,600 to 1,800°F. Table 5-4 details the total capital investment for an Exxon Thermal $DeNO_x$ system based upon information given in an Exxon study that evaluates the technology. Basic equipment cost was derived from direct cost information provided by Exxon for treatment of a 77,800 scfm flue gas stream. The Exxon direct cost information was scaled up using the six-tenths factor rule based upon the 105,190 scfm flue gas flow rate from the CHAMPION Power Boiler. Then total purchased equipment cost, direct installation costs, and indirect costs were based upon factors given in the OAQPS Control Cost Manual for other types of control equipment as indicated in Table 5-4. As with the SCR capital cost analysis, anhydrous ammonia handling safety design costs were scaled down from an estimate for a resource recovery facility based upon the facility uncontrolled $NO_x$ emission rates and the six-tenths factor rule.

Annualized cost information is presented in Table 5-5 based upon direct and indirect operating cost factors as suggested in the OAQPS Control Cost Manual. Compressed air was assumed to be the $NH_3$ carrier gas although steam could also be used. Premised upon a baseline $NO_x$ emission rate of 140 tons per year, cost effectiveness was based on an expected $NO_x$ removal efficiency of 50%. The cost effectiveness for 50% removal efficiency is $5,570 per ton of $NO_x$ removed.

Having accounted for economic and energy considerations in the cost analysis above, it can be seen that Exxon Thermal $DeNO_x$ is not cost effective based upon the same reasoning given in the previous discussion for SCR. Also noteworthy is the fact that this economic analysis represents a "best case" condition. The economic analysis was preformed using the six-tenths factor scaling rule due to a lack of final design data for the proposed power boiler. The vendor relayed a serious concern regarding the feasibility of this application on the proposed boiler. This concern is based upon the fact that the inlet loading of 140 tons per year or approximately 50 ppmvd is a very low value and with this low load condition it is extremely difficult to achieve proper mixing. This leads to limited $NO_x$ reduction without increased ammonia injection rates and the associated higher reagent costs. Furthermore, the comparatively low baseline $NO_x$

emission rate of 140 tons per year would yield only a 70 ton per year decrease in $NO_x$ emissions at a removal efficiency of 50 percent while potentially creating 24 tons per year of $NH_3$ emissions. Therefore, Exxon Thermal $DeNO_x$ is not viable as BACT for the CHAMPION Power Boiler.

### 5.2.1.5 Nalco Fuel Tech $NO_x$Out

The Electric Power Research Institute (EPRI) discovered and patented the chemical process of using urea ($CO(NH_2)_2$) to convert nitrogen oxides to nitrogen and water. This process of urea injection has been further developed and is being marketed by Nalco Fuel Tech, Inc. as the $NO_x$OUT process. In routine applications, liquid urea and proprietary enhancers (oxygenated hydrocarbons) are mixed with water and pumped into the flue gas as an aqueous solution. Atomization at injection nozzles is assisted by auxiliary compressed air or steam, similarly to the Exxon Thermal $DeNO_x$ process. The $NO_x$OUT process is based on the following chemical reaction:

$$CO(NH_2)_2 + 2\ NO + \frac{1}{2}O_2 \longrightarrow 2N_2 + CO_2 + 2H_2O$$

In the above reaction, one mole of urea is required to react with two moles of NO (i.e., a stoichiometric ratio of 0.5:1). In order to achieve a desired level of removal, greater than stoichiometric quantities of urea must be injected. Manufacturer guidance indicates that a molar ratio of 0.75 - 1 :1 (urea to $NO_x$ ) is normally required.

The reaction is temperature dependent. Urea injected alone has a high $NO_x$ reduction activity between 1700 and 1900°F. With process enhancers and adjusted concentrations, the $NO_x$OUT process is effective from 1500° to 2100°F. Enhancers alone are used between 1000 and

1500°F. A 50% urea solution is typical but solutions as low as 10% may be used. In order to optimize $NO_x$ reduction, different urea and chemical enhancer solutions may be injected at different temperature levels.

The urea (in storage and process piping) must be kept above 70°F to avoid crystallization. Recirculation pumps are also used to prevent crystallization.

$NO_x$OUT technology is applicable to certain types of stationary combustion equipment. As with Thermal De$NO_x$, $NO_x$ removal efficiencies will vary depending on the combustion equipment and system configuration. Performance is based on placement of injectors and sufficient mixing of flue gases within the specified temperature range. The $NO_x$OUT process is generally deemed impractical for application to $NO_x$ sources with large load variations and also to gas turbines.

The capital equipment required for the $NO_x$OUT process is similar to that required for Exxon Thermal De$NO_x$ and includes the following:

- Liquid urea storage tank.
- Feed system (pumps, controllers).
- Process monitoring equipment.
- Atomization assist system (steam or air).
- Process piping (pipes, nozzles, mixer).

Tables 5-6 and 5-7 summarize the capital costs and annualized costs respectively, for the $NO_x$OUT system. It was also assumed for the system that the urea injection would occur within the boiler configuration at a point where the combustion gases are maintained in a temperature range of 1700 - 1900°F. Equipment cost was derived from direct cost information provided by Nalco Fuel Tech for treatment of the 105,190 scfm flue gas flow from the CHAMPION Power Boiler. The factors in the OAQPS Control Cost Manual were once again the basis for total purchased equipment cost, direct installation costs, and indirect costs.

# Table 5-6
# Capital Costs for NALCO/Fuel Tech NOxOUT
# Champion- Pensacola

| | | | | | |
|---|---|---|---|---|---|
| Volumetric Flow Rate, acfm | | | | | 161,000 |
| Installed Costs: From NALCO/Fuel Tech - | Equipment & Services & Licensing Fee= | | $470,000 | | |
| | Installation = | | $75,000 | | |
| | | | $545,000 | | $545,000 |
| | | | | Included in Fuel Tech cost | |
| Purchased Equipment Cost: | | | | | |
| Control device and auxillary equipment (tank, vaporizer, etc) | | | | 1.0 | $267,700 *(A)* [(a)] |
| Instruments and controls | 0.10 *(A)* | x | 1.5 (CEM, feedback) | 0.1 | $40,155 |
| Taxes | 0.03 *(A)* | | | --- | $8,000 |
| Freight | 0.08 *(A)* | | | --- | $21,400 |
| Total purchased equipment cost : | | | | 1.10 *(A)* | $337,255 *(B)* |
| Direct Installation Cost: | | | | | |
| Foundations and supports | 0.06 *(B)* | (venturi scrubber, incinerator) | | --- | $20,200 |
| Erection and handling | 0.40 *(B)* | (absorber) | | 0.40 *(B)* | $134,900 |
| Electrical | 0.04 *(B)* | (incinerator, adsorber) | | 0.04 *(B)* | $13,500 |
| Piping | 0.03 *(B)* | (adsorber, incinerator) | | 0.03 *(B)* | $10,100 |
| Insulation | 0.01 *(B)* | (absorber/adsorber) | | 0.01 *(B)* | $3,400 |
| Painting | 0.01 *(B)* | (absorber/adsorber) | | 0.01 *(B)* | $3,400 |
| Total direct installation costs: | | | | 0.49 *(B)* | $185,500 |
| Total direct costs: | | | | 1.49 *(B)* | $522,755 |
| Indirect Costs: | | | | | |
| Engineering and supervision | 0.10 *(B)* | (all except ESP) | | --- | $33,700 |
| Fuel Tech process design | | ( 363800 - | 267700 ) | --- | $96,100 |
| Construction and field expenses | 0.10 *(B)* | (absorber, venturi scrubber) | | --- | $33,700 |
| Construction fee | 0.10 *(B)* | | | --- | $33,700 |
| Startup | | *(per NALCO/Fuel Tech quote)* [(b)] | | --- | $31,200 |
| Performance test | 0.01 *(B)* | | | --- | $3,400 |
| Contingencies | 0.03 *(B)* | x | 5 (efficiency guarantee) | --- | $50,600 |
| Total indirect costs: | | | | 0.00 | $282,400 |
| Total installed capital costs : | | | | 1.49 (B) | $805,155 |
| *NALCO/Fuel Tech Licensing Fee (per NALCO/Fuel Tech estimate)* [(c)]: | | | | | $0 |

[(a)] *Total installed cost minus the start-up and licensing fee* [(c)]*: ( $363,800 + $75,000* ) = 1.49(B) = 1.49(1.100(A)) = *$438,800*
*solving for A : 438800 /(1.100 x 1.49) =* $267,700

[(b)] *These values are scaled up using the six-tenths factor rule..*
[(c)] *A licensing fee of $75,000 was assumed from a previous cost estimate.*

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# Table 5-7
# Annualized Costs for NALCO/Fuel Tech NOxOUT System
# Champion- Pensacola

| Cost item | Computation method | Cost, dollars |
|---|---|---|
| Direct operating costs | | |
| Operating Labor | | |
| Operator | $15.97 /hr x 3 workers x 3 working hrs/day x 365 days/yr | $52,460 |
| Supervision | 15% of operator labor cost | $7,870 |
| Operating materials | As required, ( 0.0% of total installed capital costs) | $0 |
| Maintenance (general) | | |
| Labor | $15.97 /hr x 1 workers x 3 working hrs/day x 365 days/yr | $17,490 |
| Materials | 100% of maintenance labor | $17,490 |
| Replacement parts | | |
| Materials | As required, ( 2.0% of total installed capital costs) | $16,100 |
| Labor | 100% of replacement materials | $16,100 |
| Utilities | | |
| Electricity (including comp. air) | 0.042 /kWh x 102,674 kWh/yr | $4,310 |
| Urea (plus additive A) | 0.800 /gal x 79,144 gal/yr | $63,320 |
| Total Direct Operating Costs (A) | Subtotal of above | $195,140 (A) |
| Indirect operating (fixed) costs | | |
| Overhead | 80% of operating and maintenance labor and materials, $95,310 | $76,250 |
| Property Tax | 1% of total installed capital costs, $805,160 | $8,050 |
| Insurance | 1% of total installed capital costs, $805,160 | $8,050 |
| Administration | 2% of total installed capital costs, $805,160 | $16,100 |
| Capital Recovery | CRF, 0.1627 x (total installed capital costs + licensing fee) (at 10% interest and 10 years) | $131,035 |
| Total Fixed Costs (B) | Subtotal of above | $239,490 (B) |
| Total Annualized Costs (C) | (A+B) | $434,630 (C) |

*Tons Of Nox Emitted:* *140.2*

*Cost Effectiveness At Emission Reduction, $/Ton Of NOx Reduced*

*50%* = *$6,200*



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Annualized cost information, presented in Table 5-7, is based upon direct and indirect operating cost factors as suggested in the OAQPS Control Cost Manual. The $NO_x$ emission rate of 140 tpy and an expected $NO_x$ removal efficiency of 50% resulted in a cost effectiveness of $6,200 per calculated ton of $NO_x$ removed, slightly higher than that calculated for Exxon Thermal De$NO_x$.

The economic analysis demonstrates the Nalco Fuel Tech $NO_x$OUT System is not cost effective based upon similar prior reasoning. In addition $NH_3$ slip also occurs due to the decomposition of urea. Hence, $NO_x$OUT is ruled out as BACT for the CHAMPION Power Boiler.

### 5.2.1.6 Noell Two-Stage De$NO_x$

Noell has developed and patented the Two-Stage De$NO_x$ process, which utilizes both urea and methanol injection. Noell's initial pilot studies on a 1 MW crude oil boiler used methanol alone to remove $NO_x$. The final patent involves injection of both urea and methanol through proprietary nozzle designs. In this design the primary function of the methanol is to reduce ammonia slip and air preheater deposits. Emcotek is currently marketing this technology.

The Two-Stage De$NO_x$ system utilizes two zones of chemical injection. Bulk granular urea is mixed with water prior to injection in the first zone. Liquid methanol is injected in the second zone. The flowrates of the chemicals to the various injection zones are controlled by a sensor for flue gas temperature (or other surrogate measure determined during pilot/start-up testing).

At the present stage of development, the Noell Two-stage De$NO_x$ system is not considered to be available control technology or technology transfer that could be installed on the power boiler. Furthermore, if it were available and technically feasible at this juncture, it would likely be even less cost effective than Thermal De$NO_x$ or $NO_x$OUT. Hence, Noell Two-Stage De$NO_x$ is not BACT.

### 5.2.1.7 Selected $NO_x$ BACT - Combustion Technology

As previously discussed, thermal $NO_x$ formation is related to combustion conditions such as excess air, operating temperature, and residence time. The previously discussed $NO_x$ add-on control technologies remove $NO_x$ after it has been formed. Combustion technology utilizes integral methods of minimizing $NO_x$ formation during the combustion process. Combustion design strategies that limit $NO_x$ emissions include reducing the available oxygen at critical stages in the combustion zone, lowering the peak flame temperature, and reducing the residence time during which nitrogen is oxidized. Burner venders and boiler manufacturers have made substantial improvements in recent years at minimizing $NO_x$ formation through new burner technology and flue gas recirculation methods. In addition, combustion parameters can now be carefully controlled by automatic systems to maintain combustion within the operating range that will minimize $NO_x$ production.

The CHAMPION Power Boiler incorporates combustion design and control to minimize $NO_x$ emissions. The Coen burners together with the integral flue gas recirculation to the combustion zone results in efficient combustion at excess air levels equivalent to 2.0 - 3.0 percent oxygen levels in the flue gas. The combined design and control of the combustion system results in a $NO_x$ emission rate guaranteed by the vendor not to exceed 0.06 lb/MM Btu.

CHAMPION believes that boiler design and combustion control to meet a $NO_x$ emission rate of 0.06 lb/MMBtu represents BACT for $NO_x$ control for the following reasons:

- Low $NO_x$ emissions can be achieved without creating additional adverse impacts such as emissions of ammonia which occur with the previously discussed add-on controls such as SCR and SNCR.

- The projected $NO_x$ emissions represent the low range of recently permitted levels for many other combustion sources. In fact, the proposed $NO_x$ emission rate of 0.06 lb/MMBtu is in line with other natural gas-fired boilers listed in the BACT/LAER Clearinghouse Database.

- There are no available add-on controls which are cost effective.

### 5.2.2 BACT for Carbon Monoxide (CO) and Volatile Organic Compounds (VOC)

As previously noted in Section 5.2, when conducting a BACT analysis for CO and VOC it is imperative to consider the interrelationship of the pollutants most affected by combustion conditions: $NO_x$, CO, and VOC. Table 5-1 is a summary table of $NO_x$, CO, and VOC emission limits from the BACT/LAER Clearinghouse for large gas-fired boilers. The table includes CHAMPION's proposed limits for comparison with the other determinations made to date. Based upon the Clearinghouse data and subsequent investigation it does not appear that any of the listed units incorporate add-on control technology for CO or VOC.

A review of the BACT/LAER summary data supports the concern over the interrelationship of the combustion related contaminants. For all of the units identified in the Clearinghouse only one facility, Boise Cascade in International Falls, Minnesota, has identified lower emission rates for all three pollutants than those proposed for CHAMPION's No. 6 Power Boiler. However the proposed Boise Cascade limits are consistent with and only slightly lower than the limits proposed by CHAMPION for each pollutant.

For all of the other facilities in the Clearinghouse with identified $NO_x$, CO and VOC limits, those with both lower CO and VOC values had considerably higher $NO_x$ limits. CHAMPION believes, therefore based upon review of Clearinghouse listed sources, that the proposed limits for both CO and VOC in conjunction with good combustion practices and process control to achieve these levels and along with the proposed $NO_x$ level represents BACT for the No.6 Power Boiler.

## 5.3 BACT FOR THE LIME KILN-MUD DRYER

BACT analyses for the Lime Kiln-Mud Dryer were conducted for the following PSD significant pollutants: $NO_x$, CO, and VOC.

### 5.3.1 BACT for Nitrogen Oxides

CHAMPION proceeded with the BACT analysis by determining the applicability of $NO_x$ control systems to Lime Kiln-Mud Dryer operations. Vendors of both SCR and SNCR control systems were contacted.

#### 5.3.1.1 Selective Catalytic Reduction (SCR)

The SCR technology has been previously detailed in Subsection 5.2.1.1. The applicability of SCR to the Lime Kiln-Mud Dryer operations was examined. Due to the nature of the kiln process, catalyst poisoning would be a concern with a Lime Kiln. The catalysts are sensitive to particulate matter and, thus, must follow the particulate controls. As a result, the flue gas stream discharged from a particulate control device would no longer be at the optimal reaction temperature. Therefore, substantial energy costs would be incurred for flue gas reheat prior to $NO_x$ removal. In addition, the catalysts generally suffer degradation in activity from exposure to acid gases. Since the Lime Kiln-Mud Dryer incinerates TRS compounds to form $SO_2$, this would be another concern. Discussions with catalyst system vendors indicate that, due to the nature of the process and resulting exhaust gas composition, they would not recommend the application of SCR to the Lime Kiln-Mud Dryer. Furthermore, it should be noted that SCR has never been installed on any lime kiln. Therefore, SCR is not considered to be an available $NO_x$ control technology for lime kilns and thus not an available $NO_x$ control technology for CHAMPION's proposed Lime Kiln-Mud Dryer which is a technically more complex process than a typical kraft mill lime kiln.

#### 5.3.1.2 Selective Noncatalytic Reduction (SNCR)

<u>Ammonia Injection</u>

The technology associated with SNCR, usually exemplified by the Exxon Thermal $DeNO_x$ process, involves ammonia injection and has been presented in Subsection 5.2.1.4. Thermal $DeNO_x$ is an available technology that has been used on natural gas, oil-fired boilers and gas turbines. Thermal $DeNO_x$ has never been applied to a lime kiln. The requisite temperatures for the reaction to occur would be located within the kiln. The effect of injection of ammonia on CHAMPION's critical Lime Kiln-Mud Dryer production process has not been investigated. It is likely that formation of ammonium sulfate or bisulfate salts is likely and would result in quality control problems due to contamination of the lime. Because the effect of this control technique on the Lime Kiln-Mud Dryer process is unknown and the ability to reduce $NO_x$ emissions to a greater degree than existing lime kiln $NO_x$ control techniques is unproven, Thermal $DeNO_x$ is not considered to be an available control technology for CHAMPION's Lime Kiln-Mud Dryer.

<u>Urea Injection</u>

$NO_x$OUT technology, discussed previously in Subsection 5.2.1.5, is applicable to certain types of stationary combustion equipment. Similarly to Thermal $DeNO_x$, $NO_x$ removal efficiencies will vary depending on the combustion equipment and system configuration. Performance is based on placement of injectors and sufficient mixing of flue gases within the specified temperature range. The $NO_xOUT$ process is generally deemed impractical for application to $NO_x$ sources with large load variations.

As with Thermal $DeNO_x$, the $NO_xOUT$ process has never been applied to a kraft mill lime kiln. The effect on the chemical recovery process occurring within the kiln is unknown and the $NO_x$ removal efficiency is unproven. Therefore, for reasons similar to those presented for Thermal $DeNO_x$, the $NO_xOUT$ process can not be considered BACT for CHAMPION's Lime Kiln-Mud Dryer.

#### 5.3.1.3 Combustion Technology

CHAMPION examined the BACT/LAER Clearinghouse for existing lime kiln determinations. A summary of this information is presented in Table 5-8. Also included in Table 5-8 are CHAMPION'S Proposed Lime Kiln-Mud Dryer limits. CHAMPION proposes a $NO_x$ limit of 49.3 lb/hr based upon a $NO_x$ concentration of 200 ppm at 10% $O_2$. Based upon the lime production capacity of the unit (up to 500 TPD of lime), CHAMPION believes the proposed $NO_x$ emission rate of 49.3 lb/hr is BACT.

### 5.3.2 BACT for Carbon Monoxide (CO) and Volatile Organic Compounds (VOC)

CHAMPION also performed a BACT/LAER Clearinghouse search for kraft mill lime kiln CO and VOC entries. A summary of this search has been presented in Table 5-8. Comparison of the proposed CHAMPION Lime Kiln-Mud Dryer with the Clearinghouse entries shows CHAMPION's limits to be consistent with previously permitted PSD sources. The Clearinghouse entries present a wide range of limits for both CO and VOC. This can be attributed to different operating conditions and fuel sources at each facility. CHAMPION has examined their potential fuel usage scenarios. CHAMPION's potential Lime Kiln-Mud Dryer combustibles include NCG's, lime mud, and No. 6 fuel oil or natural gas. CHAMPION

## TABLE 5-8
## CHAMPION PAPER
## PENSACOLA, FLA

## BACT/LAER CLEARINGHOUSE
## SUMMARY OF LIME KILNS

| FACILITY | LOCATION | THROUGHPUT | $NO_x$ | CO | VOC |
|---|---|---|---|---|---|
| CHAMPION | COURTLAND, AL | 300 TPD CaO | 175 ppmv @ 10% $O_2$, 29 lb/hr | 200 ppmv @ 10% $O_2$, 20.8 lb/hr | 31 ppmv @ 10% $O_2$, 9 lb/hr |
| ALABAMA RIVER PULP CO | PURDUE HILL AL | 465 TPD CaO | 100 ppmv @ 10% $O_2$, 30.1 lb/hr | 52 ppmv @ 10% $O_2$, 9.5 lb/hr | 78 ppmv @ 10% $O_2$ |
| JAMES RIVER | PENNINGTON AL | 500 TPD CaO | 175 ppmv @ 10% $O_2$, 56.8 lb/hr | --- | --- |
| NEKOOSA PAPERS, INC | ASHDOWN, AR | 440 TPD LIME | 66.5 lb/hr | 55 lb/hr | |
| WILLAMETTE INDUSTRIES INC | CAMPII LA | 430 TPD CaO, 1740 TADP | 51.5 lb/hr, 224 TPY | 7 lb/hr, 30.6 TPY | 17.2 lb/hr, 75.3 TPY |
| BOISE CASCADE | RUMFORD, ME | 327 TPD PRODUCT | 52 lb/hr | 39 lb/hr | 2 lb/hr |
| BOISE CASCADE | INTERNATIONAL FALLS, MN | 500 TPD | 42.5 lb/hr, 220 ppm | 23.7 lb/hr, 240 ppm | 11.4 lb/hr, 185 ppm |
| WEYERHAEUSER CO | COLUMBUS, MS | 21 TPH | 300 ppmv @ 3.6% $O_2$, 60.9 lb/hr | 11 lb/metric TADP, 550 lb/hr | 1 lb/T CaO, 21 lb/hr |
| WILLAMETTE INDUSTRIES | BENNETTSVILLE,SC | 220 TPD CaO | 35 lb/hr | 3.5 lb/hr | 8.8 lb/hr |
| UNION CAMP | SOUTH CAROLINA | 265 TPD CaO(5) | 0.85 lb/MMBtu | 0.1 lb/ T ADP | 1.6 LB/T CaO |
| JAMES RIVER | CAMAS, WA(6) | --- | 234 TPY | 1798 TPY | 45 TPY |
| **CHAMPION** | **PENSACOLA, FL** | **500 TPD CaO** | **200 ppmv @ 10% $O_2$, 49.3 lb/hr** | **45 ppmv @ 10% $O_2$, 6.75 lb/hr** | **104 ppm, 24.5 lb/hr** |

(1) Low sulfur fuel.
(2) Caustic scrubber with 97% efficiency.
(3) Based on #6 oil with 2.5% sulfur.
(4) Process controls
(5) Chemical reaction with lime.
(6) Source was rebuilt and not PSD. Venturi scrubber is applied to the source.

considered these varying scenarios in the development of the proposed limits. It is important to note that no sources in the BACT/LAER Clearinghouse included add-on controls for CO or VOC emissions from Lime Kilns or Lime Kiln-Mud dryers.

CHAMPION examined the possibilities of applying add-on catalytic oxidation control technology to the Lime Kiln-Mud Dryer as the most stringent technique to control both CO and VOC. Once again, due to the nature of the process, catalyst poisoning would be a potential problem. The catalysts are sensitive to particulate matter and, thus, must follow the particulate control device. As a result, the flue gas stream would no longer be at the optimal reaction temperature - usually ~500°F for CO and ~1000°F for VOC. Therefore, substantial energy costs would be incurred for flue gas reheat prior to CO or VOC removal. Also, acid gases adversely affect the catalysts and can lead to poisoning even if the particulate matter concentration is sufficiently controlled.

An additional consideration regarding catalytic oxidation for control of VOC, is the composition of the VOC in the flue gas. In the case of CHAMPION's Lime Kiln-Mud Dryer, substantially all oft he VOC emitted are saturated organic compounds, e.g., organic sulfur compounds and aliphatic compounds. Oxidation catalyst vendors recommend large catalyst volumes and flue gas temperatures in excess of 1,000°F to achieve significant reductions of saturated VOC.

Based on the technical problems associated add-on controls and the fact that no such controls have been applied to similar sources CHAMPION believes that good combustion control and the emission rates proposed represent BACT for the Lime Kiln-Mud Dryer.

# SECTION 6
# AIR QUALITY IMPACT ANALYSIS

## 6.1 INTRODUCTION

This section of the application presents the air quality impacts associated with the existing mill and the proposed addition of the No. 6 Power Boiler and the modifications to the Lime Kiln and the Bleach Plant to reduce wastewater treatment loads. The following subsections address:

- The modeling approach used to identify air quality impacts.
- Identification of PSD increment consumption by the project.
- Definition of background air quality.
- Comparison of predicted impacts plus background to NAAQS.
- Identification of HAP impacts associated with the project.
- Identification of additional impacts due to the project.

The only criteria pollutants which must be modeled and will be emitted in quantities greater than the PSD significant emissions levels, as noted in Section 2, are carbon monoxide (CO) and nitrogen oxides ($NO_x$). Hence, based upon discussions and guidance by Florida DER, CO and $NO_x$ emissions were included in the air quality modeling analysis. The modeling analysis conducted follows the procedures and requirements discussed with Florida DER at our 10 September and 5 November 1992 meetings. In addition the EPA's "Guideline on Air Quality Models" EPA-450/2-78-027R was followed for the analysis.

The modeling analysis included both screening and refined EPA-approved models. Screening models were used to determine worst-case load conditions for the No. 6 Power Boiler and to evaluate the No. 6 Power Boiler and Lime Kiln-Mud Dryer impacts due to carbon monoxide (CO) emissions. Refined modeling was used to evaluate nitrogen dioxide ($NO_x$) impacts.

In order to quantify the $NO_x$ PSD increment consumption by the changes at the Mill and also to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS), refined air quality modeling was conducted. The refined air quality modeling included a PSD analysis and a NAAQS analysis. The PSD analysis determined the increment consumption due to the addition of the No. 6 Power Boiler and the modification to the Lime Kiln, the increment consumption of the existing No. 5 Power Boiler, and the increment expansion by the removal of the No. 1 Power Boiler and No. 2 Power Boiler. In addition, the PSD analysis included other increment-consuming sources in the significant impact area. The NAAQS analysis included all $NO_x$ sources at the Mill and all major NAAQS sources within 30 km of the Mill.

HAPs are emitted as part of the proposed mill modifications and wastewater treatment project. The HAPs evaluated include chlorine ($Cl_2$), chlorine dioxide ($ClO_2$), and chloroform ($CHCl_3$) which will be emitted from the Bleach plant sources. The Bleach Plant is the source of these HAPs. Each of these pollutants were evaluated using EPA-approved models and a comparison to applicable Florida DER Hazardous Air Pollutants Guideline values was made.

## 6.2 MODELING APPROACH

The air quality dispersion modeling analysis included both preliminary screening modeling and refined modeling. The screening modeling was used to determine the "worst-case" load conditions for the No. 6 Power Boiler. Screening modeling was also used to demonstrate that the impacts due to CO emissions were below the CO significance levels. The refined modeling was used to demonstrate compliance with applicable PSD increments and air quality standards for nitrogen dioxide.

### 6.2.1 Land Use Classification

The land use classification for the area was based on a review of land use patterns in the area conducted for a previous PSD project at the Mill in 1991. The land use analysis conducted followed the procedures recommended by EPA and the typing scheme developed by Auer. The Auer technique establishes four primary land use types: industrial, commercial, residential, and agricultural. Industrial, commercial, and compact residential areas are classified as urban, while agricultural and common residential areas are considered rural. For modeling purposes, an area is defined as urban if more than 50 percent of the surface within 3 kilometers of the source falls under an urban land use type. Otherwise, the area is determined to be rural. No major changes to land use patterns in the area have occurred, and the previous analysis indicated the area is classified rural. Therefore, models which incorporate rural dispersion coefficients were used to assess the air quality impact of Mill sources.

### 6.2.2 Screening Modeling

The EPA SCREEN model was used to determine the "worst-case" load conditions associated with operation of the No. 6 Power Boiler. The Lime Kiln-Mud Dryer will typically operate at load conditions of 90-100% and, therefore, no load condition analysis was conducted. The SCREEN model is an EPA approved screening tool contained in "EPA Screening Procedures for Estimating the Air Quality Impacts of Stationary Sources Volume X" EPA-450/4-88-010. The modeling analysis for the No. 6 Power Boiler was conducted for three different load conditions: 100%, 75%, and 50%. The appropriate exit velocity, emission rate, and temperature are shown in Table 6-1.

Based on the results of the SCREEN modeling analysis, the worst case ambient impacts were predicted to occur when the No. 6 Power Boiler was operating at the 100% load condition. The results are summarized below and represent the concentrations associated with the corresponding boiler load condition.

| Load Condition | 1-Hour Impact |
|---|---|
| 100% | 213.2 $\mu g/m^3$ |
| 75% | 136.2 $\mu g/m^3$ |
| 50% | 70.9 $\mu g/m^3$ |

**TABLE 6-1**

**SCREEN EMISSION PARAMTERS FOR NO. 6 POWER BOILER
CHAMPION MILL PENSACOLA, FLORIDA**

| SOURCE | 100% LOAD | 75% LOAD | 50% LOAD |
|---|---|---|---|
| Stack Height (m) | 38.10 | 38.10 | 38.10 |
| Stack Diameter (m) | 2.59 | 2.59 | 2.59 |
| Temperature (°K) | 449.8 | 440.9 | 431.5 |
| Velocity (m/sec)*0 | 14.41 | 10.79 | 6.85 |
| $NO_2$ (g/sec) | 4.03 | 3.02 | 2.02 |

* Velocity is based on flows of 160,693 acfm, 120,520 acfm, and 76,489 acfm, for 100%, 75%, and 50% loads, respectively.

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**TABLE 6-2**

**EMISSION PARAMETERS FOR NO. 6 POWER BOILER AND LIME KILN - MUD DRYER CHAMPION MILL PENSACOLA, FLORIDA**

| SOURCE | STACK HEIGHT (m) | STACK DIAMETER (m) | TEMPERATURE (°K) | VELOCITY (m/sec) | $NO_2$ (g/sec) | CO (g/sec) |
|---|---|---|---|---|---|---|
| No. 6 Power Boiler | 38.10 | 2.59 | 449.8 | 14.41 | 4.03 | 6.72 |
| Lime Kiln Mud Dryer | 41.45 | 1.98 | 342.3 | 8.76 | 6.21 | 0.85 |

Based on the results above, all subsequent refined modeling included the 100% load emission parameters and emission rates for the No. 6 Power Boiler.

The SCREEN Model was also used to demonstrate that the CO impacts from the No. 6 Power Boiler and the modification to the Lime Kiln were below the 1-hour and 8-hour significance levels of 2,000 $\mu g/m^3$ and 500 $\mu g/m^3$, respectively. The maximum combined impact from these two sources was 413.7 $\mu g/m^3$ on a 1-hour basis. The 1-hour impacts were scaled to an 8-hour impact using the EPA approved SCREEN scaling factor (0.7 x 1-hour concentration). The 8-hour impact was calculated to be 289.6 $\mu g/m^3$. Therefore, since the proposed mill modification will not result in a significant ambient CO air quality impact, no further air quality modeling analysis for CO is required.

The SCREEN outputs for the load condition analysis and the CO significant impact area analysis are contained in Appendix E.

### 6.2.3 Refined Modeling

The modeling procedures used for the refined air quality modeling analysis followed the recommended techniques described in "Guidelines on Air Quality Models (Revised)". Based upon this guideline, the Industrial Source Complex Long-Term 2 Model (ISCLT2 Version 92062) was used for the analysis. The ISCLT2 model is an EPA approved model.

The ISCLT2 model was used to calculate ambient pollutant concentrations for simple (flat) terrain receptors surrounding the CHAMPION facility. Annual concentrations for nitrogen dioxide, chlorine, chlorine dioxide, and chloroform were calculated. Since stacks at the Mill are less than Good Engineering Practice (GEP) stack height, the ISCLT2 direction specific downwash option was used in the modeling analysis.

In addition to utilizing the direction specific downwash routine, all of the options associated with the "regulatory default" mode in the ISCLT2 model were used. These default options are listed below.

- Stack Tip Downwash
- Final Plume Rise
- Buoyancy-Induced Dispersion
- Default Vertical Potential Temperature Gradient
- Default Wind Profile Exponents
- Upper Bound Value for Supersquat Buildings
- No Exponential Decay for Rural Mode

A polar receptor grid with discrete receptors along the plant boundary was used in the modeling analysis. Five years of surface data from Pensacola, Florida were used in the analysis. The details of the refined modeling analysis are described in greater detail in the following subsections.

### 6.2.4 Receptor Grid

A combination of polar coordinate receptors and rectangular coordinate receptors were established for the ISCLT2 modeling. The area surrounding the Mill is flat and, therefore, as agreed by the Florida DER, no terrain elevations were included for any of the receptors.

The polar grid was centered on the location of the No. 5 Boiler stack. The following downwind receptor rings for every 10 degrees of arc from 0° to 360° were included: 4250m, 4500m, 4750m, 5000m, 6000m, 7000m, 8000m, 9000m, and 10,000m. Due to the long narrow boundary of CHAMPION's property, an extensive array of discrete receptors was required to supplement the polar grid.

Since the polar receptor grid was centered on the No. 5 Boiler stack, additional discrete receptors were required to adequately evaluate the area between the property boundary and the start of the polar grid. These additional receptors included points at 100 meter spacing out to 1000m and 250m spacing from 1000m to 4250m where the full polar grid started. Receptors were also placed at approximately 100 meter intervals along the perimeter of the facility boundary. The entire receptor grid is shown in Figure 6-1.

### 6.2.5 Source Emission Parameters

The new or modified sources of criteria pollutants at the Mill include the No. 6 Power Boiler and the Lime Kiln-Mud Dryer. The emission parameters used for these sources are shown in Table 6-2. The additional PSD increment consuming and increment expanding sources as well as all the NAAQS sources are described in Section 6.3, Emission Inventory.

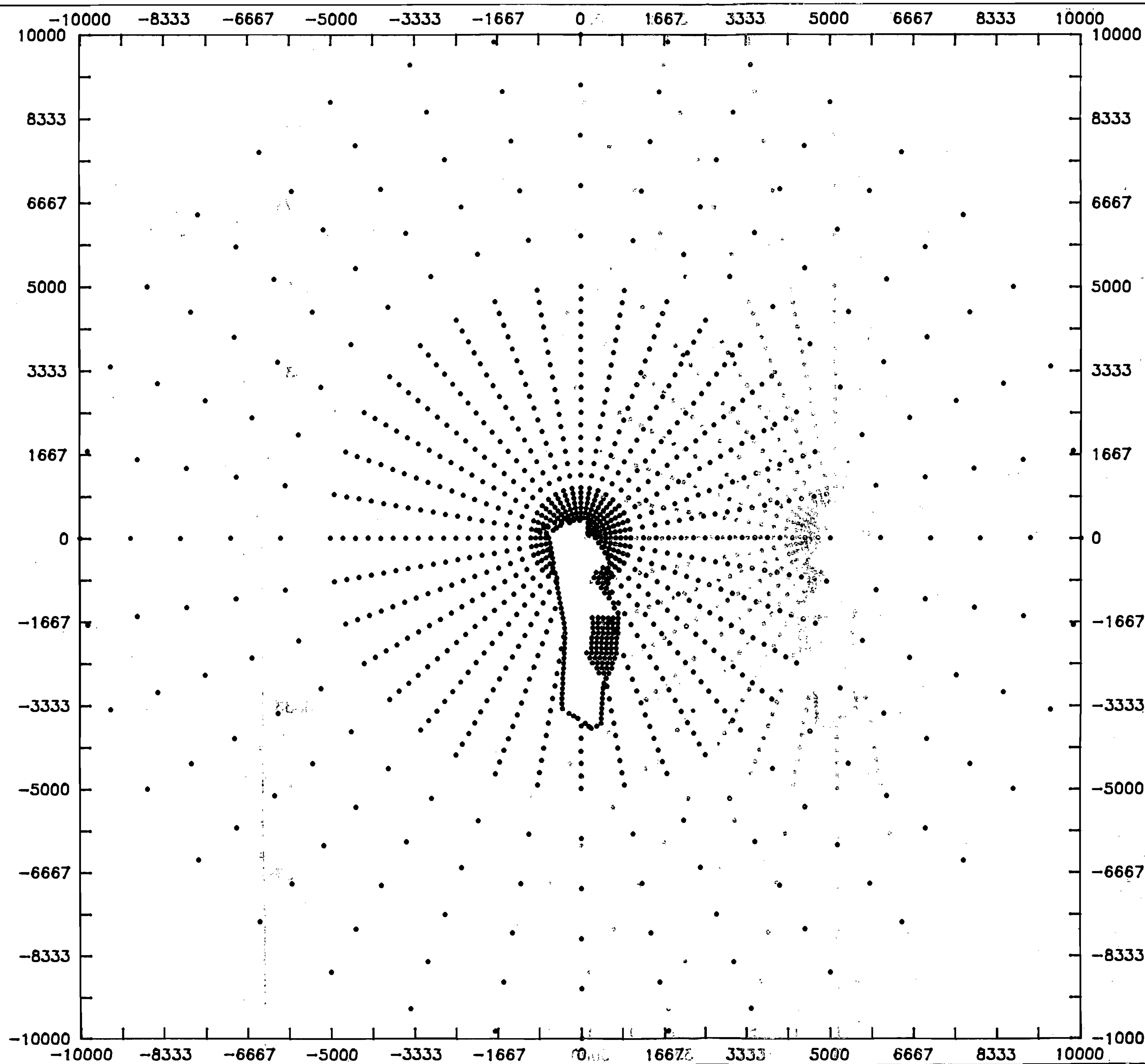
### 6.2.6 Downwash From Building Wakes

The GEP stack height is the minimum height required by a stack in order to always avoid structural or building wake-effect induced downwash. Downwash brings pollutants closer to ground-level at a shorter downwind distance than would be the case for a GEP stack. Thus, downwash often causes higher impacts. There are two downwash algorithms which are approved by EPA: Huber-Snyder and Schulman-Scire which are defined below. Both of these algorithms are direction specific.

Huber-Snyder Downwash:

$H_{gep} = H_b + 1.5L$, where

$H_{gep}$ = GEP stack height




SOURCE: MAP DEVELOPED BY WESTON, INC. WEST CHESTER, PA. FROM DATA ANALYSIS

CHAMP601-G/DM-12/92

**CHAMPION INTERNATIONAL CORPORATION**
**PENSACOLA FACILITY**
**CANTONMENT, ESCAMBIA COUNTY**
**FLORIDA**

**FIGURE 6-1**
**MILL RECEPTOR GRID SYSTEM**

$H_b$ = Height of nearby structure

L = Lesser dimension, height or projected width.

Schulman-Scire Downwash:

$H_{geps} = H_b + 0.5L$, where

$H_{geps}$ = GEP stack height for Schulman-Scire downwash

$H_b$ = Height of nearby structure

L = Lesser dimension, height or direction specific projected width.

WESTON used the following procedures to analyze the Mill for downwash. The Mill stacks and influencing buildings were first located on a plant map. Figure 2-2 in Section 2 of this application is a diagram of Mill buildings and sources which were used for the analysis. The GEP heights and relevant building dimensions were evaluated by a computer program developed by WESTON. This program incorporates the EPA guideline procedures for determining, in each of the 16 wind directions (22.5° sectors), which building may cause downwash of stack emissions. All of the stacks are subject to either Huber-Snyder or Schulman-Scire downwash and, as a result, direction-specific building dimensions were calculated. The results of this analysis for all sources at the CHAMPION Mill are included in Appendix E.

### 6.2.7 Meteorological Data Base

The meteorological data base used in the modeling analysis included five years of representative surface and upper air meteorologic data. The five year period from 1985-1989 was used in the modeling analysis. Surface data from Pensacola, Florida were used to generate the joint frequency distribution of wind speed, direction, and stability required for the ISCLT2 model (STAR distribution). This is the same meteorologic data used in CHAMPION's 1991 PSD Permit Application for the No. 5 Power Boiler.

### 6.2.8 Significant Air Quality Impacts

The ISCLT2 Model and the five years of meteorology were used determine the significant impact area associated with the No. 6 Power Boiler and Lime Kiln-Mud Dryer $NO_x$ emissions. Based upon this analysis, the significant impact area for the No. 6 Power Boiler and the Lime Kiln-Mud Dryer was predicted to be less than 2.4 km for all five years of meteorology. The highest impacts were predicted to be just off plant property.

## 6.3 EMISSIONS INVENTORY

The emissions inventory for $NO_x$ sources was developed for CHAMPION Mill sources and other major sources in the area. Table 6-3 provides a summary of the emission parameters and emission rates used in the modeling analysis for CHAMPION Mill PSD and NAAQS sources.

### 6.3.1 Mill PSD and NAAQS Emission Sources

As part of the overall project which includes the addition of the No. 6 Power Boiler and the modification to the Lime Kiln, the No. 1 and No. 2 Power Boilers will be removed. The No. 1 and No. 2 Power Boilers will be increment expanding sources. In addition, the existing Lime Kiln emissions do not consume increment. Hence, only the differences between the existing Lime Kiln emissions and the Lime Kiln-Mud Dryer emissions after modification will consume increment. The emission rates associated with the PSD increment expanding sources and the existing Lime Kiln were based on actual emissions for the past two years of operation. The PSD

4,200 TPY NOx Source

4,800 TPY CO Source

## TABLE 6-3

### CHAMPION MILL EMISSIONS DATA USED IN THE MODELING ANALYSIS FOR CRITERIA POLLUTANTS

| SOURCE | ISC SOURCE IDENTIFICATION | $NO_x$ EMISSION RATE (g/sec) | CO EMISSION RATE (g/sec) | COORDINATE (m) | | HEIGHT (m) | TEMPERATURE (°K) | EXIT VELOCITY (m/sec) | DIAMETER (m) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | X | Y | | | | |
| No. 1 Power Boiler | # 1PB | -1.27 | -1.27 | -3.3 | -37.2 | 20.42 | 524.7 | 16.92 | 1.98 |
| No. 2 Power Boiler | # 2PB | -5.69 | -1.36 | -9.4 | -41.8 | 20.42 | 466.3 | 15.09 | 1.98 |
| No. 3 Power Boiler | # 2PB | 23.64 | 3.024 | -16.8 | -82.8 | 45.11 | 335.8 | 7.62 | 2.44 |
| No. 4 Power Boiler | # 4PB | 58.74 | 20.16 | 37.7 | -94.1 | 67.36 | 335.2 | 10.24 | 3.66 |
| No. 5 Power Boiler | # 5PB | 2.46 | 2.457 | 0.0 | 0.0 | 14.30 | 533.0 | 26.27 | 1.22 |
| Lime Kiln | LK | -1.95 | -0.18 | 81.4 | -293.9 | 41.45 | 349.6 | 7.65 | 1.98 |
| Calciner | CALC | 1.93 | 1.88 | 41.0 | -194.7 | 35.84 | 346.3 | 9.17 | 1.22 |
| No. 6 Power Boiler | # 6PB | 4.03 | 6.72 | -50.8 | -83.0 | 38.10 | 449.8 | 14.41 | 2.59 |
| Lime Kiln Mud Dryer | LMD | 6.21 | 0.85 | 81.4 | -293.9 | 41.45 | 342.3 | 8.76 | 1.98 |
| No. 1 Recovery Boiler | # 1RB | 12.6 | 51.04 | 124.5 | -72.6 | 55.4 | 516.3 | 24.38 | 2.74 |
| No. 2 Recovery Boiler | # 2RB | 12.6 | 51.04 | 103.8 | -88.2 | 55.4 | 500.0 | 24.38 | 2.74 |

increment consuming sources are the No. 6 Power Boiler, the Lime Kiln-Mud Dryer, and the No. 5 Power Boiler (permitted in 1991). The emission rates used in the modeling analysis for the No. 6 Power Boiler, Lime Kiln-Mud Dryer, and No. 5 Power Boiler are based on proposed allowable permit limits.

In addition to the $NO_x$ sources at the Mill that consume PSD increment, there are several sources which affect ambient air quality and must be included in the NAAQS analysis. These sources include the No. 1 and No. 2 Recovery Boilers, the Calciner, and the No. 3 and No. 4 Power Boilers. The PSD increment consuming sources at the Mill were also included in the NAAQS analysis.

### 6.3.2 Local PSD and NAAQS Emission Sources

Data regarding other major $NO_x$ sources to be included in the modeling analysis to demonstrate compliance with PSD increments and NAAQS were obtained from Florida DER and Alabama Department of Environmental Management (DEM). In accordance with Florida DER guidance, all major sources in DER's emission data base for Escambia and Santa Rosa counties were evaluated for the modeling analysis. The data provided by DER included potential, allowable, estimated and actual emission rates of $NO_x$ for these additional sources. Not all sources had each of the emission rates identified above. Based on discussions with Florida DER, allowable emissions are based on permit limits. If allowable emission rates were identified, they were used in the modeling analysis. Potential emissions are controlled emission rates which were used if allowable rates were not provided. Estimated emissions which were developed by the Florida DER for sources without permit limits were used if potential emission rates were not identified. Finally, actual emission rates were used if estimated emissions were not provided.

A screening procedure suggested by Florida DER's meteorologist was used to eliminate small facilities from the modeling study which are not likely to have significant impacts near CHAMPION's Mill. The criteria utilized was based on the distance from the Mill to the facility and the annual emission rates associated with the source being evaluated.

In general facilities were eliminated on the following basis:

- Sources with emissions less than 100 tons per year and greater than 5 km from the Mill.
- Sources with emissions less than 200 tons per year and greater than 10 km from the Mill.
- Sources with emissions less than 300 tons per year and greater than 15 km from the Mill.
- Sources with emissions less than 400 tons per year and greater than 20 km from the Mill.
- Sources with emissions less than 500 tons per year and greater than 25 km from the Mill.
- Sources with emissions less than 600 tons per year and greater than 30 km from the Mill.

Table 6-4 identifies facilities which were excluded from the modeling analysis based upon this criteria.

## TABLE 6-4

## FACILITIES EXCLUDED FROM THE AMBIENT AIR QUALITY MODELING ANALYSIS

| | SOURCES IN SANTA ROSA AND ESCAMBIA COUNTY, FLORIDA ELIMINATED FROM $NO_x$ MODELING | | |
|---|---|---|---|
| | TOTAL FACILITY $NO_x$ EMISSIONS (tons/year) | DISTANCE FROM CHAMPION MILL SIGNIFICANCE AREA (km*) | 20 "D" EXCLUSION (tons/year) |
| Coastal Fuels | 5.20 | 22.6 | 452 |
| Escambia County Utilities | 42.0 | 22.9 | 458 |
| Puritan-Bennett | 1.48 | 4.5 | 90 |
| Reichhold Chemicals | 75.81 | 21.2 | 424 |
| Armstrong World Industries | 3.22 | 21.1 | 422 |
| Exxon @ McLellan Field | 85.18 | 59.9 | 1198 |
| Petro Acquisitions | 23.0 | 30.8 | 616 |
| Exxon @ Santa Rosa | 139.0 | 40.7 | 814 |

* The significant impact area for the mill modification is a circle 2.4 Km in diameter from the No. 5 Boiler Stack.

In addition, the Alabama DEM was contacted for a list of any NAAQS sources located in Alabama. According to Alabama DEM no new NAAQS or PSD increment consuming sources are present. Appendix D includes a letter from WESTON to Alabama DEM confirming that no new major sources or PSD increment consuming sources are present in the area near CHAMPION's Mill.

Table 6-5 provides the emission rates and emission parameters for all other major sources included in the air quality modeling analysis. For sources with similar emission parameters, a representative source was identified and all emissions from the similar sources were

summed and assumed to be emitted from the representative stack. Table 6-6 identifies the sources which were grouped into a representative stack for modeling purposes.

## 6.4 PSD INCREMENT ANALYSIS

Based on a review of data provided by Florida DER, the only $NO_x$ PSD increment consuming sources in the vicinity of the CHAMPION Mill are the existing No. 5 Power Boiler, the proposed No. 6 Power Boiler, and the modified Lime Kiln-Mud Dryer. Table 6-7 provides the annual $NO_x$ increment consumption due to these sources for the five year air quality modeling analysis. Less than 10% of the annual PSD increment is consumed by the proposed modification to the Mill. Hence, the facility will neither cause nor contribute to an exceedance of the Federal PSD increment for nitrogen dioxide. It should also be noted that the maximum predicted annual impact for the modification at the Mill is less than the PSD monitoring exemption de-minimis concentration of 14 ug/m$^3$. Therefore, pre-construction monitoring is not required for this project.

It is important to point out that the removal of the No. 1 and No. 2 Power Boilers will result in a significant PSD increment expansion in the vicinity of the Mill. Previously, the No. 5 Boiler was predicted to consume nearly 5 $\mu g/m^3$ of increment by itself (see CHAMPION's 1991

## TABLE 6-5

## OTHER MAJOR $NO_x$ SOURCES USED IN THE MODELING ANALYSIS

| Source | ISC Source Number | Emission Rate (g/sec.) | Coordinate X (m) | Coordinate Y (m) | Height (m) | Temp. (°k) | Exit Velocity (m/sec.) | Diameter (m) |
|---|---|---|---|---|---|---|---|---|
| American Cyanamid | 301 | 1.9300E-01 | 20200 | -5800 | 15.24 | 544.00 | 15.54 | 1.37 |
| | 302 | 2.1040E+00 | 20200 | -5800 | 15.24 | 477.00 | 9.14 | 1.68 |
| | 303 | 1.1329E+01 | 20200 | -5800 | 15.24 | 436.00 | 14.32 | 1.46 |
| | 309 | 8.9650E+00 | 20200 | -5800 | 15.24 | 450.00 | 10.06 | 1.92 |
| Air Products Chemicals | 401 | 1.9310E+00 | 18000 | -2600 | 12.50 | 394.00 | 7.92 | 12.5 |
| | 402 | 6.9480E+00 | 18000 | -2600 | 12.50 | 650.00 | 10.67 | 1.43 |
| | 404 | 1.4400E+00 | 18000 | -2600 | 7.62 | 477.00 | 0.61 | 0.24 |
| | 408 | 3.8860E+00 | 18000 | -2600 | 24.99 | 505.00 | 29.57 | 1.13 |
| | 410 | 5.6410E+00 | 18000 | -2600 | 27.43 | 436.00 | 39.32 | 2.29 |
| | 411 | 2.3494E+01 | 18000 | -2600 | 7.62 | 450.00 | 19.04 | 0.76 |
| | 422 | 2.6230E+00 | 18000 | -2600 | 21.64 | 450.00 | 29.87 | 0.91 |
| | 423 | 3.9200E+00 | 18000 | -2600 | 28.65 | 444.00 | 30.87 | 0.76 |
| | 426 | 2.0554E+01 | 18000 | -2600 | 6.10 | 755.00 | 41.18 | 0.52 |
| Exxon at St. Regis | 510 | 6.0500E-01 | 13800 | 39600 | 15.24 | 422.00 | 32.31 | 0.61 |
| | 515 | 6.4400E+00 | 13800 | 39600 | 12.19 | 719.00 | 24.69 | 1.68 |
| | 516 | 2.2918E+01 | 13800 | 39600 | 6.10 | 616.00 | 24.69 | 0.3 |
| | 518 | 6.9190E+00 | 13800 | 39600 | 10.67 | 496.00 | 25.51 | 2.65 |
| | 519 | 1.2511E+01 | 13800 | 39600 | 9.14 | 616.00 | 7.86 | 0.91 |
| | 514 | 1.2970E+00 | 13800 | 39600 | 12.19 | 452.00 | 17.37 | 0.76 |
| Monsanto Chemical | 4002 | 6.0250E+00 | 7000 | -1000 | 18.29 | 497.00 | 28.65 | 1.22 |
| | 4003 | 1.4500E+01 | 7000 | -1000 | 38.10 | 383.00 | 10.36 | 3.66 |
| | 4005 | 2.3150E+00 | 7000 | -1000 | 38.10 | 613.00 | 5.49 | 0.82 |
| | 4012 | 6.1000E-02 | 7000 | -1000 | 21.34 | 1033.00 | 1.52 | 0.24 |
| | 4014 | 5.2750E+00 | 7000 | -1000 | 45.72 | 455.00 | 10.67 | 3.05 |
| | 4042 | 1.5783E+01 | 7000 | -1000 | 36.58 | 429.00 | 34.14 | 1.37 |
| | 4049 | 4.6100E+01 | 7000 | -1000 | 27.43 | 474.00 | 14.02 | 1.46 |
| | 4053 | 8.6000E+02 | 7000 | -1000 | 18.29 | 1089.00 | 1.22 | 0.91 |
| | 4067 | 1.1500E+01 | 7000 | -1000 | 9.14 | 1089.00 | 3.96 | 0.3 |
| Gulf Power Co. | 4501 | 1.8841E+02 | 9500 | -4600 | 137.16 | 416.00 | 15.85 | 5.49 |
| | 4506 | 1.0149E+03 | 9500 | -4600 | 137.16 | 405.00 | 29.57 | 7.07 |
| Pensacola Christian College | 11401 | 1.2850E+01 | 8500 | -15000 | 2.29 | 884.00 | 22.41 | 0.33 |

## TABLE 6-6

## COMBINED LOCAL SOURCES FOR SANTA ROSA AND ESCAMBIA COUNTY, FLORIDA FACILITIES

| Facility Id | Source # | $NO_2$ Emission Rate (g/sec) | Stack Height (m) | Temperature (°K) | Velocity (m/sec) | Stack Diameter (m) | Representative ISC Source # |
|---|---|---|---|---|---|---|---|
| American Cyanamid | 303 | 6.515 | 15.24 | 436 | 14.63 | 1.46 | 303 |
| | 304 | 4.814 | 15.24 | 436 | 14.32 | 1.46 | 303 |
| Air Products Chemicals | 402 | 3.430 | 12.50 | 650 | 10.97 | 1.43 | 402 |
| | 403 | 3.815 | 12.19 | 672 | 10.67 | 1.52 | 402 |
| | 404 | 1.127 | 8.84 | 477 | 1.83 | 1.07 | 404 |
| | 405 | 0.011 | 13.72 | 1,144 | 3.66 | 0.24 | 404 |
| | 406 | 0.106 | 7.62 | 565 | 0.61 | 0.24 | 404 |
| | 407 | 0.199 | 7.62 | 977 | 0.61 | 0.85 | 404 |
| | 408 | 1.939 | 24.99 | 505 | 29.57 | 1.13 | 408 |
| | 425 | 1.927 | 24.99 | 505 | 29.65 | 1.13 | 408 |
| Exxon St. Regis | 510 | 0.201 | 15.24 | 422 | 32.31 | 0.61 | 510 |
| | 511 | 0.201 | 15.24 | 422 | 32.31 | 0.61 | 510 |
| | 512 | 0.201 | 15.24 | 422 | 32.31 | 0.61 | 510 |
| | 516 | 0.086 | 6.10 | 616 | 24.69 | 0.30 | 516 |
| | 517 | 22.784 | 6.10 | 616 | 24.69 | 0.30 | 516 |
| Monsanto Chemical | 4,003 | 8.199 | 38.10 | 383 | 10.36 | 3.66 | 4,003 |
| | 4,004 | 6.271 | 38.10 | 383 | 10.36 | 3.66 | 4,003 |
| | 4,005 | 1.007 | 38.10 | 613 | 5.49 | 0.82 | 4,005 |
| | 4,007 | 0.135 | 38.10 | 613 | 5.49 | 0.82 | 4,005 |
| | 4,008 | 0.135 | 38.10 | 613 | 5.49 | 0.82 | 4,005 |
| | 4,009 | 0.187 | 38.10 | 613 | 5.49 | 0.82 | 4,005 |
| | 4,010 | 0.187 | 38.10 | 613 | 5.49 | 0.82 | 4,005 |
| | 4,011 | 0.187 | 38.10 | 613 | 5.49 | 0.82 | 4,005 |
| | 4,013 | 0.472 | 38.10 | 428 | 8.53 | 0.82 | 4,005 |
| | 4,014 | 2.963 | 45.72 | 455 | 10.67 | 3.05 | 4,014 |
| | 4,015 | 0.777 | 45.72 | 455 | 10.67 | 3.05 | 4,014 |
| | 4,016 | 1.525 | 45.72 | 455 | 10.67 | 3.05 | 4,014 |
| | 4,053 | 0.029 | 18.29 | 1,144 | 1.22 | 1.01 | 4,053 |
| | 4,054 | 0.058 | 18.29 | 1,089 | 6.40 | 0.91 | 4,053 |

## TABLE 6-6
## (continued)

| Facility Id | Source # | $NO_2$ Emission Rate (g/sec) | Stack Height (m) | Temperature (°K) | Velocity (m/sec) | Stack Diameter (m) | Representative ISC Source # |
|---|---|---|---|---|---|---|---|
| Gulf Power Co. | 4,501 | 18.005 | 137.16 | 416 | 15.85 | 5.49 | 4,501 |
| | 4,502 | 18.005 | 137.16 | 416 | 15.85 | 5.49 | 4,501 |
| | 4,503 | 30.959 | 137.16 | 416 | 15.85 | 5.49 | 4,501 |
| | 4,504 | 60.443 | 137.16 | 416 | 15.85 | 5.49 | 4,501 |
| | 4,505 | 60.607 | 137.16 | 416 | 15.85 | 5.49 | 4,501 |
| | 4,506 | 371.107 | 137.16 | 405 | 29.57 | 7.07 | 4,506 |
| | 4,507 | 641.717 | 137.16 | 405 | 29.57 | 7.07 | 4,506 |
| Pensacola Christian College | 11,401 | 4.28 | 2.29 | 884 | 22.41 | 0.33 | 11,401 |
| | 11,402 | 4.28 | 2.29 | 884 | 22.41 | 0.33 | 11,401 |
| | 11,403 | 4.28 | 2.29 | 884 | 22.41 | 0.33 | 11,401 |

TABLE 6-7

PSD INCREMENT CONSUMPTION BY CHAMPION'S PENSACOLA MILL'S PROPOSED MODIFICATIONS

| | 1985 | 1986 | 1987 | 1988 | 1989 |
|---|---|---|---|---|---|
| Impact ($\mu g/m^3$) | 2.24 | 2.41 | 2.24 | 2.25 | 2.32 |
| Receptor (x,y)(m) | 256, -800 | 256, -800 | 256, -800 | 256, -800 | 256, -800 |
| % of PSD Increment | 9% | 10% | 9% | 9% | 9% |



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PSD Permit Application). However, as a result of the shutdown and removal of the No. 1 and No. 2 Boilers, the total increment consumption for the proposed mill modification, in conjunction with the No. 5 Power Boiler, is only predicted to be 2.4 $\mu g/m^3$.

## 6.5 NATIONAL AMBIENT AIR QUALITY STANDARDS DEMONSTRATION

The National Ambient Air Quality Standards (NAAQS) demonstration was based on modeling all sources of nitrogen dioxide emissions from the Mill in combination with other major sources of nitrogen dioxide in the area (Table 6-5 sources). In addition, a background concentration from nearby monitors which represents distant source plus uninventoried source impacts, was added to the modeled concentration. This conservative approach does not account for the impact of major sources, included in the modeling analysis, on the monitored values used. Hence, the demonstration is likely to over-predict the actual air quality impacts in the area.

### 6.5.1 Background Nitrogen Dioxide

Data on the background concentration to be used in the ambient air quality analysis was provided by the Florida DER. Currently the state has no $NO_2$ SLAMS site operating in the Pensacola or Cantonment, Florida areas. Data were collected at a site in Escambia County near Pensacola in 1982-1985. This site (3540004F01) was located at the Ellyson Industrial Park in northern Pensacola. Concentrations measured at this site were:

| | Nitrogen Dioxide Annual Average Concentration ($ug/m^3$) | | |
|---|---|---|---|
| | 1982 | 1983 | 1984 |
| Escambia County, FL | 13 | 14 | 21 |

In addition, data have been collected by Gulf Power Company for 1990 at two stations (CRIST #4 Brunson, CRIST #2 Monsanto). The annual average concentrations measured at these stations were 19 ug/m$^3$ and 10 ug/m$^3$, respectively. Based on these data and the previous data collected by Florida DER, a conservative background concentration would be 21 ug/m$^3$. Florida DER also provided data for sites in Jacksonville (Site No. 1960-032H02) and Tarpon Springs, Florida (Site No. 4380-002G03). The annual average background concentrations measured at these sites in 1990 were 28 ug/m$^3$ and 17 ug/m$^3$, respectively. Florida DER has requested that the average of these values (22.5 ug/m$^3$) be used as an extremely conservative regional background concentration for the NAAQS demonstration.

### 6.5.2 NAAQS Modeling Results

The results of the modeling analysis for all major sources in the area in combination with CHAMPION Mill sources including the No. 5 Power Boiler, No. 6 Power Boiler, Lime Kiln-Mud Dryer, No. 1 and No. 2 Recovery Boilers, Calciner, and the No. 3 and No. 4 Power Boilers are shown in Table 6-8 for the five years of modeling. Also shown in the table is the conservative background air quality level identified by Florida DER. The maximum annual combined impact (modeled sources plus background) is 64.5 ug/m$^3$. Therefore, based upon the conservative analysis conducted, the Mill modification will neither cause nor contribute to an exceedance of the NAAQS for nitrogen dioxide.

As noted in the PSD increment analysis, the shutdown and removal of the No. 1 and No. 2 Power Boilers result in a net air quality benefit to the area. The proposed mill modification, in conjunction with other major sources and the regional background $NO_x$ concentration, is predicted to result in an ambient $NO_2$ concentration nearly 30 $\mu g/m^3$ less than previously predicted in CHAMPION's 1991 Permit Application for the No. 5 Boiler. Hence, the proposed modification will result in a net air quality benefit to the area surrounding the Mill.

**TABLE 6-8**

**COMPARISON OF MAJOR SOURCE IMPACTS PLUS BACKGROUND TO NAAQS**

| | CONCENTRATION $\mu g/m^3$ | | | | |
|---|---|---|---|---|---|
| | **1985** | **1986** | **1987** | **1988** | **1989** |
| Major Sources Impact | 38.8 | 40.7 | 37.7 | 39.2 | 42.0 |
| Background Concentration | 22.5 | 22.5 | 22.5 | 22.5 | 22.5 |
| Total Impact | 61.3 | 63.2 | 60.2 | 61.7 | 64.5 |
| NAAQS | 100 | 100 | 100 | 100 | 100 |



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## 6.6 HAZARDOUS AIR POLLUTANTS (HAPs)

CHAMPION has conducted an HAPs modeling analysis, in accordance with discussions with Florida DER during a meeting on 5 November 1992. The analysis includes emissions of HAP compounds identified for the modified sources at the Mill. Three HAP pollutants were evaluated:

- Chlorine
- Chlorine Dioxide
- Chloroform

These pollutants are emitted by sources associated with the Mill's Bleach Plant. It is important to note that the proposed mill modifications will result in a reduction in emissions of these pollutants.

Table 6-9 includes the emission rates and emission parameters associated with the Bleach Plant point sources. All three of the HAP substances evaluated are emitted from these sources. The emission rates for chlorine, chlorine dioxide, and chloroform are based on the proposed modifications to the Bleach Plant and a conversion to 100% chlorine dioxide bleaching. The basis for partitioning of emissions for the various sources is included in Appendix D.

The information available on the chloroform generation rate associated with 100% chlorine dioxide substitution for chlorine in the bleaching sequence is laboratory test results. These data provide an estimate of the amount of chloroform which is emitted into the atmosphere by bleach plant point sources (i.e., scrubbers and vents), versus the chloroform which remains in the bleach plant effluent (wastewater). In addition, NCASI test data on the scrubber and vent sources of chloroform at the Pensacola Mill are available which provides a means by which a further refinement or partitioning of chloroform emissions between these atmospheric vents can be estimated. Similar information on chloroform emissions from the wastewater treatment

TABLE 6-9

AIR TOXICS MODELING ANALYSIS EMISSION PARAMETERS
CHAMPION MILL PENSACOLA, FLORIDA

| POINT SOURCE | STACK HEIGHT (m) | STACK DIAMETER (m) | STACK TEMP. (°K) | VELOCITY (m/s) | CHLORINE (g/s) | CHLORIINE DIOXIDE (g/s) | CHLOROFORM (g/s) |
|---|---|---|---|---|---|---|---|
| Bleach Plant Softwood Scrubber | 29.8 | 0.61 | 311 | 16.5 | 0.183 | 0.057 | 0.043 |
| Bleach Plant Hardwood Scrubber | 29.7 | 0.53 | 311 | 15.5 | 0.126 | 0.057 | 0.043 |
| ERCO Tail Gas Scrubber | 18.3 | 0.21 | 311 | 17.4 | 0.013 | 0.032 | No Emissions |
| Eo Softwood Hood Vent | 20.4 | 0.71 | 326 | 16.4 | No Emissions | No Emissions | 0.005 |
| Eo Hardwood Hood Vent | 20.4 | 0.46 | 343 | 23.7 | No Emissions | No Emissions | 0.005 |



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sources (i.e., fugitive atmospheric chloroform emissions) is not available. The anticipated low concentration of chloroform in the wastewater at a 100% chlorine dioxide substitution rate further complicates the estimation of such atmospheric releases. Therefore, CHAMPION has only modeled those sources for which adequate information is available to characterize chloroform emission rates (i.e., the point sources of chloroform from the mill).

Once the modifications to the mill bleach plant have been completed, CHAMPION is committed to conducting a study to evaluate the emission rate of chloroform from the wastewaster treatment system. The study will, at a minimum, involve collection and analysis of wastewater samples at various locations in the treatment process. This information, along with appropriate process data and other wastewater characteristics, will be used to determine atmospheric losses of chloroform in the wastewater treatment process.

The annual air quality impact associated with each of these pollutants was based on the ISCLT2 model. All modeling parameters, receptors, meteorology, and analysis techniques are consistent with those described previously in subsection 6.2 for the refined nitrogen dioxide modeling.

The results of the modeling analysis for each of the pollutants is presented in Table 6-10. The table also provides a comparison between Florida Air Toxic Guideline value and the peak predicted annual concentrations by the ISCLT2 model. As noted above, only bleach plant point sources of chloroform were included in the modeling analysis. As shown in the table, all impacts are predicted to be below the applicable Florida Guideline value.

## 6.7 IMPACT ON GROWTH, VISIBILITY, SOILS, AND VEGETATION

PSD regulations require that an analysis be conducted to determine whether any impairment to visibility and other adverse impacts on soils and vegetation in the vicinity of the source would occur. Specifically, five areas have been examined: associated growth, visibility, acidification

## TABLE 6-10

## AIR TOXIC MODELING ANNUAL AMBIENT AIR QUALITY IMPACT
**(micro grams per cubic meter)**

| POLLUTANT | 1985 | 1986 | 1987 | 1988 | 1989 | ANNUAL FLORIDA GUIDELINE VALUE |
|---|---|---|---|---|---|---|
| Chloroform | 0.026 | 0.022 | 0.021 | 0.026 | 0.026 | 0.043 |
| Chorine Dioxide | 0.198 | 0.170 | 0.165 | 0.187 | 0.164 | 0.20 |
| Chlorine | 0.384 | 0.355 | 0.326 | 0.366 | 0.326 | 0.40 |



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of rainfall, soils, and vegetation. The proposed mill modifications should not cause any of these adverse impacts; however, it is important to recognize their potential existence.

### √6.7.1 Associated Growth

It is estimated that the Mill modifications will not require any additional staff. Thus, there will be no perceptible negative growth impacts resulting from the project.

### 6.7.2 Visibility

Pollutants responsible for visibility reduction are classified into three major groups:

- Hygroscopic particulates.
- Opaque agglomerates (e.g., carbon, metal particulate).
- Transparent crystals (e.g., silicon, calcium).

The Mill modifications are estimated to result in a decrease in annual particulate matter emissions and an increase of less than 28 tons of sulfur dioxide. Hence, it is not anticipated that any perceptible reduction in visibility will occur due to the emission of primary or secondary aerosols by the proposed mill modification.

Nitrogen dioxide absorbs light energy over the entire visible spectrum, although primarily in the shorter, blue wave length regions; thus, nitrogen dioxide can by itself reduce visibility. In addition, visibility reducing aerosols are formed by photochemical processes involving oxides of nitrogen and hydrocarbons. However, the ambient ground level concentration of nitrogen oxides (in the form of nitrogen dioxide) is anticipated to decrease due to the shutdown and removal of the No. 1 and No. 2 Power Boilers. Hence, visibility impairment should not occur.

## √ 6.7.3 Acidification of Rainfall

Sulfuric acid may be formed in the natural atmospheric removal process associated with sulfur dioxide. Acidity levels of precipitation can be increased with this addition of hydrogen ions and potentially may have an adverse impact on biotic communities.

As previously indicated, the emission rate of $SO_2$ from the proposed project is estimated to be less than 28 tons per year. At this relatively low emission rate, no significant degree of rainfall acidification is anticipated due to the proposed project.

## 6.7.4 Soils

Operation of the facility must be addressed to determine the impacts of its emissions on soils in the nearby vicinity by such mechanisms as (1) dry deposition of emitted particulate; (2) washout deposition of particulate and water soluble gases; (3) dry reaction of gaseous compounds to the soil via metabolic incorporation into plant root systems; and (5) deposition of combustion particulate.

It is extremely difficult to quantify any of the potential impacts delineated above. However, at the low estimated emission rates for the proposed mill modifications, adverse impacts are unlikely.

Atmospheric washout will remove some particulate, $SO_2$, and $NO_2$. The amounts removed and initially deposited on the soil will be quite small in comparison to deposition due to emissions or sources in urban areas. It is doubtful that the pH of the rainfall in the region will be measurably lowered. Some field experiments at other locations using simulated rainfall at a pH of as low as 4 have shown only small effects on soil chemical properties. These same studies have shown that forested areas absorbed much of the deposited nitrogen and benefitted therefrom.[1]

Dry deposition acts continuously to reduce atmospheric concentrations of $SO_2$ by chemical reaction and adsorption by vegetation. Although rainfall is much more efficient at removing $SO_2$, dry deposition and reaction are probably responsible for removing twice as much atmospheric sulfur.[2] The small amount of $SO_2$ available for reaction (from the proposed boiler) will not result in any significant chemical alteration of the regional soils, and some of that which does react will be removed by subsequent rainfall.

$NO_2$, on the other hand, is dry deposited to a significant degree only after further atmospheric oxidation. Its atmospheric life is therefore longer than that of $SO_2$, and longer life means greater dispersion. When deposited, it is rapidly consumed by vegetation which increases its likelihood of eventually reacting with soils.[3] Its chemical impact on the soils,however, will likely be even less than that for $SO_2$ because it is dispersed over a greater distance.

### 6.7.5 Vegetation

The emission of common atmospheric pollutants such as $SO_2$, and $NO_2$, has the potential to cause damage to vegetation.[4] The proposed mill modifications must be addressed to determine if it has a potential impact on vegetation.

The sensitivity of vegetation to air pollution injury varies greatly with such factors as plant species and variety, climatic and seasonal conditions, soil composition, and the nature or combinations of pollutants.[5] In general, plants tend to be more susceptible to damage during spring and summer growing seasons and when exposed to short-term high concentrations as opposed to continuous lower levels of pollution.[6]

A summary of research on air pollution effects on vegetation divides air pollution injuries to plants into three general categories: acute, chronic, and subtle.[7] Acute injury is caused by exposure to a high concentration of a deleterious substance resulting in rapid visible death of some tissue. Chronic injury is caused by long-term exposure to low pollutant levels which gradually disrupts physiological processes and retards growth or yield.

Long-term subtle effects on vegetation are difficult to define and little is known to date as to the threshold concentrations and exposure times which may cause damage. The following paragraphs will, therefore, focus on acute injuries for which exposures and effects are known.

$SO_2$ will be emitted at relatively low levels resulting in a minimal $SO_2$ loading to the atmosphere. Hence, emissions of $SO_2$ from the modified facility are not expected to have an adverse impact on vegetation.

Potential $NO_2$ damage to vegetation in the area is also unlikely. In general, acute $NO_2$ damage to vegetation is not likely to occur at levels found outdoors although some reduction in growth might occur at continuous levels of 200 - 500 ug/m$^3$. Sensitive species may be damaged by 4-hour concentrations of 3800 - 13,3000 ug/m$^3$. Soybeans are considered to have intermediate sensitivity (4-hour injury threshold of 9,400 - 18,800 ug/m$^3$), while corn is rated as resistant (4-hold injury threshold of 16,900 ug/m$^3$). In view of the current background $NO_2$ levels and the decrease anticipated as a result of operation of the proposed modified mill, no adverse effects on vegetation are expected to occur.

## 6.8 REFERENCES

[1]R. A. Barnes, "The Long Range Transport of Air Pollution" in Journal of the Air Pollution Control Association, Volume 29, Number 12, December, 1979.

[2]Ibid

[3]Ibid

[4]George H. Hepting, "Air Pollution and Trees" in Man's Impact on Terrestrial and Oceanic Ecosystems, Matthews, Smith, and Goldberg, Editors, MIT Press, 1974.

[5]H. E. Heggest ad, "Air Pollution and Plants" in Matthews, et al., 1974.

[6]Wisconsin Public Service Corporation, "Air Pollution Effects on the Terrestrial Environment," Section 4.7.7.2 of Weston Generating Station Unit 3 Environmental Report, Vol. 2, 1975.

[7]Ibid

EPA "Screening Procedures for Estimating the Air Quality Impacts of Stationary Sources: EPA-450/4-88-010 August 1988

EPA "New Source Review Workshop Manual" DRAFT 1990.

EPA "Guideline on Air Quality Models (Revised)" EPA-450/2-78-027R 1986, 1987, 1990.

"PSD Permit Application for A Proposed Package Boiler" Champion International Corporation, Pensacola, Florida Mill, February 1991.

# APPENDIX A

# SUMMARY OF EMISSION FACTORS

## APPENDIX A

## CHAMPION - PENSACOLA
## SUMMARY OF EMISSION FACTORS
## BASELINE EMISSIONS

**#1 POWER BOILER**

- $NO_x$ - Stack test 2/91 (Appendix B, pg. B-2), 3 test runs conducted and the $NO_x$ emission rate reported for each run was 0.10 lbs/MMBtu, the average emission rate was 0.10 lb/MMBtu.

  Emission Factor = 0.10 lb/MMBtu

- $SO_2$ - Natural gas sulfur content reported as 10.7 ppm by weight (Appendix B, pg. B-3). $SO_2$ emission factor calculated as follows:

  10.7 ppm (by wt.) of S in natural gas

$$\frac{10.7 \text{ lb S}}{10^6 \text{ lb N.G.}} = 10.7 \text{ ppm S in N.G.}$$

Natural gas consumption

| % volume | | MW | | |
|---|---|---|---|---|
| 93.9 | $CH_4$ | 16 | $\Rightarrow$ | 15.02 |
| 3.6 | $C_2H_6$ | 30 | $\Rightarrow$ | 1.08 |
| 1.2 | $C_3H_8$ | 44 | $\Rightarrow$ | .53 |
| 1.3 | $C_4H_{10}$ | 58 | $\Rightarrow$ | .75 |
| | | | | 17.38 g/mole of N.G. |

for ideal gas at 68°F

$$\rho = 41.57 \frac{\text{mole}}{\text{m}^3}$$

Therefore:

$$\rho_{N.G.} = \left[\frac{41.57 \text{ mole}}{\text{m}^3}\right] \left[\frac{17.38 \text{ g}}{\text{mole}}\right] \left[\frac{2.832 \times 10^{-2} \text{ m}^3}{\text{ft}^3}\right] \left[\frac{1\text{lb m}}{454 \text{ g}}\right]$$

$$= .0451 \frac{\text{lb}}{\text{ft}^3}$$

$$\frac{10.7 \text{ lb S}}{10^6 \text{ lb N.G.}} \times .0451 \frac{\text{lb}}{\text{ft}^3} \text{ N.G.} = \frac{.482 \text{ lb S}}{10^6 \text{ ft}^3 \text{ N.G.}}$$

$$= \frac{0.482 \text{ lb S}}{10^6 \text{ ft}^3 \text{ N.G.}} \times \frac{\text{ft}^3 \text{ N.G.}}{1{,}000 \text{ Btu}} \times \frac{64 \text{ lb-moles } SO_2}{32 \text{ lb-moles S}}$$

$$= 0.00093 \frac{\text{lbs } SO_2}{\text{MMBtu}}$$

Emission factor = 0.00093 lb/MMBtu

- CO - PSD Permit Application for Proposed Package Boiler - Pensacola 2/91, (Appendix B, pg. B-4)

Emission Factor = 0.1 lb/MMBtu

- $PM/PM_{10}$ - The AP-42 emission factor estimate for PM/PM10 for utility boilers burning natural gas (Appendix B, pg. B-5) is 5 lbs per $10^6$ $ft^3$ of natural gas. Assuming 1,000 BTU per $ft^3$, the PM/PM10 emission factor is calculated as follows:

$$\frac{5 \text{ lbs PM/PM10}}{1 \times 10^6 \text{ ft}^3 \text{ N.G.}} \times \frac{1 \text{ ft}^3 \text{ N.G.}}{1{,}000 \text{ BTU}} = \frac{.005 \text{ lbs PM/PM10}}{\text{MMBtu}}$$

Emission Factor = 0.005 lb/MMBtu

- VOC

Emission Factor = 2.70 lb/hr

Emission Factor Based on 20 ppm as carbon and 5.71 x $10^4$ dscfm
- PSD Permit App - Pensacola 2/91, Appendix B, pg. B-7
- Stack Test 2/91

20 ppm as carbon = 6.9 ppm as propane

$$\frac{lb}{hr} = \frac{ppm}{385.35 \times 10^6} \times Q_{dscfm} \times \frac{60 \text{ min}}{hr} \times MW$$

Where:

385.35 x $10^6$ = A conversion factor relating cf/l (0.03531), g/lb (453.6), l/g-mole (24.06), and ppm ($10^6$)

44 = Molecular Weight as Propane

$$= \frac{6.9 \text{ ppm}}{385.35 \times 10^6} \times (5.71 \times 10^4) \times 60 \times 44 = 2.70 \text{ lb/hr}$$

= 2.70 lb/hr

**#2 POWER BOILER**

- $NO_x$ - Results of three separate $NO_x$ emission test runs during 2/91 were 0.40 lb/MMBtu, 0.42 lb/MMBtu and 0.44 lb/MMBtu. Mean value from the testing was 0.42 lb/MMBtu (Appendix B, pg. B-6).

Emission Factor = 0.42 lb/MMBtu

- $SO_2$ - Natural gas sulfur content reported as 10.7 ppm by weight (Appendix B, pg. B-3). $SO_2$ emission factor calculated as above for #1 Power Boiler.

  Emission Factor = 0.00093 lb/MMBtu

- CO - PSD Permit Application for Proposed Package Boiler - Pensacola 2/91, (Appendix B, pg. B-4).

  Emission Factor = 0.1 lb/MMBtu

- $PM/PM_{10}$ - The AP-42 emission factor estimate for PM/PM10 from utility boilers burning natural gas (Appendix B, pg. B-5) is 5 lbs per $10^6$ $ft^3$ of natural gas. Assuming 1,000 BTU per $ft^3$, the PM/PM10 emission factor is calculated as above for #1 Power Boiler.

  Emission Factor = 0.005 lb/MMBtu

- VOC

  Emission Factor = 2.68 lb/hr

Emission Factor Based on 20 ppm as carbon and $5.67 \times 10^4$ dscfm - PSD Permit App - Pensacola 2/91, Appendix B, pg. B-7 - Stack Test 2/91

20 ppm as carbon = 6.9 ppm as propane

Where:

$385.35 \times 10^6$ = A conversion factor relating cf/l (0.03531), g/lb (453.6), l/g-mole (24.06), and ppm ($10^6$)

44 = molecular weight as propane

$$\frac{lb}{hr} = \frac{6.9 \text{ ppm}}{385.35 \times 10^6} \times (5.67 \times 10^4) \times 60 \times 44 = 2.68 \text{ lb/hr}$$

Emission Factor = 2.68 lb/hr

## LIME KILN

- $NO_x$ - The $NO_x$ emission factor is based upon the average $NO_x$ emission rate from seven one-hour tests conducted December 1989 and one twelve-hour test conducted in April 1990. (Appendix B, pgs. B-8 and B-9)

Average

| | | |
|---|---|---|
| 14.2 lb/hr | Stack Test | 12/89 |
| 16.8 lb/hr | Stack Test | 4/90 |

Emission Factor = 15.5 lb/hr

- $SO_2$ - The $SO_2$ emission factor is based upon the average of four series of tests as indicated below (Appendix B, pgs. B-8, B-9, B-10, and B-11)

Average

| | | |
|---|---|---|
| 0.2 lb/hr | Stack Test | 4/89 |
| 0.7 lb/hr | Stack Test | 5/89 |
| 0.1 lb/hr | Stack Test | 12/89 |
| 0.7 lb/hr | Stack Test | 4/90 |

Emission Factor = 0.43 lb/hr

- CO - The CO emission factor is based upon the average of two series of tests as indicated below (Appendix B, pgs. B-8, B-9)

Average

| | | |
|---|---|---|
| 1.0 lb/hr | Stack Test | 12/89 |
| 1.8 lb/hr | Stack Test | 4/90 |

Emission Factor = 1.4 lb/hr

- $PM/PM_{10}$ - The PM/PM10 emission factor is based upon four series of stack tests as indicated below (Appendix B, pgs. B-10, B-12, B-13, and B-14)

Average

| | | |
|---|---|---|
| 10.8 lb/hr | Stack Test | 4/89 |
| 23.2 lb/hr | Stack Test | 12/89 |
| 14.8 lb/hr | Stack Test | 3/91 |
| 7.2 lb/hr | Stack Test | 3/92 |

Emission Factor = 14.0 lb/hr

- VOC - The VOC emission factor is based upon two series of stack tests as indicated below (Appendix B, pgs. B-8 and B-9)

Average (As Propane)

| | | |
|---|---|---|
| 0.700 lb/hr | Stack Test | 12/89 |
| 0.119 lb/hr | Stack Test | 4/90 |

Average Emission Factor = 0.41 lb/hr as propane

- TRS

Emission Factor = 2.02 lb/hr

Emission Factor Based on 12.8 ppm @ 10% $O_2$ - 2-year average based on CEM data using average gas stream volumetric flow data from stack tests in March 91 and March 92 (Appendix B, pgs. B-13 and B-14)

27,100 dscfm @ 8.9% $O_2$

$$27{,}100 \text{ dscfm} \times \left[\frac{20.9 - 8.9}{20.9 - 10}\right] = 29{,}835 \text{ dscfm @ } 10\%\ O_2$$

Where:

20.9 = $O_2$ concentration at standard conditions

$$\frac{lb}{hr} = \frac{ppm}{385.35 \times 10^6} \times Q_{dscfm} \times \frac{60 \text{ min}}{hr} \times MW$$

Where:

$385.35 \times 10^6$ = A conversion factor relating cf/l (0.03531), g/lb (453.6), l/g-mole (24.06), and ppm ($10^6$)

$$= 12.8 \text{ ppm} \times \frac{29{,}835 \text{ dscfm}}{385.35 \times 10^6} \times 34 \times 60 = 2.02 \text{ lb/hr}$$

$= 2.02$ lb/hr as $H_2S$

**CHAMPION - PENSACOLA**
**SUMMARY OF EMISSION FACTORS**
**FUTURE EMISSIONS**

**LIME KILN - MUD DRYER**

- $NO_x$ - Based upon an Ahlstrom Guarantee of 200 ppm $NO_x$ when firing oil (Appendix B, pg. B-15) and a scrubber outlet flow rate of 34,383 dscfm (Appendix B, p B-18).

Emission Factor = 49.3 lb/hr

VENDOR INFORMATION

$Q_{DSCFM}$ = 34,383

$NO_x$ = 200 ppm - oil fired

$$\text{lb/hr} = Q_{DSCFM} \times \frac{\text{ppm}}{385.35 \times 10^6} \times \text{M.W.} \times 60 \text{ min/hr}$$

$$= 34{,}383 \times \frac{200 \text{ ppm}}{385.35 \times 10^6} \times 46 \times 60$$

$$= 49.3 \text{ lb/hr}$$

- $SO_2$ - Based upon CHAMPION's anticipated worst case $SO_2$ loading to the scrubber (Appendix B, p B-16), a scrubber control efficiency of 95%, and a scrubber outlet flow rate of 34,383 dscfm (Appendix B, p B-18).

Emission Factor = 6.49 lb/hr

Emission Factor Based on inlet scrubber loading of 129.85 lb/hr.

= 129.85 (1 - 0.95) = 6.49 lb/hr

Assume a scrubber control efficiency of 95%.

- CO - Based upon an Ahlstrom guarantee of 45 ppm CO when firing either oil or natural gas (Appendix B, pg. B-15) and a scrubber outlet flow rate of 34,383 dscfm (Appendix B, p B-18).

Emission Factor = 6.75 lb/hr

Emission Factor Based on 45 ppm

$$\frac{lb}{hr} = \frac{45\ ppm}{385.35 \times 10^6} \times (34{,}383) \times 28 \times 60$$

$$= 6.75\ lb/hr$$

- $PM/PM_{10}$ - Based upon the Vendor guarantee of 0.037 gr/dscf and a scrubber outlet flow rate of 34,383 dscfm (Appendix B, p B-18).

Emission Factor = 10.90 lb/hr

Emission Factor Based on 0.037 gr/dscf *per vendor*

$$\frac{lb}{hr} = \frac{gr/dscf}{7000\ gr/lb} \times Q_{DSCFM} \times 60$$

$$= \frac{0.037}{7000} \times (34{,}383) \times (60) = 10.90\ lb/hr$$

- VOC - Based upon CHAMPION's maximum estimated VOC loading to the Lime Kiln-Mud Dryer (Appendix B, p B-17).

Emission Factor = 24.5 lb/hr

Emission Factor Based on 104 ppm

160 ppm as propane

$$\frac{lb}{hr} = \frac{ppm}{385.35 \times 10^6} \times MW \times Q_{DSCFM} \times 60$$

$$\frac{lb}{hr} = \frac{104}{385.35 \times 10^6} \times 44 \times 34{,}383 \times 60 = 24.5\ lb/hr$$

- TRS - Based upon the Ahlstrom guarantee of 8 ppm @ 10% $O_2$ (Appendix B, pg. B-15) and a scrubber outlet flow rate of 34,383 dscfm (Appendix B, p B-18).

  Emission Factor = 1.46 lb/hr

  Emission factor based on 8 ppm TRS @ 10% $O_2$ and $Q_{dscfm}$ = 34,383

$$8 \text{ ppm} \times \frac{34{,}383}{385.35 \times 10^6} \times 34 \times 60 = 1.46 \text{ lb/hr as } H_2S$$

**POWER BOILER #6**

- $NO_x$ - Based upon the BACT Analysis

  Emission Factor = 0.06 lb/MMBtu

- $SO_2$ - Natural gas sulfur content reported as 10.7 ppm by weight (Appendix B, pg. B-3). $SO_2$ emission factor calculated as above for #1 Power Boiler baseline emission rates.

  Emission Factor = 0.00093 lb/MMBtu

- CO - Based upon the BACT Analysis

  Emission Factor = 0.1 lb/MMBtu

- $PM/PM_{10}$ - Based upon the AP-42 factor for utility size natural gas-fired boilers; AP-42 Table 1.4-1 (Appendix B, pg. B-20).

  Emission Factor = 0.005 lb/MMBtu

- VOC - Based upon the BACT Analysis

  Emission Factor = 0.01 lb/MMBtu

**CHAMPION - PENSACOLA**
**SUMMARY OF BASELINE EMISSIONS CALCULATIONS**

## NO. 1 POWER BOILER

Baseline Fuel Usage

$$\frac{\left[745{,}897\,\frac{Mcf}{yr} + 877{,}13\,\frac{Mcf}{yr}\right]}{2} = 811{,}55\,\frac{Mcf}{yr}$$

$$= 811.46\,\frac{MMcf\ NG}{yr}$$

$$= 811.46\,\frac{MMcf\ NG}{yr} \times \frac{1000\ MMBtu}{1\ MMcf\ NG} = 811{,}455\,\frac{MMBtu}{yr}$$

$$= 811{,}455\,\frac{MMBtu}{yr}$$

- $NO_x$

$$\frac{tons\ NO_x}{yr} = 0.1\,\frac{lb\ NO_x}{MMBtu} \times 811{,}455\,\frac{MMBtu}{yr} \times \frac{1\ ton}{2000\ lb}$$

$$= 40.57\,\frac{tons\ NO_x}{yr}$$

- $SO_2$

$$\frac{tons\ SO_2}{yr} = 0.00093\,\frac{lb\ SO_2}{MMBtu} \times 811{,}455\,\frac{MMBtu}{yr} \times \frac{1\ ton}{2000\ lb}$$

$$= 0.38\,\frac{tons\ SO_2}{yr}$$

- CO

$$\frac{\text{tons CO}}{\text{yr}} = 0.1\ \frac{\text{lb CO}}{\text{MMBtu}} \times 811{,}455\ \frac{\text{MMBtu}}{\text{yr}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$$

$$= 40.57\ \frac{\text{tons CO}}{\text{yr}}$$

- $PM/PM_{10}$

$$\frac{\text{tons PM/PM}_{10}}{\text{yr}} = 0.005\ \frac{\text{lb PM/PM}_{10}}{\text{MMBtu}} \times 811{,}455\ \frac{\text{MMBtu}}{\text{yr}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$$

$$= 2.03\ \frac{\text{tons PM/PM}_{10}}{\text{yr}}$$

- VOC

$$\frac{\text{tons VOC}}{\text{yr}} = 2.70\ \frac{\text{lb VOC}}{\text{hr}} \times \left[\frac{7{,}410\ \text{hr} + 8{,}646\ \text{hr}}{2}\right] \times \frac{1\ \text{ton}}{2000\ \text{lb}}$$

$$= 10.84\ \frac{\text{tons VOC}}{\text{yr}}$$

**NO.2 POWER BOILER**

Baseline Fuel Usage

$$\frac{\left[438{,}901\ \frac{\text{Mcf}}{\text{yr}} + 639{,}177\ \frac{\text{Mcf}}{\text{yr}}\right]}{2} = 539{,}039\ \frac{\text{Mcf}}{\text{yr}}$$

$$= 539.04 \ \frac{\text{MMcf NG}}{\text{yr}}$$

$$= 539.04 \ \frac{\text{MMcf NG}}{\text{yr}} \times 1000 \ \frac{\text{MMBtu}}{\text{1 MMcf NG}} = 539{,}039 \ \frac{\text{MMBtu}}{\text{yr}}$$

$$= 539{,}039 \ \frac{\text{MMBtu}}{\text{yr}}$$

- $NO_x$

$$\frac{\text{tons } NO_x}{\text{yr}} = 0.42 \ \frac{\text{lb } NO_x}{\text{MMBtu}} \times 539{,}039 \ \frac{\text{MMBtu}}{\text{yr}} \times \frac{\text{1 ton}}{\text{2000 lb}}$$

$$= 113.2 \ \frac{\text{tons } NO_x}{\text{yr}}$$

- $SO_2$

$$\frac{\text{tons } SO_2}{\text{yr}} = 0.00093 \ \frac{\text{lb } SO_2}{\text{MMBtu}} \times 539{,}039 \ \frac{\text{MMBtu}}{\text{yr}} \times \frac{\text{1 ton}}{\text{2000 lb}}$$

$$= 0.25 \ \frac{\text{tons } SO_2}{\text{yr}}$$

- CO

$$\frac{\text{tons CO}}{\text{yr}} = 0.1 \ \frac{\text{lb CO}}{\text{MMBtu}} \times 539{,}039 \ \frac{\text{MMBtu}}{\text{yr}} \times \frac{\text{1 ton}}{\text{2000 lb}}$$

$$= 26.95 \ \frac{\text{tons CO}}{\text{yr}}$$

- $PM/PM_{10}$

$$\frac{\text{tons } PM/PM_{10}}{\text{yr}} = 0.005 \ \frac{\text{lb } PM/PM_{10}}{\text{MMBtu}} \times 539{,}039 \ \frac{\text{MMBtu}}{\text{yr}} \times \frac{1 \text{ ton}}{2000 \text{ lb}}$$

$$= 1.35 \ \frac{\text{tons } PM/PM_{10}}{\text{yr}}$$

- VOC

$$\frac{\text{tons VOC}}{\text{yr}} = 2.68 \ \frac{\text{lb VOC}}{\text{hr}} \times \left[\frac{3{,}619 \text{ hr} + 6{,}404 \text{ hr}}{2}\right] \times \frac{1 \text{ ton}}{2000 \text{ lb}}$$

$$= 6.72 \ \frac{\text{tons VOC}}{\text{yr}}$$

**LIME KILN**

Hours of Operation

$$\text{Hours of Operation} = \left[\frac{8{,}072 \text{ hr} + 8{,}305 \text{ hr}}{2}\right] = 8{,}188.5 \text{ hr}$$

$$= 8{,}188.5 \text{ hr}$$

- $NO_x$

$$\frac{\text{tons } NO_x}{\text{yr}} = 15.5 \ \frac{\text{lb } NO_x}{\text{hr}} \times 8{,}188.5 \text{ hr} \times \frac{1 \text{ ton}}{2000 \text{ lb}}$$

$$= 63.46 \ \frac{\text{tons } NO_x}{\text{yr}}$$

- $SO_2$

$$\frac{\text{tons } SO_2}{\text{yr}} = 0.43 \ \frac{\text{lb } SO_2}{\text{hr}} \times 8188.5 \text{ hr} \times \frac{1 \text{ ton}}{2000 \text{ lb}}$$

$$= 1.76 \ \frac{\text{tons } SO_2}{\text{yr}}$$

- CO

$$\frac{\text{tons CO}}{\text{yr}} = 1.4 \ \frac{\text{lb CO}}{\text{hr}} \times 8188.5 \text{ hr} \times \frac{1 \text{ ton}}{2000 \text{ lb}}$$

$$= 5.73 \ \frac{\text{tons CO}}{\text{yr}}$$

- $PM/PM_{10}$

$$\frac{\text{tons } PM/PM_{10}}{\text{yr}} = 14.0 \ \frac{\text{lb } PM/PM_{10}}{\text{hr}} \times 8188.5 \text{ hr} \times \frac{1 \text{ ton}}{2000 \text{ lb}}$$

$$= 57.32 \ \frac{\text{tons } PM/PM_{10}}{\text{yr}}$$

- VOC

$$\frac{\text{tons VOC}}{\text{yr}} = 0.41 \frac{\text{lb VOC}}{\text{hr}} \times 8188.5 \text{ hr} \times \frac{1 \text{ ton}}{2,000 \text{ lb}}$$

$$=1.68 \ \frac{\text{tons VOC}}{\text{yr}}$$

- TRS

$$\frac{\text{tons TRS}}{\text{yr}} = 2.02 \ \frac{\text{lb TRS}}{\text{hr}} \times 8188.5 \text{ hr} \times \frac{1 \text{ ton}}{2000 \text{ lb}}$$

$$= 8.27 \ \frac{\text{tons TRS}}{\text{yr}}$$

## CHAMPION - PENSACOLA

## SUMMARY OF FUTURE EMISSIONS CALCULATIONS

**Lime Kiln - Mud Dryer**

- $NO_x$

$$\frac{\text{tons } NO_x}{\text{yr}} = 49.3 \frac{\text{lb } NO_X}{\text{hr}} \times 8760 \frac{\text{hrs}}{\text{yr}} \times \frac{1 \text{ ton}}{2000 \text{ lb}}$$

$$= 215.93 \frac{\text{tons } NO_x}{\text{yr}}$$

- $SO_2$

$$\frac{\text{tons } SO_2}{\text{yr}} = 6.49 \frac{\text{lb } SO_2}{\text{hr}} \times 8760 \frac{\text{hrs}}{\text{yr}} \times \frac{1 \text{ ton}}{2000 \text{ lb}}$$

$$= 28.43 \frac{\text{tons } SO_2}{\text{yr}} \quad \text{(CONTROLLED)}$$

- CO

$$\frac{\text{tons CO}}{\text{yr}} = 6.75 \frac{\text{lb CO}}{\text{hr}} \times 8760 \frac{\text{hrs}}{\text{yr}} \times \frac{1 \text{ ton}}{2000 \text{ lb}}$$

$$= 29.57 \frac{\text{tons CO}}{\text{yr}}$$

- PM/PM_10

$$\frac{\text{tons } PM/PM_{10}}{\text{yr}} = 10.9 \frac{\text{lb } PM/PM_{10}}{\text{hr}} \times 8760 \frac{\text{hrs}}{\text{yr}} \times \frac{1 \text{ ton}}{2000 \text{ lb}}$$

$$= 47.74 \frac{\text{tons } PM/PM_{10}}{\text{yr}}$$

- VOC

$$\frac{\text{tons VOC}}{\text{yr}} = 24.5 \ \frac{\text{lb VOC}}{\text{hr}} \times 8760 \ \frac{\text{hrs}}{\text{yr}} \times \frac{\text{1 ton}}{\text{2000 lb}}$$

$$= 107.31 \ \frac{\text{tons VOC}}{\text{yr}}$$

- TRS

$$\frac{\text{tons TRS}}{\text{yr}} = 1.46 \ \frac{\text{lb TRS}}{\text{hr}} \times 8760 \ \frac{\text{hrs}}{\text{yr}} \times \frac{\text{1 ton}}{\text{2000 lb}}$$

$$= 6.39 \ \frac{\text{tons TRS}}{\text{yr}}$$

**No. 6 Power Boiler**

Boiler Heat Input Rating 533 MMBtu/hr

$$\frac{\text{533 MMBtu}}{\text{hr}} \times 8760 \ \frac{\text{hr}}{\text{yr}} = 4{,}669{,}080 \ \frac{\text{MMBtu}}{\text{yr}}$$

- $NO_x$

$$\frac{\text{tons } NO_x}{\text{yr}} = 0.06 \ \frac{\text{lb } NO_x}{\text{MMBtu}} \times 4{,}669{,}080 \ \frac{\text{MMBtu}}{\text{yr}} \times \frac{\text{1 ton}}{\text{2000 lb}}$$

$$= 140.07 \ \frac{\text{tons } NO_x}{\text{yr}}$$

- $SO_2$

$$\frac{\text{tons } SO_2}{\text{yr}} = 0.00093 \ \frac{\text{lb } SO_2}{\text{MMBtu}} \times 4{,}669{,}080 \ \frac{\text{MMBtu}}{\text{yr}} \times \frac{\text{1 ton}}{\text{2000 lb}}$$

$$= 2.17 \ \frac{\text{tons } SO_2}{\text{yr}}$$

- CO

$$\frac{\text{tons CO}}{\text{yr}} = 0.1\frac{\text{lb CO}}{\text{MMBtu}} \times 4{,}669{,}080\ \frac{\text{MMBtu}}{\text{yr}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$$

$$= 233.45\ \frac{\text{tons CO}}{\text{yr}}$$

- $PM/PM_{10}$

$$\frac{\text{tons } PM/PM_{10}}{\text{yr}} = 0.005\ \frac{\text{lb } PM/PM_{10}}{\text{MMBtu}} \times 4{,}669{,}080\ \frac{\text{MMBtu}}{\text{yr}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$$

$$= 11.67\ \frac{\text{tons } PM/PM_{10}}{\text{yr}}$$

- VOC

$$\frac{\text{tons VOC}}{\text{yr}} = 0.01\ \frac{\text{lb VOC}}{\text{MMBtu}} \times 4{,}669{,}080\ \frac{\text{MMBtu}}{\text{yr}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$$

$$= 23.35\ \text{tons}\ \frac{\text{VOC}}{\text{yr}}$$

# APPENDIX B

# EMISSION DATA SUPPORTING INFORMATION

## SECTION 2. RESULTS AND DISCUSSION

Emission testing on the No. 1 and No. 2 Power Boilers was performed on 08 and 09 February 1991. The results of this testing are summarized in Tables 2.1 and 2.2. Field and process data are located in Appendices B, C, and D, respectively. Sample calculations are illustrated in Appendix E.

TABLE 2.1. SUMMARY OF $NO_x$ EMISSION - NO. 1 POWER BOILER

| | RUN 1 | RUN 2 | RUN 3 | MEAN |
|---|---|---|---|---|
| Date | 02/08/91 | 02/08/91 | 02/08/91 | ---- |
| Time Begin | 1246 | 1417 | 1545 | ---- |
| Time Ended | 1346 | 1517 | 1645 | ---- |
| Stack Gas | | | | |
| Temperature, °F | 485 | 486 | 490 | 487 |
| Velocity, ft/sec | 47.9 | 52.7 | 52.3 | 51.0 |
| Moisture, % | 5.4 | 5.4 | 5.4 | 5.4 |
| Oxygen, % | 9.8 | 9.9 | 9.8 | 9.8 |
| Carbon Dioxide, % | 5.9 | 5.9 | 6.1 | 6.0 |
| Volumetric Flow Rate | | | | |
| at Stack Conditions, x $10^5$ $ft^3$/min | 0.98 | 1.08 | 1.07 | 1.04 |
| at Standard Conditions, x $10^4$ $ft^3$/min | 5.19 | 5.71 | 5.65 | 5.5 |
| Nitrogen Oxides | | | | |
| Concentration, ppm | 31 | 29 | 28 | 29 |
| Emission Rate, lb/hr | 11.5 | 11.9 | 11.3 | 11.6 |
| Emission Rate, lb/mmBTU | 0.10 | 0.10 | 0.10 | 0.10 |

Champion
Champion International Corporation

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DATE 9/23 TIME 4:30 NO OF PAGES 2

TO: John Egan FROM: Steve Webb

LOCATION: LOCATION:

COMMENTS: Total S component analysis from one of our suppliers.
Other component analysis included as well —

FC-1129

PETROLEUM ANALYST INC.

ANALYTICAL CONSULTANTS

GAS ANALYSIS REPORT NO: 007-050892-02 DATE: 05-08-92

FOR: FIVE FLAGS PIPELINE
ATTN: MR. N. SMITH
P.O. BOX 1062
PACE FL 32570

SAMPLE IDENTIFICATION:
COMPANY: FIVE FLAGS PIPELINE
FIELD: PACE FLORIDA
LEASE: CHAMPION

SAMPLE DATA: DATE: 04-29-92 BY: N. SMITH
PSIG: 68 TEMP: DEG.F. GRAV:
MCF/D: DIF: IN. DP: LBS H2O

REMARKS: COMPOSITE SAMPLE FROM 03-30-92 TO 04-29-92.

CYL. # 1024

COMPONENT ANALYSIS

TOTAL SULFUR = 10.7 PPM (BY WEIGHT)

Post-it™ brand fax transmittal memo 7671 # of pages ▸ 1

| To Steve Webb | From Nathan Smith |
|---|---|
| Co. Champion | Five Flags Pipeline |
| Dept. | |

# PSD Permit Application for A Proposed Package Boiler

# Champion International Corporation Pensacola Florida Mill

February 1991

2.5 Other Criteria Pollutants

A summary of the expected emission rates from the No. 5 Package Boiler of particulate matter, PM-10, sulfur dioxide, carbon monoxide, and hydrocarbons is presented in Table 2-2. The emissions of the above criteria pollutants are less than the PSD threshold levels requiring new source review.

Particulate matter emissions were derived using Table 1.4-1, Uncontrolled Emission Factors for Natural Gas Combustion in U.S. EPA Publication AP-42. A conservative factor for utility boilers of 5 lbs per million cubic feet of natural gas was used. Based on the maximum heat input of 195 MMBtu/hr and 8,760 hours of operation per year maximum hourly and annual particulate matter emissions are 0.98 lbs/hr and 4.3 tons/year respectively. All of the particulate matter generated is assumed to be PM-10.

Sulfur dioxide emissions were derived using Table 1.4-1, Uncontrolled Emission Factors for Natural Gas Combustion in U.S. EPA Publication AP-42. A conservative factor for utility boilers of 0.60 lbs per million cubic feet of natural gas was used. Based on the maximum heat input of 195 MMBtu/hr and 8,760 hours of operation per year, maximum hourly and annual sulfur dioxide emissions are estimated to be 0.12 lbs/hr and 0.53 tons/year respectively.

The carbon monoxide emission rate in Table 2-2 was derived from actual emission tests conducted on the No. 5 Package Boiler in May of 1989. Based on a "worst case" measured mass emission rate approximately 0.1 pounds of CO per MMBtu, a maximum heat input of 195 MMBtu/hr and 8,760 hours of operation per year, annual CO emissions are estimated to be 85.41 tons/year.

TABLE 1.4-1. UNCONTROLLED EMISSION FACTORS FOR NATURAL GAS COMBUSTION[a]

| Furnace Size & Type ($10^6$ Btu/hr heat input) | Particulates[b] | | Sulfur[c] Dioxide | | Nitrogen[d,e] Oxide | | Carbon[f,g] Monoxide | | Volatile Organics Nonmethane | | Volatile Organics Methane | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $kg/10^6m^3$ | $lb/10^6ft^3$ | $kg/10^6m^3$ | $lb/10^6ft^3$ | $kg/10^6m^3$ | $lb/10^6ft^3$ | $kg/10^6m^3$ | $lb/10^6ft^3$ | $kg/10^6m^3$ | $lb/10^6ft^3$ | $kg/10^6m^3$ | $lb/10^6ft^3$ |
| Utility boilers (>100) | 16-80 | 1-5 | 9.6 | 0.6 | 8800[h] | 550[h] | 640 | 40 | 23 | 1.4 | 4.8 | 0.3 |
| Industrial boilers (10 - 100) | 16-80 | 1-5 | 9.6 | 0.6 | 2240 | 140 | 560 | 35 | 44 | 2.8 | 48 | 3 |
| Domestic and commercial boilers (<10) | 16-80 | 1-5 | 9.6 | 0.6 | 1600 | 100 | 320 | 20 | 84 | 5.3 | 43 | 2.7 |

[a]All emission factors are expressed as weight per volume fuel fired.
[b]References 15-18.
[c]Reference 4 (based on an average sulfur content of natural gas of 4600 $g/10^6\ Nm^3$ (2000 $gr/10^6$ scf).
[d]References 4-5,7-8,11,14,18-19,21.
[e]Expressed as $NO_2$. Test results indicate that about 95 weight % of $NO_x$ is NO.
[f]References 4,7-8,16,18,22-25.
[g]References 16 and 18. May increase 10 to 100 times with improper operation or maintenance.
[h]Use 4400 $kg/10^6\ m^3$ (275 $lb/10^6ft^3$) for tangentially fired units. At reduced loads, multiply this factor by the load reduction coefficient given in Figure 1.4-1. See text for potential $NO_x$ reductions by combustion modifications. Note that the $NO_x$ reduction from these modifications will also occur at reduced load conditions.

## TABLE 2.2. SUMMARY OF $NO_x$ EMISSION - NO. 2 POWER BOILER

| | RUN 1 | RUN 2 | RUN 3 | MEAN |
|---|---|---|---|---|
| Date | 02/09/91 | 02/09/91 | 02/09/91 | ---- |
| Time Begin | 0938 | 1100 | 1221 | ---- |
| Time Ended | 1039 | 1200 | 1321 | ---- |
| Stack Gas | | | | |
| Temperature, °F | 373 | 379 | 382 | 378 |
| Velocity, ft/sec | 43.5 | 44.1 | 47.0 | 44.9 |
| Moisture, % | 6.1 | 6.1 | 6.1 | 6.1 |
| Oxygen, % | 9.5 | 9.4 | 9.5 | 9.5 |
| Carbon Dioxide, % | 6.5 | 6.4 | 6.5 | 6.5 |
| Volumetric Flow Rate | | | | |
| at Stack Conditions, x $10^4$ $ft^3$/min | 8.88 | 9.00 | 9.60 | 9.16 |
| at Standard Conditions, x $10^4$ $ft^3$/min | 5.30 | 5.34 | 5.67 | 5.44 |
| Nitrogen Oxides | | | | |
| Concentration, ppm | 173 | 179 | 178 | 177 |
| Emission Rate, lb/hr | 66 | 69 | 72 | 69 |
| Emission Rate, lb/mmBTU | 0.40 | 0.42 | 0.44 | 0.42 |

The hydrocarbon emission rate in Table 2-2 was derived from actual emission tests conducted on the No. 5 Package Boiler in May of 1989. Based on a measured hydrocarbon concentration of 20 ppm (vol, dry), a volumetric flow rate of 33,000 dscfm (0°C, 1 atm) and 8,760 hours of operation per year, the hourly and annual hydrocarbon emissions are estimated to be 1.8 lbs/hr and 7.9 tons/year respectively.

# PSD Permit Application for A Proposed Package Boiler

# Champion International Corporation Pensacola Florida Mill

February 1991

1989

TABLE 2.3. ONE HOUR SUMMARY OF $O_2$, CO, $NO_x$, $SO_2$, AND THC EMISSION, LIME KILN

| | TIME PERIOD | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | AVG |
| Date[a] | 12/13 | 12/13 | 12/13 | 12/13 | 12/13 | 12/13 | 12/13 | --- |
| Time Began | 1201 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | --- |
| Time Ended | 1259 | 1359 | 1459 | 1559 | 1659 | 1759 | 1859 | --- |
| Volumetric Flow Rate $\times 10^4$ $ft^3/min$ at Standard Conditions | 2.72 | 2.72 | 2.72 | 2.72 | 2.72 | 2.72 | 2.72 | 2.72 |
| Carbon Dioxide | | | | | | | | |
| Concentration, % | 16.6 | 17.2 | 17.9 | 14.9 | 18.4 | 16.7 | 17.5 | 17.0 |
| Oxygen Concentration, % | 6.0 | 5.9 | 5.7 | 7.7 | 5.6 | 6.9 | 6.2 | 6.3 |
| Carbon Monoxide | | | | | | | | |
| Concentration, ppm | 11.0 | 8 | 8 | 7 | 9 | 9 | 9 | 9 |
| Emission Rate, lb/hr | 1.3 | 1.0 | 1.0 | 0.9 | 1.1 | 1.0 | 1.0 | 1.0 |
| Nitrogen Oxides[b] | | | | | | | | |
| Concentration, ppm | 76 | 72 | 73 | 70 | 72 | 70 | 73 | 72 |
| Emission Rate, lb/hr | 14.8 | 14.1 | 14.2 | 13.6 | 14.1 | 13.6 | 14.8 | 14.2 |
| Sulfur Dioxide | | | | | | | | |
| Concentration, ppm | 1 | <1 | 1 | 0 | 0 | 0 | 0 | <1 |
| Emission Rate, lb/hr | 0.3 | 0.1 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| Total Hydrocarbons[c] | | | | | | | | |
| Concentration, ppm | 5 | 7 | 7 | 2 | 2 | 1 | 2 | 4 |
| Emission Rate, lb/hr | 0.9 | 1.2 | 1.3 | 0.4 | 0.3 | 0.2 | 0.3 | 0.7 |

[a]1989.
[b]as $NO_x$.
[c]as propane.

L:\1503\2246.RPT

## II. SUMMARY

Tabulated below are data collected on the Lime Kiln emissions during testing on April 11-12, 1990.

CHAMPION INTERNATIONAL CORPORATION

LIME KILN

| PARAMETER | PERMIT LIMIT | RUN 1 ( 12 hr avg. ) |
|---|---|---|
| DATE | | 4/11-12/90 |
| TIME | | 1720-2104 |
| | | 2251- 728 |
| SULFUR DIOXIDE | | |
| ( PPM ) | | ~~2.08~~ |
| ( lb/hr ) | | 0.666 |
| OXIDES OF NITROGEN | | |
| ( PPM ) | | 73.08 |
| ( lb/hr ) | | 16.791 |
| CARBON MONOXIDE | | |
| ( PPM ) | | 12.95 |
| ( lb/hr ) | | 1.811 |
| TOTAL HYDROCARBON** | | |
| ( PPM ) | | 1.63 |
| ( lb/hr ) | | 0.131 |
| OPERATING RATE | | |
| ( ton lime mud/hr ) | 24.5 | na |
| OXYGEN - test monitor | | |
| ( % ) | | 6.84 |
| STACK GAS DATA - * | | |
| TEMPERATURE, F | | 182 |
| MOISTURE, % | | 38.10 |
| VELOCITY, ft/ sec | | 31.37 |
| FLOW RATE, ACFM | | 62460.8 |
| , DSCFM | | 32049.7 |

* - Average of three particulate tests conducted on 4-11-90

** - AS METHANE

WESTON

## SECTION 2.

## RESULTS AND DISCUSSION

### 2.1. LIME KILN

Emission testing on the Lime Kiln was performed on 26 April 1989. The results of this testing are summarized in Tables 2.1 and 2.2. Supporting field, process, and laboratory data are provided in Appendices B and C, respectively. Example calculations are illustrated in Appendix F.

TABLE 2.1

LIME KILN
SUMMARY OF PARTICULATE, NITROGEN OXIDES,
AND SULFUR DIOXIDE EMISSIONS

| | RUN 1 | RUN 2 | RUN 3 | MEAN |
|---|---|---|---|---|
| Date | 4/26/89 | 4/26/89 | 4/26/89 | ---- |
| Time Began | 1028 | 1220 | 1423 | ---- |
| Time Ended | 1132 | 1329 | 1525 | ---- |
| Stack Gas | | | | |
| Temperature, °F | 172 | 170 | 172 | 171 |
| Velocity, ft/sec | 24.4 | 23.4 | 24.4 | 24.1 |
| Moisture, % | 41.1 | 37.6 | 38.7 | 39.2 |
| Oxygen, % | 6.7 | 4.8 | 5.0 | 5.5 |
| Carbon Dioxide, % | 16.0 | 18.9 | 17.8 | 17.6 |
| Volumetric Flow Rate | | | | |
| At Stack Conditions | | | | |
| x $10^4$ $ft^3$/min | 4.85 | 4.66 | 4.87 | 4.79 |
| At Standard Conditions | | | | |
| x $10^4$ $ft^3$/min | 2.40 | 2.45 | 2.50 | 2.45 |
| Particulate | | | | |
| Isokinetic Sampling Rate, % | 87 | 90 | 93 | 90 |
| Concentration[a], gr/$ft^3$ | 0.071 | 0.050 | 0.035 | 0.052 |
| Emission Rate, lb/hr | 14.6 | 10.4 | 7.4 | 10.8 |
| Allowable Limit, lb/hr | ---- | ---- | ---- | 26.1 |
| Nitrogen Oxides | | | | |
| Concentration[a], ppm | 82 | 82 | 81 | 82 |
| Emission Rate, lb/hr | 14.1 | 14.4 | 14.5 | 14.3 |
| Sulfur Dioxide | | | | |
| Concentration[a], ppm | 1.1 | 0.2 | 0.2 | 0.5 |
| Emission Rate, lb/hr | 0.3 | 0.1 | 0.1 | 0.2 |

[a]At standard conditions 68° F and 29.92 inches of mercury.



N:100/224625R2

WESTON
MANAGERS DESIGNERS CONSULTANTS

## 2.2. LIME KILN CONDITION 1 - ALL NGC SOURCES

Sulfur Dioxide testing on the Lime Kiln with All NCG Sources feed was performed on 16 May 1989. The results of this testing are summarized in Table 2.2. Supporting field and laboratory data are provided in Appendix B. Example calculations are illustrated in Appendix I.

TABLE 2.2

SUMMARY OF EMISSIONS - LIME KILN CONDITION 1
ALL NCG SOURCES

| | RUN 1 | RUN 2 | RUN 3 | MEAN |
|---|---|---|---|---|
| Date | 5/16/89 | 5/16/89 | 5/16/8 | --- |
| Time Began | 1000 | 1108 | 1200 | --- |
| Time Ended | 1030 | 1138 | 1230 | --- |
| Stack Gas | | | | |
| Temperature, °F | 166 | 166 | 166 | 166 |
| Velocity, ft/sec | 20.9 | 21.1 | 20.7 | 20.9 |
| Moisture, % | 37.2 | 37.2 | 37.2 | 37.2 |
| Oxygen, % | 19.0 | 19.0 | 18.0 | 18.7 |
| Carbon Dioxide, % | 6.0 | 6.5 | 4.5 | 5.7 |
| Volumetric Flow Rate | | | | |
| At Stack Conditions $\times 10^4$ $ft^3$/min | 4.16 | 4.21 | 4.13 | 4.17 |
| At Standard Conditions $\times 10^4$ $ft^3$/min | 2.21 | 2.23 | 2.19 | 2.21 |
| Sulfur Dioxide | | | | |
| Concentration[a], ppm | 4.4 | 3.3 | 2.4 | 3.3 |
| Emission Rate, lb/hr | 1.0 | 0.7 | 0.5 | 0.7 |

[a]At standard condition - 68° F and 29.92 inches of mercury.



N:100/2246RPT2

## 2.2. LIME KILN

This section summarizes the results of the emission testing on the lime kiln. Table 2.2 summarizes the three one-hour particulate emission tests performed at the outlet of the kiln. Table 2.3 summarizes the results of the continuous emission monitoring system (CEMS) for $CO_2$, $O_2$, CO, THC, $NO_x$, and $SO_2$ on an hourly basis. These results for the CEMS are then provided in graphical form in Figures 2.1 and 2.2. Particulate and CEMS field data are located in Appendices B and C, respectively. Laboratory and process data are provided in Appendices D and E, respectively. Example calculations are illustrated in Appendix G.

TABLE 2.2. LIME KILN
SUMMARY OF PARTICULATE EMISSIONS

| | RUN 1 | RUN 2 | RUN 3 | MEAN |
|---|---|---|---|---|
| Date | 12-12-89 | 12-12-89 | 12-12-89 | --- |
| Time Began | 0930 | 1230 | 1510 | --- |
| Time Ended | 1030 | 1330 | 1610 | --- |
| Stack Gas | | | | |
| Temperature, °F | 160 | 162 | 161 | 161 |
| Velocity, ft/sec | 26.5 | 25.2 | 26.9 | 26.2 |
| Moisture, % | 37.3 | 34.7 | 36.2 | 36.0 |
| Oxygen, % | 6.5 | 7.0 | 6.5 | 6.7 |
| Carbon Dioxide, % | 16.5 | 16.0 | 16.5 | 16.3 |
| Volumetric Flow Rate $x10^4$ $ft^3/min$ | | | | |
| At Stack Conditions | 5.08 | 4.82 | 5.16 | 5.02 |
| At Standard Conditions | 2.71 | 2.66 | 2.79 | 2.72 |
| Particulate | | | | |
| Isokinetic Sampling Rate, % | 95 | 97 | 95 | 96 |
| Concentration[a], $gr/ft^3$ | 0.099 | 0.103 | 0.097 | 0.100 |
| Emission Rate, lb/hr | 22.8 | 23.6 | 23.1 | 23.2 |

[a]At standard conditions 68°F and 29.92 inches of mercury.

## 2.6. LIME KILN

Table 2.6 summarizes the results of the particulate emission testing performed on 19 March 1991 on the Lime Kiln. Field and laboratory data are provided in Appendices G and K, respectively. Sample calculations are presented in Appendix N.

TABLE 2.6. EMISSION DATA - LIME KILN

| | RUN 1 | RUN 2 | RUN 3 | MEAN |
|---|---|---|---|---|
| Date | 03/19/91 | 03/19/91 | 03/19/91 | --- |
| Time Began | 1005 | 1138 | 1310 | --- |
| Time Ended | 1108 | 1240 | 1412 | --- |
| Stack Gas | | | | |
| Temperature, °F | 166 | 167 | 167 | 167 |
| Velocity, ft/sec | 24.0 | 26.1 | 24.6 | 24.9 |
| Moisture, % | 36.6 | 36.9 | 37.8 | 37.1 |
| $CO_2$ Concentration, % | 16.5 | 16.5 | 16.0 | 16.3 |
| $O_2$ Concentration, % | 11.0 | 9.0 | 9.3 | 9.8 |
| Volumetric Flow Rate | | | | |
| At Stack Conditions, x $10^4$ $ft^3$/min | 4.77 | 5.19 | 4.89 | 4.95 |
| At Standard Conditions[a], x $10^4$ $ft^3$/min | 2.56 | 2.77 | 2.57 | 2.63 |
| Particulate | | | | |
| Isokinetic Sampling Rate, % | 95 | 91 | 96 | 94 |
| Concentration, gr/$ft^3$ @ Standard Cond.[a] | 0.058 | 0.070 | 0.069 | 0.065 |
| Emission Rate, lb/hr | 12.6 | 16.5 | 15.2 | 14.8 |
| Permit Limit, lb/hr | --- | --- | --- | 26.1 |

[a]68°F, 29.92 in. Hg.

## 2.5. LIME KILN

Table 2.5 summarizes the results of the particulate emission testing performed on 27 March 1992 on the Lime Kiln. Field and laboratory data are provided in Appendices F and G, respectively. Sample calculations are presented in Appendix H.

TABLE 2.5. EMISSION DATA - LIME KILN

| | RUN 1 | RUN 2 | RUN 3 | MEAN |
|---|---|---|---|---|
| Date | 03/27/92 | 03/27/92 | 03/27/92 | ---- |
| Time Began | 1002 | 1138 | 1302 | ---- |
| Time Ended | 1102 | 1238 | 1402 | ---- |
| Stack Gas | | | | |
| Temperature, °F | 165 | 165 | 165 | 165 |
| Velocity, ft/sec | 25.1 | 26.3 | 25.9 | 25.8 |
| Moisture, % | 36.2 | 36.2 | 35.7 | 36.0 |
| $CO_2$ Concentration, % | 16.0 | 18.0 | 18.0 | 17.3 |
| $O_2$ Concentration, % | 8.0 | 8.0 | 8.0 | 8.0 |
| Volumetric Flow Rate | | | | |
| @ Stack Conditions, x $10^4$ ft³/min | 5.00 | 5.24 | 5.16 | 5.14 |
| @ Standard Conditions[a], x $10^4$ ft³/min | 2.71 | 2.84 | 2.82 | 2.79 |
| Particulate | | | | |
| Isokinetic Sampling Rate, % | 98 | 96 | 95 | 96 |
| Concentration, gr/ft³ @ Standard Cond.[a] | 0.029 | 0.032 | 0.030 | 0.030 |
| Emission Rate, lb/hr | 6.7 | 7.7 | 7.2 | 7.2 |
| Permit Limit, lb/hr | ---- | ---- | ---- | 26.1 |

[a]68°F, 29.92 in. Hg.

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## GUARANTEE AND WARRANTY
## (Revised November 3, 1992)
## PERFORMANCE GUARANTEES

- **Production** — 450 STPD of Kiln Product
- **Lime Kiln Fuel Consumption** — 6.5 MMBTU/ST Product Net; 7.2 MMBTU/ST Product Gross on Natural Gas
- **Product CaO Content** ($CaCO_3$ in dry lime mud at 93%) — 85% or Higher
- Emission guarantee for flue gases with Ahlstrom Pyroprocessing burner:
  - TRS — 8 ppm (12 hour average)
  - $NO_x$ — 200 ppm with oil firing (11/3/92); 175 ppm with gas firing (11/3/92)
  - CO — 45 ppm
  - Particulate load to ESP — 280 lb/min

Emissions are to be corrected to 10% $O_2$
All levels are given on a dry gas basis

## Champion– Pensacola
## Lime Kiln–Mud Dryer
## $SO_2$ Emission Projection

| Condition/Variable | |
|---|---|
| Operating Days | 365 |
| Mill Production Rate (ADBT) | 1500 |
| Lime Production | 500 |
| Mud Feed Rate (ton/day) | 892.86 |
| | |
| Mud Solids to Kiln (%) | 75 |
| Mud $Na_2O$ Content | 0.8 |
| % Sulfidity | 25.5 |
| $SO_2$ to Kiln from Mud (lb/hr) | 156.68 |
| | |
| MMBtu/ton Lime | 7.2 |
| MMBtu/day | 3600 |
| MMBtu/lb Oil | 0.02 |
| lb Oil/day | 198950 |
| Fuel Oil %S | 2.5 |
| lb $SO_2$/hr | 414.48 |
| | |
| NCG $H_2S$ Input (lb/ADBT) | 5 |
| NCG $SO_2$ In (lb/hr) | 588.24 |
| | |
| Total $SO_2$ Input (lb/hr) | 1159.4 |
| Total $SO_2$ Input (lb/day) | 27825.52 |
| Total $SO_2$ Input (ton/day) | 13.91 |
| | |
| Sulfur Capture Efficiency (%) | 88.8 |
| $SO_2$ to Scrubber (lb/hr) | 129.85 |
| $SO_2$ to Scrubber (lb/day) | 3116.46 |
| $SO_2$ to Scrubber (ton/day) | 1.56 |
| $SO_2$ to Scrubber (ton/year) | 568.75 |
| | |
| $SO_2$ Scrubber Efficiency (%) | 95 |
| $SO_2$ Emission Rate (lb/hr) | 6.49 |
| $SO_2$ Emission Rate (lb/day) | 155.82 |
| $SO_2$ Emission Rate (ton/day) | 0.08 |
| $SO_2$ Emission Rate (ton/year) | 28.44 |

12/16 g:\...\champen\lmd.wk3

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Printing and Writing Papers
375 Muscogee Road
P. O. Box 87
Cantonment, Florida 32533-0087
904 968-2121

**Champion**
Champion International Corporation

To: Charles Ayer

Date: 11/10/92

From: Steve Webb

Subject: LMD VOC Prediction

As requested, the following information is provided to show an expected worst case for VOC emissions from the LMD.

Assumptions & Basis:

B-Condensate is used in the mud washer and on the mud filter.
B-Condesate TOC is approximately 300ppm.
450TPD LMD production ARI guarantee.
Assume all TOC is volatilized.
Assume all TOC is converted to propane.
Assume 75% cake solids entering the LMD.
LMD stack volumetric flow rate is ~~32300 dscfm.~~ 34,383 dscfm 12/3/92

Calculations:

$$450\text{TPD lime} \times \frac{2000\#}{\text{Ton}} \times \frac{100\text{ mw}}{56\text{ mw}} \times \frac{0.25\#\text{ cond.}}{0.75\#\text{ mud}} \times \frac{300\#\text{ TOC}}{10^6\#\text{ Cond.}} = 160.7\#/\text{Day TOC}$$

$$\frac{160.7\#\text{ TOC}}{\text{Day}} \times \frac{44\text{ mw}}{12\text{ mw}} = 589\#/\text{Day VOC's as propane} ==== 24.5\#/\text{Hr}$$

$$\frac{589\#\text{ VOC's}}{\text{Day}} \times \frac{454\text{g}}{\#} \times \frac{1\text{ mole}}{44\text{g mw}} \times \frac{24.04\text{L}}{\text{mole}} \times \frac{3.53\times10^{-2}\text{ft}^3}{\text{L}} \times \frac{\text{Day}}{24\text{Hr}} \times$$

$$\frac{\text{Hr}}{60\text{min}} \times \frac{\text{min}}{\text{~~32300dscf~~ } 34{,}383\text{dscf}} \times \frac{10^6\mu\text{l}}{\text{L}} = \text{~~110 ppm as propane~~}$$

104 ppm as propane WK 12/3/92

Lime mud dryer VOC emissions could be safely expected to be less than 110 ppm since dilution and fugitive emissions are not taken into account. A total conversion and volatilization of all TOC is being assumed as well. This extremely conservative prediction should help in our evaluation of BACT requirements for LMD VOC's.

If there are any questions please give me a call at 968-2121 ext. 2498.

CC:
John Barone, Ph.D. - Weston
John Egan - Weston
Paul Johnson
Kyle Moore
Janet Price
Willie Tims, Jr.

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PRELIMINARY SCRUBBER DATA

SAT.GAS VOL., TEMP.,& OTHER DATA

12-02-1992 Job no: 2160 16:21:2

JOB/PROPOSAL NAME: Champion Int'l Page No: 4 of
DESCRIPTION: Lime Kiln Scrubber

---

| SYSTEM SUMMARY | | | INLET | OUTLET |
|---|---|---|---|---|
| GAS FLOW RATE | - ACFM | | 67,405.0000 | 57,208.1500 ✓ |
| DRY @ 68 DEG F | - SCFMD | | 34,381.7119 | 34,381.7119 ✓ |
| 14.696 PSIA | - LBS/HR | | 164,802.4622 | 164,802.4622 |
| WET @ 68 DEG F | - SCFMW | | 45,842.2826 | 48,976.5073 |
| 14.696 PSIA | - LBS/HR | | 196,949.1349 | 205,740.5729 |
| TEMPERATURE | - DEG F | | 320.0000 | 156.6872 ✓ SATURATED |
| | - DEG R | | 779.6700 | 616.3572 |
| PRESSURE | - PSIA | | 14.7680 | 14.6960 |
| (Pamb=14.696 PSIA) | - in wc | | +1.996 | +0.000 |
| MOISTURE | - LBS/HR | | 32,146.6727 | 40,938.1107 |
| | - VOL % | | 25.00000 | 29.79958 |
| | - WT % | | 16.32232 | 19.89793 |
| HUMIDITY | - LBS H2O/LB-DG | | 0.19506 | 0.24841 |
| DENSITY | - LBS/FT3 | | 0.04870 | 0.05994 |
| ENTHALPY (32 DEG F) | - BTU/LB-DG | | 304.17488 | 304.17504 SATURATED |
| HEAT CAPACITY | - BTU/LB-DEG R | | 0.2804 | 0.2810 |
| ADIABATIC FACTOR | = CP/CV = CP/(CP-R) | | 1.3456 | 1.3551 |
| HEAT CAPACITY | - BTU/LB-DEG R | DG | 0.2452 | 0.2389 |
| | | H2O | 0.4608 | 0.4506 |
| MOLECULAR WEIGHT | - LBS/LB-MOLE | WET | 27.5926 | 26.9797 |
| | | DRY | 30.7851 | 30.7851 |
| OXYGEN (O2) | - VOLUME % | WET | 4.00000 | 3.74402 |
| | | DRY | 5.33333 | 5.33333 |
| CARBON DIOXIDE (CO2) | - VOLUME % | WET | 12.00000 | 11.23207 |
| | | DRY | 16.00000 | 16.00000 |

EVAPORATION RATE 8,791.4380 LBS/HR <=> 17.590 GPM

DEW POINT OF INLET GAS: 149.7085 DEG F @ 14.7680 PSIA

LIQUID SPRAY: 1,700.00 GPM AT 150.0000 DEG F

Storage Tank
Emission Report
Friday, December 11 1992
4:26 PM

---- Tank Characteristics ----

Identification

| | |
|---|---|
| Identification No.: | CHAMP |
| City: | Mobile |
| State: | Alabama |
| Company: | CHAMPION |

Input Parameters

| | |
|---|---|
| Type of Tank: | Horizontal Fixed Roof |

Tank Dimensions

| | |
|---|---|
| Shell Length (ft): | 25 |
| Diameter (ft): | 13 |
| Liquid Height (ft): | 0 |
| Volume (gallons): | 21880 |
| Turnovers: | 20 |
| Net Throughput (bbl/yr): | 437600 |
| Is tank underground? (Y/N): | N |

Paint Characteristics

| | |
|---|---|
| Paint Color: | White |
| Paint Shade: | White |
| Condition: | Good |

Breather Vent Settings

| | |
|---|---|
| Vacuum Setting(psig): | -0.14 |
| Pressure Setting(psig): | 0.14 |

---- Storage Tank Contents Temperature Data ----

| | |
|---|---|
| Daily Average Ambient Temperature (Degrees Farenheit) = | 67.50 |
| Daily Minimum Ambient Temperature (Degrees Farenheit) = | 57.60 |
| Daily Maximum Ambient Temperature (Degrees Farenheit) = | 77.40 |
| Daily Ambient Temperature Range = | 19.80 |
| Solar Insolation Factor = | 1384.00 |
| Alpha (Shell) = | 0.17 |
| Liquid Bulk Temperature (Degrees Farenheit) = | 67.52 |
| Average Liquid Surface Temperature (Degrees Farenheit) = | 69.37 |
| Daily Maximum Liquid Surface Temperature (Degrees Farenheit) = | 74.58 |
| Daily Minimum Liquid Surface Temperature (Degrees Farenheit) = | 64.16 |
| Daily Vapor Temperature Range = | 20.84 |

---- Storage Tank Vapor Pressure Information ----

Speciation Option: None
Chemical Liquid: Methyl Alcohol

| | |
|---|---|
| Vapor Pressure of total mixture = | 1.925290 |
| Minimum Vapor Pressure of total mixture = | 1.641939 |
| Maximum Vapor Pressure of total mixture = | 2.249324 |
| Vapor Molecular Weight of Mixture = | 32.040000 |

Storage Tank
Emission Report
Friday, December 11 1992
4:26 PM

---- Storage Tank Working Loss Information (AP-42) ----

| | |
|---|---|
| Net Throughput (gal/year) = | 437600 |
| Liquid Volume (cubic feet) = | 2925 |
| Turnovers = | 20 |
| Turnover Factor = | 1.0000 |
| Working Loss Product Factor = | 1.00 |
| Total Working Losses = | 642.71 |

# APPENDIX C
# SUMMARY OF OPERATING DATA

TABLE C-1
CHAMPION PAPER
PENSACOLA, FLA
SUMMARY OF FUEL USAGE AND BLS FIRING RATES
BASELINE EMISSIONS

| | #1 POWER BOILER NAT GAS MCF | #2 POWER BOILER NAT GAS MCF | #1 RECOVERY BOILER NAT GAS MCF | #1 RECOVERY BOILER BLS TONS | #2 RECOVERY BOILER NAT GAS MCF | #2 RECOVERY BOILER BLS TONS | LIME KILN NAT GAS MCF |
|---|---|---|---|---|---|---|---|
| **JULY 1990 - JUNE 1991** | | | | | | | |
| JULY | 68255 | 29824 | 3791 | 28250 | 11378 | 39500 | 66014 |
| AUGUST | 59233 | 23397 | 4387 | 31250 | 2601 | 35000 | 38205 |
| SEPTEMBER | 17573 | 36018 | 942 | 37500 | 3758 | 35750 | 59954 |
| OCTOBER | 22428 | 72631 | 5367 | 37000 | 5713 | 35500 | 59954 |
| NOVEMBER | 60138 | 79234 | 677 | 37500 | 3115 | 10750 | 48243 |
| DECEMBER | 72004 | 23764 | 3131 | 38250 | 4604 | 39400 | 71857 |
| JANUARY | 77658 | 20639 | 4278 | 36687 | 4795 | 40505 | 68545 |
| FEBUARY | 62558 | 20639 | 2914 | 36240 | 3074 | 34701 | 60673 |
| MARCH | 79126 | 25355 | 6410 | 27100 | 4449 | 35151 | 55633 |
| APRIL | 70618 | 79987 | 7737 | 37115 | 6695 | 37411 | 67532 |
| MAY | 78319 | 11796 | 6303 | 36932 | 8707 | 32162 | 64778 |
| JUNE | 77987 | 15617 | 5749 | 35543 | 5330 | 39439 | 62870 |
| **TOTAL** | 745897 | 438901 | 51686 | 419367 | 64219 | 415269 | 724258 |
| **JULY 1991 - JUNE 1992** | | | | | | | |
| JULY | 85896 | 12759 | 1936 | 35990 | 2885 | 39333 | 60628 |
| AUGUST | 90188 | 18899 | 4420 | 39632 | 4253 | 39212 | 60054 |
| SEPTEMBER | 84396 | 31455 | 4201 | 32887 | 4081 | 38109 | 51897 |
| OCTOBER | 85672 | 28729 | 2057 | 38166 | 4268 | 38952 | 61132 |
| NOVEMBER | 77255 | 86364 | 3058 | 36070 | 3607 | 31551 | 56137 |
| DECEMBER | 82502 | 90904 | 3574 | 36524 | 3002 | 38640 | 55669 |
| JANUARY | 79989 | 90904 | 1101 | 38541 | 4780 | 38514 | 58747 |
| FEBUARY | 60252 | 58326 | 4385 | 27542 | 2087 | 33818 | 44198 |
| MARCH | 56035 | 49474 | 1022 | 36658 | 4596 | 38177 | 62085 |
| APRIL | 58854 | 57331 | 2207 | 36403 | 5719 | 31902 | 56431 |
| MAY | 54785 | 52559 | 1609 | 38673 | 3444 | 38057 | 60342 |
| JUNE | 61189 | 61473 | 3462 | 35577 | 6958 | 37610 | 56258 |
| **TOTAL** | 877013 | 639177 | 33032 | 432663 | 49680 | 443875 | 683578 |

TABLE C-2
CHAMPION PAPER
PENSACOLA, FLA
SUMMARY OF HOURS OF OPERATION AND PULP PRODUCTION
BASELINE EMISSIONS

| | #1 POWER BOILER (hrs) | #2 POWER BOILER (hrs) | #1 RECOVERY BOILER (hrs) | #2 RECOVERY BOILER (hrs) | LIME KILN (hrs) | PULP PRODUCTION (ADUBT)[1] HARDWOOD | SOFTWOOD |
|---|---|---|---|---|---|---|---|
| **JULY 1990 - JUNE 1991** | | | | | | | |
| JULY | 711 | 198 | 744 | 744 | 729 | 22725 | 24516 |
| AUGUST | 741 | 198 | 624 | 744 | 570 | 22968 | 19358 |
| SEPTEMBER | 245 | 477 | 715 | 713 | 675 | 21951 | 23578 |
| OCTOBER | 194 | 685 | 732 | 670 | 735 | 20988 | 24053 |
| NOVEMBER | 615 | 712 | 223 | 714 | 556 | 18054 | 16839 |
| DECEMBER | 741 | 222 | 744 | 743 | 717 | 22572 | 23842 |
| JANUARY | 707 | 172 | 697 | 744 | 716 | 21423 | 21103 |
| FEBUARY | 625 | 97 | 671 | 662 | 643 | 19205 | 20367 |
| MARCH | 737 | 217 | 606 | 741 | 599 | 21741 | 18485 |
| APRIL | 635 | 420 | 713 | 700 | 713 | 21402 | 21780 |
| MAY | 742 | 88 | 711 | 650 | 722 | 17875 | 22867 |
| JUNE | 717 | 133 | 701 | 720 | 697 | 22480 | 21065 |
| | | | | | | | |
| **TOTAL** | 7410 | 3619 | 7881 | 8545 | 8072 | 253384 | 257853 |
| | | | | | | | |
| **JULY 1991 - JUNE 1992** | | | | | | | |
| JULY | 730 | 107 | 709 | 737 | 738 | 22098 | 22196 |
| AUGUST | 737 | 141 | 744 | 740 | 731 | 22689 | 21920 |
| SEPTEMBER | 709 | 232 | 632 | 700 | 601 | 22159 | 17549 |
| OCTOBER | 744 | 191 | 743 | 734 | 735 | 21853 | 20756 |
| NOVEMBER | 642 | 638 | 710 | 580 | 704 | 18008 | 20927 |
| DECEMBER | 744 | 740 | 727 | 744 | 720 | 21545 | 21105 |
| JANUARY | 718 | 744 | 743 | 744 | 732 | 21942 | 23437 |
| FEBUARY | 696 | 696 | 564 | 692 | 556 | 16551 | 22327 |
| MARCH | 744 | 732 | 739 | 727 | 736 | 23022 | 23532 |
| APRIL | 720 | 720 | 711 | 617 | 709 | 22059 | 20441 |
| MAY | 744 | 743 | 736 | 734 | 729 | 23094 | 23294 |
| JUNE | 718 | 720 | 687 | 720 | 614 | 21604 | 21234 |
| | | | | | | | |
| **TOTAL** | 8646 | 6404 | 8445 | 8469 | 8305 | 256624 | 258718 |

[1] ADUBT - AIR DRIED UNBLEACHED TONS

**TABLE C-3**
**CHAMPION**
**PENSACOLA, FLA**
**SUMMARY OF BASELINE EMISSIONS**

**JULY 1990 - JUNE 1991**

| SOURCE | $NO_x$ | $SO_2$ | CO | $PM/PM_{10}$ | VOC | TRS |
|---|---|---|---|---|---|---|
| #1 POWER BOILER | 37.29 tons | 0.35 tons | 37.29 tons | 1.86 tons | 10.00 tons | NA |
| #2 POWER BOILER | 92.17 tons | 0.20 tons | 21.95 tons | 1.10 tons | 4.85 tons | NA |
| LIME KILN | 62.56 tons | 1.74 tons | 5.65 tons | 56.50 tons | 1.65 tons | 8.15 tons |
| LINE A- $Cl_2$ SCRUBBER(1) (3) | NA | NA | NA | NA | 10.70 tons | NA |
| LINE A- $E_o$ WASHER(1) (3) | NA | NA | NA | NA | 1.16 tons | NA |
| LINE B- $Cl_2$ SCRUBBER(2) (4) | NA | NA | NA | NA | 15.20 tons | NA |
| LINE B- $E_o$ WASHER(2) (4) | NA | NA | NA | NA | 2.03 tons | NA |
| TOTAL | 192.02 tons | 2.29 tons | 64.89 tons | 59.47 tons | 45.60 tons | 8.15 tons |

(1) Softwood
(2) Hardwood
(3) VOC emission rates are based on the lb/ADTP emission factor and actual softwood pulp (ADTP) production.
(4) VOC emission rates are based on the lb/ADTP emission factor and actual hardwood pulp (ADTP) production.

**TABLE C-4**
**CHAMPION**
**PENSACOLA, FLA**
**SUMMARY OF BASELINE EMISSIONS**

**JULY 1991 - JUNE 1992**

| SOURCE | $NO_x$ | $SO_2$ | CO | $PM/PM_{10}$ | VOC | TRS |
|---|---|---|---|---|---|---|
| #1 POWER BOILER | 43.85 tons | 0.41 tons | 43.85 tons | 2.19 tons | 11.67 tons | NA |
| #2 POWER BOILER | 134.23 tons | 0.30 tons | 31.96 tons | 1.60 tons | 8.58 tons | NA |
| LIME KILN | 64.36 tons | 1.79 tons | 5.81 tons | 58.13 tons | 1.70 tons | 8.39 tons |
| LINE A- $Cl_2$ SCRUBBER(1) (3) | NA | NA | NA | NA | 10.74 tons | NA |
| LINE A- $E_o$ WASHER(1) (3) | NA | NA | NA | NA | 1.16 tons | NA |
| LINE B- $Cl_2$ SCRUBBER(2) (4) | NA | NA | NA | NA | 15.40 tons | NA |
| LINE B- $E_o$ WASHER(2) (4) | NA | NA | NA | NA | 2.05 tons | NA |
| TOTAL | 242.44 tons | 2.49 tons | 81.62 tons | 61.92 tons | 51.31 tons | 8.39 tons |

(1) Softwood
(2) Hardwood
(3) VOC emission rates are based on the lb/ADTP emission factor and actual softwood pulp (ADTP) production.
(4) VOC emission rates are based on the lb/ADTP emission factor and actual hardwood pulp (ADTP) production.

# APPENDIX D

# BLEACH PLANT CHLOROFORM EMISSIONS

## APPENDIX D

## BLEACH PLANT CHLOROFORM EMISSIONS

In order to determine baseline and future chloroform emission rates from the bleach plant air emission sources, two sets of data were evaluated. These included recent laboratory studies utilizing 100% $ClO_2$ substitution for molecular chlorine in the bleaching sequence and NCASI chloroform emission sampling conducted at the mill in March 1990 under current bleaching conditions.

CHAMPION has conducted extensive laboratory testing to determine how the $CHCl_3$ generation rates will change with increased levels of $ClO_2$ substitution for molecular chlorine. The results of the lab studies indicate that for the proposed modified Pensacola bleaching process, substituting 100% $ClO_2$ for molecular chlorine will result in a $CHCl_3$ generation rate of 0.02 lb per ADTP or less.

The results of the NCASI testing identified the mill $CHCl_3$ generation rate of approximately 0.4 lbs per air dried ton of pulp (ADTP) for the existing bleaching operations. Furthermore, the testing identified emission rates for the various bleach plant sources which were then used in conjunction with the production data during the test period to determine $CHCl_3$ emission factors for the sources.

Table D1 summarizes the $CHCl_3$ emission factors determined during the NCASI testing. The table also includes average and maximum $CHCl_3$ emission rates at current mill pulping rates. These were used to develop annual baseline emission rates. The NCASI data also indicated that approximately 60% of the chloroform generated was emitted from the bleach plant air sources while the remaining portion was discharged with the wastewater to the treatment system.

**TABLE D-1**

**CHAMPION PENSACOLA MILL**
**BASELINE CHLOROFORM EMISSION RATES**

| | | |
|---|---|---|
| A Line - Line 2 - | softwood, permit limits: | 800 ADT/day Annual Average<br>888 ADT/day 24-hr Average |
| B Line - Line 1 - | hardwood, permit limits: | 600 ADT/day Annual Average<br>792 ADT/day 24-hr Average |

## I. GAS PHASE

| SOURCE | EMISSION FACTOR (lb/ADTP)* | EMISSION RATES | | | |
|---|---|---|---|---|---|
| | | AVERAGE | | MAXIMUM | |
| | | (lb/hr) | (g/sec) | (lb/hr) | (g/sec) |
| A - $Cl_2$ Scrubber | 0.083 | 2.77 | 0.349 | 3.07 | 0.387 |
| A - $E_o$ Washer | 0.009 | 0.300 | 0.038 | 0.333 | 0.042 |
| B - $Cl_2$ Scrubber | 0.120 | 3.00 | 0.378 | 3.96 | 0.499 |
| B - $E_o$ Washer | 0.016 | 0.400 | 0.050 | 0.528 | 0.067 |

CHAMPION has utilized the results of the lab data in conjunction with the results of the NCASI study, to estimate new emission factors for the bleach plant air sources as identified in Table D-2. The table also includes maximum predicted $CHCl_3$ emission rates at the projected new maximum pulp production rate of 1500 ADTP per day. The new rates have been utilized to project the future annual emissions associated with the bleach plant air sources. These emission rates were used in the HAPs modeling study.

<u>Chloride and Chlorine Dioxide Emissions</u>

Chlorine and chlorine dioxide will potentially be emitted from the bleach plant point source vents and from the ERCO chlorine dioxide tail gas srubber. The ERCO tail gas scrubber controls the ERCO generator along with emissions from the $ClO_2$ tank vent scrubbers. The vendor for the ERCO generator has guaranteed that the emissions from the modified R8/R10 system will not exceed 0.25 lbs per hour of chlorine dioxide and 0.1 lb per hour of chlorine. Projected emissions of these three compounds from the bleach plant scrubbers have been provided for both the pine and hardwood lines. The projected rates are conservative estimates based upon previous testing and measured scrubber removal efficiencies for both pollutants. The projected emission rates include 1.45 lbs per hour of $Cl_2$ and 0.45 lbs per hour of $ClO_2$ from the pine bleach plant scrubber and 1.0 lbs per hour of $Cl_2$ and 0.45 lbs per hour of $ClO_2$ from the hardwood bleach plant scrubber. CHAMPION is committed to meeting these proposed permit allowable emission rates for the chlorine and chlorine dioxide point sources in the bleach plant.

## TABLE D-2

**CHAMPION PENSACOLA MILL**
**Future Chloroform Emission Rates**
**(100% $ClO_2$ Substitution)**

| SOURCE | EMISSION FACTOR (#/ADT) | EMISSION RATE* | | % OF GENERATION RATE** |
|---|---|---|---|---|
| | | (lbs/yr) | (lbs/hr) | |
| A-line $Cl_2$ Scrubber | .0054 | 2956.5 | 0.3375 | 27 |
| A-line $E_o$ Washer | .0006 | 328.5 | 0.0375 | 3 |
| | | | | |
| B-line $Cl_2$ Scrubber | .0054 | 2956.5 | 0.3375 | 27 |
| B-line $E_o$ Washer | .0006 | 328.5 | 0.0375 | 3 |
| | | | | |
| A + B-line Wastewater | .008 | 4380.0 | 0.50 | 40 |
| | | | | |
| Total | 0.02 | 10,950 | 1.25 | 100 |

} 60% - Air Stream

} - Wastewater

* Based on 1500 ADT/day and applicable emission factor.

** Based on existing facility splits for: air vs. wastewater; scrubber vs. $E_o$ washer; softwood vs. hardwood.

CH237A.TAB

# APPENDIX E

# MODELING SUPPORT INFORMATION

WESTON
MANAGERS DESIGNERS/CONSULTANTS
1 WESTON WAY
WEST CHESTER, PA 19380-1499
PHONE: 215-692-3030
FAX: 215-430-3186

23 November 1992

Mr. Glen Golson
ADEM
1751 Federal Drive
Montgomery, Alabama 36130

Work Order No. 02246-056-001

Dear Mr. Golson:

In accordance with our telecon on 20 November 1992, this is to confirm our understanding of your file search for other major sources in Alabama to be included in the NAAQS and PSD modeling study for Champion International Corporation's Pensacola Mill. As we discussed, Champion plans to modify their existing pulp and paper mill located in Cantonment, Florida.

In 1991, Champion added a boiler which required a PSD permit, due to the proposed increase in nitrogen dioxide ($NO_x$) emissions. At that time, an emissions inventory of $NO_x$ sources was prepared and used in the PSD modeling analysis. We received information on Alabama sources to be included in the modeling analysis from ADEM for that permit application.

We understand, based on your review, that no new PSD increment consuming or major sources of $NO_x$ have been permitted in Baldwin or Escambia County. Hence, the previous emissions inventory is acceptable to ADEM for this modeling study.

We appreciate your assistance in reviewing your files relative to this important project. Please call if you wish to discuss the project or if your understanding of the issues addressed in this letter is different than those presented.

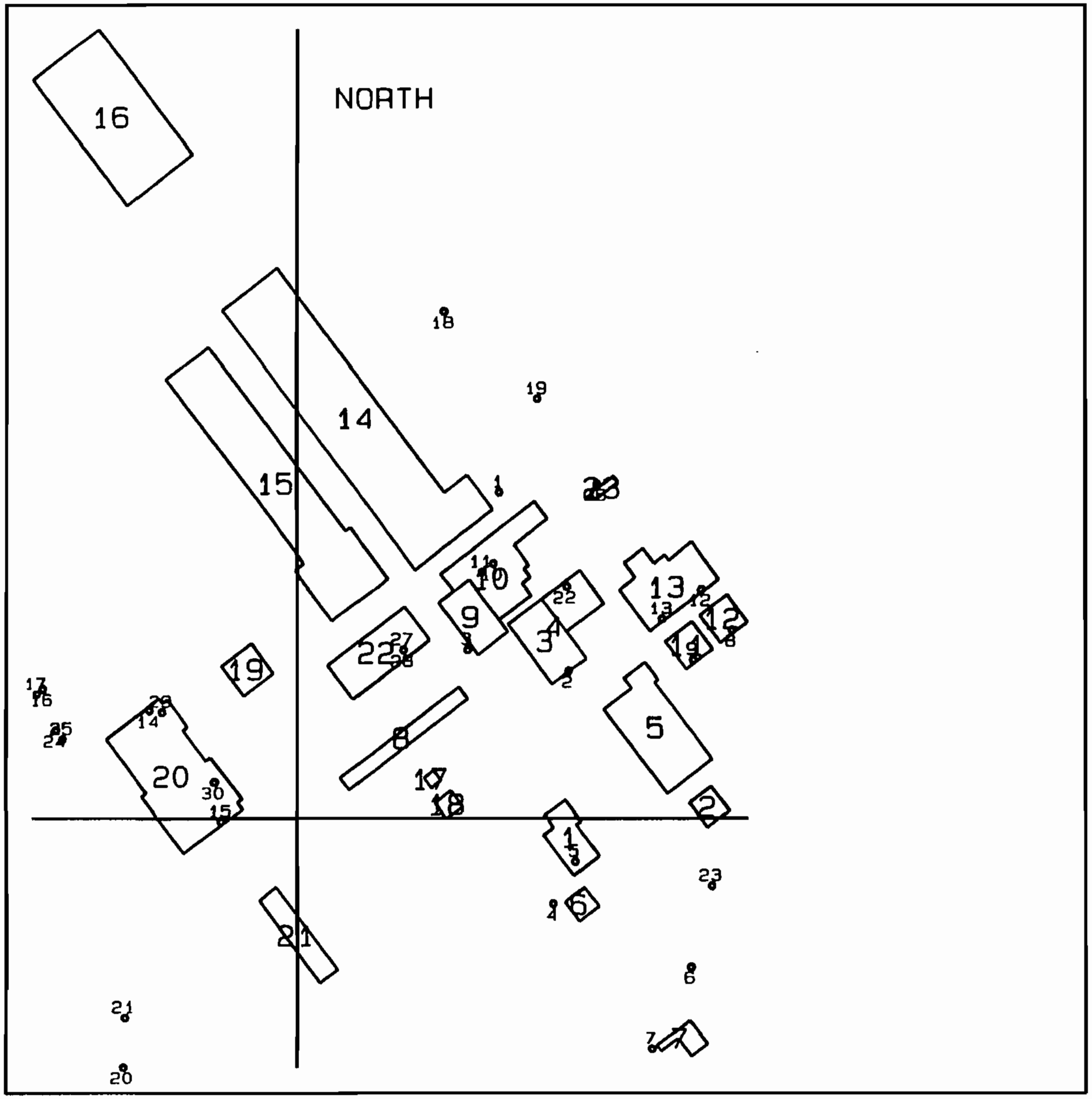
Very truly yours,

ROY F. WESTON, INC.

John B. Barone, Ph.D.
Technical Director

cc: S. Webb
K. Moore
C. Ayer
J. Egan

## DOWNWASH ANALYSIS




STRUCTURES:

1 -- A-LIME RECOVERY BLDG
2 -- B-COOLING TOWER
3 -- C-NO 4 POWER BOILER
4 -- D-TURBINE GENERATOR BLDG
5 -- E-EVAPORATORS
6 -- F-LIME KILN NORTH
7 -- G-LIME KILN SOUTH
8 -- H-DIGESTER
9 -- I-NO.3 POWER BOILER
10 -- I+J+K-NO.1+2 BOILER/TURB
11 -- L-PRECIPITATORS 1
12 -- M-PRECIPITATORS 2
13 -- N-RECOVERY BOILERS
14 -- O-NO. 5 PAPER MACHINE
15 -- P-NO.3 PAPER MACHINE
16 -- Q-HIGH BAY STORAGE BLDG
17 -- R-CONT. DIGESTER
18 -- S-WASHER
19 -- T-NO 9 H.D STORAGE CHEST
20 -- U-BLEACH PLANT
21 -- V-CHIP SILOS
22 -- Y-SCREEN BLDG
23 -- No. 6 POWER BOILER BLGD

SOURCES:

1 -- NO. 5 STACK
2 -- NO. 4 STACK
3 -- NO. 3 STACK
4 -- SLAKER STACK
5 -- CALCINER STACK
6 -- COAL CRUSHER VENT
7 -- LIME KILN STACK
8 -- RECOV BOILER STACK A
9 -- RECOV BOILER STACK B
10 -- NO.1 STACK
11 -- NO.2 STACK
12 -- DISSOLV. TANK STACK A
13 -- DISSOLV. TANK STACK B
14 -- BLEACH PLANT STACK A
15 -- BLEACH PLANT STACK B
16 -- CLO2 SALT VENT NO.1
17 -- CLO2 SALT VENT NO.2
18 -- STARCH SILO VENT NO.2
19 -- P-5 PAPER MACHINE VENT
20 -- NO.1 CYCLONE
21 -- FINE CYCLONE
22 -- COAL BAGHOUSE VENT
23 -- TALL OIL STACK
24 -- TAIL GAS SCRUBBER
25 -- CLO2 STORAGE VENT
26 -- NO 6 STACK @ 75FT
27 -- REV NO. 6 STACK @ 75FT
28 -- REV NO. 6 STACK @ 150FT
29 -- PINE Eo HOOD VENT
30 -- HARDWOOD Eo HOOD VENT

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOMINANT STRUCTURES AND DIMENSIONS FOR SOURCE

Source ID : NO. 5 STACK ✓
Source Height : 46.90 feet [ 14.30 meters]
Source Diameter : 4.00 feet [ 1.22 meters]

INPUT SITE COORDINATES:
Easting : 622.00 feet [ 189.59 meters]
Northing : 236.00 feet [ 71.93 meters]

ROTATED SITE COORDINATES:
Easting : 354.72 feet [ 108.12 meters]
Northing : 562.81 feet [ 171.54 meters]

DOWNWASH ALGORITHM REQUIRED : Schulman-Scire

DIRECTION-SPECIFIC WIDTHS, HEIGHTS, AND DOMINANT STRUCTURES FOR THIS SOURCE,
BASED ON EPA GUIDANCE RECTANGULAR AREAS OF EFFECT FOR STRUCTURES:

| DIR deg | PW m | HB m | DOMINANT STRUCTURE | DIR deg | PW m | HB m | DOMINANT STRUCTURE |
|---|---|---|---|---|---|---|---|
| 23 | 58.9 | 61.0 | H-DIGESTER | 203 | 58.9 | 61.0 | H-DIGESTER |
| 45 | 179.3 | 18.3 | O-NO. 5 PAPER MACHINE | 225 | 179.3 | 18.3 | O-NO. 5 PAPER MACHINE |
| 68 | 175.6 | 18.3 | O-NO. 5 PAPER MACHINE | 247 | 175.6 | 18.3 | O-NO. 5 PAPER MACHINE |
| 90 | 170.5 | 18.3 | O-NO. 5 PAPER MACHINE | 270 | 170.5 | 18.3 | O-NO. 5 PAPER MACHINE |
| 113 | 51.7 | 48.8 | N-RECOVERY BOILERS | 292 | 51.7 | 48.8 | N-RECOVERY BOILERS |
| 135 | 51.1 | 48.8 | N-RECOVERY BOILERS | 315 | 51.1 | 48.8 | N-RECOVERY BOILERS |
| 158 | 37.4 | 48.8 | C-NO.4 POWER BOILER | 338 | 37.4 | 48.8 | C-NO.4 POWER BOILER |
| 180 | 75.2 | 61.0 | H-DIGESTER | 360 | 75.2 | 61.0 | H-DIGESTER |

NOTES: DIR represents a wind direction, NOT A FLOW VECTOR.
Asterisks mark structures producing only Huber-Snyder effects in ISC.

INFLUENCING STRUCTURE WITH MAXIMUM FORMULA GEP HEIGHT:

H-DIGESTER
HL = HW = MPW * 0.886 = 71.10 meters
HB = 60.96 meters

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOMINANT STRUCTURES AND DIMENSIONS FOR SOURCE

Source ID : NO. 4 STACK
Source Height : 221.00 feet [ 67.36 meters]
Source Diameter : 10.99 feet [ 3.35 meters]

INPUT SITE COORDINATES:
Easting : 535.00 feet [ 163.07 meters]
Northing : -85.00 feet [ -25.91 meters]

ROTATED SITE COORDINATES:
Easting : 478.42 feet [ 145.82 meters]
Northing : 254.09 feet [ 77.45 meters]

DOWNWASH ALGORITHM REQUIRED : Schulman-Scire

DIRECTION-SPECIFIC WIDTHS, HEIGHTS, AND DOMINANT STRUCTURES FOR THIS SOURCE,
BASED ON EPA GUIDANCE RECTANGULAR AREAS OF EFFECT FOR STRUCTURES:

| DIR deg | PW m | HB m | DOMINANT STRUCTURE | DIR deg | PW m | HB m | DOMINANT STRUCTURE |
|---|---|---|---|---|---|---|---|
| 23 | 51.1 | 48.8 | N-RECOVERY BOILERS | 203 | 51.1 | 48.8 | N-RECOVERY BOILERS |
| 45 | 46.6 | 48.8 | N-RECOVERY BOILERS | 225 | 46.6 | 48.8 | N-RECOVERY BOILERS |
| 68 | 41.5 | 61.0 | H-DIGESTER | 247 | 41.5 | 61.0 | H-DIGESTER |
| 90 | 64.6 | 61.0 | H-DIGESTER | 270 | 64.6 | 61.0 | H-DIGESTER |
| 113 | 77.9 | 61.0 | H-DIGESTER | 292 | 77.9 | 61.0 | H-DIGESTER |
| 135 | 34.2 | 48.8 | C-NO.4 POWER BOILER | 315 | 34.2 | 48.8 | C-NO.4 POWER BOILER |
| 158 | 37.4 | 48.8 | C-NO.4 POWER BOILER | 338 | 37.4 | 48.8 | C-NO.4 POWER BOILER |
| 180 | 44.5 | 48.8 | C-NO.4 POWER BOILER | 360 | 44.5 | 48.8 | C-NO.4 POWER BOILER |

NOTES: DIR represents a wind direction, NOT A FLOW VECTOR.
Asterisks mark structures producing only Huber-Snyder effects in ISC.

INFLUENCING STRUCTURE WITH MAXIMUM FORMULA GEP HEIGHT:

H-DIGESTER
HL = HW = MPW * 0.886 = 71.10 meters
HB = 60.96 meters

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOMINANT STRUCTURES AND DIMENSIONS FOR SOURCE

Source ID : NO. 3 STACK
Source Height : 150.00 feet [ 45.72 meters]
Source Diameter : 8.01 feet [ 2.44 meters]

INPUT SITE COORDINATES:
Easting : 415.00 feet [ 126.49 meters]
Northing : 52.00 feet [ 15.85 meters]

ROTATED SITE COORDINATES:
Easting : 300.14 feet [ 91.48 meters]
Northing : 291.28 feet [ 88.78 meters]

DOWNWASH ALGORITHM REQUIRED : Schulman-Scire

DIRECTION-SPECIFIC WIDTHS, HEIGHTS, AND DOMINANT STRUCTURES FOR THIS SOURCE, BASED ON EPA GUIDANCE RECTANGULAR AREAS OF EFFECT FOR STRUCTURES:

| DIR deg | PW m | HB m | DOMINANT STRUCTURE | DIR deg | PW m | HB m | DOMINANT STRUCTURE |
|---|---|---|---|---|---|---|---|
| 23 | 58.9 | 61.0 | H-DIGESTER | 203 | 58.9 | 61.0 | H-DIGESTER |
| 45 | 33.5 | 61.0 | H-DIGESTER | 225 | 33.5 | 61.0 | H-DIGESTER |
| 68 | 41.5 | 61.0 | H-DIGESTER | 247 | 41.5 | 61.0 | H-DIGESTER |
| 90 | 64.6 | 61.0 | H-DIGESTER | 270 | 64.6 | 61.0 | H-DIGESTER |
| 113 | 77.9 | 61.0 | H-DIGESTER | 292 | 77.9 | 61.0 | H-DIGESTER |
| 135 | 80.2 | 61.0 | H-DIGESTER | 315 | 80.2 | 61.0 | H-DIGESTER |
| 158 | 80.2 | 61.0 | H-DIGESTER | 338 | 80.2 | 61.0 | H-DIGESTER |
| 180 | 75.2 | 61.0 | H-DIGESTER | 360 | 75.2 | 61.0 | H-DIGESTER |

NOTES: DIR represents a wind direction, NOT A FLOW VECTOR.
Asterisks mark structures producing only Huber-Snyder effects in ISC.

INFLUENCING STRUCTURE WITH MAXIMUM FORMULA GEP HEIGHT:

H-DIGESTER
HL = HW = MPW * 0.886 = 71.10 meters
HB = 60.96 meters

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOMINANT STRUCTURES AND DIMENSIONS FOR SOURCE

Source ID : CALCINER STACK
Source Height : 117.59 feet [ 35.84 meters]
Source Diameter : 4.00 feet [ 1.22 meters]

INPUT SITE COORDINATES:
Easting : 345.00 feet [ 105.16 meters]
Northing : -355.00 feet [-108.20 meters]

ROTATED SITE COORDINATES:
Easting : 489.17 feet [ 149.10 meters]
Northing : -75.89 feet [ -23.13 meters]

DOWNWASH ALGORITHM REQUIRED : Schulman-Scire

DIRECTION-SPECIFIC WIDTHS, HEIGHTS, AND DOMINANT STRUCTURES FOR THIS SOURCE, BASED ON EPA GUIDANCE RECTANGULAR AREAS OF EFFECT FOR STRUCTURES:

| DIR deg | PW m | HB m | DOMINANT STRUCTURE | DIR deg | PW m | HB m | DOMINANT STRUCTURE |
|---|---|---|---|---|---|---|---|
| 23 | 51.1 | 48.8 | N-RECOVERY BOILERS | 203 | 36.3 | 21.3 | A-LINE RECOVERY BLDG* |
| 45 | 63.8 | 22.9 | E-EVAPORATORS* | 225 | 36.3 | 21.3 | A-LINE RECOVERY BLDG* |
| 68 | 40.2 | 21.3 | A-LINE RECOVERY BLDG* | 247 | 40.2 | 21.3 | A-LINE RECOVERY BLDG* |
| 90 | 40.3 | 21.3 | A-LINE RECOVERY BLDG* | 270 | 54.4 | 27.4 | V-CHIP SILOS |
| 113 | 77.9 | 61.0 | H-DIGESTER | 292 | 77.9 | 61.0 | H-DIGESTER |
| 135 | 80.2 | 61.0 | H-DIGESTER | 315 | 80.2 | 61.0 | H-DIGESTER |
| 158 | 80.2 | 61.0 | H-DIGESTER | 338 | 80.2 | 61.0 | H-DIGESTER |
| 180 | 33.0 | 21.3 | A-LINE RECOVERY BLDG* | 360 | 53.3 | 48.8 | N-RECOVERY BOILERS |

NOTES: DIR represents a wind direction, NOT A FLOW VECTOR.
Asterisks mark structures producing only Huber-Snyder effects in ISC.

INFLUENCING STRUCTURE WITH MAXIMUM FORMULA GEP HEIGHT:

H-DIGESTER
HL = HW = MPW * 0.886 = 71.10 meters
HB = 60.96 meters

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOMINANT STRUCTURES AND DIMENSIONS FOR SOURCE

Source ID : LIME KILN STACK
Source Height : 136.00 feet [ 41.45 meters]
Source Diameter : 6.50 feet [ 1.98 meters]

INPUT SITE COORDINATES:
Easting : 255.00 feet [ 77.72 meters]
Northing : -695.00 feet [-211.84 meters]

ROTATED SITE COORDINATES:
Easting : 621.91 feet [ 189.56 meters]
Northing : -401.59 feet [-122.40 meters]

DOWNWASH ALGORITHM REQUIRED : Schulman-Scire

DIRECTION-SPECIFIC WIDTHS, HEIGHTS, AND DOMINANT STRUCTURES FOR THIS SOURCE, BASED ON EPA GUIDANCE RECTANGULAR AREAS OF EFFECT FOR STRUCTURES:

| DIR deg | PW m | HB m | DOMINANT STRUCTURE | DIR deg | PW m | HB m | DOMINANT STRUCTURE |
|---|---|---|---|---|---|---|---|
| 23 | 0.0 | 0.0 | NO STRUCTURES | 203 | 0.0 | 0.0 | NO STRUCTURES |
| 45 | 0.0 | 0.0 | NO STRUCTURES | 225 | 0.0 | 0.0 | NO STRUCTURES |
| 68 | 0.0 | 0.0 | NO STRUCTURES | 247 | 0.0 | 0.0 | NO STRUCTURES |
| 90 | 0.0 | 0.0 | NO STRUCTURES | 270 | 0.0 | 0.0 | NO STRUCTURES |
| 113 | 0.0 | 0.0 | NO STRUCTURES | 292 | 0.0 | 0.0 | NO STRUCTURES |
| 135 | 0.0 | 0.0 | NO STRUCTURES | 315 | 80.2 | 61.0 | N-DIGESTER |
| 158 | 0.0 | 0.0 | NO STRUCTURES | 338 | 80.2 | 61.0 | N-DIGESTER |
| 180 | 0.0 | 0.0 | NO STRUCTURES | 360 | 53.3 | 48.8 | N-RECOVERY BOILERS |

NOTES: DIR represents a wind direction, NOT A FLOW VECTOR.
Asterisks mark structures producing only Huber-Snyder effects in ISC.

INFLUENCING STRUCTURE WITH MAXIMUM FORMULA GEP HEIGHT:

N-DIGESTER
HL = HW = MPW * 0.886 = 71.10 meters
HB = 60.96 meters

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOMINANT STRUCTURES AND DIMENSIONS FOR SOURCE

Source ID : NO.1 STACK ✓
Source Height : 67.00 feet [ 20.42 meters]
Source Diameter : 6.50 feet [ 1.98 meters]

INPUT SITE COORDINATES:
Easting : 540.00 feet [ 164.59 meters]
Northing : 145.00 feet [ 44.20 meters]

ROTATED SITE COORDINATES:
Easting : 344.00 feet [ 104.85 meters]
Northing : 440.78 feet [ 134.35 meters]

DOWNWASH ALGORITHM REQUIRED : Schulman-Scire

DIRECTION-SPECIFIC WIDTHS, HEIGHTS, AND DOMINANT STRUCTURES FOR THIS SOURCE, BASED ON EPA GUIDANCE RECTANGULAR AREAS OF EFFECT FOR STRUCTURES:

| DIR deg | PW m | HB m | DOMINANT STRUCTURE | DIR deg | PW m | HB m | DOMINANT STRUCTURE |
|---|---|---|---|---|---|---|---|
| 23 | 58.9 | 61.0 | H-DIGESTER | 203 | 58.9 | 61.0 | H-DIGESTER |
| 45 | 39.4 | 22.9 | I-NO.3 POWER BOILER | 225 | 39.4 | 22.9 | I-NO.3 POWER BOILER |
| 68 | 40.0 | 22.9 | I-NO.3 POWER BOILER | 247 | 40.0 | 22.9 | I-NO.3 POWER BOILER |
| 90 | 50.1 | 48.8 | N-RECOVERY BOILERS | 270 | 50.1 | 48.8 | N-RECOVERY BOILERS |
| 113 | 51.7 | 48.8 | N-RECOVERY BOILERS | 292 | 51.7 | 48.8 | N-RECOVERY BOILERS |
| 135 | 34.2 | 48.8 | C-NO.4 POWER BOILER | 315 | 34.2 | 48.8 | C-NO.4 POWER BOILER |
| 158 | 37.4 | 48.8 | C-NO.4 POWER BOILER | 338 | 37.4 | 48.8 | C-NO.4 POWER BOILER |
| 180 | 75.2 | 61.0 | H-DIGESTER | 360 | 75.2 | 61.0 | H-DIGESTER |

NOTES: DIR represents a wind direction, NOT A FLOW VECTOR.
Asterisks mark structures producing only Huber-Snyder effects in ISC.

INFLUENCING STRUCTURE WITH MAXIMUM FORMULA GEP HEIGHT:

H-DIGESTER
HL = HW = MPW * 0.886 = 71.10 meters
HB = 60.96 meters

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC.          WORK ORDER NO.  22464301
RUN TITLE:          CHAMPION PENSECOLA  * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOMINANT STRUCTURES AND DIMENSIONS FOR SOURCE

Source ID : NO.2 STACK
Source Height : 67.00 feet [ 20.42 meters]
Source Diameter : 6.50 feet [ 1.98 meters]

INPUT SITE COORDINATES:
Easting : 515.00 feet [ 156.97 meters]
Northing : 145.00 feet [ 44.20 meters]

ROTATED SITE COORDINATES:
Easting : 324.03 feet [ 98.77 meters]
Northing : 425.74 feet [ 129.76 meters]

DOWNWASH ALGORITHM REQUIRED : Schulman-Scire

DIRECTION-SPECIFIC WIDTHS, HEIGHTS, AND DOMINANT STRUCTURES FOR THIS SOURCE, BASED ON EPA GUIDANCE RECTANGULAR AREAS OF EFFECT FOR STRUCTURES:

| DIR deg | PW m | HB m | DOMINANT STRUCTURE | DIR deg | PW m | HB m | DOMINANT STRUCTURE |
|---|---|---|---|---|---|---|---|
| 23 | 58.9 | 61.0 | H-DIGESTER | 203 | 58.9 | 61.0 | H-DIGESTER |
| 45 | 39.4 | 22.9 | I-NO.3 POWER BOILER | 225 | 39.4 | 22.9 | I-NO.3 POWER BOILER |
| 68 | 43.5 | 48.8 | N-RECOVERY BOILERS | 247 | 43.5 | 48.8 | N-RECOVERY BOILERS |
| 90 | 50.1 | 48.8 | N-RECOVERY BOILERS | 270 | 50.1 | 48.8 | N-RECOVERY BOILERS |
| 113 | 51.7 | 48.8 | N-RECOVERY BOILERS | 292 | 51.7 | 48.8 | N-RECOVERY BOILERS |
| 135 | 34.2 | 48.8 | C-NO.4 POWER BOILER | 315 | 34.2 | 48.8 | C-NO.4 POWER BOILER |
| 158 | 37.4 | 48.8 | C-NO.4 POWER BOILER | 338 | 37.4 | 48.8 | C-NO.4 POWER BOILER |
| 180 | 75.2 | 61.0 | H-DIGESTER | 360 | 75.2 | 61.0 | H-DIGESTER |

NOTES: DIR represents a wind direction, NOT A FLOW VECTOR.
Asterisks mark structures producing only Huber-Snyder effects in ISC.

INFLUENCING STRUCTURE WITH MAXIMUM FORMULA GEP HEIGHT:

H-DIGESTER
HL = HW = MPW * 0.886 = 71.10 meters
HB = 60.96 meters

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:54

DWA: DOMINANT STRUCTURES AND DIMENSIONS FOR SOURCE

Source ID : BLEACH PLANT STACK A
Source Height : 120.00 feet [ 36.58 meters]
Source Diameter : 1.75 feet [ 0.53 meters]

INPUT SITE COORDINATES:
Easting : -95.00 feet [ -28.96 meters]
Northing : 305.00 feet [ 92.96 meters]

ROTATED SITE COORDINATES:
Easting : -259.42 feet [ -79.07 meters]
Northing : 186.41 feet [ 56.82 meters]

DOWNWASH ALGORITHM REQUIRED : Schulman-Scire

DIRECTION-SPECIFIC WIDTHS, HEIGHTS, AND DOMINANT STRUCTURES FOR THIS SOURCE,
BASED ON EPA GUIDANCE RECTANGULAR AREAS OF EFFECT FOR STRUCTURES:

| DIR deg | PW m | HB m | DOMINANT STRUCTURE | DIR deg | PW m | HB m | DOMINANT STRUCTURE |
|---|---|---|---|---|---|---|---|
| 23 | 81.4 | 18.3 | U-BLEACH PLANT* | 203 | 81.4 | 18.3 | U-BLEACH PLANT* |
| 45 | 25.2 | 22.9 | T-NO.9 H.D. STORAGE CHEST* | 225 | 25.2 | 22.9 | T-NO.9 H.D. STORAGE CHEST* |
| 68 | 26.4 | 22.9 | T-NO.9 H.D. STORAGE CHEST* | 247 | 26.4 | 22.9 | T-NO.9 H.D. STORAGE CHEST* |
| 90 | 64.6 | 61.0 | H-DIGESTER | 270 | 64.6 | 61.0 | H-DIGESTER |
| 113 | 77.9 | 61.0 | H-DIGESTER | 292 | 77.9 | 61.0 | H-DIGESTER |
| 135 | 62.3 | 18.3 | U-BLEACH PLANT* | 315 | 62.3 | 18.3 | U-BLEACH PLANT* |
| 158 | 64.3 | 18.3 | U-BLEACH PLANT* | 338 | 64.3 | 18.3 | U-BLEACH PLANT* |
| 180 | 78.2 | 18.3 | U-BLEACH PLANT* | 360 | 78.2 | 18.3 | U-BLEACH PLANT* |

NOTES: DIR represents a wind direction, NOT A FLOW VECTOR.
Asterisks mark structures producing only Huber-Snyder effects in ISC.

INFLUENCING STRUCTURE WITH MAXIMUM FORMULA GEP HEIGHT:

H-DIGESTER
HL = HW = MPW * 0.886 = 71.10 meters
HB = 60.96 meters

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC.          WORK ORDER NO. 22464301
RUN TITLE:          CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:54

DWA: DOMINANT STRUCTURES AND DIMENSIONS FOR SOURCE

Source ID : BLEACH PLANT STACK B
Source Height : 120.00 feet [ 36.58 meters]
Source Diameter : 2.00 feet [ 0.61 meters]

INPUT SITE COORDINATES:
Easting : -110.00 feet [ -33.53 meters]
Northing : 75.00 feet [ 22.86 meters]

ROTATED SITE COORDINATES:
Easting : -132.99 feet [ -40.53 meters]
Northing : -6.30 feet [ -1.92 meters]

DOWNWASH ALGORITHM REQUIRED : Schulman-Scire

DIRECTION-SPECIFIC WIDTHS, HEIGHTS, AND DOMINANT STRUCTURES FOR THIS SOURCE, BASED ON EPA GUIDANCE RECTANGULAR AREAS OF EFFECT FOR STRUCTURES:

| DIR deg | PW m | HB m | DOMINANT STRUCTURE | DIR deg | PW m | HB m | DOMINANT STRUCTURE |
|---|---|---|---|---|---|---|---|
| 23 | 28.0 | 22.9 | T-NO.9 H.D. STORAGE CHEST* | 203 | 81.4 | 18.3 | U-BLEACH PLANT* |
| 45 | 80.8 | 18.3 | U-BLEACH PLANT* | 225 | 80.8 | 18.3 | U-BLEACH PLANT* |
| 68 | 41.5 | 61.0 | H-DIGESTER | 247 | 41.5 | 61.0 | H-DIGESTER |
| 90 | 64.6 | 61.0 | H-DIGESTER | 270 | 64.6 | 61.0 | H-DIGESTER |
| 113 | 77.7 | 18.3 | U-BLEACH PLANT* | 292 | 77.7 | 18.3 | U-BLEACH PLANT* |
| 135 | 28.8 | 27.4 | V-CHIP SILOS | 315 | 28.8 | 27.4 | V-CHIP SILOS |
| 158 | 34.1 | 27.4 | V-CHIP SILOS | 338 | 34.1 | 27.4 | V-CHIP SILOS |
| 180 | 78.2 | 18.3 | U-BLEACH PLANT* | 360 | 28.0 | 22.9 | T-NO.9 H.D. STORAGE CHEST* |

NOTES: DIR represents a wind direction, NOT A FLOW VECTOR.
Asterisks mark structures producing only Huber-Snyder effects in ISC.

INFLUENCING STRUCTURE WITH MAXIMUM FORMULA GEP HEIGHT:

H-DIGESTER
HL = HW = MPW * 0.886 = 71.10 meters
HB = 60.96 meters

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:54

DWA: DOMINANT STRUCTURES AND DIMENSIONS FOR SOURCE

Source ID : (ERCO) TAIL GAS SCRUBBER
Source Height : 60.04 feet [ 18.30 meters]
Source Diameter : 0.69 feet [ 0.21 meters]

INPUT SITE COORDINATES:
Easting : -245.00 feet [ -74.68 meters]
Northing : 375.00 feet [ 114.30 meters]

ROTATED SITE COORDINATES:
Easting : -421.35 feet [-128.43 meters]
Northing : 152.04 feet [ 46.34 meters]

DOWNWASH ALGORITHM REQUIRED : Schulman-Scire

DIRECTION-SPECIFIC WIDTHS, HEIGHTS, AND DOMINANT STRUCTURES FOR THIS SOURCE, BASED ON EPA GUIDANCE RECTANGULAR AREAS OF EFFECT FOR STRUCTURES:

| DIR deg | PW m | HB m | DOMINANT STRUCTURE | DIR deg | PW m | HB m | DOMINANT STRUCTURE |
|---|---|---|---|---|---|---|---|
| 23 | 0.0 | 0.0 | NO STRUCTURES | 203 | 0.0 | 0.0 | NO STRUCTURES |
| 45 | 0.0 | 0.0 | NO STRUCTURES | 225 | 0.0 | 0.0 | NO STRUCTURES |
| 68 | 26.4 | 22.9 | T-NO.9 H.D. STORAGE CHEST | 247 | 82.7 | 18.3 | U-BLEACH PLANT |
| 90 | 64.6 | 61.0 | H-DIGESTER | 270 | 82.8 | 18.3 | U-BLEACH PLANT |
| 113 | 77.7 | 18.3 | U-BLEACH PLANT | 292 | 77.7 | 18.3 | U-BLEACH PLANT |
| 135 | 62.3 | 18.3 | U-BLEACH PLANT | 315 | 62.3 | 18.3 | U-BLEACH PLANT |
| 158 | 0.0 | 0.0 | NO STRUCTURES | 338 | 0.0 | 0.0 | NO STRUCTURES |
| 180 | 0.0 | 0.0 | NO STRUCTURES | 360 | 0.0 | 0.0 | NO STRUCTURES |

NOTES: DIR represents a wind direction, NOT A FLOW VECTOR.
Asterisks mark structures producing only Huber-Snyder effects in ISC.

INFLUENCING STRUCTURE WITH MAXIMUM FORMULA GEP HEIGHT:

H-DIGESTER
HL = HW = MPW * 0.886 = 71.10 meters
HB = 60.96 meters

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:54

DWA: DOMINANT STRUCTURES AND DIMENSIONS FOR SOURCE

Source ID : PINE Eo HOOD VENT
Source Height : 67.00 feet [ 20.42 meters]
Source Diameter : 1.00 feet [ 0.30 meters]

INPUT SITE COORDINATES:
Easting : -78.00 feet [ -23.77 meters]
Northing : 288.00 feet [ 87.78 meters]

ROTATED SITE COORDINATES:
Easting : -235.62 feet [ -71.82 meters]
Northing : 183.07 feet [ 55.80 meters]

DOWNWASH ALGORITHM REQUIRED : Schulman-Scire

DIRECTION-SPECIFIC WIDTHS, HEIGHTS, AND DOMINANT STRUCTURES FOR THIS SOURCE, BASED ON EPA GUIDANCE RECTANGULAR AREAS OF EFFECT FOR STRUCTURES:

| DIR deg | PW m | HB m | DOMINANT STRUCTURE | DIR deg | PW m | HB m | DOMINANT STRUCTURE |
|---|---|---|---|---|---|---|---|
| 23 | 81.4 | 18.3 | U-BLEACH PLANT | 203 | 81.4 | 18.3 | U-BLEACH PLANT |
| 45 | 25.2 | 22.9 | T-NO.9 H.D. STORAGE CHEST | 225 | 25.2 | 22.9 | T-NO.9 H.D. STORAGE CHEST |
| 68 | 45.5 | 48.8 | C-NO.4 POWER BOILER | 247 | 26.4 | 22.9 | T-NO.9 H.D. STORAGE CHEST |
| 90 | 64.6 | 61.0 | H-DIGESTER | 270 | 64.6 | 61.0 | H-DIGESTER |
| 113 | 77.9 | 61.0 | H-DIGESTER | 292 | 77.9 | 61.0 | H-DIGESTER |
| 135 | 62.3 | 18.3 | U-BLEACH PLANT | 315 | 62.3 | 18.3 | U-BLEACH PLANT |
| 158 | 34.1 | 27.4 | V-CHIP SILOS | 338 | 64.3 | 18.3 | U-BLEACH PLANT |
| 180 | 78.2 | 18.3 | U-BLEACH PLANT | 360 | 78.2 | 18.3 | U-BLEACH PLANT |

NOTES: DIR represents a wind direction, NOT A FLOW VECTOR.
Asterisks mark structures producing only Huber-Snyder effects in ISC.

INFLUENCING STRUCTURE WITH MAXIMUM FORMULA GEP HEIGHT:

H-DIGESTER
HL = HW = MPW * 0.886 = 71.10 meters
HB = 60.96 meters

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:54

DWA: DOMINANT STRUCTURES AND DIMENSIONS FOR SOURCE

Source ID : HARDWOOD Eo HOOD VENT
Source Height : 67.00 feet [ 20.42 meters]
Source Diameter : 1.00 feet [ 0.30 meters]

hrdl

INPUT SITE COORDINATES:
Easting : -78.00 feet [ -23.77 meters]
Northing : 138.00 feet [ 42.06 meters]

ROTATED SITE COORDINATES:
Easting : -145.34 feet [ -44.30 meters]
Northing : 63.27 feet [ 19.28 meters]

DOWNWASH ALGORITHM REQUIRED : Schulman-Scire

DIRECTION-SPECIFIC WIDTHS, HEIGHTS, AND DOMINANT STRUCTURES FOR THIS SOURCE, BASED ON EPA GUIDANCE RECTANGULAR AREAS OF EFFECT FOR STRUCTURES:

| DIR deg | PW m | HB m | DOMINANT STRUCTURE | DIR deg | PW m | HB m | DOMINANT STRUCTURE |
|---|---|---|---|---|---|---|---|
| 23 | 28.0 | 22.9 | T-NO.9 H.D. STORAGE CHEST | 203 | 81.4 | 18.3 | U-BLEACH PLANT |
| 45 | 80.8 | 18.3 | U-BLEACH PLANT | 225 | 80.8 | 18.3 | U-BLEACH PLANT |
| 68 | 41.5 | 61.0 | H-DIGESTER | 247 | 41.5 | 61.0 | H-DIGESTER |
| 90 | 64.6 | 61.0 | H-DIGESTER | 270 | 64.6 | 61.0 | H-DIGESTER |
| 113 | 77.9 | 61.0 | H-DIGESTER | 292 | 77.9 | 61.0 | H-DIGESTER |
| 135 | 62.3 | 18.3 | U-BLEACH PLANT | 315 | 62.3 | 18.3 | U-BLEACH PLANT |
| 158 | 34.1 | 27.4 | V-CHIP SILOS | 338 | 64.3 | 18.3 | U-BLEACH PLANT |
| 180 | 28.0 | 22.9 | T-NO.9 H.D. STORAGE CHEST | 360 | 28.0 | 22.9 | T-NO.9 H.D. STORAGE CHEST |

NOTES: DIR represents a wind direction, NOT A FLOW VECTOR.
Asterisks mark structures producing only Huber-Snyder effects in ISC.

INFLUENCING STRUCTURE WITH MAXIMUM FORMULA GEP HEIGHT:

H-DIGESTER
HL = HW = MPW * 0.886 = 71.10 meters
HB = 60.96 meters

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:54

DWA: DOMINANT STRUCTURES AND DIMENSIONS FOR SOURCE

Source ID : REV NO. 6 STACK @ 75FT
Source Height : 75.00 feet [ 22.86 meters]
Source Diameter : 1.00 feet [ 0.30 meters]

INPUT SITE COORDINATES:
Easting : 325.00 feet [ 99.06 meters]
Northing : 119.00 feet [ 36.27 meters]

ROTATED SITE COORDINATES:
Easting : 187.94 feet [ 57.28 meters]
Northing : 290.63 feet [ 88.58 meters]

DOWNWASH ALGORITHM REQUIRED : Schulman-Scire

DIRECTION-SPECIFIC WIDTHS, HEIGHTS, AND DOMINANT STRUCTURES FOR THIS SOURCE, BASED ON EPA GUIDANCE RECTANGULAR AREAS OF EFFECT FOR STRUCTURES:

| DIR deg | PW m | HB m | DOMINANT STRUCTURE | DIR deg | PW m | HB m | DOMINANT STRUCTURE |
|---|---|---|---|---|---|---|---|
| 23 | 58.9 | 61.0 | H-DIGESTER | 203 | 58.9 | 61.0 | H-DIGESTER |
| 45 | 39.4 | 22.9 | I-NO.3 POWER BOILER | 225 | 39.4 | 22.9 | I-NO.3 POWER BOILER |
| 68 | 45.5 | 48.8 | C-NO.4 POWER BOILER | 247 | 45.5 | 48.8 | C-NO.4 POWER BOILER |
| 90 | 64.6 | 61.0 | H-DIGESTER | 270 | 64.6 | 61.0 | H-DIGESTER |
| 113 | 77.9 | 61.0 | H-DIGESTER | 292 | 77.9 | 61.0 | H-DIGESTER |
| 135 | 80.2 | 61.0 | H-DIGESTER | 315 | 80.2 | 61.0 | H-DIGESTER |
| 158 | 80.2 | 61.0 | H-DIGESTER | 338 | 80.2 | 61.0 | H-DIGESTER |
| 180 | 75.2 | 61.0 | H-DIGESTER | 360 | 75.2 | 61.0 | H-DIGESTER |

NOTES: DIR represents a wind direction, NOT A FLOW VECTOR.
Asterisks mark structures producing only Huber-Snyder effects in ISC.

INFLUENCING STRUCTURE WITH MAXIMUM FORMULA GEP HEIGHT:

H-DIGESTER
HL = HW = MPW * 0.886 = 71.10 meters
HB = 60.96 meters

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

A-LIME RECOVERY BLDG

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 350.00 feet [ 106.68 meters]
Northing : -258.00 feet [ -78.64 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 8
Height (HB) : 70.00 feet [ 21.34 meters]

Maximum projected width (MPW) : 132.23 feet [ 40.30 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 350.00 feet [ 106.68 meters]
Huber-Snyder critical height^ : 175.00 feet [ 53.34 meters]
Schulman-Scire critical height : 105.00 feet [ 32.00 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 35.71 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 33.0 | 32.0 | 33.0 | 10.7 | 42.7 | 106.7 |
| 23 | 23 203 | 36.3 | 32.0 | 36.3 | 10.7 | 42.7 | 106.7 |
| 45 | 45 225 | 36.3 | 32.0 | 36.3 | 10.7 | 42.7 | 106.7 |
| 68 | 68 247 | 40.2 | 32.0 | 40.2 | 10.7 | 42.7 | 106.7 |
| 90 | 90 270 | 40.3 | 32.0 | 40.3 | 10.7 | 42.7 | 106.7 |
| 113 | 113 292 | 38.3 | 32.0 | 38.3 | 10.7 | 42.7 | 106.7 |
| 135 | 135 315 | 30.6 | 32.0 | 30.6 | 10.7 | 42.7 | 106.7 |
| 158 | 158 338 | 27.1 | 32.0 | 27.1 | 10.7 | 42.7 | 106.7 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

B-COOLING TOWER

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 565.00 feet [ 172.21 meters]
Northing : -392.00 feet [-119.48 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 4
Height (HB) : 40.00 feet [ 12.19 meters]

Maximum projected width (MPW) : 72.25 feet [ 22.02 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 200.00 feet [ 60.96 meters]
Huber-Snyder critical height^ : 100.00 feet [ 30.48 meters]
Schulman-Scire critical height : 60.00 feet [ 18.29 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 19.51 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 22.0 | 18.3 | 22.0 | 6.1 | 24.4 | 61.0 |
| 23 | 23 203 | 22.0 | 18.3 | 22.0 | 6.1 | 24.4 | 61.0 |
| 45 | 45 225 | 20.3 | 18.3 | 20.3 | 6.1 | 24.4 | 61.0 |
| 68 | 68 247 | 21.2 | 18.3 | 21.2 | 6.1 | 24.4 | 61.0 |
| 90 | 90 270 | 22.0 | 18.3 | 22.0 | 6.1 | 24.4 | 61.0 |
| 113 | 113 292 | 21.9 | 18.3 | 21.9 | 6.1 | 24.4 | 61.0 |
| 135 | 135 315 | 19.2 | 18.3 | 19.2 | 6.1 | 24.4 | 61.0 |
| 158 | 158 338 | 20.3 | 18.3 | 20.3 | 6.1 | 24.4 | 61.0 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

C-NO.4 POWER BOILER

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 498.00 feet [ 151.79 meters]
Northing : 44.00 feet [ 13.41 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 4
Height (HB) : 160.00 feet [ 48.77 meters]

Maximum projected width (MPW) : 149.59 feet [ 45.59 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 747.93 feet [ 227.97 meters]
Huber-Snyder critical height^ : 384.38 feet [ 117.16 meters]
Schulman-Scire critical height : 234.79 feet [ 71.56 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 40.40 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 44.5 | 71.0 | 44.5 | 22.3 | 89.1 | 222.7 |
| 23 | 23 203 | 45.6 | 71.6 | 45.6 | 22.8 | 91.2 | 228.0 |
| 45 | 45 225 | 44.8 | 71.2 | 44.8 | 22.4 | 89.6 | 224.0 |
| 68 | 68 247 | 45.5 | 71.5 | 45.5 | 22.7 | 90.9 | 227.4 |
| 90 | 90 270 | 45.6 | 71.6 | 45.6 | 22.8 | 91.2 | 228.0 |
| 113 | 113 292 | 43.1 | 70.3 | 43.1 | 21.6 | 86.3 | 215.7 |
| 135 | 135 315 | 34.2 | 65.9 | 34.2 | 17.1 | 68.5 | 171.1 |
| 158 | 158 338 | 37.4 | 67.5 | 37.4 | 18.7 | 74.8 | 187.1 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC.          WORK ORDER NO.    22464301
RUN TITLE:              CHAMPION PENSECOLA  * PROGRAM RUN 12/11/92 AT  8:53

DWA:  DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

D-TURBINE GENERATOR BLDG

SITE COORDINATES (NW CORNER OR CENTER):
Easting        :   498.00 feet  [ 151.79 meters]
Northing       :    44.00 feet  [  13.41 meters]
Rotation Angle :    -37.0 degrees

STRUCTURE DIMENSIONS:
Corners     :      6
Height (HB) :    70.00 feet  [  21.34 meters]

Maximum projected width (MPW)  :   203.84 feet  [  62.13 meters]
Building correction angle      :      0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure  :   350.00 feet  [ 106.68 meters]
Huber-Snyder critical height^  :   175.00 feet  [  53.34 meters]
Schulman-Scire critical height :   105.00 feet  [  32.00 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 =  55.05 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | Min(HB,PW)* 2.0 UPWND (m) | Min(HB,PW)* 5 DNWND (m) |
|---|---|---|---|---|---|---|---|---|
| 0 | 180 | 360 | 52.6 | 32.0 | 52.6 | 10.7 | 42.7 | 106.7 |
| 23 | 23 | 203 | 48.1 | 32.0 | 48.1 | 10.7 | 42.7 | 106.7 |
| 45 | 45 | 225 | 44.8 | 32.0 | 44.8 | 10.7 | 42.7 | 106.7 |
| 68 | 68 | 247 | 56.4 | 32.0 | 56.4 | 10.7 | 42.7 | 106.7 |
| 90 | 90 | 270 | 62.1 | 32.0 | 62.1 | 10.7 | 42.7 | 106.7 |
| 113 | 113 | 292 | 62.1 | 32.0 | 62.1 | 10.7 | 42.7 | 106.7 |
| 135 | 135 | 315 | 58.1 | 32.0 | 58.1 | 10.7 | 42.7 | 106.7 |
| 158 | 158 | 338 | 52.6 | 32.0 | 52.6 | 10.7 | 42.7 | 106.7 |

^  - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

E-EVAPORATORS

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 544.00 feet [ 165.81 meters]
Northing : -174.00 feet [ -53.04 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 8
Height (HB) : 75.00 feet [ 22.86 meters]

Maximum projected width (MPW) : 229.89 feet [ 70.07 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 375.00 feet [ 114.30 meters]
Huber-Snyder critical height^ : 187.50 feet [ 57.15 meters]
Schulman-Scire critical height : 112.50 feet [ 34.29 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 62.08 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 61.2 | 34.3 | 61.2 | 11.4 | 45.7 | 114.3 |
| 23 | 23 203 | 63.0 | 34.3 | 63.0 | 11.4 | 45.7 | 114.3 |
| 45 | 45 225 | 63.8 | 34.3 | 63.8 | 11.4 | 45.7 | 114.3 |
| 68 | 68 247 | 70.0 | 34.3 | 70.0 | 11.4 | 45.7 | 114.3 |
| 90 | 90 270 | 70.1 | 34.3 | 70.1 | 11.4 | 45.7 | 114.3 |
| 113 | 113 292 | 65.4 | 34.3 | 65.4 | 11.4 | 45.7 | 114.3 |
| 135 | 135 315 | 50.8 | 34.3 | 50.8 | 11.4 | 45.7 | 114.3 |
| 158 | 158 338 | 50.8 | 34.3 | 50.8 | 11.4 | 45.7 | 114.3 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC.    WORK ORDER NO. 22464301
RUN TITLE:    CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

F-LINE KILN NORTH

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 288.00 feet [ 87.78 meters]
Northing : -400.00 feet [-121.92 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 4
Height (HB) : 50.00 feet [ 15.24 meters]

Maximum projected width (MPW) : 59.41 feet [ 18.11 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 250.00 feet [ 76.20 meters]
Huber-Snyder critical height^ : 125.00 feet [ 38.10 meters]
Schulman-Scire critical height : 75.00 feet [ 22.86 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 16.04 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 18.1 | 22.9 | 18.1 | 7.6 | 30.5 | 76.2 |
| 23 | 23 203 | 18.0 | 22.9 | 18.0 | 7.6 | 30.5 | 76.2 |
| 45 | 45 225 | 16.1 | 22.9 | 16.1 | 7.6 | 30.5 | 76.2 |
| 68 | 68 247 | 16.9 | 22.9 | 16.9 | 7.6 | 30.5 | 76.2 |
| 90 | 90 270 | 18.1 | 22.9 | 18.1 | 7.6 | 30.5 | 76.2 |
| 113 | 113 292 | 18.1 | 22.9 | 18.1 | 7.6 | 30.5 | 76.2 |
| 135 | 135 315 | 16.5 | 22.9 | 16.5 | 7.6 | 30.5 | 76.2 |
| 158 | 158 338 | 17.2 | 22.9 | 17.2 | 7.6 | 30.5 | 76.2 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

S-LIME KILN SOUTH

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 265.00 feet [ 80.77 meters]
Northing : -695.00 feet [-211.84 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 6
Height (HB) : 50.00 feet [ 15.24 meters]

Maximum projected width (MPW) : 88.81 feet [ 27.07 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 250.00 feet [ 76.20 meters]
Huber-Snyder critical height^ : 125.00 feet [ 38.10 meters]
Schulman-Scire critical height : 75.00 feet [ 22.86 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 23.98 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths For ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|---|
| 0 | 180 | 360 | 27.1 | 22.9 | 27.1 | 7.6 | 30.5 | 76.2 |
| 23 | 23 | 203 | 26.4 | 22.9 | 26.4 | 7.6 | 30.5 | 76.2 |
| 45 | 45 | 225 | 22.1 | 22.9 | 22.1 | 7.6 | 30.5 | 76.2 |
| 68 | 68 | 247 | 18.9 | 22.9 | 18.9 | 7.6 | 30.5 | 76.2 |
| 90 | 90 | 270 | 19.1 | 22.9 | 19.1 | 7.6 | 30.5 | 76.2 |
| 113 | 113 | 292 | 22.0 | 22.9 | 22.0 | 7.6 | 30.5 | 76.2 |
| 135 | 135 | 315 | 22.7 | 22.9 | 22.7 | 7.6 | 30.5 | 76.2 |
| 158 | 158 | 338 | 26.6 | 22.9 | 26.6 | 7.6 | 30.5 | 76.2 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

H-DIGESTER

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 102.00 feet [ 31.09 meters]
Northing : 10.00 feet [ 3.05 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 4
Height (HB) : 200.00 feet [ 60.96 meters]

Maximum projected width (MPW) : 263.29 feet [ 80.25 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 1000.00 feet [ 304.80 meters]
Huber-Snyder critical height^ : 500.00 feet [ 152.40 meters]
Schulman-Scire critical height : 300.00 feet [ 91.44 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 71.10 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 75.2 | 91.4 | 75.2 | 30.5 | 121.9 | 304.8 |
| 23 | 23 203 | 58.9 | 90.4 | 58.9 | 29.4 | 117.7 | 294.3 |
| 45 | 45 225 | 33.5 | 77.7 | 33.5 | 16.7 | 67.0 | 167.5 |
| 68 | 68 247 | 41.5 | 81.7 | 41.5 | 20.8 | 83.1 | 207.7 |
| 90 | 90 270 | 64.6 | 91.4 | 64.6 | 30.5 | 121.9 | 304.8 |
| 113 | 113 292 | 77.9 | 91.4 | 77.9 | 30.5 | 121.9 | 304.8 |
| 135 | 135 315 | 80.2 | 91.4 | 80.2 | 30.5 | 121.9 | 304.8 |
| 158 | 158 338 | 80.2 | 91.4 | 80.2 | 30.5 | 121.9 | 304.8 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

I-NO.3 POWER BOILER

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 424.00 feet [ 129.24 meters]
Northing : 148.00 feet [ 45.11 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 4
Height (HB) : 75.00 feet [ 22.86 meters]

Maximum projected width (MPW) : 131.73 feet [ 40.15 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 375.00 feet [ 114.30 meters]
Huber-Snyder critical height^ : 187.50 feet [ 57.15 meters]
Schulman-Scire critical height : 112.50 feet [ 34.29 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 35.57 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths For ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|---|
| 0 | 180 | 360 | 39.3 | 34.3 | 39.3 | 11.4 | 45.7 | 114.3 |
| 23 | 23 | 203 | 40.1 | 34.3 | 40.1 | 11.4 | 45.7 | 114.3 |
| 45 | 45 | 225 | 39.4 | 34.3 | 39.4 | 11.4 | 45.7 | 114.3 |
| 68 | 68 | 247 | 40.0 | 34.3 | 40.0 | 11.4 | 45.7 | 114.3 |
| 90 | 90 | 270 | 40.2 | 34.3 | 40.2 | 11.4 | 45.7 | 114.3 |
| 113 | 113 | 292 | 38.1 | 34.3 | 38.1 | 11.4 | 45.7 | 114.3 |
| 135 | 135 | 315 | 30.3 | 34.3 | 30.3 | 11.4 | 45.7 | 114.3 |
| 158 | 158 | 338 | 33.1 | 34.3 | 33.1 | 11.4 | 45.7 | 114.3 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

I+J+K-NO.1+2 BOILER/TURB

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 424.00 feet [ 129.24 meters]
Northing : 148.00 feet [ 45.11 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 14
Height (HB) : 55.00 feet [ 16.76 meters]

Maximum projected width (MPW) : 282.40 feet [ 86.07 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 275.00 feet [ 83.82 meters]
Huber-Snyder critical height^ : 137.50 feet [ 41.91 meters]
Schulman-Scire critical height : 82.50 feet [ 25.15 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 76.26 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | Min(HB,PW)* 2.0 UPWND (m) | Min(HB,PW)* 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 65.2 | 25.1 | 65.2 | 8.4 | 33.5 | 83.8 |
| 23 | 23 203 | 50.3 | 25.1 | 50.3 | 8.4 | 33.5 | 83.8 |
| 45 | 45 225 | 50.1 | 25.1 | 50.1 | 8.4 | 33.5 | 83.8 |
| 68 | 68 247 | 73.0 | 25.1 | 73.0 | 8.4 | 33.5 | 83.8 |
| 90 | 90 270 | 84.9 | 25.1 | 84.9 | 8.4 | 33.5 | 83.8 |
| 113 | 113 292 | 86.1 | 25.1 | 86.1 | 8.4 | 33.5 | 83.8 |
| 135 | 135 315 | 83.7 | 25.1 | 83.7 | 8.4 | 33.5 | 83.8 |
| 158 | 158 338 | 72.4 | 25.1 | 72.4 | 8.4 | 33.5 | 83.8 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

L-PRECIPITATORS 1

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 700.00 feet [ 213.36 meters]
Northing : -145.00 feet [ -44.20 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 4
Height (HB) : 100.00 feet [ 30.48 meters]

Maximum projected width (MPW) : 83.45 feet [ 25.44 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 417.25 feet [ 127.18 meters]
Huber-Snyder critical height^ : 225.18 feet [ 68.63 meters]
Schulman-Scire critical height : 141.73 feet [ 43.20 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 22.54 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths For ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DWWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 25.4 | 43.2 | 25.4 | 12.7 | 50.9 | 127.2 |
| 23 | 23 203 | 25.4 | 43.2 | 25.4 | 12.7 | 50.8 | 127.1 |
| 45 | 45 225 | 23.0 | 42.0 | 23.0 | 11.5 | 46.1 | 115.2 |
| 68 | 68 247 | 24.1 | 42.5 | 24.1 | 12.1 | 48.2 | 120.6 |
| 90 | 90 270 | 25.4 | 43.2 | 25.4 | 12.7 | 50.9 | 127.2 |
| 113 | 113 292 | 25.4 | 43.2 | 25.4 | 12.7 | 50.7 | 126.8 |
| 135 | 135 315 | 22.7 | 41.8 | 22.7 | 11.3 | 45.3 | 113.3 |
| 158 | 158 338 | 23.8 | 42.4 | 23.8 | 11.9 | 47.7 | 119.1 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

N-PRECIPITATORS 2

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 776.00 feet [ 236.52 meters]
Northing : -145.00 feet [ -44.20 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 4
Height (HB) : 100.00 feet [ 30.48 meters]

Maximum projected width (MPW) : 84.15 feet [ 25.65 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 420.73 feet [ 128.24 meters]
Huber-Snyder critical height^ : 226.22 feet [ 68.95 meters]
Schulman-Scire critical height : 142.07 feet [ 43.30 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 22.72 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 25.6 | 43.3 | 25.6 | 12.8 | 51.3 | 128.2 |
| 23 | 23 203 | 25.6 | 43.3 | 25.6 | 12.8 | 51.2 | 128.1 |
| 45 | 45 225 | 23.1 | 42.1 | 23.1 | 11.6 | 46.3 | 115.7 |
| 68 | 68 247 | 24.2 | 42.6 | 24.2 | 12.1 | 48.5 | 121.2 |
| 90 | 90 270 | 25.6 | 43.3 | 25.6 | 12.8 | 51.3 | 128.2 |
| 113 | 113 292 | 25.6 | 43.3 | 25.6 | 12.8 | 51.2 | 127.9 |
| 135 | 135 315 | 23.0 | 42.0 | 23.0 | 11.5 | 45.9 | 114.8 |
| 158 | 158 338 | 24.1 | 42.5 | 24.1 | 12.1 | 48.2 | 120.5 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

N-RECOVERY BOILERS

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 690.00 feet [ 210.31 meters]
Northing : -24.00 feet [ -7.32 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 10
Height (HB) : 160.00 feet [ 48.77 meters]

Maximum projected width (MPW) : 174.93 feet [ 53.32 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 800.00 feet [ 243.84 meters]
Huber-Snyder critical height^ : 400.00 feet [ 121.92 meters]
Schulman-Scire critical height : 240.00 feet [ 73.15 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 47.24 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 53.3 | 73.2 | 53.3 | 24.4 | 97.5 | 243.8 |
| 23 | 23 203 | 51.1 | 73.2 | 51.1 | 24.4 | 97.5 | 243.8 |
| 45 | 45 225 | 46.6 | 72.1 | 46.6 | 23.3 | 93.1 | 232.9 |
| 68 | 68 247 | 43.5 | 70.5 | 43.5 | 21.8 | 87.1 | 217.7 |
| 90 | 90 270 | 50.1 | 73.2 | 50.1 | 24.4 | 97.5 | 243.8 |
| 113 | 113 292 | 51.7 | 73.2 | 51.7 | 24.4 | 97.5 | 243.8 |
| 135 | 135 315 | 51.1 | 73.2 | 51.1 | 24.4 | 97.5 | 243.8 |
| 158 | 158 338 | 53.1 | 73.2 | 53.1 | 24.4 | 97.5 | 243.8 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

0-NO. 5 PAPER MACHINE

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 424.00 feet [ 129.24 meters]
Northing : 782.00 feet [ 238.35 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 6
Height (HB) : 60.00 feet [ 18.29 meters]

Maximum projected width (MPW) : 588.40 feet [ 179.34 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 300.00 feet [ 91.44 meters]
Huber-Snyder critical height^ : 150.00 feet [ 45.72 meters]
Schulman-Scire critical height : 90.00 feet [ 27.43 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 158.90 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|---|
| 0 | 180 | 360 | 162.4 | 27.4 | 162.4 | 9.1 | 36.6 | 91.4 |
| 23 | 23 | 203 | 179.2 | 27.4 | 179.2 | 9.1 | 36.6 | 91.4 |
| 45 | 45 | 225 | 179.3 | 27.4 | 179.3 | 9.1 | 36.6 | 91.4 |
| 68 | 68 | 247 | 175.6 | 27.4 | 175.6 | 9.1 | 36.6 | 91.4 |
| 90 | 90 | 270 | 170.5 | 27.4 | 170.5 | 9.1 | 36.6 | 91.4 |
| 113 | 113 | 292 | 141.6 | 27.4 | 141.6 | 9.1 | 36.6 | 91.4 |
| 135 | 135 | 315 | 91.0 | 27.4 | 91.0 | 9.1 | 36.6 | 91.4 |
| 158 | 158 | 338 | 120.9 | 27.4 | 120.9 | 9.1 | 36.6 | 91.4 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC.            WORK ORDER NO.    22464301
RUN TITLE:                CHAMPION PENSECOLA  * PROGRAM RUN 12/11/92 AT  8:53

DWA:  DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

P-NO.3 PAPER MACHINE

SITE COORDINATES (NW CORNER OR CENTER):
Easting          :   275.00 feet  [  83.82 meters]
Northing         :   745.00 feet  [ 227.08 meters]
Rotation Angle :    -37.0 degrees

STRUCTURE DIMENSIONS:
Corners      :        8
Height (HB) :    60.00 feet  [  18.29 meters]

Maximum projected width (MPW)  :   522.15 feet  [ 159.15 meters]
Building correction angle      :      0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure  :   300.00 feet  [  91.44 meters]
Huber-Snyder critical height^  :   150.00 feet  [  45.72 meters]
Schulman-Scire critical height :    90.00 feet  [  27.43 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 141.01 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 136.3 | 27.4 | 136.3 | 9.1 | 36.6 | 91.4 |
| 23 | 23 203 | 156.9 | 27.4 | 156.9 | 9.1 | 36.6 | 91.4 |
| 45 | 45 225 | 158.5 | 27.4 | 158.5 | 9.1 | 36.6 | 91.4 |
| 68 | 68 247 | 159.2 | 27.4 | 159.2 | 9.1 | 36.6 | 91.4 |
| 90 | 90 270 | 154.7 | 27.4 | 154.7 | 9.1 | 36.6 | 91.4 |
| 113 | 113 292 | 128.6 | 27.4 | 128.6 | 9.1 | 36.6 | 91.4 |
| 135 | 135 315 | 82.9 | 27.4 | 82.9 | 9.1 | 36.6 | 91.4 |
| 158 | 158 338 | 95.0 | 27.4 | 95.0 | 9.1 | 36.6 | 91.4 |

^  - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

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ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

Q-HIGH BAY STORAGE BLDG

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 400.00 feet [ 121.92 meters]
Northing : 1300.00 feet [ 396.24 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 4
Height (HB) : 75.00 feet [ 22.86 meters]

Maximum projected width (MPW) : 309.53 feet [ 94.35 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 375.00 feet [ 114.30 meters]
Huber-Snyder critical height^ : 187.50 feet [ 57.15 meters]
Schulman-Scire critical height : 112.50 feet [ 34.29 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 83.59 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths For ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 91.4 | 34.3 | 91.4 | 11.4 | 45.7 | 114.3 |
| 23 | 23 203 | 94.3 | 34.3 | 94.3 | 11.4 | 45.7 | 114.3 |
| 45 | 45 225 | 93.3 | 34.3 | 93.3 | 11.4 | 45.7 | 114.3 |
| 68 | 68 247 | 94.3 | 34.3 | 94.3 | 11.4 | 45.7 | 114.3 |
| 90 | 90 270 | 94.3 | 34.3 | 94.3 | 11.4 | 45.7 | 114.3 |
| 113 | 113 292 | 88.2 | 34.3 | 88.2 | 11.4 | 45.7 | 114.3 |
| 135 | 135 315 | 68.7 | 34.3 | 68.7 | 11.4 | 45.7 | 114.3 |
| 158 | 158 338 | 75.6 | 34.3 | 75.6 | 11.4 | 45.7 | 114.3 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

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ROY F. WESTON, INC.  WORK ORDER NO. 22464301
RUN TITLE:  CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

R-CONT. DIGESTER

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 220.00 feet [ 67.06 meters]
Northing : -78.00 feet [ -23.77 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 4
Height (HB) : 200.00 feet [ 60.96 meters]

Maximum projected width (MPW) : 31.11 feet [ 9.48 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 155.56 feet [ 47.42 meters]
Huber-Snyder critical height^ : 246.67 feet [ 75.18 meters]
Schulman-Scire critical height : 215.56 feet [ 65.70 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 8.40 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 9.5 | 65.7 | 9.5 | 4.7 | 19.0 | 47.4 |
| 23 | 23 203 | 9.5 | 65.7 | 9.5 | 4.7 | 18.9 | 47.3 |
| 45 | 45 225 | 8.5 | 65.2 | 8.5 | 4.3 | 17.0 | 42.6 |
| 68 | 68 247 | 8.9 | 65.4 | 8.9 | 4.5 | 17.9 | 44.7 |
| 90 | 90 270 | 9.5 | 65.7 | 9.5 | 4.7 | 19.0 | 47.4 |
| 113 | 113 292 | 9.5 | 65.7 | 9.5 | 4.7 | 18.9 | 47.3 |
| 135 | 135 315 | 8.5 | 65.2 | 8.5 | 4.3 | 17.0 | 42.6 |
| 158 | 158 338 | 8.9 | 65.4 | 8.9 | 4.5 | 17.9 | 44.7 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

S-WASHER

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 210.00 feet [ 64.01 meters]
Northing : -124.00 feet [ -37.80 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 4
Height (HB) : 100.00 feet [ 30.48 meters]

Maximum projected width (MPW) : 49.50 feet [ 15.09 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 247.49 feet [ 75.43 meters]
Huber-Snyder critical height^ : 174.25 feet [ 53.11 meters]
Schulman-Scire critical height : 124.75 feet [ 38.02 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 13.37 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 15.1 | 38.0 | 15.1 | 7.5 | 30.2 | 75.4 |
| 23 | 23 203 | 15.1 | 38.0 | 15.1 | 7.5 | 30.1 | 75.3 |
| 45 | 45 225 | 13.6 | 37.3 | 13.6 | 6.8 | 27.1 | 67.8 |
| 68 | 68 247 | 14.2 | 37.6 | 14.2 | 7.1 | 28.4 | 71.1 |
| 90 | 90 270 | 15.1 | 38.0 | 15.1 | 7.5 | 30.2 | 75.4 |
| 113 | 113 292 | 15.1 | 38.0 | 15.1 | 7.5 | 30.1 | 75.3 |
| 135 | 135 315 | 13.6 | 37.3 | 13.6 | 6.8 | 27.1 | 67.8 |
| 158 | 158 338 | 14.2 | 37.6 | 14.2 | 7.1 | 28.4 | 71.1 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

T-NO.9 H.D. STORAGE CHEST

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 52.00 feet [ 15.85 meters]
Northing : 290.00 feet [ 88.39 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 4
Height (HB) : 75.00 feet [ 22.86 meters]

Maximum projected width (MPW) : 91.92 feet [ 28.02 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 375.00 feet [ 114.30 meters]
Huber-Snyder critical height^ : 187.50 feet [ 57.15 meters]
Schulman-Scire critical height : 112.50 feet [ 34.29 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 24.82 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths For ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 28.0 | 34.3 | 28.0 | 11.4 | 45.7 | 114.3 |
| 23 | 23 203 | 28.0 | 34.3 | 28.0 | 11.4 | 45.7 | 114.3 |
| 45 | 45 225 | 25.2 | 34.3 | 25.2 | 11.4 | 45.7 | 114.3 |
| 68 | 68 247 | 26.4 | 34.3 | 26.4 | 11.4 | 45.7 | 114.3 |
| 90 | 90 270 | 28.0 | 34.3 | 28.0 | 11.4 | 45.7 | 114.3 |
| 113 | 113 292 | 28.0 | 34.3 | 28.0 | 11.4 | 45.7 | 114.3 |
| 135 | 135 315 | 25.2 | 34.3 | 25.2 | 11.4 | 45.7 | 114.3 |
| 158 | 158 338 | 26.4 | 34.3 | 26.4 | 11.4 | 45.7 | 114.3 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

U-BLEACH PLANT

SITE COORDINATES (NW CORNER OR CENTER):
Easting : -185.00 feet [ -56.39 meters]
Northing : 310.00 feet [ 94.49 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 14
Height (HB) : 60.00 feet [ 18.29 meters]

Maximum projected width (MPW) : 271.53 feet [ 82.76 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 300.00 feet [ 91.44 meters]
Huber-Snyder critical height^ : 150.00 feet [ 45.72 meters]
Schulman-Scire critical height : 90.00 feet [ 27.43 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 73.33 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 78.2 | 27.4 | 78.2 | 9.1 | 36.6 | 91.4 |
| 23 | 23 203 | 81.4 | 27.4 | 81.4 | 9.1 | 36.6 | 91.4 |
| 45 | 45 225 | 80.8 | 27.4 | 80.8 | 9.1 | 36.6 | 91.4 |
| 68 | 68 247 | 82.7 | 27.4 | 82.7 | 9.1 | 36.6 | 91.4 |
| 90 | 90 270 | 82.8 | 27.4 | 82.8 | 9.1 | 36.6 | 91.4 |
| 113 | 113 292 | 77.7 | 27.4 | 77.7 | 9.1 | 36.6 | 91.4 |
| 135 | 135 315 | 62.3 | 27.4 | 62.3 | 9.1 | 36.6 | 91.4 |
| 158 | 158 338 | 64.3 | 27.4 | 64.3 | 9.1 | 36.6 | 91.4 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC.          WORK ORDER NO.    22464301
RUN TITLE:          CHAMPION PENSECOLA  * PROGRAM RUN 12/11/92 AT  8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

V-CHIP SILOS

SITE COORDINATES (NW CORNER OR CENTER):
Easting : -140.00 feet [ -42.67 meters]
Northing : -74.00 feet [ -22.56 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 4
Height (HB) : 90.00 feet [ 27.43 meters]

Maximum projected width (MPW) : 183.97 feet [ 56.07 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 450.00 feet [ 137.16 meters]
Huber-Snyder critical height^ : 225.00 feet [ 68.58 meters]
Schulman-Scire critical height : 135.00 feet [ 41.15 meters]

^ - *Maximum GEP stack height for the structure.*

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 49.68 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths For ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | Min(HB,PW)* 2.0 UPWND (m) | Min(HB,PW)* 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 48.5 | 41.1 | 48.5 | 13.7 | 54.9 | 137.2 |
| 23 | 23 203 | 55.6 | 41.1 | 55.6 | 13.7 | 54.9 | 137.2 |
| 45 | 45 225 | 56.1 | 41.1 | 56.1 | 13.7 | 54.9 | 137.2 |
| 68 | 68 247 | 56.1 | 41.1 | 56.1 | 13.7 | 54.9 | 137.2 |
| 90 | 90 270 | 54.4 | 41.1 | 54.4 | 13.7 | 54.9 | 137.2 |
| 113 | 113 292 | 45.0 | 41.1 | 45.0 | 13.7 | 54.9 | 137.2 |
| 135 | 135 315 | 28.8 | 41.1 | 28.8 | 13.7 | 54.9 | 137.2 |
| 158 | 158 338 | 34.1 | 41.1 | 34.1 | 13.7 | 54.9 | 137.2 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
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RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

Y-SCREEN BLDG

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 202.00 feet [ 61.57 meters]
Northing : 178.00 feet [ 54.25 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 4
Height (HB) : 60.00 feet [ 18.29 meters]

Maximum projected width (MPW) : 185.01 feet [ 56.39 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 300.00 feet [ 91.44 meters]
Huber-Snyder critical height^ : 150.00 feet [ 45.72 meters]
Schulman-Scire critical height : 90.00 feet [ 27.43 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 49.96 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 56.3 | 27.4 | 56.3 | 9.1 | 36.6 | 91.4 |
| 23 | 23 203 | 51.0 | 27.4 | 51.0 | 9.1 | 36.6 | 91.4 |
| 45 | 45 225 | 37.9 | 27.4 | 37.9 | 9.1 | 36.6 | 91.4 |
| 68 | 68 247 | 42.4 | 27.4 | 42.4 | 9.1 | 36.6 | 91.4 |
| 90 | 90 270 | 53.4 | 27.4 | 53.4 | 9.1 | 36.6 | 91.4 |
| 113 | 113 292 | 56.4 | 27.4 | 56.4 | 9.1 | 36.6 | 91.4 |
| 135 | 135 315 | 56.2 | 27.4 | 56.2 | 9.1 | 36.6 | 91.4 |
| 158 | 158 338 | 56.4 | 27.4 | 56.4 | 9.1 | 36.6 | 91.4 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

DOWNWASH ANALYSIS PROGRAM, VERSION 4.0X, February 1991
ROY F. WESTON, INC. WORK ORDER NO. 22464301
RUN TITLE: CHAMPION PENSECOLA * PROGRAM RUN 12/11/92 AT 8:53

DWA: DOWNWASH CALCULATIONS FOR AN ISOLATED SIMPLE STRUCTURE

No. 6 POWER BOILER BLGD

SITE COORDINATES (NW CORNER OR CENTER):
Easting : 750.00 feet [ 228.60 meters]
Northing : 138.00 feet [ 42.06 meters]
Rotation Angle : -37.0 degrees

STRUCTURE DIMENSIONS:
Corners : 4
Height (HB) : 21.00 feet [ 6.40 meters]

Maximum projected width (MPW) : 51.66 feet [ 15.75 meters]
Building correction angle : 0.0 degrees

CRITICAL HEIGHT INFORMATION:
Radius of effect of structure : 105.00 feet [ 32.00 meters]
Huber-Snyder critical height^ : 52.50 feet [ 16.00 meters]
Schulman-Scire critical height : 31.50 feet [ 9.60 meters]

^ - Maximum GEP stack height for the structure.

HUBER-SNYDER DOWNWASH DIMENSIONS:
HL = HW = MPW * 0.886 = 13.95 meters

SCHULMAN-SCIRE DOWNWASH CALCULATIONS:

| Attack Angle (deg) | Wind Direction Sectors (deg) | Proj. Width PW^ (m) | Critical Height^^ (m) | Widths for ISC (PW) (m) | Min(HB,PW)* 0.5 XWND (m) | 2.0 UPWND (m) | 5 DNWND (m) |
|---|---|---|---|---|---|---|---|
| 0 | 180 360 | 15.4 | 9.6 | 15.4 | 3.2 | 12.8 | 32.0 |
| 23 | 23 203 | 13.1 | 9.6 | 13.1 | 3.2 | 12.8 | 32.0 |
| 45 | 45 225 | 8.7 | 9.6 | 8.7 | 3.2 | 12.8 | 32.0 |
| 68 | 68 247 | 10.1 | 9.6 | 10.1 | 3.2 | 12.8 | 32.0 |
| 90 | 90 270 | 14.0 | 9.6 | 14.0 | 3.2 | 12.8 | 32.0 |
| 113 | 113 292 | 15.7 | 9.6 | 15.7 | 3.2 | 12.8 | 32.0 |
| 135 | 135 315 | 15.7 | 9.6 | 15.7 | 3.2 | 12.8 | 32.0 |
| 158 | 158 338 | 15.7 | 9.6 | 15.7 | 3.2 | 12.8 | 32.0 |

^ - Maximum projected width at 1 degree intervals in each sector.
^^ - Schulman-Scire GEP height based on directional PW.

**NO. 6 POWER BOILER**

**LOAD CONDITION MODELING**

12-11-92
09:32:52

*** SCREEN-1.1 MODEL RUN ***
*** VERSION DATED 88300 ***

G6 POWER BOILER 100% LOAD CONDITION 12/11/92

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = POINT
EMISSION RATE (G/S) = 1.000
STACK HEIGHT (M) = 38.10
STK INSIDE DIAM (M) = 2.59
STK EXIT VELOCITY (M/S)= 14.41
STK GAS EXIT TEMP (K) = 449.80
AMBIENT AIR TEMP (K) = 293.00
RECEPTOR HEIGHT (M) = .00
IOPT (1=URB,2=RUR) = 2
BUILDING HEIGHT (M) = 61.00
MIN HORIZ BLDG DIM (M) = 19.00
MAX HORIZ BLDG DIM (M) = 80.20

BUOY. FLUX = 82.61 M**4/S**3; MOM. FLUX = 226.84 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

| DIST (M) | CONC (UG/M**3) | STAB | U10M (M/S) | USTK (M/S) | MIX HT (M) | PLUME HT (M) | SIGMA Y (M) | SIGMA Z (M) | DWASH |
|---|---|---|---|---|---|---|---|---|---|
| 100. | .0000 | 0 | .0 | .0 | .0 | .0 | .0 | .0 | NA |
| 200. | 51.37 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 11.6 | 36.8 | SS |
| 300. | 52.93 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 16.9 | 42.4 | SS |
| 400. | 51.70 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 22.0 | 48.0 | SS |
| 500. | 48.76 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 27.0 | 53.7 | SS |
| 600. | 45.03 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 31.9 | 59.3 | SS |
| 700. | 40.17 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 36.8 | 61.9 | SS |
| 800. | 35.71 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 41.5 | 62.4 | SS |
| 900. | 32.20 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 46.3 | 62.9 | SS |
| 1000. | 29.36 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 50.9 | 63.4 | SS |
| 1100. | 27.02 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 55.6 | 63.9 | SS |
| 1200. | 25.05 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 60.2 | 64.4 | SS |
| 1300. | 23.36 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 64.7 | 64.9 | SS |
| 1400. | 21.90 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 69.2 | 65.4 | SS |
| 1500. | 20.63 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 73.7 | 65.8 | SS |
| 1600. | 19.50 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 78.1 | 66.3 | SS |
| 1700. | 18.51 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 82.6 | 66.8 | SS |
| 1800. | 17.61 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 87.0 | 67.3 | SS |
| 1900. | 16.80 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 91.3 | 67.7 | SS |
| 2000. | 16.19 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 98.2 | 67.9 | SS |
| 2100. | 15.74 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 101.0 | 68.0 | SS |
| 2200. | 15.32 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 103.7 | 68.0 | SS |
| 2300. | 14.93 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 106.4 | 68.1 | SS |
| 2400. | 14.55 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 109.1 | 68.2 | SS |
| 2500. | 14.19 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 111.8 | 68.3 | SS |
| 2600. | 13.85 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 114.5 | 68.3 | SS |
| 2700. | 13.53 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 117.2 | 68.4 | SS |
| 2800. | 13.22 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 119.9 | 68.5 | SS |
| 2900. | 12.93 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 122.6 | 68.6 | SS |
| 3000. | 12.65 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 125.3 | 68.6 | SS |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3500. | 11.44 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 138.5 | 68.7 | SS |
| 4000. | 10.43 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 151.6 | 69.0 | SS |
| 4500. | 9.596 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 164.6 | 69.3 | SS |
| 5000. | 8.889 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 177.4 | 69.6 | SS |
| 5500. | 8.282 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 190.1 | 69.9 | SS |
| 6000. | 7.756 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 202.7 | 70.2 | SS |
| 6500. | 7.294 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 215.2 | 70.5 | SS |
| 7000. | 6.886 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 227.6 | 70.8 | SS |
| 7500. | 6.523 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 239.9 | 71.1 | SS |
| 8000. | 6.198 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 252.2 | 71.4 | SS |
| 8500. | 5.904 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 264.3 | 71.7 | SS |
| 9000. | 5.637 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 276.4 | 72.0 | SS |
| 9500. | 5.395 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 288.4 | 72.2 | SS |
| 10000. | 5.173 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 300.3 | 72.5 | SS |

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 100. M:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 301. | 52.93 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 17.0 | 42.5 | SS |

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

| *** CAVITY CALCULATION - 1 *** | | *** CAVITY CALCULATION - 2 *** | |
|---|---|---|---|
| CONC (UG/M**3) = | 136.3 | CONC (UG/M**3) = | 513.5 |
| CRIT WS @10M (M/S) = | 1.00 | CRIT WS @10M (M/S) = | 1.71 |
| CRIT WS @ HS (M/S) = | 1.31 | CRIT WS @ HS (M/S) = | 2.24 |
| DILUTION WS (M/S) = | 1.00 | DILUTION WS (M/S) = | 1.12 |
| CAVITY HT (M) = | 126.10 | CAVITY HT (M) = | 78.67 |
| CAVITY LENGTH (M) = | 198.91 | CAVITY LENGTH (M) = | 25.16 |
| ALONGWIND DIM (M) = | 19.00 | ALONGWIND DIM (M) = | 80.20 |

***************************************
*** SUMMARY OF SCREEN MODEL RESULTS ***
***************************************

| CALCULATION PROCEDURE | MAX CONC (UG/M**3) | DIST TO MAX (M) | TERRAIN HT (M) | |
|---|---|---|---|---|
| SIMPLE TERRAIN | 52.93 | 301. | 0. | |
| BUILDING CAVITY-1 | 136.3 | 199. | -- | (DIST = CAVITY LENGTH) |
| BUILDING CAVITY-2 | 513.5 | 25. | -- | (DIST = CAVITY LENGTH) |

***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************

12-11-92
09:32:56

*** SCREEN-1.1 MODEL RUN ***
*** VERSION DATED 88300 ***

#6 POWER BOILER 75% LOAD CONDITION 12/11/92

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = POINT
EMISSION RATE (G/S) = .7500
STACK HEIGHT (M) = 38.10
STK INSIDE DIAM (M) = 2.59
STK EXIT VELOCITY (M/S)= 10.79
STK GAS EXIT TEMP (K) = 449.80
AMBIENT AIR TEMP (K) = 293.00
RECEPTOR HEIGHT (M) = .00
IOPT (1=URB,2=RUR) = 2
BUILDING HEIGHT (M) = 61.00
MIN HORIZ BLDG DIM (M) = 19.00
MAX HORIZ BLDG DIM (M) = 80.20

BUOY. FLUX = 61.86 M**4/S**3; MOM. FLUX = 127.18 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

| DIST (M) | CONC (UG/M**3) | STAB | U10M (M/S) | USTK (M/S) | MIX HT (M) | PLUME HT (M) | SIGMA Y (M) | SIGMA Z (M) | DWASH |
|---|---|---|---|---|---|---|---|---|---|
| 100. | .0000 | 0 | .0 | .0 | .0 | .0 | .0 | .0 | NA |
| 200. | 43.86 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 30.0 | 42.7 | SS |
| 300. | 37.08 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 36.7 | 49.3 | SS |
| 400. | 31.15 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 43.4 | 55.8 | SS |
| 500. | 26.80 | 5 | 1.0 | 1.6 | 5000.0 | 66.4 | 50.1 | 58.5 | SS |
| 600. | 24.03 | 5 | 1.0 | 1.6 | 5000.0 | 66.4 | 56.8 | 64.7 | SS |
| 700. | 21.60 | 5 | 1.0 | 1.6 | 5000.0 | 66.4 | 63.2 | 67.4 | SS |
| 800. | 20.15 | 5 | 1.0 | 1.6 | 5000.0 | 66.4 | 67.7 | 67.9 | SS |
| 900. | 18.89 | 5 | 1.0 | 1.6 | 5000.0 | 66.4 | 72.2 | 68.4 | SS |
| 1000. | 17.78 | 5 | 1.0 | 1.6 | 5000.0 | 66.4 | 76.7 | 68.8 | SS |
| 1100. | 16.97 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 73.1 | 71.6 | SS |
| 1200. | 16.33 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 75.9 | 71.7 | SS |
| 1300. | 15.74 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 78.7 | 71.8 | SS |
| 1400. | 15.19 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 81.6 | 71.8 | SS |
| 1500. | 14.68 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 84.4 | 71.9 | SS |
| 1600. | 14.20 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 87.1 | 71.9 | SS |
| 1700. | 13.76 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 89.9 | 72.0 | SS |
| 1800. | 13.34 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 92.7 | 72.0 | SS |
| 1900. | 12.95 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 95.5 | 72.1 | SS |
| 2000. | 12.58 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 98.2 | 72.1 | SS |
| 2100. | 12.24 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 101.0 | 72.2 | SS |
| 2200. | 11.91 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 103.7 | 72.3 | SS |
| 2300. | 11.60 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 106.4 | 72.3 | SS |
| 2400. | 11.31 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 109.1 | 72.4 | SS |
| 2500. | 11.03 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 111.8 | 72.4 | SS |
| 2600. | 10.76 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 114.5 | 72.5 | SS |
| 2700. | 10.51 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 117.2 | 72.5 | SS |
| 2800. | 10.27 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 119.9 | 72.6 | SS |
| 2900. | 10.04 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 122.6 | 72.6 | SS |
| 3000. | 9.826 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 125.3 | 72.7 | SS |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3500. | 8.869 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 138.5 | 73.0 | SS |
| 4000. | 8.088 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 151.6 | 73.2 | SS |
| 4500. | 7.437 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 164.6 | 73.5 | SS |
| 5000. | 6.886 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 177.4 | 73.8 | SS |
| 5500. | 6.414 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 190.1 | 74.0 | SS |
| 6000. | 6.004 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 202.7 | 74.3 | SS |
| 6500. | 5.645 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 215.2 | 74.5 | SS |
| 7000. | 5.328 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 227.6 | 74.8 | SS |
| 7500. | 5.045 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 239.9 | 75.0 | SS |
| 8000. | 4.792 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 252.2 | 75.3 | SS |
| 8500. | 4.564 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 264.3 | 75.5 | SS |
| 9000. | 4.356 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 276.4 | 75.8 | SS |
| 9500. | 4.168 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 288.4 | 76.0 | SS |
| 10000. | 3.995 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 300.3 | 76.3 | SS |

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 100. M:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 183. | 45.05 | 6 | 1.0 | 2.1 | 5000.0 | 50.9 | 28.9 | 41.7 | SS |

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** CAVITY CALCULATION - 1 ***
CONC (UG/M**3) = 102.2
CRIT WS @10M (M/S) = 1.00
CRIT WS @ HS (M/S) = 1.31
DILUTION WS (M/S) = 1.00
CAVITY HT (M) = 126.10
CAVITY LENGTH (M) = 198.91
ALONGWIND DIM (M) = 19.00

*** CAVITY CALCULATION - 2 ***
CONC (UG/M**3) = 431.4
CRIT WS @10M (M/S) = 1.32
CRIT WS @ HS (M/S) = 1.73
DILUTION WS (M/S) = 1.00
CAVITY HT (M) = 78.67
CAVITY LENGTH (M) = 25.16
ALONGWIND DIM (M) = 80.20

***************************************
*** SUMMARY OF SCREEN MODEL RESULTS ***
***************************************

| CALCULATION PROCEDURE | MAX CONC (UG/M**3) | DIST TO MAX (M) | TERRAIN HT (M) | |
|---|---|---|---|---|
| SIMPLE TERRAIN | 45.05 | 183. | 0. | |
| BUILDING CAVITY-1 | 102.2 | 199. | -- | (DIST = CAVITY LENGTH) |
| BUILDING CAVITY-2 | 431.4 | 25. | -- | (DIST = CAVITY LENGTH) |

***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************

*** SCREEN-1.1 MODEL RUN ***
*** VERSION DATED 88300 ***

G6 POWER BOILER 50% LOAD CONDITION 12/11/92

SIMPLE TERRAIN INPUTS:

| | | |
|---|---|---|
| SOURCE TYPE | = | POINT |
| EMISSION RATE (G/S) | = | .5000 |
| STACK HEIGHT (M) | = | 38.10 |
| STK INSIDE DIAM (M) | = | 2.59 |
| STK EXIT VELOCITY (M/S) | = | 6.85 |
| STK GAS EXIT TEMP (K) | = | 449.80 |
| AMBIENT AIR TEMP (K) | = | 293.00 |
| RECEPTOR HEIGHT (M) | = | .00 |
| IOPT (1=URB,2=RUR) | = | 2 |
| BUILDING HEIGHT (M) | = | 61.00 |
| MIN HORIZ BLDG DIM (M) | = | 19.00 |
| MAX HORIZ BLDG DIM (M) | = | 80.20 |

BUOY. FLUX = 39.27 M**4/S**3; MOM. FLUX = 51.26 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

| DIST (M) | CONC (UG/M**3) | STAB | U10M (M/S) | USTK (M/S) | MIX HT (M) | PLUME HT (M) | SIGMA Y (M) | SIGMA Z (M) | DWASH |
|---|---|---|---|---|---|---|---|---|---|
| 100. | .0000 | 0 | .0 | .0 | .0 | .0 | .0 | .0 | NA |
| 200. | 34.33 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 30.0 | 43.8 | SS |
| 300. | 29.61 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 36.7 | 50.5 | SS |
| 400. | 25.21 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 43.4 | 57.2 | SS |
| 500. | 21.44 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 50.1 | 63.9 | SS |
| 600. | 18.31 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 56.8 | 70.6 | SS |
| 700. | 16.17 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 63.2 | 73.6 | SS |
| 800. | 15.05 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 67.7 | 74.0 | SS |
| 900. | 14.08 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 72.2 | 74.4 | SS |
| 1000. | 13.23 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 76.7 | 74.9 | SS |
| 1100. | 12.47 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 81.1 | 75.3 | SS |
| 1200. | 11.80 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 85.5 | 75.7 | SS |
| 1300. | 11.19 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 89.9 | 76.1 | SS |
| 1400. | 10.65 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 94.3 | 76.5 | SS |
| 1500. | 10.15 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 98.6 | 76.9 | SS |
| 1600. | 9.751 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 87.1 | 73.7 | SS |
| 1700. | 9.445 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 89.9 | 73.8 | SS |
| 1800. | 9.159 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 92.7 | 73.8 | SS |
| 1900. | 8.890 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 95.5 | 73.9 | SS |
| 2000. | 8.637 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 98.2 | 73.9 | SS |
| 2100. | 8.399 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 101.0 | 74.0 | SS |
| 2200. | 8.174 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 103.7 | 74.0 | SS |
| 2300. | 7.961 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 106.4 | 74.1 | SS |
| 2400. | 7.760 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 109.1 | 74.1 | SS |
| 2500. | 7.569 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 111.8 | 74.2 | SS |
| 2600. | 7.387 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 114.5 | 74.2 | SS |
| 2700. | 7.214 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 117.2 | 74.3 | SS |
| 2800. | 7.050 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 119.9 | 74.3 | SS |
| 2900. | 6.893 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 122.6 | 74.4 | SS |
| 3000. | 6.743 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 125.3 | 74.5 | SS |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3500. | 6.085 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 138.5 | 74.7 | SS |
| 4000. | 5.548 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 151.6 | 75.0 | SS |
| 4500. | 5.100 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 164.6 | 75.2 | SS |
| 5000. | 4.722 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 177.4 | 75.5 | SS |
| 5500. | 4.397 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 190.1 | 75.7 | SS |
| 6000. | 4.115 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 202.7 | 75.9 | SS |
| 6500. | 3.869 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 215.2 | 76.2 | SS |
| 7000. | 3.651 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 227.6 | 76.4 | SS |
| 7500. | 3.456 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 239.9 | 76.7 | SS |
| 8000. | 3.282 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 252.2 | 76.9 | SS |
| 8500. | 3.125 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 264.3 | 77.1 | SS |
| 9000. | 2.983 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 276.4 | 77.4 | SS |
| 9500. | 2.854 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 288.4 | 77.6 | SS |
| 10000. | 2.735 | 6 | 1.0 | 2.1 | 5000.0 | 46.2 | 300.3 | 77.8 | SS |

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 100. M:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 183. | 35.10 | 5 | 1.0 | 1.6 | 5000.0 | 55.2 | 28.9 | 42.8 | SS |

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

| *** CAVITY CALCULATION - 1 *** | | *** CAVITY CALCULATION - 2 *** | |
|---|---|---|---|
| CONC (UG/M**3) = | 68.14 | CONC (UG/M**3) = | 287.6 |
| CRIT WS @10M (M/S) = | 1.00 | CRIT WS @10M (M/S) = | 1.00 |
| CRIT WS @ HS (M/S) = | 1.31 | CRIT WS @ HS (M/S) = | 1.31 |
| DILUTION WS (M/S) = | 1.00 | DILUTION WS (M/S) = | 1.00 |
| CAVITY HT (M) = | 126.10 | CAVITY HT (M) = | 78.67 |
| CAVITY LENGTH (M) = | 198.91 | CAVITY LENGTH (M) = | 25.16 |
| ALONGWIND DIM (M) = | 19.00 | ALONGWIND DIM (M) = | 80.20 |

***************************************
*** SUMMARY OF SCREEN MODEL RESULTS ***
***************************************

| CALCULATION PROCEDURE | MAX CONC (UG/M**3) | DIST TO MAX (M) | TERRAIN HT (M) | |
|---|---|---|---|---|
| SIMPLE TERRAIN | 35.10 | 183. | 0. | |
| BUILDING CAVITY-1 | 68.14 | 199. | -- | (DIST = CAVITY LENGTH) |
| BUILDING CAVITY-2 | 287.6 | 25. | -- | (DIST = CAVITY LENGTH) |

***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
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# CO SIGNIFICANT IMPACT AREA MODELING

*** SCREEN-1.1 MODEL RUN ***
*** VERSION DATED 88300 ***

LIME MUD DRYER CO SCREENING FOR SIGNIFICANCE 12/08/92

SIMPLE TERRAIN INPUTS:

| | | |
|---|---|---|
| SOURCE TYPE | = | POINT |
| EMISSION RATE (G/S) | = | .8500 |
| STACK HEIGHT (M) | = | 41.45 |
| STK INSIDE DIAM (M) | = | 1.98 |
| STK EXIT VELOCITY (M/S) | = | 8.76 |
| STK GAS EXIT TEMP (K) | = | 342.30 |
| AMBIENT AIR TEMP (K) | = | 293.00 |
| RECEPTOR HEIGHT (M) | = | .00 |
| IOPT (1=URB,2=RUR) | = | 2 |
| BUILDING HEIGHT (M) | = | 61.00 |
| MIN HORIZ BLDG DIM (M) | = | 19.00 |
| MAX HORIZ BLDG DIM (M) | = | 80.20 |

BUOY. FLUX = 12.13 M**4/S**3; MOM. FLUX = 64.38 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

| DIST (M) | CONC (UG/M**3) | STAB | U10M (M/S) | USTK (M/S) | MIX HT (M) | PLUME HT (M) | SIGMA Y (M) | SIGMA Z (M) | DWASH |
|---|---|---|---|---|---|---|---|---|---|
| 100. | .0000 | 0 | .0 | .0 | .0 | .0 | .0 | .0 | NA |
| 200. | 68.53 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 30.0 | 41.9 | SS |
| 300. | 57.05 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 36.7 | 48.3 | SS |
| 400. | 47.42 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 43.4 | 54.7 | SS |
| 500. | 39.66 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 50.1 | 61.1 | SS |
| 600. | 33.45 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 56.8 | 67.5 | SS |
| 700. | 29.41 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 63.2 | 70.3 | SS |
| 800. | 27.35 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 67.7 | 70.8 | SS |
| 900. | 25.56 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 72.2 | 71.2 | SS |
| 1000. | 23.99 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 76.7 | 71.6 | SS |
| 1100. | 22.60 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 81.1 | 72.1 | SS |
| 1200. | 21.37 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 85.5 | 72.5 | SS |
| 1300. | 20.26 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 89.9 | 72.9 | SS |
| 1400. | 19.25 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 94.3 | 73.4 | SS |
| 1500. | 18.35 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 98.6 | 73.8 | SS |
| 1600. | 17.52 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 102.9 | 74.2 | SS |
| 1700. | 16.76 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 107.2 | 74.7 | SS |
| 1800. | 16.06 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 111.5 | 75.1 | SS |
| 1900. | 15.42 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 115.8 | 75.5 | SS |
| 2000. | 14.83 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 120.0 | 75.9 | SS |
| 2100. | 14.28 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 124.2 | 76.3 | SS |
| 2200. | 13.76 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 128.4 | 76.7 | SS |
| 2300. | 13.28 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 132.6 | 77.2 | SS |
| 2400. | 12.84 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 136.8 | 77.6 | SS |
| 2500. | 12.51 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 111.8 | 74.2 | SS |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2600. | 12.21 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 114.5 | 74.2 | SS |
| 2700. | 11.93 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 117.2 | 74.3 | SS |
| 2800. | 11.65 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 119.9 | 74.3 | SS |
| 2900. | 11.39 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 122.6 | 74.4 | SS |
| 3000. | 11.15 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 125.3 | 74.5 | SS |
| 3500. | 10.06 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 138.5 | 74.7 | SS |
| 4000. | 9.168 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 151.6 | 75.0 | SS |
| 4500. | 8.428 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 164.6 | 75.2 | SS |
| 5000. | 7.801 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 177.4 | 75.5 | SS |
| 5500. | 7.264 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 190.1 | 75.7 | SS |
| 6000. | 6.798 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 202.7 | 75.9 | SS |
| 6500. | 6.390 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 215.2 | 76.2 | SS |
| 7000. | 6.029 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 227.6 | 76.4 | SS |
| 7500. | 5.708 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 239.9 | 76.7 | SS |
| 8000. | 5.420 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 252.2 | 76.9 | SS |
| 8500. | 5.160 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 264.3 | 77.1 | SS |
| 9000. | 4.924 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 276.4 | 77.4 | SS |
| 9500. | 4.710 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 288.4 | 77.6 | SS |
| 10000. | 4.514 | 6 | 1.0 | 2.2 | 5000.0 | 44.0 | 300.3 | 77.8 | SS |

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 100. M:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 183. | 70.62 | 5 | 1.0 | 1.6 | 5000.0 | 47.7 | 28.9 | 40.8 | SS |

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** CAVITY CALCULATION - 1 ***

| | | |
|---|---|---|
| CONC (UG/M**3) | = | 115.8 |
| CRIT WS @10M (M/S) | = | 1.00 |
| CRIT WS @ HS (M/S) | = | 1.33 |
| DILUTION WS (M/S) | = | 1.00 |
| CAVITY HT (M) | = | 126.10 |
| CAVITY LENGTH (M) | = | 198.91 |
| ALONGWIND DIM (M) | = | 19.00 |

*** CAVITY CALCULATION - 2 ***

| | | |
|---|---|---|
| CONC (UG/M**3) | = | 488.9 |
| CRIT WS @10M (M/S) | = | 1.03 |
| CRIT WS @ HS (M/S) | = | 1.37 |
| DILUTION WS (M/S) | = | 1.00 |
| CAVITY HT (M) | = | 78.67 |
| CAVITY LENGTH (M) | = | 25.16 |
| ALONGWIND DIM (M) | = | 80.20 |

***************************************
*** SUMMARY OF SCREEN MODEL RESULTS ***
***************************************

| CALCULATION PROCEDURE | MAX CONC (UG/M**3) | DIST TO MAX (M) | TERRAIN HT (M) | |
|---|---|---|---|---|
| SIMPLE TERRAIN | 70.62 | 183. | 0. | |
| BUILDING CAVITY-1 | 115.8 | 199. | -- | (DIST = CAVITY LENGTH) |
| BUILDING CAVITY-2 | 488.9 | 25. | -- | (DIST = CAVITY LENGTH) |

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** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************

12-08-92
15:58:22

*** SCREEN-1.1 MODEL RUN ***
*** VERSION DATED 88300 ***

#6 POWER BOILER CO SCREENING FOR SIGNIFICANCE 12/08/92

SIMPLE TERRAIN INPUTS:

| | | |
|---|---|---|
| SOURCE TYPE | = | POINT |
| EMISSION RATE (G/S) | = | 6.720 ✓ |
| STACK HEIGHT (M) | = | 38.10 ✓ |
| STK INSIDE DIAM (M) | = | 2.59 ✓ |
| STK EXIT VELOCITY (M/S) | = | 14.41 ✓ |
| STK GAS EXIT TEMP (K) | = | 449.80 ✓ |
| AMBIENT AIR TEMP (K) | = | 293.00 ✓ |
| RECEPTOR HEIGHT (M) | = | .00 |
| IOPT (1=URB,2=RUR) | = | 2 ✓ |
| BUILDING HEIGHT (M) | = | 61.00 ✓ |
| MIN HORIZ BLDG DIM (M) | = | 19.00 ✓ |
| MAX HORIZ BLDG DIM (M) | = | 80.20 ✓ |

BUOY. FLUX = 82.61 M**4/S**3; MOM. FLUX = 226.84 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

| DIST (M) | CONC (UG/M**3) | STAB | U10M (M/S) | USTK (M/S) | MIX HT (M) | PLUME HT (M) | SIGMA Y (M) | SIGMA Z (M) | DWASH |
|---|---|---|---|---|---|---|---|---|---|
| 100. | .0000 | 0 | .0 | .0 | .0 | .0 | .0 | .0 | NA |
| 200. | 345.2 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 11.6 | 36.8 | SS |
| 300. | 355.7 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 16.9 | 42.4 | SS |
| 400. | 347.4 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 22.0 | 48.0 | SS |
| 500. | 327.6 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 27.0 | 53.7 | SS |
| 600. | 302.6 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 31.9 | 59.3 | SS |
| 700. | 270.0 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 36.8 | 61.9 | SS |
| 800. | 240.0 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 41.5 | 62.4 | SS |
| 900. | 216.4 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 46.3 | 62.9 | SS |
| 1000. | 197.3 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 50.9 | 63.4 | SS |
| 1100. | 181.6 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 55.6 | 63.9 | SS |
| 1200. | 168.3 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 60.2 | 64.4 | SS |
| 1300. | 157.0 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 64.7 | 64.9 | SS |
| 1400. | 147.2 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 69.2 | 65.4 | SS |
| 1500. | 138.6 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 73.7 | 65.8 | SS |
| 1600. | 131.1 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 78.1 | 66.3 | SS |
| 1700. | 124.4 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 82.6 | 66.8 | SS |
| 1800. | 118.3 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 87.0 | 67.3 | SS |
| 1900. | 112.9 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 91.3 | 67.7 | SS |
| 2000. | 108.8 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 98.2 | 67.9 | SS |
| 2100. | 105.8 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 101.0 | 68.0 | SS |
| 2200. | 103.0 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 103.7 | 68.0 | SS |
| 2300. | 100.3 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 106.4 | 68.1 | SS |
| 2400. | 97.77 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 109.1 | 68.2 | SS |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2500. | 95.37 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 111.8 | 68.3 | SS |
| 2600. | 93.09 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 114.5 | 68.3 | SS |
| 2700. | 90.92 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 117.2 | 68.4 | SS |
| 2800. | 88.85 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 119.9 | 68.5 | SS |
| 2900. | 86.88 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 122.6 | 68.6 | SS |
| 3000. | 85.00 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 125.3 | 68.6 | SS |
| 3500. | 76.86 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 138.5 | 68.7 | SS |
| 4000. | 70.10 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 151.6 | 69.0 | SS |
| 4500. | 64.49 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 164.6 | 69.3 | SS |
| 5000. | 59.73 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 177.4 | 69.6 | SS |
| 5500. | 55.66 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 190.1 | 69.9 | SS |
| 6000. | 52.12 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 202.7 | 70.2 | SS |
| 6500. | 49.02 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 215.2 | 70.5 | SS |
| 7000. | 46.28 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 227.6 | 70.8 | SS |
| 7500. | 43.84 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 239.9 | 71.1 | SS |
| 8000. | 41.65 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 252.2 | 71.4 | SS |
| 8500. | 39.67 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 264.3 | 71.7 | SS |
| 9000. | 37.88 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 276.4 | 72.0 | SS |
| 9500. | 36.25 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 288.4 | 72.2 | SS |
| 10000. | 34.76 | 6 | 1.0 | 2.1 | 5000.0 | 56.5 | 300.3 | 72.5 | SS |

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 100. M:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 301. | 355.7 | 5 | 1.0 | 1.6 | 5000.0 | 77.3 | 17.0 | 42.5 | SS |

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** CAVITY CALCULATION - 1 ***

| | | |
|---|---|---|
| CONC (UG/M**3) | = | 915.7 |
| CRIT WS @10M (M/S) | = | 1.00 |
| CRIT WS @ HS (M/S) | = | 1.31 |
| DILUTION WS (M/S) | = | 1.00 |
| CAVITY HT (M) | = | 126.10 |
| CAVITY LENGTH (M) | = | 198.91 |
| ALONGWIND DIM (M) | = | 19.00 |

*** CAVITY CALCULATION - 2 ***

| | | |
|---|---|---|
| CONC (UG/M**3) | = | 3451. |
| CRIT WS @10M (M/S) | = | 1.71 |
| CRIT WS @ HS (M/S) | = | 2.24 |
| DILUTION WS (M/S) | = | 1.12 |
| CAVITY HT (M) | = | 78.67 |
| CAVITY LENGTH (M) | = | 25.16 |
| ALONGWIND DIM (M) | = | 80.20 |

***************************************
*** SUMMARY OF SCREEN MODEL RESULTS ***
***************************************

| CALCULATION PROCEDURE | MAX CONC (UG/M**3) | DIST TO MAX (M) | TERRAIN HT (M) | |
|---|---|---|---|---|
| SIMPLE TERRAIN | 355.7 | 301. | 0. | |
| BUILDING CAVITY-1 | 915.7 | 199. | -- | (DIST = CAVITY LENGTH) |
| BUILDING CAVITY-2 | 3451. | 25. | -- | (DIST = CAVITY LENGTH) |

***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************