GARDINIER INC.

July 3, 1984

DER
JUL 6 1984
BAQM

Mr. Clair Fancy
Deputy Chief, Air Quality Management
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

Subject: Construction Permit and PSD Application for No. 7 and No. 8 Sulfuric Acid Plants

Dear Clair:

As discussed, Gardinier is submitting the following:

Construction Permit Application - No. 7 Sulfuric Acid Plant (3 Cys)

Construction Permit Application - No. 8 Sulfuric Acid Plant (3 Cys)

Air Quality Impact Assessment - No. 7 & No. 8 Sulfuric Acid Plants (3 Cys)

Printout Data - (1 Cy)

Two Checks for Permit Application Fees

One copy each of the two applications and the Air Quality Impact Assessment is being sent to the DER District Office and Hillsborough County Environmental Protection Commission. Also, two checks to Hillsborough County for their application fees.

The PSD Assessment was made by Environmental Science and Engineering, Inc., in Gainesville, Florida (Mr. David Buff, in particular).

If you have any questions, please advise.

Very truly yours,

A. E. Morrison
Manager, Environmental Services

AEM:rw
Enclosures
cc: Mr. Rudy J. Cabina
Mr. Roger Stewart, HCEPC
Mr. Dan Williams, DER, Tampa

AC 29-089497

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

DER

JUL 6 1984

BAQM

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Air Pollution [ ] New[1] [X] Existing[1]

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

COMPANY NAME: Gardinier, Inc. COUNTY: Hillsborough

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peeking Unit No. 2, Gas Fired) No. 7 Sulfuric Acid Plant

SOURCE LOCATION: Street U.S. Highway 41 & Riverview Drive City South of Tampa

UTM: East 363.2 North 3082.3

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

APPLICANT NAME AND TITLE: Rudy J. Cabina, Vice President

APPLICANT ADDRESS: P.O. Box 3269, Tampa, Florida 33601

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Gardinier, 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: By: Rudy J Cabina

Rudy J. Cabina, Vice President
Name and Title (Please Type)

Date: 7/3/84 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 judgment, that 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.

Signed: By: Robert B Melreit

Robert B. Melreit
Name (Please Type)

(Affix Seal)

Gardinier, Inc.
Company Name (Please Type)

P.O. Box 3269, Tampa, Florida 33601
Mailing Address (Please Type)

Florida Registration No. 20408 Date: 7/3/84 Telephone No. 813 677 9111

[1]See Section 17-2.02(15) and (22), Florida Administrative Code, (F.A.C.)

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.

This project will modify the No. 7 Sulfuric Acid Plant to produce 450 tons per day of additional sulfuric acid. Emissions from this source will comply with all applicable State of Florida and Hillsborough County regulations.

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

Start of Construction November 1, 1984 Completion of Construction January 31, 1985

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.)

Modifications to Converter - $85,000

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

Permit No.	AO29-22820	AC29-21337	AO29-5763	AC29-2384	AO29-2180	AO29-5699
Issued	Sep 10, 1982	Sep 7, 1979	Nov 2, 1977	Nov 25, 1974	May 25, 1973	Sep 1982
Expire	Jul 15, 1987	Jul 1, 1983	Sep 30, 1979	Mar 1, 1977	Jul 1, 1975	July 1987

E. Is this application associated with or part of a Development of Regional Impact (DRI) pursuant to Chapter 380, Florida Statutes, and Chapter 22F-2, Florida Administrative Code? ____ Yes __X__ No

F. Normal equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ; if power plant, hrs/yr n/a ;

if seasonal, describe: Not seasonal

G. 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? N/A
   b. If yes, has "Lowest Achievable Emission Rate" been applied? N/A
   c. If yes, list non-attainment pollutants.

      Total Suspended Particulate, 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 Deterioriation" (PSD) requirements 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

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

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	-	-	60,124	A
Atmospheric Oxygen	-	-	89,911	B
Water	-	-	33,678	C

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

1. Total Process Input Rate (lbs/hr): 183,713

2. Product Weight (lbs/hr): 183,333

C. Airborne Contaminants Emitted:

Name of Contaminant	Emission[1]		Allowed Emission[2] Rate per Ch. 17-2, F.A.C.	Allowable[3] Emission lbs/hr	Potential Emission[4]		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/hr	T/yr	
Sulfur Dioxide	367	1606	4.0lb/ton H_2SO_4	367	367	1606	D
Acid Mist	13.8	60.2	0.15 lb/ton H_2SO_4	13.8	13.8	60.2	D

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

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles[5] Size Collected (in microns)	Basis for Efficiency (Sec. V, It[5])
Final Converter	Sulfur Dioxide	99.5+	-	
Final Absorber & Mist Eliminator	Sulfuric Acid Mist	99+	Unk	

[1]See Section V, Item 2.

[2]Reference applicable emission standards and units (e.g., Section 17-2.05(6) Table II, E. (1), F.A.C. – 0.1 pounds per million BTU heat input)

[3]Calculated from operating rate and applicable standard

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

[5]If Applicable

E. Fuels NO FUEL IS USED

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	

*Units Natural Gas, MMCF/hr; Fuel Oils, barrels/hr; Coal, 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 _____ Maximum _____

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

There are no solid wastes. Cooling tower and boiler blowdown will be discharged to a deep well injection disposal system.

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: 113,925 ACFM Gas Exit Temperature: 150 °F.

Water Vapor Content: 0 % Velocity: 43.0 FPS

SECTION IV: INCINERATOR INFORMATION

NOT APPLICABLE

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

Description of Waste _____

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

Approximate Number of Hours of Operation per day _____ days/week _____

Manufacturer _____

Date Constructed _____ Model No. _____

NOT APPLICABLE

	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 device: [ ] 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.):

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

1. Total process input rate and product weight – show derivation.
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, 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 8½" 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 8½" 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 (Example: Copy of relevant portion of USGS topographic map).
8. An 8½" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

Supplemental Requirements

1. Total Process Input Rate and Product Weight:

The following data and chemical equations will describe the input rates and product weight:

The atomic weight of sulfur (2) is 32.064
The molecular weight of oxygen (O_2) is 31.9988
The molecular weight of water (H_2O) is 18.01534
The molecular weight of sulfur dioxide (SO_2) is 64.0628
The molecular weight of sulfur trioxide (SO_3) is 80.0622
The molecular weight of sulfuric acid (H_2SO_4) is 98.0754

The following chemical equations describe the production of sulfuric acid:

$$S + O_2 \longrightarrow SO_2$$

$$SO_2 + \tfrac{1}{2}O_2 \longrightarrow SO_3$$

$$SO_3 + H_2O \longrightarrow H_2SO_4$$

If the plant produces 183,333 lbs/hr of H_2SO_4 and emits 367 lbs/hr of SO_2 and 13.8 lbs/hr of H_2SO_4 mist, then the amounts of sulfur, oxygen and water required are easily calculated. These amounts are:

Sulfur = 60,124 lbs/hr

Oxygen = 89,911 lbs/hr

Water = 33,678 lbs/hr

Total = 183,713 lbs/hr input weight

2. Emission estimate is based on performance standards for existing sulfuric acid plants. EPA Method 8 will be used to determine compliance.

3. Potential discharge is the actual emission.

4. Design details are discussed in attached report.

5. SO_2 Efficiency based on sulfur budget is as follows:

Total Sulfur input = 60,124 lbs/hr

Sulfur Emitted as SO_2 = 124 lbs/hr

100% - 0.31 % = 99.69% Efficiency

$$\frac{184}{60,124} \times 100 = .31\%$$

Acid Mist Efficiency is 99.99%

9. An application fee of $20, unless exempted by Section 17-4.05(3), F.A.C. 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 H_2SO_4
Sulfuric Acid Mist	0.15 lb/ton H_2SO_4

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy) [ ] Yes [ ] No

Contaminant	Rate or Concentration
Sulfur Dioxide	4.0 lb/ton H_2SO_4
Sulfuric Acid Mist	0.15 lb/ton H_2SO_4

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

Contaminant	Rate or Concentration
Sulfur Dioxide	4.0 lb/ton H_2SO_4
Sulfuric Acid Mist	0.15 lb/ton H_2SO_4

D. Describe the existing control and treatment technology (if any). See Attachment

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:
5. Useful Life:
6. Operating Costs:
7. Energy:
8. Maintenance Cost:
9. Emissions:

Contaminant	Rate or Concentration

*Explain method of determining D 3 above.

10. Stack Parameters

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

c. Flow Rate: ACFM d. Temperature: °F

e. Velocity: FPS

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

1. SEE ATTACHMENT

a. Control Device:

b. Operating Principles:

c. Efficiency*: d. Capital Cost:

e. Useful Life: f. Operating Cost:

g. Energy*: 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*: d. Capital Cost:

e. Useful Life: f. Operating Cost:

g. Energy**: h. Maintenance Costs:

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:

*Explain method of determining efficiency.

**Energy to be reported in units of electrical power – KWH design rate.

3.

a. Control Device:

b. Operating Principles:

c. Efficiency*: d. Capital Cost:

e. Life: f. Operating Cost:

g. Energy: h. Maintenance Cost:

*Explain method of determining efficiency above.

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*:

d. Capital Cost:

e. Life:

f. Operating Cost:

g. Energy:

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 ATTACHMENT

1. Control Device:

2. Efficiency*:

3. Capital Cost:

4. Life:

5. Operating Cost:

6. Energy:

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a.

(1) Company:

(2) Mailing Address:

(3) City:

(4) State:

(5) Environmental Manager:

(6) Telephone No.:

*Explain method of determining efficiency above.

(7) Emissions*:

Contaminant	Rate or Concentration

(8) Process Rate*:

b.

(1) Company:

(2) Mailing Address:

(3) City:

(4) State:

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

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions*:

Contaminant	Rate or Concentration

(8) Process Rate*:

10. Reason for selection and description of systems:

*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

A. Company Monitored Data SEE ATTACHMENT

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.

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

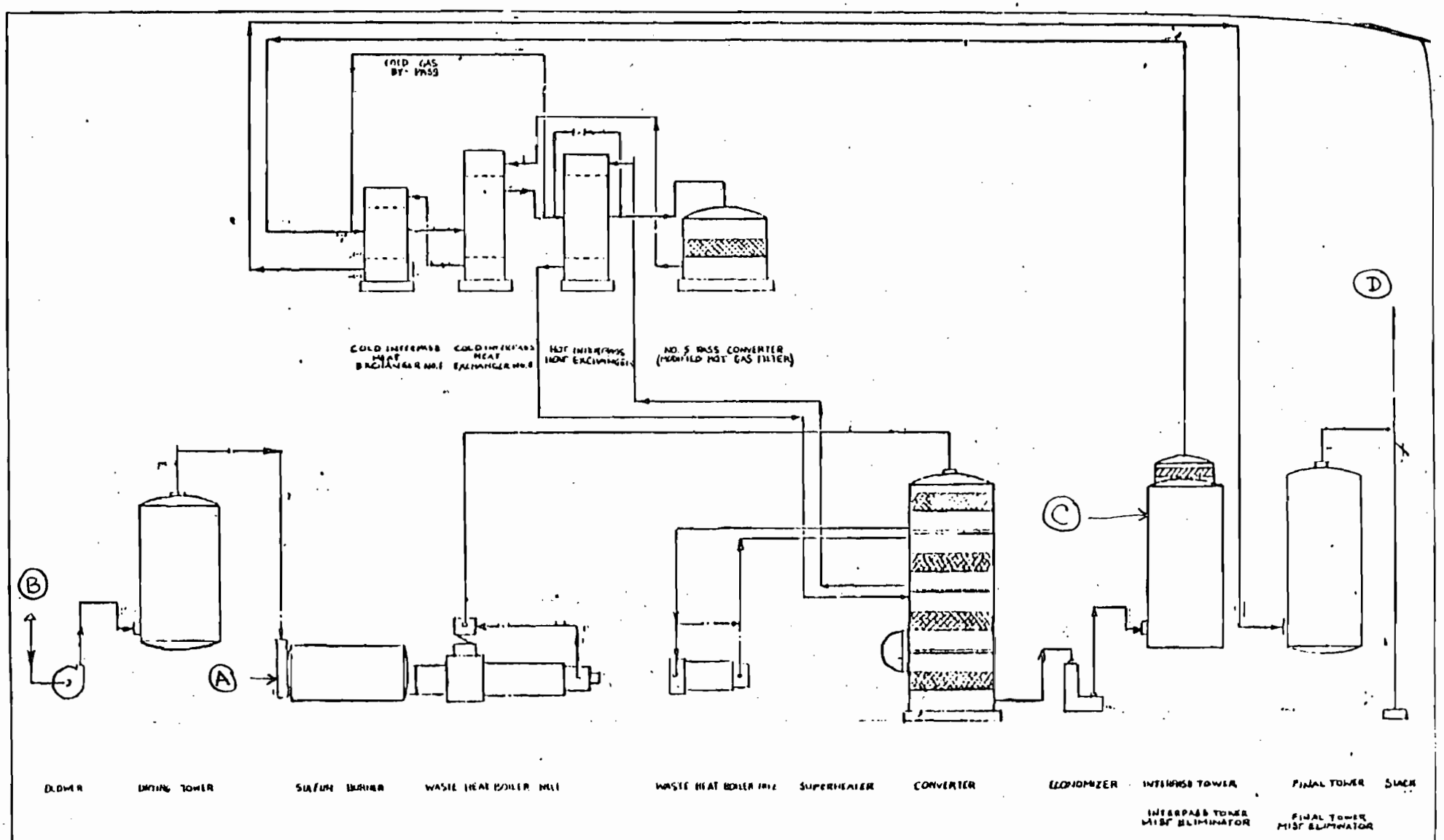
Attach list of emission sources. Emission data required is source name, description on point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

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

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

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.

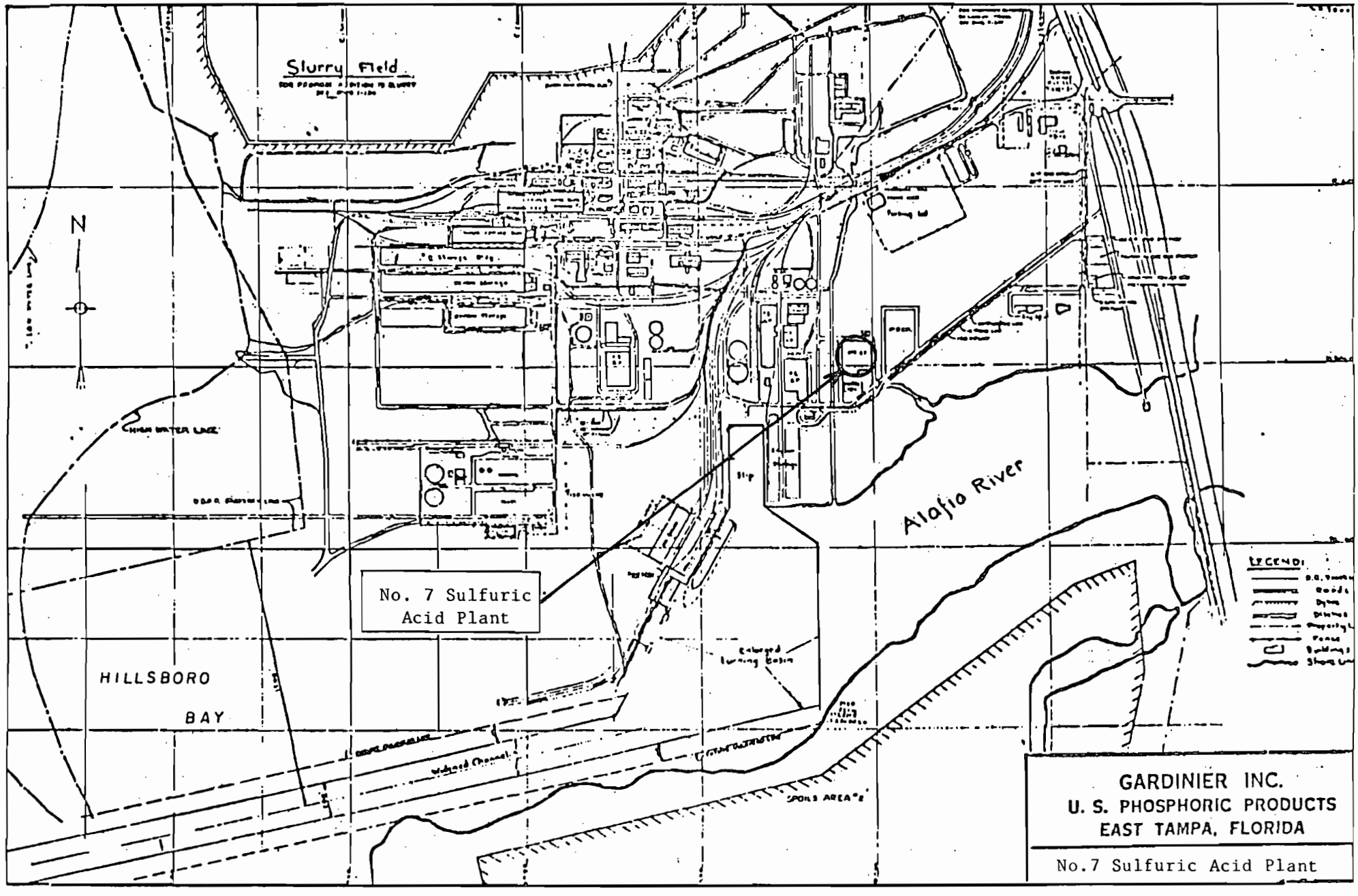
H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology.



FLOW DIAGRAM

No. 8 CONTACT ACID PLANT

Best Available Copy



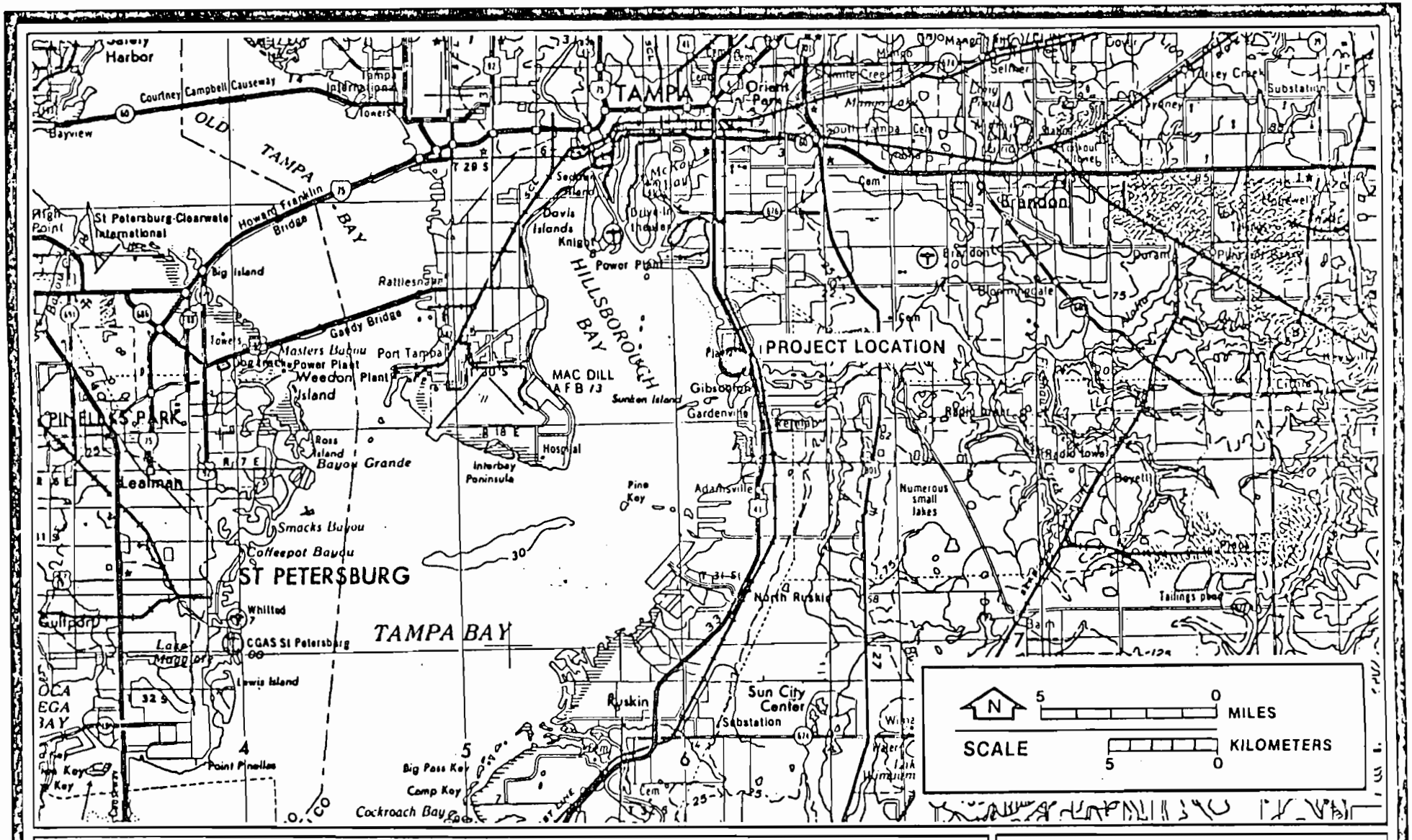


Figure 1-1
GENERAL LOCATION MAP OF GARDINIER, INC.

SOURCE: USGS, 1972.

GARDINIER, INC.
TAMPA, FLORIDA

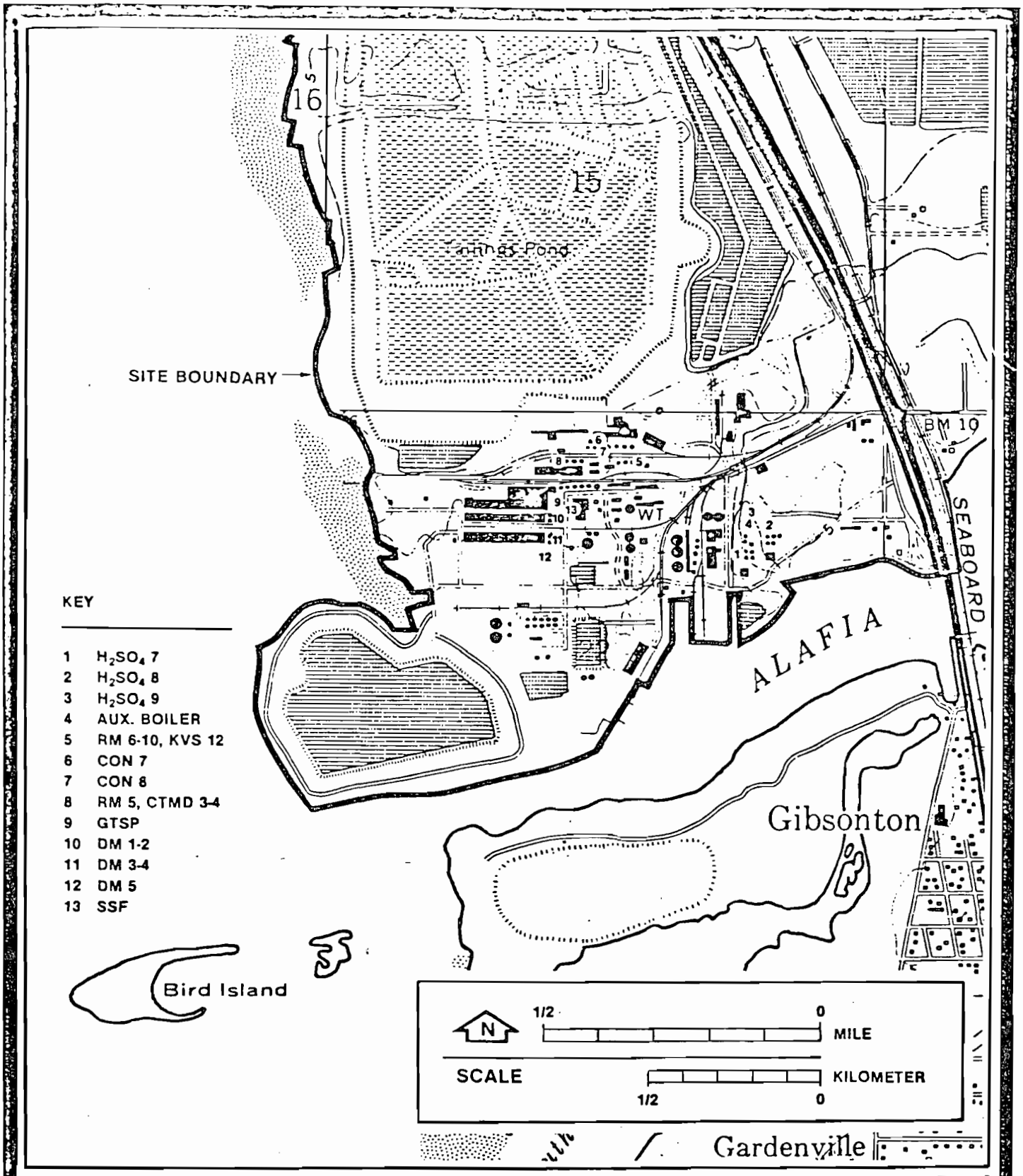


Figure 1-2
SITE LOCATION MAP OF GARDINIER, INC.

SOURCE: USGS, 1981.

GARDINIER, INC.
TAMPA, FLORIDA

GARDINIER INC.

Post Office Box 3269 • Tampa, Florida 33601 • Telephone 813 - 677 - 9111 • TWX 810 - 876 0648 • Telex 52666 • Cable - Gardinphos

-C-E-R-T-I-F-I-C-A-T-E-

I, Robert C. Guthrie, Secretary of GARDINIER, INC. a Delaware Corporation (hereinafter called the "Corporation"), DO HEREBY CERTIFY that attached hereto is a correct and complete copy of a resolution duly adopted by the Board of Directors of the Corporation at the Regular Meeting thereof held on July 13, 1982, duly convened and held pursuant to notice, at which meeting a quorum was present and acting throughout, and such resolution has not been amended or revoked and such resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this day of January 4, 1983.

Robert C. Guthrie

Robert C. Guthrie
Secretary

RESOLVED THAT Mr. Pearce A. Nelson and/or Mr. Rudy J. Cabina, or either of them be and each hereby is, appointed as the authorized representative of GARDINIER, INC. to execute the applications for permits to operate/construct pollution sources.

State of Florida

Department of State

I certify from the records of this office that GARDINIER, INC., a Delaware corporation, is authorized to transact business within the State of Florida, qualified on February 15, 1973.

The charter number for this corporation is 829527.

I further certify that said corporation has filed all annual reports and paid all annual report filing fees due this office through December 31, 1982, and its status is active.

Given under my hand and the Great Seal of the State of Florida, at Tallahassee, the Capital, this the 25th day of January, 1983.

George Firestone
Secretary of State

CER 101

BEST AVAILABLE COPY

GARDINIER, INC. TAMPA, FLORIDA

CHECK NO. 065871

66-798
531

DATE MO.	DAY	YR.	DOLLARS	CENTS
5/25/	84		******1,000	00

PAY EXACTLY ******1,000 DOLLARS AND 00 CENTS $******1,000 00

VOID 90 DAYS AFTER CHECK DATE

TO THE ORDER OF
FLORIDA DEPARTMENT OF
ENVIRONMENTAL REGULATION
7601 HIGHWAY 301
TAMPA FL 33610

PAYABLE AT
NCNB NATIONAL BANK OF FLORIDA
TAMPA, FLORIDA
OR PAYABLE AT
NCNB NATIONAL BANK OF NORTH CAROLINA
ASHEVILLE, N.C.

[redacted]

[redacted]

GARDINIER, INC. TAMPA, FLORIDA

CHECK NO. 066063

66-798
531

DATE MO.	DAY	YR.	DOLLARS	CENTS
5/30/	84		********170	00

PAY EXACTLY ********170 DOLLARS AND 00 CENTS $********170 00

VOID 90 DAYS AFTER CHECK DATE

TO THE ORDER OF
HILLSBOROUGH COUNTY ENVIRONMENTAL PROTECTION COMMISSION
1900 9TH AVENUE
TAMPA FL 33605

PAYABLE AT
NCNB NATIONAL BANK OF FLORIDA
TAMPA, FLORIDA
OR PAYABLE AT
NCNB NATIONAL BANK OF NORTH CAROLINA
ASHEVILLE, N.C.

[redacted]

AC 29-84046

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

DER

JUL 6 1984

BAQM

SOURCE TYPE: Air Pollution [ ] New[1] [X] Existing[1]

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

COMPANY NAME: Gardinier, Inc. COUNTY: Hillsborough

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SOURCE LOCATION: Street U.S. Highway 41 South & Riverview Drive City South of Tampa

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APPLICANT NAME AND TITLE: Rudy J. Cabina, Vice President

APPLICANT ADDRESS: P.O. Box 3269, Tampa, Florida 33601

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Signed: By: Rudy J Cabina

Rudy J. Cabina, Vice President
Name and Title (Please Type)

Date: 7/3/84 Telephone No. 813 677 9111

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Robert B. Melreit
Name (Please Type)

(Affix Seal)

Gardinier, Inc.
Company Name (Please Type)

P.O. Box 3269, Tampa, Florida 33601
Mailing Address (Please Type)

Florida Registration No. 20408 Date: 7/3/84 Telephone No. 813 677 9111

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Start of Construction November 1, 1984 Completion of Construction January 31, 1985

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.)

Modifications to converter and steam system - $250,000

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

Permit No.	A029-18228	A029-2930	AC29-2390
Issued	Apr 26, 1979	Apr 21, 1977	Nov 25, 1974
Expire	Apr 15, 1984	May 10, 1979	Mar 1, 1977

E. Is this application associated with or part of a Development of Regional Impact (DRI) pursuant to Chapter 380, Florida Statutes, and Chapter 22F-2, Florida Administrative Code? ____ Yes __X__ No

F. Normal equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ; if power plant, hrs/yr n/a ; if seasonal, describe: not seasonal

G. 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? N/A
   b. If yes, has "Lowest Achievable Emission Rate" been applied? N/A
   c. If yes, list non-attainment pollutants.
      Total suspended particulates, 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 Deterioriation" (PSD) requirements 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? No
5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? No

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

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
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

C. Airborne Contaminants Emitted:

Name of Contaminant	Emission[1]		Allowed Emission[2] Rate per Ch. 17-2, F.A.C.	Allowable[3] Emission lbs/hr	Potential Emission[4]		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/hr	T/yr	
Sulfur Dioxide	917	4,015	10 lb/ton H_2SO_4	917	917	4,015	D
Sulfuric Acid	27.5	120.5	0.3lb/ton H_2SO_4	27.5	27.5	120.5	D

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

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles[5] Size Collected (in microns)	Basis for Efficiency (Sec. V, It[5]
Final Converter	Sulfur Dioxide	99.5+	-	See Attach.
Final Absorber and Mist	Sulfuric Acid	99+	unk	
Eliminator	Mist			

[1]See Section V, Item 2.

[2]Reference applicable emission standards and units (e.g., Section 17-2.05(6) Table II, E. (1), F.A.C. – 0.1 pounds per million BTU heat input)

[3]Calculated from operating rate and applicable standard

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

[5]If Applicable

E. Fuels NO FUELS USED

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	

*Units Natural Gas, MMCF/hr; Fuel Oils, barrels/hr; Coal, 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 N/A Maximum N/A

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

There are no solid wastes. Cooling tower and boiler blowdown will be discharged to a deepwell injection disposal system.

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: 113,790 ACFM Gas Exit Temperature: 150 °F.

Water Vapor Content: 0.0 % Velocity: 37.7 FPS

SECTION IV: INCINERATOR INFORMATION

Not Applicable

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

Description of Waste _____

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

Approximate Number of Hours of Operation per day _____ days/week _____

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 device: [ ] 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.):

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

1. Total process input rate and product weight -- show derivation.
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, 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 8½" 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 8½" 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 (Example: Copy of relevant portion of USGS topographic map).
8. An 8½" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

Supplemental Requirements

1. Total Process Input Rate and Product Weight:

The following data and chemical equations will describe the input rates and product weight:

The atomic weight of sulfur (2) is 32.064
The molecular weight of oxygen (O_2) is 31.9988
The molecular weight of water (H_2O) is 18.01534
The molecular weight of sulfur dioxide (SO_2) is 64.0628
The molecular weight of sulfur trioxide (SO_3) is 80.0622
The molecular weight of sulfuric acid (H_2SO_4) is 98.0754

The following chemical equations describe the production of sulfuric acid:

$$S + O_2 \text{ -----} \rightarrow SO_2$$

$$SO_2 + \tfrac{1}{2}O_2 \text{ -----} \rightarrow SO_3$$

$$SO_3 + H_2O \text{ -----} \rightarrow H_2SO_4$$

If the plant produces 183,333 lbs/hr of H_2SO_4 and emits 917 lbs/hr of SO_2 and 27.5 lbs/hr of H_2SO_4 mist, then the amounts of sulfur, oxygen and water required are easily calculated. These amounts are:

Sulfur = 60,404 lbs/hr

Oxygen = 90,193 lbs/hr

Water = 33,680 lbs/hr

Total = 184,277 lbs/hr input weight

2. Emission estimate is based on performance standards for existing sulfuric acid plants. EPA Method 8 will be used to determine compliance.

3. Potential discharge is the actual emission.

4. Design details are discussed in attached report.

5. SO_2 Efficiency based on sulfur budget is as follows:

Total Sulfur input = 60,404 lbs/hr

Sulfur Emitted as SO_2 = 458 lbs/hr

$$\frac{458}{60404} \times 100 = .759\%$$

100% - 0.759% = 99.24% Efficiency

Acid Mist Efficiency is 99.99%

9. An application fee of $20, unless exempted by Section 17-4.05(3), F.A.C. 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?
[ ] Yes [x] No

Contaminant	Rate or Concentration
Not applicable	Not applicable

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy) [ ] Yes [ ] No

Contaminant	Rate or Concentration
Sulfur Dioxide	10 lb/ton H_2SO_4
Sulfuric Acid Mist	0.3 lb/ton H_2SO_4

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

Contaminant	Rate or Concentration
Sulfur Dioxide	10 lb/ton H_2SO_4
Sulfuric Acid Mist	0.3 lb/ton H_2SO_4

D. Describe the existing control and treatment technology (if any). See Attachment

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:
5. Useful Life:
6. Operating Costs:
7. Energy:
8. Maintenance Cost:
9. Emissions:

Contaminant	Rate or Concentration

*Explain method of determining D 3 above.

10. Stack Parameters

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

c. Flow Rate: ACFM d. Temperature: °F

e. Velocity: FPS

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

1.

a. Control Device:

b. Operating Principles:

c. Efficiency*: d. Capital Cost:

e. Useful Life: f. Operating Cost:

g. Energy*: 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*: d. Capital Cost:

e. Useful Life: f. Operating Cost:

g. Energy**: h. Maintenance Costs:

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:

*Explain method of determining efficiency.

**Energy to be reported in units of electrical power – KWH design rate.

3.

a. Control Device:

b. Operating Principles:

c. Efficiency*: d. Capital Cost:

e. Life: f. Operating Cost:

g. Energy: h. Maintenance Cost:

*Explain method of determining efficiency above.

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*:

d. Capital Cost:

e. Life:

f. Operating Cost:

g. Energy:

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:

1. Control Device:

2. Efficiency*:

3. Capital Cost:

4. Life:

5. Operating Cost:

6. Energy:

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a.

(1) Company:

(2) Mailing Address:

(3) City:

(4) State:

(5) Environmental Manager:

(6) Telephone No.:

*Explain method of determining efficiency above.

(7) Emissions*:

Contaminant	Rate or Concentration

(8) Process Rate*:

b.

(1) Company:

(2) Mailing Address:

(3) City:

(4) State:

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

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions*:

Contaminant	Rate or Concentration

(8) Process Rate*:

10. Reason for selection and description of systems:

*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

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.

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

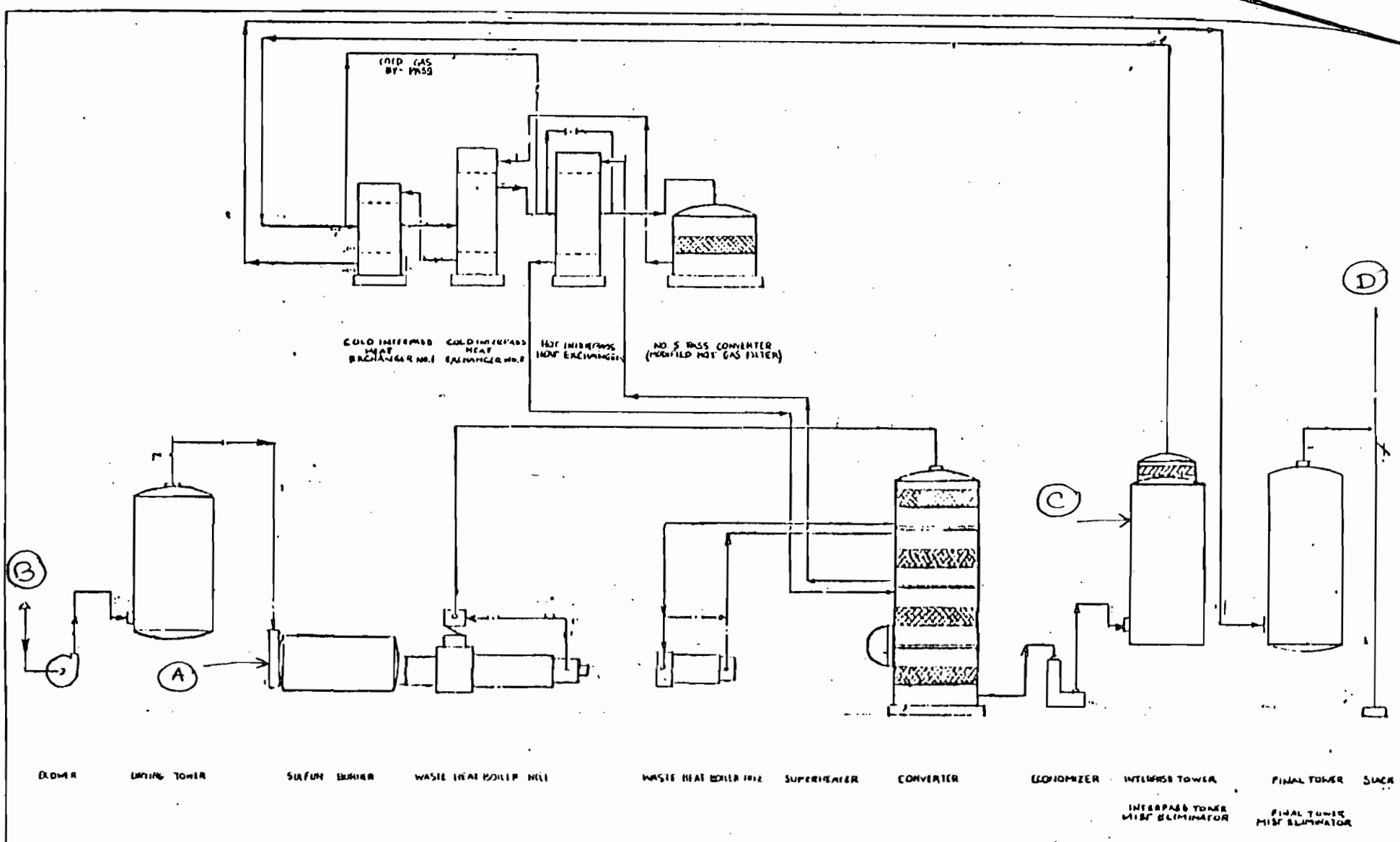
Attach list of emission sources. Emission data required is source name, description on point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

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

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

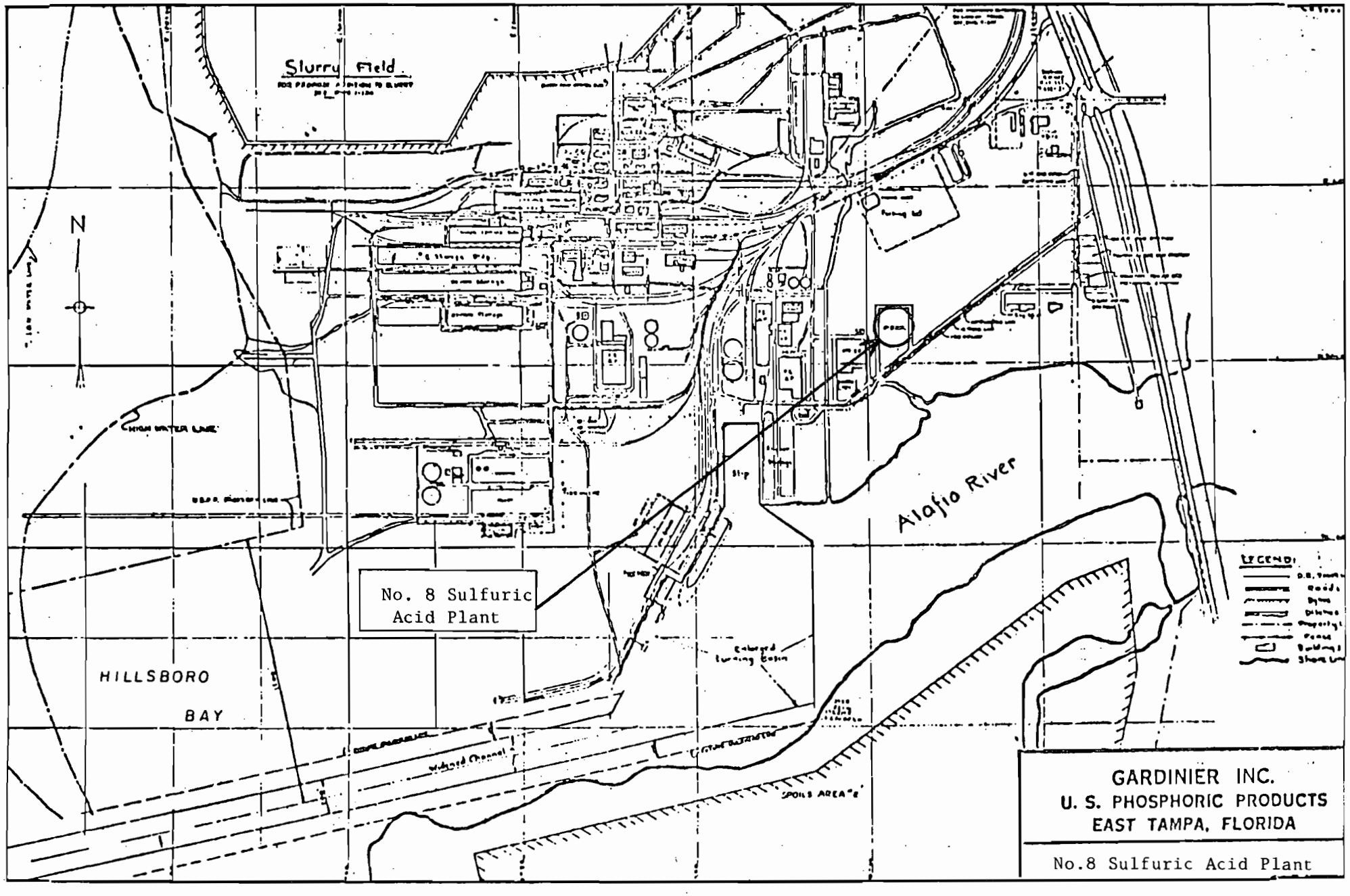
G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

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.



FLOW DIAGRAM

No. 8 CONTACT ACID PLANT



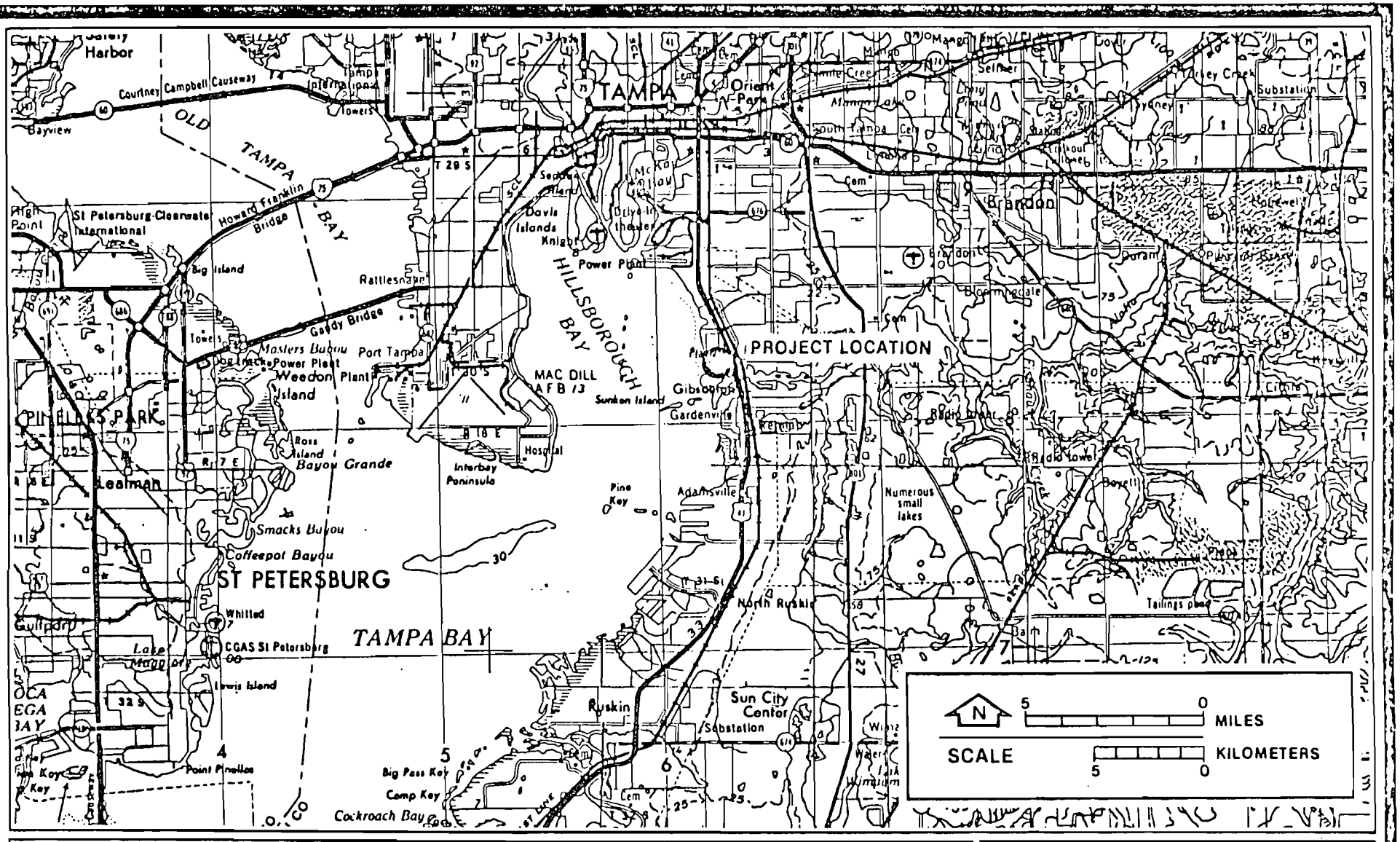


Figure 1-1
GENERAL LOCATION MAP OF GARDINIER, INC.

SOURCE: USGS, 1972.

GARDINIER, INC.
TAMPA, FLORIDA

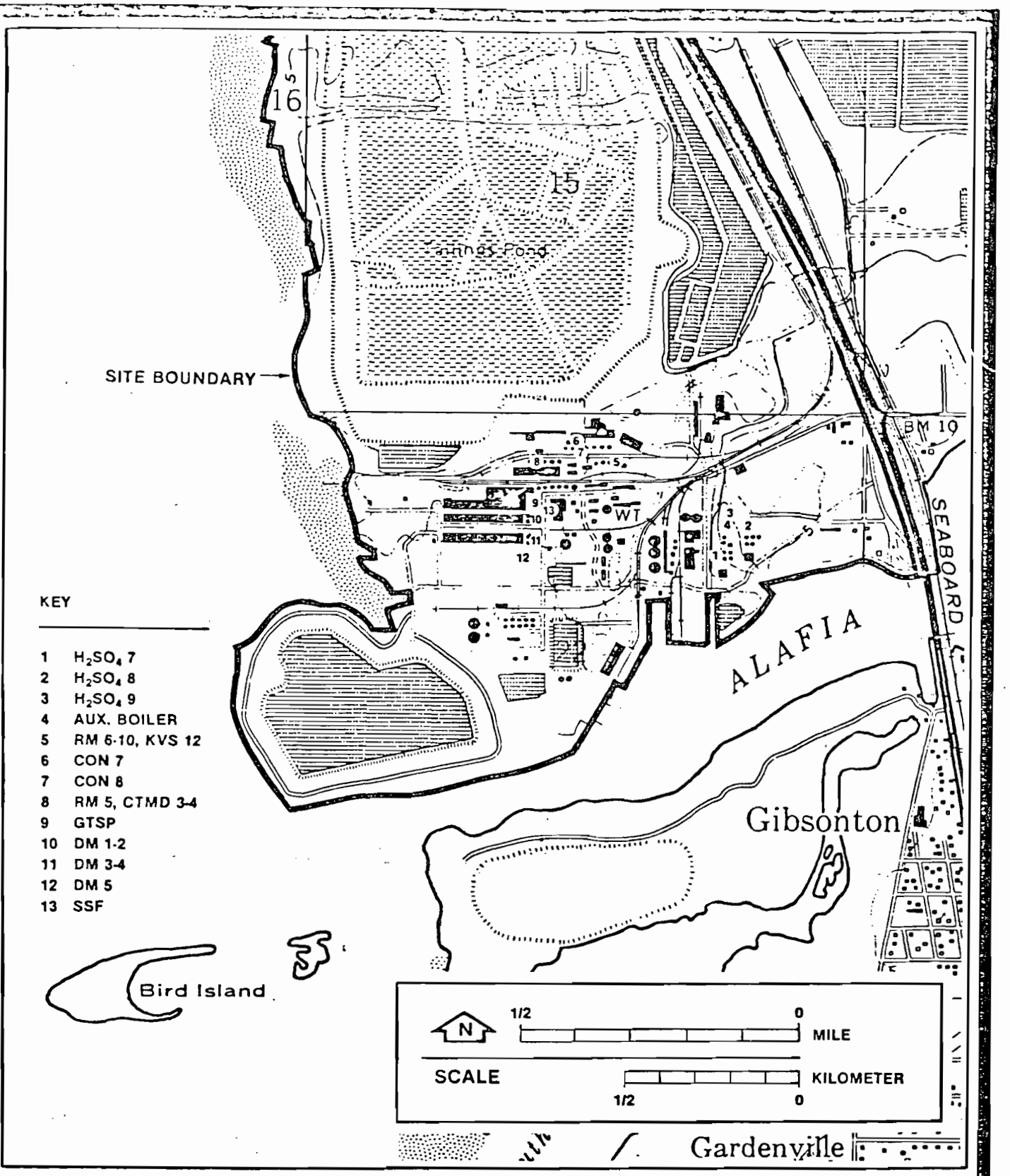


Figure 1-2
SITE LOCATION MAP OF GARDINIER, INC.

SOURCE: USGS, 1981.

GARDINIER, INC.
TAMPA, FLORIDA

GARDINIER INC.

Post Office Box 3269 • Tampa, Florida 33601 • Telephone 813-677-9111 • TWX 810-876-0648 • Telex 52666 • Cable - Gardinphos

-C-E-R-T-I-F-I-C-A-T-E-

I, Robert C. Guthrie, Secretary of GARDINIER, INC. a Delaware Corporation (hereinafter called the "Corporation"), DO HEREBY CERTIFY that attached hereto is a correct and complete copy of a resolution duly adopted by the Board of Directors of the Corporation at the Regular Meeting thereof held on July 13, 1982, duly convened and held pursuant to notice, at which meeting a quorum was present and acting throughout, and such resolution has not been amended or revoked and such resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this day of January 4, 1983.

Robert C. Guthrie

Robert C. Guthrie
Secretary

RESOLVED THAT Mr. Pearce A. Nelson and/or Mr. Rudy J. Cabina, or either of them be and each hereby is, appointed as the authorized representative of GARDINIER, INC. to execute the applications for permits to operate/construct pollution sources.

State of Florida

Department of State

I certify from the records of this office that GARDINIER, INC., a Delaware corporation, is authorized to transact business within the State of Florida, qualified on February 15, 1973.

The charter number for this corporation is 829527.

I further certify that said corporation has filed all annual reports and paid all annual report filing fees due this office through December 31, 1982, and its status is active.

Given under my hand and the Great Seal of the State of Florida, at Tallahassee, the Capital, this the 25th day of January, 1983.

George Firestone
Secretary of State

CER 101

BEST AVAILABLE COPY

GARDINIER, INC. TAMPA, FLORIDA

CHECK NO. 065921

66-798
531

DATE MO.	DAY	YR.	DOLLARS	CENTS
5/29/84			********170	00

PAY EXACTLY ********170 DOLLARS AND 00 CENTS

VOID 90 DAYS AFTER CHECK DATE

TO THE ORDER OF
HILLSBOROUGH COUNTY ENVIRON-
MENTAL PROTECTION COMMISSION
1900 9TH AVENUE
TAMPA FL 33605

PAYABLE AT
NCNB NATIONAL BANK OF FLORIDA
TAMPA, FLORIDA
OR PAYABLE AT
NCNB NATIONAL BANK OF NORTH CAROLINA
ASHEVILLE, N.C.

[redacted]

[redacted]

GARDINIER, INC. TAMPA, FLORIDA

CHECK NO. 066008

66-798
531

DATE MO.	DAY	YR.	DOLLARS	CENTS
5/30/84			******1,000	00

PAY EXACTLY ******1,000 DOLLARS AND 00 CENTS

VOID 90 DAYS AFTER CHECK DATE

TO THE ORDER OF
FLORIDA DEPARTMENT OF
ENVIRONMENTAL REGULATION
7601 HIGHWAY 301 N
TAMPA FL 33610

PAYABLE AT
NCNB NATIONAL BANK OF FLORIDA
TAMPA, FLORIDA
OR PAYABLE AT
NCNB NATIONAL BANK OF NORTH CAROLINA
ASHEVILLE, N.C.

[redacted]

AIR QUALITY IMPACT ASSESSMENT NO. 7 AND NO. 8 SULFURIC ACID PLANT EXPANSION

GARDINIER, INC.
TAMPA, FLORIDA

Prepared for:

GARDINIER, INC.,
Tampa, Florida

Prepared by:

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.
Gainesville, Florida

ESE No. 83-157-0100

January 13, 1984

ESE

ENVIRONMENTAL SCIENCE
AND ENGINEERING, INC.

January 13, 1984
ESE No. 83-157-0100

Mr. Al Morrison
U.S. 41 South and Riverview Drive
Gardinier, Inc.
Tampa, Florida 33601

Dear Al:

Please find enclosed two copies of the draft air quality impact assessment for the proposed No. 7 and No. 8 H_2SO_4 plants' expansion. Please review the report and provide any comments. ESE will retain the computer model printouts until submittal of the document to DER.

Please call at your earliest convenience after review of the report.

Sincerely,

David A. Buff

David A. Buff, P.E.
Senior Engineer

DAB:jgh

Enclosures

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LIST OF FIGURES

1.0 PROJECT DESCRIPTION

Gardinier, Inc. of Tampa, Florida, is proposing to expand the production capacities of the No. 7 and No. 8 Sulfuric Acid (H_2SO_4) plants at the Tampa phosphate fertilizer complex. The No. 7 H_2SO_4 is currently permitted to produce 1,750 tons per day (TPD) of H_2SO_4, and No. 8 H_2SO_4 is permitted for 1,770 TPD H_2SO_4. It is proposed to increase the H_2SO_4 production capabilities of both of these plants to 2,200 TPD. These increases in production will be accomplished by modifying the drying tower acid drain system, the second catalyst mass performance, and the final absorbing tower cooling system on both H_2SO_4 plants.

Phosphate fertilizers are manufactured at the Gardinier plant. Sulfuric acid is used to derive phosphoric acid from mined phosphate rock. The Gardinier plant currently does not have sufficient H_2SO_4 production capabilities to meet phosphoric acid production and phosphate fertilizer production capacities, capacities which are allowed under existing air pollution permits for those specific facilities. Expansion of the No. 7 and No. 8 H_2SO_4 plants will allow future demands to be met and allow the capacities of the H_2SO_4 plants to match the remainder of the facility.

The Gardinier Tampa plant is located south of Tampa on Hillsborough Bay (Figures 1-1 and 1-2). The surrounding land area is rural in nature. Other significant air pollution sources are located nearby, including the Tampa Electric Company (TEC) Big Bend, Hookers Point, and Gannon generating stations.

The only pollutants emitted by the No. 7 and No. 8 H_2SO_4 plants are sulfur dioxide (SO_2) and sulfuric acid mist (H_2SO_4 mist). As a result, these are also the only pollutants affected by the proposed expansion of these plants. The H_2SO_4 plants are the only H_2SO_4 mist-emitting sources at the Gardinier plant. However, several other SO_2 sources exist which result from fuel oil burning. The majority of these sources do not have any emission limit or allowable emission rate for

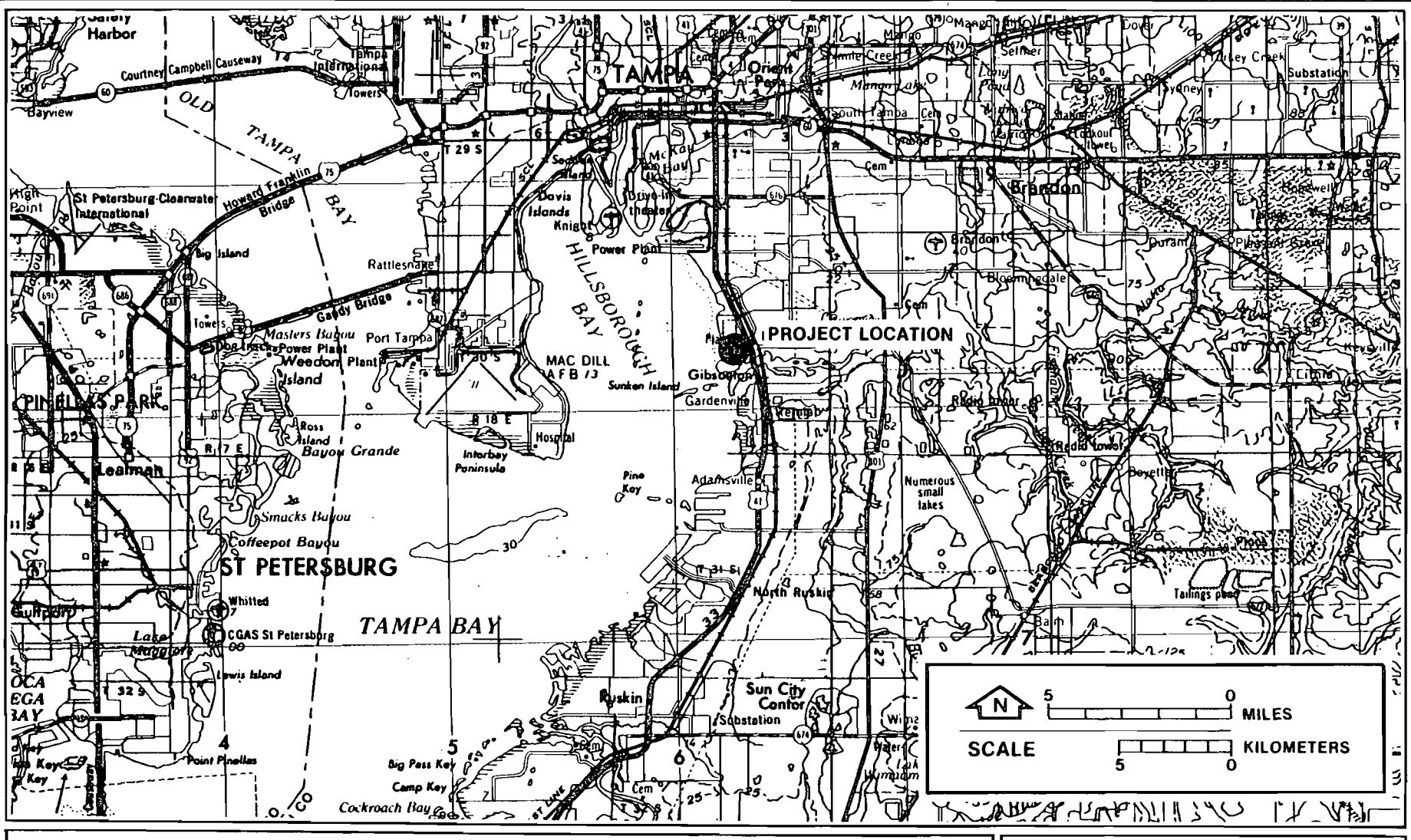

Figure 1-1
GENERAL LOCATION MAP OF GARDINIER, INC.

SOURCE: USGS, 1972.

GARDINIER, INC.
TAMPA, FLORIDA

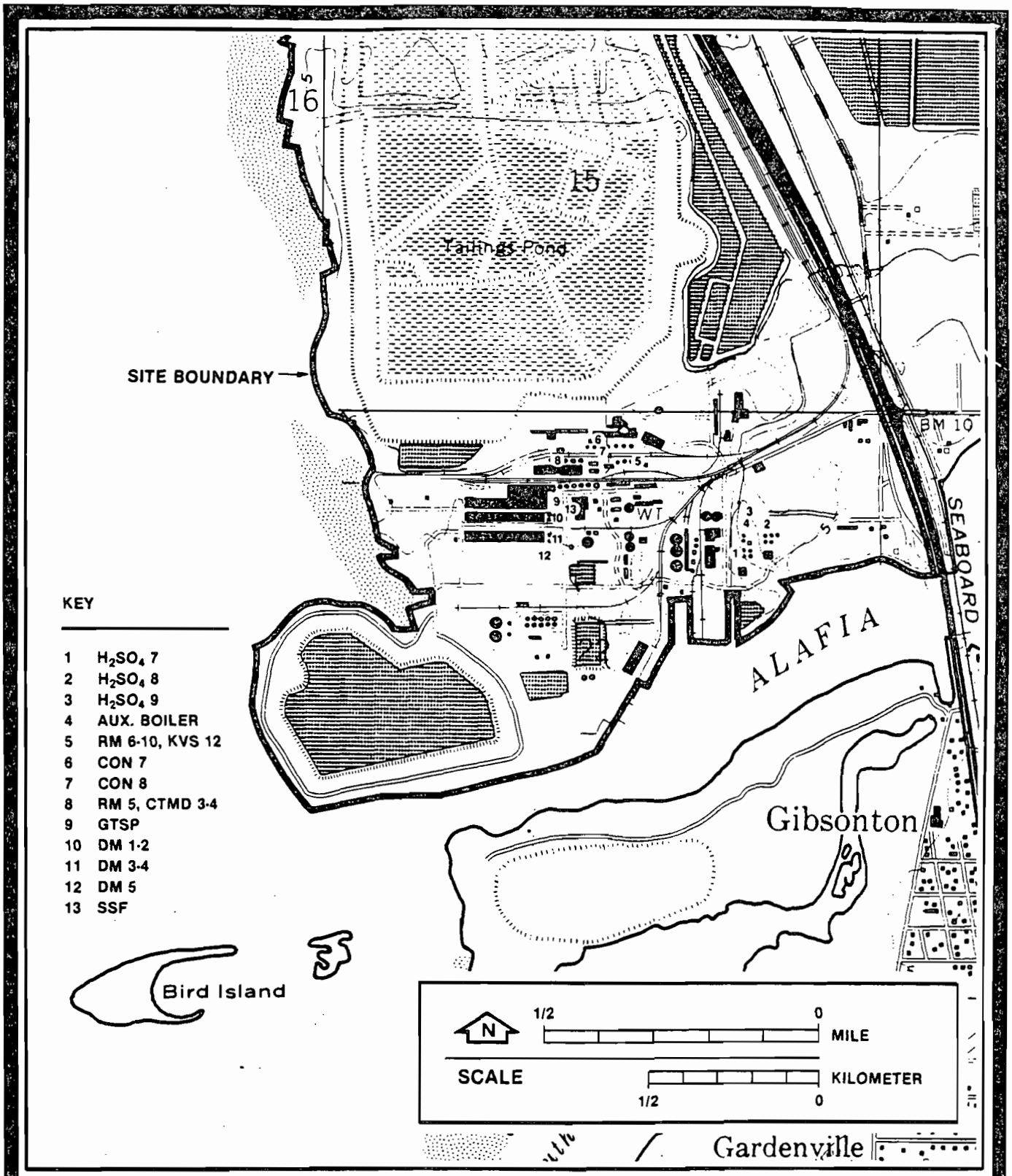

Figure 1-2
SITE LOCATION MAP OF GARDINIER, INC.

SOURCE: USGS, 1981.

GARDINIER, INC.
TAMPA, FLORIDA

SO_2. Shown in Table 1-1 are the calculated SO_2 emissions from each source other than H_2SO_4 plants based on the rated heat input (10^6 Btu/hr) and the type oil fired. In determining the fuel oil heating values and sulfur contents, the Air Pollutant Emissions Reports (APER) submitted annually to the Florida Department of Environmental Regulation (DER) were reviewed for the years 1975 through 1982. The worst-case oil from any year, in terms of SO_2 emitting potential, was used to develop the emission rates in Table 1-1. Many of the fuel-burning sources can use and have historically used natural gas. Price and availability dictate which fuel is used. The values in Table 1-1 reflect all fuel oil burning, which is the worst-case for SO_2 emissions.

The No. 5 diammonium phosphate plant SO_2 emissions are limited by permit condition to 10 pounds per hour (lb/hr). It is noted that Table 1-1 does not include two permitted sources of SO_2 emissions. The first is the ammonia (NH_3) plant, since it is currently shutdown and will remain so in the future. The second is the Auxiliary Boiler. This boiler will operate only when one of the H_2SO_4 plants is shutdown, and therefore will operate very infrequently. In addition, maximum SO_2 emissions from the Auxiliary Boiler would be only 55.6 lb/hr, which is much lower than the emissions from any one of the H_2SO_4 plants.

Stack parameters and emissions for all SO_2 sources to be operating in the future at Gardinier, including the expanded No. 7 and No. 8 H_2SO_4 plants, are presented in Table 1-2. The locations of the various sources within the Gardinier complex are shown in Figure 1-2. The No. 7 and No. 8 H_2SO_4 plants emissions are based upon 2,200 TPD H_2SO_4 production for each, with No. 7 at 4 lb SO_2/ton H_2SO_4 produced and No. 8 at 10 lb/ton. No. 9 H_2SO_4 plant emissions are based upon 2,631 TPD H_2SO_4 and 4 lb SO_2/ton. Stack parameters for the H_2SO_4 plants are based upon the source tests described in the footnotes to Table 1-2. No modifications will be made to the existing stacks serving the No. 7 and No. 8 H_2SO_4 plants.

Table 1-1. Maximum SO_2 Emissions from Fuel-Burning Sources at Gardinier

Source	Unit Code	Maximum Heat Input (10^6 Btu/hr)	Type Oil	Maximum Gallons Per Hour*	Maximum SO_2 Emissions* (lb/hr)
No. 12 Mill	KVS 12	3.0	#2	22.9	1.3
No. 5 Mill	RM 5	0.2	#2	1.5	0.084
Nos. 6-10 Mills	RM 6-10	0.9	#2	6.9	0.39
No. 7 Concentrator	CONC 7	30	#6	202.7	85.3
No. 8 Concentrator	CONC 8	30	#6	202.7	85.3
No. 3 Triple Dryer	CTMD 3	13.5	#6	91.2	38.4
No. 4 Triple Dryer	CTMD 4	13.5	#6	91.2	38.4
Granular Triple Super Phosphate	GTSP	40	#6	270.3	113.7
Nos. 1 and 2 Diammonium phosphate**	DM 1-2	3.6	#2	27.5	1.54
Nos. 3 and 4 Diammonium phosphate**	DM 3-4	3.6	#2	27.5	1.54
No. 5 Diammonium phosphate	DM 5	--	#2	--	10.0†
Sodium Fluosilicate	SSF	1.3	#2	9.9	0.55

* Calculated based upon worst-case fuel from 1975-1982 of: 2.63% S--148,000 Btu/gal for No. 6 oil (1980); 0.35% S--130,853 Btu/gal for No. 2 oil (1977). Assumes 8.0 lb/gal for both No. 6 and No. 2 fuels.

† Based upon PSD permit (PSD-FL-026) of July 11, 1980.

** Values represent total of both sources.

Source: ESE, 1983.

Table 1-2. Maximum SO_2 Emissions and Stack Parameters for Gardinier After Proposed Expansion

Unit Code	Maximum SO_2 Emission Rate (g/s)	Height (m)	Diameter (m)	Velocity (m/s)	Temperature (K)	UTM Coordinates (km) X	UTM Coordinates (km) Y
KVS 12	0.16	21.6	0.49	21.5	333	362.90	3082.60
RM 5	0.01	20.1	0.61	14.9	336	362.65	3082.60
RM 6-10	0.049	29.0	0.61	29.1	339	362.90	3082.60
CON 7	10.75	23.8	1.83	5.8	347	362.80	3082.70
CON 8	10.75	23.8	1.83	5.8	344	362.80	3082.70
CTMD 3	4.84	20.7	1.07	10.7	316	362.65	3082.60
CTMD 4	4.84	20.7	1.07	12.2	316	362.65	3082.60
GTSP	14.3	38.4	2.44	11.0	327	362.60	3082.45
DM 1,2*	0.19	27.4	1.22	16.8	336	362.60	3082.40
DM 3,4*	0.19	27.4	1.07	20.4	336	362.60	3082.30
DM 5	3.05	40.4	2.13	16.0	314	362.60	3082.25
SSF	0.069	12.2	0.51	9.1	322	362.75	3082.45
H_2SO_4 7†	46.2	45.6	2.29	13.1	339	363.20	3082.30
H_2SO_4 8†	115.5	45.6	2.44	11.5	339	363.30	3082.40
H_2SO_4 9**	55.3	45.6	2.74	10.0	347	363.20	3082.45

* Emissions represent total for both plants; stack parameters represent individual plants.

† Emissions based upon 2,200 TPD H_2SO_4 and 4 lb SO_2/ton for No. 7 H_2SO_4, 10 lb/ton for No. 8 H_2SO_4. Stack parameters based on source test of 5/19/82 for No. 7 which reflected production rate of 88.8 tons per hour, i.e., closest to 91.7 TPH (= 2,200 TPD); ACFM = 113,500. Stack temperature = 151°F.

** Emissions based upon 2,631 TPD H_2SO_4 and 4 lb SO_2/ton. Stack parameters based upon stack test of 1/18/83, with 108.8 TPH production (Permit = 108.3 TPH); ACFM = 124,700; stack temperature = 165°F.

Source: ESE, 1983.

Stack parameters for all other SO_2 sources were obtained from review of the APER submitted yearly to DER, and generally represent average values. SO_2 emissions represent maximum values due to fuel oil burning, as presented in Table 1-1.

2.0 AIR QUALITY REVIEW REQUIREMENTS AND SOURCE APPLICABILITY

The following discussions pertain to the regulatory requirements that must be met for the construction and operation of the expanded No. 7 and No. 8 H_2SO_4 plants, as required by federal and state PSD regulations and other air quality regulations.

2.1 NATIONAL AND STATE AAQS

As a result of the requirements of the 1970 CAA Amendments, EPA enacted primary and secondary national AAQS (Federal Register, 1971) for six air pollutants. Primary national AAQS are required to protect the public health, and secondary national AAQS are required to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air.

Table 2-1 presents the existing applicable national and State of Florida AAQS for SO_2. Since the original standards were issued in 1971, EPA eliminated the annual and 24-hour secondary AAQS for SO_2. Prior to these changes, the State of Florida promulgated the secondary national AAQS for SO_2 as the state AAQS. Since states have the authority to adopt AAQS more stringent than those established by EPA, the State of Florida has chosen to retain the secondary AAQS for SO_2 which were eliminated by EPA. Pollutants for which AAQS have been established are called "criteria" pollutants.

Areas of the country shown to be in violation of AAQS are designated as nonattainment areas, and new sources to be located in or near these areas may be subject to more stringent air permitting requirements. The only area of the state designated as nonattainment for SO_2 by EPA (Federal Register, March 3, 1978) and the State of Florida (Ch 17-2, FAC, 1982) is the northwest corner of Pinellas County.

The Gardinier plant is located in Hillsborough County, which is designated as attainment for all pollutants, except particulate matter and ozone. The SO_2 nonattainment area is located 44 km to the

Table 2-1. Federal and State AAQS for SO_2

Pollutant	Averaging Time	Federal		State of Florida
		Primary Standard	Secondary Standard	
Sulfur Dioxide	Annual Arithmetic Mean	80	N/A	60
	24-Hour Maximum*	365	N/A	260
	3-Hour Maximum*	N/A	1,300	1,300

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

Sources: 40 CFR, Parts 50 and 52.
Ch 17-2, FAC.

northwest of the Gardinier plant site. Current DER regulations provide that the Pinellas County SO_2 nonattainment area will become attainment by March 31, 1984 (FAC, Chapter 17-2.410). This date is prior to the start-up dates of the expanded No. 7 and No. 8 sulfuric acid plants; therefore, no analysis of SO_2 impacts upon the nonattainment area was conducted.

2.2 FEDERAL AND STATE PSD

2.2.1 General Requirements

Under federal PSD review requirements, all major new or modified sources of air pollutants regulated under CAA must be reviewed and approved by EPA (or in this case, reviewed by DER since review authority has been delegated to the state: Federal Register, Vol. 48, No. 226, November 22, 1983). A "major stationary source" is defined as any one of 28 named source categories which has the potential to emit 100 TPY or more, or any other stationary source which has the potential to emit 250 TPY or more, of any pollutant regulated under CAA. "Potential to emit" means the capability at maximum design capacity to emit a pollutant after the application of control equipment.

"Major modification" means any physical change in the design or operation of a major stationary source, or a series of contemporaneous changes in the design or operation of a major stationary source, that would result in a significant net emission increase of any pollutant regulated under CAA. "Significant" is defined as any increase in emissions in excess of specified levels (Table 2-2).

PSD review is used to determine whether significant air quality deterioration will result from the new or modified source. PSD requirements are contained in 40 CFR 52.21, Prevention of Significant Deterioration of Air Quality, and in the State of Florida PSD Regulations (Ch 17-2, FAC). Major sources are required to undergo the

Table 2-2. Federal and State of Florida PSD Significant Emission Rates

Pollutant	Regulated Under	Federal and State Significant Emission Rate (TPY)
Sulfur Dioxide	NAAQS, NSPS	40
Particulate Matter	NAAQS, NSPS	25
Nitrogen Oxides	NAAQS, NSPS	40
Carbon Monoxide	NAAQS, NSPS	100
Ozone	NAAQS, NSPS	40*
Lead	NAAQS	0.6
Sulfuric Acid Mist	NSPS	7
Total Fluorides	NSPS	3
Total Reduced Sulfur	NSPS	10
Reduced Sulfur Compounds	NSPS	10
Hydrogen Sulfide	NSPS	10
Asbestos	NESHAP	0.007
Beryllium	NESHAP	0.0004
Mercury	NESHAP	0.1
Vinyl Chloride	NESHAP	1
Benzene	NESHAP	0
Radionuclides	NESHAP	0
Inorganic Arsenic	NESHAP	0
Any Regulated Pollutant	--	Class I Impact†

* Increase in Volatile Organic Compound emissions.
† Any emission rate for a source located within 10 km of a Class I area which causes impacts of 1 ug/m^3, 24-hour average, or greater.

Notes: TPY = Tons per year
NAAQS = National Ambient Air Quality Standards.
NSPS = New Source Performance Standards.
NESHAP = National Emission Standards for Hazardous Air Pollutants.

Sources: 40 CFR, Part 52.21.
Ch 17-2, FAC.

following reviews related to PSD for each pollutant emitted in significant amounts:

1. Control technology review,
2. Source impact analysis,
3. Air quality analysis (monitoring), and
4. Additional impact analyses.

Requirements for each of these areas are discussed in more detail below.

2.2.2 Increments/Classifications

Congress, in promulgating the 1977 CAA Amendments, specified that certain increases above an air quality "baseline concentration" level of SO_2 and PM concentrations would constitute significant deterioration. The magnitude of the increment that cannot be exceeded depends on the classification of the area in which a new source (or modification) will have an impact. Three classifications were designated based on criteria established in the CAA Amendments. Initially, Congress promulgated areas as Class I (international parks, national wilderness areas, and memorial parks larger than 5,000 acres; and national parks larger than 6,000 acres) or Class II (all other areas not designated as Class I). No Class III areas, which would be allowed greater deterioration than Class II areas, were designated. However, the states were given the authority to redesignate any Class II area to Class III status, provided certain requirements were met. EPA then promulgated as regulations the CAA Amendments requirements for classifications and area designations (Federal Register, August 7, 1977). The State of Florida has adopted the EPA class designations and allowable PSD increments (Table 2-3).

The term "baseline concentration" evolves from federal and state PSD regulations and denotes a fictitious concentration level corresponding to a specified baseline date and certain additional baseline sources. The baseline concentration is comprised of the predicted impact of the baseline emissions and a representative background concentration, which

Table 2-3. Federal* and State† PSD Allowable Increments

Pollutant/Averaging Time	Allowable Increment (ug/m^3) Class I	Class II	Class III
Particulate Matter			
Annual Geometric Mean	5	19	37
24-Hour Maximum**	10	37	75
Sulfur Dioxide			
Annual Arithmetic Mean	2	20	40
24-Hour Maximum**	5	91	182
3-Hour Maximum**	25	512	700

* 40 CFR Part 52, Section 52.21.
† Ch 17-2, FAC.
**Maximum concentration not to be exceeded more than once per year.

Source: ESE, 1983.

refers to concentration levels due to sources not accounted for in the point source emission inventories (i.e., natural and distant manmade sources).

Within Florida, there are four Class I areas: Everglades National Park, Chassahowitzka National Wilderness Area, St. Marks National Wilderness Area, and Bradwell Bay Wilderness Area. All of these Class I areas are more than 100 km from the Gardinier plant site, except for the Chassahowitzka Class I area, which is located approximately 85 km to the north. All other areas of the state classified as attainment or unclassifiable are designated Class II areas.

2.2.3 Control Technology Review

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

Under EPA's implementation of the CAA Amendments, the basic control technology requirement is the application and evaluation of BACT. BACT is defined as follows [40 CFR 52.21(b)(12)]:

> An emission limitation...based on the maximum degree of reduction for each pollutant...which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable... for control of such pollutant.

In December 1978, EPA's Office of Air, Noise, and Radiation published Guidelines for the Evaluation of BACT to assist states and EPA Regional Offices in making BACT determinations. 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 state emission limits. 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 chosen technology, is also 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.

2.2.4 Air Quality Analysis

In accordance with requirements of 40 CFR 52.21(m), any application for a PSD permit must contain, for each pollutant regulated under CAA, an analysis of continuous ambient air quality data in the area affected by the proposed major stationary source or major modification. For a new major source, the affected pollutants are those that the source would potentially emit in a significant amount.

According to CAA, ambient air monitoring for a period of up to 1 year generally is appropriate to complete the PSD requirements of CAA. Existing data from the vicinity of the proposed source may be utilized, 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, November 1980).

The regulations include an exemption which excludes or limits the pollutants for which an air quality analysis is conducted. This exemption states that the Administrator may exempt a proposed major stationary source or major modification from the monitoring requirements of 40 CFR 52.21(m) with respect to a particular pollutant if the emissions increase of the pollutant from the source or modification would cause, in any area, air quality impacts less than the federal de minimis levels presented in Table 2-4.

Table 2-4. Federal and State of Florida PSD De Minimis Impact Levels

Pollutant	De Minimis Air Quality Impact Level (ug/m^3)		
	Code of Federal Regulations	EPA Ambient Monitoring Guidelines	State of Florida
Sulfur Dioxide	13, 24-hour	13, 24-hour	13, 24-hour
Particulate Matter	10, 24-hour	10, 24-hour	10, 24-hour
Nitrogen Oxides	14, annual	14, annual	14, annual
Carbon Monoxide	575, 8-hour	575, 8-hour	575, 8-hour
Ozone	100 tons/yr*	100 tons/yr*	100 tons/yr*
Lead	0.1, 24-hour	0.1, 3-month	0.1, 24-hour
Sulfuric Acid Mist	†	†	†
Total Fluorides	0.25, 24-hour	0.25, 24-hour	0.25, 24-hour
Total Reduced Sulfur	10, 1-hour	†	10, 1-hour
Reduced Sulfur Compounds	10, 1-hour	†	10, 1-hour
Hydrogen Sulfide	0.04, 1-hour	0.2, 1-hour	0.04, 1-hour
Asbestos	†	†	†
Beryllium	0.0005, 24-hour	0.001, 24-hour	0.0005, 24-hour
Mercury	0.25, 24-hour	0.25, 24-hour	0.25, 24-hour
Vinyl Chloride	15, 24-hour	15, 24-hour	15, 24-hour
Benzene	†	†	†
Radionuclides	†	†	†
Inorganic Arsenic	†	†	†

* Increase in VOC emissions.
† No ambient air measurement method; no monitoring required.

Sources: 40 CFR 52.21(i)(8).
FAC, Chapter 17-2.500.
Ambient Monitoring Guidelines for Prevention of Significant Deterioration, EPA, November 1980.

The State of Florida has passed similar PSD air quality analysis requirements. EPA and State of Florida de minimis air quality impact levels are currently identical. In February 1981, EPA revised the de minimis levels and averaging times for three of the pollutants in the "Ambient Monitoring Guidelines for PSD" (EPA, February 1981), as shown in Table 2-4. The averaging period for the de minimis level for lead was changed to 3 months, and the de minimis impact levels for beryllium and hydrogen sulfide were changed to 0.001 microgram per cubic meter (ug/m^3) and 0.2 ug/m^3, respectively. Those revisions, however, have not been incorporated into the Code of Federal Regulations, and, therefore, the original federal (and State of Florida) de minimis levels technically still apply.

2.2.5 Source Impact Analysis

A source impact analysis must be performed by a proposed major source subject to PSD for each pollutant for which the increase in emissions exceeds the significant emission rates (Table 2-2). The PSD regulations specifically require the use of atmospheric dispersion models in performing impact analysis, estimating baseline and future air quality levels, and determining compliance with AAQS and allowable PSD increments. Designated EPA models must normally 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, 1978).

Various lengths of record for meteorological data can be utilized for impact analysis. 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" 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 fewer than 5 years of meteorological data are used, the highest concentration at each receptor must be used.

2.2.6 Additional Impact Analysis

In addition to air quality impact analyses, federal PSD regulations require analyses of the impairment to visibility and the impacts on soils and vegetation that would occur as a result of the proposed source. These analyses are to be conducted primarily for PSD Class I areas. Impacts due to general commercial, residential, industrial, and other growth associated with the source must also be addressed. These analyses are required for each pollutant emitted in significant amounts.

2.2.7 Good Engineering Practice (GEP) 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 February 8, 1982, EPA promulgated final stack height regulations (EPA, February 8, 1982). Guidelines were published by EPA in July 1981 to assist in the determination of the GEP stack height.

GEP stack height is defined as the highest of:

1. 65 m, or
2. A height established by applying the formula:

   $H_g = H + 1.5L$

   where: H_g = GEP stack height,
   H = Height of the structure or nearby structure, and
   L = Lesser dimension (height or projected width) of nearby structure(s).

"Nearby" is defined as a distance up to five times the lesser of the height or width dimension of a structure or terrain feature, but not greater than 0.5 mi. While 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.

2.3 SOURCE APPLICABILITY

2.3.1 Pollutant Applicability

As described in Section 1.0, the only regulated pollutants affected by the proposed expansion are SO_2 and H_2SO_4 mist. Historic annual emissions of SO_2 from the Gardinier plant are shown in Table 2-5 for the last 2 calendar years (1981 and 1982). The emissions figures were obtained from the APER submitted annually by Gardinier to DER. As shown, total plant SO_2 emissions were nearly equal in 1981 and 1982 at about 1,820 tons per year. Since phosphate rock processing plants are one of the 28 listed source categories, and the Gardinier plant is a phosphate rock processing plant, the plant is an existing major source if emissions of any regulated pollutant exceed 100 tons per year. Emissions of SO_2 do exceed 100 tons per year and, therefore, the Gardinier plant is an existing major source for PSD purposes.

Review of Table 2-5 reveals that the H_2SO_4 plants produce the majority of SO_2 emissions (greater than 80 percent in either year). Emissions of SO_2 from sources other than the H_2SO_4 plants are dependent upon fuel type and quality. Many can use natural gas or fuel oil; price and availability during any particular year dictate the choice of fuel.

A major modification, as described in Section 2.2, is a significant increase in emissions of any regulated pollutant at a major stationary source. PSD review applies to each pollutant for which the increase in emissions exceeds the PSD significant emission rate (Table 2-2). Since emission increases at the Gardinier plant due to the proposed modifications will only occur at the No. 7 and No. 8 H_2SO_4 plants, only these sources were considered in determining the net emissions increase. Emissions from all other SO_2 sources will not exceed current permit

Table 2-5. Summary of SO_2 Emissions, Gardinier, Inc., 1981-1982

Unit Code	SO_2 Emissions (tons/yr) 1981	1982	Average 1981-1982
KVS 12	0.26	--	0.13
RM 5	0.24	0.10	0.27
RM 6-10	0.08	0.20	0.14
CONC 7	73.70	*	36.85
CONC 8	81.70	*	40.85
CTMD 3	18.38	0.88	9.63
CTMD 4	15.06	0.48	7.77
GTSP	109.80	11.90	60.85
DM 1-2	0.64	*	0.32
DM 3-4	0.42	<0.01	0.21
DM 5	16.40	9.22	12.81
SSF	0.75	0.06	0.41
Ammonia (NH_3)	1.40	3.91	2.66
Auxiliary Boiler	4.80	0.04	2.42
H_2SO_4 7	128.40	764.70	446.55
H_2SO_4 8	477.30	396.20	436.75
H_2SO_4 9	891.30	635.90	763.60
TOTAL	1,820.63	1,823.59	1,822.11†

* Unit did not operate.
† Sum may not equal total due to round-off error.

Source: Gardinier, Inc. Air Pollutant Emissions Reports to the DER, 1981, 1982.

conditions, although emissions may fluctuate below these levels depending upon phosphate fertilizer market conditions and fuel type and quality. Since such fluctuations constitute normal routine operation, they need not be considered in determining the net emissions increase [40 CFR 52.21(2)(i) and FAC 17-2.100(102)].

Current actual and allowable emissions, proposed allowable emissions, and the net increase in allowable emissions of SO_2 and H_2SO_4 mist from the No. 7 and No. 8 H_2SO_4 plants are shown in Table 2-6. Current actual emissions of both SO_2 and H_2SO_4 mist are well below allowable emissions. The net increase in both SO_2 and H_2SO_4 mist emissions are estimated to exceed the PSD significant emission rates. As a result, both of these pollutants are required to undergo the PSD review described in Section 2.2. The calculated net increase does not include offsets derived from the shutdown of the ammonia plant, but these offsets are minor (less than 3 tons per year) and would not change the pollutant applicability.

2.3.2 Emission Standards

The No. 7 H_2SO_4 plant is currently required to emit no more than 4 lb SO_2 per ton H_2SO_4 produced and 0.15 lb H_2SO_4 mist per ton H_2SO_4 produced. Emission limits for the No. 8 H_2SO_4 plant are 10 lb/ton for SO_2 and 0.30 lb/ton for H_2SO_4 mist. These emission limits will be retained after the expansion of the H_2SO_4 production capacities of these plants.

2.3.3 Increment Consumption

The PSD increments allow a specified amount of deterioration in air quality to occur as judged against a "baseline" air quality level. This baseline level must be established before PSD increment consumption due to a proposed modification can occur. The baseline date has been established by DER to be December 27, 1977, for the entire State of Florida. Several provisions exist in FAC 17-2.500(4) which identify emissions which affect PSD increment consumption. These provisions

Table 2-6. Net Emission Increases at Gardinier, Inc., Due to the Proposed Modification

	SO_2 (tons/yr)		H_2SO_4 Mist (tons/yr)	
	Actual*	Allowable	Actual*	Allowable
Current Emissions				
No. 7 H_2SO_4 @ 1,750 TPD	447	1,278 (4 lb/ton)	13.6	47.9 (0.15 lb/ton)
No. 8 H_2SO_4 @ 1,770 TPD	438	3,232 (10 lb/ton)	14.7	96.9 (0.30 lb/ton)
TOTALS	885	4,510	28.3	144.8
Proposed Emissions				
No. 7 H_2SO_4 @ 2,200 TPD	--	1,606 (4 lb/ton)	--	60.2 (0.15 lb/ton)
No. 8 H_2SO4 @ 2,200 TPD	--	4,015 (10 lb/ton)	--	120.5 (0.30 lb/ton)
TOTALS		5,621		180.7
Net Increase	--	1,111	--	35.9
PSD Significant Emission Rate		40		7

* Average of 1981 and 1982 calendar years, from Air Pollutant Emissions Reports.

Source: ESE, 1984.

relate to emission increases and decreases at facilities which occurred due to construction commencing after January 6, 1975.

A review of the history of the Gardinier plant in regard to SO_2 emissions will allow a better understanding of the status of the facility in regard to PSD increment consumption. The permit history of the H_2SO_4 plants (Nos. 4 through 9) is shown in Table 2-7. The No. 7 and No. 8 H_2SO_4 plants were modified to double absorption prior to January 6, 1975 (i.e., construction permits were obtained before this date). In 1979, the No. 7 H_2SO_4 plant received a construction permit to increase capacity from 1,380 TPD to 1,750 TPD of H_2SO_4. In conjunction with this change, the allowable SO_2 emission level was reduced from 10 lb/ton to 4 lb/ton.

The original construction permit for the No. 9 H_2SO_4 plant was received prior to January 6, 1975. In October 1976, the older Nos. 4, 5, and 6 H_2SO_4 plants were permanently shutdown.

The SO_2 emission decreases and increases at the Gardinier H_2SO_4 plants which affect increment consumption, including the presently proposed expansion, are summarized in Table 2-8. Both actual and allowable emissions are shown, based upon a 100-percent capacity factor on all units. The post-January 6, 1975 capacity increases at the No. 7 H_2SO_4 plant represent increases in actual emissions which consume PSD increments. Although the allowable SO_2 emission rate was reduced from 10 lb/ton to 4 lb/ton, review of historic source test data (Appendix A) show that the unit had met the 4-lb/ton limit since converting to double adsorption in 1977. Thus, for purposes of calculating actual emissions changes from this unit, the 4-lb/ton factor was assumed for both prior to and after the change occurred.

The currently proposed increases in production capacity of the No. 7 and No. 8 H_2SO_4 plants will also represent post-January 6, 1975 emissions increases which consume PSD increments. The actual emissions for the

Table 2-7. Permit History of Sulfuric Acid Plants at Gardinier, Inc.

Permit No.	Date	Comments
No. 7 H_2SO_4		
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	Modify to 1,750 TPD and reduce allowable SO_2 emissions to 4 lb/ton
AO 29-56993	9/10/82	Operating permit for 1,750 TPD expansion
No. 8 H_2SO_4		
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)
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)
Nos. 4, 5, and 6 H_2SO_4		
	October 1976	Units shutdown

Source: ESE, 1984.

No. 8 H_2SO_4 are based upon 4 lb/ton, since historic source test data (Appendix A) show that this level has been generally achieved.

The shutdown of the No. 4, No. 5, and No. 6 H_2SO_4 plants in 1976 represents post-January 6, 1975 emission decreases which expand the available PSD increments. The actual emissions for these units are based upon the last 2 years of operation (1975 through October 1976), as reported in the APER for 1975 and 1976.

The bottom line of Table 2-8 shows the net change in increment-affecting emissions at Gardinier, including the proposed expansions of the No. 7 and No. 8 H_2SO_4 plants. The results show large decreases in both actual and allowable SO_2 emissions. In addition to these changes in emissions, the stack heights of the No. 7 and No. 8 H_2SO_4 plants are currently 149.5 feet. The shutdown No. 4, No. 5, and No. 6 H_2SO_4 plants all had shorter stacks, ranging from 72 feet to 80 feet. Thus, the air quality impacts from the older units would be greater than for the No. 7 and No. 8 units, per ton of SO_2 emitted.

Changes to other SO_2-emitting sources at Gardinier since January 6, 1975, at Gardinier have been minimal and would not significantly affect the results shown in Table 2-8. These changes include the addition of the No. 5 diammonium phosphate plant (10 lb/hr, 44 tons per year), and the shutdown of the ammonia plant (less than 5 tons per year).

Based upon the above considerations, it is concluded that the proposed expansion of the No. 7 and No. 8 H_2SO_4 plants will not cause or contribute to any violation of the allowable SO_2 PSD increments. The Gardinier plant is not located in an area where the PSD increments are known to be violated. Emission reductions at Gardinier since January 6, 1975, provide greatly expanded PSD increments in the vicinity of the plant. These emission decreases are of such magnitude that no detailed modeling analysis is needed, either for the PSD Class II area

Table 2-8. Summary of SO_2 Emission Changes at Gardinier H_2SO_4 Plants Which Affect PSD Increment Consumption

Unit/Date	Change	Actual SO_2 (tons/yr)*	Allowable SO_2 (tons/yr)*
No. 7 H_2SO_4			
9/07/79	Increase capacity from 1,380 TPD to 1,750 TPD and reduce allowables from 10 lb/ton to 4 lb/ton	+270†	-1,241
Proposed	Increase capacity from 1,750 TPD to 2,200 TPD	+329†	+329
No. 8 H_2SO_4			
Proposed	Increase capacity from 1,770 TPD to 2,200 TPD at 10 lb/ton	+312†	+785
No. 4 H_2SO_4			
1976	Unit shutdown, 274 TPD @ 6,992 lb SO_2/day	-892**	-1,276
No. 5 H_2SO_4			
1976	Unit shutdown, 475 TPD @ 12,140 lb SO_2/day	-1,773**	-2,216
No. 6 H_2SO_4			
1976	Unit shutdown, 650 TPD @ 16,598 lb SO_2/day	-2,469**	-3,029
Net Change		-4,223	-6,648

* Based upon year-round, continuous operation. Negative numbers indicate emission decreases; positive numbers indicate emission increases.

† Based upon 4 lb/ton before and after increase in capacity.

** Average of last 2 years of operation (1975 and 1976) based upon Air Pollutant Emissions Reports.

Source: ESE, 1984.

surrounding the Gardinier site, or for the PSD Class I area located 85 km to the north of the site.

2.3.4 GEP Stack Height

The heights of the existing No. 7 and No. 8 H_2SO_4 plants are 149.5 feet (45.6 m). These existing stacks will not be modified as a result of the proposed expansion. These stack heights are less than the 65-m height allowed under the GEP stack height regulations and, therefore, the stacks will not exceed the GEP stack height.

2.3.5 Ambient Monitoring

An ambient monitoring analysis is presented in Section 4.0 for SO_2 to satisfy PSD preconstruction monitoring requirements. Currently, no ambient monitoring requirements exist for H_2SO_4 mist under PSD, as no acceptable ambient monitoring technique has been approved (see Table 2-4).

3.0 BEST AVAILABLE CONTROL TECHNOLOGY EVALUATION

The source applicability analysis for the proposed Gardinier H_2SO_4 plant expansion, presented in Section 2.0, identified SO_2 and H_2SO_4 mist as air pollutants requiring a BACT review under federal and state PSD regulations. The State of Florida has received review authority for the federal PSD program (Federal Register, Vol. 48, No. 226, November 22, 1983). As a result, Florida's PSD regulations and BACT requirements must be met by the proposed modification. DER defines BACT as follows [Ch 17-2.100(22), FAC]:

> An emission limitation, including a visible emissions 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 each such pollutant . . . Each BACT determination shall include applicable test methods or shall provide for determining compliance with the standard(s) by means which achieve equivalent results.

DER generally follows EPA's BACT guidelines in defining BACT. The remainder of this section describes the proposed BACT and emission limit for each pollutant subject to BACT. An analysis of alternative control technologies, including economic, energy, and environmental considerations, is also presented.

3.1 SULFUR DIOXIDE

3.1.1 Proposed SO_2 BACT

The No. 7 and No. 8 H_2SO_4 plants at Gardinier are double-absorption, 5-stage converter plants. SO_2 to H_2SO_4 conversion efficiency depends primarily on the number of converter stages and, to a lesser extent, on the amount of catalyst. No H_2SO_4 plant in the United States is known to currently have more than five converter stages. The double absorption, 5-stage converter 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. 7 and No. 8 plants, and therefore this control technology is proposed as BACT for SO_2. The proposed BACT

SO_2 emission limit is the current allowable level of 4 lb/ton H_2SO_4 produced for No. 7 H_2SO_4 and 10 lb/ton for No. 8 H_2SO_4.

The SO_2 source test data presented in Appendix A show that the maximum SO_2 emission level measured from No. 7 H_2SO_4 is 2.97 lb/ton. Compliance test results (average of three consecutive individual tests) ranged from 0.43 to 2.63 lb/ton. The upper levels recorded approach the 4.0-lb/ton allowable emission level. As the catalyst beds in the H_2SO_4 plant age over time, the SO_2 conversion efficiency decreases. Thus, the source test data alone cannot reflect emission levels that the No. 7 H_2SO_4 plant can achieve in the future, and the 4-lb/ton allowable rate is the proposed BACT emission rate. In addition, day-to-day emission rates can vary due to fluctuations in process variables.

Source test data for the No. 8 H_2SO_4 plant (Appendix A) show individual SO_2 tests have ranged up to 6.20 lb/ton. Compliance test results have ranged from 0.73 lb/ton to 6.01 lb/ton, with two values exceeding the 4-lb/ton level. Because these SO_2 test results have shown greater variability and higher levels than those for the No. 7 H_2SO_4 plant, it is proposed to retain the current allowable emission limit on the No. 8 H_2SO_4 plant of 10 lb/ton as the BACT emission limit. Day-to-day variations in process variables and catalyst aging affects could cause SO_2 emissions to increase above the historic measured levels for this plant.

3.1.2 Alternative SO_2 Control Technologies

EPA's review of New Source Performance Standards (NSPS) for H_2SO_4 plants (MITRE Corp., 1979) presents a comprehensive assessment of the alternative control technologies applicable to SO_2 removal from H_2SO_4 plant tail gases. The study identified the double-absorption contact H_2SO_4 plant, sodium sulfite-bisulfite scrubbing, ammonia scrubbing, and molecular sieves as alternatives. 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 dual-absorption process, wherein two absorber stages are used instead of only one, as in the single-absorption process. SO_2 conversion efficiencies for the double-absorption plant range from 96 percent and up.

Reduction of SO_2 emissions below those currently achieved by the No. 7 and No. 8 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, produce a waste disposal problem, and would not result in significant benefits to the environment. The proposed Gardinier expansion will increase allowable SO_2 emissions from the entire plant by less than 255 lb/hr. This represents only 12 percent of the total allowable SO_2 emissions the Gardinier plant will be permitted to emit after the expansion is completed (2,113 lb/hr).

The EPA NSPS review studied 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 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 available 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. 7 and No. 8 H_2SO_4 plants is the currently operating double-absorption plant.

3.2 SULFURIC ACID MIST

3.2.1 Proposed H_2SO_4 Mist BACT

The No. 7 and No. 8 H_2SO_4 plants at Gardinier are currently equipped with Brinks vertical pad-type, high efficiency mist eliminators to control H_2SO_4 mist emissions. Current mist emission limits are 0.15 lb/ton for No. 7 and 0.3 lb/ton for No. 8. All H_2SO_4 plants operating in the United States in 1979 that were required to meet the NSPS level of 0.15 lb/ton used high efficiency mist eliminators, primarily of the vertical pad type. 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 No. 7 and No. 8 Gardinier H_2SO_4 plants currently use high efficiency mist eliminators, and these are considered to be the state-of-the-art control, they are 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. The proposed BACT emission levels for H_2SO_4 mist are the current allowables for the units--0.15 lb/ton for No. 7 H_2SO_4 plant and 0.30 lb/ton for No. 8 H_2SO_4.

Review of the source test data presented in Appendix A shows that H_2SO_4 mist compliance test values ranged from 0.030 lb/ton to 0.130 lb/ton for the No. 7 H_2SO_4 plant. These data indicate that emissions can fluctuate significantly, due to the factors discussed previously, and can range up to the 0.15-lb/ton current allowable limit. Based on the source test data, no reduction in the allowable level is justified.

The source test data for No. 8 H_2SO_4 show similar results. Individual tests ranged up to 0.207 lb/ton, while compliance tests ranged from 0.035 to 0.174 lb/ton. Day-to-day fluctuations in process variables could cause emissions to approach the current allowable level

of 0.30 lb/ton, and no reduction in this level is warranted based on the available data.

3.2.2 Alternative H_2SO_4 Mist Control Technologies

EPA's review of the H_2SO_4 plant NSPS 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.

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 of the types can meet the NSPS level of 0.15 lb/ton, and no one type is superior to the others, although the majority of plants use the vertical tube type. Therefore, it is concluded that the alternative filter types cannot achieve a degree of H_2SO_4 mist reduction that is significantly better than the vertical pad filters currently in use on the No. 7 and No. 8 H_2SO_4 plants. The selected BACT for control of H_2SO_4 mist emissions is the currently operating, high efficiency mist eliminators.

The proposed Gardinier H_2SO_4 expansion will increase allowable H_2SO_4 mist emissions by 8.2 lb/hr. This will result in only a 25-percent increase in current allowable H_2SO_4 emissions (33.1 lb/hr). A lower BACT emission limit would not result in significant benefits to the environment.

4.0 AIR QUALITY ANALYSIS

4.1 MONITORING REQUIREMENTS

The Clean Air Act 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. Monitoring must be conducted for a period of up to 1 year prior to submission of a construction permit application. As discussed in the source applicability section, Section 2.3, only SO_2 requires an air quality analysis to meet PSD preconstruction monitoring requirements for the proposed Gardinier expansion.

The EPA "Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)" (EPA, 1980) sets forth guidelines for preconstruction monitoring. The guidelines allow the use of existing air quality data in lieu of additional air monitoring, if the existing data are "representative." Three criteria are used in determining if the data are representative: monitor location, quality of data, and currentness of data.

Gardinier desires to submit existing representative SO_2 air quality data in lieu of additional monitoring to satisfy the preconstruction requirements. The representativeness criteria are discussed in Section 4.2 for the available existing data.

4.2 EXISTING SO_2 AIR QUALITY DATA

The EPA Ambient Monitoring guidelines state that:

> If the proposed construction will be in an area of multisource emissions and basically flat terrain, then the proposed source or modification may propose the use of existing data at nearby monitor sites if either of the following criteria are met.
>
> 1. The existing monitor is within 10 km of the points of proposed emissions, or
> 2. The existing monitor is within or not farther than 1 km away from either the area(s) of the maximum air pollutant concentration from existing sources or the area(s) of the combined maximum impact from existing and proposed sources.

The Gardinier site is located in an area of multisource emissions (i.e., TEC Big Bend, Gannon, and Hookers Point, etc.) and flat terrain; therefore, the criteria presented above are applicable. Gardinier proposes to satisfy the first criterion, i.e., existing monitor located within 10 km of the proposed emissions. Presented in Table 4-1 is a summary of ambient SO_2 data available from 1981 through June 1983 for all monitors located within 10 km of the Gardinier site. A total of six stations is located within 10 km of Gardinier, four of which have continuous SO_2 monitors. Thus, the existing data satisfy the monitor location criterion.

The second criterion is data quality. The monitoring network is operated by the Hillsborough County Environmental Protection Commission and is believed to meet all quality assurance requirements. All data recoveries have exceeded the requirement of 80-percent recovery, as shown in Table 4-1.

The third criterion is the currentness of data. This generally means that the data have been gathered within the last 3 years, provided the data are still representative of current conditions. Since Table 4-1 presents the data available up to the present time (these monitors are currently operating), the data are considered to be representative of current conditions.

The data presented are considered to meet all of the requirements for PSD preconstruction monitoring. Gardinier is therefore submitting these data in lieu of additional monitoring.

4.3 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. The available ambient SO_2 data presented in Table 4-1 were used for this purpose.

Table 4-1. Summary of SO_2 Data for Sites Within 10 km of Gardinier, Inc.

SAROAD Site No. (Distance Away)	Monitoring Method	Period	No. of Obs.	Percent Data Recovery	SO_2 Concentration (ug/m_3) 3-Hour Max	3-Hour 2nd Max	24-Hour Max	24-Hour 2nd Max	Annual Average
1800-021	Continuous	1981	8,181	93.4	897	652	123	116	15
(8.2 km)		1982	7,714	88.1	693	629	160	125	15
		1983*	4,182	95.5	624	507	104	84	14
1800-066	Gas bubbler	1981	52	—	—	—	63	58	14
(3.9 km)		1982	51	—	—	—	39	24	8
		1983*	27	—	—	—	45	24	8
1800-083	Gas bubbler	1981	52	—	—	—	110	47	14
(G02)		1982	51	—	—	—	52	31	8
(0.6 km)		1983*	29	—	—	—	31	24	7
4360-035	Continuous	1981	7,655	87.4	293	291	116	116	28
(9.8 km)		1982	8,481	96.8	376	334	103	88	25
		1983*	4,287	97.9	327	265	85	77	18
4360-051	Continuous	1981	7,459	85.1	271	266	118	102	18
(8.6 km)		1982	8,615	98.3	452	327	117	97	24
		1983*	4,231	96.6	432	273	81	81	15
4360-053	Continuous	1981	7,754	88.5	219	217	64	60	14
(9.5 km)		1982	8,467	96.7	375	292	90	84	19
		1983*	4,307	98.3	225	199	69	58	15

* January through June only.
† Based upon 8,760 hr/yr.

Source: ESE, 1984.

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, these concentrations are expected to include substantial contributions from sources in the area, including the existing Gardinier facility. Potential major contributing sources are also explicitly included in the modeling analysis. For the short-term averaging times, these concentrations would not be representative of background concentrations which would be expected to occur in conjunction with the worst-case meteorology. For the annual averaging time, the background concentration would be significantly lower than the values shown in Table 4-1.

A representative background SO_2 concentration was considered to be the highest annual average concentration recorded at monitoring site 1800-021. This value was 15 ug/m^3, recorded in both 1981 and 1982. Site 1800-021 is located 8.2 km southeast of Gardinier. TEC Big Bend power plant lies about 5 km due east of the site. 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 15-ug/m^3 background SO_2 level was used for all averaging times and was added to dispersion modeling results, presented in Section 5.0, 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 Gardinier 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 (i.e., greater than 25 TPY) located within 20 km of the Gardinier plant were considered in the dispersion modeling analysis, the 15-ug/m^3 annual average recorded at Station 1800-021 was also considered to be representative of the short-term background concentration level.

5.0 SOURCE IMPACT ANALYSIS

5.1 ANALYSIS APPROACH AND ASSUMPTIONS

5.1.1 General Modeling Approach

The general modeling approach followed EPA and DER modeling guidelines for determining compliance with AAQS. In general, when model predictions are used to determine compliance with AAQS, current EPA and DER policies stipulate that the highest annual average and highest or highest, second-highest short-term (i.e., 24 hours or less) concentrations must 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 data base allows comparison of the predicted highest, second-highest short-term concentrations 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 5.2. To develop the maximum short-term SO_2 concentrations for the proposed Gardinier expansion, the general modeling approach was divided into screening and refined phases to reduce the computation time required to model the emission points. 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 (i.e., sources with SO_2 emissions of more than 250 tons per year), and a 5-year meteorological record. The highest and highest, second-highest short-term concentrations predicted over the field of receptors were then reviewed to ensure the hourly concentrations were predicted during valid meteorological conditions (e.g., non-calm wind conditions).

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 run 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 5.1.4 and 5.1.5, respectively.

5.1.2 Model Selection

The ISC dispersion model (Cramer, 1979) was used to evaluate the SO_2 emissions from the Gardinier facility. This model is contained in EPA's User's Network for Applied Modeling of Air Pollution (UNAMAP), Version 5 (EPA, 1983). The ISC model was selected primarily for the following reasons:

1. EPA and DER have approved the general use of the model for air quality dispersion analyses because the model assumptions and methods are consistent with those in the Guideline on Air Quality Models (EPA, April 1978).
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.

3. The results from the ISC model are appropriate for addressing compliance with AAQS.

The ISC model has rural and urban options which affect the plume rise formulas, wind speed profile exponent law, dispersion curves, and mixing height formulations used in calculating ground-level concentrations. One of the criteria used to determine when the rural or urban mode is appropriate is based on land use near the proposed plant (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 radius circle centered on the proposed source, the urban mode should be selected. Otherwise, the rural option is more appropriate. Based on a review of the land use around the Gardinier facility, the rural mode was selected because of the general lack of or minimal residential, industrial, and commercial development.

The ISC model consists of two model codes. 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 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. For the annual averaging period, the 1-hour concentrations are summed for all hours in the year for each receptor.

The second model code 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. This model code was not used because the annual average concentrations were obtained from the ISCST model.

5.1.3 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 NWS station at Tampa International Airport and twice-daily radiosonde soundings from the NWS station at Ruskin, Florida. The years of meteorological data consisted 1973, 1974, 1975, 1978, and 1979.

The NWS stations in Tampa, located approximately 18 km to the northwest of the Gardinier 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 data base which is representative of the proposed plant sites.

The surface observations included wind direction, wind speed, temperature, cloud cover, and cloud ceiling. The wind speed, cloud cover, and cloud ceiling values are 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 are classified into one of thirty-six 10-degree sectors, the wind directions are randomized within each sector using an EPA preprocessing program to account for the expected variability in air flow.

5.1.4 Emission Inventory

A listing of all sources considered in the modeling analyses for determining total air quality impacts is presented in Table 5-1. The emission and stack parameters for the Gardinier sources were presented in Table 1-2 in Section 1.0. The emission and stack parameters for all other sources were obtained from a previous ESE report for the coal reconversion at the TEC Gannon Units 1 through 4 (ESE, 1980), and discussions with personnel from DER and Hillsborough County Environmental Protection Commission.

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

1. For Gardinier sources, individual point sources with emissions greater than or equal to 3.1 g/s (i.e., equivalent to 125 TPY).
2. For other sources, individual point sources with emissions greater than 7.2 g/s (i.e., equivalent to 250 TPY) within 20 km of the Gardinier sources.

For the screening modeling, Gardinier sources with similar stack heights and stack parameters were combined and treated as one stack to reduce computation time. The Gardinier screening emission inventory is listed in Table 5-2.

Table 5-1. SO_2 Emissions and Stack Parameters for All Sources Considered in the Modeling*

Sources	SO_2 Emissions (g/s)	Stack Height (m)	Stack Diameter (m)	Exit Gas Velocity (m/s)	Exit Gas Temperature (K)	UTM Coordinates (km) X	UTM Coordinates (km) Y
Tampa Electric Company							
Big Bend Units 1, 2	5,250†	149.35	7.3	28.7	423	361.6	3075.0
Big Bend Unit 3	2,690†	149.35	7.3	14.43	418	361.6	3075.0
Big Bend Unit 4	436	149.35	7.3	19.97	342	361.6	3075.0
Gannon Units 1, 2	760.2	93.3	3.05	32.4	438	360.0	3087.5
Gannon Unit 3	483.5	93.3	3.23	35.4	427	360.0	3087.5
Gannon Unit 4	567.3	93.3	2.93	24.6	443	360.0	3087.5
Gannon Unit 5	690.7	93.3	4.45	20.7	416	360.0	3087.5
Gannon Unit 6	1,148.5	93.3	5.40	23.4	439	360.0	3087.5
Hookers Point Units 1,2,5	167.0	85.3	3.43	18.2	403	358.0	3091.0
Hookers Point Units 3, 4	113.6	81.7	3.66	11.5	397	358.0	3091.0
Hookers Point Unit 6	107.1	85.3	2.89	17.9	436	358.0	3091.0
Chloride Metals							
50-01	13.0	30.2	0.6	22.9	398	361.8	3088.3
50-04	7.2	29.9	0.6	12.1	345	361.8	3088.3
General Portland							
18-04	81.0	36.0	2.7	17.7	505	358.0	3090.6
18-05	10.3	36.0	2.7	8.8	454	358.0	3090.6
Gulf Coast 57-01	10.3	29.6	0.6	29.1	344	363.9	3093.8
Tampa Water Pump							
9-01	1.79	38.1	2.5	6.9	589	360.0	3092.2
9-02	1.79	38.1	1.5	0.4	394	360.0	3092.2
Florida Steel 20-01	0.81	22.6	2.9	1.3	306	364.6	3094.2
Exxon 21-01	0.78	9.4	3.0	11.0	340	362.2	3087.2
IMC Corporation 24-01	3.62	13.1	0.3	9.7	349	360.1	3087.5
National Gypsum 28-01	3.92	27.1	0.3	8.3	374	347.4	3082.5
Nitram							
29-03	0.50	27.4	1.4	1.9	505	363.1	3089.0
29-04	2.62	27.4	1.4	10.8	505	363.1	3089.0
Thatcher Glass							
45-01	3.51	29.9	0.6	12.1	345	361.8	3088.3
45-02	1.56	30.2	0.6	22.9	398	361.8	3088.3

Table 5-1. SO_2 Emissions and Stack Parameters for All Sources Considered in the Modeling* (Continued, Page 2 of 2)

Sources	SO_2 Emissions (g/s)	Stack Height (m)	Stack Diameter (m)	Exit Gas Velocity (m/s)	Exit Gas Temperature (K)	UTM Coordinates (km) X	UTM Coordinates (km) Y
Sulfur Terminal 82-01, 02	1.5	9.1	0.6	5.9	592	358.0	3089.2
Conco							
Dryer	3.4	22.9	0.35	24.4	366	361.4	3086.9
Heater	0.55	12.2	0.36	8.66	561	361.4	3086.9
AMAX							
2-01, 02	90.7	61.0	2.4	10.3	337	348.5	3057.3
2-06, 07	3.1	61.0	2.1	20.5	311	348.5	3057.3
2-11	0.83	12.5	1.4	10.0	299	348.5	3057.3
FPL Manatee Units 1, 2	1,905	152.0	7.9	20.5	427	367.6	3055.1

* See text for details concerning those sources considered in the screening and refined analyses.
† SO_2 emissions are based on maximum allowable 3-hour emissions. For 24-hour average, maximum allowable SO_2 emissions Units 1 and 2 are 4,170 g/s and for Unit 3 is 2,130 g/s.

Source: ESE, 1984.

Table 5-2. Combined Gardinier Sources Used for Screening Modeling

Sources	SO_2 Emissions (g/s)	Stack Height (m)	Stack Diameter (m)	Exit Gas Velocity (m/s)	Exit Gas Temperature (K)	UTM Coordinates (km) X	Y
RM 5, CTMD 3, 4	9.69	20.7	1.07	11.5	316	362.65	3082.6
CON 7, 8	21.5	23.8	1.83	5.8	345	362.8	3082.7
GTSP	14.3	38.4	2.44	11.0	327	362.6	3082.45
H_2SO_4 7	46.2	45.6	2.29	13.1	339	363.2	3082.3
H_2SO_4 8	116.0	45.6	2.44	11.5	339	363.3	3082.4
H_2SO_4 9	55.3	45.6	2.74	10.0	347	363.2	3082.45

Source: ESE, 1984.

After the screening modeling was performed and the worst-case meteorological periods identified, all the sources shown in Table 5-1 and Gardinier sources shown in Table 1-2 were modeled using a refined receptor grid. This inventory includes all other sources with emissions greater than 0.72 g/s (i.e., 25 TPY) and located within 20 km of the Gardinier site. In addition, emissions from the Florida Power & Light Company (FPL) Manatee and AMAX facilities, located about 30 km from the Gardinier facility, were included in the modeling because of the magnitude of their emissions and the potential combined impacts with TEC Big Bend Units and Gardinier sources.

A summary of the number of sources and emissions considered in the screening and refined phases of the analysis is presented in Table 5-3. As shown in this table, 22 sources were modeled in the screening phase and represent almost 50 percent of all sources and 86 percent of all emissions considered in the refined analysis. For sources that were within 20 km of the Gardinier plant (i.e., excluding emissions from the AMAX and FPL Manatee facilities), the total emissions considered in the screening phase represent more than 99 percent of those used in the refined analysis. For the Gardinier sources, the emissions considered in the screening phase represent approximately 99 percent of all emissions from the Gardinier plant.

5.1.5 Receptor Grids

As discussed in Section 5.1.1, the general modeling approach considered screening and refined phases to address compliance with AAQS. For the screening phase, concentrations were predicted for three main receptor grids using a limited number of receptors and sources for each receptor grid. The locations of the receptor grids were based on identifying the areas in which the maximum concentrations would be expected due to the Gardinier sources only and due to the interaction of the Gardinier sources with other major sources of SO_2. For the screening phase, only those non-Gardinier sources with SO_2 emissions greater than

Table 5-3. Summary of SO_2 Sources Within 20 km of the Gardinier Facility Considered in the Screening and Refined Modeling

Sources	Screening Modeling		Refined Modeling	
	SO_2 Emissions (g/s)	Number of Emission Points	SO_2 Emissions (g/s)	Number of Emission Points
Gardinier	263.0	6*	266.2	15
Tampa Electric Company				
Big Bend	8,376.0†	3	8,376.0†	3
Gannon	3,650.2	5	3,650.2	5
Hooker's Point	387.7	3*	387.7	3*
Chloride Metals	20.2	2	20.2	2
General Portland	91.3	2	91.3	2
Gulf Coast	10.3	1	10.3	1
Tampa Water Pump	--	--	3.6	2
Florida Steel	--	--	0.8	1
Exxon	--	--	0.8	1
IMC Corporation	--	--	3.6	1
National Gypsum	--	--	3.9	1
Nitram	--	--	3.1	2
Thatcher Glass	--	--	5.1	2
Sulfur Terminal	--	--	1.5	1
Comco	--	--	4.0	2
AMAX**	--	--	94.6	3
FPL Manatee**	--	--	1,905.0	1
TOTAL ALL SOURCES	12,798.7	22	14,829.4	48

* Several emission points for these sources were combined in the modeling based upon similar stack parameters.

† Emissions for Units 1, 2, and 3 based on maximum allowed for 3 hours (32 tons per hour).

** These sources were more than 20 km from the Gardinier facility, but because of their emissions, were considered in the modeling analysis.

Source: ESE, 1984.

250 TPY and located within 20 km of the Gardinier facility were considered (see Section 5.1.4). A listing of the non-Gardinier SO_2 sources and their location with respect to the Gardinier facility are presented in Table 5-4. Because these major sources are located in distinct directions and more than 5 km from the Gardinier facility, not all of these sources were modeled for each of the three grids. Descriptions of the three receptor grids and major sources considered in each grid are as follows:

1. Receptor grid that consisted of 148 receptors located in the immediate vicinity of the Gardinier plant. These receptors were generally spaced at intervals of 200 to 400 m along the plant boundary lines and out to about 2 km from the plant boundary. Because other major sources are located either to the northwest or southwest of Gardinier (see Table 5-4), this receptor grid was divided into three receptor grids: north, south, and east-west. For the north receptor grid (77 receptors located in the immediate vicinity to the north of the Gardinier sources), emissions from only the Gardinier and the TEC Big Bend plants were considered in the modeling since the other major sources would not contribute to concentrations at these receptors for wind directions from the south that align the Gardinier sources with those at the Big Bend plant.

   For the south receptor grid (48 receptors located in the immediate vicinity to the south of the Gardinier sources), emissions from the TEC Gannon and Hookers Point, Chloride Metals, General Portland, Gulf Coast, and Gardinier facilities were considered in the modeling. Emissions from the TEC Big Bend facility are not expected to contribute to the maximum concentrations for wind directions from the north that align the Gardinier sources with these major sources.

   For the east-west receptor grid (23 receptors located in the immediate vicinity to the east and west of the Gardinier

Table 5-4. Major Sources* Within 20 km from the Gardinier Facility

Source	Location from the Gardinier Plant†	
	Direction (degrees)	Distance (km)
Tampa Electric Company		
Big Bend	191	7.6
Hookers Point	330	9.9
Gannon	329	5.8
Chloride Metals	348	5.9
General Portland	328	9.5
Gulf Coast	5	11.3

* Sources with SO_2 emissions greater than 250 TPY.
† Based on UTM x,y coordinates of 363.0, 3082.5 km.

Source: ESE, 1984.

sources), emissions from all the major sources were considered.

2. Receptor grid that consisted of 20 receptors located in an area to the southwest of TEC Big Bend plant that aligned the Gardinier sources with those at the Big Bend plant. The receptors were located at intervals of 300 to 500 m. Emissions from the Gardinier and Big Bend sources only were considered for this receptor grid.
3. Receptor grid that consisted of a total of 12 receptors, with 3 receptors located at distances of 0.5, 1.0, and 2.0 km of each of the following sources: TEC Hookers Point/General Portland, TEC Gannon, Chloride Metals, and Gulf Coast Lead. The General Portland and TEC Hookers Point facilities were considered as one major source area because they are located within 400 m of each other. Emissions from all the major sources were considered in the modeling. The receptors were placed along the directions which aligned the Gardinier facility and the major source.

After the screening modeling was completed, the refined modeling consisted of modeling all sources (see Section 5.1.4) using a receptor grid centered on the receptor which had the highest, second-highest 3- and 24-hour concentrations. The receptors were located at intervals of 100 m in a 400-m by 400-m grid, for a total of 25 receptors. 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 the highest, second-highest concentration from the screening receptor grid.

Refined modeling analysis was not performed for the annual averaging time because the spatial distribution of annual average concentrations is not expected to vary significantly from those produced during the screening analysis.

5.1.6 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 15 ug/m^3. This background level was considered to be representative of all averaging times. This background level was added to model-predicted concentrations to estimate total air quality levels for comparison to AAQS.

5.2 MODEL RESULTS

A summary 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 5-5, 5-6, and 5-7, respectively. The total concentrations are determined from the impacts of Gardinier and other modeled sources, added to background concentrations determined from monitoring data. The results are also presented for the maximum concentrations for the three general receptor grids used in the modeling analyses. Based on the results presented in these tables, the maximum SO_2 concentrations due to all sources are predicted to be less than the AAQS for all averaging periods.

As shown in Table 5-5, the total 3-hour average concentrations for all receptor locations considered in the modeling are predicted to be less than the Florida 3-hour AAQS of 1,300 ug/m^3, which is not to be exceeded more than once per year. The maximum predicted 3-hour concentration was 1,005 ug/m^3 and occurred in the receptor grid located to the north of the major sources. This maximum concentration is primarily due to the sources to the north of the Gardinier facility with little contribution from sources at Gardinier.

Table 5-5. Maximum 3-Hour Average SO_2 Concentrations for Comparison to AAQS

Receptor Grid Location	Modeling Analysis	Concentration (ug/m^3)				Receptor Location UTM Coordinates (km)		Period		
			Contribution From							
		Total	Gardinier Sources	Other Modeled Sources	Background	X	Y	Julian Day	Hour Ending	Year
Around Gardinier	Screening	898	456	427	15	363.5	3083.4	158	18	1978
	Refined	901	456	430	15	363.5	3083.4	158	18	1978
South of Big Bend	Screening*	999	0	984	15	360.4	3073.7	158	12	1979
North of Other Major Sources	Screening	937	2	920	15	361.7	3088.79	153	12	1978
	Refined	1005	4	986	15	361.8	3088.99	183	15	1978

Note: Florida 3-hour AAQS is 1,300 ug/m^3, not to be exceeded more than once per year.

* Refined analysis not performed for this receptor grid. See text for details.

Source: ESE, 1984.

Table 5-6. Maximum 24-Hour Average SO_2 Concentrations for Comparison to AAQS

Receptor Grid Location	Modeling Analysis	Concentration (ug/m^3)				Receptor Location UTM Coordinates (km)		Period		
			Contribution From							
		Total	Gardinier Sources	Other Modeled Sources	Background	X	Y	Julian Day	Hour Ending	Year
Around Gardinier	Screening	246	231	0	15	361.9	3083.2	127	24	1979
	Refined	249	234	0	15	362.0	3083.1	127	24	1979
South of Big Bend	Screening*	114	0	99	15	360.4	3073.7	158	24	1979
North of Other Major Sources	Screening*	180	31	134	15	361.38	3090.26	193	24	1975

Note: Florida 24-hour AAQS is 260 ug/m^3, not to be exceeded more than once per year.

* Refined analysis not performed for this receptor grid. See text for details.

Source: ESE, 1984.

Table 5-7. Maximum Annual Average SO_2 Concentrations for Comparison to AAQS

Receptor Grid Location	Concentration (ug/m^3) Total	Total Due To: Gardinier Sources	Total Due To: Other Modeled Sources	Total Due To: Background	Receptor Location UTM Coordinates (km) X	Receptor Location UTM Coordinates (km) Y	Period Year
Around Gardinier	58.4	29.2	14.2	15	362.1	3082.4	1978
South of Big Bend	20.8	3.1	2.7	15	360.4	3073.7	1978
North of Other Major Sources	41.3	2.4	23.9	15	361.38	3090.26	1975

Note: Florida annual AAQS is 60 ug/m^3.

Source: ESE, 1984.

For the refined receptor grids around the Gardinier facility and to the south of the TEC Big Bend facility, the maximum predicted 3-hour average concentrations were 901 and 999 ug/m^3, respectively. The Gardinier sources contributed approximately 51 and 0 percent, respectively, to those maximum concentrations. The maximum concentration of 901 ug/m^3 predicted around the Gardinier facility occurred at the plant property line to the northeast of the Gardinier sources. Because emissions from the Gardinier facility did not contribute to this maximum concentration to the south of the Big Bend facility, modeling results were not refined using a refined receptor grid.

As shown in Table 5-6, the total 24-hour average concentrations for all receptors considered in the modeling are predicted to be less than the Florida 24-hour AAQS of 260 ug/m^3, which is not to be exceeded more than once per year. The maximum predicted 24-hour concentration of 249 ug/m^3 occurred in the receptor grid around the Gardinier facility. This maximum concentration, located along the northwest plant property line, is primarily due to the Gardinier sources, which contribute 94 percent to the total concentration. The estimated background concentration constituted the remainder of the total. None of the other major sources considered in the modeling contributed to the maximum concentration.

The maximum 24-hour average concentrations predicted in the screening analysis for the other receptor grids were less than 200 ug/m^3. Because the Gardinier sources contributed less than 20 percent to the maximum concentrations and maximum concentrations were much lower than that predicted for the receptor grid around the Gardinier facility, modeling results were not refined using a refined grid.

As shown in Table 5-7, the total annual average concentrations for all receptors considered in the modeling are predicted to be less than the Florida annual AAQS of 60 ug/m^3. The maximum predicted annual average concentration was 58.4 ug/m^3 and occurred in the receptor

grid around the Gardinier facility. The Gardinier sources contributed 50 percent to the maximum concentration, which is predicted to occur at the western plant property line.

For the other receptor grids, the maximum predicted annual concentrations were less than 42 ug/m^3. The contribution of the Gardinier sources was less than 15 percent to these concentrations.

6.0 ADDITIONAL IMPACT ANALYSIS

6.1 IMPACTS UPON VEGETATION

Natural vegetation in the vicinity of the Gardinier site consists of cut-over pine flatwoods and mixed forest. Near the coast, mangrove trees and salt-tolerant plants form the vegetative cover. Winter vegetables and pasture grasses are cultivated inland from the facility.

Plant response to atmospheric pollutants is influenced by the concentration during exposure, duration of each exposure, and the frequency of exposures. The usual pattern of pollutant exposure is that of a few episodes of relatively high concentrations for a short duration interspersed with long periods of extremely low concentrations. Effects on most plants will be from the short-term higher doses (a dose is the product of the concentration of the pollutant and the duration of exposure).

The total maximum (highest, second-highest) predicted 3-hour concentration of SO_2 around the Gardinier facility is 901 ug/m^3; this concentration is most likely to occur within 1 km northeast of the emission source. Concentrations will diminish appreciably with distance beyond the location of the maximum concentration. Higher 3-hour concentrations are predicted to the south of Big Bend and north of the other major sources, but the contributions of Gardinier sources to these maximum concentrations, which are below the AAQS, are minimal.

The total maximum predicted 24-hour average SO_2 concentration is 249 ug/m^3, and is predicted to occur northwest of the Gardinier sources in Hillsborough Bay. The total maximum predicted annual SO_2 concentration, including the background concentration level, is 58.4 ug/m^3. It is noted that these predicted levels of impact are much higher than actual measured concentrations at monitors located within 10 km of Gardinier.

Little information is available on the effects of airborne pollutants on species native to Florida. Woltz and Howe (1981) showed that exposure to 1,300 ug/m^3 SO_2 for 8 hours caused no visible injury

to bald cypress (Taxodium distichum), slash pine (Pinus elliottii), live oak (Quercus virginiana), or red mangrove (Rhizophora mangle).

The threshold SO_2 doses known to adversely affect the growth of some common vegetables and grasses are shown in Table 6-1. Most of these doses are higher than SO_2 doses predicted to result from the proposed facility, particularly since agricultural areas and large areas of natural vegetation are some distance from the areas where maximum concentrations will occur.

6.2 IMPACTS UPON SOILS

Soils in the vicinity of the Gardinier site consist primarily of tidal lands and somewhat poorly drained sands with organic pans. The tidal lands occur along the coast between the tidal swamps and the flatwoods. It consists 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 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 Gardinier by agricultural interests will effectively mitigate the small effects of any increased SO_2 deposition resulting from increased SO_2 emissions from the proposed expansion.

6.3 IMPACTS UPON VISIBILITY

The existing No. 7 and No. 8 H_2SO_4 plants must currently meet an opacity limitation of 10 percent. This opacity limit must also be met after the plants are expanded to greater capacity. This opacity level produces essentially no visible emissions and, therefore, no increase in the visible plume from the existing plants due to the expansion is expected.

Table 6-1. Lowest Doses of SO_2 Reported to Affect Growth of Some Grasses and Vegetables

Species	Lowest SO_2 Dose Known to Affect Species (ug/m^3)	Reference
Rye grass	367, for 131 days reduced growth	Ayazloo and Bell, 1981
Orchard grass	37 to 62, for 72 days reduced growth	Crittenden and Read, 1979
Oats	1,048, for 3 hours four times during life cycle reduced growth	Heck and Dunning, 1978
Sweet corn	812, for 7 days causes chlorosis, but no yield effects	Mandl et al., 1975
Tomato	1,258, for 5 hours on each of 57 days reduced growth	Kohut et al., 1982
Radish	262, for 3 hours reduced growth	Reinert et al., 1982
Cucumber	52, for 672 hours reduced growth	Meistrik, 1980

Source: ESE, 1984.

Since a PSD Class I area is located less than 100 km from the Gardinier site (85 km), 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 procedure calculates three visibility parameters: plume contrast against the sky (C_1), plume contrast against terrain (C_2), and change in sky/terrain contrast (C_3). If the absolute values of each of these parameters are less than 0.1, then it is highly unlikely that the emissions from the source would cause visibility impairment in the Class I area.

Parameter C_1 is dependent upon NO_x emissions; since no NO_x emissions have been calculated for the proposed Gardinier H_2SO_4 expansion, this parameter was not evaluated further. Parameter C_2 is dependent upon both particulate and NO_x emissions, where particulate emissions would include H_2SO_4 mist. Parameter C_3 is dependent upon particulate and SO_2 emissions. Particulate (H_2SO_4 mist) and SO_2 emissions used for the calculations were based upon the total allowable emissions from the No. 7 and No. 8 H_2SO_4 plants (not just the increase in allowables due to the proposed expansion). Following the Workbook procedure, the value of C_2 was calculated to be 6×10^{-5}, and C_3 was calculated to be 0.005.

Since the absolute values of C_2 and C_3 are below the threshold criteria of 0.10, no visibility impacts are expected upon the Class I area due to emissions from the proposed expansion.

6.4 ADDITIONAL GROWTH

Only the existing No. 7 and No. 8 H_2SO_4 plants are being expanded at the Gardinier facility. Total H_2SO_4 production capacity will increase by 880 tons per day, representing a 15-percent increase. The remainder of the Gardinier plant is already capable of utilizing this increased H_2SO_4 capacity. This small increase in production capacity will have a commensurately small impact on jobs, payroll, and taxes in the area.

Significant new associated facilities will not be required. As a result, no significant growth-related impacts are expected due to the proposed expansion.

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No. 7 Sulfuric Acid Plant Emission Tests

Date	Average Production Rate (tons/hr)	Sulfur Dioxide (lb/hr) Avg.	Sulfur Dioxide (lb/hr) Max.	Sulfur Dioxide (lb/ton) Avg.	Sulfur Dioxide (lb/ton) Max.	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.
08/15/77	57.5	48	56	0.83	0.98	1.9	2.1	0.032	0.037
03/30/78	47.5	106	109	2.23	2.29	1.5	2.0	0.032	0.042
10/31/78	46.0	43	56	0.93	1.19	3.0	4.6	0.065	0.099
05/18/79	44.8	19	20	0.43	0.44	4.3	4.4	0.095	0.097
01/21/80	49.6	32	35	0.64	0.70	1.2	1.8	0.025	0.036
09/11/80	41.7	31	32	0.75	0.77	1.9	2.0	0.045	0.049
05/20/81	42.7	41	45	0.95	1.05	5.4	8.9	0.130	0.210
05/19/82	88.8	235	250	2.65	2.82	3.0	3.2	0.030	0.040
01/13/83	81.5	214	243	2.63	2.97	3.7	4.5	0.040	0.050
Maximums			250		2.97		8.9		0.210

Note: Rated capacity: Prior to 1982--1,350 TPD (57.5 TPH).
Begin 1982--1,750 TPD (72.9 TPH).

Source: Gardinier, Inc., 1984.

No. 7 Sulfuric Acid Plant Emission Tests

Date	Average Production Rate (tons/hr)	Sulfur Dioxide (lb/hr) Avg.	Sulfur Dioxide (lb/hr) Max.	Sulfur Dioxide (lb/ton) Avg.	Sulfur Dioxide (lb/ton) Max.	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.
03/02/77	74.0	127	133	1.73	1.81	4.5	5.7	0.061	0.077
12/09/77	53.4	39	41	0.73	0.78	9.3	11.0	0.174	0.207
08/04/78	63.5	86	95	1.36	1.49	6.8	9.4	0.107	0.147
03/07/79	73.8	299	307	4.05	4.16	2.6	2.7	0.035	0.036
10/25/79	65.1	391	404	6.01	6.20	2.7	3.7	0.042	0.057
08/05/80	69.1	231	245	3.35	3.55	4.2	4.5	0.060	0.065
03/03/81	68.2	118	120	1.70	1.80	3.4	6.2	0.050	0.090
01/26/82	69.8	110	111	1.58	1.59	7.0	10.3	0.100	0.150
08/18/82	66.0	93	93	1.40	1.41	2.2	2.4	0.040	0.040
Maximums			404		6.20		11.0		0.207

Note: Rated capacity = 1,770 TPD (73.75 TPH).

Source: Gardinier, Inc., 1984.

No. 7 Sulfuric Acid Plant Emission Tests

Date	Average Production Rate (tons/hr)	Sulfur Dioxide (lb/hr) Avg.	Sulfur Dioxide (lb/hr) Max.	Sulfur Dioxide (lb/ton) Avg.	Sulfur Dioxide (lb/ton) Max.	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.
12/20/76	118.2	256	272	2.16	2.31	6.0	6.9	0.050	0.060
11/23/77	111.1	216	217	1.94	1.97	7.9	8.3	0.071	0.074
05/12/78	107.5	192	196	1.78	1.82	14.7	16.4	0.136	0.152
03/22/79	112.0	214	222	1.91	1.98	3.5	3.9	0.031	0.035
08/30/79	103.0	204	207	1.98	2.01	3.5	3.7	0.034	0.035
05/29/80	94.0	192	198	2.05	2.12	4.5	5.2	0.048	0.055
02/26/81	106.8	174	204	1.60	1.90	6.6	7.4	0.060	0.070
11/12/81	103.5	202	211	1.95	2.04	4.4	4.5	0.040	0.040
07/14/82	89.0	154	156	1.73	1.75	4.3	4.5	0.048	0.050
01/18/83	108.8	234	239	2.15	2.19	4.6	4.9	0.040	0.050
Maximums			272		2.31		16.4		0.152

Note: Rated capacity = 2,600 TPD (108.3 TPH).

Source: Gardinier, Inc., 1984.

SKETCH OF NO. 8 CAP CONVERTER
SHOWING EXISTING LAY-OUT AND
PROPOSED GAS DUCT CHANGES THAT
MIGHT REMOVE 12 – 20 IN. H₂O ΔP
FROM THE GAS FLOW SYSTEM.

NORTH

STEAM SUPERHEATER
EXIT NO. 3 MASS

4/5 CONV. PASS
(HOT GAS FILTER)

HOT IP
EXCH.

NO. 2
COOL
EXCH

NO 1
COOL
EXCH.

CONVERTER

FROM
NO 1 BOILER

ECONOMIZER
SUPERHEATER

TO
FAT

FROM IPAT

TO IPAT

EXISTING:
PLAN VIEW
NO. 8 CAP CONVERTER
AND GAS-TO-GAS EXCHANGERS

HOT IP
EXCH.

INLET 3A
MASS

INSTALL:
ABOUT 50 FT. OF
NEW DUCT TO
NEW INLET
TO 3B MASS

CONVERTER
PLAN
BELOW SECOND
MASS
EXIT CHAMBER

FROM HOT I.P. EXCH

CLOSE OLD
OPENING INTO
3B MASS

NEW OPENING

INSTALL:
ABOUT 15 FT OF
NEW DUCT TO NEW
OPENING BELOW
3B MASS.

MIXED GAS FLOW
TO THE OLD
ECONOMIZER/SUPERHEAT

TO: NO. 2 WASTE HEAT
BOILER

FROM:

TO HOT IP EXCH.

FROM HOT I.P. EXCH.

EXIT NO. 3 MASS
STEAM
SUPERHEATER

TO SUPERHEATER-
ECONOMIZER

$300,00

EXISTING: SCHEMATIC ELEVATION OF $SO_2 \rightarrow SO_3$ CONVERTER
NO. 8 H_2SO_4 PLANT

DKH