KBN ENGINEERING AND APPLIED SCIENCES, INC.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Mountain-Prairie Region

IN REPLY REFER TO:

MAILING ADDRESS:
Post Office Box 25486
Denver Federal Center
Denver, Colorado 80225

STREET LOCATION:
134 Union Blvd.
Lakewood, Colorado 80228

RW Air Quality
Mail Stop 60130

NOVEMBER 07 1991

RECEIVED
NOV 12 1991
Division of Air
Resources Management

Mr. C.H. Fancy, P.E., Chief
Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dear Mr. Fancy:

We have completed our review of the material that you forwarded to us regarding Cargill Fertilizer's (Cargill) application to increase the production rate at their No. 5 Diammonium Phosphate plant in Riverview. As you know, the increased production rate will result in a significant increase in emissions of particulate matter (PM), but will also result in a decrease in sulfur dioxide and fluoride emissions. The Riverview facility is located 87 km SE of the Chassahowitzka Wilderness Area, a class I air quality area administered by the U.S. Fish and Wildlife Service.

We were pleased to see that the Florida Department of Environmental Regulation (FDER) performed both a class I visibility analysis and a cumulative class I PM increment analysis for the wilderness area. The visibility analysis indicates that the proposed increased emissions will not result in visibility impairment due to plumes in the wilderness area, and the FDER's increment analysis indicates that less than 13 percent of the annual average class I PM increment will be consumed. Therefore, based on the amount of proposed emissions, the distance from the class I area, and the results of your analyses, we do not anticipate that increasing the production rate at Cargill's Riverview facility will have a significant impact on sensitive air quality-related resources in the Chassahowitzka Wilderness Area.

We appreciated the opportunity to comment on Cargill's permit application. If you have any further questions regarding our comments on this project, please contact Tonnie Maniero of our Air Quality Branch at (303) 969-2071.

Sincerely,

Wilbur N. Ladd, Jr.
Assistant Regional Director
Refuges and Wildlife, Region 6

cc: Jellell Harper, Chief
Air Enforcement Branch
Air, Pesticides and Toxic Management Division
U.S. EPA, Region 4
345 Courtland Street, NE
Atlanta, Georgia 30365

DRAFT

PREVENTION OF SIGNIFICANT DETERIORATION APPLICATION

Sulfuric Acid Production Expansion
CARGILL FERTILIZER, INC.
Riverview, Florida

Prepared For:

Cargill Fertilizer, Inc.
8813 Highway 41 South
Riverview, Florida 33569

Prepared By:

KBN Engineering and Applied Sciences, Inc.
1034 NW 57th Street
Gainesville, Florida 32605

March 1992
91125C1

PART A

AIR CONSTRUCTION PERMIT APPLICATION FOR NO. 7, NO. 8, AND NO. 9 SULFURIC ACID PLANTS

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: *Sulfuric Acid Plant* [ ] New[1] [*X*] Existing[1]

APPLICATION TYPE: [*X*] Construction [ ] Operation [ ] Modification

COMPANY NAME: *Cargill Fertilizer, Inc.* COUNTY: *Hillsborough*

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) *No. 7, No. 8, and No. 9 Sulfuric Acid Plants*

SOURCE LOCATION: Street *8813 Highway 41 South* City *Riverview*

UTM: East *363.3* North *3082.4*

Latitude *27* ° *51* ' *28* "N Longitude *82* ° *23* ' *15* "W

APPLICANT NAME AND TITLE: *Ozzie Morris, Environmental Manager*

APPLICANT ADDRESS: *8813 Highway 41 South, Riverview, FL 33569*

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of *Cargill Fertilizer, Inc.*

I certify that the statements made in this application for a *Construction* permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and 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:

Ozzie Morris, Environmental Manager
Name and Title (Please Type)

Date: Telephone No. *(813) 677-9111*

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 Administration Code Rule 17-2.100(57) and (104)

Cargill

Currently 7500 TPD
Want to go to 8000 TPD
Bubble the three
3 individual permits

Higher

TECO

Preston wants us to give call back
to Dave Buff

Preapplication Meeting

Cargill - Ozzie Morris wants us to state
whether or not the project is
permittable
WH told applicant to talk w/ HCEPC + SWD..

Looking for 6 mo. issuance of permit
Start Co. around 1 Jun 93
They'll set up meeting w/
Jerry Campbell and Bill Thomas

Best time for Dave to call is Mon at 1:30 PM.

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes 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.

DAVID A. BUFF
NO. 19011

Signed David A. Buff

David A. Buff
Name (Please Type)

KBN Engineering and Applied Sciences, Inc.
Company Name (Please Type)

1034 N.W. 57th Street, Gainesville, FL 32605
Mailing Address (Please Type)

Florida Registration No. *19011* Date: *03/20/92* Telephone No. *(904) 331-9000*

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.

See PSD report

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

Start of Construction *upon permit issuance* Completion of Construction *18 mos after permit issued*

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.)

Air pollution controls already in place.

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

See PSD report

E. Requested permitted equipment operating time: hrs/day *24*; days/wk *7*; wks/yr *52*;
If power plant, hrs/yr _____; 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?	*Yes*
a. If yes, has "offset" been applied?	*No*
b. If yes, has "Lowest Achievable Emission Rate" been applied?	*No*
c. If yes, list non-attainment pollutants.	*Ozone*
2. Does best available control technology (BACT) apply to this source? If yes, see Section VI.	*Yes*
3. Does the State "Prevention of Significant Deterioration" (PSD) requirement apply to this source? If yes, see Sections VI and VII.	*Yes*
4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source?	*Yes*
5. Do "National Emission Standards for 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.

No. 7 Sulfuric Acid Plant

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		
Sulfur	--	--	*60,404*	*A*
Atmos. Oxygen	--	--	*90,193*	*B*
Water	--	--	*33,680*	*C*

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

1. Total Process Input Rate (lbs/hr): *184,277*

2. Product Weight (lbs/hr): *183,333 as 100%* H_2SO_4

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	
Sulfur	*366.67*	*1,606*	*4.0 lb/ton*	*366.67*	*366.67*	*1,606*	*D*
dioxide							
Sulfuric	*13.75*	*60.2*	*0.15 lb/ton*	*13.75*	*13.75*	*60.2*	*D*
acid mist							

[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 with~~out~~ control (See Section V, Item 3).

No. 8 Sulfuric Acid Plant

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		
Sulfur	--	--	*71,057*	*A*
Atmos. Oxygen	--	--	*106,260*	*B*
Water	--	--	*39,801*	*C*

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

1. Total Process Input Rate (lbs/hr): *217,118*

2. Product Weight (lbs/hr): *216,667 as 100% H_2SO_4*

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	
Sulfur	*433.3*	*1,898*	*4.0 lb/ton*	*433.3*	*433.3*	*1,898*	*D*
dioxide							
Sulfuric	*16.25*	*71.2*	*0.15 lb/ton*	*16.25*	*16.25*	*71.2*	*D*
acid mist							

[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 with~~out~~ control (See Section V, Item 3).

No. 9 Sulfuric Acid Plant

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		
Sulfur	--	--	*87,455*	*A*
Atmos. Oxygen	--	--	*130,782*	*B*
Water	--	--	*48,986*	*C*

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

1. Total Process Input Rate (lbs/hr): *267,223*
2. Product Weight (lbs/hr): *266,667 as 100%* H_2SO_4

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	
Sulfur	*533.3*	*2,336*	*4.0 lb/ton*	*533.3*	*533.3*	*2,336*	*D*
dioxide							
Sulfuric	*20.0*	*87.6*	*0.15 lb/ton*	*20.0*	*20.0*	*87.6*	*D*
acid mist							

[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 with~~out~~ control (See Section V, Item 3).

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

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)
Final Converter	*Sulfur dioxide*	*99.7+*	*N/A*	*AP-42*
Final Absorber/Mist	*Acid Mist*	*99+*	*>1 micron*	*AP-42*
Eliminator				

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, others--lbs/hr.

Fuel Analysis:

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 *Not applicable* Maximum ____________

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

Cooling tower and boiler blowdown will be discharged to plant recirculation system or to the NPDES outfalls.

No. 7 Sulfuric Acid Plant

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

Stack Height: *149.5* ft. Stack Diameter: *7.5* ft.

Gas Flow Rate: *110,000* ACFM *94,900* DSCFM Gas Exit Temperature: *152* °F.

Water Vapor Content: *0* % Velocity: *41.5* FPS

SECTION IV: INCINERATOR INFORMATION

Not Applicable

Type of Waste	Type 0 (Plastics)	Type II (Rubbish)	Type III (Refuse)	Type IV (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (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

*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.

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

[ ] Other (specify)______

No. 8 Sulfuric Acid Plant

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

Stack Height: *149.5* ft. Stack Diameter: *8.0* ft.

Gas Flow Rate: *137,800* ACFM *119,080* DSCFM Gas Exit Temperature: *151* °F.

Water Vapor Content: *0* % Velocity: *45.7* FPS

SECTION IV: INCINERATOR INFORMATION

Not Applicable

Type of Waste	Type 0 (Plastics)	Type II (Rubbish)	Type III (Refuse)	Type IV (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (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

*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.

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

[ ] Other (specify) ________

No. 9 Sulfuric Acid Plant

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

Stack Height: *149.5* ft. Stack Diameter: *9.0* ft.

Gas Flow Rate: *158,600* ACFM *132,900* DSCFM Gas Exit Temperature: *170* °F.

Water Vapor Content: *0* % Velocity: *41.6* FPS

SECTION IV: INCINERATOR INFORMATION

Not Applicable

Type of Waste	Type O (Plastics)	Type II (Rubbish)	Type III (Refuse)	Type IV (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (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

*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.

Type of pollution control devices: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner
[ ] Other (specify) ____

Brief description of operating characteristics of control devices: ______

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

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

SECTION V: SUPPLEMENTAL REQUIREMENTS

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)]

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.

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

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).

6. An 8 ½" 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.

7. An 8 ½" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Examples: Copy of relevant portion of USGS topographic map).

8. An 8 ½" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

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

Contaminant	Rate or Concentration
Sulfur dioxide	*4.0 lb/ton*
Sulfuric acid mist	*0.15 lb/ton*

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

[*X*] Yes [ ] No

Contaminant	Rate or Concentration
Sulfur dioxide	*4.0 lb/ton*
Sulfuric acid mist	*0.15 lb/ton*

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

Contaminant	Rate or Concentration
Sulfur dioxide	*4.0 lb/ton*
Sulfuric acid mist	*0.15 lb/ton*

D. Describe the existing control and treatment technology (if any). ***See PSD report***

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). *See PSD report*

1.

a. Control Devices:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

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 Cost:

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 Cost:
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 Cost:
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: *See PSD report*

1. Control Device:	2. Efficiency:[1]
3. Capital Cost:	4. Useful Life:
5. Operating Cost:	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: ***See PSD report***

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

SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

See PSD report

A. Company Monitored Data

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

1. ______ Year(s) of data from ______/______/______ to ______/______/______
month day year month day year

2. Surface data obtained from (location)______________________

3. Upper air (mixing height) data obtained from (location) ______________________

4. Stability wind rose (STAR) data obtained from (location) ______________________

C. Computer Models Used

1. ______________________ Modified? If yes, attach description.

2. ______________________ Modified? 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

Pollutant	Emission Rate	
TSP	______________________	grams/sec
SO^2	______________________	grams/sec

E. Emission Data Used in Modeling

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

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

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.

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.

PART B

PSD REPORT

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APPENDICES

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LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

AAQS	ambient air quality standards
API	American Petroleum Institute
APIS	Air Permit Inventory System
AQDM	Air Quality Display Model
BACT	best available control technology
CAA	Clean Air Act
CDM	Climatological Dispersion Model
CFR	Code of Federal Regulations
EPA	U.S. Environmental Protection Agency
ESP	electrostatic preciptitator
FAC	Florida Administrative Code
FDER	Florida Department of Environmental Regulation
FGD	flue gas desulfurization
g/s	grams per second
GEP	good engineering practice
H_2SO_4	sulfuric acid
ISCLT	Industrial Source Complex Long-Term
ISCST	Industrial Source Complex Short-Term
K	Kelvin
km	kilometer
lb/hr	pounds per hour
lb/day	pounds per day
lb/ton	pounds per ton
lb	pound
m/s	meters per second
m	meter
NO_2	nitrogen dioxide
NSPS	new source performance standards
NWS	National Weather Service
PM(TSP)	total suspended particulate matter
PM10	particulate matter with an aerodynamic diameter less than or equal to 10 micrometers
%	percent
PSD	prevention of significant deterioration
SIP	State Implementation Plan
SO_2	sulfur dioxide
TPD	tons per day
TPH	tons per hour
TPY	tons per year
UNAMAP	Users Network for Applied Modeling of Air Pollution
$\mu g/m^3$	micrograms per cubic meter

1.0 INTRODUCTION

Cargill Fertilizer, Inc., is proposing to modify the existing No. 8 and No. 9 sulfuric acid (H_2SO_4) plants at its phosphate fertilizer manufacturing facility located in Riverview, Florida. The modifications will allow the No. 8 and No. 9 H_2SO_4 plants to increase their maximum H_2SO_4 production rates to 2,600 tons per day (TPD) and 3,200 TPD, respectively, of 100 percent H_2SO_4. As a result of these production increases, an increase in the allowable sulfur dioxide (SO_2) and H_2SO_4 mist emissions for the two plants is being requested.

Based on the requested maximum emissions for the affected sources, the proposed modification will constitute a major modification at a major stationary source under current federal and state air quality regulations. This report addresses the requirements of the prevention of significant deterioration (PSD) review procedures pursuant to rules and regulations implementing the Clean Air Act (CAA) Amendments of 1977. The Florida Department of Environmental Regulation (FDER) has PSD review and approval authority in Florida. Based on the PSD source applicability analysis, a PSD review is indicated for SO_2 and H_2SO_4 mist.

This application contains six additional sections. A complete description of the project, including air emission rates, is presented in Section 2.0. The air quality review requirements and new source review applicability of the project are discussed in Section 3.0.

Ambient monitoring requirements under PSD are addressed in Section 4.0. The best available control technology (BACT) analysis is presented in Section 5.0. The air quality impact analysis and impacts on soils, vegetation and visibility required as part of the PSD permitting process are addressed in Sections 6.0 and 7.0, respectively.

By means of this permit application, Cargill is also requesting that a single construction permit be issued for this project, and upon approval and construction, a single operating permit will be issued for all three sulfuric acid plants. This action will reduce paperwork and provide more efficient permitting.

2.0 PROJECT DESCRIPTION

Cargill is proposing to expand the maximum production capacity of the existing No. 8 and No. 9 H_2SO_4 plants at its phosphate fertilizer manufacturing plant located in Riverview, Florida. The plant is located south of Tampa on Hillsborough Bay (see Figure 2-1). Cargill operates a total of three H_2SO_4 plants (Nos. 7, 8 and 9) at the facility. The location of the three existing H_2SO_4 plants at Cargill are shown in Figure 2-2.

Phosphate fertilizers are manufactured at the Cargill facility. A raw material utilized in the manufacture of phosphate fertilizers is sulfuric acid. Sulfuric acid is used to react with phosphate rock to produce phosphoric acid. In order to produce sulfuric acid, molten sulfur is burned in a sulfuric acid plant. SO_2 and H_2SO_4 mist emissions are a byproduct of the chemical reaction. All of the H_2SO_4 plants at Cargill use double adsorption technology to increase the efficiency of sulfuric acid recovery and to minimize emissions. A flow diagram of the process is presented in Figure 2-3.

The current capacity of the No. 8 H_2SO_4 plant is 2,500 TPD [104.17 tons per hour (TPH), 24-hour average], expressed as 100 percent H_2SO_4. The maximum capacity after modification will be 2,600 TPD (108.33 TPH, 24-hour average).

The current capacity of the No. 9 H_2SO_4 plant is 2,800 TPD (116.67 TPH, 24-hour average), expressed as 100 percent H_2SO_4. The maximum capacity after modification will be 3,200 TPD (133.33 TPH, 24-hour average). Together with the existing No. 7 H_2SO_4 plant, which is permitted for 2,200 TPD production rate, the total H_2SO_4 production rate of the Cargill facility will be 8,000 TPD. The No. 7 H_2SO_4 plant is not being modified at this time.

All of the H_2SO_4 plants at Cargill are currently subject to emission limits of 4.0 lb/ton for SO_2 and 0.15 lb/ton for H_2SO_4 mist emissions. These limits are equivalent to the federal new source performance standards (NSPS) for new sulfuric acid plants. The current permit limitations for all three plants at Cargill are summarized in Table 2-1. It is noted that the No. 9 plant has a permitted production rate of 2,800 TPD, but the allowable emission rate of 433.2 pounds per hour (lb/hr) is based on a 2,600 TPD production rate and 4.0 pounds per ton (lb/ton) of acid produced. As stated previously, the No. 7 H_2SO_4 plant is not being modified.

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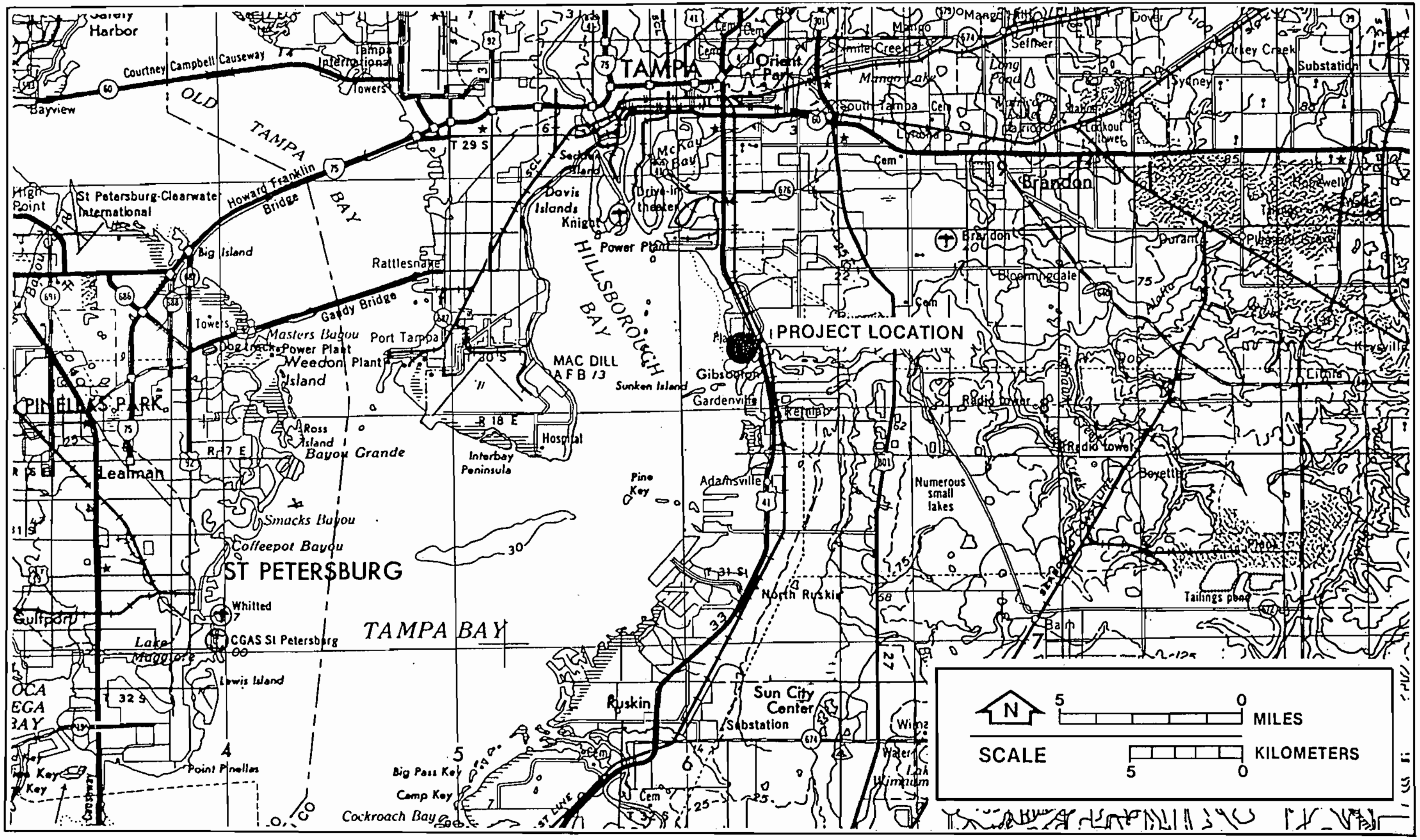

Figure 2-1 GENERAL LOCATION MAP OF CARGILL FERTILIZER, INC.

SOURCE: USGS, 1981.

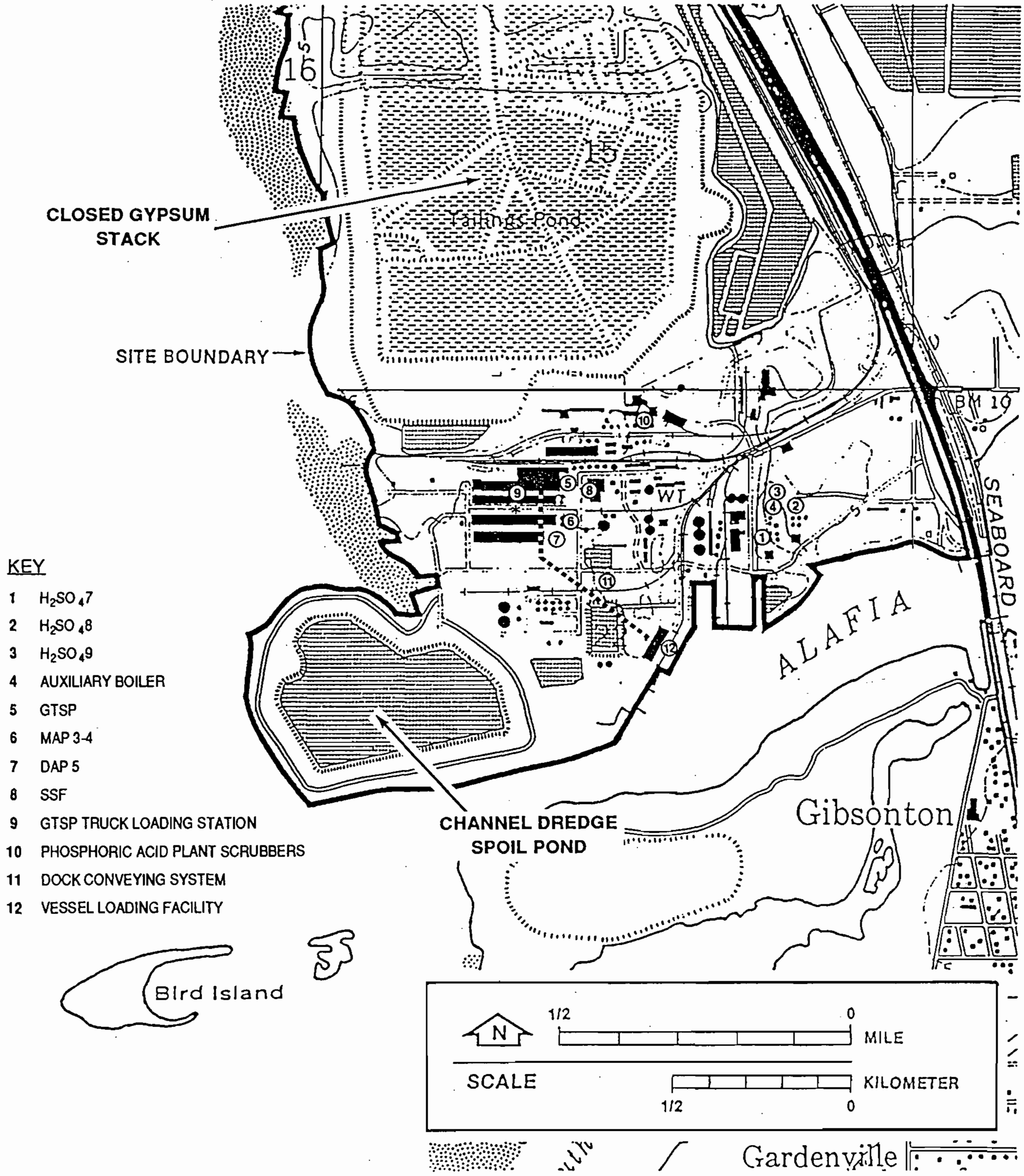

Figure 2-2 SITE LOCATION MAP OF CARGILL FERTILIZER, INC.

SOURCE: USGS, 1981.

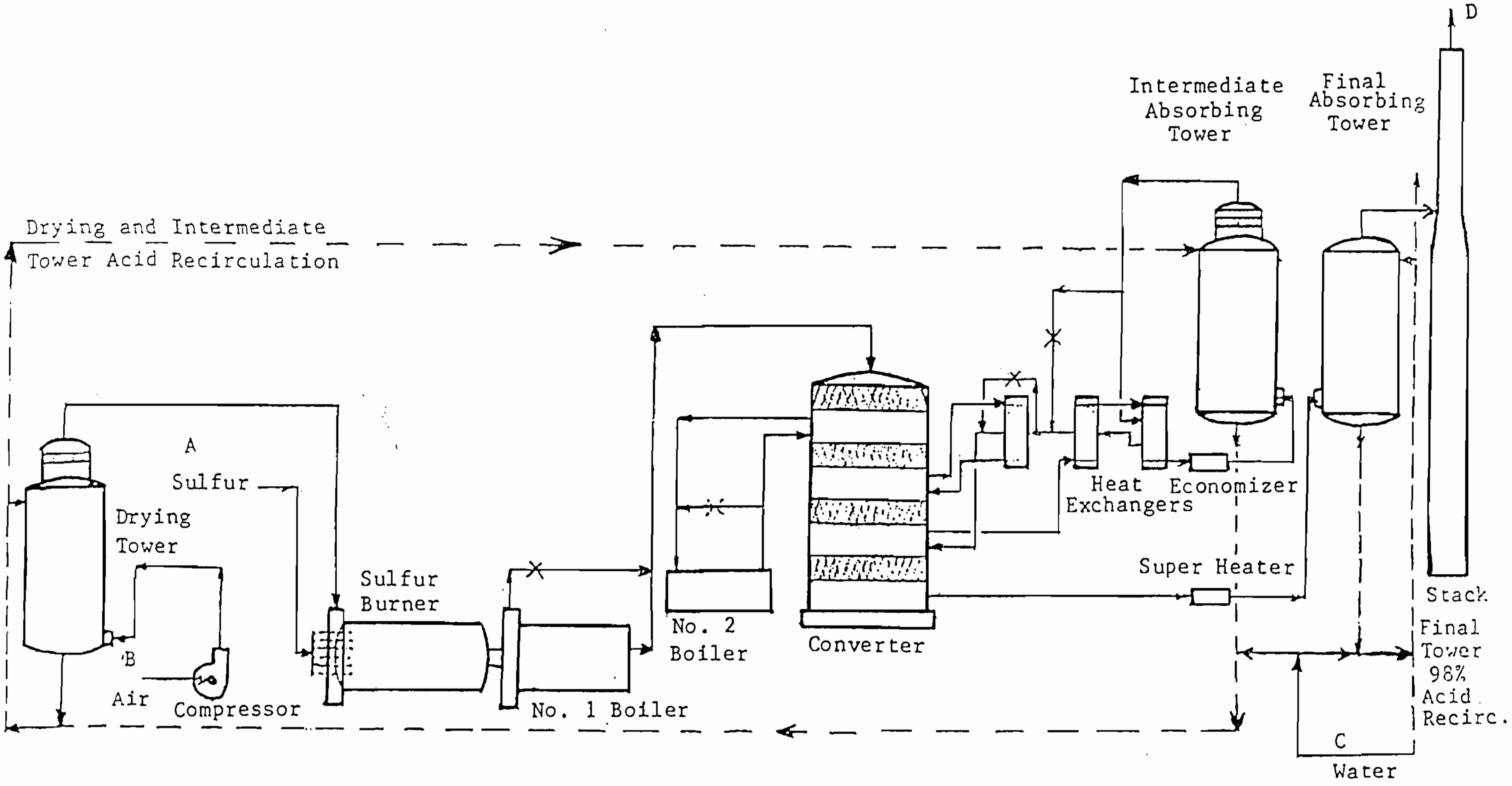

Figure 2-3 FLOW DIAGRAM OF SULFURIC ACID PLANT

Table 2-1. Current and Proposed Permit Limitations for Sulfuric Acid Plants, Cargill Fertilizer, Inc.

	Sulfuric Acid Plant		
	No. 7	No. 8	No. 9
Current Limitations			
Production Rate (100% H_2SO_4)	2,200 TPD	2,500 TPD[a]	2,800 TPD
SO_2 Emissions:	4.0 lb ton[b]	4.0 lb/ton[b] 10,000 lb/day 416.67 lb/hr[c]	4.0 lb/ton[b] 433.2 lb/hr[d]
H_2SO_4	0.15 lb/ton[b]	0.15 lb/ton[b] 375 lb/day 15.63 lb/hr[c]	0.15 lb/ton[b] 16.2 lb/hr
Proposed Limitations			
Production Rate (100% H_2SO_4)	2,200 TPD	2,600 TPD	3,200 TPD
SO_2 Emissions	4.0 lb/ton[b] 8,800 lb/day 366.67 lb/hr[c] 1,606 TPY	4.0 lb/ton[b] 10,400 lb/day 433.33 lb/hr[c] 1,898 TPY	4.0 lb/ton[b] 12,800 lb/day 533.33 lb/hr[c] 2,336 TPY
H_2SO_4 Mist Emission	0.15 lb/ton[b] 330 lb/day 13.75 lb/hr[c] 60.2 TPY	0.15 lb/ton[b] 390 lb/day 16.25 lb/hr[c] 71.2 TPY	0.15 lb/ton[b] 480 lb/day 20.0 lb/hr[c] 87.6 TPY

Note: lb/day = pounds per day
lb/hr = pounds per hour
lb/ton = pounds per ton
H_2SO_4 = sulfuric acid
% = percent
SO_2 = sulfur dioxide
TPD = tons per day
TPY = tons per year

[a] No limitation in permit, but permit based on indicated rate.
[b] lb/ton of 100% H_2SO_4.
[c] 3-hour average.
[d] Based on 2,600 TPD (108.33 TPH) production rate.

Source: KBN, 1991.

The proposed permit limitations for the expanded No. 8 and No. 9 plants are presented in Table 2-1. It is proposed to retain the current NSPS limits of 4.0 lb/ton for SO_2 and 0.15 lb/ton for H_2SO_4 mist. The basis for these limits as BACT is presented in Section 5.0.

Stack parameters for the both the current and expanded H_2SO_4 plants are presented in Table 2-2. The existing stacks at Cargill serving the H_2SO_4 plants will be utilized for the expanded plants. The stack parameters shown in Table 2-2 will be used in the modeling analysis to determine the net increase in impacts due to the proposed expansion, as well as the total ambient impacts due to the expanded facility.

Because of the similarity of the No. 7, No. 8, and No. 9 H_2SO_4 plants, a single permit application form for all three sources has been presented in Part A of this application. Cargill requests that a single construction permit be issued for the expansion upon approval by FDER. Cargill further requests that a single operating permit be issued which includes all three H_2SO_4 plants, once construction is completed and compliance testing is performed on the proposed expansion. This action will significantly reduce paperwork by FDER, and make permitting and compliance determinations more efficient by incorporating all similar H_2SO_4 plants into a single permit.

Table 2-2. Stack Parameters for Existing and Expanded No. 8 and No. 9 H_2SO_4 Plants

Plant	H_2SO_4 Production Rate[a] (TPH)	Stack Height (ft)	Stack Diameter (ft)	Gas Flow Rate (acfm)	Gas Velocity (fps)	Gas Temperature (°F)
Existing Conditions						
No. 8 H_2SO_4	104.17	149.5	8.0	132,500	43.9	151
No. 9 H_2SO_4	108.33[b]	149.5	9.0	128,900	33.8	170
Future Conditions						
No. 8 H_2SO_4	108.33	149.5	8.0	137,800	45.7	151
No. 9 H_2SO_4	133.33	149.5	9.0	158,600	41.6	170

Note: acfm = actual cubic feet per minute.
°F = degrees fahrenheit.
fps = feet per second.
ft = feet.
H_2SO_4 = sulfuric acid.
TPD = tons per day.
TPH = tons per hour.

[a] As 100% H_2SO_4.

[b] Lower production rate of 2,600 TPD was used to reflect conservative gas flow rate (maximum permitted rate is 2,800 TPD).

Source: KBN, 1991.

3.0 AIR QUALITY REVIEW REQUIREMENTS AND APPLICABILITY

The following discussion pertains to the federal and state air regulatory requirements and their applicability to Cargill's proposed modifications. These requirements must be satisfied before construction can begin on the proposed project.

3.1 NATIONAL AND STATE AAQS

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

3.2 PSD REQUIREMENTS

3.2.1 GENERAL REQUIREMENTS

Federal PSD requirements are contained in the Code of Federal Regulations (CFR), Title 40, Part 52.21, prevention of significant deterioration of air quality. The State of Florida has adopted PSD regulations [Chapter 17-2.500, Florida Administrative Code (F.A.C.)] that essentially are identical to the federal regulations. PSD regulations require that all new major stationary sources or major modifications to existing major sources of air pollutants regulated under CAA be reviewed and a construction permit issued. Florida's State Implementation Plan (SIP), which contains PSD regulations, has been approved by the U.S. Environmental Protection Agency (EPA) and PSD approval authority in Florida has been granted to FDER.

A "major facility" is defined under Florida PSD regulations as any one of 28 named source categories that has the potential to emit 100 tons per year (TPY) or more of any pollutant regulated under the CAA, or any other stationary facility that has the potential to emit 250 TPY or more of any pollutant regulated under CAA. A "source" is defined as an identifiable piece of process equipment or emissions unit. "Potential to emit" means the capability, at maximum

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

		AAQS					
		National		State of Florida	PSD Increments		Significant Impact Levels
Pollutant	Averaging Time	Primary Standard	Secondary Standard		Class I	Class II	
Particulate Matter (TSP)	Annual Geometric Mean	NA	NA	NA	5	19	1
	24-Hour Maximum[a]	NA	NA	NA	10	37	5
Particulate Matter (PM10)	Annual Arithmetic Mean	50	50	50	4[c]	17[c]	1
	24-Hour Maximum[b]	150	150	150	8[c]	30[c]	5
Sulfur Dioxide	Annual Arithmetic Mean	80	NA	60	2	20	1
	24-Hour Maximum[b]	365	NA	260	5	91	5
	3-Hour Maximum[b]	NA	1,300	1,300	25	512	25
Carbon Monoxide	8-Hour Maximum[b]	10,000	10,000	10,000	NA	NA	500
	1-Hour Maximum[b]	40,000	40,000	40,000	NA	NA	2,000
Nitrogen Dioxide	Annual Arithmetic Mean	100	100	100	2.5	25	1
Ozone	1-Hour Maximum[d]	235	235	235	NA	NA	NA
Lead	Calendar Quarter Arithmetic Mean	1.5	1.5	15	NA	NA	NA

Note:
AAQS = Ambient Air Quality Standards.
NA = Not applicable, i.e., no standard exists.
Particulate matter (PM10) = particulate matter with aerodynamic diameter less than or equal to 10 micrometers.
Particulate matter (TSP) = total suspended particulate matter.
PSD = Prevention of significant deterioration.
$\mu g/m^3$ = micrograms per cubic meter.

[a] Maximum concentration not to be exceeded more than once per year.
[b] Achieved when the expected number of exceedances per year is less than 1.
[c] Proposed by EPA in the Federal Register on October 5, 1989.
[d] Achieved when the expected number of days per year with concentrations above the standard is less than 1.

Sources: Federal Register, Vol. 43, No. 118, June 19, 1978.
40 CFR 50.
40 CFR 52.21.
Chapter 17-2.400, F.A.C.

design capacity, to emit a pollutant, considering the application of control equipment and any other federally enforceable limitations on the source's capacity. A "major modification" is defined under PSD regulations as a change at an existing major stationary facility that increases emissions by greater than significant amounts. PSD significant emission rates are shown in Table 3-2.

PSD review is used to determine whether significant air quality deterioration will result from the new or modified facility. Major new facilities and major modifications are required to undergo the following analyses related to PSD for each pollutant emitted in significant amounts:

1. Source information,
2. Control technology review,
3. Source impact analysis,
4. Preconstruction air quality monitoring analysis, and
5. Additional impact analyses.

In addition to these analyses, a new source also must be reviewed with respect to good engineering practices (GEP) stack height regulations. If the proposed new source or modification is located in a non-attainment area for any pollutant, the source may be subject to non-attainment new source review requirements.

Discussions concerning each of these requirements are presented in the following sections.

3.2.2 INCREMENTS/CLASSIFICATIONS

The 1977 CAA amendments address the prevention of significant deterioration of air quality. The law specifies that certain increases in air quality concentrations above the baseline concentration level of SO_2 and total suspended particulate matter [PM(TSP)] would constitute significant deterioration. The magnitude of the allowable increment depends on the classification of the area in which a new source (or modification) will be located or will have an impact. Congress also directed EPA to evaluate PSD increments for other criteria pollutants and, if appropriate, promulgate PSD increments for such pollutants.

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

Pollutant	Regulated Under	Significant Emission Rate (TPY)	De Minimis Monitoring Concentration ($\mu g/m^3$)
Sulfur Dioxide	NAAQS, NSPS	40	13, 24-hour
Particulate Matter (TSP)	NAAQS, NSPS	25	10, 24-hour
Particulate Matter (PM10)	NAAQS	15	10, 24-hour
Nitrogen Oxides	NAAQS, NSPS	40	14, annual
Carbon Monoxide	NAAQS, NSPS	100	575, 8-hour
Volatile Organic Compounds (Ozone)	NAAQS, NSPS	40	100 TPY[a]
Lead	NAAQS	0.6	0.1, 3-month
Sulfuric Acid Mist	NSPS	7	NM
Total Fluorides	NSPS	3	0.25, 24-hour
Total Reduced Sulfur	NSPS	10	10, 1-hour
Reduced Sulfur Compounds	NSPS	10	10, 1-hour
Hydrogen Sulfide	NSPS	10	0.2, 1-hour
Asbestos	NESHAP	0.007	NM
Beryllium	NESHAP	0.0004	0.001, 24-hour
Mercury	NESHAP	0.1	0.25, 24-hour
Vinyl Chloride	NESHAP	1	15, 24-hour

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

NAAQS = National Ambient Air Quality Standards.
NESHAP = National Emission Standards for Hazardous Air Pollutants.
NM = No ambient measurement method.
NSPS = New Source Performance Standards.
PM10 = particulate matter with aerodynamic diameter less than or equal to 10 micrometers.
PSD = prevention of significant deterioration.
TPY = tons per year.
TSP = total suspended particulate matter.
$\mu g/m^3$ = micrograms per cubic meter.

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

[b] Any emission rate of these pollutants.

Source: F.A.C., Rule 17-2.500, Table 500-2.

Three classifications were designated, based on criteria established in the CAA amendments. Certain types of areas (international parks, national wilderness areas, memorial parks larger than 5,000 acres, and national parks larger than 6,000 acres) were designated as Class I areas. All other areas of the country were designated as Class II. PSD increments for Class III areas were defined, but no areas were designated as Class III. However, Congress made provisions in the law to allow the redesignation of Class II areas to Class III areas.

In 1978, EPA promulgated PSD regulations related to the requirements for classifications, increments, and area designations as set forth by Congress. PSD increments were initially set for only SO_2 and PM(TSP). However, in 1988, EPA promulgated final PSD regulations for NO_x and established PSD increments for nitrogen dioxide (NO_2).

The current federal PSD increments are shown in Table 3-1. As shown, Class I increments are the most stringent, allowing the smallest amount of air quality deterioration, while the Class III increments allow the greatest amount of deterioration. FDER has adopted the EPA class designations and allowable PSD increments for PM(TSP), SO_2, and NO_2. The Florida NO_2 increments were adopted in August 1990.

On October 5, 1989, EPA proposed PSD increments for particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM10). Those proposed increments are shown in Table 3-1. The PM10 increments as proposed are somewhat lower in magnitude than the current PM(TSP) increments.

The term "baseline concentration" evolves from federal and state PSD regulations and refers to a fictitious concentration level corresponding to a specified baseline date and certain additional baseline sources. In reference to the baseline concentration, the baseline date actually includes three different dates:

1. The major source baseline date, which is January 6, 1975, in the cases of SO_2 and PM(TSP), and February 8, 1988, in the case of NO_2;
2. The minor source baseline date, which is the earliest date after the trigger date on which a major stationary source or major modification subject to PSD regulations submits a complete PSD application; and

3. The trigger date, which is August 7, 1977, for SO_2 and PM(TSP), and February 8, 1988, for NO_2.

By definition in the PSD regulations, baseline concentration means the ambient concentration level that exists in the baseline area at the time of the applicable baseline date. A baseline concentration is determined for each pollutant for which a baseline date is established and includes:

1. The actual emissions representative of sources in existence on the applicable minor source baseline date, and
2. The allowable emissions of major stationary facilities that began construction before January 6, 1975, for SO_2 and PM(TSP) sources, or February 8, 1988, for NO_x sources, but which were not in operation by the applicable baseline date.

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

1. Actual emissions representative of a major stationary source on which construction began after January 6, 1975, for SO_2 and PM(TSP) sources, and after February 8, 1988, for NO_x sources; and
2. Actual emission increases and decreases at any stationary facility occurring after the major source baseline date that result from a physical change or change in the method of operation of the facility.

The minor source baseline date for SO_2 and PM(TSP) has been set as December 27, 1977, for the entire State of Florida (Chapter 17-2.450, F.A.C.). The minor source baseline date for NO_2 has been set as March 28, 1988, for all of Florida.

3.2.3 CONTROL TECHNOLOGY REVIEW

The control technology review requirements of the federal and state PSD regulations require that all applicable federal and state emission-limiting standards be met, and that BACT be applied to control emissions from the source [Chapter 17-2.500(5)(c), F.A.C]. The BACT requirements are applicable to all regulated pollutants for which the increase in emissions from the facility or modification exceeds the significant emission rate (see Table 3-2).

BACT is defined in Chapter 17-2.100(28), F.A.C. as:

> An emissions limitation, including a visible emission standard, based on the maximum degree of reduction of each pollutant emitted which the department, on a case by case basis, taking into account energy, environmental, and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of such pollutant. If the Department determines that technological or economic limitations on the application of measurement methodology to a particular part of a source or facility would make the imposition of an emission standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reductions achievable by implementation of such design, equipment, work practice, or operation.

The requirements for BACT were promulgated within the framework of PSD in the 1977 amendments of the CAA [Public Law 95-95; Part C, Section 165(a)(4)]. The primary purpose of BACT is to optimize consumption of PSD air quality increments and thereby enlarge the potential for future economic growth without significantly degrading air quality (EPA, 1978; 1980). Guidelines for the evaluation of BACT can be found in EPA's Guidelines for Determining Best Available Control Technology (BACT) (EPA, 1978) and in the PSD Workshop Manual (EPA, 1980). These guidelines were promulgated by EPA to provide a consistent approach to BACT and to ensure that the impacts of alternative emission control systems are measured by the same set of parameters. In addition, through implementation of these guidelines, BACT in one area may not be identical to BACT in another area. According to EPA (1980),

> BACT analyses for the same types of emissions unit and the same pollutants in different locations or situations may determine that different control strategies should be applied to the different sites, depending on site-specific factors. Therefore, BACT analyses must be conducted on a case-by-case basis.

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

Historically, a "bottom-up" approach consistent with the BACT Guidelines and PSD Workshop Manual has been used. With this approach, an initial control level, which is usually NSPS, is evaluated against successively more stringent controls until a BACT level is selected.

Recently, EPA issued a draft guidance document on the top-down approach entitled Top-Down Best Available Control Technology Guidance Document (EPA, 1990a). The "draft" guidance requires starting with the most stringent (or top) technology and emissions limits that have been applied elsewhere to the same or a similar source category. The applicant must next provide a basis for rejecting this technology in favor of the next most stringent technology or propose to use it. Rejection of control alternatives may be based on technical or economic infeasibility. Such decisions are made on the basis of physical differences (e.g., fuel type), locational differences (e.g., availability of water), or significant differences that may exist in the environmental, economic, or energy impacts. The differences between the proposed facility and the facility on which the control technique was applied previously must be justified.

It is noted that the American Paper Institute (API) initiated legal action in 1989 against the EPA over the implementation of the top-down approach. EPA and API recently reached a settlement agreement (July 9, 1991) which requires EPA to initiate formal rulemaking for BACT procedures. A proposed rule is required by January, 1992. However, until new rules are issued, EPA is requiring that the top-down approach still be used to determine BACT.

3.2.4 AIR QUALITY MONITORING REQUIREMENTS

In accordance with requirements of 40 CFR 52.21(m) and Chapter 17-2.500(5)(f), F.A.C, any application for a PSD permit must contain an analysis of continuous ambient air quality data in the area affected by the proposed major stationary facility or major modification. For a new major facility, the affected pollutants are those that the facility potentially would emit in significant amounts. For a major modification, the pollutants are those for which the net emissions increase exceeds the significant emission rate (see Table 3-2).

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

Under the exemption rule, FDER may exempt a proposed major stationary facility or major modification from the monitoring requirements with respect to a particular pollutant if the emissions increase of the pollutant from the facility or modification would cause, in any area, air quality impacts less than the de minimis levels presented in Table 3-2 [Chapter 17-2.500(3)(e), F.A.C.].

3.2.5 SOURCE IMPACT ANALYSIS

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

Guidance for the use and application of dispersion models is presented in the EPA publication Guideline on Air Quality Models (EPA, 1987b). The source impact analysis for criteria pollutants can be limited to the new or modified source if the net increase in impacts as a result of the new or modified source is below significance levels, as presented in Table 3-1.

Various lengths of record for meteorological data can be used for impact analyses. A 5-year period can be used with corresponding evaluation of highest, second-highest short-term concentrations for comparison to AAQS or PSD increments. The term "highest, second-highest" (HSH) refers to the highest of the second-highest concentrations at all receptors (i.e., the highest concentration at each receptor is discarded). The second-highest concentration is significant because short-term AAQS specify that the standard should not be exceeded at any location more than once a year. If less than 5 years of meteorological data are used in the modeling analysis, the highest concentration at each receptor must normally be used for comparison to air quality standards.

3.2.6 ADDITIONAL IMPACT ANALYSES

In addition to air quality impact analyses, federal and State of Florida PSD regulations require analysis of the impairment to visibility and the impacts on soils and vegetation that would occur as a result of the proposed source [40 CFR 52.21; Chapter 17-2.500(5)(e), F.A.C.]. These analyses are to be conducted primarily for PSD Class I areas. Impacts from general commercial, residential, industrial, and other growth associated with the source also must be addressed. These analyses are required for each pollutant emitted in significant amounts (Table 3-2).

3.2.7 GOOD ENGINEERING PRACTICE STACK HEIGHT

The 1977 CAA amendments require that the degree of emission limitation required for control of any pollutant not be affected by a stack height that exceeds GEP or any other dispersion technique. On July 8, 1985, EPA promulgated final stack height regulations (EPA, 1985). Identical regulations have been adopted by FDER [Chapter 17-2.270, F.A.C.]. GEP stack height is defined as the highest of:

1. 65 meters (m); or
2. A height established by applying the formula:

   $Hg = H + 1.5L$

   where: Hg = GEP stack height,
   H = Height of the structure or nearby structure, and
   L = Lesser dimension (height or projected width) of nearby structure(s); or
3. A height demonstrated by a fluid model or field study.

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

The stack height regulations also allow increased GEP stack height beyond that resulting from the formula in cases where plume impaction occurs. Plume impaction is defined as concentrations measured or predicted to occur when the plume interacts with elevated terrain. Elevated terrain is defined as terrain that exceeds the height calculated by the GEP stack height formula. Because the terrain in the vicinity of the Cargill facility is generally flat, plume impaction was not considered in determining the GEP stack height.

3.3 NON-ATTAINMENT RULES

Based on the current non-attainment provisions (Chapter 17-2.510, F.A.C.), all major new facilities and modifications to existing major facilities located in a non-attainment area must undergo non-attainment review if the proposed pieces of equipment have the potential to emit 100 TPY or more of the non-attainment pollutant, or if the modification results in a significant net emission increase of the non-attainment pollutant.

For major facilities or major modifications that locate in an attainment or unclassifiable area, the non-attainment review procedures apply if the source or modification is located within the area of influence of a non-attainment area. The area of influence is defined as an area that is outside the boundary of a non-attainment area but within the locus of all points that are 50 km outside the boundary of the non-attainment area. Based on Chapter 17-2.510(2)(a)2.a, F.A.C., all VOC sources that are located within an area of influence are exempt from the provisions of new source review for non-attainment areas. Sources that emit other non-attainment pollutants and are located within the area of influence are subject to non-attainment review unless the maximum allowable emissions from the proposed source do not have a significant impact within the non-attainment area.

3.4 SOURCE APPLICABILITY

3.4.1 PSD REVIEW

3.4.1.1 Pollutant Applicability

The Cargill facility is located in Hillsborough County, which has been designated by EPA and FDER as an attainment area for SO_2. Hillsborough County and surrounding counties are designated as PSD Class II areas for SO_2. The site is located about 85 km from a PSD Class I area (Chassahowitzka National Wilderness Area).

The Cargill facility is considered to be an existing major stationary facility because potential emissions of certain regulated pollutants exceed 100 TPY (for example, potential SO_2 emissions currently exceeds 100 TPY). As a result, PSD review is required for the proposed modification for each pollutant for which the net increase in emissions exceeds the PSD significant emission rates presented in Table 3-2 (i.e., a major modification).

The net increase in allowable emissions due to the proposed expansion is shown in Table 3-3 (reference Table 2-1). As shown, the increase in allowable SO_2 emissions is 512 TPY, and the increase in allowable H_2SO_4 mist emissions is 19.3 TPY. The increase in SO_2 and H_2SO_4 mist emissions will exceed the PSD significant emission rates. Therefore, the proposed project is subject to PSD review for these pollutants.

There have been no contemporaneous SO_2 emission increases occurring during the last five years at the Cargill facility. The phosphoric acid plants at Cargill will utilize the increased H_2SO_4 produced by the Nos. 8 and 9 plants. However, the phosphoric acid plants were recently issued a construction permit for increased capacity (Permit No. AC29-186726, issued February 6, 1991). The increased H_2SO_4 capacity will allow the phosphoric acid plants to meet their permitted capacities, while reducing requirements for purchase of H_2SO_4 from outside producers.

3.4.1.2 Ambient Monitoring

Based upon the increase in emissions from Cargill's proposed project, a PSD preconstruction ambient monitoring analysis is required for SO_2 and H_2SO_4 mist. However, if the increase in impacts of a pollutant is less than the de minimis monitoring concentration, then an exemption from the preconstruction ambient monitoring requirement may be granted for that pollutant. In addition, if an acceptable ambient monitoring method for the pollutant has not been established by EPA, monitoring is not required.

The air quality impact analysis, presented in Section 6.0, demonstrates that the maximum impacts resulting from the net increase in emissions will be below the de minimis monitoring concentrations for SO_2. In addition, there is no approved ambient monitoring method for H_2SO_4 mist. As a result, the proposed modification can be exempted from the preconstruction monitoring requirements.

Table 3-3. PSD Source Applicability Analysis, Cargill Sulfuric Acid Plant Expansion

Emission Scenario	SO_2 (TPY)	H_2SO_4 Mist (TPY)
Current Allowable Emissions		
No. 8 H_2SO_4	1,825	68.5
No. 9 H_2SO_4	1,897	71.0
Total	3,722	139.5
Proposed Allowable Emissions		
No. 8 H_2SO_4 @ 2,600 TPD	1,898	71.2
No. 9 H_2SO_4 @ 3,200 TPD	2,336	87.6
Total	4,234	158.8
Total Net Increase	512	19.3
PSD Significant Emission Rate	40	7

Note: H_2SO_4 = sulfuric acid.
PSD = prevention of significant deterioration.
SO_2 = sulfur dioxide.
TPD = tons per day.
TYP = tons per year.

Source: KBN, 1991.

3.4.1.3 GEP Stack Height Analysis

The GEP stack height regulations allow any stack to be at least 65 m [213 feet (ft)] high. The Nos. 8 and 9 H_2SO_4 plants at Cargill are existing sources with stacks less than 65 m. These existing stacks will not be modified. As a result, the de minimis GEP stack height is not exceeded.

3.4.1.4 PSD Increment Consumption

The PSD regulations provide that any emission increases or decreases occurring after January 6, 1975, due to construction at major stationary sources affects PSD increment consumption. A review of the history of the Cargill H_2SO_4 plants in regards to SO_2 emissions is presented in Table 3-4. The changes to the plants which affect PSD increment consumption are described below.

As of January 6, 1975, the Nos. 4, 5, 6, 7 and 8 H_2SO_4 plants were operating at Cargill. In addition, the No. 9 plant received its initial construction permit on November 25, 1974. As a result, all of these plants (Nos. 4 through 9) are in the PSD increment consumption baseline.

The Nos. 7 and 8 plants also received construction permits on November 25, 1974. These plants were to be modified from single adsorption to double adsorption plants, with a reduced allowable SO_2 level of 10 lb/ton H_2SO_4. Since the Nos. 7, 8 and 9 plants had received construction permits just prior to the PSD major source baseline date, but their operation did not yet reflect these modifications, the PSD baseline emissions for these plants are based on their allowable emissions specified in the construction permits. The calculated emissions are presented in Table 3-5.

The Nos. 4, 5 and 6 H_2SO_4 plants were operating as of January 6, 1975. However, as a provision of the construction permits issued to Nos. 7, 8 and 9 plants in November 1974, these plants were to be shutdown. Based on this provision, these plants were not considered as shutdowns subsequent to January, 1975.

The PSD increment consumption SO_2 emission changes for the sulfuric acid plants are presented in Table 3-5. The total baseline SO_2 emissions are 7,673 TPY. Total future SO_2 emissions after expansion are 5,840 TPY. Thus, there has been a net decrease of 1,833 TPY of SO_2. This represents an expansion of the available PSD increments.

Table 3-4. Permit History of H_2SO_4 Plants at Cargill Fertilizer, Inc.

Permit No.	Date	Comments
No. 7 H_2SO_4		What were actuals?
AC 29-2391	11/25/74	Modify to double absorption plant
AO 29-5762	11/02/77	Operating permit for double absorption plant (1,380 TPD)
AO 29-22820	8/24/79	Renew operating permit
AC 29-21337	9/07/79	Increase to 1,750 TPD H_2SO_4 and reduce allowable SO_2 emissions from 10 lb/ton to 4 lb/ton
AO 29-56993	9/10/82	Operating permit for 1,750 TPD expansion
AC 29-089697	2/8/85	Modify to 2,200 TPD
AO 29-104895	8/23/85	Operating permit (2,200 TPD)
AO 29-178406	6/29/90	Renew operating permit (2,200 TPD)
No. 8 H_2SO_4		What were actuals?
AC 29-3290	11/25/74	Modify to double absorption plant
AO 29-2390	5/21/77	Operating permit for double absorption plant (1,784 TPD)
AO 29-18228	5/26/79	Renew operating permit (1,770 TPD)
AC 29-089696	2/8/85	Increase to 2,200 TPD H_2SO_4 and reduce allowable SO_2 emissions from 10 lb/ton to 4 lb/ton
AC 29-130371 (PSD-F1-118)	7/21/87	Increase to 2,500 TPD H_2SO_4
AO 29-162411	8/10/89	Operating permit for 2,500 TPD
No. 9 H_2SO_4		
AC 29-2391	11/25/74	Original construction permit for 2,600 TPD double absorption plant
AO 29-2391	3/29/77	Operating permit (2,800 TPD)
AO 29-16532	2/09/79	Renew operating permit (2,631 TPD)
AO 29-78960	2/28/84	Renew operating permit (2,600 TPD)
A0 29-157890	2/10/89	Renew operating permit (2,600 TPD)
Permit amendment	10/19/89	Revise operating permit to 2,800 TPD
Nos. 4, 5, and 6 H_2SO_4	October 1976	Units shutdown

Notes:
H_2SO_4 = sulfuric acid.
lb/ton = pounds per ton.
SO_2 = sulfur dioxide.
TPD = tons per day.

Source: KBN, 1991

Table 3-5. PSD Increment Consumption Baseline and Future SO_2 Emissions, Cargill Fertilizer, Inc.

Emission Scenario	SO_2 Emissions (TPY)	Basis
Baseline Emissions[a]		
No.7 H_2SO_4	2,519	1,380 TPD; 10 lb/ton
No.8 H_2SO_4	3,256	1,784 TPD; 10 lb/ton
No.9 H_2SO_4	1,898	2,600 TPD; 4 lb/ton
Total	7,673	
Future Emissions		
No.7 H_2SO_4	1,606	2,200 TPD; 4 lb/ton
No.8 H_2SO_4	1,898	2,600 TPD; 4 lb/ton
No.9 H_2SO_4	2,336	3,200 TPD; 4 lb/ton
Total	5,840	
Net Change	-1,833	

Note: H_2SO_4 = sulfuric acid.
lb/ton = pounds per ton.
PSD = prevention of significant deterioration.
SO_2 = sulfur dioxide.
TPD = tons per day.
TPY = tons per year.

[a] Represents allowable SO_2 emissions as of January 6, 1975, representative of construction permits issued in November, 1974.

Source: KBN, 1991

3.4.2 NON-ATTAINMENT REVIEW

The Cargill facility is located in Hillsborough County, which has been designated as an attainment area for SO_2. As a result, non-attainment review does not apply to the proposed project.

3.4.3 NEW SOURCE PERFORMANCE STANDARDS

Federal NSPS have been promulgated for new and modified sulfuric acid plants (40 CFR 60, Subpart H). The NSPS currently apply to the No. 8 and No. 9 plants, and will continue to apply in the future. The NSPS limits are 4.0 lb/ton for SO_2, and 0.15 lb/ton for H_2SO_4 mist emissions.

4.0 AMBIENT MONITORING ANALYSIS

4.1 MONITORING REQUIREMENTS

The CAA Amendments of 1977 require that the owner or operator of any proposed major new source or major modification conduct ambient air monitoring for applicable pollutants. As discussed in the source applicability section, Section 3.4, only SO_2 requires an air quality analysis to meet PSD preconstruction monitoring requirements for the proposed Cargill expansion. Monitoring must be conducted for a period of up to 1 year prior to submission of a construction permit application. However, if the increase in impacts due to the proposed new source or modification is less than the PSD de minimis monitoring concentrations, the applicant may be exempted from the PSD preconstruction monitoring requirements. For SO_2, the de minimis level is 13 micrograms per cubic meter ($\mu g/m^3$), 24-hour average. As demonstrated in Section 6.0, the predicted maximum increase in 24-hour SO_2 impacts due to the proposed modification at Cargill is 7.6 $\mu g/m^3$. As a result, the proposed modification may be exempted from preconstruction SO_2 monitoring.

4.2 BACKGROUND SO_2 CONCENTRATIONS

A background SO_2 concentration must be estimated to account for SO_2 sources which are not explicitly included in the atmospheric dispersion modeling analysis. In order to estimate reasonable background SO_2 concentrations, a review of recent, available SO_2 monitoring data in the area of Cargill was performed. Presented in Table 4-1 is a summary of ambient SO_2 data available from 1988 to 1990 for all monitors located within 10 km of the Cargill site. A total of four stations are located within 10 km of Cargill, all of which have continuous SO_2 monitors. The monitors are operated by Hillsborough County Environmental Protection Commission. Data recoveries exceed 95 percent for all the stations.

Annual average, 24-hour maximums, and 3-hour maximums for SO_2 are shown in Table 4-1. Since all of the monitors are located in an area of multisource emissions (refer to Section 6.0), these concentrations are expected to include substantial contributions from sources in the area, including the existing Cargill facility. These potential major contributing sources are explicitly included in the modeling analysis, as are almost 95 percent of emissions from sources located within 50 km of the Cargill facility (refer to Table 6-4). As a result, these concentrations would

Table 4-1. Summary of Ambient SO_2 Data for Sites Within 10 km of Cargill Fertilizer, Inc., 1988 - 1990

SAROAD Site No. (Distance Away)	City	Monitoring Method	Period	No. of Obs.	Percent Data Recovery	SO_2 Concentration ($\mu g/m^3$) 3-Hour[a]	24-Hour[a]	Annual Average
1800-021-GO2[b] (8.2 km)	South of Gibsonton	Continuous	1988	8582	98.0	361	72	16
			1989	8661	98.9	521	95	19
			1990	8641	98.6	388	80	15
1800-95-GO2[b] (7.0 km)	Tampa	Continuous	1988	8714	99.5	445	112	25
			1989	8593	98.1	406	92	28
			1990	8593	98.1	586	100	19
4360-035-GO2[b] (9.8 km)	Tampa	Continuous	1988	8670	99.0	417	102	28
			1989	8640	98.6	364	116	29
			1990	8673	99.0	322	105	21
4360-053-GO2[c] (9.5 km)	Tampa	Continuous	1988	8683	99.1	431	77	15
			1989	8420	96.1	239	82	24
			1990	8700	99.3	343	98	24

Note: No. = number.
Obs. = observations.
SO_2 = sulfur dioxide.
$\mu g/m^3$ = micrograms per cubic meter.

[a] Second-highest concentrations for calendar year are shown.

[b] Monitoring objective for this site is to measure the impact of a significant source.

[c] Monitoring objective for this site is to measure pollutant concentrations representative of areas of high population density.

Source: Florida DER, 1988, 1989, 1990.

not be representative of actual background concentrations which would be expected to occur in conjunction with the worst-case meteorology. For the annual averaging time, the actual background concentration would be significantly lower than the values shown in Table 4-1.

A representative short-term background SO_2 concentration is considered to be the 1989 annual average concentration of 19 $\mu g/m^3$ recorded at monitoring site 1800-021. This value is higher than the background concentration used in a previous air modeling analysis performed for Cargill (KBN, 1987), which used the same monitoring site to develop a background concentration. Site 1800-021 is located 8.2 km southeast of Cargill and 5 km west of the TEC Big Bend power plant. These two sources are the only nearby sources of SO_2 that would directly influence the monitor. Therefore, the data from this site were considered to be more representative of the background concentration than the data from the other monitoring sites listed in Table 4-1, which could be impacted by a number of SO_2 sources.

The annual values shown in Table 4-1 are considered to be significantly higher than the actual annual background levels near the Cargill facility, since 95 percent of all SO_2 emissions from sources located within 50 km of Cargill were explicitly included in the modeling analysis. Based on review of the 1990 summary of FDER SO_2 monitoring data, many non-private continuous monitors located throughout the state have recorded annual average concentrations of 5 $\mu g/m^3$ or less. These values are more indicative of the natural SO_2 background levels in the vicinity of the Cargill facility. Therefore, a value of 5 $\mu g/m^3$ was used as an annual background SO_2 concentration in this analysis.

The 19 $\mu g/m^3$ background SO_2 level was used for the 3- and 24-hour averaging periods and was added to dispersion modeling results, presented in Section 6.0, in order to estimate total air quality impacts. The highest and second-highest 3-hour and 24-hour concentrations reported for monitoring site 1800-021 in Table 4-1 are assumed to be due to either the Cargill plant or the TEC Big Bend plant, and therefore were considered not to be representative of the short-term background concentration. Since all major SO_2 sources located within 50 km of the Cargill plant were considered in the dispersion modeling analysis, the 19 $\mu g/m^3$ annual average recorded at Station 1800-021 was also considered to be representative of the short-term background concentration level. Similarly, the 19 $\mu g/m^3$ level was considered unrealistic as an annual SO_2 background level. Therefore, a level of 5 $\mu g/m^3$ was used that is similar to annual, continuous

SO_2 monitoring values recorded throughout the state. This value was added to the annual average air dispersion modeling results for comparison to AAQS.

5.0 BEST AVAILABLE CONTROL TECHNOLOGY

The source applicability analysis for the proposed Cargill No. 8 and No. 9 H_2SO_4 plant expansion, presented in Section 3.0, identified SO_2 and H_2SO_4 mist as air pollutants requiring a BACT review under federal and state PSD regulations. This section describes the proposed BACT and emission limits for each pollutant subject to BACT. An analysis of alternative control technologies is also presented.

5.1 SULFUR DIOXIDE

5.1.1 PROPOSED SO_2 BACT

The No. 8 and No. 9 H_2SO_4 plants at Cargill are double-absorption plants. The double absorption plant is considered to be state-of-the-art in reducing SO_2 emissions from H_2SO_4 plants and is already in operation at the No. 8 and No. 9 H_2SO_4 plants. Therefore, this control technology is proposed as BACT for SO_2. The proposed BACT SO_2 emission limit for both plants is the current allowable level of 4 lb/ton of H_2SO_4 produced, and is equivalent to the BACT emission rate determined by FDER in the 1987 PSD construction permit for the No. 8 H_2SO_4 expansion.

5.1.1.1 No. 8 H_2SO_4 Plant

SO_2 source test data for the No. 8 and No. 9 H_2SO_4 plants since their last operating rate increase are presented in Table 5-1. The No. 8 H_2SO_4 plant received an operating permit for a production increase from 2,200 TPD to 2,500 TPD in 1989. The two source tests conducted at or near the higher operating rate (104.2 TPH) are presented in Table 5-1. The data show that the SO_2 compliance tests, have ranged from 2.25 to 2.99 lb/ton, and individual tests have been as high as 3.12 lb/ton.

The test data for No. 8 plant at the 2,500 TPD operating rate is limited, and may not adequately affect the true range of actual emissions. In addition, higher emissions on a lb/ton basis may occur at the higher operating rate of 2,600 TPD. Day-to-day variations in process variables and catalyst aging effects can also cause SO_2 emissions to increase above the historic measured levels

Table 5-1. Summary of Recent H_2SO_4 Plant SO_2 Emission Tests

Date	Average Production Rate[a] (tons/hr)	Sulfur Dioxide (lb/hr) Avg.	Sulfur Dioxide (lb/hr) Max.	Sulfur Dioxide (lb/ton) Avg.	Sulfur Dioxide (lb/ton) Max.
No. 8 H_2SO_4 Plant					
01/11/89	102.0	229	232	2.25	2.27
01/08/90	104.4	312	326	2.99	3.12
No. 9 H_2SO_4 Plant					
07/22/86	100.7	373	402	3.70	3.99
10/30/87	107.0	300	334	2.80	3.12
01/10/89	106.0	298	303	2.81	2.86
09/29/89	109.4	265	267	2.42	2.44
10/19/89	117.5	394	400	3.36	3.41
11/02/90	114.2	389	407	3.41	3.56

Note:
avg. = average.
H_2SO_4 = sulfuric acid.
lb/hr = pounds per hour.
lb/ton = pounds per ton.
max. = maximum.
SO_2 = sulfur dioxide.
tons/hr = tons per hour.

[a] As 100 percent sulfuric acid.

Source: KBN, 1991.

for this plant. The 4.0 lb/ton SO_2 emission rate proposed as BACT and determined previously as BACT for the No. 8 plant is considered to be achievable at the proposed higher production rate. A lower SO_2 emission level may not be achievable on a continuous basis, particularly in light of the potential effects of higher production, catalyst aging, and other process variables.

5.1.1.2 No. 9 H_2SO_4 Plant

SO_2 compliance test data for the No. 9 H_2SO_4 plant for the last five years are presented in Table 5-1. The current permitted production rate for the plant is 2,800 TPD (116.7 TPH), which is the original permitted capacity of the unit (1977 operating permit). The permitted capacity was 2,600 TPD (108.3 TPH) from February 1984 to October 1989. As shown, the two most recent tests were conducted at the higher production rate and ranged from 3.36 to 3.41 lb/ton, with a maximum individual test of 3.56 lb/ton. These levels are close to the 4.0 lb/ton limit, and higher operating rates, process variables, and catalyst aging could cause higher emissions. As a result, BACT for the No. 9 H_2SO_4 plant is proposed as 4.0 lb/ton.

5.1.2 ALTERNATIVE SO_2 CONTROL TECHNOLOGIES

EPA's latest review of NSPS for H_2SO_4 plants (MITRE Corp., 1979) presents a comprehensive assessment of alternative control technologies for removing SO_2 from H_2SO_4 plant tail gases. Alternative technologies identified included the double-absorption contact H_2SO_4 plant, sodium sulfite-bisulfite scrubbing, ammonia scrubbing, and molecular sieves. The study concluded that the best demonstrated control technology to reduce SO_2 emissions is the double-absorption H_2SO_4 plant. Nearly all the H_2SO_4 plants built in the United States since 1971 have used the double-absorption process, wherein two absorber stages are used. The SO_2 conversion efficiency for the double-absorption plant is 96 percent or greater.

A review of H_2SO_4 plant BACT determinations was conducted to determine control technologies and emission rates associated with plants constructed or modified since the EPA study was conducted in 1979. The results of the review are summarized in Table 5-2. This information was obtained from the EPA's BACT/LAER Clearinghouse. As indicated in the table, all BACT determinations since 1979 have resulted in allowable SO_2 levels equivalent to the NSPS of 4.0 lb/ton. These plants have ranged in capacity from 700 TPD to 2,750 TPD. All have utilized the double-absorption technology. In addition, the FDER determined BACT for SO_2 emissions

Table 5-2. Previous BACT Determinations for H_2SO_4 Plants

			Sulfur Dioxide		H_2SO_4 Mist	
Date Permit Issued	Company Name	Plant Capacity (TPD)	Allowable Emissions (lb/ton)	Basis	Allowable Emissions (lb/ton)	Basis
02/29/88	Coal Gasification, Inc.	700	4.0	NSPS	0.15	NSPS
07/21/87	Gardinier, Inc. (No. 8 H_2SO_4 plant)	2,500	4.0	NSPS	0.15	NSPS
06/13/84	Chevron Co., USA	1900	4.0	NSPS	0.15	NSPS
10/02/81	Conserv, Inc.	2000	4.0	NSPS, Double Absorption	0.15	NSPS, Acid Mist Eliminator
06/01/81	New Wales Chemical, Inc.	2750	4.0	NSPS, Double Absorption	0.15	NSPS
04/01/81	U.S.S. Agri-Chemicals	1850	4.0	NSPS	-	-
07/11/80	Gardinier, Inc. (No. 7 H_2SO_4 Plant)	1750	4.0	NSPS, Double Absorption	0.15	NSPS

Note: BACT = best available control technology.
H_2SO_4 = sulfuric acid.
TPD = tons per day.
lb/ton = pounds per ton.
NSPS = New Source Performance Standards.

Source: KBN, 1991.

from the No. 8 H_2SO_4 plant to be 4.0 lb/ton in the recent (1987) PSD permit issued for the No. 8 H_2SO_4 expansion. Since this determination, no significant changes have occurred at Cargill or in regards to air quality levels to warrant a lower BACT limit.

Reduction of SO_2 emissions below those currently achieved by the No. 8 and No. 9 H_2SO_4 double-absorption plants would require add-on control equipment, such as one of the flue gas desulfurization (FGD) processes described above. This would add considerable capital and operating costs to the present system and produce a waste disposal problem. The proposed Cargill expansion will increase allowable SO_2 emissions from the entire plant by 116.7 lb/hr. This represents less than a 15 percent increase in total allowable SO_2 emissions from the No. 8 and No. 9 H_2SO_4 plants. The air quality impact analysis presented in Section 6.0 demonstrates that the proposed increase in emissions will have a very minor impact upon current air quality levels, i.e., the maximum increase in impacts are less than 0.6 $\mu g/m^3$, annual average; 7.0 $\mu g/m^3$, 24-hour average; and 26 $\mu g/m^3$, 3-hour average.

The EPA NSPS review analyzed the SO_2 control alternative of replacing the catalyst bed in the dual-absorption plant more frequently than is normally practiced. Complete replacement of the first three beds of a 4-stage converter at a frequency rate three times greater than is normally practiced was estimated to result in a cost impact of $0.50/ton of H_2SO_4 produced. This was considered to be an unacceptable method because pretax profits to the plant could be reduced by 20 percent or more.

None of the alternative SO_2 control technologies is considered to be superior to the selected BACT, based on economic, energy, and environmental impacts. The chosen SO_2 BACT for the No. 8 and No. 9 H_2SO_4 plant is the currently operating double-absorption plant, reflective of a maximum SO_2 emission rate of 4.0 lb/ton.

5.2 SULFURIC ACID MIST

5.2.1 PROPOSED H_2SO_4 MIST BACT

The No. 8 and No. 9 H_2SO_4 plants at Cargill are currently equipped with a high efficiency mist eliminator to control H_2SO_4 mist emissions. Current emission limits are 0.15 lb/ton for H_2SO_4 mist based upon FDER's 1987 PSD permit and BACT determination, and the NSPS. The proposed BACT emission level for H_2SO_4 mist is the current allowable for the units of 0.15 lb/ton.

All H_2SO_4 plants operating in the United States in 1979 that were required to meet the NSPS level for H_2SO_4 mist of 0.15 lb/ton used high efficiency mist eliminators, primarily of the vertical pad type (MITRE Corp., 1979). Acid mist emissions are primarily related to moisture levels in the sulfur feedstock and in the air fed to the furnace, and the efficiency of the mist eliminator. Since the Cargill H_2SO_4 plants currently use high efficiency mist eliminators, and this technology is considered to be the state-of-the-art control, it is proposed as BACT for H_2SO_4 mist emissions. The EPA NSPS review study (MITRE Corp., 1979) identified these types of mist eliminators as the best demonstrated control technology for H_2SO_4 emissions. In addition, FDER previously determined this technology as BACT for the No. 8 H_2SO_4 expansion permitted in 1987.

H_2SO_4 mist source test data from the No. 8 and No. 9 plants operating near their current permitted rates are presented in Table 5-3. Review of the source test data presented in Table 5-3 shows that past H_2SO_4 mist compliance test values have ranged from 0.013 lb/ton to 0.099 lb/ton for the No. 8 and No. 9 H_2SO_4 plants. Individual tests have been as high as 0.134 lb/ton, near the 0.15 lb/ton limit. These data indicate that emissions can fluctuate significantly, due to the factors discussed previously for SO_2, and can range up to the 0.15 lb/ton current allowable limit. Based on the source test data, no reduction in the current allowable level is justified for these two plants.

5.2.2 ALTERNATIVE H_2SO_4 MIST CONTROL TECHNOLOGIES

EPA's review of the H_2SO_4 plant NSPS (MITRE Corp., 1979) identified three types of fiber mist eliminators and an electrostatic precipitator (ESP) as control techniques for controlling H_2SO_4 mist emissions from H_2SO_4 plants. EPA chose the fiber mist eliminator as the best demonstrated technology for the following reasons:

1. No evidence exists that any new H_2SO_4 plants have installed ESPs to control mist emissions.
2. ESPs require a relatively large space for erection.
3. ESPs would have high capital and installation costs, as well as high operating costs as a result of high maintenance due to the acid environment in which the ESP would operate.

Table 5-3. Summary of Recent H_2SO_4 Plant Sulfuric Acid Mist Emission Tests

	Average Production Rate[a] (tons/hr)	H_2SO_4 Mist (lb/hr) Avg.	H_2SO_4 Mist (lb/hr) Max.	H_2SO_4 Mist (lb/ton) Avg.	H_2SO_4 Mist (lb/ton) Max.
No. 8 H_2SO_4 Plant					
01/11/89	102.0	1.4	1.6	0.013	0.015
01/08/90	104.4	2.7	2.8	0.026	0.027
No. 9 H_2SO_4 Plant					
07/22/86	100.7	4.6	8.20	0.047	0.080
10/30/87	107.0	10.6	14.4	0.099	0.134
01/10/89	106.0	3.5	5.7	0.043	0.054
09/29/89	109.4	2.7	3.7	0.024	0.033
10/19/89	117.5	5.1	5.9	0.043	0.050
11/02/90	114.2	3.0	3.5	0.027	0.030

Note: H_2SO_4 = sulfuric acid.
lb/hr = pounds per hour.
lb/ton = pounds per ton.
tons/hr = tons per hour.

[a] As 100 percent sulfuric acid.

Source: KBN, 1991.

The three types of fiber mist eliminators identified as applicable to H_2SO_4 plants are the vertical tube, the vertical panel, and the horizontal pad filters. Source test data in the EPA review indicated that all types can meet the NSPS level of 0.15 lb/ton, and no one type is superior to the others. Since these types of filters are currently in use on the No. 8 and No. 9 H_2SO_4 plants, it is concluded that the alternative mist eliminators cannot achieve a degree of H_2SO_4 mist reduction that is significantly better than is now being achieved.

Previous BACT determinations for H_2SO_4 plants throughout the U.S. are summarized in Table 5-2. This information was obtained from the EPA's BACT/LAER Clearinghouse. The data show that all BACT determinations for H_2SO_4 plants constructed or modified since 1980 have resulted in allowable H_2SO_4 mist emission rates equivalent to the NSPS of 0.15 lb/ton. Based upon these considerations, the selected BACT for control of H_2SO_4 mist emissions is the currently operating, high efficiency mist eliminators to control mist emissions to 0.15 lb/ton.

The proposed Cargill H_2SO_4 expansion will increase allowable H_2SO_4 mist emissions by 4.4 lb/hr. This will result in only a 14 percent increase in the current total allowable H_2SO_4 emissions from the two plants of 31.8 lb/hr. A lower BACT emission limit would not result in significant benefits to the environment.

6.0 SOURCE IMPACT ANALYSIS

6.1 ANALYSIS APPROACH AND ASSUMPTIONS

6.1.1 GENERAL MODELING APPROACH

The general modeling approach followed EPA and FDER modeling guidelines for determining compliance with AAQS. In general, when model predictions are used to determine compliance with AAQS, current EPA and FDER policies stipulate that the highest annual average and highest, second-highest short-term (i.e., 24 hours or less) concentrations can be compared to the applicable AAQS. If concentrations are predicted with only 1 year of meteorological data, the highest short-term concentration calculated among the field of receptors should be compared with AAQS. The use of a 5-year meteorological database allows comparison of the predicted highest, second-highest short-term concentration with short-term AAQS. The highest, second-highest concentration is calculated for a receptor field by:

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

This approach is consistent with AAQS, which permits a short-term average concentration to be exceeded once per year at each receptor.

Model predictions for all averaging periods were performed using the Industrial Source Complex Short-Term (ISCST) model. A brief description of the ISCST model is given in Section 6.1.2. To develop the maximum short-term SO_2 concentrations for the proposed Cargill expansion, the general modeling approach was divided into screening and refined phases to reduce the computation time required to perform the modeling analysis. The basic difference between the two phases is the receptor grid used when predicting concentrations, the number of emission points, and the number of meteorological periods evaluated. In general, concentrations for the screening phase were predicted using a coarse receptor grid, limited number of major sources, and a 5-year meteorological record.

After a final list of highest, second-highest short-term concentrations was developed, the refined phase of the analysis was conducted by predicting concentrations for a refined receptor grid centered on the receptor at which the highest, second-highest concentration from the screening phase was produced. The ISCST model was executed for the meteorological periods during which both the highest and second-highest concentrations were predicted to occur at that receptor, based on the screening phase results. This approach was used to ensure that valid highest, second-highest concentrations were obtained. More detailed descriptions of the emission inventory and receptor grids used in the screening and refined phases of the analysis are presented in Sections 6.1.4 and 6.1.5, respectively.

6.1.2 MODEL SELECTION

The ISC dispersion model (EPA, 1990a) was used to evaluate the SO_2 emissions from the Cargill facility. This model is contained in EPA's User's Network for Applied Modeling of Air Pollution (UNAMAP), Version 6 (EPA, 1986a). The ISC model was selected primarily for the following reasons:

1. EPA and FDER have approved the general use of the model for air quality dispersion analysis because the model assumptions and methods are consistent with those in the Guideline on Air Quality Models (EPA, 1986b);
2. The ISC model is capable of predicting the impacts from stack, area, and volume sources that are spatially distributed over large areas and located in flat or gently rolling terrain; and
3. The results from the ISC model are appropriate for addressing compliance with AAQS.

The ISC model consists of two sets of computer codes which are used to calculate short- and long-term ground level concentrations. The main differences between the two codes are the input format of the meteorological data and the method of estimating the plume's horizontal dispersion.

The first model code, the ISCST model, is an extended version of the single-source (CRSTER) model (EPA, 1977). The ISCST model is designed to calculate hourly concentrations based on hourly meteorological parameters (i.e., wind direction, wind speed, atmospheric stability, ambient temperature, and mixing heights). The hourly concentrations are processed into non-overlapping, short-term and annual averaging periods. For example, a 24-hour average concentration is based on twenty-four 1-hour averages calculated from midnight to midnight of each day. For each short-term averaging period selected, the highest and second-highest average concentrations are calculated for each receptor. As an option, a table of the 50 highest concentrations over the entire field of receptors can be produced.

The second model code of the ISC model is the ISC long-term (ISCLT) model, which is an extension of the Air Quality Display Model (AQDM) and the Climatological Dispersion Model (CDM). The ISCLT model uses joint frequencies of wind direction, wind speed, and atmospheric stability to calculate seasonal and/or annual average ground-level concentrations. Because the input wind directions are for 16 sectors, with each sector defined as 22.5 degrees, the model calculates concentrations by assuming that the pollutant is uniformly distributed in the horizontal plane within a 22.5-degree sector.

In this analysis, the ISCST model was used to calculate both short-term and annual average concentrations. These concentrations are readily obtainable from the model output.

Major features of the ISCST model are presented in Table 6-1. Concentrations due to stack and volume sources are calculated by the ISCST model using the steady-state Gaussian plume equation for a continuous source. The area source equation in the ISCST model is based on the equation for a continuous and finite crosswind line source.

The ISC model has rural and urban options which affect the wind speed profile exponent law, dispersion rates, and mixing-height formulations used in calculating ground level concentrations. The criteria used to determine when the rural or urban mode is appropriate are based on land use near the proposed plant's surroundings (Auer, 1978). If the land use is classified as heavy industrial, light-moderate industrial, commercial, or compact residential for more than 50 percent of the area within a 3 km radium circle centered on the proposed source, the urban option should be selected. Otherwise, the rural option is more appropriate.

For modeling analyses that will undergo regulatory review, such as PSD permit applications, the following model features are recommended by EPA (1986b) and are referred to as the regulatory options in the ISCST model:

1. Final plume rise at all receptor locations,
2. Stack-tip downwash,
3. Buoyancy-induced dispersion,

Table 6-1. Major Features of the ISCST Model

ISCST Model Features
• Polar or Cartesian coordinate systems for receptor locations
• Rural or one of three urban options which affect wind speed profile exponent, dispersion rates, and mixing height calculations
• Plume rise due to momentum and buoyancy as a function of downwind distance for stack emissions (Briggs, 1969, 1971, 1973, and 1975)
• Procedures suggested by Huber and Snyder (1976) and Huber (1977) for evaluating building wake effects
• Procedures suggested by Briggs (1974) for evaluating stack-tip downwash
• Separation of multiple point sources
• Consideration of the effects of gravitational settling and dry deposition on ambient particulate concentrations
• Capability of simulating point, line, volume and area sources
• Capability to calculate dry deposition
• Variation of wind speed with height (wind speed-profile exponent law)
• Concentration estimates for 1-hour to annual average times
• Terrain-adjustment procedures for elevated terrain including a terrain truncation algorithm
• Consideration of time-dependent exponential decay of pollutants
• The method of Pasquill (1976) to account for buoyancy-induced dispersion
• A regulatory default option to set various model options and parameters to EPA recommended values (see text for regulatory options used)
• Procedure for calm-wind processing

Note: ISCST = Industrial Source Complex Short-Term.

Source: EPA, 1990a.

4. Default wind speed profile coefficients for rural or urban option,
5. Default vertical potential temperature gradients,
6. Calm wind processing, and
7. A decay half life of 4 hours for SO_2 concentration calculations in urban areas.

Some of the above model features have been recommended for use by EPA over the last 5 years. These assumptions include the use of final plume rise, default wind speed profile coefficients, default vertical potential temperature gradients, and calm wind processing of maximum ground level concentrations. The recently revised EPA modeling guidelines recommend use of the remaining features, including the use of calm wind processing regardless if impacts are expected to occur under such meteorological conditions. The effect of using these options to predict maximum ground level concentrations from elevated point sources is to produce higher concentrations than if these options were not used by:

1. Lowering the effective plume height (stack-tip downwash),
2. Increasing the plume width such that the plume may have an impact over areas where it previously would not (buoyancy-induced dispersion), and
3. Mathematically adjusting the longer term averaging concentration (i.e., 24 hours or more) by the number of non-calm hours (calm wind processing).

In this analysis, the regulatory options were used to address maximum impacts from the Cargill facility. Based on a review of the land use around the Cargill facility, the rural mode was selected because of the general lack of, or minimal residential, industrial and commercial development.

6.1.3 METEOROLOGICAL DATA

Meteorological data used in the ISCST model to determine air quality impacts consisted of a concurrent 5-year period of hourly surface weather observations from the National Weather Service (NWS) station at Tampa International Airport and twice-daily radiosonde soundings from the NWS station at Ruskin, Florida. The 5-year period of meteorological data consisted of 1982 through 1986.

The NWS station in Tampa, located approximately 18 km to the northwest of the Cargill plant site, and Ruskin, located approximately 15 km to the south-southwest of the plant site, were selected for use in the study because they are the closest primary weather stations to the study area with similar surrounding topographical features and land-water boundaries. These stations also have the most readily available and complete database which is representative of the proposed plant site.

The surface observations included wind direction, wind speed, temperature, cloud cover, and cloud ceiling. The wind speed, cloud cover, and cloud ceiling values were used in the ISCST meteorological preprocessor program to determine atmospheric stability using the Turner stability scheme. Based on the temperature measurements at Tampa, Florida, morning and afternoon mixing heights were calculated with the radiosonde data at Ruskin using the Holzworth approach (1972). Hourly mixing heights were derived from the morning and afternoon mixing heights using the interpolation method developed by EPA (Holzworth, 1972). The hourly surface data and mixing heights were used to develop a sequential series of hourly meteorological data (i.e., wind direction, wind speed, temperature, stability, and mixing heights). Because the observed hourly wind directions were classified into one of thirty-six 10-degree sectors, the wind directions were randomized within each sector using an EPA preprocessing program to account for the expected variability in air flow.

6.1.4. SIGNIFICANT IMPACT AREA ANALYSIS

In order to determine the SO_2 significant impact area, the current and future operating conditions of the No. 8 and No. 9 H_2SO_4 plants were modeled to determine the net air quality change due to the proposed expansion. The modeled SO_2 emissions rates are shown in Table 2-1, and stack parameters are shown in Table 2-2.

Modeling of the existing and future Nos. 8 and 9 H_2SO_4 plants demonstrated that the proposed expansion would have a significant impact at a distance no greater than 5 km from the Cargill facility. Therefore, for further modeling analysis the significant impact area is established as 5 km.

6.1.5 EMISSION INVENTORY

All major SO_2 sources located within 50 km of Cargill were identified and are presented in Table 6-2. The inventory data were based on information developed for the PSD permit

Table 6-2. SO_2 Emission Inventory of Sources Considered in the Modeling Analysis

APIS Number	Facility	Distance (D) from Cargill (km)	Screening Threshold Emissions (TPY)[a]	Maximum Allowable Emissions (TPY)	Included in the Modeling Analysis
40HIL290024	IMC -Port Sutton	6.0	20	1,443	Yes
40HIL290040	TECO -Gannon	6.0	21	93,266	Yes
40HIL290039	TECO -Big Bend	7.3	45	301,974[b]	Yes
40HIL290082	Sulfur Terminal	9.2	84	210	Yes
40HIL290018	Lafarge Corp.	9.9	97	20,293	Yes
40HIL290038	TECO -Hookers Point	10.1	101	13,524	Yes
40HIL290127	McKay Bay Res. Rec.	10.1	102	745	Yes
40HIL290083	AMOCO Oil	11.0	121	304	Yes
40HIL290005	Central Phosphate	11.3	127	8,836	Yes
40HIL290057	Gulf Coast Lead	11.6	133	1,638	Yes
40HIL290261	Hillsborough Co. Res. Rec.	11.8	135	1,029	Yes
40HIL290099	Sulphuric Acid Trading	13.9	178	156	No
40HIL290028	Gold Bond Building	15.6	212	332	Yes
40HIL290223	Couch Construction	16.0	219	115	No
40PNL520011	FPC -Bartow	20.5	310	62,618	Yes
40PNL520013	FPC -Bayboro	26.5	429	6,876	Yes
40PNL520117	Pinellas Co. Res. Rec.	27.8	455	2,300	Yes
40MAN410010	FPL -Manatee	28.3	467	83,351	Yes
40MAN410002	Royster Phosphate	28.8	475	1,463	Yes
40HIL290101	IMC -Fort Lonesome	30.2	504	1,547	Yes
40PNL520012	FPC -Higgins	31.0	519	12,072	Yes
40TPA530059	IMC -New Whales	33.9	578	10,169	Yes
40HIL290076	Delta Asphalt	34.0	579	167	No
40HIL290075	Consolidated Minerals	34.0	579	1,267	Yes
40HIL290102	Mobil Oil Big Four Mine	34.2	584	569	No
40TPA530047	Mobil Chemical Co./Nichols	35.6	613	1,498	Yes
40TPA530057	Conserv. Chemicals	35.9	617	1,597	Yes
40TPA530059	IMC/Praire	40.3	706	137	No
40TPA530054	Agrico Chemical Co. (Pierce)	40.9	719	417	No
40TPA530060	Mobil-Electrophosphate Division	42.8	756	1,440	Yes
40TPA530080	Imperial Phosphate	43.8	776	275	No
40TPA530008	Royster Co.	44.0	780	1,232	Yes
40MAN410007	Tropicana	44.3	787	437	No
40TPA530052	C.F. Industries	45.1	802	8,443	Yes
40TPA530055	Agrico Chemical Co. (S. Pierce)	45.9	817	4,982	Yes
40TPA530053	Farmland Industries	46.6	833	2,878	Yes
40TPA530046	W.R. Grace/Seminole Fert.	47.1	842	8,180	Yes
40HIL290029	Nitram	48.4	868	108	No
NA	Hardee Power Station	48.7	874	11,992	Yes
40TPA530004	Lakeland City Power	52.2	943	30,567	Yes
40TPA510017	FPC -Anclote	53.1	961	116,874	Yes

Note: APIS = Florida Air Pollution Inventory System.
km = kilometer.
NA = not available.
SO_2 = sulfur dioxide.
TPY = tons per year.

[a] Screening Threshold emissions (Q) are equal to 20 times the distance from the source in question to the edge of Cargill's significant impact area (5 km). Sources with emissions less than Q were eliminated from the modeling analysis (see text for details).

[b] Based on 3-hour emissions.

Source: KBN, 1987, 1988 and FDER, 1990.

application for the Hardee Power Station, data obtained from the Florida Air Pollution Inventory System (APIS), and the previous air quality impact assessment prepared for Cargill (KBN, 1987).

The FDER has recommended a technique for eliminating sources in the modeling analyses if the source's emissions do not meet an emission criteria. The technique is the "Screening Threshold" method, developed by the North Carolina Department of Natural Resources and Community Development, and approved by the EPA (refer to Appendix A). The method is designed to objectively eliminate from the emission inventory those sources which are not likely to have a significant interaction with the source undergoing evaluation. In general, sources that should be considered in the modeling analyses are those with emissions greater than Q (in TPY) which is calculated by the following criteria:

$$Q = 20 \times D$$

where D is:

1. the distance (km) from Cargill to the source undergoing evaluation for short-term analysis, or
2. the distance (km) from the edge of Cargill's significant impact area (5 km) to the source undergoing evaluation for long-term analysis.

For this analysis the long-term criteria was used since less sources would be eliminated than with the short-term criteria and would thus result in a more conservative approach.

A listing of the sources in the inventory, along with associated maximum allowable emissions, distance from Cargill, and associated Q, are presented in Table 6-2. Those sources with maximum allowable SO_2 emissions which are below the calculated "screening threshold" emissions were eliminated from further consideration in the modeling analysis.

To reduce the amount of computation time required to model the remaining sources the modeling was performed in screening and refined phases. In the screening phase, only those sources with SO_2 emissions above a certain threshold based on the source's location from the Cargill plant were considered. The following criteria were used to determine the sources to be modeled:

1. All Cargill SO_2 sources.
2. For other sources:
    - all sources within 5 km of Cargill (significant impact area)

- sources with SO_2 emissions greater than 750 TPY and located between 5 and 20 km from Cargill
- sources with SO_2 emissions greater than 10,000 TPY and located between 20 and 50 km from Cargill.

The use of this criteria was based on similar criteria used in a previous modeling analysis of Cargill (KBN, 1987). Since the significant impact area of the proposed modification is only 5 km, sources beyond 20 km are expected to have little or no contribution to the maximum impacts predicted within the significant impact area.

In general, sources located more than 50 km from Cargill were not considered in the screening analysis. However, the Lakeland City Power and Florida Power Corporation (FPC) Anclote facilities were included in the screening analysis since they are substantial SO_2 emitters and are located at distances of 52.2 and 53.1 km, respectively, from Cargill. For the screening modeling, sources with similar stack heights and stack parameters were combined and treated as one stack to reduce computation time.

The Cargill SO_2 emission inventory is presented in Table 6-3. Stack data for the Cargill sources were obtained from current operating permits and stack test data. SO_2 emissions for all Cargill sources were developed using data from current permits and AP-42 emission factors (refer to Appendix B). Operating data for H_2SO_4 plants No. 7, 8, and 9 were derived by taking the average of the last 2 years of stack test data and prorating it based on the proposed production rate increase.

The individual emissions, stack, and operating parameters for the other sources considered in the screening and refined analysis are presented in Appendix C, Table C-1. The combined source parameters for other sources considered in the screening and refined analysis are presented in Table C-2.

After the screening modeling was performed and the worst-case meteorological periods identified, all the sources shown in Table C-2, and the Cargill sources shown in Table 6-3 were modeled using a refined receptor grid.

Table 6-3. Summary of Cargill SO_2 Sources Used for the Modeling Analysis

Sources	SO_2 Emissions (g/s)	Stack Height (m)	Stack Diameter (m)	Exit Gas Velocity (m/s)	Exit Gas Temperature (K)	Stack Location[a] X (m)	Y (m)
GTSP	1.90	38.4	2.44	12.35	325	0	119
DAP 5	0.96	40.4	2.13	16.09	319	0	0
SSF	0.16	12.2	0.51	9.28	322	39	108
H_2SO_4 7[b]	46.2	45.6	2.29	12.64	340	502	-33
H_2SO_4 8[c]	54.6	45.6	2.44	13.93	339	599	68
H_2SO_4 9[d]	67.2	45.6	2.74	12.66	350	521	96

Note:
g/s = grams per second.
H_2SO_4 = sulfuric acid.
K = Kelvin.
lb = pound.
m = meter.
m/s = meters per second.
SO_2 = sulfur dioxide.
TPH = tons per hour.

[a] Relative to grid center located at the No. 5 DAP stack location.

[b] Emissions based on a production rate of 2,200 TPD (91.7 TPH) of H_2SO_4 and 4.0 lb SO_2 per ton of H_2SO_4 produced. Stack parameters based on an average of 1990 and 1991 source test data.

[c] Emissions based on a production rate of 2,600 TPD (108.3 TPH) of H_2SO_4 and 4.0 lb SO_2 per ton of H_2SO_4 produced. Stack parameters based on an average of 1990 and 1991 source test data.

[d] Emissions based on a production rate of 3,200 TPD (133.3 TPH) of H_2SO_4 and 4.0 lb SO_2 per ton of H_2SO_4 produced. Stack parameters based on an average of 1989 and 1991 source test data.

Source: KBN, 1986, 1991.

A summary of the SO_2 emissions considered in the screening and refined phases of the analysis is presented in Table 6-4. As shown in this table, emissions from sources located within 50 km of Cargill and considered in the screening and refined phases represent approximately 94.2 and 99.7 percent, respectively, of all SO_2 emissions. For sources located within 20 km of the Cargill plant, the emissions considered in the screening and refined phases represent approximately 99.6 and 99.9 percent, respectively, of the total emissions within 20 km of Cargill. The total emissions represent all emission sources identified within 50 km of Cargill, along with the emissions from the Lakeland City Power and FPC Anclote facilities. Emissions from the Cargill facility are not included in this total.

6.1.6 RECEPTOR LOCATIONS

As discussed in Section 6.1.1, the general modeling approach considered screening and refined phases to address compliance with AAQS. For the screening phase, concentrations were predicted for the following receptor locations:

1. For determination of the SO_2 significant impact area, 432 receptors located at distances of 500; 1,000; 1,500; 2,000; 3,000; 4,000; 5,000; 6,000; 7,000; 8,000; 9,000; and 10,000 m along 36 radials with each radial spaced at 10-degree increments. This grid was centered at the DAP No. 5 stack location.
2. For the AAQS analysis, 260 total receptors located in a radial grid centered at the DAP No. 5 stack location. These receptors were classified into two main groups:
    a. 116 plant property and near-field receptors. The plant boundary receptors consisted of 39 receptors placed at the nearest plant boundary along 36 radials spaced at 10-degree increments. Seventy-seven additional near-field receptors were placed beyond the plant boundary at distances of 600; 800; 1,000; and 1,500 m along each radial. These receptors are presented in Table 6-5.
    b. 144 general grid receptors located at distances of 2,000; 3,000; 4,000; and 5,000 m along 36 radials with each radial spaced at 10-degree increments. A maximum distance of 5,000 m was used based on the extent of Cargill's significant impact area.

After the screening modeling was completed, the refined modeling consisted of modeling all sources in the refined phase (see Section 6.1.4) using a receptor grid centered on the receptor

Table 6-4. Summary of SO_2 Emissions for All Sources Located at Various Distances from Cargill Fertilizer, Inc.

Distance (km) from Cargill	Total Emissions[a] (TPY)	Emissions (TPY) Considered in Modeling Analysis Screening (% of total for Distance)	Emissions (TPY) Considered in Modeling Analysis Refined (% of total for Distance)
0 - 20	443,865	442,003 (99.6)	443,594 (99.9)
20 - 50	373,456	327,643 (87.7)	371,346 (99.4)
0 - 50	817,321	769,646 (94.2)	814,940 (99.7)

Note:
km = kilometer.
% = percent.
SO_2 = sulfur dioxide.
TPY = tons per year.

[a] Does not include emissions from Cargill but does include emissions from FPC Anclote and Lakeland City Power.

Source: KBN, 1986, 1991.

Table 6-5. Summary of Plant Boundary and Near Field Receptors Used in the Analysis

Direction (degrees)	Distance(s) (meters)					Direction (degrees)	Distance(s) (meters)				
10	1589					190	643	800	1000	1500	
20	1369	1500				200	697	800	1000	1500	
30	1236	1500				210	786	1000	1500		
40	1148	1500				220	934	1000	1500		
50	1077	1500				230	1023	1500			
60	1044	1500				240	486	975	1000	1500	
70	1040	1500				250	483	806	1000	1500	
80	1045	1500				260	485	698	800	1000	1500
90	988	1500				270	500	600	800	1000	1500
100	605	800	1000	1500		280	533	600	800	1000	1500
110	446	600	800	1000	1500	290	590	800	1000	1500	
120	415	600	800	1000	1500	300	684	800	1000	1500	
130	421	600	800	1000	1500	310	844	1000	1500		
140	442	600	800	1000	1500	320	1019	1500			
150	481	600	800	1000	1500	330	1289	1500			
160	545	600	800	1000	1500	340	1829				
170	606	800	1000	1500		350	1836				
180	614	800	1000	1500		360	1829				

Note: Grid centered at the No. 5 DAP stack location.
First distance listed represents the closest distance to plant property within a 10-degree radial sector.

Source: KBN, 1991.

which had the highest, second-highest 3- and 24-hour concentrations. The receptors were located at intervals of 100 m between the distances considered in the screening phase along 9 radials, at 2 degree increments, centered on the radial along which the maximum concentration was produced. For example, if the maximum concentration was produced along the 90 degree radial at a distance of 2.0 km, the refined receptor grid would consist of receptors at the following locations:

Directions (degrees)	Distance (km)
82, 84, 86, 88, 90, 92, 94, 96, 98	1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2100, 2200, 2300, 2400, 2500, 2600, 2700, 2800, 2900 per direction

To ensure that a valid highest, second-highest concentration was calculated, concentrations were predicted for the refined grid for the periods that produced both the highest and second-highest concentration from the screening receptor grid. Refined modeling analysis was not performed for the annual averaging period because the spatial distribution of annual average concentrations is not expected to vary significantly from those produced from the screening analysis.

6.1.7 BACKGROUND CONCENTRATIONS

To estimate total air quality concentrations, a background concentration must be added to the modeling results. The background concentration is considered to be the air quality concentration contributed by sources not included in the modeling evaluation.

The derivation of the background concentration for the modeling analysis was presented in Section 4.0. Based on this analysis, the background SO_2 concentration was determined to be 19 $\mu g/m^3$ for the 3- and 24-hour averaging periods, and 5 $\mu g/m^3$ for the annual averaging period. These background levels were added to model-predicted concentrations to estimate total air quality levels for comparison to AAQS.

6.1.8 BUILDING DOWNWASH EFFECTS

The procedures used for addressing the effects of building downwash are those recommended in the ISC Dispersion Model User's Guide. The building height, length, and width are input to the model, which uses these parameters to modify the dispersion parameters. For short stacks (i.e., physical stack height is less than $H_b + 0.5\ L_b$, where H_b is the building height and L_b is the lesser of the building height or projected width), the Schulman and Scire (1980) method is used.

If this method is used, then direction-specific building dimensions are input for H_b and L_b for 36 radial directions, with each direction representing a 10 degree sector. The features of the Schulman and Scire method are as follows:

1. Reduced plume rise as a result of initial plume dilution,
2. Enhanced plume spread as a linear function of the effective plume height, and
3. Specification of building dimensions as a function of wind direction.

For cases where the physical stack is greater than $H_b + 0.5\ L_b$ but less than GEP, the Huber-Snyder (1976) method is used. For this method, the ISCST model calculates the area of the building using the length and width, assumes the area is representative of a circle, and then calculates a building width by determining the diameter of the circle. If a specific width is to be modeled, then the value input to the model must be adjusted according to the following formula:

$$M_w^2 = \frac{\pi W^2}{4} \qquad (1)$$

$$M_w = 0.886W$$

where: M_w = Input to the model to produce a building width of W used in the dispersion calculation.
W = The actual building width.

The building dimensions considered in the modeling analysis are presented in Table 6-6. The units at the Cargill facility effected by building downwash are limited to the SSF, GTSP and DAP #5.

6.2 MODEL RESULTS

A summary of the maximum SO_2 concentrations predicted for the proposed modification only in the screening analysis is presented in Table 6-7. These results indicate the proposed increase in SO_2 emissions from the Nos. 8 and 9 H_2SO_4 plants will result in low ambient impacts. The maximum concentrations are slightly greater than the significance levels for the 3- and 24-hour

Table 6-6. Building Dimensions Used in the Modeling Analysis for Cargill SO_2 Sources

		Associated Building(s)				Dominant Building	
Source	Area of Influence (degrees)	Building Description	Building Height (feet)	Building Length (feet)	Building Width (feet)	Height (feet)	Length & Width[a] (feet)
SSF	10-360	GTSP Production building	127	100	120	127	137
GTSP	10-360	GTSP Production building	127	100	120	127	137
DAP #5	10-150,210-360	#5 MAP Production, high section #3,4 MAP Production building	127 100	36 100	30 80	127	137
	160-200	GTSP Production building	127	100	120	127	137

Note: SO_2 = sulfur dioxide.

[a] Calculated to result in model simulation of projected crosswind width.

Source: KBN, 1991.

Table 6-7. Maximum SO_2 Concentrations Predicted for the Proposed Modification Only -- Screening Analysis

Averaging Period	Concentration ($\mu g/m^3$)	Period			Location[a]	
		Julian Day	Hour Ending	Year	Direction	Distance (km)
3-Hour	21.5	185	15	1982	90	2.0
	21.8	207	12	1983	90	2.0
	20.2	211	12	1984	340	1.0
	25.8	144	9	1985	80	2.0
	22.9	260	12	1986	250	0.5
24-Hour	6.0	239	24	1982	20	2.0
	5.8	242	24	1983	60	1.5
	4.9	154	24	1984	90	2.0
	5.8	4	24	1985	110	3.0
	5.5	230	24	1986	90	2.0
Annual	0.35	—	—	1982	70	2.0
	0.26	—	—	1983	70	2.0
	0.33	—	—	1984	80	2.0
	0.45	—	—	1985	70	2.0
	0.54	—	—	1986	90	2.0

Note: Significance levels for 3-, 24-hour, and annual averaging periods are 25, 5, and 1.0 $\mu g/m^3$, respectively. Highest concentrations are reported for all averaging periods.

km = kilometers.
SO_2 = sulfur dioxide.
$\mu g/m^3$ = micrograms per cubic meter.

[a] With respect to Cargill DAP No. 5 stack location.

Source: KBN, 1991.

averaging periods and less than the significance levels for the annual averaging periods. Based on these results, the significant impact area for the proposed modification extends approximately out to 5.0 km from the Cargill facility.

Summaries of the maximum 3-hour, 24-hour, and annual average total SO_2 concentrations predicted for all sources for the screening and refined analyses are presented in Tables 6-8 and 6-9, respectively. The total concentrations are determined from the impacts of Cargill and other modeled sources, added to background concentrations determined from monitoring data. Based on the results presented in these tables, the maximum SO_2 concentrations due to all sources are predicted to be above the AAQS at certain receptors for the 24-hour averaging period.

As shown in Table 6-9, the maximum predicted 3-hour concentration from the refined analysis was 1,045 $\mu g/m^3$ and occurred approximately 1.2 km to the north-northeast of the Cargill facilities, along the plant property boundary. This maximum concentration is primarily due to sources to the north of the Cargill facility; the proposed modification at Cargill contributed 19.8 $\mu g/m^3$ to the predicted concentration.

The maximum total 24-hour average concentration due to all sources is predicted to be above the Florida 24-hour AAQS of 260 $\mu g/m^3$ at certain receptor locations. From the refined analysis, the maximum predicted 24-hour concentration of 368 $\mu g/m^3$ occurred approximately 2.1 km to the southeast of the sulfuric acid units. The proposed modification at Cargill contributed 0.72 $\mu g/m^3$ to the predicted violation.

The maximum total annual average concentration due to all sources is predicted to be 53.1 $\mu g/m^3$ and occurred approximately 5.0 km to the north of the sulfuric acid units. The proposed modification contributed 0.1 $\mu g/m^3$ to the maximum concentration. This maximum concentration is a conservative estimate (i.e., higher than expected) of the annual average concentration because all sources were modeled at their maximum allowable emissions for every hour in the year. By considering actual operating conditions, the emissions are expected to be lower which would result in lower ambient impacts. Also, because the calm wind processing option was used, all calm hours were eliminated from the meteorological database. As a result, the annual concentration was based on the number of non-calm hours in the year.

Table 6-8. Screening Analysis Results of the Maximum Total SO_2 Concentrations Predicted in the Vicinity of the Cargill Facility

	SO_2 Concentration ($\mu g/m^3$)				Receptor Location[a]		Period		
		Total Due To							
Averaging Period	Total	All Modeled Sources	Back-ground	Cargill Proposed Modification	Direction (°)	Distance (km)	Julian Day	Hour Ending	Year
3-Hour[b]	979	960	19	0	360	5.0	161	18	1982
	994	975	19	0	310	4.0	265	15	1983
	951	932	19	0	340	5.0	203	15	1984
	981	962	19	0	330	3.0	6	15	1985
	1,021	1,002	19	13.6	40	1.148	181	12	1986
24-Hour[b]	286	267	19	0	360	4.0	234	24	1982
	289	270	19	0	310	5.0	167	24	1983
	341	322	19	2.7	140	3.0	60	24	1984
	292	273	19	0	360	5.0	137	24	1985
	322	303	19	0	360	5.0	129	24	1986
Annual	42.1	37.1	5	-0.08	240	0.486	—	—	1982
	45.6	40.6	5	0.10	360	5.0	—	—	1983
	45.0	40.0	5	0.05	360	5.0	—	—	1984
	48.3	43.3	5	0.10	360	5.0	—	—	1985
	53.1	48.1	5	0.10	360	5.0	—	—	1986

Note: Florida 3- and 24-hour AAQS are 1300 and 260 $\mu g/m^3$, respectively, not to be exceeded more than once per year. Florida annual AAQS is 60 $\mu g/m^3$.

° = degrees.
km = kilometer.
SO_2 = sulfur dioxide.
$\mu g/m^3$ = micrograms per cubic meter.

[a] With respect to the Cargill DAP No. 5 Stack location.

[b] Highest, second-highest concentration presented for this averaging period.

Source: KBN, 1991.

Table 6-9. Refined Analysis Results of the Maximum Total SO_2 Concentrations Predicted in the Vicinity of the Cargill Facility

	SO_2 Concentration ($\mu g/m^3$)				Receptor Location[a]		Period		
	Total Due To								
Averaging Period	Total	All Modeled Sources	Back-ground	Cargill Proposed Modification	Direction (°)	Distance (km)	Julian Day	Hour Ending	Year
3-Hour[b]	1,045	1,026	19	19.8	36	1.226	181	12	1986
24-Hour[b]	368	349	19	0.72	138	2.1	60	24	1984

Note: Florida 3- and 24-hour AAQS are 1300 and 260 $\mu g/m^3$, respectively, not to be exceeded more than once per year. Florida annual AAQS is 60 $\mu g/m^3$.

° = degrees.
km = kilometers.
SO_2 = sulfur dioxide.
$\mu g/m^3$ = micrograms per cubic meter.

[a] With respect to the Cargill DAP No. 5 stack location.
[b] Highest, second-highest concentration presented for this averaging period.

Source: KBN, 1991.

All predicted violations of the 24-hour AAQS for the 5 years of meteorological data, along with the proposed modification's contribution to these predicted violations, are presented in Table 6-10. As shown, the proposed modification does not contribute significantly to any predicted violation. In many cases, the large power plant to the north of the Cargill facility contributes a major portion to the total impact.

Higher Production
More flow

Table 6-10. Summary of Predicted 24-Hour Violations of the Florida AAQS Near the Cargill Facility (Page 1 of 5)

	SO2 Concentration ($\mu g/m^3$)				Receptor Location[a]		Period	
	Total Due To							
Year	Total	All Modeled Sources	Back-ground	Cargill Proposed Modification	Direction (degrees)	Distance (km)	Julian Day	Hour Ending
1982	380	361	19	0.0	360	5.0	180	24
	346	327	19	0.0	10	5.0	180	24
	308	289	19	0.0	360	4.0	181	24
	290	271	19	0.014	350	5.0	236	24
	286	267	19	0.0	360	4.0	234	24
	284	265	19	0.0	350	5.0	180	24
	278	259	19	0.0	350	5.0	161	24
	275	256	19	0.00004	360	5.0	236	24
	267	248	19	0.0	350	5.0	215	24
	266	247	19	0.0	360	5.0	185	24
	262	243	19	0.00002	10	5.0	185	24
1983	294	275	19	0.0	310	5.0	299	24
	289	270	19	0.0	310	5.0	167	24
	281	262	19	-0.025	360	5.0	308	24
	276	257	19	0.0	360	5.0	278	24
	275	256	19	-0.00086	360	5.0	173	24
	267	248	19	0.0	310	5.0	166	24
1984	368	349	19	2.05	140	3.0	67	24
	360	341	19	0.45	140	2.0	60	24
	353	334	19	-0.56	130	2.0	67	24
	352	333	19	-3.24	130	1.5	67	24
	341	322	19	2.66	140	3.0	60	24
	341	322	19	-2.79	130	1.5	60	24
	338	319	19	-0.61	140	2.0	67	24

Table 6-10. Summary of Predicted 24-Hour Violations of the Florida AAQS Near the Cargill Facility (Page 2 of 5)

	SO2 Concentration ($\mu g/m^3$)				Receptor Location[a]		Period	
	Total Due To							
Year	Total	All Modeled Sources	Back-ground	Cargill Proposed Modification	Direction (degrees)	Distance (km)	Julian Day	Hour Ending
1984 (cont.)	337	318	19	2.83	140	4.0	67	24
	328	309	19	-0.21	130	2.0	60	24
	308	289	19	-0.42	140	1.5	60	24
	307	288	19	1.28	130	3.0	67	24
	307	288	19	1.83	150	4.0	60	24
	306	287	19	-1.05	120	1.5	67	24
	304	285	19	0.0	150	0.481	60	24
	304	285	19	0.0	140	0.442	60	24
	303	284	19	2.68	140	5.0	67	24
	303	284	19	-0.80	140	1.5	67	24
	303	284	19	0.0	360	5.0	244	24
	303	284	19	0.0	360	5.0	154	24
	302	283	19	0.0	150	0.6	60	24
	302	283	19	2.84	140	4.0	60	24
	301	282	19	2.38	150	5.0	60	24
	300	281	19	0.0	150	0.8	60	24
	299	280	19	0.69	150	3.0	60	24
	298	279	19	0.0	150	1.0	60	24
	298	279	19	0.0	140	0.6	60	24
	296	277	19	0.0	130	0.421	60	24
	293	274	19	-1.64	120	1.0	67	24
	293	274	19	-0.00004	150	1.5	60	24
	293	274	19	0.0	140	0.8	60	24
	290	271	19	0.01	150	2.0	60	24
	289	270	19	0.0	130	0.421	67	24
	289	270	19	-0.47	130	1.0	67	24

Table 6-10. Summary of Predicted 24-Hour Violations of the Florida AAQS Near the Cargill Facility (Page 3 of 5)

	SO2 Concentration ($\mu g/m^3$)				Receptor Location[a]		Period	
	Total Due To							
Year	Total	All Modeled Sources	Back-ground	Cargill Proposed Modification	Direction (degrees)	Distance (km)	Julian Day	Hour Ending
1984 (cont.)	289	270	19	-0.00008	140	1.0	60	24
	288	269	19	0.0	130	0.6	67	24
	288	269	19	0.0	130	0.6	60	24
	287	268	19	-0.027	130	0.8	67	24
	286	267	19	0.0	140	0.442	67	24
	286	267	19	0.0	120	0.415	67	24
	286	267	19	-0.073	140	1.0	67	24
	286	267	19	0.0	140	0.6	67	24
	285	266	19	-0.00003	140	0.8	67	24
	285	266	19	-0.45	130	1.0	60	24
	284	265	19	0.0	120	0.415	60	24
	283	264	19	0.0	120	0.6	67	24
	283	264	19	-0.34	150	2.0	67	24
	283	264	19	0.0	110	0.446	67	24
	282	263	19	-0.00013	130	0.8	60	24
	281	262	19	-0.064	120	0.8	67	24
	281	262	19	1.67	130	3.0	60	24
	280	261	19	-0.00001	110	0.6	67	24
	280	261	19	-1.75	120	1.5	60	24
	279	260	19	0.37	150	3.0	67	24
	279	260	19	-2.47	120	1.0	60	24
	277	258	19	0.0	110	0.446	60	24
	277	258	19	0.0	120	0.6	60	24
	276	257	19	0.77	150	4.0	67	24
	275	256	19	-0.54	110	0.8	67	24
	275	256	19	0.0	100	0.605	67	24

Table 6-10. Summary of Predicted 24-Hour Violations of the Florida AAQS Near the Cargill Facility (Page 4 of 5)

	SO2 Concentration (μg/m³)				Receptor Location[a]		Period	
	Total Due To							
Year	Total	All Modeled Sources	Back-ground	Cargill Proposed Modification	Direction (degrees)	Distance (km)	Julian Day	Hour Ending
1984 (cont.)	275	256	19	0.0	340	2.0	69	24
	273	254	19	0.0	340	3.0	115	24
	272	253	19	0.0	340	2.0	67	24
	272	253	19	-0.18	120	0.8	60	24
	272	253	19	1.17	150	5.0	67	24
	272	253	19	0.0	110	0.6	60	24
	271	252	19	2.47	130	1.5	69	24
	270	251	19	-0.15	150	1.5	67	24
	270	251	19	0.0	340	3.0	67	24
	269	250	19	0.0	150	0.6	67	24
	269	250	19	0.0	150	0.481	67	24
	269	250	19	2.49	140	5.0	60	24
	268	249	19	0.0	150	0.8	67	24
	268	249	19	-0.00002	150	1.0	67	24
	267	248	19	0.0	100	0.605	60	24
	264	245	19	-0.24	110	0.8	60	24
1985	297	278	19	0.0	360	5.0	153	24
	292	273	19	0.0	360	5.0	137	24
	274	255	19	0.0	10	5.0	153	24
	268	249	19	0.0	10	5.0	137	24
	266	247	19	0.0	330	4.0	6	24
	261	242	19	0.0	330	4.0	269	24

Table 6-10. Summary of Predicted 24-Hour Violations of the Florida AAQS Near the Cargill Facility (Page 5 of 5)

	SO2 Concentration ($\mu g/m^3$)				Receptor Location[a]		Period	
	Total Due To							
Year	Total	All Modeled Sources	Back-ground	Cargill Proposed Modification	Direction (degrees)	Distance (km)	Julian Day	Hour Ending
1986	373	354	19	0.054	360	5.0	227	24
	337	318	19	0.0	10	5.0	227	24
	322	303	19	0.0	360	5.0	129	24
	320	301	19	0.0	350	5.0	201	24
	317	298	19	0.0	350	5.0	129	24
	310	291	19	0.0	360	5.0	158	24
	308	289	19	0.0	360	5.0	230	24
	306	287	19	0.0	360	5.0	201	24
	306	287	19	-0.00002	20	5.0	227	24
	302	283	19	0.0	360	5.0	117	24
	288	269	19	0.012	350	5.0	227	24
	280	261	19	0.0	350	5.0	200	24
	278	259	19	0.58	350	5.0	205	24
	274	255	19	0.0	10	5.0	129	24
	273	254	19	0.00035	10	5.0	158	24
	272	253	19	0.0	360	5.0	98	24
	272	253	19	0.0	350	5.0	229	24
	264	245	19	0.0	360	5.0	118	24
	264	245	19	0.0	350	5.0	118	24
	262	243	19	0.0	20	5.0	129	24
	262	243	19	0.0	10	5.0	201	24
	262	243	19	0.0	10	5.0	117	24
	261	242	19	0.0	10	5.0	230	24

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[a] With respect to the Cargill DAP No. 5 stack location.

7.0 ADDITIONAL IMPACT ANALYSIS

7.1 IMPACTS UPON VEGETATION

Cut-over pine flatwoods and mixed forest comprise the natural vegetation in the vicinity of the Cargill site. Mangrove trees and salt-tolerant plants are found near the coast. Winter vegetables and pasture grasses are cultivated inland from the facility.

Air pollutants occurring at elevated levels have long been known to potentially cause injury to plants. For SO_2, acute injury usually develops within a few hours or days of exposure. Symptoms include marginal, flecked, and/or intercostal necrotic areas which appear water-soaked and dullish green initially. This injury generally occurs to younger leaves. Chronic injury usually is evident by signs of chlorosis, bronzing, premature senescence, reduced growth and possible tissue necrosis (EPA, 1982). Background levels of sulfur dioxide range from 2.5 to 25 $\mu g/m^3$. Phytotoxic symptoms demonstrated by plants can occur as low as 88 $\mu g/m^3$ (US Department of Health, Education, and Welfare, 1971). However, this occurs with the more primitive plants (i.e., mosses, ferns, lichens).

Many studies have been conducted to determine the effects of high concentration, short-term SO_2 exposure on agronomic and natural community plants. Sensitive plants include ragweed, legumes, blackberry, southern pine, red and black oak, white ash, and sumac. These species can be injured by exposure to 3-hour SO_2 concentrations ranging from 790 to 1,570 $\mu g/m^3$. Intermediate sensitivity plants include maples, locust, sweetgum, cherry, elm, and many crop and garden species. These species can be injured by exposure to 3-hour SO_2 concentrations ranging from 1,570 to 2,100 $\mu g/m^3$. Resistant species (potentially injured at concentrations above 2,100 $\mu g/m^3$ for 3 hours) include white oak, potato, cotton, dogwood, and peach (EPA, 1982). A study of native Floridian species (Woltz and Howe, 1981) demonstrated that cypress, slash pine, live oak, and mangrove exposed to 1,300 $\mu g/m^3$ SO_2 for 8 hours were not visibly damaged. This supports the levels cited by other researchers on the effects of SO_2 on vegetation. It is important to note that because plants possess metabolisms that can convert SO_2 into cellular constituents, they are capable of recovery when exposed to elevated levels of SO_2 for short periods of time.

Based upon the predicted maximum 3-hour SO_2 concentrations from the proposed plant addition, sensitive species may be slightly damaged by short term emissions. By using a 3-hour averaging period concentration of 1,045 $\mu g/m^3$ and comparing this with the concentrations that cause plant injury, it can be shown that the SO_2 concentration 5 km from the plant (the maximum impact distance) is 1.3 times that of the most conservative concentration (790 $\mu g/m^3$) that can cause injury to sensitive species. However, it is important to realize that the modeled concentration of SO_2 from the facility represents a worst-case scenario, since the impact is based on a combination of worst-case meteorology and all facilities modeled at maximum allowable emissions. Plants would be exposed to this concentration for a minimal amount of time, if at all. Based on the SO_2 monitors in the area, the maximum measured 3-hour concentration has only been 586 $\mu g/m^3$, or less than one-half of the maximum modeled concentration.

The 24-hour and annual SO_2 concentrations predicted within 5 km of the Cargill facility (368 and 53.1 $\mu g/m^3$, respectively) represent levels that are lower than those known to cause damage to the majority of test species. Radish and barley are considered good indicators of SO_2 pollution because of their inherent sensitivities to this gas. When these two plants were exposed to 370 and 310 $\mu g/m^3$ SO_2 for 8 hours, respectively, visible damage occurred (EPA, 1982). By comparison of these levels, it is apparent that the 24-hour total maximum predicted SO_2 concentration is within a range that could potentially damage SO_2-sensitive plants. Again, it is important to realize that this modeled concentration represents a worst-case scenario. Although the concentrations of SO_2 appear to be within a hazardous range for SO_2-sensitive species in the 5-km area around the facility, concentrations modeled represent worst-case scenarios which, in reality, are not likely to occur. Actual measured SO_2 concentrations in the area have been 116 $\mu g/m^3$, 24-hour, and 29 $\mu g/m^3$, annual average. These actual levels pose minimal threats to area vegetation.

The increase in SO_2 levels due to the modification only, presented in Table 6-7, are low (less than 1 $\mu g/m^3$, annual average and 7 $\mu g/m^3$, 24-hr average) and well below any threshold affect level.

7.2 IMPACTS UPON SOILS

Soils in the vicinity of the Cargill site consist primarily of tidal lands and poorly drained sands with organic pans. These tidal lands occur along the coast between the tidal swamps and the flatwoods. The tidal lands consist of mucky fine sand to dark-gray fine sand overlying gray fine sand, mixed with broken and whole shells. These soils will not be affected by SO_2 concentrations resulting from facility emissions, because both the underlying substrate and the sea spray from the nearby Hillsborough bay are neutral to alkaline and would neutralize any acidifying effects of SO_2 deposition.

The poorly drained sands are already strongly acidic. Normal liming practices currently used on soils in the vicinity of Cargill by agricultural interests will effectively mitigate the small effects of any increased SO_2 deposition resulting from the increased SO_2 emissions from the proposed expansion.

7.3 IMPACTS UPON VISIBILITY

The existing No. 8 and No. 9 H_2SO_4 plants must currently meet an opacity limitation of 10 percent. This opacity limit is expected to be met after the plant is expanded to greater capacity. This opacity level produces essentially no visible emissions and, therefore, no increase in the visible plume from the No. 8 and No. 9 H_2SO_4 plants due to the expansion is expected.

Since the Chassahowitzka PSD Class I area is located approximately 85 km to the north of the Cargill site, a visibility impact assessment of the Class I area is required. A Level I visibility screening analysis was conducted following the procedures outlined in "Workbook for Estimating Visibility Impairment" (EPA, 1980). The Level-1 screening analysis is designed to provide a conservative estimate of plume visual impacts (i.e., impacts higher than expected). The EPA model, VISCREEN, was used for this analysis. Particulate (H_2SO_4 mist) emissions used for the calculations were based upon the total allowable emissions from the No. 8 and No. 9 H_2SO_4 plants after expansion (not just the increase in allowables due to the proposed expansion).

Model input and output results are presented in Figure 7-1. As indicated, the maximum visual impacts caused by the proposed modification do not exceed the screening criteria inside or outside the Class I area.

7.4 ADDITIONAL GROWTH

Only the existing No. 8 and No. 9 H_2SO_4 plants are being expanded at the Cargill facility, Total H_2SO_4 production capacity for the Cargill plant will increase by 500 tons per day, representing only a 7 percent increase in total capacity. A small increase in jobs, payroll, and taxes in the

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                  Visual Effects Screening Analysis for
                  Source: CARGILL H2SO4 PLANTS 8 AND 9
                    Class I Area: CHASSAHOWITZKA NWR


                    ***   Level-1 Screening   ***
Input Emissions for

   Particulates    36.30  LB /HR
   NOx (as NO2)      .00  LB /HR
   Primary NO2       .00  LB /HR
   Soot              .00  LB /HR
   Primary SO4       .00  LB /HR


    **** Default Particle Characteristics Assumed

              Transport Scenario Specifications:

    Background Ozone:                  .04 ppm
    Background Visual Range:         25.00 km
    Source-Observer Distance:        85.00 km
    Min. Source-Class I Distance:    85.00 km
    Max. Source-Class I Distance:   103.00 km
    Plume-Source-Observer Angle:     11.25 degrees
    Stability:   6
    Wind Speed:   1.00 m/s

                              R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

         Maximum Visual Impacts INSIDE  Class I Area
          Screening Criteria ARE NOT Exceeded
                                     Delta E       Contrast
                                   ===========   ============
Backgrnd Theta Azi Distance Alpha Crit  Plume    Crit  Plume
======== ===== === ======== ===== ====  =====    ====  =====
 SKY       10.  84.   85.0    84.  2.00  .056     .05   .001
 SKY      140.  84.   85.0    84.  2.00  .006     .05  -.000
 TERRAIN   10.  84.   85.0    84.  2.00  .007     .05   .000
 TERRAIN  140.  84.   85.0    84.  2.00  .002     .05   .000


         Maximum Visual Impacts OUTSIDE Class I Area
          Screening Criteria ARE NOT Exceeded
                                     Delta E       Contrast
                                   ===========   ============
Backgrnd Theta Azi Distance Alpha Crit  Plume    Crit  Plume
======== ===== === ======== ===== ====  =====    ====  =====
 SKY       10.  65.   79.3   104.  2.00  .059     .05   .001
 SKY      140.  65.   79.3   104.  2.00  .006     .05  -.000
 TERRAIN   10.  60.   77.7   109.  2.00  .009     .05   .000
 TERRAIN  140.  60.   77.7   109.  2.00  .002     .05   .000
```

Figure 7-1. Level-1 Visibility Screening Analysis for Cargill Expansion

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area is expected as a result of these changes. As a result, no significant growth-related impacts are expected due to the proposed expansion.

REFERENCES
(Page 1 of 4)

Auer, A.H. 1978. Correlation of Land Use and Cover With Meteorological Anomalies. J. Applied Meteorology, Vol. 17.

Ayazloo, M., and J.N.B. Bell. 191. Studies on the Tolerance to Sulfur Dioxide of Grass Populations in Polluted Areas. I. Identification of Tolerant Populations. New Phytologist, 88:203-222.

Briggs, G.A. 1969. Plume Rise, USAEC Critical Review Services, TID-25075.

Briggs, G.A. 1971. Some Recent Analyses of Plume Rise Observations. In Proceedings of the Second International Clean Air Congress, Academic Press, New York.

Briggs, G.A. 1972. Discussion on Chimney Plumes in Neutral and Stable Surroundings. Atmospheric Environment, 6:507-510.

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

Briggs, G.A. 1975. Plume Rise Predictions. In Lectures on Air Pollution and Environmental Impact Analysis, American Meteorological Society, Boston, Massachusetts.

Crittenden, P.D., and D.J. Read. 1979. The Effects of Air Pollution on Plant Growth With Special Reference to Sulphur Dioxide. III Growth Studies with Lolium Multiflorum Lam and Dactylis glomerato L. New Phytologist, 83:645-651.

Environmental Science and Engineering, Inc. 1984. Air Quality Impact Assessment, No. 7 and No. 8 Sulfuric Acid Plant Expansion, Gardinier, Inc. ESE No. 83-157-0100.

Florida Department of Environmental Regulation Air Construction Permit AC 29-08969, Issued February 8, 1985.

Heck, W.W., and J.A. Dunning. 1978. Response of Oats to Sulfur Dioxide: Interactions of Growth Temperature with Exposure Temperature or Humidity. Journal Air Pollution Control Association, 28:241-246.

Holzworth, G.C. 1972. Mixing Heights, Wind Speeds and Potential for Urban Air Pollution Throughout the Contiguous United States. Pub. No. AP-101. U.S. Environmental Protection Agency.

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

REFERENCES
(Page 2 of 4)

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

KBN Engineering and Applied Sciences, Inc. 1986. Personal Communications, Mr. Tom Rogers, Meteorologist, Florida Department of Environmental Regulation.

KBN Engineering and Applied Sciences, Inc. 1987. Prevention of Significant Deterioration Analysis, No. 8 Sulfuric Acid Plant Expansion, Gardinier, Inc. KBN Project No. 87001.

Kohut, R.J., et al. 1982. The National Crop Loss Assessment Network: A Summary of Field Studies. Paper 82-69.5. Session 69. Presentation at the 75th Annual Meeting of the Air Pollution Control Association.

Leighty, R.G., et al. 1958. Soil Survey of Hillsborough County, Florida. USDA Soil Conservation Service in Cooperation with Florida Agricultural Experiment Station.

Mandl, R.H., et al. 1975. Effects of Hydrogen Fluoride and Sulfur Dioxide Alone and in Combination on Several Species of Plants. Environmental Pollution, 9:133-143.

Meistrik, V. 1980. The Influence of Low SO_2 Concentrations on Growth Reduction of <u>Nicotiana</u> <u>tabacum</u> LCV Samsun and <u>Cucumis</u> <u>sativa</u> L. CV. Unikat. Environmental Pollution, 21:73-76.

MITRE Corp. 1979. A Review of Standards of Performance for New Stationary Sources--Sulfuric Acid Plants. EPA-4550/3-79-003.

Pasquill, F. 1976. Atmospheric Dispersion Parameters in Gaussian Plume Modeling. Part II. Possible Requirements for Change in the Turner Workbook Values. EPA-800/4-76-0306.

Reinert, R.A. 1982. Growth of Radish and Marigold Following Repeated Exposure to Nitrogen Dioxide, Sulfur Dioxide, and Ozone. Plant Disease, 66:122-124.

Turner, D.B. 1970. Workbook of Atmospheric Dispersion Estimates. PHS Publication No. 999-AP-26, U.S. Department of Health, Education and Welfare, National Air Pollution Control Administration, Cincinnati, Ohio.

Unzicker, H.J, H.J. Jager, and L. Steubing. Influence of SO_2 on the Vitamin Content of Plants. Angew. Bot. 49:131--139, 1975.

U.S. Department of Health, Education, and Welfare. 1971. Air Pollution Injury to Vegetation. National Air Pollution Control Administration Publication No. AP-71.

REFERENCES
(Page 3 of 4)

U.S. Environmental Protection Agency. 1977. User's Manual for Single Source (CRSTER) Model. EPA Report No. EPA-450/2-77-013, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

U.S. Environmental Protection Agency. 1978. Guidelines for Determining Best Available Control Technology (BACT). Office of Air Quality Planning and Standards.

U.S. Environmental Protection Agency. 1980. Prevention of Significant Deterioration Workshop Manual.

U.S. Environmental Protection Agency. 1980. Workbook for Estimating Visibility Impairment. Office of Air, Noise and Radiation, Office of Air Quality Planning and Standards.

U.S. Environmental Protection Agency. 1981. Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD). EPA Report No. EPA-450/4-80-012. Revised February 1981.

U.S. Environmental Protection Agency. 1982. Air Quality Criteria for Particulate Matter and Sulfur Oxides. Vol. 3.

U.S. Environmental Protection Agency. 1983. Regional Workshops on Air Quality Modeling: A Summary Report. EPA Report No. EPA-450/4-82-015.

U.S. Environmental Protection Agency. 1985a. Stack Height Regulation. Federal Register, Vol. 50, No. 130, July 8, 1985. Pg. 27892.

U.S. Environmental Protection Agency. 1985b. BACT/LAER Clearinghouse - A Compilation of Control Technology Determinations.

U.S. Environmental Protection Agency. 1986a. Guideline on Air Quality Models (Revised). EPA-450/2-78-027R.

U.S. Environmental Protection Agency. 1990a. Industrial Source Complex (ISC) Dispersion Model User's Guide - Second Edition. EPA-450/4-86-005a.

U.S. Environmental Protection Agency. 1986b. User's Network for Applied Modeling of Air Pollution (UNAMAP), Version 6. PB 86-222361.

U.S. Environmental Protection Agency. 1986d. BACT/LAER Clearinghouse: A Compilation of Control Technology Determinations. First Supplement to 1985 Edition. PB 86-226974.

REFERENCES
(Page 4 of 4)

Woltz, S.S., and T.K. Howe. 1981. Effects of Coal Burning Emissions on Florida Agriculture. In: The Impact of Increased Coal Use in Florida. Interdisciplinary Center for Aeronomy and (other) Atmospheric Sciences. University of Florida, Gainesville, Florida.

APPENDIX A

SCREENING THRESHOLD TECHNIQUE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET
ATLANTA, GEORGIA 30365

RECEIVED
SEP 12 1985
AIR QUALITY

SEP 5 1985
REF: APT-AP

Eldewins Haynes
Air Permit Unit
State of North Carolina Department of
Natural Resources & Community Development
512 North Salisbury Street
Raleigh, North Carolina 27611

Subject: A Screening Method for PSD

Dear Mr. Haynes:

This is to acknowledge receipt of your July 22, 1985, letter containing a screening procedure for eliminating sources from the emission inventory for modeling purposes. EPA has reviewed your submittal and has determined that your screening procedure is consistent with the PSD Workshop Manual. Therefore, approval is hereby given to use the screening procedure.

Sincerely yours,

Bruce P. Miller

Bruce P. Miller, Acting Chief
Air Programs Branch

DER
APR 14 1986
BAQM

State of North Carolina
Department of Natural Resources and Community Development
Division of Environmental Management
512 North Salisbury Street • Raleigh, North Carolina 27611

James G. Martin, Governor
S. Thomas Rhodes, Secretary

R. Paul Wilms
Director

July 22, 1985

Mr. Lewis Nagler
Air Management Branch
EPA Region IV
345 Courtland Street
Atlanta, Georgia 30365

Dear Mr. Nagler:

Subject: A Screening Method for PSD

A simple screening procedure which is applicable to PSD has been developed by the North Carolina Air Quality Section. The "Screening Threshold" method is designed to rapidly and objectively eliminate from the emissions inventory those sources which are beyond the PSD impact area yet within the screening area, but are not likely to have significant interaction with the PSD source. Sources which are flagged by this procedure may then be evaluated with conventional screening techniques, or else be included in refined modeling.

Page I-C-18 of the PSD Workshop Manual does state "A simple screening model technique can be used to justify the exclusion of certain emissions...Such exclusions should be justified and documented." The "Screening Threshold" method is documented in the attachment.

We would very much appreciate your comments and ultimate approval. Please feel free to direct any questions or comments to me in writing or by phone at (919) 733-7015.

Sincerely,
Eldewins Haynes

Eldewins Haynes, Meteorologist
Air Permit Unit

Attachment

cc: Mr. Ogden Gerald
Mr. Mike Sewell
Mr. Sammy Amerson
Mr. Jerry Clayton
Mr. Richard Laster
Regional Air Engineers

"Screening Threshold" Method for PSD Modeling
North Carolina Air Quality Section

This method is best suited for situations where a PSD source has several sources outside its impact area, but within its screening area. The object is to find an effective means to minimize the number of such sources in a model, yet to include all sources which are likely to have a significant impact inside the impact area.

As a first-level screening technique, it is suggested to include those sources within the screening area when

$$Q = 20D$$

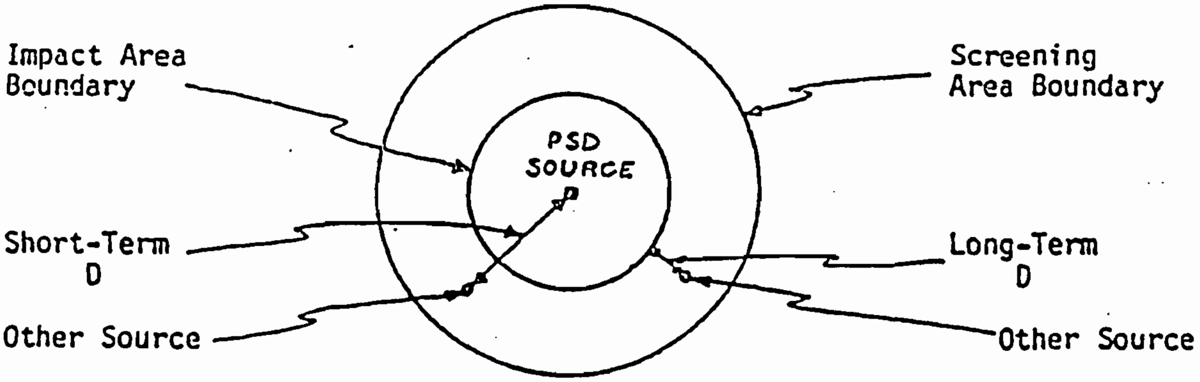
where Q is the maximum emission rate, in tons/year, of the source in the screening area; and D is a distance, in kilometers, from either:

a. the source in the screening area to the nearest edge of the impact area, for long-term analyses

or

b. the source in the screening area to the PSD source defining the impact area, for short-term analyses.

The figure below illustrates the difference between the long-term D and the short-term D.



This method does not preclude the use of alternate screening techniques or of more sophisticated screening techniques given the approval of the review agency. Also, this method does not prevent the review agency from specifying additional sources of interest in the modeling analysis.

The justification for this "Screening Threshold Method" rests upon the following assumptions:

a. effective stack height = 10 meters
b. stability class D (neutral)
c. 2.5 meter/second wind speed
d. mixing height = 300 meters
e. Q = 20D = critical emission rate for a given pollutant
f. one-hour concentrations derived from figure 3-5D in Turner's WADE or from PTDIS.
g. 3-hour and 24-hour concentrations estimated using "Vol. 10R". Annual impacts are 1/7 of 24 hour impacts.

The results, for various distances, are shown in the table below:

D (km)	Q (T/yr)	1-hr Conc. (ug/m^3)	3-hr Conc. (ug/m^3)	24-hr Conc. (ug/m^3)	Annual Conc. (ug/m^3)
0.5	10	47	42	19	2.7
1.0	20	32	29	13	1.9
1.5	30	27	24	10	1.4
2.0	40	23	21	9	1.3
3	60	18	16	7	1.0
4	80	17	15	7	1.0
5	100	14	13	6	1
6	120	13	12	5	1
10	200	10	9	4	1
20	400	7	6	3	1
30	600	6	6	3	1
40	800	6	6	3	1
50	1000	7	6	3	1

The "Screening Threshold" method is conservative. Most sources either have effective stack heights greater than 10 meters; or they have several short stacks spread out over an industrial complex. Thus, actual modeled concentrations will most likely be lower than the "Screening Threshold" would indicate in the table above. One implication of the table is that all major sources within 5 km of the subject PSD source or within 5 km of the PSD source's impact area should be scrutinized before being exempted from the final emissions inventory.

The "Screening Threshold" method is in qualitative agreement with the suggestions on page I-C-18 of the Prevention of Significant Deterioration Workshop Manual (1980). On that page, it is suggested that a 100 T/Y source 10 km outisde the impact area may be excluded from the analysis. The above table would exclude a 100 T/Y source more than 5 km beyond the impact area for long-term analyses or more than 5 km away from the PSD source for short-term analyses; if the source is inside the impact area, it must be included regardless of the "Screening

Threshold". The PSD Workshop Manual also states on page I-C-18 that a 10,000 T/Y source 40 km outside the impact area would probably have to be included in the increment analysis. By the "Screening Threshold" method, the critical distance D = Q/20 = 10,000/20 = 500 km. Thus a 10,000 T/Y source within 500 km would always be included for short-term and long-term analyses if within the screening area.

This "Screening Threshold" method is quick, inexpensive to execute, conservative, and consistent with the intent of the PSD Workshop Manual.

APPENDIX B

SO_2 EMISSION RATE CALCULATIONS

SO_2 Emission Rate Calculations

GTSP

Maximum heat input to dryer: 30.0 MMBtu/hr (permit condition)
Fuel oil heating capacity: 141,000 Btu/gal
AP42 emission factor: 142 x S (S = percent sulfur in fuel)
0.5% sulfur fuel oil

30.0×10^6 Btu/hr + 141,000 Btu/gal fuel x
(142 x 0.5 lbs $SO_2/10^3$ gal fuel) = 15.11 lbs SO_2/hr

SSF

Maximum fuel use: 17.74 gal/hr (permit condition)
AP42 emission factor: 142 x S (S = percent sulfur in fuel)
0.5% sulfur fuel oil

17.74 gal fuel/hr x (142 x 0.5 lbs $SO_2/10^3$ gal fuel) = 1.26 lb SO_2/hr

DAP 5

Emission rate taken from No. 5 DAP production rate increase application for construction, May 1991.

H_2SO_4 Plant 7

Current production rate: 2,200 tons acid/day = 91.7 tons acid/hr
Maximum SO_2 emission rate: 4.0 lbs SO_2/ton acid

91.7 tons acid/hr x 4.0 lb SO_2/ton acid = 366.8 lb SO_2/hr

H_2SO_4 Plant 8

Proposed production rate: 2,600 tons acid/day = 108.3 tons acid/hr
Maximum SO_2 emission rate: 4.0 lbs SO_2/ton acid

108.3 tons acid/hr x 4.0 lb SO_2/ton acid = 433.2 lb SO_2/hr

H_2SO_4 Plant 9

Proposed production rate: 3,200 tons acid/day = 133.3 tons acid/hr
Maximum SO_2 emission rate: 4.0 lbs SO_2/ton acid

133.3 tons acid/hr x 4.0 lb SO_2/ton acid = 533.2 lb SO_2/hr

APPENDIX C

SO_2 EMISSION INVENTORY

91125C2
12/11/91

Table C-1. Summary of Individual Source Emission and Operating Parameters for Facilities Considered in the Modeling Analysis (1 of 9)

APIS Number	Facility	Location Relative to Cargill X (m)	Location Relative to Cargill Y (m)	Distance from Cargill (km)	APIS Src #	Stack Height (ft)	Stack Height (m)	Stack Diameter (ft)	Stack Diameter (m)	Exit Velocity (ft/s)	Exit Velocity (m/s)	Temperature (°F)	Temperature (K)	Emissions (lb/hr)	Emissions (TPY)	Emissions (g/s)	Used in the Screening Analysis?
40HIL290024	IMC - Port Sutton	-2800	5300	6.0	01	65.0	19.80	7.9	2.41	34.4	10.50	150	339	329.5	1443	41.5	Yes
40HIL290040	TECO - Gannon	-2900	5300	6.0	01	306.0	93.27	10.4	3.17	79.0	24.08	309	427	3017.0	9669	380.1 (e) 278.1 (f)	Yes
					02	306.0	93.27	10.4	3.17	79.0	24.08	309	427	3017.0	9669	380.1 (e) 278.1 (f)	
					03	306.0	93.27	11.0	3.35	99.0	30.18	300	422	3838.0	12301	483.6 (e) 353.9 (f)	
					04	306.0	93.27	10.0	3.05	72.0	21.95	329	438	4502.0	14429	567.3 (e) 415.1 (f)	
					05	306.0	93.27	10.8	3.29	23.0	37.49	288	415	5482.0	17570	690.7 (e) 505.4 (f)	
					06	306.0	93.27	17.5	5.33	77.0	23.47	292	418	9115.0	29215	1148.5 (e) 840.4 (f)	
					07	35.0	10.67	5.0	1.52	16.4	5.00	1010	816	94.4	413	11.9	
													TOTAL	29065.4	93266	3662.2 (e) 2682.9 (f)	
40HIL290039	TECO - Big Bend (a)	-1000	-7200	7.3	01,02	490.0	149.35	24.0	7.32	94.0	28.65	300	422	42000.0 33333.4	183960 146000	5292.0 (c) 4200.0 (d)	Yes
					03	490.0	149.35	24.0	7.32	47.0	14.33	292	418	21000.0 16666.7	91980 73000	2646.0 (c) 2100.0 (d)	
					04	490.0	149.35	24.0	7.32	65.0	19.81	156	342	5190.0	15552	653.9	
					05	75.0	22.86	14.0	4.27	26.8	8.17	928	771	329.8	1445	41.6	
					06	75.0	22.86	14.0	4.27	26.8	8.17	928	771	329.8	1445	41.6	
					07	35.0	10.67	10.4	3.17	18.2	5.55	1010	816	94.2	413	11.9	
													TOTAL	68943.8 55943.9	294795 237855	8687.0 (c) 7049.0 (d)	

Table C-1. Summary of Individual Source Emission and Operating Parameters for Facilities Considered in the Modeling Analysis (2 of 9)

APIS Number	Facility	Location Relative to Cargill X (m)	Location Relative to Cargill Y (m)	Distance from Cargill (km)	APIS Src #	Stack Height (ft)	Stack Height (m)	Stack Diameter (ft)	Stack Diameter (m)	Exit Velocity (ft/s)	Exit Velocity (m/s)	Temperature (°F)	Temperature (K)	Emissions (lb/hr)	Emissions (TPY)	Emissions (g/s)	Used in the Screening Analysis?
40HIL290082	Sulfur Terminals Co.	-4900	7800	9.2	01	30.0	9.14	1.8	0.55	17.0	5.18	660	622	48.0	210	6.0	No
40HIL290018	Lafarge Corp.	-5000	8500	9.9	29	146.0	44.50	8.0	2.44	132.0	40.23	431	495	4633.0	20293	583.8	Yes
40HIL290038	TECO - Hookers Point	-4900	8800	10.1	01	280.0	85.34	11.3	3.44	20.0	6.10	295	419	328.0	1437	41.3	Yes
					02	280.0	85.34	11.3	3.44	18.0	5.49	329	438	328.0	1437	41.3	
					03	280.0	85.34	12.0	3.66	26.0	7.92	322	434	452.7	1983	57.0	
					04	280.0	85.34	12.0	3.66	24.0	7.32	300	422	452.0	1980	57.0	
					05	280.0	85.34	11.3	3.44	36.0	10.97	347	448	671.0	2939	84.5	
					06	280.0	85.34	9.4	2.87	73.0	22.25	322	434	856.0	3749	107.9	
												TOTAL		3087.7	13524	389.1	
40HIL290127	McKay Bay Resource Recovery	-2900	9700	10.1	01	160.0	48.77	5.8	1.77	97.0	29.57	540	555	42.5	186	5.4	No
					02	160.0	48.77	5.8	1.77	97.0	29.57	540	555	42.5	186	5.4	
					03	160.0	48.77	5.8	1.77	97.0	29.57	540	555	42.5	186	5.4	
					04	160.0	48.77	5.8	1.77	97.0	29.57	540	555	42.5	186	5.4	
												TOTAL		170.0	745	21.4	
40HIL290083	AMOCO Oil	-5100	9800	11.0	01	36.0	10.97	2.8	0.85	12.0	3.66	520	544	38.0	166	4.8	No
					02	36.0	10.97	2.8	0.85	12.0	3.66	520	544	31.3	137	3.9	
												TOTAL		69.3	304	8.7	

Table C-1. Summary of Individual Source Emission and Operating Parameters for Facilities Considered in the Modeling Analysis (3 of 9)

APIS Number	Facility	Location Relative to Cargill X (m)	Location Relative to Cargill Y (m)	Distance from Cargill (km)	APIS Src #	Stack Height (ft)	Stack Height (m)	Stack Diameter (ft)	Stack Diameter (m)	Exit Velocity (ft/s)	Exit Velocity (m/s)	Temperature (°F)	Temperature (K)	Emissions (lb/hr)	Emissions (TPY)	Emissions (g/s)	Used in the Screening Analysis?
40HIL290005	Central Phosphate	-4000	10600	11.3	01	25.0	7.62	3.5	1.07	58.0	17.68	550	561	158.5	694	20.0	Yes
					02	110.0	33.53	5.0	1.52	64.0	19.51	110	316	350.0	1533	44.1	
					03	110.0	33.53	5.0	1.52	64.0	19.51	110	316	350.0	1533	44.1	
					07	199.0	60.66	8.0	2.44	53.0	16.15	175	353	400.0	1752	50.4	
					08	199.0	60.66	8.0	2.44	31.0	9.45	148	338	317.0	1388	39.9	
					10	94.0	28.65	10.0	3.05	26.0	7.92	128	326	23.5	103	3.0	
					11	180.0	54.86	9.2	2.80	43.0	13.11	137	331	104.6	458	13.2	
					12	180.0	54.86	9.2	2.80	26.0	7.92	105	314	104.6	458	13.2	
					16	180.0	54.86	9.2	2.80	32.0	9.75	125	325	104.6	458	13.2	
					17	180.0	54.86	9.2	2.80	4.0	1.22	125	325	104.6	458	13.2	
													TOTAL	2017.4	8836	254.2	
40HIL290057	Gulf Coast Lead	1000	11600	11.6	01	97.0	29.57	2.0	0.61	123.0	37.49	160	344	374.0	1638	47.1	Yes
40HIL290261	Hillsborough County Resource Recovery	5300	10500	11.8	01	219.8	67.00	11.5	3.50	55.4	16.90	430	494	234.9	1029	29.6	Yes
40HIL290028	Gold Bond Building Products	-15600	500	15.6	21	42.0	12.80	1.1	0.34	59.0	17.98	350	450	0.01	0.04	0.001	No
					23	42.0	12.80	1.1	0.34	50.0	15.24	350	450	0.01	0.04	0.001	
					24	42.0	12.80	1.1	0.34	61.0	18.59	350	450	0.01	0.04	0.001	
					28	42.0	12.80	1.1	0.34	71.0	21.64	350	450	5.1	22	0.6	
					29	42.0	12.80	1.1	0.34	71.0	21.64	350	450	5.1	22	0.6	
					30	42.0	12.80	1.1	0.34	71.0	21.64	350	450	2.1	9	0.3	
					31	42.0	12.80	1.1	0.34	71.0	21.64	350	450	5.1	22	0.6	
					34	47.0	14.33	2.5	0.76	67.0	20.42	309	427	27.3	120	3.4	
					36	64.0	19.51	3.5	1.07	40.0	12.19	185	358	4.0	17	0.5	
					47	35.0	10.67	2.8	0.85	64.0	19.51	300	422	27.0	118	3.4	
													TOTAL	75.7	332	9.5	

Table C-1. Summary of Individual Source Emission and Operating Parameters for Facilities Considered in the Modeling Analysis (4 of 9)

APIS Number	Facility	Location Relative to Cargill X (m)	Location Relative to Cargill Y (m)	Distance from Cargill (km)	APIS Src #	Stack Height (ft)	Stack Height (m)	Stack Diameter (ft)	Stack Diameter (m)	Exit Velocity (ft/s)	Exit Velocity (m/s)	Temperature (°F)	Temperature (K)	Emissions (lb/hr)	Emissions (TPY)	Emissions (g/s)	Used in the Screening Analysis?
40PNL520011	FPC - Bartow	-20500	500	20.5	01	300.0	91.44	9.0	2.74	119.0	36.27	312	429	3558.0	15584	448.3	Yes
					02	300.0	91.44	9.0	2.74	102.0	31.09	305	425	3558.0	15584	448.3	
					03	300.0	91.44	11.0	3.35	113.0	34.44	275	408	5635.0	24681	710.0	
					04	30.0	9.14	3.0	0.91	17.0	5.18	515	541	14.4	63	1.8	
					05	45.0	13.72	17.3	5.27	73.0	22.25	930	772	569.2	2493	71.7	
					06	45.0	13.72	17.3	5.27	73.0	22.25	930	772	569.2	2493	71.7	
					08	45.0	13.72	17.3	5.27	73.0	22.25	930	772	392.5	1719	49.5	
													TOTAL	14296.3	62618	1801.3	
40PNL520013	FPC - Bayboro	-24100	-10900	26.5	01	40.0	12.19	22.9	6.98	21.0	6.40	900	755	392.5	1719	49.5	No
					02	40.0	12.19	22.9	6.98	21.0	6.40	900	755	392.5	1719	49.5	
					03	40.0	12.19	22.9	6.98	21.0	6.40	900	755	392.5	1719	49.5	
					04	40.0	12.19	22.9	6.98	21.0	6.40	900	755	392.5	1719	49.5	
													TOTAL	1569.9	6876	197.8	
40PNL520117	Pinellas County Resource Recovery	-27700	1900	27.8	03	161.0	49.07	9.0	2.74	90.0	27.43	450	505	525.0	2300	66.2	No
40MAN410010	FPL - Manatee	4400	-28000	28.3	01	475.0 (b)	144.78	26.2	7.99	56.0	17.07	307	426	9515.0	41676	1198.9	Yes
					02	475.0 (b)	144.78	26.2	7.99	56.0	17.07	307	426	9515.0	41676	1198.9	
													TOTAL	19030.0	83351	2397.8	
40MAN410002	Royster Phosphate	-14400	-24900	28.8	01	200.0	60.96	7.8	2.38	33.0	10.06	147	337	334.0	1463	42.1	No

Table C-1. Summary of Individual Source Emission and Operating Parameters for Facilities Considered in the Modeling Analysis (5 of 9)

APIS Number	Facility	Location Relative to Cargill X (m)	Location Relative to Cargill Y (m)	Distance from Cargill (km)	APIS Src #	Stack Height (ft)	Stack Height (m)	Stack Diameter (ft)	Stack Diameter (m)	Exit Velocity (ft/s)	Exit Velocity (m/s)	Temperature (°F)	Temperature (K)	Emissions (lb/hr)	Emissions (TPY)	Emissions (g/s)	Used in the Screening Analysis?
40HIL290101	IMC - Fort Lonesome	26600	-14300	30.2	01	125.0	38.10	8.0	2.44	49.0	14.94	151	339	195.0	683	24.6	No
					02	125.0	38.10	8.0	2.44	55.0	16.76	151	339	195.0	854	24.6	
					05	20.0	6.10	1.0	0.30	27.0	8.23	650	616	1.0	10	0.1	
													TOTAL	391.0	1547	49.3	
40PNL520012	FPC - Higgins	-26400	16200	31.0	01	174.0	53.04	12.5	3.81	27.0	8.23	312	429	771.9	3381	97.3	Yes
					02	174.0	53.04	12.5	3.81	27.0	8.23	310	428	753.0	3298	94.9	
					03	174.0	53.04	12.5	3.81	24.0	7.32	301	423	1031.1	4516	129.9	
					04	55.0	16.76	15.1	4.60	372.0	113.39	850	728	33.4	146	4.2	
					05	55.0	16.76	15.1	4.60	372.0	113.39	850	728	44.7	196	5.6	
					06	55.0	16.76	15.1	4.60	372.0	113.39	850	728	7.6	33	1.0	
					07	53.0	16.15	15.1	4.60	372.0	113.39	850	728	114.6	502	14.4	
													TOTAL	2756.2	12072	347.3	
40TPA530059	IMC - New Wales	33800	-2800	33.9	02	200.0	60.96	8.5	2.59	41.0	12.50	170	350	402.7	1764	50.7	Yes
					03	200.0	60.96	8.5	2.59	41.0	12.50	170	350	395.0	1730	49.8	
					04	200.0	60.96	8.5	2.59	41.0	12.50	170	350	410.5	1798	51.7	
					09	133.0	40.54	7.0	2.13	49.0	14.94	105	314	74.6	327	9.4	
					13	95.0	28.96	5.6	1.71	56.0	17.07	556	564	52.6	230	6.6	
					27	172.0	52.43	8.0	2.44	43.0	13.11	120	322	18.3	80	2.3	
					42	200.0	60.96	8.5	2.59	41.0	12.50	170	350	458.0	2006	57.7	
					44	200.0	60.96	8.5	2.59	41.0	12.50	170	350	458.3	2007	57.7	
					45	171.0	52.12	6.0	1.83	58.0	17.68	110	316	9.7	43	1.2	
					46	171.0	52.12	6.0	1.83	58.0	17.68	110	316	22.0	96	2.8	
					47	94.0	28.65	6.0	1.83	35.0	10.67	175	353	19.9	87	2.5	
													TOTAL	2321.6	10169	292.5	

Table C-1. Summary of Individual Source Emission and Operating Parameters for Facilities Considered in the Modeling Analysis (6 of 9)

APIS Number	Facility	Location Relative to Cargill X (m)	Location Relative to Cargill Y (m)	Distance from Cargill (km)	APIS Src #	Stack Height (ft)	Stack Height (m)	Stack Diameter (ft)	Stack Diameter (m)	Exit Velocity (ft/s)	Exit Velocity (m/s)	Temperature (°F)	Temperature (K)	Emissions (lb/hr)	Emissions (TPY)	Emissions (g/s)	Used in the Screening Analysis?
40HIL290075	Consolidated Minerals	30900	14100	34.0	20	20.0	6.10	1.2	0.37	66.0	20.12	630	605	1.0	4	0.1	No
					22	152.0	46.33	5.8	1.77	39.0	11.89	80	300	91.8	402	11.6	
					24	152.0	46.33	5.8	1.77	36.0	10.97	72	295	74.0	324	9.3	
					26	152.0	46.33	5.8	1.77	43.0	13.11	77	298	122.4	536	15.4	
												TOTAL		289.2	1267	36.4	
40TPA530047	Mobil Chemical Co. (Nichols)	35500	3100	35.6	01	80.0	24.38	7.5	2.29	41.0	12.50	160	344	156.6	686	19.7	No
					02	80.0	24.38	7.5	2.29	41.0	12.50	160	344	156.6	686	19.7	
					03	100.0	30.48	3.6	1.10	62.0	18.90	150	339	0.4	2	0.05	
					04	85.0	25.91	7.5	2.29	52.0	15.85	150	339	19.4	85	2.4	
					08	13.0	3.96	2.5	0.76	6.0	1.83	480	522	13.9	40	1.8	
												TOTAL		346.9	1498	43.7	
40TPA530057	Conserv. Chemicals	35800	2000	35.9	02	52.0	15.85	2.5	0.76	66.0	20.12	120	322	2.5	11	0.3	No
					05	150.0	45.72	7.5	2.29	33.0	10.06	170	350	333.3	1460	42.0	
					12	81.0	24.69	7.5	2.29	12.0	3.66	130	328	26.5	116	3.3	
					15	27.0	8.23	2.0	0.61	45.0	13.72	500	533	0.9	4	0.1	
					16	39.0	11.89	3.2	0.98	29.0	8.84	500	533	1.3	6	0.2	
												TOTAL		364.5	1597	45.9	
40TPA530060	Mobil-Electrophosphate Division	42700	-2800	42.8	02	96.0	29.26	7.0	2.13	25.0	7.62	93	307	56.4	247	7.1	No
					04	100.0	30.48	4.3	1.31	40.0	12.19	115	319	228.1	999	28.7	
					06	24.0	7.32	1.5	0.46	42.0	12.80	300	422	17.5	77	2.2	
					07	24.0	7.32	3.0	0.91	10.0	3.05	375	464	8.7	38	1.1	
					08	60.0	18.29	2.5	0.76	47.0	14.33	120	322	18.0	79	2.3	
												TOTAL		328.7	1440	41.4	

Table C-1. Summary of Individual Source Emission and Operating Parameters for Facilities Considered in the Modeling Analysis (7 of 9)

APIS Number	Facility	Location Relative to Cargill X (m)	Location Relative to Cargill Y (m)	Distance from Cargill (km)	APIS Src #	Stack Height (ft)	Stack Height (m)	Stack Diameter (ft)	Stack Diameter (m)	Exit Velocity (ft/s)	Exit Velocity (m/s)	Temperature (°F)	Temperature (K)	Emissions (lb/hr)	Emissions (TPY)	Emissions (g/s)	Used in the Screening Analysis?
40TPA530008	Royster Co.	43900	2900	44.0	02	200.0	60.96	7.0	2.13	32.0	9.75	200	366	283.3	1190	35.7	No
					05	102.0	31.09	8.8	2.68	26.0	7.92	110	316	9.0	39	1.1	
					09	45.0	13.72	3.7	1.13	8.0	2.44	80	300	0.5	2	0.1	
													TOTAL	292.8	1232	36.9	
40TPA530055	Agrico Chemical	44600	-10700	45.1	01	35.0	10.67	4.8	1.46	51.0	15.54	430	494	63.5	278	8.0	No
					04	150.0	45.72	5.1	1.55	92.0	28.04	170	350	287.7	1260	36.3	
					05	150.0	45.72	5.1	1.55	85.0	25.91	160	344	287.7	1260	36.3	
					06	150.0	45.72	9.5	2.90	31.0	9.45	170	350	333.0	1459	42.0	
					10	125.0	38.10	10.0	3.05	47.0	14.33	130	328	33.5	147	4.2	
					23	140.0	42.67	9.0	2.74	34.0	10.36	89	305	132.0	578	16.6	
													TOTAL	1137.4	4982	143.3	
40TPA530052	C.F. Industries	45100	200	45.9	03	112.0	34.14	4.0	1.22	57.0	17.37	90	305	316.4	1386	39.9	No
					04	112.0	34.14	4.0	1.22	64.0	19.51	90	305	399.8	1751	50.4	
					05	206.0	62.79	7.0	2.13	21.0	6.40	150	339	439.3	1924	55.4	
					06	206.0	62.79	7.0	2.13	21.0	6.40	140	333	459.4	2012	57.9	
					14	201.0	61.26	8.5	2.59	28.0	8.53	170	350	312.8	1370	39.4	
													TOTAL	1927.7	8443	242.9	
40TPA530053	Farmland Industries	46600	-2100	46.6	01	100.0	30.48	4.5	1.37	61.0	18.59	95	308	221.0	449	27.8	No
					02	100.0	30.48	4.5	1.37	60.0	18.29	95	308	169.5	446	21.4	
					03	100.0	30.48	7.5	2.29	28.0	8.53	170	350	347.5	1522	43.8	
					04	100.0	30.48	7.5	2.29	31.0	9.45	174	352	86.6	379	10.9	
					28	95.0	28.96	5.5	1.68	11.0	3.35	630	605	18.6	81	2.3	
													TOTAL	843.2	2878	106.2	

Table C-1. Summary of Individual Source Emission and Operating Parameters for Facilities Considered in the Modeling Analysis (8 of 9)

APIS Number	Facility	Location Relative to Cargill		Distance from Cargill	APIS Src	Stack Height		Stack Diameter		Exit Velocity		Temperature		Emissions			Used in the Screening Analysis?
		X (m)	Y (m)	(km)	#	(ft)	(m)	(ft)	(m)	(ft/s)	(m/s)	(°F)	(K)	(lb/hr)	(TPY)	(g/s)	
40TPA530046	W.R. Grace/ Seminole Fertilizer	46900	4500	47.1	08	150.0	45.72	6.7	2.04	30.0	9.14	88	304	460.0	2015	58.0	No
					12	200.0	60.96	5.0	1.52	80.0	24.38	155	341	283.1	1240	35.7	
					13	100.0	30.48	6.7	2.04	43.0	13.11	125	325	1.4	6	0.2	
					14	53.0	16.15	2.2	0.67	13.0	3.96	84	302	0.7	3	0.1	
					21	132.0	40.23	7.0	2.13	86.0	26.21	110	316	35.0	153	4.4	
					30	80.0	24.38	6.6	2.01	54.0	16.46	105	314	0.01	1	0.001	
					31	50.0	15.24	6.7	2.04	56.0	17.07	140	333	326.0	1428	41.1	
					32	200.0	60.96	5.0	1.52	93.0	28.35	165	347	264.8	1160	33.4	
					33	200.0	60.96	5.0	1.52	93.0	28.35	165	347	170.5	747	21.5	
					39	50.0	15.24	6.7	2.04	56.0	17.07	140	333	326.0	1428	41.1	
													TOTAL	1867.5	8180	235.3	
NA	Hardee Power Station	41900	-24800	48.7	--	75.0	22.86	16.0	4.88	54.2	16.52	240	389	2738.0	11992	345.0	Yes
40TPA530004	Lakeland City Power	46300	24000	52.2	01	150.0	45.72	9.0	2.74	78.0	23.77	295	419	2797.9	12255	352.5	Yes
					02	20.0	6.10	2.6	0.79	77.0	23.47	715	653	11.6	51	1.5	
					03	20.0	6.10	2.6	0.79	77.0	23.47	715	653	11.6	51	1.5	
					04	36.0	10.97	9.2	2.80	1.0	0.30	965	791	66.0	289	8.3	
					05	150.0	45.72	10.4	3.17	69.0	21.03	265	403	203.7	892	25.7	
					06	250.0	76.20	16.0	4.88	107.0	32.61	170	350	3888.0	17029	489.9	
													TOTAL	6978.8	30567	879.3	

Table C-1. Summary of Individual Source Emission and Operating Parameters for Facilities Considered in the Modeling Analysis (9 of 9)

APIS Number	Facility	Location Relative to Cargill X (m)	Location Relative to Cargill Y (m)	Distance from Cargill (km)	APIS Src #	Stack Height (ft)	Stack Height (m)	Stack Diameter (ft)	Stack Diameter (m)	Exit Velocity (ft/s)	Exit Velocity (m/s)	Temperature (°F)	Temperature (K)	Emissions (lb/hr)	Emissions (TPY)	Emissions (g/s)	Used in the Screening Analysis?
40TPA510017	FPC - Anclote	-38500	36500	53.1	--	499.0	152.10	24.0	7.32	62.7	19.10	320	433	13341.3	58437	1681.0	Yes
					--	499.0	152.10	24.0	7.32	62.3	19.00	316	431	13341.3	58437	1681.0	
													TOTAL	26682.5	116874	3362.0	

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[a] TECO Big Bend Units 1,2,3 are subject to a 3-hour limit of 31.5 tons per hour for all 3 units, and a 24-hour and annual limit of 25 tons per hour for all 3 units.
[b] GEP stack height. Actual stack height is 499 feet (152.1 m).
[c] Used to predict 3-hour impacts based on permit limitations.
[d] Used to predict 24-hour and annual impacts based on permit limitations.
[e] Used to predict 3- and 24-hour impacts.
[f] Used to predict annual impacts.

Table C-2. Summary of Combined Source Emission and Operating Parameters for the Facilities Considered in the Modeling Analysis (Page 1 of 5)

APIS Number	Facility	Location Relative to Cargill X (m)	Location Relative to Cargill Y (m)	Distance from Cargill (km)	APIS Source Number(s)	Stack Data Height (m)	Stack Data Diameter (m)	Operating Data Velocity (m/s)	Operating Data Temp (K)	Emissions Data (g/s)	Modeled Source Number
40HIL290024	IMC - Port Sutton	-2800	5300	6.0	01	19.80	2.41	10.50	339	41.5	1
40HIL290040	TECO - Gannon	-2900	5300	6.0	01,02	93.27	3.17	24.08	427	760.2 (e) 556.2 (f)	2
					03	93.27	3.35	30.18	422	483.6 (e) 353.9 (f)	
					04	93.27	3.05	21.95	438	567.3 (e) 415.1 (f)	
					05	93.27	3.29	37.49	415	690.7 (e) 505.4 (f)	
					06	93.27	5.33	23.47	418	1,148.5 (e) 840.4 (f)	
					07	10.67	1.52	5.00	816	11.9	
									TOTAL	3,662.2 (e) 2,682.9 (f)	
40HIL290039	TECO - Big Bend (a)	-1000	-7200	7.3	01	149.35	7.32	28.65	422	5292.0 (c) 4200.0 (d)	3
					03	149.35	7.32	14.33	418	2646.0 (c) 2100.0 (d)	
					04	149.35	7.32	19.81	342	653.9	
					05	22.86	4.27	8.17	771	41.6	
					06	22.86	4.27	8.17	771	41.6	
					07	10.67	3.17	5.55	816	11.9	
									TOTAL	8687.0 (c) 7049.0 (d)	
40HIL290082	Sulfur Terminals Co.	-4900	7800	9.2	01	9.14	0.55	5.18	622	6.0	4

Table C-2. Summary of Combined Source Emission and Operating Parameters for the Facilities Considered in the Modeling Analysis (Page 2 of 5)

APIS Number	Facility	Location Relative to Cargill		Distance from Cargill (km)	APIS Source Number(s)	Stack Data		Operating Data		Emissions Data (g/s)	Modeled Source Number
		X (m)	Y (m)			Height (m)	Diameter (m)	Velocity (m/s)	Temp (K)		
40HIL290018	Lafarge Corp.	-5000	8500	9.9	29	44.50	2.44	40.23	495	583.8	5
40HIL290038	TECO - Hookers Point	-4900	8800	10.1	01,02,03,04,05	85.34	3.44	10.97	448	281.1	6
					06	85.34	2.87	22.25	434	107.9	
									TOTAL	389.0	
40HIL290127	McKay Bay Resource Recovery	-2900	9700	10.1	01,02,03,04	48.77	1.77	29.57	555	21.6	7
40HIL290083	AMOCO Oil	-5100	9800	11.0	01,02	10.97	0.85	3.66	544	8.7	8
40HIL290005	Central Phosphate	-4000	10600	11.3	01,10	7.62	1.07	17.68	561	23.0	9
					02,03	33.53	1.52	19.51	316	88.2	
					07,08	60.66	2.44	9.45	338	90.3	
					11,12,16,17	54.86	2.80	7.92	314	52.8	
									TOTAL	254.3	
40HIL290057	Gulf Coast Lead	1000	11600	11.6	01	29.57	0.61	37.49	344	47.1	10
40HIL290261	Hillsborough County Resource Recovery	5300	10500	11.8	01	67.00	3.50	16.90	494	29.6	11
40HIL290028	Gold Bond Building Products	-15600	500	15.6	21,23,24,28,29 30,31,34,36,47	14.33	0.76	20.42	427	9.4	12

Table C-2. Summary of Combined Source Emission and Operating Parameters for the Facilities Considered in the Modeling Analysis (Page 3 of 5)

APIS Number	Facility	Location Relative to Cargill X (m)	Location Relative to Cargill Y (m)	Distance from Cargill (km)	APIS Source Number(s)	Stack Data Height (m)	Stack Data Diameter (m)	Operating Data Velocity (m/s)	Operating Data Temp (K)	Emissions Data (g/s)	Modeled Source Number
40PNL520011	FPC - Bartow	-20500	500	20.5	01,02,03	91.44	3.35	34.44	408	1606.6	13
					04,05,06,08	13.72	5.27	22.25	772	194.7	
									TOTAL	1801.3	
40PNL520013	FPC - Bayboro	-24100	-10900	26.5	01,02,03,04	12.19	6.98	6.40	755	197.8	14
40PNL520117	Pinellas County Resource Recovery	-27700	1900	27.8	03	49.07	2.74	27.43	505	66.2	15
40MAN410010	FPL - Manatee	4400	-28000	28.3	01,02	144.78 (b)	7.99	17.07	426	2397.8	16
40MAN410002	Royster Phosphate	-14400	-24900	28.8	01	60.96	2.38	10.06	337	42.1	17
40HIL290101	IMC - Fort Lonesome	26600	-14300	30.2	01,02,05	38.10	2.44	16.76	339	49.3	18
40PNL520012	FPC - Higgins	-26400	16200	31.0	01,02,03	53.04	3.81	7.32	423	322.1	19
					04,05,06,07	16.15	4.60	113.39	728	25.2	
									TOTAL	347.3	
40TPA530059	IMC - New Wales	33800	-2800	33.9	02,03,04,09, 13,27,42,44, 45,46,47	60.96	2.59	12.50	350	292.4	20
40HIL290075	Consolidated Minerals	30900	14100	34.0	20,22,24,26	46.33	1.77	13.11	298	36.4	21
40TPA530047	Mobil Chemical Co.	35500	3100	35.6	01,02,03,04,08	24.38	2.29	12.50	344	43.6	22

Table C-2. Summary of Combined Source Emission and Operating Parameters for the Facilities Considered in the Modeling Analysis (Page 4 of 5)

APIS Number	Facility	Location Relative to Cargill X (m)	Location Relative to Cargill Y (m)	Distance from Cargill (km)	APIS Source Number(s)	Stack Data Height (m)	Stack Data Diameter (m)	Operating Data Velocity (m/s)	Operating Data Temp (K)	Emissions Data (g/s)	Modeled Source Number
40TPA530057	Conserv. Chemicals	35800	2000	35.9	02,05,12,15,16	45.72	2.29	10.06	350	45.9	23
40TPA530060	Mobil-Electrophosphate	42700	-2800	42.8	02,04,06,07,08	30.48	1.31	12.19	319	41.4	24
40TPA530008	Royster Co.	43900	2900	44.0	02,05,09	60.96	2.13	9.75	366	36.9	25
40TPA530052	C.F. Industries	45100	200	45.1	03,04	34.14	1.22	19.51	305	90.3	26
					05,06	62.79	2.13	6.40	333	113.3	
					14	61.26	2.59	8.53	350	39.4	
									TOTAL	243.0	
40TPA530055	Agrico Chemical	44600	-10700	45.9	01,04,05,06 10,23	45.72	2.90	9.45	350	143.4	27
40TPA530053	Farmland Industries	46600	-2100	46.6	01,02	30.48	1.37	18.59	308	49.2	28
					03,04,28	30.48	2.29	8.53	350	57.0	
									TOTAL	106.2	
40TPA530046	W.R. Grace/ Seminole Fertilizer	46900	4500	47.1	08,13,14,30	45.72	2.04	9.14	304	58.3	29
					12,21,32,33	60.96	1.52	28.35	347	95.0	
					31,39	15.24	2.04	17.07	333	82.2	
									TOTAL	235.5	
NA	Hardee Power Station	41900	-24800	48.7	--	22.86	4.88	16.52	389	345.0	30

Table C-2. Summary of Combined Source Emission and Operating Parameters for the Facilities Considered in the Modeling Analysis (Page 5 of 5)

APIS Number	Facility	Location Relative to Cargill X (m)	Location Relative to Cargill Y (m)	Distance from Cargill (km)	APIS Source Number(s)	Stack Data Height (m)	Stack Data Diameter (m)	Operating Data Velocity (m/s)	Operating Data Temp (K)	Emissions Data (g/s)	Modeled Source Number
40TPA530004	Lakeland City Power	46300	24000	52.2	01	45.72	2.74	23.77	419	352.5	31
					02,03,04,05,06	76.20	4.88	32.61	350	526.9	
									TOTAL	879.4	
40TPA510017	FPC - Anclote	-38500	36500	53.1	--	152.10	7.32	19.10	433	3362.0	32

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[a] TECO Big Bend Units 1,2,3 are subject to a 3-hour limit of 31.5 tons per hour for the 3 units combined, and a 24-hour and annual limit of 25 tons per hour for the 3 units combined.

[b] GEP stack height.Actual stack height is 499 feet (152.1 meters).

[c] Used for predicting 3-hour impacts based on permit limitations.

[d] Used for predicting 24-hour and annual impacts based on permit limitations.

[e] Used for predicting 3- and 24-hour impacts.

[f] Used for predicting annual impacts.