

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

May 09, 1988

Enrique R. Arias, Exec. Vice President
Sugar Cane Growers Cooperative
Post Office Box 666
Belle Glade, Florida 33430

RE: PALM BEACH COUNTY - AP
Sugar Cane Growers Cooperative
Boiler No. 8

Dear Mr. Arias:

Enclosed is Permit Number A050-147870 to operate the boiler at the above-referenced location, issued pursuant to Section(s) 403.087, Florida Statutes.

Persons whose substantial interests are affected by this permit have a right, pursuant to Section 120.57, Florida Statutes, to petition for an administrative determination (hearing). The petition must conform to the requirements of Chapters 17-103 and 28-5.201, FAC, and must be filed (received) in the Department's Office of General Counsel, 2600 Blair Stone Road, Tallahassee 32399-2400, within fourteen (14) days of receipt of this notice. Failure to file a petition within the fourteen (14) days constitutes a waiver of any right such person has to an administrative determination (hearing) pursuant to Section 120.57, Florida Statutes. This permit is final and effective on the date filed with the Clerk of the Department unless a petition is filed in accordance with this paragraph or unless a request for extension of time in which to file a petition is filed within the time specified for filing a petition and conforms to Rule 17-103.070, FAC. Upon timely filing of a petition or a request for an extension of time this permit will not be effective until further Order of the Department.

When the Order (Permit) is final, any party to the Order has the right to seek judicial review of the Order pursuant to Section 120.68, Florida Statutes, by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure,

DEPARTMENT OF ENVIRONMENTAL REGULATION

**ROUTING AND
TRANSMITTAL SLIP**

ACTION NO

ACTION DUE DATE

1. TO: (NAME, OFFICE, LOCATION)

BAQM

Initial

Date

2.

Tallahassee

Initial

Date

3.

Willard

5/23

Initial

Date

4.

Initial

Date

REMARKS:

please check to make sure this
tracks the construction permit.
If it does not, please let
me know. If it does, file
in const. permit file.

RECEIVED
MAY 20 1988
DER-BAQM

6/2/88

Except for typo in description,
operation permit appears
consistent with revised construction
permit.

Willard

INFORMATION

Review & Return

Review & File

Initial & Forward

DISPOSITION

Review & Respond

Prepare Response

For My Signature

For Your Signature

Let's Discuss

Set Up Meeting

Investigate & Report

Initial & Forward

Distribute

Concurrence

For Processing

Initial & Return

5-20-88

CHF:

Disposition -
Please!

(2)

FROM:

SFB - FTM

DATE

5/18/88

PHONE

with the Clerk of the Department in the Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date the Final Order is filed with the Clerk of the Department.

Executed in Ft. Myers, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION



Philip R. Edwards
District Manager
2269 Bay Street
Ft. Myers, FL 33901-2896

PRE/PRC/djb
Copies furnished to:
DER - Tallahassee
EPA - Atlanta
Palm Beach County Health Dept.

CERTIFICATE OF SERVICE

This is to certify that this NOTICE OF PERMIT and all copies were mailed before the close of business on May 18, 1988 to the listed persons.

CLERK STAMP

FILING AND ACKNOWLEDGMENT
FILED, on this day, pursuant to S. 2.52
Florida Statutes, with the designated Department
Clerk, receipt of which is hereby acknowledged.

Irene S. Herxton 5/18/88
CLERK DATE

1850

260

80

160

550

70

50

3020

100

~ 3100

2500

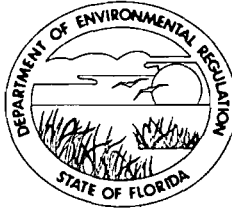
600

500

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTH FLORIDA DISTRICT

2269 BAY STREET
FORT MYERS, FLORIDA 33901-2896
(813)332-2667.



BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

PHILIP R. EDWARDS
DISTRICT MANAGER

PERMITTEE: Sugar Cane Growers Cooperative
Post Office Box 666
Belle Glade, Florida 33430

I.D. Number: 52/50/0026/08
Permit/Certification Number: A050-147870
Date of Issue: May 09, 1988
Expiration Date: May 09, 1993
County: PALM BEACH
Latitude/Longitude: 26°42'06"N/80°38'57"W
Section/Township/Range: 28/43S/37E
Project: Boiler No. 8

This permit is issued under the provisions of Chapter(s) 403, Florida Statutes, and Florida Administrative Code Rule(s) 17-2. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings(s), plans, and other documents attached hereto or on file with the department and made a part hereof and specifically described as follows:

Operation of Boiler No. 8 with a design capacity of 264,000 pounds of steam per hour of operation fired by bagasse, residue or oil. Emissions are controlled by two Joy Type D Turbulaire Scrubbers.

Facility located north of Airport Road near Belle Glade.

PERMITTEE: Sugar Cane Growers
Cooperative

I.D. Number: 52/50/0026/08
Permit/Certification Number: A050-147870
Date of Issue: May 09, 1988
Expiration Date: May 09, 1993

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Section 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is hereby placed on notice that the department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.
2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the department.
3. As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Nor does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit does not constitute a waiver of or approval of any other department permit that may be required for other aspects of the total project which are not addressed in the permit.
4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the state. Only the Trustees of the Internal Improvement Trust Fund may express state opinion as to title.
5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, plant or aquatic life or property and penalties therefor caused by the construction or operation of this permitted source, nor does it allow the permittee to cause pollution in contravention of Florida Statutes and department rules, unless specifically authorized by an order from the department.
6. The permittee shall at all times properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by department rules.

GENERAL CONDITIONS:

7. The permittee, by accepting this permit, specifically agrees to allow authorized department personnel, upon presentation of credentials or other documents as may be required by law, access to the premises, at reasonable times, where the permitted activity is located or conducted for the purpose of:

a. Having access to and copying any records that must be kept under the conditions of the permit;

b. Inspecting the facility, equipment, practices, or operations regulated or required under this permit; and

c. Sampling or monitoring any substances or parameters at any location reasonably necessary to assure compliance with this permit or department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately notify and provide the department with the following information:

a. a description of and cause of non-compliance; and

b. the period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the department for penalties or revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source, which are submitted to the department, may be used by the department as evidence in any enforcement case arising under the Florida Statutes or department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes.

10. The permittee agrees to comply with changes in department rules and Florida Statutes after a reasonable time for compliance, provided however, the permittee does not waive any other rights granted by Florida Statutes or department rules.

11. This permit is transferable only upon department approval in accordance with Florida Administrative Code Rules 17-4.12 and 17-30.30, as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the department.

12. This permit is required to be kept at the work site of the permitted activity during the entire period of construction or operation.

PERMITTEE: Sugar Cane Growers
Cooperative

I.D. Number: 52/50/0026/08
Permit/Certification Number: A050-147870
Date of Issue: May 09, 1988
Expiration Date: May 09, 1993

GENERAL CONDITIONS:

13. This permit also constitutes:

- () Determination of Best Available Control Technology (BACT)
- () Determination of Prevention of Significant Deterioration (PSD)
- () Certification of Compliance with State Water Quality Standards
(Section 401, PL 92-500)
- () Compliance with New Source Performance Standards

14. The permittee shall comply with the following monitoring and record keeping requirements:

a. Upon Request, the permittee shall furnish all records and plans required under department rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the department, during the course of any unresolved enforcement action.

b. The permittee shall retain at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be at least three years from the date of the sample, measurement, report or application unless otherwise specified by department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurements;
- the person responsible for performing the sampling or measurements;
- the date(s) analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the department, such facts or information shall be submitted or corrected promptly.

PERMITTEE: Sugar Cane Growers
Cooperative

I.D. Number: 52/50/0026/08
Permit/Certification Number: A050-147870
Date of Issue: May 09, 1988
Expiration Date: May 09, 1993

SPECIFIC CONDITIONS:

1. The boiler's maximum emission rates shall not exceed the emission limits listed below:

Pollutant	Maximum Allowable Emissions		
	lb/hr	ton/day	ton/yr
PM	75.6 (95.0)*		276 (324)*
SO ₂		14.0+	
CO	140		511 ²⁰⁶
VOC	140		511 ³²⁵
NO _x	123		449 ²⁰⁹

Visible emission: 30% opacity except for 40% no more than two minutes per hour.

* The air quality impact analysis was conducted on the basis of the emissions contained in parantheses. The numbers not contained in parentheses are based upon the BACT determination. The BACT determination gives the permittee the right to seek revision if the 0.15 lb/10⁶ BTU input limit cannot be met on a continuous basis. However, any revision of the BACT emission cannot exceed the 0.20lb/10⁶ BTU input Florida new source limit, nor will the allowable lb/hr and ton/yr emissions be allowed to exceed the numbers contained in parentheses.

+ SO₂ emissions for all boilers from Unit 1 through 8.

2. SCGC shall meter daily oil consumption by Units 6 and 7, and Unit 8, individually. The total quantity of fuel oil consumed on a daily basis by Units 6, 7, and 8 shall be replaced by the addition to the system of an equal or greater amount of 1% or less sulfur fuel oil within 72 hours (excluding weekends). Record shall be retained for two years. The balance of the oil in the system should not exceed 2.4% sulfur. For the purpose of simplicity, compliance with the fuel purchase scheme above when the total plant wide fuel oil consumption does not exceed 31,500** gallons. In the event that the daily consumption of oil exceeds 31,500** gallons, permittee must demonstrate compliance with the 14 ton per day limit by providing the amounts of bagasse, residue, and oil combusted, and the sulfur content of the oil for each such day. The demonstration of compliance shall be based on the same assumptions used to derive the threshold oil consumption figure except that the actual sulfur content of the oil for each day shall be substituted for 1.15%.

** This threshold oil consumption figure is based upon the assumptions that the bagasse, residue and oil sulfur contents are 0.2%, 0.5% and 1.15%, respectively, and also SO₂ emissions from bagasse and residue are 40% below the amounts calculated stoichiometrically and all sulfur in fuel oil is emitted as SO₂. If further tests show that the foregoing assumptions are significantly incorrect, the 31,500 gallons per day shall be adjusted accordingly.

3. Emission of VOC and CO shall be maintained at the lowest possible level through good combustion control. A flue gas oxygen or CO₂ monitor shall be maintained operational.

PERMITTEE: Sugar Cane Growers
Cooperative

I.D. Number: 52/50/0026/08
Permit/Certification Number: A050-147870
Date of Issue: May 09, 1988
Expiration Date: May 09, 1993

SPECIFIC CONDITIONS:

4. From April 16, through October 12 plant operation shall be restricted to no more than three boilers of unit numbers 1,2,4,5 or 8 and to no more than 120 days. During this period of restricted operation, steam production shall not exceed a maximum daily average of 450,000 lb/hr.

5. Compliance with the emission limits required in condition No. 2 shall be determined by performance tests. Particulate matter emissions test shall be made while burning bagasse with the minimal amount of oil necessary to reach test capacity. The two SO₂ emission tests shall be made while burning bagasse only and residue only with the minimal amounts of fuel oil necessary to reach test capacity. These tests are to determine compliance with the SO₂ emission limits of 299 lb/hr from non-fossil fuel while burning residue, and 152 lb/hr from non-fossil fuel while burning bagasse. EPA reference method 25 shall be used to establish VOC emissions during compliance tests. The boiler shall be at or near to full operating capacity during all performance tests. The performance tests shall be conducted in accordance with EPA reference methods (40 CFR 60, Appendix A) and the provision of 40 CFR 60.8 and 40 CFR 60.46.

6. Particulate emission and visible emission tests shall be conducted once per year commencing prior to February 15.

7. Sulfur Dioxide emission test shall be conducted by EPA Method Six while burning residue only with the minimal amount of fuel oil necessary to reach test capacity. This test shall be conducted prior to renewal of this permit unless residue is not used for fuel at any time during the five (5) year period of this permit.

8. Carbon Monoxide emission test shall be conducted by EPA Method Three while burning residue only with the minimal amount of fuel oil necessary to reach test capacity. This test shall be conducted prior to renewal of this permit unless residue is not used for fuel.

9. Volatile organic compounds emission test shall be conducted by EPA Method Twenty-five while burning residue only with the minimal amount of fuel oil necessary to reach test capacity. This test shall be conducted prior to renewal of this permit unless residue is not used for fuel.

10. Nitrogen Oxides emission test shall be conducted by EPA Method Seven while burning residue only with the minimal amount of fuel oil necessary to reach test capacity. This test shall be conducted prior to renewal of this permit unless residue is not used for fuel.

11. Visible emissions from the bagasse handling system shall not exceed 10 percent opacity over any 6 minute period as measured by EPA reference Method Nine.

PERMITTEE: Sugar Cane Growers
Cooperative

I.D. Number: 52/50/0026/08
Permit/Certification Number: A050-147870
Date of Issue: May 09, 1988
Expiration Date: May 09, 1993

SPECIFIC CONDITIONS:

12. Instruments shall be maintained to continuously measure the amount of fuel oil used individually by boiler 8 and boilers 6 and 7, the total amount of fuel used by boilers 1 through 5, and the total amount of residue used in all boilers. Bagasse consumption shall be calculated from steam consumption. The records of fuel oil, residue and bagasse usage will be kept by the company, available for regulatory agency inspection, for two years.

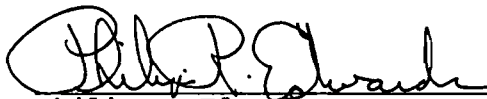
13. The scrubber shall be equipped with a manometer or equivalent instrument to measure the total pressure drop of the flue gas stream across the scrubber, with pressure gauges to measure the water pressure at the spray nozzles, with a flow meter or equivalent device (weir) to measure the quantity of water circulating through the scrubber. The pH of scrubber water at the scrubber inlet and outlet shall be measured. Data from these instruments shall be recorded each shift (every 8 hours) and available for regulatory agencies inspection for two years.

14. The maximum fuel oil consumption of boiler number 8 is limited to the quantity equivalent to 250 MMBTU/hr (1,667 gallons per hours, if the heating value of the fuel oil is 18,500 BTU per pound).

15. All fugitive dust generated at this site shall be adequately controlled.

16. An annual operation report (DER Form 17-1.202(6) attached) shall be submitted by March 1st each year. The attached form shall be reproduced by the permittee and used for future annual submittals.

Issued this 9th, day of May, 1988.
STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION



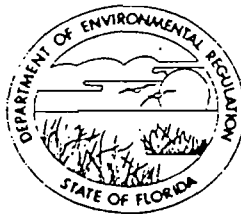
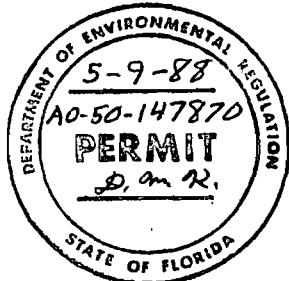
Philip R. Edwards
District Manager
2269 Bay Street
Fort Myers, Florida 33901

PRE/PRC/djb
Pages attached 9

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTH FLORIDA
DISTRICT

2269 BAY STREET
FORT MYERS, FLORIDA 33901



TALLAHASSEE

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

RECEIVED

APR 11 1988

DER: 501.164, DISTRICT

WBO

APPLICATION FOR RENEWAL OF
PERMIT TO OPERATE AIR POLLUTION SOURCE(S)

If major alterations have occurred, the applicant should complete the Standard Air Permit Application Form.

Source Type: Stationary Steam Boiler Renewal of DER Permit No. AO-50-68945

Company Name: Sugar Cane Growers Cooperative of County: Palm Beach
Florida

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

Boiler No. 8 with Joy Type D Turbulaire Scrubber

Source Location: Street: North of Airport Road City: Belle Glade, FL

UTM: East 534.9 km North 2953.3 km

Latitude: 26° 42' 06" N. Longitude: 80° 38' 57" W.

1. Attach a check made payable to the Department of Environmental Regulation in accordance with operation permit fee schedule set forth in Florida Administrative Code Rule 17-4.05.
2. Have there been any alterations to the plant since last permitted? ☐ Yes ☒ No
If minor alterations have occurred, describe on a separate sheet and attach.
3. Attach the last compliance test report required per permit conditions if not submitted previously. Previously submitted
4. Have previous permit conditions been adhered to? ☒ Yes ☐ No If no, explain on a separate sheet and attach.
5. Has there been any malfunction of the pollution control equipment during tenure of current permit? ☐ Yes ☒ No If yes, and not previously reported, give brief details and what action was taken on a separate sheet and attach.
6. Has the pollution control equipment been maintained to preserve the collection efficiency last permitted by the Department? ☒ Yes ☐ No
7. Has the annual operating report for the last calendar year been submitted? ☒ Yes ☐ No If no, please attach.

8. Please provide the following information if applicable:

A. Raw Materials and Chemical Used in Your Process:

Description	Contaminant		Utilization	
	Type	%Wt	Rate	lbs/hr
N/A				

B. Product Weight (lbs/hr): _____

C. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	Avg/hr*	Max/hr**	
Bagasse (dry basis)	21 tons	31.5 tons	504.0
Bagasse residue (dry basis)	0	24.9 tons	443.5
No. 6 Fuel Oil	166 gals	1,667 gals	250.0
	SEE NOTE (1) BELOW		SEE NOTE (1) BELOW

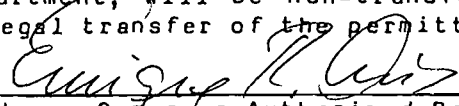
D. Normal Equipment Operating Time: hrs/day 24; days/wk 7; wks/yr 39;
hrs/yr (power plants only) _____; if seasonal, describe Crop Season operations
may last a maximum of 184 days while Off-Season operations may last a maximum of
120 days with a total possible combined maximum of 273 days equivalent to 6,552 hours
or 39 weeks.

The undersigned owner or authorized representative*** of Sugar Cane Growers Cooperative of Fla is fully aware that the statements made in this application for a renewal of a permit to operate an air pollution source are true, correct and complete to the best of his knowledge and belief. Further, the undersigned agrees to maintain and operate the pollution source and pollution control facilities in such a manner as to comply with the provisions of Chapter 403, Florida Statutes, and all the rules and regulations of the Department. He also understands that a permit, if granted by the Department, will be non-transferable and he will promptly notify the Department upon sale or legal transfer of the permitted facility.

*During actual time of operation.

**Units: Natural Gas-MMCF/hr;
Fuel Oils-barrels/hr; Coal-lbs/hr.

***Attach letter of authorization if not previously submitted


Signature, Owner or Authorized Representative
(Notarization is mandatory)

Enrique R. Arias, Executive Vice President

Typed Name and Title
Post Office Box 666

Address
Belle Glade Florida 33430-0666
City State Zip

April 8, 1988 (305) 996-5556
Date Telephone No.

NOTE 1 : The Avg/hr consumption figures are based on the 1987 calendar year operation. The Max/hr consumption and heat input figures represent the maximum potential if each fuel is burned separately. All in accordance with the provisions of our existing operating permits.

ACKNOWLEDGMENT FOR
APPLICATION FOR RENEWAL OF PERMIT TO OPERATE AIR POLLUTION SOURCES

Renewal of Permit No. A050-68945
Boiler No. 8
Sugar Cane Growers Cooperative of Florida

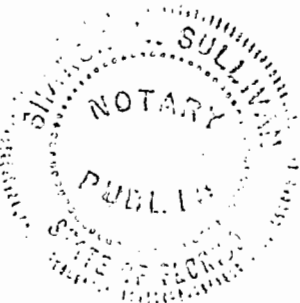
RECEIVED

APR 11 1988

DEPT. OF ENV. & NAT. RES. DISTRICT

Before me personally appeared Enrique R. Arias, to me well known and known to me to be the person described in and who executed the foregoing instrument, and acknowledged to and before me that he executed said instrument for the purposes therein expressed.

WITNESS my hand and official seal, this 8th day of April, 1988.



Sharon L. Sullivan
Sharon L. Sullivan, Notary Public
State of Florida at Large

My Commission expires: My Commission Expires Feb. 16, 1991
Notary Public, State of Florida
Bonded Thru Troy Fain - Insurance Inc.

Check Sheet

Company Name:

Sugar Cane Growers Cooperative

Permit Number:

AC 50-092476

PSD Number:

Permit Engineer:

Willard Hanks King, Mentions Willard Hanks
issued 10/28/81

Application:

- ☒ Initial Application
 - ☒ Incompleteness Letters
 - ☒ Responses
 - ☐ Waiver of Department Action
 - ☐ Department Response
 - ☐ Other

Cross References:

- ☒ AC 05-147870
- ☐
- ☐

Intent:

- ☒ Intent to Issue
- ☒ Notice of Intent to Issue
- ☐ Technical Evaluation Draft
- ☐ BACT or LAER Determination
- ☐ Unsigned Permit

Correspondence with:

- ☐ EPA
- ☐ Park Services
- ☐ Other
- ☒ Proof of Publication
 - ☐ Petitions - (Related to extensions, hearings, etc.)
 - ☒ Waiver of Department Action
 - ☐ Other

missing copy of TCE PD
ad sent to applicant

Final

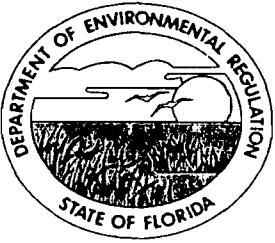
Determination:

- ☒ Final Determination
- ☒ Signed Permit
- ☐ BACT or LAER Determination
- ☐ Other

Post Permit Correspondence:

- ☐ Extensions/Amendments/Modifications
- ☒ Other

This threshold oil consumption figure is based upon the assumption that the kerosene, residue and oil sulfur contents are 0.2%, 0.5% and 1.15%, respectively, and also that SO₂ emissions from kerosene and residue are 40% below the amounts calculated stoichiometrically, ^{and all S in fuel is emitted as SO₂.} It further tests show that these ~~assumptions~~ foregoing assumptions are significantly incorrect, the 31,500 gallon/day threshold figure, shall be adjusted accordingly.



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Bob Martinez, Governor

Dale Twachtmann, Secretary

John Shearer, Assistant Secretary

September 20, 1989

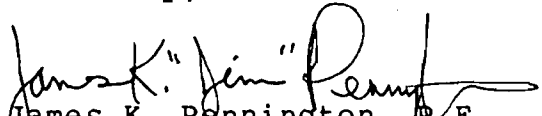
Mr. Ajay Satyl
Palm Beach County Health Department
Division of Environmental Science
and Engineering
Post Office Box 29
901 Evernia Street
West Palm Beach, Florida 33402

Dear Mr. ^{AJAY} Satyl:

Attached is a copy of the analysis of modeling done for the Sugar Cane Grower's Coop facility. The modeling shows a potential for a violation of the old TSP NAAQS standard. Additional information is needed to determine if there is a potential for exceeding the present PM₁₀ standard.

If you have any questions on the modeling, please call Tom Rogers at SunCom 278-1344.

Sincerely,


James K. Pennington, R.E.
Compliance Monitoring Section
Bureau of Air Regulation

JKP/ht

cc: ✓ Tom Rogers

BEST AVAILABLE COPY

To: Jim Pennington

Through: Larry George *LG*

From: Tom Rogers *TR*

Date: April 6, 1989

Subject: Sugar Cane Growers Co-op
Modeling Analysis Pursuant to a Complaint

I have completed a modeling evaluation of total particulate emissions from the six boilers located at the Sugar Cane Growers Co-op. No other sources of particulates were addressed. Given the stack data and emission characteristics provided to me, I ran a commonly used dispersion model to estimate the maximum ground-level concentration attributable to the six boilers. The model used was the Industrial Source Complex Short-Term (ISCST) program. This model is appropriate for the subject facility.

The results of the analysis indicate that concentrations of total particulates are from 1000 to 4000 micrograms/cubic meter over a three-hour averaging period, and from 300 to 1000 micrograms/cubic meter over a 24-hour averaging period. These values have no direct comparison to current health-based ambient air quality standards. It should be noted, however, that the recently rescinded total particulate standard was 100 micrograms/cubic meter, 24-hour average. The new standard refers to particulates less than 10 micrometers in diameter and is set at 150 micrograms/cubic meter, 24-hour. More information on the particle size distribution of the emissions is required to make a comparison with the standard.

Let me know if you need more to be done on the modeling side of this project.

AGENDA

Sugar Industry Overview Meeting
Thursday August 10, 1989
9:00 AM - 12:00 Noon

DARM Conference Room

Chairman: J. C. Brown

9:00 - 9:15	Opening Remarks	John Brown
9:15 - 9:30	Complaints	Jim Pennington
9:30 - 10:00	Ambient Monitoring and Exceedances	Bill Blommel
10:00 - 10:15	Quality Assurance	Don Stuart
10:15 - 10:30	Now Weather Casting for Field Burning	Jim Pennington
10:30 - 10:45	Modeling at Sugar Cane Coop✓	Tom Rogers
10:45 - 11:00	Break	
11:00 - 11:15	Future Actions	John Brown
11:15 - 12:00	Open Discussion	Steve Smallwood
12:00	Adjourn	

Attendees: Steve Smallwood
Larry George
John Brown
Clair Fancy
Ed Huck
Bill Blommel
Don Stuart
Jim Pennington
Bill Thomas
Tom Rogers✓
Syed Arif

Reporter: Jim Pennington

Module: Air Compliance/Enforcement (105)

To: Jim Pennington

Through: Larry George 

From: Tom Rogers 

Date: April 6, 1989

Subject: Sugar Cane Growers Co-op
Modeling Analysis Pursuant to a Complaint

I have completed a modeling evaluation of total particulate emissions from the six boilers located at the Sugar Cane Growers Co-op. No other sources of particulates were addressed. Given the stack data and emission characteristics provided to me, I ran a commonly used dispersion model to estimate the maximum ground-level concentration attributable to the six boilers. The model used was the Industrial Source Complex Short-Term (ISCST) program. This model is appropriate for the subject facility.

The results of the analysis indicate that concentrations of total particulates are from 1000 to 4000 micrograms/cubic meter over a three-hour averaging period, and from 300 to 1000 micrograms/cubic meter over a 24-hour averaging period. These values have no direct comparison to current health-based ambient air quality standards. It should be noted, however, that the recently rescinded total particulate standard was 150 micrograms/cubic meter, 24-hour average. The new standard refers to particulates less than 10 micrometers in diameter and is set at 150 micrometers/cubic meter, 24-hour. More information on the particle size distribution of the emissions is required to make a comparison with the standard.

Let me know if you need more to be done on the modeling side of this project.

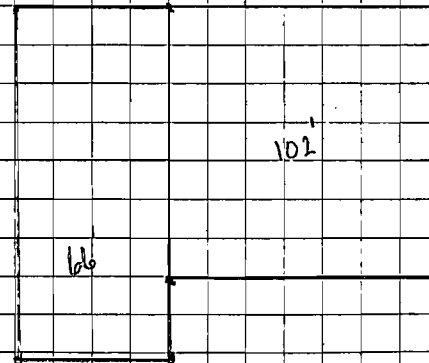
⊗
(-350, 250)

78
1
3
120, 30

• (-10, 300)
10
• 4 (15, 125)
• 3 (0, 80)
• 7 (0, 40)
57
• (0, 0)

Sugarcone Growers, Belle Glade

1" = 100'



Sugar Industries Meeting

Dexter Lattant - Brought suit against state

440,000 acres of sugar cane

increasing at a rate of 20,000 acres/yr.

Oct/Nov thru March -- Season ~~burning~~

11 ~~PM~~ monitoring sites (now all PM 10)

1 SO₂ monitor

1 O₃ monitor

Need deposition monitoring system.

✓ What's involved to model depos. from cane burning and mills?

✓ Estimate annual ashfall rate? dirtfall?

✓ Get with Tim to evaluate Met network.

• PM standard for sugar industry 0.15 lb/MP+u.

Particle size distribution of bagasse boilers?

GLADES SUGAR HOUSE

Sugar Cane Growers Cooperative of Florida

POST OFFICE BOX 666

BELLE GLADE, FLORIDA

ZIP CODE 33430

File

January 6, 1982

REF: 4AH-AF

Chief, Air Facilities Branch
Air and Waste Management Division
US Environmental Protection Agency
Region IV
345 Courtland Street
Atlanta, GA 30365



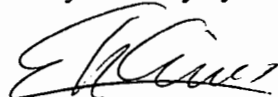
Your re: PSD-FL-077

Gentlemen:

Pursuant to Paragraph 1 of the General Conditions corresponding to the Permit PSD-FL-077, we hereby notify you that construction of the permitted source has started.

We are planning on the completion and start-up of this, our Boiler No. 8, on or about November 1, 1982.

Very truly yours,



E. R. Arias
Executive Vice President

ERA/st

cc: ✓ C. H. Fancy, Florida Department of Environmental Regulation
David M. Knowles, Department of Environmental Regulation,
South Florida District
Michael Martin, Palm Beach County Health Department
William H. Green, Atty.
David Buff, Environmental Science & Engineering, Inc.

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

TO: Michael Martin
Mirza Baig
File

FROM: Tim Powell, BAQM TP

DATE: November 30, 1981

SUBJ: Sugar Cane Growers Coop - Modification of
conditions to Construction Permit (AC 50-42476)

Please attach this amendment to the Specific
Conditions of the referenced Construction Permit.
Note the explanation in the attached memo to the
Secretary from Clair Fancy.

TP/bjm

Attachment

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

November 16, 1981

Mr. Enrique R. Arias
Executive Vice President
Sugar Cane Growers Cooperative of Florida
Post Office Box 666
Belle Glade, Florida 33430

Dear Mr. Arias:

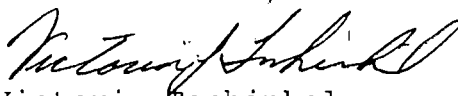
Modification of Conditions
Permit No. AC 50-42476

We are in receipt of your request for a modification of the permit conditions. The conditions are changed as follows:

<u>Condition</u>	<u>Pollutant</u>	<u>From(ton/yr)</u>	<u>To(ton/yr)</u>
(Specific)	PM	243	276
	CO	326	511
#2	VOC	325	511
	NO _x	209	449

This letter must be attached to your permit and becomes a part of that permit.

Sincerely,


Victoria Tschinkel
Secretary

VT:caa

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

November 20, 1981

Mr. Kent Williams
Air Facilities Branch
US EPA Region IV
345 Courtland Street
Atlanta, Georgia 30365

Re: Sugar Cane Growers Cooperative, Belle Glade,
Florida: PSD-FL-077

Dear Mr. Williams:

You comments dated October 26, 1981 on the Preliminary Determination for the Sugar Cane Growers Cooperative proposed construction were received on October 29, 1981. The response to the comments are as follows:

Comment 1

The derating of boilers 6 and 7 must be a physical derating, not through permit limitations only. Copies of the revised permits should be attached to the State's determination.

Response

We agree that physical derating of boilers 6 and 7 would be desirable to control heat input. We feel that the combination of metering fuel oil input to the boilers and fuel analysis as addressed in the permit is a much more practical way to control maximum heat input. Revision of permits for boilers 1 through 7 must be completed prior to issuance of an operating permit for boiler 8.

Comment 2

GEP stack height calculations should be submitted not only for the new stack applied for, but also for boiler No. 4.

Page Two

Response

The stack for boiler No. 4 falls within the area of influence of a building with a height of 102 feet and a width of more than 102 feet. Thus, application of the "2.5 times" rule results in a GEP stack height of 255 feet.

Comment 3

40% SO₂ removal is claimed for the TSP scrubbers. Verification of this should be submitted in the form of test reports, manufacturer's guarantees, etc.

Response

The 40% SO₂ removal claimed by the firm is a total system loss, not only TSP scrubbers. The firm must prove their claim by performance tests. The requirement of SO₂ emission tests was addressed in Specific Condition #6 of the permit.

Comment 4

The state should expand on the "design limitation" of boiler No. 8 limiting the heat input from oil firing to less than 250 MMBTU/hr. The explanation should describe the physical derating of the boiler during oil firing.

Response

We believe that metering fuel oil input to boiler No. 8 with fuel oil analysis is one of the best ways to control the maximum heat input. It would be hard to limit total heat input just by using physical derating without fuel analysis

Comment 5

The averaging out of the sulfur content of the fuel oil (decreasing the % on some boilers while increasing on others) may constitute a "bubble application". Revised permits containing the reduced sulfur limitations should be attached to the determination.

Response

We have revised Specific Condition No. 3 on the Final Determination which allows the firm to purchase different sulfur content fuel oils to blend at the site; therefore, it becomes unnecessary to revise operating permits for existing boilers. Daily oil consumption has been limited to provide

BEST AVAILABLE COPY

Page Three

a daily SO₂ emissions cap of 14.0 tons.

Comment 6

The banked VOC emissions from Palm Beach County offered as offsets for the modification increase should be recorded officially in some form in the determination in order to maintain accurate tracking of such banked emissions.

Response

All the offsets of VOC emissions for the modifications increases have been recorded as required by Chapter 17-2.17 (5) F.A.C..

Comments 7 and 8

24-Hour TSP background data should be directly obtainable from the monitored annual TSP data, thereby negating the need to calculate such a value. The table reflecting the ambient air quality impacts shows the 24-hour TSP value to be <150 ug/m³. This appears to us to mean that the value is extremely close to violating the secondary standard. The calculated 24-hour TSP background value should be shown, along with impacts from the proposed modification and nearby sources.

Response

SCGC's PSD application was declared complete by FDER before June 8, 1981. Therefore, the 1978 PSD regulations concerning ambient data requirements are applicable. In addition, the guidelines which implemented those regulations (i.e., Ambient Monitoring Guidelines for Prevention of Significant Deterioration, EPA-450/2-78-019, May 1978; Guidelines on Air Quality Models, EPA-450-12-78-027, April 1978; and Guidelines for Air Quality Maintenance Planning and Analysis Volume 10 (Revised): Procedures for Evaluating Air Quality Impact of New Stationary Sources, EPA-450/4-77-001) would be applicable to any ambient data submitted with SCGC's application. These documents recommend using data from regional monitoring stations to assess preconstruction air quality when it is not possible to determine uninfluenced levels from monitors located near the subject source.

When the existing emissions from SCGC's mill were modeled by their consultant, violations of the 24-hour TSP secondary standard were predicted. As part of the proposed modification, additional control measures were needed to reduce plantwide TSP emissions to levels necessary to attain the secondary

Page Four

standard. In determining these additional measures, SCGC's consultant used a design 24-hour TSP background value of 40 ug/m^3 which when added to the modeled impact of the SCGC mill with additional controls and other nearby sources would result in a second high 24-hour TSP concentration of 149 ug/m^3 .

This 40 ug/m^3 background value was based upon the average 84th percentile concentration derived from monitoring data gathered at three regional stations. Only one of these three stations, PB-16 operated by the Palm Beach County Health Department (PBCHD), is an FDER and EPA approved monitoring station. The other two are operated by the Sugar Cane League (SCL).

We had no reason to believe that the data gathered at the two SCL stations were erroneous; however, the data had not been quality assured. Furthermore, we felt that PB-16 was not suitable to be used by itself because it is located too far away and the data from this monitor would not accurately reflect the impact of cane field burning on the air quality in the region surrounding the SCGC mill. Therefore we asked for additional assurances that the 24-hour secondary standard would not be violated. The only other FDER and EPA approved TSP monitor located near the SCGC mill is PB-19. However, this monitor, which is located 5 kilometers to the southwest of the mill, is impacted by emissions from the mill. No adequate means of subtracting these impacts on the measured concentrations at PB-19 exists. Since neither PB-16 nor PB-19 is suitable for use by itself in determining a 24-hour TSP background value, we have accepted, as additional assurances a statistical analysis by SCGC's consultant which demonstrates that the probability is reasonably low that the combined impact of modeled PM emissions from the SCGC mill and the existing air quality as measured at the two monitors will result in a violation of the 24-hour secondary standard.

Comment 9

Even though a proposed increment expansion is expected, a comparison of the existing values to the proposed consumptions for SO_2 and TSP should be presented.

Response

The proposed modification would result in an improvement in air quality at all points and for all averaging times over that predicted for the existing plant configuration with actual emission rates. This means that regardless of increment consuming activity by any surrounding source, the net impact

of this project on any increment standard would be negative. Maximum existing, modeled 24-hour TSP and 24-hour SO₂ ground level concentrations exceed Florida ambient air quality standards (FAAQS). Therefore, in order for this modification to be approvable, the 24-hour TSP and SO₂ FAAQS become limiting factors and increment is not expanded in the sense that any increment is made available for future growth.

Comment 10

Impacts from nearby sources should be included in the modeling analysis unless they are less than 1 ug/m³.

Response

All significant TSP and SO₂ sources upwind of the directions of maximum SCGC impacts and within 50 km of the mill are accounted for in the modeling. Under meteorological conditions aligning the surrounding sources with SCGC, none of these facilities contributes more than 2 ug/m³ to the TSP or SO₂ concentrations in the area of impact of the proposed SCGC boiler; these contributions are included in all reported impact values. No violations of any FAAQS or NAAQS are predicted to occur.

Comment 11

Background levels for SO₂ should be assigned in addition to the modeled values for conservativeness.

Response

FDER has customarily assumed a background value of 0 ug/m³ for SO₂ in those areas of the state where space heating requirements are low and the easterly subtropical flow prevails. However, a conservative background SO₂ concentration attributable to non-specified sources can be estimated from current monitoring sites in the surrounding region. The annual average from these sites may be used as the background concentration for all averaging times, since the distances from the non-specified sources are greater than 50 kilometers. The monitor locations and annual concentrations are listed below.

<u>Monitor Location</u>	<u>Annual Average (ug/m³)</u>	<u>Year</u>
Riviera Beach, Florida	7	1980
West Palm Beach, Florida	11	1979

Both of these locations are influenced by local sources and thereby give a conservative estimate of the background concentration from distant sources. Nevertheless, the addition of an 11 ug/m^3 background to the previously computed concentrations in the SCGC modeling will not result in a violation of an applicable ambient air quality standard.

Comment 12

It appears from the application that there are many major industries in the vicinity of the proposed modification. Please explain then, why assumed background values and calculations were used instead of actual monitored data.

Response

There are no FDER or EPA approved SO_2 , CO and NO_2 monitors within 15 miles of the SCGC mill. The annual TSP background value is based on data from two PBCHD TSP monitors, both of which are FDER and EPA approved. We have explained our reasoning for not assigning a background value for 24-hour TSP in our response to comments 7 and 8. In our response to comment 11, we have explained our reasoning for assigning a background value of 0 ug/m^3 for SO_2 ; however, we note that a conservative value of 11 ug/m^3 would not result in a violation of any ambient standards. FDER modeling shows that projected NO_x and CO concentrations are well below ambient standards. We have assumed a conservative background value of 20 ug/m^3 for NO_x and could have assumed a conservative background value of 1 ppm for CO without approaching ambient standards for these two pollutants. These values for NO_x and CO are consistent with EPA monitoring guidelines applicable to projects submitting complete applications prior to June 8, 1981. Finally, this modification represents a projected air quality improvement over existing TSP and SO_2 ground level concentrations which are shown by modeling to exceed Florida ambient standards. Since SCGC has voluntarily proposed a modification which would result in a reduction of TSP and SO_2 ambient concentrations in the near future, we have chosen not to require a period of preconstruction monitoring for any pollutant.

Sincerely,



C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality Management

State of Florida

DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices
And/Or To Other Than The Addressee

To: _____	Locn.: _____
To: _____	Locn.: _____
To: _____	Locn.: _____
From: _____	Date: _____
Reply Optional []	Reply Required []
Info. Only []	
Date Due: _____	Date Due: _____

NOV 13 1981
Office of the Secretary

TO: Victoria Tschinkel, Secretary

FROM: Clair Fancy, Deputy Chief, Bureau of Air Quality Management

DATE: November 16, 1981

SUBJ: Sugar Cane Growers Cooperative of Florida -- To Revise
Specific Condition #2 of State Final Determination, AC 50 42476

1. The Bureau requests your approval and signature for revision of part of the subject condition #2.
2. The PM emissions in ton/yr should be 276. The 243 in the subject condition was a typographical error.
3. If considering the worst condition yearly, the allowable emissions of CO, VOC and NO_x shall be 511, 511, and 449 ton/yr, respectively. The original^x limits in ton/yr were based on average condition and were not consistent with the hourly limits.

CF:caa



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

4E-CP

OCT 26 1981

*Bill
Fancy*

Mr. C. H. Fancy, Deputy Chief
Bureau of Air Quality Management
Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Re: Sugar Cane Growers Cooperative, Belle Glade,
Florida: PSD-FL-077

Dear Mr. Fancy:

We have completed our review of the Preliminary Determination of the PSD permit application for the subject source and we have the following comments to offer.

For the same reasons submitted in our comments to you regarding Atlantic Sugar Association's Preliminary Determination, we feel the permit should include an opacity limit for the proposed bagasse boiler. Therefore, EPA intends to include an opacity limit of 30% in the federally-issued permit.

Enclosed are the comments received from the Air Facilities Branch regarding this Preliminary Determination for your consideration, also.

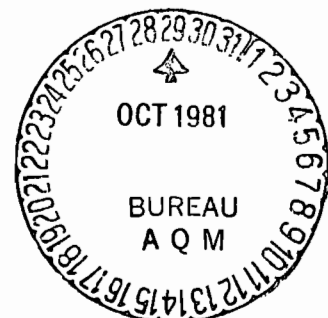
Thank you for your cooperation. If there are any questions, please contact Mr. Richard Schutt at 404/881-2017.

Sincerely yours,

T. Michael Taimi

T. Michael Taimi, Chief
Consolidated Permits Branch
Enforcement Division

Enclosure(s)



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: OCT 13 1981

Rec'd 10/14/81
CPB

SUBJECT: Preliminary Determination - Sugar Cane Growers Cooperative

FROM: Chief
Air Facilities Branch

TO: T. Michael Taimi
Chief, Consolidated Permits Branch

My staff has completed its review of the Sugar Cane Growers Cooperative preliminary determination and offers the following comments:

- ✓ 1. The derating of boilers 6 and 7 must be a physical derating, not through permit limitations only. Copies of the revised permits should be attached to the State's determination.
- ✗ 2. GEP stack height calculations should be submitted not only for the new stack applied for, but also for boiler no. 4.
- ✓ 3. 40% SO₂ removal is claimed for the TSP scrubbers. Verification of this should be submitted in the form of test reports, manufacturer's guarantees, etc.
- ✓ 4. The state should expand on the "design limitation" of boiler No. 8 limiting the heat input from oil firing to less than 250 MMBtu/hr. The explanation should describe the physical derating of the boiler during oil firing.
- ✓ 5. The averaging out of the sulfur content of the fuel oil (decreasing the % on some boilers while increasing on others) may constitute a "bubble application". Revised permits containing the reduced sulfur limitations should be attached to the determination.
- ✓ 6. The banked VOC emissions from Palm Beach County offered as offsets for the modification increase should be recorded officially in some form in the determination in order to maintain accurate tracking of such banked emissions.
7. 24-Hour TSP background data should be directly obtainable from the monitored annual TSP data, thereby negating the need to calculate such a value.
8. The table reflecting the ambient air quality impacts shows the 24-hour TSP value to be $< 150 \text{ ug/m}^3$. This appears to us to mean that the value is extremely close to violating the secondary standard. The calculated 24-hour TSP background value should be shown, along with impacts from the proposed modification and nearby sources.
9. Even though a proposed increment expansion is expected, a comparison of the existing values to the proposed consumptions for SO₂ and TSP should be presented.
10. Impacts from nearby sources should be included in the modeling analysis unless they are less than 1 ug/m^3 .

11. Background levels for SO₂ should be assigned in addition to the modeled values for conservativeness.
12. It appears from the application that there are many major industries in the vicinity of the proposed modification. Please explain then, why assumed background values and calculations were used instead of actual monitored data.

T. A. Gibbs

Tommie A. Gibbs

OCTOBER 16, 1981

SUGAR CANE GROWERS

PERMIT CONDITIONS

NAME	COMPANY	PHONE
C FANCY	FDER	904 488 1344
C HOLLADAY	FDER	904 488 1344
B. Green	HBS	904 222 7500
E. R. Quial	SC Growers Corp	305 996 5556
A. Villamil	Sugar Cane Growers Corp	305 996 5556
M. Dyberick	ESE	904/372-3316
D. Buff	ESE	904/372-3318
Bob King	FDER	904/488-1344
Bill Thomas	"	"

OCTOBER 5, 1981
SUGAR CANE GROWERS
PERMIT CONDITIONS

NAME	COMPANY	PHONE
C PANCY	FDER	904 488 1344
Bill Thomas	"	"
Bob King	FDER	"
Willard Hanks	"	"
Bill Green	NBC&S	222-7500
E. R. Ceviae	Sugar Cane Growers Coop	305-996- ⁵⁵⁵⁶ ~~5556~~
A.O. Villamil	Sugar Cane Growers Coop	305-996-5556
M.H. Dybeville	EXE	(904) 372-3318
DA Buff	"	"
CG Holladay	FDER	904-488-1344
Larry George	DER	" " "

AC 50-42476

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

September 10, 1981

Mr. Enrique R. Arias
Executive Vice President
Sugar Cane Growers Cooperative
P.O. Box 666
Belle Glade, Florida 33430

RE: Preliminary Determination - Proposed Construction of New
Bagasse/Fuel Oil Boiler (AC 50-42476, PSD-FL-077)

Dear Mr. Arias:

Please find enclosed two copies of the Preliminary Determination for both State and Federal air construction permit applications as referenced.

It is our understanding that you have arranged for publication of the public notice in the Palm Beach Post on September 11, 1981. A copy of the Preliminary Determination and your application will be open to public review and comment for a period of 30 days. The public can also request a public hearing to review and discuss specific issues. At the end of this period, the Department will evaluate any comments received and make a final determination regarding the proposed construction.

Should you have any questions regarding this information, please contact Mr. Bill Thomas at (904) 488-1344.

Sincerely,

C.H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality Management

cc: David Buff, ESE
Bill Green, Hopping Boyd Green & Sams

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

September 10, 1981

Phyllis Lilley
Municipal Library
530 South Main Street
Belle Glade, Florida 33430

Dear Ms. Lilley:

As we have in the past, we need to make the enclosed information available for public inspection, pursuant to Federal Prevention of Significant Deterioration Regulations (40 CFR 52.51, Paragraph (q)). A notice directing people to the library will be published in the West Palm Beach Post in the near future.

The information must be available upon request for a period of at least 30 days from the notice date. At the end of the period, we will forward to your a Final Determination on the permit application which must be available for an additional 30 days.

We appreciate your help in providing this valuable public service. Should you have any questions, please call me at (904) 488-1344.

Sincerely,

Tim Powell, Engineer
Bureau of Air Quality Management

TP:mjr

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

September 10, 1981

MEMORANDUM

TO: Michael Martin, Palm Beach County HRS
Mirza Baig, FDER, South Florida District *CH Fancy*

FROM: C.H. Fancy

DATE: September 10, 1981

SUBJECT: Preliminary Determination - Sugar Cane Growers
Cooperative Proposed New Bagasse/Fuel Oil Boiler
(AC 50-42476 and PSD-FL-077)

Please find enclosed, one copy each of the Preliminary Determination, application and related materials for Sugar Cane Growers Cooperative proposed new bagasse/fuel oil boiler in Belle Glade, Palm Beach County, Florida. This determination covers both State and Federal PSD requirements.

The information must be available for public inspection for 30 days from the date of public notice, which will appear in the Palm Beach Post, in the near future (probably September 11, 1981).

Should you have any questions, please call Bill Thomas or myself.

CF:TP:mjr

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

September 10, 1981

John Sansbury
County Administrator
Palm Beach County Board of
County Commissioners
P.O. Box 1989
West Palm Beach, Florida 33402

RE: Preliminary Determination - Sugar Cane Growers Cooperative
Proposed New Bagasse Boiler (AC 50-42476, PSD-FL-077)

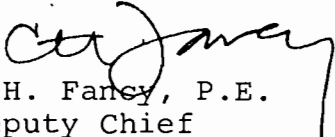
Dear Mr. Sansbury:

I wish to bring to your attention that Sugar Cane Growers Cooperative proposes to construct a new bagasse/fuel oil boiler at their facility near Belle Glade, Palm Beach County, Florida, and that emissions of air pollutants will thereby be increased. The Florida Department of Environmental Regulation, under the authority delegated by the U.S. Environmental Protection Agency, has reviewed the proposed construction under Federal Prevention of Significant Deterioration Regulations (40 CFR 52.21) and reached a preliminary determination of approval, with conditions, for this construction. This approval applies only to Federal regulatory requirements and has no other State or local functions.

Please also be aware that the attached Public Notice announcing the preliminary determination, the availability of pertinent information for public scrutiny and the opportunity for public comment will be published in a local newspaper, the Palm Beach Post, in the near future. This notice has been mailed to you for your information and in accordance with regulatory requirements. You need take no action unless you wish to comment on the proposed construction.

If you have any questions, please feel free to call Mr. Bill Thomas or myself at (904) 488-1344.

Sincerely,


C.H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality Management

CF:mjr

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

September 10, 1981

Sam Shannon, Executive Director
Treasure Coast Regional Planning Council
P.O. Box 2395
Stuart, Florida 33494

RE: Preliminary Determination - Sugar Cane Growers Cooperative
Proposed New Bagasse Boiler (AC 50-42476, PSD-FL-077)

Dear Mr. Shannon:

I wish to bring to your attention that Sugar Cane Growers Cooperative proposes to construct a new bagasse/fuel oil boiler at their facility near Belle Glade, Palm Beach County, Florida, and that emissions of air pollutants will thereby be increased. The Florida Department of Environmental Regulation, under the authority delegated by the U.S. Environmental Protection Agency, has reviewed the proposed construction under Federal Prevention of Significant Deterioration Regulations (40 CFR 52.21) and reached a preliminary determination of approval, with conditions, for this construction. This approval applies only to Federal regulatory requirements and has no other State or local functions.

Please also be aware that the attached Public Notice announcing the preliminary determination, the availability of pertinent information for public scrutiny and the opportunity for public comment will be published in a local newspaper, the Palm Beach Post, in the near future. This notice has been mailed to you for your information and in accordance with regulatory requirements. You need take no action unless you wish to comment on the proposed construction.

If you have any questions, please feel free to call Mr. Bill Thomas or myself at (904) 488-1344.

Sincerely,

C.H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality Management

CF:mjr

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

September 10, 1981

Mr. Max Osceola
Superintendent of Seminole Agency
Bureau of Indian Affairs
Department of the Interior
6075 Sterling Road
Hollywood, Florida 33024

RE: Preliminary Determination - Sugar Cane Growers Cooperative
Proposed New Bagasse Boiler (AC 50-42476, PSD-FL-077)

Dear Mr. Osceola:

I wish to bring to your attention that Sugar Cane Growers Cooperative proposes to construct a new bagasse/fuel oil boiler at their facility near Belle Glade, Palm Beach County, Florida, and that emissions of air pollutants will thereby be increased. The Florida Department of Environmental Regulation, under the authority delegated by the U.S. Environmental Protection Agency, has reviewed the proposed construction under Federal Prevention of Significant Deterioration Regulations (40 CFR 52.21) and reached a preliminary determination of approval, with conditions, for this construction. This approval applies only to Federal regulatory requirements and has no other State or local functions.

Please also be aware that the attached Public Notice announcing the preliminary determination, the availability of pertinent information for public scrutiny and the opportunity for public comment will be published in a local newspaper, the Palm Beach Post, in the near future. This notice has been mailed to you for your information and in accordance with regulatory requirements. You need take no action unless you wish to comment on the proposed construction.

If you have any questions, please feel free to call Mr. Bill Thomas or myself at (904) 488-1344.

Sincerely,

C.H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality Management

CF:mjr

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

September 10, 1981

Ms. Carolyn Dekle
State A-95 Coordinator
Office of Planning and Budget
The Capitol
Tallahassee, Florida 32301

RE: Preliminary Determination - Sugar Cane Growers Cooperative
Proposed New Bagasse Boiler (AC 50-42476, PSD-FL-077)

Dear Ms. Dekle:

I wish to bring to your attention that Sugar Cane Growers Cooperative proposes to construct a new bagasse/fuel oil boiler at their facility near Belle Glade, Palm Beach County, Florida, and that emissions of air pollutants will thereby be increased. The Florida Department of Environmental Regulation, under the authority delegated by the U.S. Environmental Protection Agency, has reviewed the proposed construction under Federal Prevention of Significant Deterioration Regulations (40 CFR 52.21) and reached a preliminary determination of approval, with conditions, for this construction. This approval applies only to Federal regulatory requirements and has no other State or local functions.

Please also be aware that the attached Public Notice announcing the preliminary determination, the availability of pertinent information for public scrutiny and the opportunity for public comment will be published in a local newspaper, the Palm Beach Post, in the near future. This notice has been mailed to you for your information and in accordance with regulatory requirements. You need take no action unless you wish to comment on the proposed construction.

If you have any questions, please feel free to call Mr. Bill Thomas or myself at (904) 488-1344.

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STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

September 10, 1981

Thomas Altman, Mayor
City of Belle Glade
110 S.W. Avenue E
Belle Glade, Florida 33430

RE: Preliminary Determination - Sugar Cane Growers Cooperative
Proposed New Bagasse Boiler (AC 50-42476, PSD-FL-077)

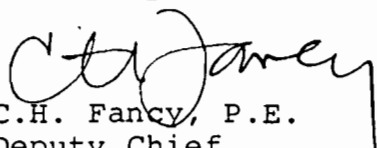
Dear Mayor Altman:

I wish to bring to your attention that Sugar Cane Growers Cooperative proposes to construct a new bagasse/fuel oil boiler at their facility near Belle Glade, Palm Beach County, Florida, and that emissions of air pollutants will thereby be increased. The Florida Department of Environmental Regulation, under the authority delegated by the U.S. Environmental Protection Agency, has reviewed the proposed construction under Federal Prevention of Significant Deterioration Regulations (40 CFR 52.21) and reached a preliminary determination of approval, with conditions, for this construction. This approval applies only to Federal regulatory requirements and has no other State or local functions.

Please also be aware that the attached Public Notice announcing the preliminary determination, the availability of pertinent information for public scrutiny and the opportunity for public comment will be published in a local newspaper, the Palm Beach Post, in the near future. This notice has been mailed to you for your information and in accordance with regulatory requirements. You need take no action unless you wish to comment on the proposed construction.

If you have any questions, please feel free to call Mr. Bill Thomas or myself at (904) 488-1344.

Sincerely,


C.H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality Management

CF:mjr

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

September 10, 1981

Mr. T. Michael Taimi, Chief
Consolidated Permits Branch
EPA Region IV
345 Courtland Street. N.E.
Atlanta, Georgia 30365

RE: Preliminary Determination - Sugar Cane Growers Cooperative
Proposed New Bagasse Boiler (PSD-FL-077)

Dear Mr. Taimi:

Enclosed for your review and comment are the Public Notice and Preliminary Determination for the Sugar Cane Growers Cooperative proposed construction of a new bagasse boiler at their facility near Belle Glade, Palm Beach County, Florida. The public notice will appear in a local newspaper, the Palm Beach Post, in the near future.

Please inform my office if you have comments or questions regarding this determination, at (904) 488-1344.

Sincerely,

C.H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality Management

CH:TP:mjr

Public Notice

A modification to an existing air pollution source is being proposed by Sugar Cane Growers Cooperative of Florida (SCGC) near the city of Belle Glade, Palm Beach County, Florida. The proposed modification is the construction of a bagasse/residue/fuel oil fired boiler with 264,000 pounds of steam per hour capacity. The modification will increase emissions of pollutants, in tons per year, by the following amounts:

<u>PM</u>	<u>SO₂</u>	<u>NO_x</u>	<u>CO</u>	<u>VOC</u>
324	805	209	326	325

The proposed modification has been reviewed by the Florida Department of Environmental Regulation under Chapter 403, Florida Statutes, and Federal regulation 40 CFR 52.21, Prevention of Significant Deterioration (PSD). The Department has made a preliminary determination that the construction can be approved provided certain conditions are met. A summary of the basis for the determination and the application for State and Federal permits submitted by SCGC are available for public review at the following offices:

Municipal Library
530 South Main Street
Belle Glade, Florida 33430

Health and Rehab. Services
Palm Beach County Health Dept.
West Palm Beach, Florida 33402

South Florida District
Dept. of Environmental Regulation
2269 Bay Street
Fort Myers, Florida 33901

Bureau of Air Quality Management
Dept. of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

No PM or SO₂ PSD increments will be consumed by the proposed modification.

Any person may submit written comments regarding the proposed modification. All comments, postmarked not later than 30 days from the date of this notice, will be considered in making a final determination regarding approval of construction of this source. These comments will be made available for public review on request. Furthermore, a public hearing can be requested by any person. Such a request should be submitted within 15 days of the date of this notice. Letters should be addressed to:

Mr. C.H. Fancy
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

Technical Evaluation
and
Preliminary Determination

Sugar Cane Growers Cooperative of Florida
~~Atlantic Sugar Association~~

Power Boiler No. ~~5~~ 8

Palm Beach County, Florida

Permit Numbers

State: AC 50-~~42389~~⁴²⁴⁷⁶

Federal: PSD-FL-~~078~~⁰⁷⁷

Florida Department of Environmental Regulation

Bureau of Air Quality Management

Central Air Permitting

~~August 28~~, 1981

September 4

Technical Evaluation
and
Preliminary Determination

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I. Applicant and Location

Sugar Cane Growers Cooperative of Florida
Post Office Box 666
Belle Glade, Florida 33430

The proposed modification will occur at Sugar Cane Growers Cooperative's ~~56465~~ existing plant site that is located about a mile east northeast of Belle Glade, Palm Beach County, Florida. The UTM coordinates are 534.9 km east and 2953.3 km north.

~~Earth~~

II Project and Process Descriptions

Sugar Cane Growers Cooperative of Florida (SCGC) plans to construct a new boiler (No. 8) that has a maximum capacity of 264,000 lb/hr steam produced from 504 MMBTU/hr heat input. The boiler will be capable of burning ^{bagasse residue} (residue), bagasse, and fuel oil. Fuel oil usage is limited to 250 MMBTU/hr heat input.

Currently, there are seven boilers at the existing site. The total steam generating capacity is 890,000 lb/hr while the seven boilers are operating at rated capacity. Boilers 1, 2, 4, and 5 are capable of burning residue, bagasse, and fuel oil. Boiler 3 is limited to burn bagasse and fuel

3

oil only; Boilers 6 and 7 are exclusively fuel oil burning.

During the crop season from November through March, the projected maximum residue consumption will be 1,500 tons per day which will be distributed among Boilers 1, 2, 4, 5, and 8. Additional fuel required to meet each plant's steam demand is obtained by the use of bagasse and fuel oil.

Boilers 3, 6, and 7 are also operated during the crop season. During the off-season in October, April, May, and June, Some of Boilers 1, 2, 4, 5 and 8 need to be operated to provide steam to a furfural manufacturing facility. Bagasse

is not available for use during this off-season operation.

While adding a new boiler at the existing site, SCGC proposes to take following steps in order to meet ambient air quality standards.

- (1) A 155-foot-tall stack will be built for Boiler 8.
- (2) Boilers 6 and 7 each will be limited to a maximum production of 75,000 lb steam/hr instead of 125,000 lb steam/hr.
- (3) The three 85-foot stacks serving Boiler 4 will be ducted into a single stack 110 feet tall.
- (4) Permit conditions of the existing boilers will be changed to reduce maximum allowable emissions from 0.3 lb PM/MMBtu to 0.25 lb PM/MMBtu to

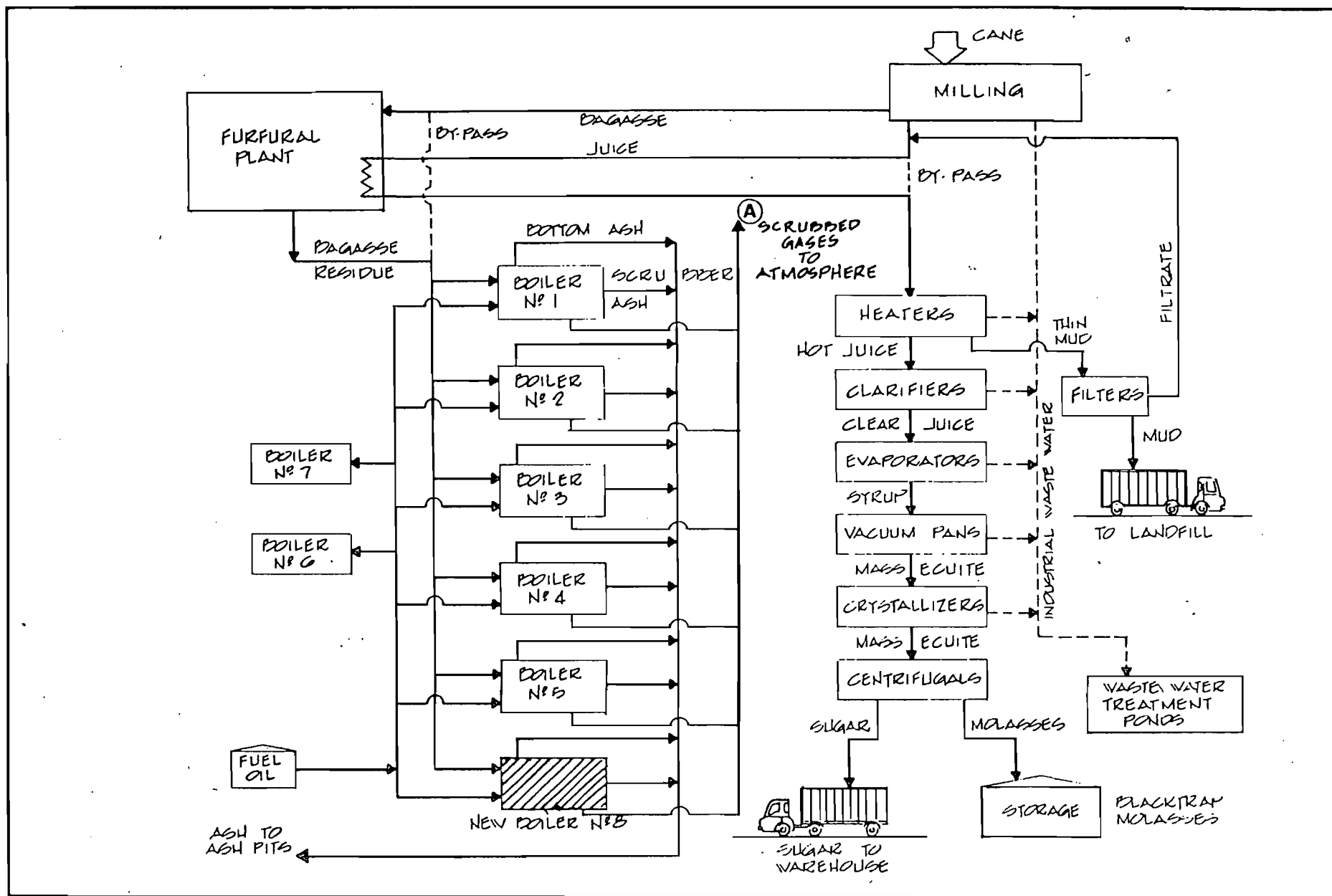
reflect actual emissions.

- (5) The exit gases from Boiler 6 and 7 (currently passing through two 40-foot stack) will be combined into a single 40-foot stack.

The increased buoyancy and plume height provided by the stack modifications will reduce ground-level concentrations.

During the crop season, harvested cane is crushed and the juice is extracted in the processing mill. Then the raw juice goes through a series of process units, which include heaters, clarifiers, evaporators, vacuum pans, crystallizers and centrifuges, to produce two products - sugar crystals and molasses. Most of the bagasse

(cane after the juice is extracted) is delivered to a neighboring furfural extraction plant. The byproduct of the furfural process is residue. A process flow chart, Figure 1, is attached. It illustrates the different fuel usage for each boiler and the processes required to produce sugar and molasses from sugar cane.



SOURCE: SUGAR CANE GROWERS COOPERATIVE OF FLORIDA.

Figure 1. SUGAR PROCESS BLOCK DIAGRAM

III Emissions and Controls

The proposed boiler is capable of burning residue, bagasse, and fuel oil. The fuel usage varies depending on residue and bagasse availability. Therefore, the emission rate for each pollutant in the flue gas will be variable. For actual annual emissions calculations, the fuel usage is assumed to be 18.3 ton/hr residue, 7.5 ton/hr bagasse, and 64 gal/hr fuel oil during the crop season (184 days); 24.3 ton/hr residue and 64 gal/hr fuel oil during the off-season (120 days).

The applicant proposed to use a Joy's Type D Turbulence Scrubber as the emissions control equipment, for Boiler, 8. The proposed scrubber will be operated

With a pressure drop of between 5 and 9 inches H₂O.

Based on the proposed fuel usage, ~~all~~ the actual emissions are listed in Table I for each boiler during both crop season and off-season operations. SO₂ emissions in Table I was calculated based on 40% SO₂ system loss, 0.1 percent sulfur content in bagasse and 0.4 percent sulfur content in residue.

The maximum emissions of the ^{various} pollutants will not occur during the same fuel burning condition. Generally, at the same heat input level from each fuel, bagasse burning will cause higher particulate emissions than fuel oil burning. But fuel oil burning should emit more SO₂ and NO_x emissions than what ^{would be} emitted from burning bagasse or residue.

FDER made a BACT determination to limit particulate ^{matter (PM)} emissions by 0.15 and 0.1 lb/MMBtu heat input while burning bagasse ^{or} residue and fuel oil respectively, and to control SO₂ emissions by limiting ^{maximum} sulfur content in fuel oil up to 1.0 percent.

Maximum PM emissions from Boiler 8 will be 75.6 pounds per hour, while it is burning 100% bagasse. Maximum SO₂ emissions will be 328 lb/hr, while the boiler is burning maximum fuel oil (250 MMBtu/hr) and residue. Maximum NO_x ^{emissions} will occur when burning maximum fuel oil and bagasse; The

emissions will be 123 lb/hr. Maximum CO or VOC emissions will be 140 lb/hr while burning 100 % bagasse. The above maximum emissions for PM and SO₂ are based on the BACT determination.

~~Practically~~ Sugar Cane Growers Cooperative ^{of Florida} plans to use one fuel oil storage tank to serve a blend of fuel oils to all the boilers at the site. Boilers 1 thru 5 have been limited to ^{using} use fuel oil with ^a maximum ^{of} 2.4 % sulfur content by their operating permits, and oil-fired Boilers 6 and 7 ^{are} limited to ^{using} use 1.0 % sulfur content fuel oil.

In order to simplify investigation and enforcement procedure handled by district engineers or other enforcement people, and to avoid improperly fuel oil mix ~~improperly~~ managed by SCGE's employees, FDER believes that the applicant should buy one grade of fuel oil instead of ^{blending} two grades of fuel oil ^{in the storage tank at the site}. Based on permit conditions FDER calculated the maximum sulfur content in the fuel oil for all the boilers should be limited to 1.15 per cent.

Table 1

Crop Season and Off-Season Emissions
(Proposed by the Applicant)

Boiler	Capacity (lb steam/hr)	Total Btu (10 ⁶ Btu/hr)	Actual Pollutant Emissions (tons/yr)				
			PM	SO ₂	NO _x	CO	VOC
			(Crop Season Emissions)				
1 and 2	240,000	414	226	424	122	190	190
3	100,000	189	103	77	72	114	114
4	240,000	414	181	424	122	190	190
5	160,000	277	151	283	81	127	127
6 and 7	150,000	194	43	896	184	15	3
8	264,000	504	324	829	209	326	325
<u>Crop Season Total</u>			<u>1,028</u>	<u>2,933</u>	<u>790</u>	<u>962</u>	<u>949</u>
			(Off-Season Emissions)				
Combination of Boilers 1, 2, 4, 5, or 8	400,000	—	236	548	114	177	177
<u>Total Annual Emissions</u>			<u>1,264</u>	<u>3,481</u>	<u>904</u>	<u>1,139</u>	<u>1,126</u>

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IV. Rule Applicability

A. State Rule

The proposed project is subject to preconstruction review under the provisions of Chapter 403, Florida Statutes, and Chapter 17-2, Florida Administrative Code (FAC).

Based on the latest revised application and responses from the applicant, and the BACT determination, FDER has recalculated the emissions for each pollutant under the worst conditions. The average sulfur content 1.15% in the fuel oil has been used for calculations. Calculated emissions are listed as follows:

Pollutant	Emission without Control		Actual Emissions	
	lb/hr	ton/yr	lb/hr	ton/yr
PM	1,121	4,091	75.6	324
SO ₂	413	1,211	368	805
NO _x	123	209	123	209
CO	140	326	140	326
VOC	140	325	140	325

The proposed project location is in the Palm Beach County ozone (VOC) nonattainment area. The actual emissions of the proposed boiler, which are listed above, show that VOC emissions will be ³²⁵~~93.7~~ ton/yr. This is greater than the 50 ton/yr ^{cutoff level}~~as~~ listed in Table II of 17-2.17(3), FAC. Therefore, LAER, emission offsets and statewide compliance are required pursuant to 17-2.17(5) FAC. In accordance with the LAER determination for this boiler and 17-2.17(5)(b), it is necessary to allocate ³²⁵~~93.7~~ tons per year of VOC new source allowance from the current amount available in Palm Beach County. Recognizing the present uncertainty in VOC emission factors as discussed in the LAER determination, certain conditions will be imposed.

Since Palm Beach County's initial new source allowance through 1981 is 970 tons per year (17-2.17(7)(d)) and ^{93.7 ton/yr will be} ~~none~~ has been assigned to Atlantic Sugar Association, ^{total 418.7} ~~to date~~, the allocation of ~~93.7~~ tons will leave a balance of ^{151.3} ~~876.3~~ tons which should have no foreseeable limitations on county growth in the near term before emission factors can be established and reflected in the LAER determination. (X)

At such time as emission factors are established, the anticipated balance over and above any required by 17-2.17 will revert to new source allowance and be available for future growth.

The proposed project is a major emitting facility for PM, ^{SO₂, or CO} as defined in Chapter 17-2, because PM, ^{SO₂, or CO} emissions (before control) exceed 250 tons per year. The project is subject to the provisions of Subsection 17-2.05(6) Table II, Emission Limiting Standards, and Subsection 17-2.04(6), Prevention of Significant Deterioration (PSD) which requires the use of Best Available Control Technology (BACT).

B. Federal Rule

The proposed source is subject to federal PSD review because it is a major modification. The net increases for pollutant emissions and significant emission rates are listed as follows:

<u>Pollutant</u>	<u>Actual Emission increase (T/yr)</u>	<u>Significant Emission Rate</u>
PM	~~51.4~~ 324	25
SO ₂	~~167.8~~ 805	40
NO _x	~~56.3~~ 209	40
CO	~~93.7~~ 326	100
VOC	~~93.7~~ 325	40

The actual emission rate for ^{each} pollutant is greater than its significant level. Therefore, ~~these~~ ^{all} pollutants, ^{except VOC,} are subject to federal BACT analysis under 40 CFR 52.21(j). VOC emissions, which are also above the significant emission rate, are not subject to ^{federal PSD review or} a BACT analysis because the proposed site is in the ozone nonattainment area. ^{VOC emissions are only} and subject to review under the State's nonattainment rule 17-2.17. ~~It is therefore exempt from review under Federal PSD.~~

V. Control Technology Review

The BACT^{and LAER} determinations^{are} proposed by the Department ~~is~~ attached. A discussion of ^{these} ~~this~~ determinations follows...

A. Particulate Matter (PM)

The applicant has proposed use of an impingement scrubber with ^{better than} 90 percent efficiency and an emission rate of 0.20 lb PM/MMBTU heat input as BACT. This type scrubber has been standard in the sugar cane industry in Florida. FDER believes better control systems, such as multicyclone plus scrubber or bag filters, are available for control of particulate matter emissions from ^{bagasse/residue} ~~bagasse~~ boilers. Cost and maintenance of these alternatives would be higher than the impingement scrubber proposed and, at the present time, it is not clear whether sufficient improvement in performance would be gained to offset the additional cost. FDER believes that a well designed impingement scrubber and related control system, with adequate pressure drop across the scrubber and optimum amount of make up water to the scrubber, can reduce the PM emission rate to less than 0.15 lb/MMBTU heat input when the boiler is burning bagasse/^{residue}.

B. Sulfur Dioxide (SO₂)

Sulfur dioxide is created in the boiler when sulfur containing fuels are burned. The sulfur content of bagasse is reported to vary from 0.1 to 0.2 percent on a dry basis; ^{the sulfur content of residue varies from 0.4 to 0.5 percent.} No feasible method ^{exists to reduce the sulfur content in bagasse} ~~exists to reduce the sulfur content in bagasse~~ ^{or in residue.} Sulfur content in [?] (the) fuel oil varies. The applicant has proposed and FDER has accepted the use of ^{fuel} oil with a maximum of 1.0% sulfur content as BACT ^{to control} ~~for~~ sulfur dioxide emissions for this boiler.

SO₂ emissions could be reduced by installation of a flue gas desulfurization (FGD) system. However, FDER does not believe a FGD system is justified for this seasonal industry. Use of low sulfur fuel oil as BACT is more cost effective.

C. Nitrogen Oxide (NO_x), ~~and~~ Ozone (VOC), and Carbon Monoxide (CO)

The operating practice of the proposed boiler requires the use of ⁴⁰~~50~~ percent excess air to burn ^{bagasse or residue}~~bagasse~~. High excess air for combustion encourages the formation of NO_x but reduces the emissions of VOC and CO. As the plant site is classified nonattainment for ozone, FDER believes good boiler operation practice should minimize VOC emissions. To limit the NO_x and VOC emissions as required by BACT and LAER, the applicant shall install an oxygen or carbon dioxide monitor in the boiler's duct, calibrate it and set alarms in it as described in the attached article entitled "Use of Flue Gas Oxygen Meter as BACT for Combustion Controls".

D. Maximum Allowable Emissions

from the boiler
The maximum allowable emissions for each pollutant are based on the different fuel burning, which has described in Section III. The following ^{table} summarizes the maximum allowable emissions for each pollutant.

Pollutant	Maximum Allowable Emissions	
	lb/hr	ton/yr
PM	75.6	324
SO ₂	368	805
NO _x	123	209
CO	140	326
VOC	140	325

Opacity: 30% except for 40% no more than 2 minutes per hour

VII. Conclusions

FDER proposed a preliminary determination of approval with conditions for the construction of the proposed boiler by ~~Atlantic Sugar Association~~ ^{SCGC}. The determination is made on the basis of information contained in the application and in the additional information dated ~~March 24, April 29, May 15, May 28, June 16,~~ ^{April 24, May 29, June 25, July 6, July 9, 15, July 22, and August 18} ~~June 25, and July 6,~~ 1981, supplied by the applicant.

The general and specific conditions are listed in the attached draft state permit (AC 50-42389) and federal permit (PSD-FL-078).
 42476 077

VIII. Attachments

1. Proposed State Permit.
2. Proposed Federal Permit
3. BACT and LAER Determination.
4. Application to Construct Air Pollution Sources, DER Form 17-1.122(16), received on ~~March 30~~^{April 24}, 1981.
5. DER's incompleteness letter to ~~ASA~~^{SCGC}, dated ~~April 29~~^{May 21}, 1981.
6. ~~ASA's~~^{SCGC's} response to DER, dated May ~~15~~²⁹, 1981.
- ? ~~7. ASA's response with revised application to DER, date May 28, 1981.~~
- 7 ~~8. DER's second incompleteness letter to ASA~~^{SCGC}, dated June ~~16~~²⁵, 1981.
- 9 ~~8. ASA's~~^{SCGC's} response to DER, dated ~~June 25~~^{July 9}, 1981.
- 8.10. ESE's response to DER, ^{about background determination,} dated July 6, 1981.
- ~~11. ASA's response to July 13 letter from DER about cane field and proposed scrubber, date July 17, 1981.~~
- 10 ~~12. ESE's response, about soils, vegetation, and visibility impacts, dated July 22, 1981.~~
^{to DER about additional background analysis,}
- ~~13. ASA's response about growth impact, site boundary, and BACT analysis, dated July 31, 1981.~~
- 11.14. ESE's response, ^{to DER - oil burning scenarios} about ~~downwash analysis~~, dated August ~~18~~¹⁸, 1981.
- ~~15. ESE's revised ambient air quality analysis, dated August 7, 1981.~~
- ~~16. ESE's revised PSD analysis, dated August, 17, 1981.~~

Preliminary Determination

Sugar Cane Growers Cooperative of Florida
~~Atlantic Sugar Association~~

Application PSD-FL-077

The preceding Technical Evaluation and Preliminary Determination are adopted by reference for the proposed federal permit, PSD-FL-077.

42476

↓ Special Conditions listed in the draft State permit, AC 50-42389, are adopted as special conditions for the draft federal permit, PSD-FL-077, for this source.

The attached General Conditions are also made a part of the proposed federal permit PSD-FL-077 for this source.

Attachment: General Conditions (Federal)



STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

APPLICANT: ~~Atlantic Sugar Association~~
~~P.O. Drawer B~~
~~Belle Glade, Florida 33430~~

Sugar Cane Growers Cooperative of Florida (SCGC)
P.O. Box 666
Belle Glade, Florida 33430

PERMIT/CERTIFICATION
NO. AC 50-42389
42476

COUNTY: Palm Beach

PROJECT: Boiler No. 8

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Chapter 17-2 and 17-4, Florida Administrative Code. The above named applicant, hereinafter called Permittee, is hereby authorized to perform the work or operate the facility shown on the approved drawing(s), plans, documents, and specifications attached hereto and made a part hereof and specifically described as follows:

For the construction of a ^{264,000}~~100,000~~ pounds of steam per hour ^{bagasse/residue}~~bagasse~~ fuel (No. 6 oil supplementary fuel) fired boiler equipped with an impingement scrubber to be located at ~~Atlantic Sugar Association's~~ existing plant that is approximately ^{1.1}~~1.0~~ miles ^{east-southeast}~~east~~ of Belle Glade, Palm Beach County, Florida. The UTM coordinates of the proposed plant are ~~2,945.9~~ km north and ~~552.9~~ km east. *SCGC's* ^{2,953.3}

Construction shall be in accordance with the attached permit application plans, documents and drawings except as otherwise noted on pages 3, 4 and 5, Specific Conditions.

Attachments:

1. Application to Construct Air Pollution Sources, DER Form 17-1.122(16), received on ~~March 30~~, 1981. *April 24*
2. DER's incompleteness letter to ~~ASA~~ ^{SCGC}, dated ~~April 29~~ ^{May 21}, 1981.
3. ~~ASA's~~ ^{SCGC's} response to DER, dated May ~~15~~ ²⁹, 1981.
4. DER's second incompleteness letter to ~~ASA~~ ^{SCGC}, dated June ~~16~~ ²⁵, 1981.
5. ~~ASA's~~ ^{SCGC's} response to DER, dated June ~~25~~ ⁹, 1981.
6. ESE's response to DER, dated July ~~8~~ ¹⁵, 1981.
7. BACT and LAER determinations, dated August 6 and 10, 1981.

PAGE 1 OF 45

~~ASA's and ESE's additional information, dated on July 17, 23, 31, and August 7, 17, 1981.~~

42476
 ERMIT NO.: AC 50-42389
 APPLICANT: ~~Atlantic Sugar Association~~
Sugar Cane Growers Cooperative of Florida

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions", and as such are binding upon the permittee and enforceable pursuant to the authority of Section 403.161(1), Florida Statutes. Permittee is hereby placed on notice that the department will review this permit periodically and may initiate court action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

2. This permit is valid only for the specific processes and operations indicated in the attached drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit shall constitute grounds for revocation and enforcement action by the department.

3. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately notify and provide the department with the following information: (a) a description of and cause of non-compliance; and (b) the period of non-compliance, including exact dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance. The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the department for penalties or revocation of this permit.

4. As provided in subsection 403.087(6), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Nor does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

5. This permit is required to be posted in a conspicuous location at the work site or source during the entire period of construction or operation.

6. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source, which are submitted to the department, may be used by the department as evidence in any enforcement case arising under the Florida Statutes or department rules, except where such use is proscribed by Section 403.111, F.S.

7. In the case of an operation permit, permittee agrees to comply with changes in department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or department rules.

8. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, plant, or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, nor does it allow the permittee to cause pollution in contravention of Florida Statutes and department rules, except where specifically authorized by an order from the department granting a variance or exception from department rules or state statutes.

9. This permit is not transferable. Upon sale or legal transfer of the property or facility covered by this permit, the permittee shall notify the department within thirty (30) days. The new owner must apply for a permit transfer within thirty (30) days. The permittee shall be liable for any non-compliance of the permitted source until the transferee applies for and receives a transfer of permit.

10. The permittee, by acceptance of this permit, specifically agrees to allow access to permitted source at reasonable times by department personnel presenting credentials for the purposes of inspection and testing to determine compliance with this permit and department rules.

11. This permit does not indicate a waiver of or approval of any other department permit that may be required for other aspects of the total project.

12. This permit conveys no title to land or water, nor constitutes state-recognition or acknowledgement of title, and does not constitute authority for the reclamation of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the state. Only the Trustees of the Internal Improvement Trust Fund may express state opinion as to title.

13. This permit also constitutes:

- ☒ Determination of Best Available Control Technology (BACT)
- ☒ Determination of Prevention of Significant Deterioration (PSD)
- ☐ Certification of Compliance with State Water Quality Standards (Section 401, PL 92-500)

42476

PERMIT NO.: AC 50-42389

APPLICANT: Atlantic Sugar Association

Sugar Cane Growers Cooperative of Florida

SPECIFIC CONDITIONS:

- ✓ 1. The proposed boiler shall be constructed in accordance with the capacities and specifications stated in the application and additional information supplied by the applicant.

2. The proposed boiler's maximum emission rates shall not exceed the emission limits listed below.

Pollutant	Maximum Allowable Emissions				~~Burning Bagasse with Fuel Oil~~	
	~~Burning Bagasse 100%~~	~~lb/MMBTU~~	~~lb/hr~~	~~ton/yr~~	~~lb/MMBTU~~	~~lb/hr~~
PM	0.15	75.6	29.2	324	0.14	27.9
SO ₂	0.49	368	95.1	805	0.55	106.1
CO	0.27	1140	53.1	326	0.28	53.8
VOC	0.27	140	53.1	325	0.27	53.2
NO _x	0.16	123	31.9	209	0.19	36.5

3. Sulfur content^{1.15} of the fuel oil fired in the proposed boiler shall not exceed ~~1.0~~ percent. Permit conditions of all operation permits for Boilers 1, 2, 3, 4, 5, 6, and 7 shall be revised to limit sulfur content in the fuel oil ~~up to~~ ^{to} 1.15 percent. (and all existing boilers)
4. Emissions of VOC and CO shall be maintained at the lowest possible level through the installation, calibration, and operation of a flue gas oxygen monitor as described in the attached article: "Use of Flue Gas Oxygen Meter as BACT for Combustion Controls".

5. The boiler shall not be operated ~~more than 3,528 hours per year~~ during the ~~off~~ season from ~~October to April~~ ^{July to September}.

6. Compliance with the emission limits required in condition No. 2 shall be determined by performance tests while the boiler is at or close to full operating capacity. The performance tests shall be conducted in accordance with EPA reference methods (40 CFR 60, Appendix A) and the provisions of 40 CFR 60.8 and 40 CFR 60.46. EPA reference method 25 shall be used to establish ^{VOC emissions} during compliance tests.

7. Visible emissions from the bagasse handling system shall not exceed 5 percent opacity over any 6 minute period as measured by EPA reference method 9. ^{PM emissions test shall be under 100% bagasse burning condition; SO₂ test shall be under maximum fuel oil burning (250 MMBTU) plus 13879 lb/hr residue burning}

8. Instruments shall be installed, calibrated, and maintained to continuously measure the fuel oil ^{and residue} used by the proposed boiler and all existing boilers. The records of fuel oil usage will be kept by the company, available for regulatory agencies inspection for a two-year period.

9. Bagasse fired in the proposed boiler shall not ~~be~~ ^{Residue consumption in Boiler 1, 2, 4, 5, and} dried in the existing on-site bagasse drying system. ^{exceed 1,500 tons per day}

5. During the off season, no boiler or combination of
boilers will be operated at more than

? 400,000 lbs steam/hr production

10-42476

PERMIT NO.: AC 50-42389

APPLICANT: ~~Atlantic Sugar Association~~
Sugar Cane Growers Cooperative of Florida

10. The scrubber shall be equipped with a manometer or equivalent instrument to measure the total pressure drop of the flue gas stream across the scrubber, with pressure gauges to measure the water pressure at the spray nozzles, with a flow meter or equivalent device (weir) to measure the quantity of water circulating through the scrubber and a pH meter to measure pH of scrubber water at the scrubber inlet. Data from these instruments shall be recorded each shift (every 8 hours) and kept available for regulatory agency's inspection for ~~one year~~ *a two-year period.* *agencies*

11. The stack sampling configuration of the proposed boiler shall comply with the minimum of 2D downstream and 0.5D upstream distances to the sampling ports required to use reference method 2.

~~12. *Sugar Cane Growers Cooperative of Florida*
Atlantic Sugar Association will take precautions to exclude the general public from the company's property surrounding the plant during the operating season.~~

12. The quantity of ~~93.7~~ ^{32.5} tons per year of VOC emissions is hereby assigned to the boiler from the new source allowance balance for Palm Beach County pursuant to 17-2.17(7)(a) and (d). At such time as the LAER determination for this boiler is revised, based on data acquired under Specific Condition #6, any VOC emission allowance not required shall revert to Palm Beach County available new source allowance.

13. ~~14.~~ SCGC's fuel oil storage tank and main pipeline from tank to boilers shall be equipped with sampling points. Daily fuel oil analysis ^{at least} shall include heat capacity (BTU/lb), sulfur content, density, and ash content. The records of the analyses shall be kept by the company, available for regulatory agencies inspection for a two-year period.

PAGE 4 of 5

This is too much analysis for G. OK to require sample + analysis on much lower. Can also rely on gallons + %S in oil from fuel oil supplier even when G. blends oil in own tank. Best situation would be for G. not to buy oil having more than 1.15% S.

13, — — — • Fuel oil purchased for all boilers and plants
will not contain more than 1.15 per cent sulfur

PERMIT NO.: AC 50-42476
APPLICANT: Sugar Cane Grower Cooperative of Florida.

14. Before the Operation Permit is issued, SCGC shall ^{finish} the stack modifications and revise the operation permits of existing boilers based on the following commitments.
- (a) A 155-foot-tall stack will be built for Boiler 8.
 - (b) The three 85-foot stacks serving Boiler 4 will be ducted into a single stack 110 feet tall.
 - (c) The exit gases from Boiler 6 and 7 (Currently passing through two 40-foot stack) will be combined into a single 40-foot stack.
 - (d) Boilers 6 and 7 each will be limited to a maximum production of 75,000 pounds of steam per hour instead of 125,000 pounds of steam per hour.
 - (e) Permit conditions of the existing boilers will be changed to reduce allowable particulate matter emissions from 0.3 pound per million BTU to 0.25 pound per million BTU.
15. The maximum fuel oil ^{consumption} of the proposed boiler is limited to ^{the quantity equivalent to 250 mm BTU/hr} 1,667 gallons per hour, if the heating value of the fuel oil is 18,500 BTU per pound. ^{to the boiler} Heat input from burning fuel oil at any time shall not exceed 250 Million BTU per hour.

Expiration Date: May 31, 1982

Issued this _____ day of _____, 19____

Pages Attached.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

Signature

PAGE 45 OF 45

Preliminary Determination

Sugar Cane Growers Cooperative of Florida
~~Atlantic Sugar Association~~

Application PSD-FL-077

The preceding Technical Evaluation and Preliminary Determination are adopted by reference for the proposed federal permit, PSD-FL-077.

42476

↓ Special Conditions listed in the draft State permit, AC 50-42389, are adopted as special conditions for the draft federal permit, PSD-FL-077, for this source.

The attached General Conditions are also made a part of the proposed federal permit PSD-FL-077 for this source.

Attachment: General Conditions (Federal)

Best Available Control Technology (BACT) Determination

Sugar Cane Growers Cooperative

Palm Beach County

The proposed installation is a 240,000 pound per hour steam generating unit designed to fire, singly or in combination, Bagasse and/or Residue. No. 6 fuel oil will be used for start-up and as a supplementary fuel not to exceed 42 barrels per hour. Bagasse is a plant residue remaining from the processing of sugar cane. Residue is a by-product from the furfural process which uses bagasse as the raw material. Both are burned in the boiler to eliminate a solid waste disposal problem and produce steam required in the processing plant.

The trade uses the terms "Bagasse" and "Residue" to differentiate between the two by-product fuels, which differ in composition. This nomenclature will be used in this determination. The proposed unit designated as boiler No. 8 is rated at 504.0, 443.5, 250.0 million Btu heat input when firing 100 percent Bagasse, Residue or No. 6 fuel oil, respectively. The unit is scheduled to operate around-the-clock 7 days per week for a total of 6552 hours at the existing facility located in Belle Glade, Florida.

Emissions When Burning 100% Residue (Dry Basis):

<u>Pollutant</u>	<u>Potential</u>		
	lb/hr	ton/yr	
Particulate	724.9	2374.7	6552 hr/yr. 273 day
SO ₂	398.7	1306.1	6552 hr/yr
NO _x	54.4	178.2	

Burning 100% Bagasse (Dry Basis):

<u>Pollutant</u>	<u>Potential</u>	
	lb/hr	ton/yr
Particulate	1120.0	3669.1
SO ₂	126.0	412.8
NO _x	84.0	275.2

Page Two

Burning Fuel Oil at Maximum 42 bbl/hr.

Particulate	22.9	75.0
SO ₂	276.9	907.1
NO _x	105.8	346.6
HC	1.8	5.9
CO	8.8	28.8

BACT Determination Requested by the Applicant:

<u>Pollutant</u>	<u>Emission Limit</u>
Particulate	
Bagasse/Residue	0.2 lb/million Btu heat input
No. 6 Oil	0.1 lb/million Btu heat input
Sulfur Dioxide	
Bagasse	0.15 lb/million Btu heat input
Residue	0.54 lb/million Btu heat input
No. 6 Oil	2.10 lb/million Btu heat input
NO _x , CO, HC	Good firing practice & operation
Visible Emissions	30% except 40% up to 2 minutes/hr.

A Joy Turbulaire Type D impingement scrubber will be used to control particulate emissions. Low sulfur fuel will be used to control SO₂ emissions.

Date of Receipt of a BACT Application:

April 27, 1981

Date of Publication in the Florida Administrative Weekly:

May 22, 1981

Review Group Members:

A tentative BACT determination was drafted based upon a previous Department determination for a similar source. Comments on the draft were obtained from Willard Hanks and Bob King, New Source Review Section; Mirza Baig, DER South Florida District; Michael Martin, Palm Beach County Health Department; and Cleve Holladay, Air Modeling Section. There was group solidarity for the pollutant emission limits which have been determined to be BACT.

BACT Determination by DER:

<u>Pollutant</u>	<u>Emission Limit</u>
Particulates	
100% Bagasse/Residue	0.15 lb/million Btu input
100% No. 6 Oil	0.10 lb/million Btu input
Sulfur Dioxide	No. 6 new ^[1] fuel oil with sulfur content not to exceed 1.0 percent.
Visible Emissions	Maximum 30% opacity except that 40% opacity is permissible for not more than 2 minutes in any one hour
Hydrocarbons (VOC)	LAER

[1] The term "new" oil means an oil which has been refined from crude oil and has not been used, and which may or may not contain additives.

Justification of DER Determination:

Bagasse is a plant residue remaining from the processing of sugar cane. Some of the bagasse is further processed to obtain furfural. The furfural process yields a granular residual by-product called "residue". Both bagasse and residue are burned in a boiler to eliminate a solid waste disposal problem and produce steam required in the processing plant. Fuel oil is used during the boiler start-up and may be fired concurrently with bagasse/residue as necessary to meet plant steam demands. Due to design limitations of the fuel oil system maximum heat input from oil firing will be less than 250 million Btu/hour.

The sulfur content of bagasse ranges from 0.1 to 0.2 percent. The sulfur content of residue ranges from 0.4 to 0.5 which has increased due to the sulfuric acid used in the furfural process. The moisture content of the bagasse can vary from 52 to 61 percent depending on geographic location and climate conditions during the sugar cane growing season.

Bagasse is by DER definition a Carbonaceous Fuel (17-2.02(21)F.A.C.). The particulate emission limiting standard for a new source burning carbonaceous fuel is 0.2 pound per million Btu heat input (17-2.05(6)I.(2)(b)F.A.C., Table II). A previous Department and EPA determination for a similar source was 0.15 pound particulates per million Btu heat input when burning bagasse. This emission limit was based upon stack test results obtained from various facilities with existing bagasse burning boilers.

There have been no significant technology improvements made since the last BACT determination on a bagasse boiler to justify a more stringent particulate emission limit. The particulate emission limit of 0.15 lb per million Btu heat input is, therefore, determined to be BACT.

The proposed boiler will burn oil, bagasse and, in addition, residue which is not the case in the majority of sugar cane processing plants. The applicant contends it will not be economical to meet the more stringent particulate emission limit, and this limit is not warranted since there is no documentation indicating this limit can be obtained on a continuous basis using the present control technology.

Data from Joy Manufacturing Company indicates that this type of scrubber can meet the 0.15 limit by adjusting operating parameters. The test data available does not show the 0.15 limit can routinely be obtained. The test data submitted, however, does not include test or operating parameters and thus cannot be considered as admissible proof that the 0.15 limit is beyond system capabilities. Therefore, the particulate emission limit will be as determined to be BACT, however, the applicant has the option to prove, with actual operating and test data, that this limit is not attainable on a continuous basis. The Department will then review the BACT determination based on the submitted data.

The applicant presently is permitted to burn 2.4 percent sulfur content fuel oil in boilers 1 through 5 and 1 percent sulfur content oil in boilers 6 and 7. The proposed boiler No. 8 will also burn the lower sulfur content oil. The applicant has one fuel storage tank and mixes the oil received, therefore, the actual sulfur content of the fuel used in all the boilers is actually a blend or approximately 1.8 percent sulfur. The percent sulfur and quantity of fuel oil received is based on each boiler fuel consumption data.

The average fuel blend of bagasse and residue during the crop season produces 94.7 percent of the daily SO₂ emissions, balance from the oil. The sulfur content of the solid fuels are more or less fixed, where as the sulfur content of oil is variable on demand. The solid fuel is not metered into the boiler so a SO₂ emission factor based on Btu input is not practical.

The use of fuel oil with a low sulfur content to control SO₂ emissions is determined as BACT.

<u>Fuel</u>	<u>SO₂ Emissions</u>	
Residue Only	398.7 lb/hr	
Bagasse Only	126.0 lb/hr	
Oil Only	276.9 lb/hr	(1.0%S)
Oil Only	498.5 lb/hr	(1.8%S)
Oil Only	664.7 lb/hr	(2.4%S)
Average Mixture	340.8 lb/hr	

The applicant shall install a recording flow meter in the boiler fuel oil line as close to the burner as practical. The meter shall be accurate to within five percent and shall be approved by the Department. The recorder charts will be held for a two year period. Oil analysis by the applicant's fuel oil supplier may be used in lieu of a compliance test to determine SO₂ emissions.

One member of the review group recommended the use of fuel oil with a 0.7 percent sulfur content. Since bagasse/residue is the major and more economical fuel, and, fuel oil with 1 percent sulfur content is a common blend in the area; and, no SO₂ increment violation is predicted, the Department does not think a fuel oil containing 0.7 percent sulfur is justified at this time.

The term "new oil" is included to prevent the use of waste oil as fuel, emissions from which were not considered in this BACT analysis.

The source is located in an area classified nonattainable for the pollutant ozone (17-2.16(1)(e)F.A.C.). The emission limit for hydrocarbons will be subject to a Lowest Achievable Emission Rate (LAER) determination (17-2.17(5)(a)1.F.A.C.).

Details of the Analysis May be Obtained by Contacting:

Edward Palagyi, BACT Coordinator
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32301

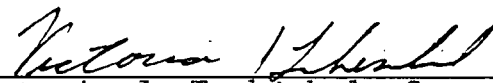
Recommended by:


for Steve Smallwood, Chief, BAQM

Date:

8/12/81

Approved:


Victoria J. Tschinkel, Secretary

Date:

8/14/81

Lowest Achievable Emission Rate (LAER) Determination

Sugar Cane Growers Cooperative

Palm Beach County

The proposed installation is a 240,000 pound per hour steam boiler designed to fire, singly or in combination, Bagasse, Residue and residual fuel oil. No. 6 fuel oil will be used for start-up and as a supplementary fuel not to exceed 42 barrels per hour. Bagasse is a plant residue remaining from the processing of sugar cane. Residue is a by-product from the furfural process which uses bagasse as the raw material. Both are burned in the boiler to eliminate a solid waste disposal problem and produce steam required in the processing plant.

The trade uses the terms "Bagasse" and "Residue" to differentiate between the two by-product streams. This nomenclature will be used in this determination. The proposed unit designated as boiler No. 8 is rated at 504.0, 443.5, and 250 million Btu heat input when firing 100 percent Bagasse, Residue or oil, respectively. The facility located in Belle Glade, Florida operates around-the-clock for a total of 6552 hours per year.

The source is located in an area classified nonattainment for the pollutant ozone (17-2.16(1)(e)F.A.C.). Hydrocarbons or Volatile Organic Compounds (VOC) from the burning of bagasse and/or residue are considered an anthropogenic emission which when released to the atmosphere can remain long enough to participate in photochemical reactions. The emission of VOC from the proposed unit is therefore subject to a LAER determination (17-2.17(5)(a)1.F.A.C.).

LAER Determination Requested by the Applicant:

Pollutant	Emission Limit
Hydrocarbons	2 lb/ton bagasse fired

LAER Determination by DER:

Emissions from the combustion of 100% bagasse and 100% residue are to be tested and VOC emission factors determined. 40 CFR 60, EPA method 25, Appendix A or Department approved equivalent shall be the test method used.

Justification of DER Determination:

The applicant proposed a hydrocarbon (VOC) emission limit as listed in the Source Classification Codes (SCC) in the National Emission Data System. There was no VOC emission factor listed in table 1.8-1 of AP-42. This was cause for question since the two are usually interrelated. EPA was contacted and no documentation was available to substantiate the VOC emission factor listed in the SCC. Residue is not addressed in either reference.

Using the Pulp and Paper industry VOC emission factor for wood residue and EPA report 600/7-80-111 for the VOC emission factor for residual oil, the VOC emissions would be less than 50 tons per year. This scenario would, however, exempt the source from the nonattainment provisions (17-2.17(3)(a) 1.a.(ii) F.A.C.) and require compliance with any applicable NSPS or emission limiting standard in 17-2.05 or 17-2.16, (17-2.17(4)F.A.C.).

The VOC emission factor of 2 pounds per ton of bagasse burned would result in emission of 63 lb/hr or 206 tons per year. The Department, however, has reasonable doubt concerning the accuracy of this VOC emission factor. There are presently no actual test data available and verification by testing can not be done until after the 1981 harvest begins. There is no known VOC emission factor when firing residue.

In order to comply with the intent of the New Source Allowance/Offset provisions, it is necessary to assume the higher factor until sufficient test data can be obtained to clearly establish rule applicability.

LAER, therefore, is determined to be the documentation of a VOC emission factor for bagasse and residue when burned as boiler fuel. The VOC emission factor of 2 pounds per ton bagasse burned, in the interim, is determined as LAER. Once a VOC emission factor from bagasse and residue firing is documented, this determination will be reviewed.

Page Three

Details of the Analysis May be Obtained by Contacting:

Edward Palagyi, LAER Coordinator
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32301

Recommended by:

Ctl Jarey
TS Steve Smallwood, Chief, BAQM

Date:

8/14/81

Approved:

Victoria J. Tschinkel
Victoria J. Tschinkel, Secretary

Date:

8/17/81

SS:EP:dav

Public Notice

A modification to an existing air pollution source is being proposed by Sugar Cane Growers Cooperative of Florida (SCGC) near the city of Belle Glade, Palm Beach County, Florida. The proposed modification is the construction of a bagasse/residue/fuel oil fired boiler with 264,000 pounds of steam per hour capacity. The modification will increase emissions of pollutants, in tons per year, by the following amounts:

<u>PM</u>	<u>SO₂</u>	<u>NO_x</u>	<u>CO</u>	<u>VOC</u>
324	805	209	326	325

The proposed modification has been reviewed by the Florida Department of Environmental Regulation under Chapter 403, Florida Statutes, and Federal regulation 40 CFR 52.21, Prevention of Significant Deterioration (PSD). The Department has made a preliminary determination that the construction can be approved provided certain conditions are met. A summary of the basis for the determination and the application for State and Federal permits submitted by SCGC are available for public review at the following offices:

Municipal Library
530 South Main Street
Belle Glade, Florida 33430

Health and Rehab. Services
Palm Beach County Health Dept.
West Palm Beach, Florida 33402

South Florida District
Dept. of Environmental Regulation
2269 Bay Street
Fort Myers, Florida 33901

Bureau of Air Quality Management
Dept. of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

No PM or SO₂ PSD increments will be consumed by the proposed modification.

Any person may submit written comments regarding the proposed modification. All comments, postmarked not later than 30 days from the date of this notice, will be considered in making a final determination regarding approval of construction of this source. These comments will be made available for public review on request. Furthermore, a public hearing can be requested by any person. Such a request should be submitted within 15 days of the date of this notice. Letters should be addressed to:

Mr. C.H. Fancy
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

RULES OF THE ADMINISTRATIVE COMMISSION
MODEL RULES OF PROCEDURE
CHAPTER 28-5
DECISIONS DETERMINING SUBSTANTIAL INTERESTS

28-5.15 Requests for Formal and Informal Proceedings

- (1) Requests for proceedings shall be made by petition to the agency involved. Each petition shall be printed typewritten or otherwise duplicated in legible form on white paper of standard legal size. Unless printed, the impression shall be on one side of the paper only and lines shall be double spaced and indented.
- (2) All petitions filed under these rules should contain:
 - (a) The name and address of each agency affected and each agency's file or identification number, if known;
 - (b) The name and address of the petitioner or petitioners;
 - (c) All disputed issues of material fact. If there are none, the petition must so indicate;
 - (d) A concise statement of the ultimate facts alleged, and the rules, regulations and constitutional provisions which entitle the petitioner to relief;
 - (e) A statement summarizing any informal action taken to resolve the issues, and the results of that action;
 - (f) A demand for the relief to which the petitioner deems himself entitled; and
 - (g) Such other information which the petitioner contends is material.

HOPPING, BOYD GREEN & SAMS

ATTORNEYS AND COUNSELLORS

SUITE 420, LEWIS STATE BANK BUILDING

POST OFFICE BOX 6526

TALLAHASSEE, FLORIDA 32301

(904) 222-7500

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CALVIN J. LIVINGSTON
GEORGE N. MEROS, JR.
WILLIAM D. PRESTON

OF COUNSEL,
W. ROBERT FOKES
JOHN C. WHITE

October 5, 1981

HAND DELIVERED THIS DATE

Mr. C. H. Fancy
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

Re: AC-50-42476 and PSD-FL-077 Technical Evaluation and
Preliminary Determination

Dear Mr. Fancy:

Sugar Cane Growers Cooperative of Florida (SCGC) and their technical consultants Environmental Science & Engineering, Inc. (ESE) have reviewed the above-referenced evaluation and determination. We wish to take this opportunity to submit the comments of SCGC on those matters for your consideration and review prior to finalization of the permit conditions. SCGC's comments will be made in the order in which they appear in the proposed permit conditions. As you will see, some of SCGC's problems with the language of the conditions proposed by the Department are of major importance. Nevertheless, we feel that this very complex permitting situation is very near resolution as a result of the continued good faith efforts of the Department and SCGC.

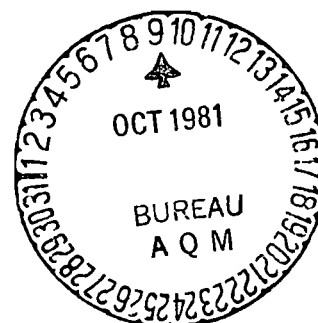
In order to facilitate your review, in those cases where SCGC agrees with the proposed condition, that will be indicated by "no comment". Where SCGC has differences, it has suggested replacement permit condition language and the reason for its suggestion. SCGC's comments are as follows:

Specific Condition No. 1 - No comment.

Specific Condition No. 2 -

Suggested Language

The proposed boiler's maximum emission rates shall not exceed the emission limits listed below.



Pollutant	Boiler No. 8 Maximum Allowable Emissions lb/hr	ton/yr
PM	75.6	276
SO ₂	555	2025
CO	140	511
VOC	140	511
NO _x	123	449

In addition, the total plantwide sulfur dioxide emissions shall not exceed 14 tons per day as determined by fuel consumption rates and emissions factors determined by SO₂ compliance testing.

The applicant has the option to prove, with actual operating and test data, that the BACT particulate matter emission limit is not attainable on a continuous basis. The department will review and will modify the limit to reflect a value that is attainable on a continuous basis, if justified by the submitted data.

Rationale

The maximum annual emissions are based on assumed boiler usage of 184 crop-season days and 120 off-season days for a total of 7296 hours. The maximum allowable annual emissions of CO and VOC specified in condition No. 2 are too low to allow the use of 100% bagasse or residue at maximum yearly production for boiler No. 8. Fuel oil, with its lower CO and VOC emissions, would have to be substituted for some of the bagasse or residue to maintain maximum yearly production. We request that the annual emission limitation for PM, CO, and VOC be set to reflect the combustion of 100% bagasse or residue as was done in the case of the maximum hourly emissions set forth in Condition No. 2.

The specified maximum annual emissions of SO₂ and NO_x for the proposed Boiler No. 8 are based on the projected annual fuel oil usage as pro-rated over each boiler. SCGC agrees to the limitation on daily fuel oil consumption in condition 9 and the modeling analysis has shown that SO₂ air quality standards will be met if plantwide emissions of SO₂ are no more than 14 tons/day. Maximum plantwide fuel oil usage has been set at 61,000 gallons per day in Condition 9. The limit on fuel oil usage in boiler No. 8 should not be more restrictive than 250×10^6 Btu/hr since oil burned in No. 8 would shift more of the plantwide emissions to a taller stack, thus improving dispersion. Maximum hourly emissions should also be based on a residue sulfur content of 0.5%.

Mr. C. H. Fancy
October 5, 1981
Page 3

The maximum hourly emissions of particulate matter reflect the determination of 0.15 lb/10⁶ Btu as BACT. SCGC has continuously taken the position that the data support a BACT limit of 0.20 lb/10⁶ Btu. The DER determination, explicitly recognizing the possibility that 0.15 lb/10⁶ Btu might not be achievable on a continuous basis, provides that the limit may be modified if justified by future performance tests. SCGC request that this right to future revision be repeated in the permit conditions and that the particulate matter "maximum allowable emissions" limit be similarly conditioned.

Specific Condition No. 3 - (See also Specific Condition No. 13 below.)

Suggested Language

Sulfur content of the fuel oil fired in the proposed boiler and all existing boilers shall not exceed 1.8%. Operating permit conditions for Boilers 1, 2, 3, 4, 5, 6, and 7 shall be revised to limit sulfur content in the fuel oil to 1.8%. Records shall be kept to document that average sulfur content of fuel oil purchased does not exceed 1.8% on the average and that sufficient 1.0% sulfur oil is purchased to meet the fuel consumption of boilers 6, 7 and 8. The fuel oil storage tank at the site and main pipeline from the tank to boilers shall be equipped with sampling points.

Rationale

Condition 3 would impose a 1.15% average fuel oil sulfur content limitation on the new boiler and all existing boilers. SCGC agrees that for every gallon of fuel oil burned in boiler No. 8, a gallon of 1.0% sulfur oil will be added systemwide. The 1980 plantwide average fuel sulfur content was 1.8%. Although additional 1.0% fuel oil would slightly lower this average, to reach 1.15% would require operating boilers 6, 7 and 8 at maximum oil burning capacity for more than an entire season. The limit proposed by the department would require a major reduction in fuel sulfur content at existing boilers even if boiler No. 8 burned no oil at all. It is an unnecessary condition since SO₂ air quality standards will be met while burning 1.8% sulfur oil if plantwide SO₂ emissions are limited to 14 tons per day. Any oil purchased for boiler No. 8 will lower the average plantwide sulfur content to less than 1.8% and will reduce SO₂ impacts from those predicted with 1.8% sulfur oil.

Specific Condition No. 4 - SCGC suggests deletion of this condition.

Rationale

This condition presupposes that control of NO_x and CO emissions will minimize VOC emissions. In addition, flue gas oxygen content is required to be maintained within the range bounded by the maximum allowable NO_x and CO emission rates. However, in recently published test results (see copy attached) no relation was evident between VOC emission and flue gas oxygen content in a wood-fired boiler.

SCGC is concerned about the method to show compliance, as described in the article attached to the permit conditions. No installation of this type is known to exist on bagasse or wood-fired boilers in the State of Florida. Where testing has been performed on carbonaceous fuel boilers to correlate VOC and O₂ levels, little or no correlation can be found between these parameters.

The problem at SCGC would be compounded by the fact that three fuels will be used in varying combinations and that substantial routine fluctuations in bagasse and residue quality (and therefore combustion performance) continuously occur and are beyond the control of the source. Thus, there may be an infinite number of "allowable excess oxygen ranges" that would have to be tested to no avail. Because of these facts, SCGC requests that the flue gas oxygen meter BACT requirement be deleted.

Specific Condition No. 5 -

Suggested Language

From 16 April through 12 October plant operation shall be restricted to no more than three boilers of unit numbers 1, 2, 4, 5 or 8, and to no more than 120 days. During this period of restricted operation steam production shall not exceed a maximum daily average of 450,000 lb/hr.

Rationale

Allowable full capacity operating times for all boilers should reflect the air quality modeling assumptions, i.e. October 13 through April 15 (184 days). The 120 days of off-season operation should not be restricted to a particular calendar period. In

addition, although the daily average steam demand during the off-season is approximately 400,000 lb/hr, to maintain this average, peak daily average steam production of 450,000 lb/hr sometimes occurs.

Specific Condition No. 6 -

Suggested Language

Compliance with the emission limits in condition No. 2 shall be determined by performance tests.

Particulate matter emission tests shall be made while burning bagasse with the minimal amount of oil necessary to reach test capacity.

Two SO₂ emission tests shall be made during the first year. Compliance in following years shall be determined by fuel analysis and consumption records. The tests shall be made while burning bagasse only and residue only with the minimal amounts of fuel oil necessary to reach test capacity. These tests are to determine compliance with SO₂ emission limits of 300 lb/hr from non-fossil fuel while burning residue, and 152 lb/hr from non-fossil fuel while burning bagasse.

EPA reference method 25 shall be used to establish VOC emissions during the first compliance tests. The performance tests shall be conducted in accordance with EPA reference methods (40 CFR 60, Appendix A) and the provisions of 40 CFR 60.8 and 40 CFR 60.46.

Rationale

SCGC agrees that particulate emission tests should be conducted while burning all bagasse and the minimal quantity of oil required to reach full test capacity.

In light of our comments on Condition 3 and the assumptions used in the computer modeling study, SCGC disagrees with the proposed SO₂ compliance test requirements.

SO₂ emissions tests while burning maximum fuel oil are unnecessary because SO₂ removal from oil has never been assumed. Such a test would also be unreasonably expensive -- about \$1500/hr for fuel oil alone. Finally, the BACT determination made by the department specifies that "oil analysis by the applicant's fuel oil supplier may be used in lieu of a compliance test to determine SO₂ emission".

In addition, for purposes of compliance, the maximum allowable SO₂ emissions when burning bagasse and residue, should be based upon the assumption that these fuels contain 0.2 and 0.5% sulfur by weight, respectively, as was assumed for purposes of the modeling study.

It is also requested that Condition 6 be modified to clarify that compliance testing for SO₂ will be performed during the first year only in order to establish scrubber operating parameters necessary to achieve 40 percent or greater SO₂ removal on residue and bagasse. The scrubber would then be operated within the established parameters, with no future SO₂ testing required.

Specific Condition No. 7 -

Suggested Language

Visible emissions from the bagasse handling system shall not exceed 20% opacity. Reasonable precautions shall be taken to prevent emissions of fugitive particulate matter.

Rationale

Condition 7 restricts visible emissions from the conveyor system to 5% opacity. SCGC does not believe this to be a realistic value, since generally if any visible emissions whatsoever can be observed, 5% or greater opacity exists. Therefore, SCGC requests that maximum visible emissions be limited to 20% opacity, as required in 17-2.05(1)(a), and that "reasonable precautions" be taken to prevent emissions of fugitive particulate matter, as required in 17-2.05(3).

Specific Condition No. 8 -

Suggested Language

Instruments shall be installed to continuously measure the amount of fuel oil used individually by the proposed boiler and boilers 6 and 7, the total amount of fuel oil used by boilers 1 through 5, and the total amount of residue used in all boilers.

Mr. C. H. Fancy
October 5, 1981
Page 7

The records of fuel oil and residue usage will be kept by the company, available for regulatory agency inspection, for two years.

Rationale

In order to measure the individual fuel oil usage in boilers 1 through 5 or individual boiler residue usage, highly expensive and impractical plant modifications and metering equipment would be required.

Specific Condition No. 9 - No comment.

Specific Condition No. 10 - No comment.

Specific Condition No. 11 - No comment.

Specific Condition No. 12 -

Suggested Language

The quantity of 325 tons per year of VOC emissions is hereby assigned to the boiler from the new source allowance balance for Palm Beach County pursuant to Section 17-2.17(7)(a) and (d). Once a VOC emission factor from bagasse and residue firing is determined, this assignment will be reviewed, and any VOC emission allowance not required shall revert to Palm Beach County available new source allowance.

SCGC also requests that the review clause of the last paragraph of the LAER determination be made a part of the permit:

"LAER is determined to be the documentation of a VOC emission factor for bagasse and residue when burned as a boiler fuel. The VOC emission factor of 2 pounds per ton bagasse burned, in the interim, is determined as LAER. Once a VOC emission factor from bagasse and residue firing is documented, this determination will be reviewed."

Rationale

The apparent inconsistency between the 325 tons of VOC per year from the Palm Beach County new source allowance and the 511 tons/yr maximum allowed VOC emissions for this boiler stems from the fact that the operation of Boiler No. 8 during the off-season will be entirely offset by the shutdown of a boiler previously used. The 325 tons per year reflects this internal offset, and corresponds to the maximum crop-season emissions of boiler No. 8.

Specific Condition No. 13 -

Suggested Language

Incorporated into Specific Condition #3.

Rationale

Condition 13 implies that fuel of the specified sulfur content can be purchased directly from the supplier. Actually 1.0% and 2.4% fuel oil will be purchased in quantities necessary to maintain a 1.8% overall sulfur content and to match the consumption of boilers 6, 7 and 8 with 1.0% oil. The permit condition should provide for this method of maintaining the sulfur content limitation.

Specific Condition No. 14 - SCGC has suggested deletion of this condition.

Rationale

Condition 14 would require that the boiler efficiency of the new unit be determined and used to establish the heat input during the compliance test. Sugar Cane Growers Cooperative strongly objects to this requirement. Sugar Cane Growers Cooperative did offer to furnish FDER with the boiler manufacturer's performance test when this becomes available. However, the test results should in no case be used to determine the heat input of the boiler during compliance tests. The variability of bagasse and associated handling problems, previously led DER and the industry to establish 55% as the assumed efficiency of all boilers for the purpose of carrying out heat input calculations and when compliance testing. It is on this basis that the existing DER emission limitations for bagasse boilers were established as well as all of the particulate tests conducted for the past 6 years, including those used to justify or support DER's proposed BACT limitation of $0.15 \text{ lb}/10^6 \text{ Btu input}$.

Mr. C. H. Fancy
October 5, 1981
Page 9

Because of the extreme rapid fluctuations in bagasse moisture content, heating value and other constituents, actual boiler efficiency determinations will vary unpredictably in a fashion totally unrelated to how well the boiler is operated. Thus, in situ efficiency determinations would not be correlatable to heat input over the period of even one particulate test.

Even to attempt an actual boiler efficiency determination would necessitate continuously measuring the weight of the input bagasse, bagasse moisture content and heating value, and the associated very expensive and impractical use of scales. If these measurements could be made, assumptions would still need to be made concerning radiant heat loss, unburned carbon loss, and air leaks.

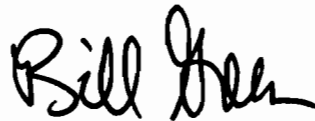
It is unreasonable to require SCGC to ignore this and blindly speculate about its ability to comply using a different heat input determination method. Thus, we request that the 55% efficiency assumption be retained.

Specific Condition No. 15 - No comment.

Specific Condition No. 16 - No comment.

We wish to thank you for this opportunity to comment.

Sincerely,



William H. Green

Counsel for Sugar Cane Growers
Cooperative of Florida

WHG/gs

cc: Stephen Smallwood
Enrique Arias
David Buff
Mirza Baig
Michael Martin

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PROCEEDINGS
OF THE
TECHNICAL ASSOCIATION
OF THE
PULP AND PAPER INDUSTRY



1981 Environmental Conference

Fairmont Hotel
New Orleans, LA
April 27-29



TAPPI PRESS

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ABSTRACT

Total gaseous non-methane organic compounds (TGMNO) were measured from wood-residue fired boilers, kraft recovery furnaces, and kraft process lime kilns with the EPA Reference Method 25. An interference to EPA Method 25 on combustion sources was noted and corrected for.

Wood-residue fired boiler TGMNO emissions were found to correlate to overfire air use. Larger proportions of overfire air result in lower TGMNO emissions. Kraft recovery furnace TGMNO emission levels were influenced by the use of direct contact evaporators. Direct contact evaporators were found to contribute to TGMNO emissions. Emissions from lime kilns were difficult to measure. Lime kiln TGMNO emissions were found to depend upon the source of make-up water. Use of contaminated water in the lime kiln area contributed significantly to TGMNO emissions. Wet scrubbers did not remove TGMNO's from wood-residue fired boiler or lime kiln emissions.

INTRODUCTION

Volatile organic compounds are considered by the Environmental Protection Agency to be photo-oxidants resulting in the formation of ozone and are thereby designated criteria pollutants. Potential emissions of these criteria pollutants in amounts greater than a threshold tonnage per year results in classification of new sources as major. Major new sources and existing source modifications must satisfy non-attainment (NA) or prevention of significant deterioration (PSD) regulations mandated by the 1977 Clean Air Act Amendment.

To date, no definitive assessment has been made of total gaseous organic compounds emissions resulting from pulp and paper industry combustion sources. Modeling to satisfy non-attainment and PSD regulations is unreliable with the information presently available. It is also unknown which and what size new pulp and paper mill processes will be considered major sources with respect to gaseous organics.

Hydrocarbon emission factors expressed as methane for wood-residue fired boilers published in AP 42, 1979 (1) were 1 g hydrocarbon per kg (2 lb ton) of 384 moisture fuel fired. This value translates to 0.11 kg carbon per 10^6 J (1.22 lb ton) fired assuming 2.08×10^6 J (9,050 Btu/lb) wood-residue heat value. The values published in the 1979 supplement are the same as published in the AP 42 1976 edition and no new references are listed. Consequently, little is known about the method used in obtaining this data or if the procedures used would yield data consistent with the EPA reference method for sampling hydrocarbon emissions. Any comparisons made between the data presented in this text and the value presented in AP 42, should consider the difference in methods by which the data was generated. No hydrocarbon emission factors for kraft recovery furnaces or kraft process lime kilns are listed in AP 42.

The National Council is conducting a survey of total gaseous organic emissions from the pulp and paper industry to provide a data

base on potential emissions to be expected from various sources. It was the aim of this project to produce data consistent with the EPA reference method for the measurement of total gaseous nonmethane organic compounds (TGMNO). The sampling and analysis procedures used in this study were in accordance with EPA Method 25, published in the Federal Register October 3, 1980.

SAMPLING AND ANALYSIS PROCEDURES

The EPA-25 analytical procedure yields values for carbon dioxide, carbon monoxide, methane and total gaseous organics. The analytical procedure was altered to produce results for ethane and ethylene. Methane and ethane are not photoreactive and were not included in the results. The TGMNO results were reported as methane.

The principle of EPA-25 is to separate the light compounds (those with vapor pressures at -78°C) from the less volatile organics by capture of less volatile compounds in a cold trap in the field. The light compounds are captured in an evacuated tank. The samples were returned to the laboratory for analysis where the trap containing condensed organics was heated and hot while purified air swept the trap contents through a catalytic oxidizer to convert organics to CO_2 for analysis. Prior to heating the cold trap is flushed with carbon compound free air to remove free gas CO_2 . The light organics captured in the evacuated tank were separated on a chromatographic column yielding concentrations for CO , CH_4 , C_2H_6 , C_2H_4 , C_3H_8 , and all other organics. Evacuation of the trap and tank organics gives results for calculating TGMNO stack concentrations. All results are reported as methane.

SAMPLING

Field samples were taken in duplicate through 1/4 stainless steel probes for one-hour duration. The stack end of the probe was filled with quartz glass wool before each sample was drawn to prevent collection of particles in the trap. Six feet of 1/4 in.

pling procedure. The variation due to the sampling procedure was separated from the variation of the TCMSO emissions from the sources by a statistical technique called analysis of variance. Using a lumped relative standard deviation of 0.23 for wood-residue fired boilers and 0.28 for kraft recovery furnaces and using the appropriate t statistic it can be shown that the average of the duplicate samples taken at a source are within 11% and 12% of the true values at the 95% confidence level for wood-residue fired boilers and kraft recovery furnaces respectively.

The analysis of variance results also showed that only from boiler A and in furnaces C, D, and E was there significant enough variation in TCMSO emissions to be resolvable by the EPA sampling technique. In all other sources the variation within the EPA-25 sampling technique obscured that variation there may have been from the source.

WOOD-RESIDUE FIRED BOILERS

Average corrected TCMSO emissions from the wood-residue fired boilers studied expressed as methane equivalent were 0.43, 0.22, 0.31, 0.14 $\text{Kg}/10^9 \text{ J}$ (0.10, 0.059, 0.072, 0.037 $\text{lb}/10^9 \text{ Btu}$) for boilers A through D respectively. Average CO_2 absorption interferences were 0.032, 0.044, 0.061 and 0.046 $\text{Kg}/10^9 \text{ J}$ (0.019, 0.015, 0.014 and 0.015 $\text{lb}/10^9 \text{ Btu}$) for boilers A through D respectively. These average emission rates were found to be related to the percentage of the total air fired as overfire or secondary air. As illustrated in Figure 5 the greater the percentage of total air used as overfire, the lower the TCMSO emission rates were. Data corrected for CO_2 absorption interference was used for plotting Figure 5. When 11% overfire air was used, as in boiler A, an average TCMSO emission rate of 0.43 $\text{Kg}/10^9 \text{ J}$ (0.10 $\text{lb}/10^9 \text{ Btu}$) was experienced. At 40% overfire air use, less than 0.13 $\text{Kg}/10^9 \text{ J}$ (0.03 $\text{lb}/10^9 \text{ Btu}$) TCMSO emissions result.

CORRELATIONS TO BOILER OPERATION

The TCMSO emission data was searched for relationships to operating conditions such as steam production, flue gas moisture content and boiler flue gas exit temperature. No strong correlations could be found with any of the recorded operating parameters. Most of the boiler operations were over a narrow range of operating parameters.

Both boilers A and C showed a trend with higher TCMSO emissions higher stack oxygen levels as shown in Figures 6 and 7.

It is possible to postulate that in boilers A and C, where most of the combustion air was provided under the grates, uneven burning could result. An uneven fuel cover on the grate could allow combustion air to pass through some portions of the grate unreacted. High pressure drops elsewhere across the bed would prevent sufficient air to pass through the fuel for complete combustion. Inadequate gas turbulence would allow uncombusted organics to escape the combustion zone resulting in

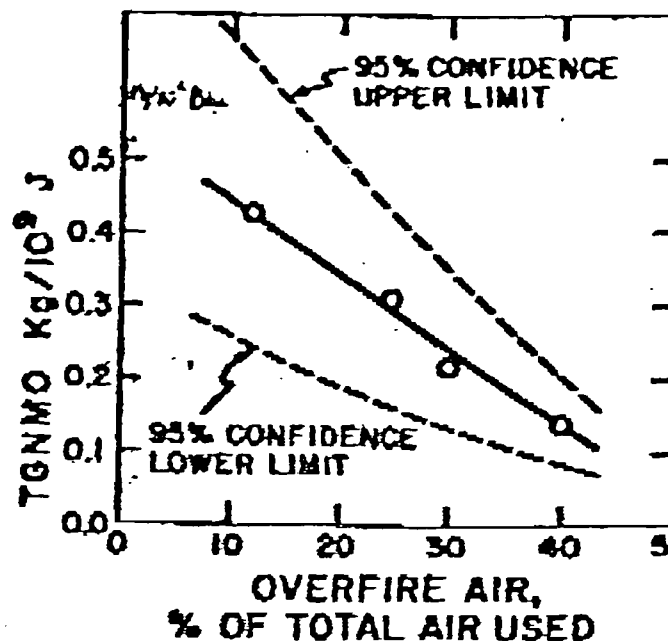


Figure 5. Relationship Between TCMSO and Overfire Air Use.

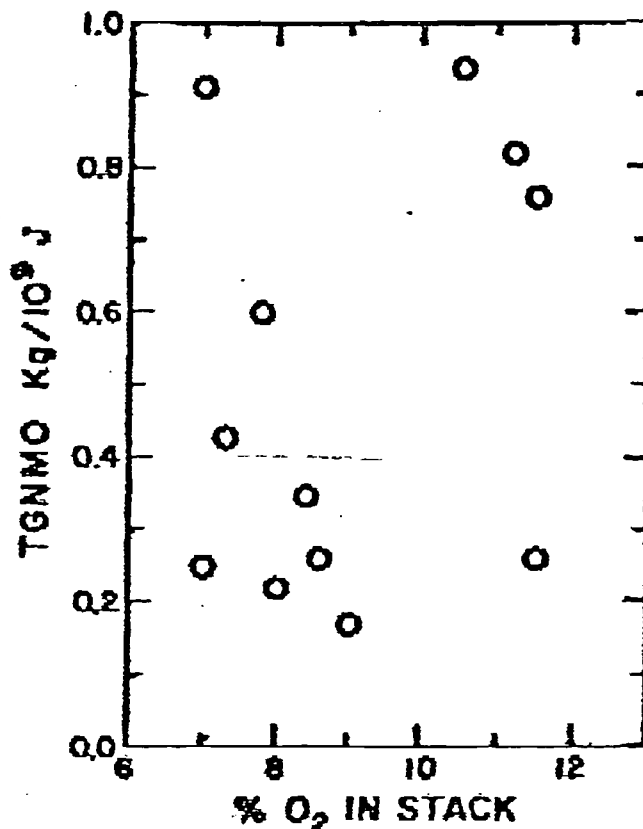


Figure 6. Relationship Between TCMSO and Stack O_2 for Boiler A

a TCMSO emission. Furnaces using overfire air are designed to induce turbulence for gas mixing and complete combustion. With low overfire air usage, evenness of the fuel on the grate would influence TCMSO emissions.

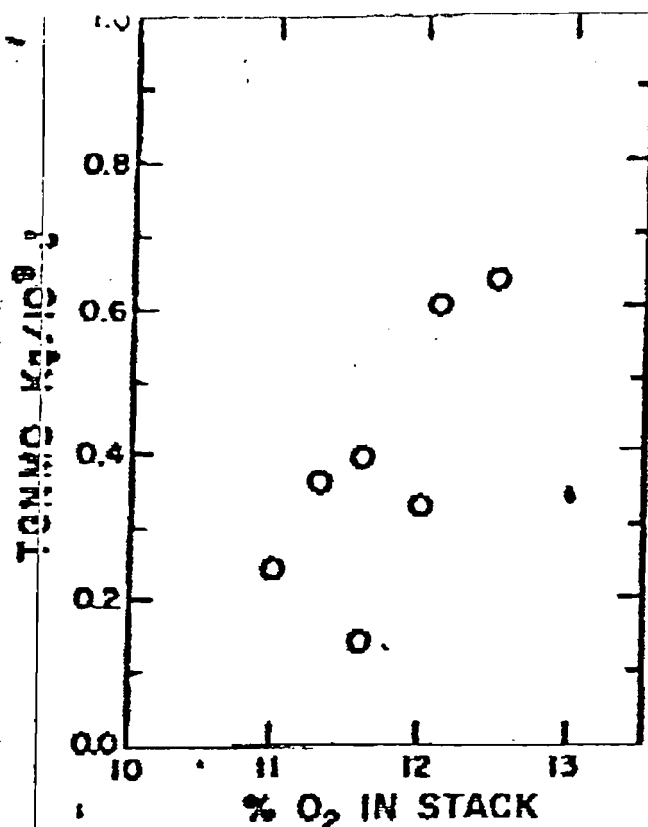


Figure 7. Relationship Between TQMO and Stack % O₂ for Boiler C

Boilers B and D showed no relationship between TQMO's and flue gas oxygen content.

Carbon monoxide emissions correlated with stack gas moisture content and auxiliary fuel type for boiler B and with O₂ for boiler C. The high CO emissions for boiler B occurred when a large amount of oil was burned while flue gas oxygen content was high, indicating too short of a residence time for complete combustion of oil. Carbon monoxide emissions were always low when natural gas was burned as an auxiliary fuel in boiler B.

Both the carbon monoxide and TQMO's for boiler C increased in proportion with flue gas oxygen content indicating a common mechanism and incomplete combustion of these materials.

EFFECT OF A WET SCRUBBER ON TQMO EMISSIONS

Samples were taken simultaneously preceding and following an impingement type wet scrubber to determine if removal of TQMO's occurred. There was a small reduction in TQMO's across the scrubber averaging about 0.18 kg/10³ J (0.012 lb/10³ Btu).

No significant removal of TQMO's should be expected from impingement type wet scrubbers used on wood-residue fired boilers. This type of scrubber is not designed for gas absorption and does not function well in that

capacity. The high water content of the organic compounds present in the flue gas may condense to form particulate organics which will be removed from the scrubber water along with other solids. Lower boiling point soluble organics such as alcohols removed by the scrubber would likely be stripped from the recirculated scrubber water into the gas stream. However, if a contaminated water makeup (i.e., evaporator condensate) is used in the scrubber, evaporation and stripping of the contaminated water could lead to an increase in TQMO emissions.

KRAFT RECOVERY FURNACE RESULTS

Average TQMO emissions as methane collected from kraft recovery furnaces are shown in Table 1. The emissions are reported in terms of parts per million, kg/10³ J (lb/10³ Btu) fired, kg/1000 kg (lb/1000 lb) dry black liquor solids fired, and kg/metric ton (lb/ton) pulp rated capacity. As expected, the magnitude of the TQMO emissions separated into two levels corresponding to furnaces equipped with direct contact evaporators (DCE) and those not equipped with direct contact evaporators (NDCE). DCE furnaces averaged 0.45 kg/10³ J (0.18 lb/10³ Btu) emissions and NDCE furnaces averaged 0.18 kg/10³ J (0.042 lb/10³ Btu) emissions.

Recovery Furnace	TQMO PPM	TQMO	TQMO	TQMO
		kg/10 ³ J (lb/10 ³ Btu)	kg/1000 kg ble (lb/1000 lb ble)	kg/ton Pulp (lb/ton Pulp)
A (NDCE)	82	0.17 (0.040)	0.24 (0.24)	0.4 (0.8)
B (DCE)	172	0.43 (0.100)	0.55 (0.55)	0.7 (1.4)
C (NDCE)	29	0.15 (0.037)	0.17 (0.17)	0.2 (0.4)
D (DCE)	169	0.46 (0.106)	0.63 (0.63)	1.0 (2.1)
E (NDCE)	61	0.23 (0.054)	0.32 (0.32)	0.5 (1.0)

Table 1. Average TQMO Emissions From Kraft Recovery Furnaces.

Weak correlations could be found between TQMO emissions in kg/10³ J and stack gas flow rates and oxygen content. TQMO emissions from furnace C weakly correlated with total stack flow at the point of measurement. Higher stack flow rates resulted in higher TQMO emissions in kg/10³ J fired. When stack gas flow rates were corrected to zero percent oxygen there was no correlation with TQMO emissions. TQMO emissions in kg/10³ J also correlated with stack gas oxygen content for furnaces D and E. For furnace D higher emissions occurred at higher stack gas oxygen content. For furnace E higher TQMO emissions in kg/10³ J occurred at lower stack gas oxygen levels. When TQMO emissions were compared to the flue gas oxygen levels as it left the fur-

HOPPING, BOYD GREEN & SAMS

ATTORNEYS AND COUNSELLORS

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OF COUNSEL
W. ROBERT FOKES
JOHN C. WHITE

Tim
September 29, 1981

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality Management
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

Re: Preliminary Determination - AC 50-42476, PSD-FL-077

Dear Mr. Fancy:

Enclosed please find the original Proof of Publication from the West Palm Beach Evening Times concerning the above permit applications.

If you have any questions, please do not hesitate to call.

Sincerely,

Bill

William H. Green

WHG/gs
Enclosure

cc: Enrique Arias
David Buff



The Evening Times

Published Every Weekday
West Palm Beach, Palm Beach County, Florida

PROOF OF PUBLICATION

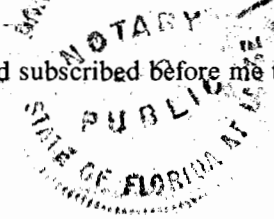
STATE OF FLORIDA

COUNTY OF PALM BEACH

Before the undersigned authority personally appeared ... Don K. Creamer ...
who on oath says that he is Class. Adv. Mgr. of The Evening Times, a daily
newspaper published at West Palm Beach in Palm Beach County, Florida; that the attached
copy of advertising, being a Notice
in the matter of Proposed Modification
in the Court, was published in said newspaper in the
issues of September 11, 1981

Affiant further says that the said The Evening Times is a newspaper published at West
Palm Beach, in said Palm Beach County, Florida, and that the said newspaper has heretofore
been continuously published in said Palm Beach County, Florida, each weekday and has
been entered as second class mail matter at the post office in West Palm Beach, in said Palm
Beach County, Florida, for a period of one year next preceding the first publication of the
attached copy of advertisement; and affiant further says that he has neither paid nor promised
any person, firm or corporation any discount, rebate, commission or refund for the purpose of
securing this advertisement for publication in the said newspaper.

Sworn to and subscribed before me this 11 day of September, A.D. 1981



Barbara M. McCord
NOTARY PUBLIC STATE OF FLORIDA AT LARGE
MY COMMISSION EXPIRES SEPT 9 1983
BONDED thru GENERAL INS. UNDERWRITERS

NO. 878801
PUBLIC NOTICE
A modification to an existing air pollution source is being proposed by Sugar Cane Growers Cooperative of Florida (SCGC) near the city of Belle Glade, Palm Beach County, Florida. The proposed modification is the construction of a bagasse/residue/fuel oil fired boiler with 264,000 pounds of steam per hour capacity. The modification will increase emissions of pollutants in tons per year by the following amounts:

PM	SO ₂	NO _x	CO	VOC
324	805	208	828	1325

The proposed modification has been reviewed by the Florida Department of Environmental Regulation under Chapter 403, Florida Statutes, and Federal regulation 40 CFR 52.21, Prevention of Significant Deterioration (PSD). The Department has made a preliminary determination that the summary of the basis for the determination and the application for State and Federal permits submitted by SCGC are available for public review at the following offices:

- Municipal Library, 530 South Main Street, Belle Glade, Florida 33430
- Health and Rehab. Services, Palm Beach County Health Dept. West Palm Beach, Florida 33402
- South Florida District, Dept. of Environmental Regulation, 2269 Bay Street, Fort Myers, Florida 33901
- Bureau of Air Quality Management, Dept. of Environmental Regulation, 2600 Blair Stone Road, Tallahassee, Florida 32301

No PM or SO₂ PSD increments will be consumed by the proposed modification. Any person may submit written comments regarding the proposed modification. All comments, postmarked not later than 30 days from the date of this notice, will be considered in making a final determination regarding approval of construction of this source. These comments will be made available for public review on request. Furthermore, a public hearing can be requested by any person. Such a request should be submitted within 15 days of the date of this notice. Letters should be addressed to:

Mr. C. H. Fancy
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

PUBLISH: The EVENING TIMES
September 11, 1981

Proof of Publication

.....

.....

vs.

.....

.....

Filed in the Office of Clerk of Circuit Court

..... 19

....., Clerk

By, D. C.

.....

Complainant's Solicitor.



ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

P.O. BOX ESE
GAINESVILLE, FLORIDA 32602
904/372-3318

August 18, 1981
ESE NO. 80 190 100



Mr. Cleve Holladay
Bureau of Air Quality Management
Florida Department of Environmental
Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

RE: Sugar Cane Growers Cooperative AC-42476; PSD-FL-077

Dear Cleve:

As we agreed last week, I am sending you the printouts of the oil burning scenarios we discussed. Printout Number 1 shows that 542,000 pounds/hour steam can be produced by burning oil alone without violating the three hour Ambient Air Quality Standard.

Printout Number 2 shows that when boiler Number 8 is operated at maximum oil burning capacity, a 75 percent reduction in SO₂ emissions from Boilers 1 through 5 will maintain 24-hour Ambient Air Quality Standards.

Both of these combinations produce more than enough steam to meet demands during a shortage of bagasse or residue as described in the project summary and compliance plan.

Do not hesitate to call with any questions.

Sincerely,

Michael H. Dybevick
Associated Engineer
Air Modeling and Permitting

MHD/ctw

cc: Enrique Arias

BEST AVAILABLE COPY

*** SCGC 2251 --S02 THREE HOUR BURNING OIL AT 40% RATING

PRINTOUT #1

CALCULATE (CONCENTRATION=1,DEPOSITION=2)	ISW(1) = 1
RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)	ISW(2) = 3
DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)	ISW(3) = 1
TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)	ISW(4) = 0
CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)	ISW(5) = 0
LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)	ISW(6) = 1
COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)	
WITH THE FOLLOWING TIME PERIODS:	
HOURLY (YES=1,NO=0)	ISW(7) = 0
2-HOUR (YES=1,NO=0)	ISW(8) = 0
3-HOUR (YES=1,NO=0)	ISW(9) = 1
4-HOUR (YES=1,NO=0)	ISW(10) = 0
6-HOUR (YES=1,NO=0)	ISW(11) = 0
8-HOUR (YES=1,NO=0)	ISW(12) = 0
12-HOUR (YES=1,NO=0)	ISW(13) = 0
24-HOUR (YES=1,NO=0)	ISW(14) = 0
PRINT *N*-DAY TABLE(S) (YES=1,NO=0)	ISW(15) = 0
PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE SPECIFIED BY ISW(7) THROUGH ISW(14):	
DAILY TABLES (YES=1,NO=0)	ISW(16) = 1
HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)	ISW(17) = 0
MAXIMUM 50 TABLES (YES=1,NO=0)	ISW(18) = 0
METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)	ISW(19) = 1
RURAL-URBAN OPTION (RURAL=0,URBAN MODE 1=1,URBAN MODE 2=2)	ISW(20) = 0
WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)	ISW(21) = 1
VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)	ISW(22) = 1
SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)	ISW(23) = 0
PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)	ISW(24) = 1
PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)	ISW(25) = 1
NUMBER OF INPUT SOURCES	NSOURC = 6
NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)	NGROUP = 0
TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)	IPERD = 5
NUMBER OF X (RANGE) GRID VALUES	NXPNTS = 10
NUMBER OF Y (THETA) GRID VALUES	NYPNTS = 10
NUMBER OF DISCRETE RECEPTORS	NXUYPT = 0
SOURCE EMISSION RATE UNITS CONVERSION FACTOR	TK = .100000E+07
ENTRAINMENT COEFFICIENT FOR UNSTABLE ATMOSPHERE	BETA1 = 0.600
ENTRAINMENT COEFFICIENT FOR STABLE ATMOSPHERE	BETA2 = 0.600
HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED	ZR = 7.00 METERS
LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA	IMET = 9
DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION DECAY	= 0.000000E+00
SURFACE STATION NO.	ISS = 12844
YEAR OF SURFACE DATA	ISY = 70
UPPER AIR STATION NO.	IUS = 12839
YEAR OF UPPER AIR DATA	IUY = 70
ALLOCATED DATA STORAGE	LIMIT = 43500 WORDS
REQUIRED DATA STORAGE FOR THIS PROBLEM RUN	MIMIT = 1610 WORDS

1

Best Available Copy

*** SCGC 2251 --S02 THREE HOUR BURNING OIL AT 40% RATING ***

*** METEOROLOGICAL DAYS TO BE PROCESSED ***
(IF=1)

```
0000000000 0000000000 0000000000 0000000000 0000000000
0000000000 0000000000 0000000000 0000000000 0000000000
0000000000 0000000000 0000000000 0000000000 0000000000
0000000000 0000000000 0000000000 0000000000 0000000000
0000000000 0000000000 0000000000 0000000000 0000000000
0000000000 0000000000 0000000000 0000000000 0000000000
0000000000 0000000000 0000000010 0000000000 0000000000
0000000000 000000
```

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

*** WIND PROFILE EXPONENTS ***

STABILITY CATEGORY	1	2	3	4	5	6
A	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00
B	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
C	.20000E+00	.20000E+00	.20000E+00	.20000E+00	.20000E+00	.20000E+00
D	.25000E+00	.25000E+00	.25000E+00	.25000E+00	.25000E+00	.25000E+00
E	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00
F	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00

*** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
(DEGREES KELVIN PER METER)

STABILITY CATEGORY	1	2	3	4	5	6
A	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
B	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
C	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
D	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
E	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01
F	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01

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*** SCGC 2251 --502 THREE HOUR BURNING OIL AT 40% RATING ***

SOURCE # 1---BOILERS #1 & #2 -- 2 STACKS EACH
 SOURCE # 2---BOILER #3 -- 1 STACK
 SOURCE # 3---BOILER #4 -- 1 STACK
 SOURCE # 4---BOILER #5 -- 2 STACKS
 SOURCE # 5---NEW BOILER #8
 SOURCE # 6---BOILERS #6 & #7 -- BOTH INTO ONE STACK

*** SOURCE DATA ***

EMISSION *										TEMP. EXIT VEL. †													
RATE										TYPE=0		TYPE=0											
TYPE=0,1										(DEG.K)		(M/S)											
TYPE=2										BASE		VERT.DIM.		HORZ.DIM.		DIAM.		HEIGHT		LENGTH		WIDTH	
SOURCE	P	K	NUMBER	E	CATS.	PER M**2	X	Y	ELEV.	HEIGHT	TYPE=1	TYPE=1,2	TYPE=0	TYPE=0	TYPE=0	TYPE=0	TYPE=0	TYPE=0	TYPE=0	TYPE=0	TYPE=0	TYPE=0	TYPE=0
NUMBER	E	E	CATS.	PER M**2	(M)	(M)	(M)	(M)	(M)	(M)	(M)	(M)	(M)	(M)	(M)	(M)	(M)	(M)	(M)	(M)	(M)	(M)	(M)
1	0	0	0	32.600			0.	31.0	0.0	24.40	344.0		6.30	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0	0	0	13.600			0.	0.0	0.0	29.40	344.0		4.10	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0	0	0	32.600			0.	-16.0	0.0	33.50	344.0		3.10	2.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0	0	0	21.800			0.	-30.0	0.0	24.40	344.0		8.50	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0	0	0	32.600			-33.	-16.0	0.0	47.20	344.0		2.70	3.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0	0	0	51.000			-33.	10.0	0.0	12.20	606.0		22.40	1.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

* Based on 1.0% S/G
 See table A-1

† See table A-2

		RAISED STEAM CAPACITY (1000 lb/hr)	RAISED PRODUCTION (1000 lb/hr)
Boiler			
#1 & #2	240	96	
#3	100	40	
#4	240	96	
#5	160	64	
#6 & #7	150	150	
#8	240	96	
TOTAL	1130	542	

(3)

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DAILY: 329 - See table 2-5 (pg 2-13)

3-HR/PO 5

SGROUP# 1

YEAR 1973

*** SCGC 2251 --S02 THREE HOUR BURNING OIL AT 40X RATING ***

* DAILY 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)

* ENDING WITH HOUR 15 FOR DAY 329 *

* FROM ALL SOURCES *

* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 1189.8 AND OCCURRED AT (-314.0, 412.0) *

Y-AXIS (METERS)	-1014.0	-914.0	-814.0	-714.0	-614.0	-514.0	-414.0	-314.0	-214.0
X-AXIS (METERS)									
1012.0 /	256.2	473.9	700.7	660.5	336.2	95.3	15.9	1.2	0.0
912.0 /	138.2	295.9	565.0	800.7	631.7	235.9	45.7	4.0	0.1
812.0 /	57.9	149.4	344.0	678.8	892.0	839.8	133.3	14.4	0.4
712.0 /	16.1	54.4	159.4	401.8	816.9	937.0	381.4	52.9	1.9
612.0 /	2.5	11.5	47.8	165.8	468.7	973.4	879.8	197.3	9.9
512.0 /	0.2	1.1	6.9	37.6	164.7	543.4	1125.6	658.4	55.4
412.0 /	0.0	0.0	0.3	3.0	24.3	149.9	616.1	1189.8	300.0
312.0 /	0.0	0.0	0.0	0.0	0.8	10.8	113.0	645.4	942.5
212.0 /	0.0	0.0	0.0	0.0	0.0	0.1	2.1	52.2	488.3
112.0 /	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5

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*** SCGC 2254 --S02 BOILER #8 AT MAX OIL, OTHERS REDUCED CAPACITY ***

PRINTOUT #2

CALCULATE (CONCENTRATION=1,DEPOSITION=2)
RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)
DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)
TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)
CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)
LIST ALL INPUT DATA (NO=0,YES=1,NET DATA ALSO=2)

ISW(1) = 1
ISW(2) = 3
ISW(3) = 1
ISW(4) = 0
ISW(5) = 0
ISW(6) = 1

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)
WITH THE FOLLOWING TIME PERIODS:

HOURLY (YES=1,NO=0)
2-HOUR (YES=1,NO=0)
3-HOUR (YES=1,NO=0)
4-HOUR (YES=1,NO=0)
6-HOUR (YES=1,NO=0)
8-HOUR (YES=1,NO=0)
12-HOUR (YES=1,NO=0)
24-HOUR (YES=1,NO=0)

ISW(7) = 0
ISW(8) = 0
ISW(9) = 0
ISW(10) = 0
ISW(11) = 0
ISW(12) = 0
ISW(13) = 0
ISW(14) = 1
ISW(15) = 0

PRINT N-DAY TABLE(S) (YES=1,NO=0)

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE
SPECIFIED BY ISW(7) THROUGH ISW(14):

DAILY TABLES (YES=1,NO=0)
HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)
MAXIMUM 50 TABLES (YES=1,NO=0)
METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)
RURAL-URBAN OPTION (RURAL=0,URBAN MODE 1=1,URBAN MODE 2=0)
WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)
VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)
SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)
PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)
PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)

ISW(16) = 1
ISW(17) = 0
ISW(18) = 0
ISW(19) = 1
ISW(20) = 0
ISW(21) = 1
ISW(22) = 1
ISW(23) = 0
ISW(24) = 1
ISW(25) = 1

NUMBER OF INPUT SOURCES
NUMBER OF SOURCE GROUPS (0,ALL SOURCES)
TIME PERIOD INTERVAL TO BE PRINTED (0,ALL INTERVALS)
NUMBER OF X (RANGE) GRID VALUES
NUMBER OF Y (THETA) GRID VALUES
NUMBER OF DISCRETE RECEPTORS

NSOURC = 6
NGROUP = 0
IPERD = 0
NXPNTS = 10
NYPNTS = 10
NXPYPT = 0

SOURCE EMISSION RATE UNITS CONVERSION FACTOR
ENTRAINMENT COEFFICIENT FOR UNSTABLE ATMOSPHERE
ENTRAINMENT COEFFICIENT FOR STABLE ATMOSPHERE
HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED

TK = 1.0000E+07
BETA1 = 0.600
BETA2 = 0.600
ZR = 1.00 METERS

LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA
DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION DECAY = 0.000000E+00

IMET = 9

SURFACE STATION NO.

ISS = 12844

YEAR OF SURFACE DATA

ISY = 70

UPPER AIR STATION NO.

IUS = 12839

YEAR OF UPPER AIR DATA

IUY = 70

ALLOCATED DATA STORAGE

LIMIT = 43500 WORDS

REQUIRED DATA STORAGE FOR THIS PROBLEM RUN

NIMIT = 1610 WORDS

(5)

BEST AVAILABLE COPY

*** SCGC 2254 --S02 BOILER #8 AT MAX OIL, OTHERS REDUCED CAPACITY ***

*** METEOROLOGICAL DAYS TO BE PROCESSED ***
(IF=1)

0000000000	0000000000	0000000000	0000000000	0000000000
0000000000	0000000000	0000000000	0000000000	0000000000
0000000000	0000000000	0000000000	0000000000	0000000000
0000000000	0000000000	0000000000	0000000000	0000000000
0000000000	0000000000	0000000000	0000000000	0000000000
0000000000	0000000000	0000000000	0000000000	0000000000
0000000000	0000000000	0000000000	0000000000	0000000000
0000000000	0000000000	0000000000	0000000000	0000000000
0000000000	0000000000	0000000000	0000000000	0000000000
0000000000	0000000000	0000000000	0000000000	0000000000

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
(METERS/SEC)

1.54, 5.09, 5.14, 8.23, 10.80,

*** WIND PROFILE EXPONENTS ***

STABILITY CATEGORY	1	2	3	4	5	6
A	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00
B	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
C	.20000E+00	.20000E+00	.20000E+00	.20000E+00	.20000E+00	.20000E+00
D	.25000E+00	.25000E+00	.25000E+00	.25000E+00	.25000E+00	.25000E+00
E	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00
F	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00

*** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
(DEGREES KELVIN PER METER)

STABILITY CATEGORY	1	2	3	4	5	6
A	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
B	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
C	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
D	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
E	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01
F	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01

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*** SCGC 2254 --S02 BOILER #5 AT MAX OIL, OTHERS REDUCED CAPACITY ***

SOURCE # 1---BOILERS #1 & #2 -- 2 STACKS EACH
 SOURCE # 2---BOILER #3 -- 1 STACK
 SOURCE # 3---BOILER #4 -- 1 STACK
 SOURCE # 4---BOILER #5 -- 2 STACKS
 SOURCE # 5---NEW BOILER #6
 SOURCE # 6---BOILERS #6 & #7 -- BOTH INTO ONE STACK

*** SOURCE DATA ***

SOURCE NUMBER	P E	K E	PART CATS.	EMISSION RATE TYPE=0,1 (G/S)		X (M)	Y (M)	BASE ELEV. (M)	HEIGHT (M)	TEMP. (DEG.K) TYPE=0	EXIT VEL. (M/S) TYPE=0	BLDG. DIAM. (M) TYPE=0	BLDG. HEIGHT (M) TYPE=0	BLDG. LENGTH (M) TYPE=0	BLDG. WIDTH (M) TYPE=0
				TYPE=2 (G/S)	PER H.2										
1	0	0	0	18.150	0.	31.	0.0	24.40	344.0	11.40	1.40	0.00	0.00	0.00	
2	0	0	0	3.300	0.	0.	0.0	24.40	344.0	15.60	1.60	0.00	0.00	0.00	
3	0	0	0	18.150	0.	-16.	0.0	33.50	344.0	11.20	2.82	0.00	0.00	0.00	
4	0	0	0	12.150	0.	-30.	0.0	24.40	344.0	15.20	1.40	0.00	0.00	0.00	
5	0	0	0	67.900	-33.	-16.	0.0	47.20	344.0	5.60	3.05	0.00	0.00	0.00	
6	0	0	0	51.000	-33.	10.	0.0	12.20	606.0	22.40	1.52	0.00	0.00	0.00	

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DAILY: 319
24-HR/PC 1
SGROUP# 1
YEAR 1971

*** SCGC 2254 --S02 BOILER #8 AT MAX OIL, OTHERS REDUCED CAPACITY ***

* DAILY 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *

* ENDING WITH HOUR 24 FOR DAY 319 *

* FROM ALL SOURCES *

* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 233.5 AND OCCURRED AT (-1105.0, -274.0) *

Y-AXIS / (METERS) /	-1485.0	-1385.0	-1285.0	-1185.0	-1085.0	-985.0	-885.0	-785.0	-685.0
X-AXIS (METERS)									
226.0 /	5.3	4.0	2.9	1.9	1.1	0.6	0.3	0.1	0.0
126.0 /	26.5	24.4	21.9	19.0	16.0	12.7	9.4	6.4	3.9
26.0 /	68.8	69.8	70.4	70.4	69.6	67.0	62.2	56.1	49.0
-74.0 /	111.7	117.3	123.0	128.7	134.1	137.6	137.2	134.2	128.3
-174.0 /	146.8	157.8	170.2	183.9	198.5	211.0	214.2	204.6	175.4
-274.0 /	195.7	211.3	224.9	233.5	232.6	217.2	181.4	135.2	90.6
-374.0 /	211.9	209.6	198.9	179.3	152.6	123.1	93.8	68.2	46.5
-474.0 /	160.2	143.1	123.7	104.2	86.2	69.8	54.6	39.3	21.5
-574.0 /	102.0	88.8	76.4	64.8	54.0	43.7	31.7	16.1	3.9
-674.0 /	67.4	58.9	50.8	43.3	35.1	24.2	11.3	2.7	0.2

Lowest Achievable Emission Rate (LAER) Determination

Sugar Cane Growers Cooperative

Palm Beach County

The proposed installation is a 240,000 pound per hour steam boiler designed to fire, singly or in combination, Bagasse, Residue and residual fuel oil. No. 6 fuel oil will be used for start-up and as a supplementary fuel not to exceed 42 barrels per hour. Bagasse is a plant residue remaining from the processing of sugar cane. Residue is a by-product from the furfural process which uses bagasse as the raw material. Both are burned in the boiler to eliminate a solid waste disposal problem and produce steam required in the processing plant.

The trade uses the terms "Bagasse" and "Residue" to differentiate between the two by-product streams. This nomenclature will be used in this determination. The proposed unit designated as boiler No. 8 is rated at 504.0, 443.5, and 250 million Btu heat input when firing 100 percent Bagasse, Residue or oil, respectively. The facility located in Belle Glade, Florida operates around-the-clock for a total of 6552 hours per year.

The source is located in an area classified nonattainment for the pollutant ozone (17-2.16(1)(e)F.A.C.). Hydrocarbons or Volatile Organic Compounds (VOC) from the burning of bagasse and/or residue are considered an anthropogenic emission which when released to the atmosphere can remain long enough to participate in photochemical reactions. The emission of VOC from the proposed unit is therefore subject to a LAER determination (17-2.17(5)(a)1.F.A.C.).

LAER Determination Requested by the Applicant:

Pollutant	Emission Limit
Hydrocarbons	2 lb/ton bagasse fired

LAER Determination by DER:

Emissions from the combustion of 100% bagasse and 100% residue are to be tested and VOC emission factors determined. 40 CFR 60, EPA method 25, Appendix A or Department approved equivalent shall be the test method used.

Justification of DER Determination:

The applicant proposed a hydrocarbon (VOC) emission limit as listed in the Source Classification Codes (SCC) in the National Emission Data System. There was no VOC emission factor listed in table 1.8-1 of AP-42. This was cause for question since the two are usually interrelated. EPA was contacted and no documentation was available to substantiate the VOC emission factor listed in the SCC. Residue is not addressed in either reference.

Using the Pulp and Paper industry VOC emission factor for wood residue and EPA report 600/7-80-111 for the VOC emission factor for residual oil, the VOC emissions would be less than 50 tons per year. This scenario would, however, exempt the source from the nonattainment provisions (17-2.17(3)(a) 1.a.(ii) F.A.C.) and require compliance with any applicable NSPS or emission limiting standard in 17-2.05 or 17-2.16, (17-2.17(4)F.A.C.).

The VOC emission factor of 2 pounds per ton of bagasse burned would result in emission of 63 lb/hr or 206 tons per year. The Department, however, has reasonable doubt concerning the accuracy of this VOC emission factor. There are presently no actual test data available and verification by testing can not be done until after the 1981 harvest begins. There is no known VOC emission factor when firing residue.

In order to comply with the intent of the New Source Allowance/Offset provisions, it is necessary to assume the higher factor until sufficient test data can be obtained to clearly establish rule applicability.

LAER, therefore, is determined to be the documentation of a VOC emission factor for bagasse and residue when burned as boiler fuel. The VOC emission factor of 2 pounds per ton bagasse burned, in the interim, is determined as LAER. Once a VOC emission factor from bagasse and residue firing is documented, this determination will be reviewed.

Page Three

Details of the Analysis May be Obtained by Contacting:

Edward Palagyi, LAER Coordinator
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32301

Recommended by:

CTI Jarey
Steve Smallwood, Chief, BAQM

Date:

8/14/81

Approved:

Victoria J. Tschinkel
Victoria J. Tschinkel, Secretary

Date:

8/17/81

SS:EP:dav

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee		
To: _____	Locn.: _____	
To: _____	Locn.: _____	
To: _____	Locn.: _____	
From: _____	Date: _____	
Reply Optional []	Reply Required []	Info. Only []
Date Due: _____	Date Due: _____	

TO: Victoria Tschinkel

FROM: *for* Steve Smallwood *ctj*

DATE: August 14, 1981

SUBJ: LAER Determination for Sugar Cane Growers Cooperative

RECEIVED
AUG 14 1981

Office of the Secretary

Attached please find a LAER determination for a bagasse boiler to be constructed in Belle Glade, Palm Beach County, Florida.

We recommend that you approve and sign the determination, the results of which will be made specific conditions of the construction permit.

SS:caa

State of Florida

DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices
And/Or To Other Than The Addressee

To: _____	Locn.: _____
To: _____	Locn.: _____
To: _____	Locn.: _____
From: _____	Date: _____

TO: District, Subdistrict and Local Program Air Engineers
FROM: Edward Palagyi, ^{EP}BACT Coordinator
DATE: August 14, 1981
SUBJ: BACT as determined for: Osceola Farms Company
Atlantic Sugar Association
Sugar Cane Growers Cooperative

Attached please find one copy of each BACT as determined by the Florida Department of Environmental Regulation for the subject applicants.

Should you have any questions regarding these BACT's, please contact me at (904) 488-1344 or Suncom 278-1344.

EP:dav

Attachments

Best Available Control Technology (BACT) Determination

Sugar Cane Growers Cooperative

Palm Beach County

The proposed installation is a 240,000 pound per hour steam generating unit designed to fire, singly or in combination, Bagasse and/or Residue. No. 6 fuel oil will be used for start-up and as a supplementary fuel not to exceed 42 barrels per hour. Bagasse is a plant residue remaining from the processing of sugar cane. Residue is a by-product from the furfural process which uses bagasse as the raw material. Both are burned in the boiler to eliminate a solid waste disposal problem and produce steam required in the processing plant.

The trade uses the terms "Bagasse" and "Residue" to differentiate between the two by-product fuels, which differ in composition. This nomenclature will be used in this determination. The proposed unit designated as boiler No. 8 is rated at 504.0, 443.5, 250.0 million Btu heat input when firing 100 percent Bagasse, Residue or No. 6 fuel oil, respectively. The unit is scheduled to operate around-the-clock 7 days per week for a total of 6552 hours at the existing facility located in Belle Glade, Florida.

Emissions When Burning 100% Residue (Dry Basis):

<u>Pollutant</u>	<u>Potential</u>	
	lb/hr	ton/yr
Particulate	724.9	2374.7
SO ₂	398.7	1306.1
NO _x	54.4	178.2

Burning 100% Bagasse (Dry Basis):

<u>Pollutant</u>	<u>Potential</u>	
	lb/hr	ton/yr
Particulate	1120.0	3669.1
SO ₂	126.0	412.8
NO _x	84.0	275.2

Page Two

Burning Fuel Oil at Maximum 42 bbl/hr.

Particulate	22.9	75.0
SO ₂	276.9	907.1
NO _x	105.8	346.6
HC	1.8	5.9
CO	8.8	28.8

BACT Determination Requested by the Applicant:

<u>Pollutant</u>	<u>Emission Limit</u>
Particulate	
Bagasse/Residue	0.2 lb/million Btu heat input
No. 6 Oil	0.1 lb/million Btu heat input
Sulfur Dioxide	
Bagasse	0.15 lb/million Btu heat input
Residue	0.54 lb/million Btu heat input
No. 6 Oil	2.10 lb/million Btu heat input
NO _x , CO, HC	Good firing practice & operation
Visible Emissions	30% except 40% up to 2 minutes/hr.

A Joy Turbulaire Type D impingement scrubber will be used to control particulate emissions. Low sulfur fuel will be used to control SO₂ emissions.

Date of Receipt of a BACT Application:

April 27, 1981

Date of Publication in the Florida Administrative Weekly:

May 22, 1981

Review Group Members:

A tentative BACT determination was drafted based upon a previous Department determination for a similar source. Comments on the draft were obtained from Willard Hanks and Bob King, New Source Review Section; Mirza Baig, DER South Florida District; Michael Martin, Palm Beach County Health Department; and Cleve Holladay, Air Modeling Section. There was group solidarity for the pollutant emission limits which have been determined to be BACT.

BACT Determination by DER:

<u>Pollutant</u>	<u>Emission Limit</u>
Particulates	
100% Bagasse/Residue	0.15 lb/million Btu input
100% No. 6 Oil	0.10 lb/million Btu input
Sulfur Dioxide	No. 6 new ^[1] fuel oil with sulfur content not to exceed 1.0 percent.
Visible Emissions	Maximum 30% opacity except that 40% opacity is permissible for not more than 2 minutes in any one hour
Hydrocarbons (VOC)	LAER

[1] The term "new" oil means an oil which has been refined from crude oil and has not been used, and which may or may not contain additives.

Justification of DER Determination:

Bagasse is a plant residue remaining from the processing of sugar cane. Some of the bagasse is further processed to obtain furfural. The furfural process yields a granular residual by-product called "residue". Both bagasse and residue are burned in a boiler to eliminate a solid waste disposal problem and produce steam required in the processing plant. Fuel oil is used during the boiler start-up and may be fired concurrently with bagasse/residue as necessary to meet plant steam demands. Due to design limitations of the fuel oil system maximum heat input from oil firing will be less than 250 million Btu/hour.

The sulfur content of bagasse ranges from 0.1 to 0.2 percent. The sulfur content of residue ranges from 0.4 to 0.5 which has increased due to the sulfuric acid used in the furfural process. The moisture content of the bagasse can vary from 52 to 61 percent depending on geographic location and climate conditions during the sugar cane growing season.

Bagasse is by DER definition a Carbonaceous Fuel (17-2.02(21)F.A.C.). The particulate emission limiting standard for a new source burning carbonaceous fuel is 0.2 pound per million Btu heat input (17-2.05(6)I.(2)(b)F.A.C., Table II). A previous Department and EPA determination for a similar source was 0.15 pound particulates per million Btu heat input when burning bagasse. This emission limit was based upon stack test results obtained from various facilities with existing bagasse burning boilers.

There have been no significant technology improvements made since the last BACT determination on a bagasse boiler to justify a more stringent particulate emission limit. The particulate emission limit of 0.15 lb per million Btu heat input is, therefore, determined to be BACT.

The proposed boiler will burn oil, bagasse and, in addition, residue which is not the case in the majority of sugar cane processing plants. The applicant contends it will not be economical to meet the more stringent particulate emission limit, and this limit is not warranted since there is no documentation indicating this limit can be obtained on a continuous basis using the present control technology.

Data from Joy Manufacturing Company indicates that this type of scrubber can meet the 0.15 limit by adjusting operating parameters. The test data available does not show the 0.15 limit can routinely be obtained. The test data submitted, however, does not include test or operating parameters and thus cannot be considered as admissible proof that the 0.15 limit is beyond system capabilities. Therefore, the particulate emission limit will be as determined to be BACT, however, the applicant has the option to prove, with actual operating and test data, that this limit is not attainable on a continuous basis. The Department will then review the BACT determination based on the submitted data.

The applicant presently is permitted to burn 2.4 percent sulfur content fuel oil in boilers 1 through 5 and 1 percent sulfur content oil in boilers 6 and 7. The proposed boiler No. 8 will also burn the lower sulfur content oil. The applicant has one fuel storage tank and mixes the oil received, therefore, the actual sulfur content of the fuel used in all the boilers is actually a blend or approximately 1.8 percent sulfur. The percent sulfur and quantity of fuel oil received is based on each boiler fuel consumption data.

The average fuel blend of bagasse and residue during the crop season produces 94.7 percent of the daily SO₂ emissions, balance from the oil. The sulfur content of the solid fuels are more or less fixed, where as the sulfur content of oil is variable on demand. The solid fuel is not metered into the boiler so a SO₂ emission factor based on Btu input is not practical.

The use of fuel oil with a low sulfur content to control SO₂ emissions is determined as BACT.

<u>Fuel</u>	<u>SO₂ Emissions</u>
Residue Only	398.7 lb/hr
Bagasse Only	126.0 lb/hr
Oil Only	276.9 lb/hr (1.0%S)
Oil Only	498.5 lb/hr (1.8%S)
Oil Only	664.7 lb/hr (2.4%S)
Average Mixture	340.8 lb/hr

The applicant shall install a recording flow meter in the boiler fuel oil line as close to the burner as practical. The meter shall be accurate to within five percent and shall be approved by the Department. The recorder charts will be held for a two year period. Oil analysis by the applicant's fuel oil supplier may be used in lieu of a compliance test to determine SO₂ emissions.

One member of the review group recommended the use of fuel oil with a 0.7 percent sulfur content. Since bagasse/residue is the major and more economical fuel, and, fuel oil with 1 percent sulfur content is a common blend used in the area; and, no SO₂ increment violation is predicted, the Department does not think a fuel oil containing 0.7 percent sulfur is justified at this time.

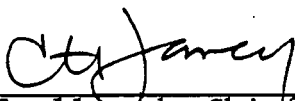
The term "new oil" is included to prevent the use of waste oil as fuel, emissions from which were not considered in this BACT analysis.

The source is located in an area classified nonattainable for the pollutant ozone (17-2.16(1)(e)F.A.C.). The emission limit for hydrocarbons will be subject to a Lowest Achievable Emission Rate (LAER) determination (17-2.17(5)(a)1.F.A.C).

Details of the Analysis May be Obtained by Contacting:

Edward Palagyi, BACT Coordinator
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32301

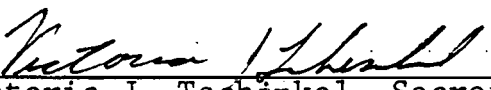
Recommended by:


for Steve Smallwood, Chief, BAQM

Date:

8/12/81

Approved:


Victoria J. Tschinkel, Secretary

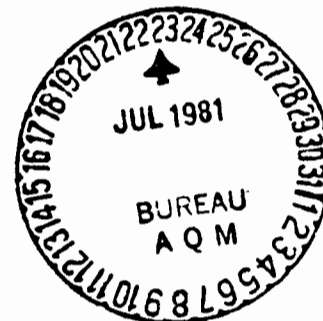
Date:

8/17/81



ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

July 22, 1981
ESE No. 80-190-100



Clair Fancy
Deputy Bureau Chief
Central Air Permitting Section
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

Subject: Sugar Cane Growers Cooperative, Boiler #8
Federal PSD Permit Application, PSD-FL-077
Air Construction Permit Application, AC-42476

Dear Mr. Fancy:

Enclosed is a report describing the results of the additional analysis of background TSP data requested by Larry George during the 10 July 1981 meeting in Tallahassee.

Please do not hesitate to contact me with any questions.

Sincerely,

David A. Buff, P.E.
Senior Engineer
Project Operations

DAB/sn

cc: Bill Green (with enclosures)
Enrique Arias (with enclosures)

MONITORING DATA

Printouts 1 and 3 demonstrate that the measured concentration data from PB-16 and PB-19 for the years 1978 to 1980 are not well described by a normal distribution curve. Printouts 2 and 4 show the results of taking the log transform of the two data sets. In both of these cases, the mean and median values for each station are within 0.01; this is one indication of a good fit to a log-normal distribution.

In the log domain, the data sets can be described as follows:

	<u>Mean</u>	<u>Standard Deviation</u>
PB-16	3.44742	0.410849
PB-19	3.98112	0.346605

The area under the normal curve above 150 ug/m³, and thus the probability of encountering a value above 150 ug/m³ on a given day, can be found by determining the number of standard deviations 150 is above the mean, and reading the area from a table of values for the normal probability function.

$$\text{Number of standard deviation} = \frac{\ln(150) - \text{mean}}{\text{standard deviation}}$$

	<u>Number of Standard Deviations</u>	<u>Normal Probability</u>
PB-16	3.805	0.000071
PB-19	2.970	0.0015

Thus, the chances of PB-16 or PB-19 measuring a concentration greater than 150 on any given day are 0.0071 percent (once every 38.6 years) and 0.15 percent (once every 1.8 years), respectively, based on the last 3 years of measured data at these stations.

BINOMIAL DISTRIBUTION

These individual daily probabilities may be used to determine the probability of a violation in any year (i.e., two exceedances in 1 year). This is done by means of the binominal distribution function:

$$p(x) = \binom{n}{x} p^x (1-p)^{n-x}$$

$p(x)$ = probability of exactly x occurrences (exceeding 150) in n trials (days)

p = probability of occurrence (exceeding 150) in single trial (day)

$$\binom{n}{x} = \frac{n!}{(n-x)!x!}$$

Considering the actual monitoring data at PB-16 and PB-19, these equations yield:

	<u>PB-16</u>	<u>PB-19</u>	
$p(\text{monitor exceeds 150 on any given day})$	.000071	.0015	
$p(x=0)$	0.974	0.580	- probability that 150 is never exceeded in any 365-day period.
$p(x=1)$	0.025	0.320	- probability that 150 is exceeded exactly one time in any 365-day period.
$p(x \geq 2)^*$	0.001	0.10	- probability that 150 is exceeded two or more times in any 365-day period.
$1/p(x \geq 2)$	1,000 yrs	10 yrs	- expected return period for air quality violation.

$$*P(x \geq 2) = 1 - [p(0) + p(1)]$$

As the figures show, PB-16 currently displays a much lower probability of violating the 24-hour TSP standard than does PB-19. This result is not surprising considering the urban location of PB-19 and the nearly rural location of PB-16, except for the large traffic volume along U.S. 98.

PROJECTED CONCENTRATIONS

Modeled plant concentrations at the point of highest, second-highest impact were determined with the ISCST model. A total of 1,827 24-hour TSP concentrations due to SCGC mill emissions were calculated by the model, including two leap years which contained 366 days.

The concentrations were found to fit a two-part distribution--622 of the 1,827 daily values were zero; the remaining values fit an exponential distribution (see Printout 5).

With the modeled and measured (assumed to be all background) data sets thus described, it is possible to calculate the probability that on any given day the plant and background contributions will add to produce a total concentration greater than 150 ug/m^3 when the background concentration is less than 150 ug/m^3 . The mathematical expression of this probability is described in the McClave report (letter to C. Fancy, July 6, 1981). Numerical evaluation of this expression yields:

	<u>PB-16</u>	<u>PB-19</u>
Probability that plant emissions cause exceedence of 150 ug/m^3 when background is less than 150 ug/m^3	0.000331	0.000290

This probability excludes all cases where the background was already above 150 ug/m^3 even without plant contributions. This exclusion is responsible for the lower probability using PB-19, since there are less days when background is expected to be below 150 ug/m^3 .

Using the binomial theorem to determine the probability of exceedances and violations for this case yields:

	<u>PB-16</u>	<u>PB-19</u>
p(plant emissions cause exceedence on any given day when background is less than 150 ug/m^3)	0.000331	0.000290
p(x=0)	0.8862	0.8996
p(x=1)	0.1071	0.0952
p(x $\geq$ 2, plant causes violation)	0.0067	0.0052
1/p(x $\geq$ 2), return period	149 yrs	192 yrs

COMBINED PROBABILITIES

The probability that there will be any exceedence due to background, plant emissions, or any combination of the two, is the sum of the probability that the background is above 150 ug/m³ regardless of plant contributions and the probability that plant emissions cause an exceedence when the background is less than 150 ug/m³.

The physical analog that would actually be represented by this assumption is construction of a new facility, equivalent to the entire SCGC mill, 800 meters from the monitoring stations.

	<u>PB-16</u>	<u>PB-19</u>
p(background $\geq$ 150)	0.000071	0.0015
p(plant causes exceedence)	0.000331	0.000290
p(exceedence by any means)	0.000402	0.00179
p(x=0)	0.864	0.520
p(x=1)	0.127	0.340
p(x $\geq$ 2, violation predicted)	0.009	0.14
1/p(x $\geq$ 2)	111 yrs	7 yrs

Addition of plant impacts reduces the expected period of return of a violation from 1,000 yrs to 111 yrs using PB-16 and from 10 yrs to 7 yrs using PB-19. In reality, the return period for a violation will not actually decrease at these stations if they are currently influenced by the SCGC mill, since the proposed modification is predicted to improve air quality.

The probability that plant emissions contribute more than 10 ug/m³ to an existing exceedence or violation can be approximated as follows:

$$p(\text{contribute to existing exceedence}) = p(\text{background} > 150) \times p(\text{plant contribution} > 0) \times p(\text{plant contribution} > 10)$$

Printout 5 shows the 50-percentile level for plant contributions is 11 ug/m³. Thus:

$$p(\text{contribute to existing exceedence}) \text{ approximately } =$$

(0.000071) (0.66) (0.50) = 0.000023	(PB-16)
(0.0015) (0.66) (0.50) = 0.000495	(PB-19)

	<u>PB-16</u>	<u>PB-19</u>
p(contribute to exceedence)	0.000023	0.000495
p(cause exceedence)	0.000331	0.000290
p(cause or contribute)	0.000354	0.000785
p(x=0)	0.8788	0.7508
p(x=1)	0.1133	0.2153
p(x $\geq$ 2)	0.0079	0.0339
1/p(x $\geq$ 2)	126 yrs	29 yrs

REVIEW OF ASSUMPTIONS

As explained in the PSD report, the proposed modification is predicted to improve air quality at all points. The actual effect upon the PB-19 monitor will be to increase the expected violation return period for 24-hour TSP concentrations, i.e., longer time interval between expected violations. Annual average TSP impacts at the monitor due to SCGC are predicted to decrease as a result of the modification.

The preceeding analysis was an attempt to characterize air quality at a point 800 meters west of the SCGC mill by assuming that values observed at PB-16 and PB-19 would also be observed at that point in the absence of any mill emissions. The resulting figures, therefore, are considered conservative, since PB-19 is potentially influenced by the SCGC mill and PB-16 is potentially influenced by the Atlantic Sugar mill. Unrefined modeling has indicated that existing maximum 24-hour TSP impacts upon PB-19 from the SCGC mill could be up to 40 ug/m³. PSD modeling performed for Atlantic Sugar indicates this mill could impact PB-16 by 10 ug/m³ or more on a 24-hour average. As a result, mill impacts could be double counted by assuming measured concentrations at these stations are purely background, with no mill contributions.

If the standard deviation of PB-19 measured data remained consistent and the mean were reduced by 3 ug/m³ to account for influence by the existing mill facilities, the expected violation return period would approximately double, i.e., twice as long between expected violations.

In addition, PB-19 monitored data, because of the monitor's urban location and influence from the city of Belle Glade (traffic, industrial operations, etc.), are considered not to be representative of background TSP concentrations existing in the area of SCGC mill highest, second-highest predicted impact, i.e., 800 meters from the mill in an open field.

The above analysis also does not consider the conservativeness of the entire modeling approach, where maximum steam load conditions and particulate matter emission rates are assumed to occur every hour of the year. Historical particulate test data at the mill indicate that emissions vary with time, and from boiler to boiler. Thus, the probability of all boilers emitting the maximum modeled rate for a 24-hour period is very small.

(5) MODELED IMPACT SUMMARY

USE AIR QUALITY PROJECT ^{concentration}
DISTRIBUTIONAL CHARACTERISTICS OF PLANT EMISSIONS

18:41 MONDAY, JULY 6, 1981

VARIABLE=PCS_LEVEL ^{concentration}
POSITIVE EMISSION VALUES

UNIVARIATE

MOMENTS

N	1205	SUM WGTs	1205
MEAN	16.3644	SUM	19719.1
STD DEV	16.7802	VARIANCE	281.574
SKEWNESS	1.5847	KURTOSIS	3.29492
USS	661707	CSS	339015
CV	102.541	STD MEAN	0.483396
T:MEAN=0	33.8531	PROB> T	0.0001
D:NORMAL	0.164872	PROB>D	<0.01

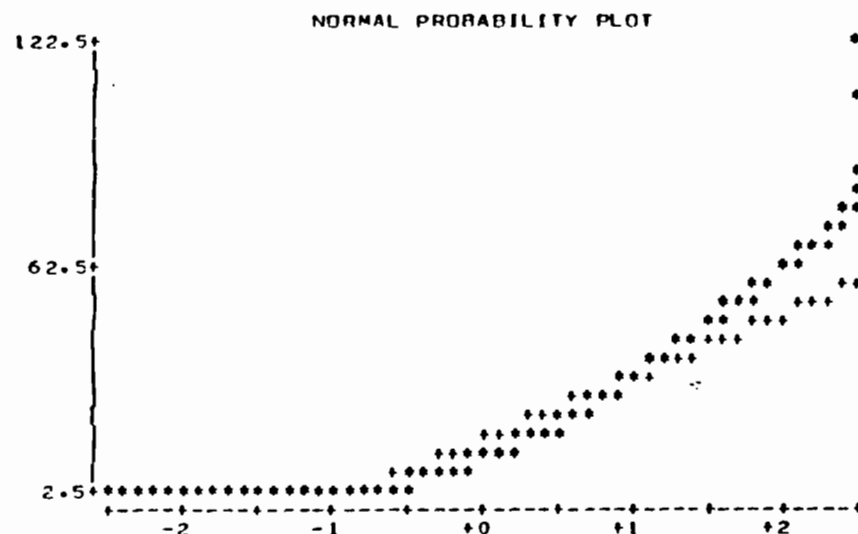
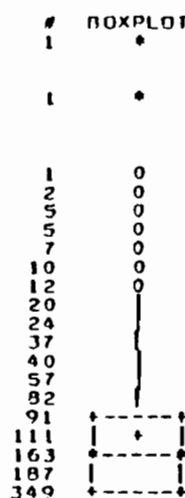
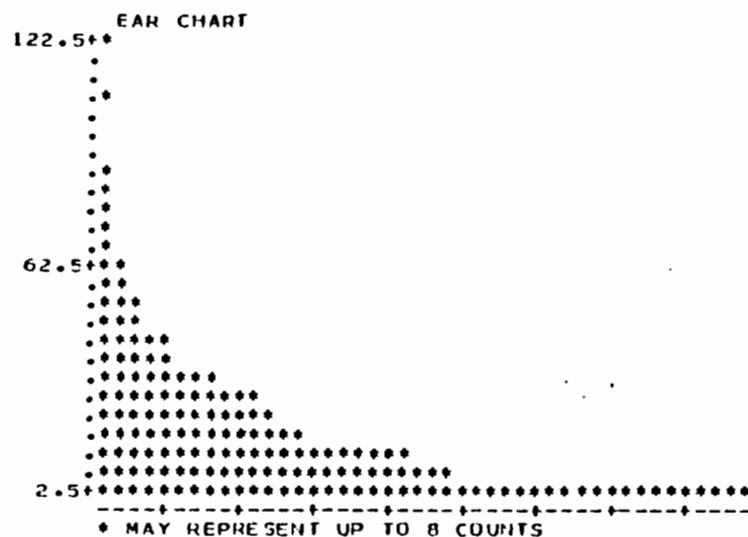
QUANTILES (DEF=4)

100% MAX	122.14	99%	73.3581
75% Q3	24.74	95%	50.28
50% MED	11.12	90%	40.228
25% Q1	3.555	10%	0.295999
0% MIN	0.01	5%	0.05
		1%	0.01
RANGE	122.13		
Q3-Q1	21.185		
MODE	0.01		

EXTREMES

LOWEST	HIGHEST
0.01	80.16
0.01	84.25
0.01	85.68
0.01	108.63
0.01	122.14

MISSING VALUE
COUNT 622
% COUNT/NOBS 34.04



- Modeled concentrations at 800m 290°
- When the 622 zero values are excluded the remaining values fit an exponential distribution
- 50% of the non-zero values are below 11.12 $\mu\text{g}/\text{m}^3$
- Highest value is 122 $\mu\text{g}/\text{m}^3$, second highest is 108.6 as reported.

1978-80
PB19 BACKGROUND DATA
UNIVARIATE

14:23 MONDAY, JULY 13, 1981

VARIABLE=LOG_BACK

LOG TRANSFORM BACKGROUND SUS. PART.

MOMENTS		QUANTILES (DEF=4)	
N	169	SUM WGTs	169
MEAN	3.98112	SUM	672.81
STD DEV	0.346605	VARIANCE	0.120135
SKEWNESS	-0.412566	KURTOSIS	0.482823
USS	2698.72	Q33	20.1827
CV	8.70622	STD MEAN	0.0266619
T:MEAN=0	149.319	PROB>IT	0.0001
D:NORMAL	0.0678787	PROB>D	0.055
		RANGE	2.0232
		Q3-Q1	0.484672
		MODE	3.8712

EXTREMES

LOWEST	HIGHEST
2.77259	4.57471
2.99573	4.70048
3.13549	4.70048
3.17805	4.79579
3.21887	4.79579

STEM	LEAF	#	BOXPLOT
48	00	2	
47	00	2	
46			
45	0267	4	
44	2344789	7	
43	000023446799	12	
42	000002233335555566669999	25	
41	3333466777779	13	
40	3346688888899999	17	
39	1111111333333355577799	23	
38	11113577777777999	18	
37	11114446888	11	
36	11444466699	11	
35	000003336888888	14	
34	33	2	
33	337	3	
32	2	1	
31	48	2	
30	0	1	
29			0
28			
27	7	1	0

MULTIPLY STEM, LEAF BY 10**01

ESE AIR QUALITY PROJECT--SUGAR MILL

DISTRIBUTIONAL PROPERTIES OF BACKGROUND DATA

1978-80

14:23 MONDAY, JULY 13, 1981

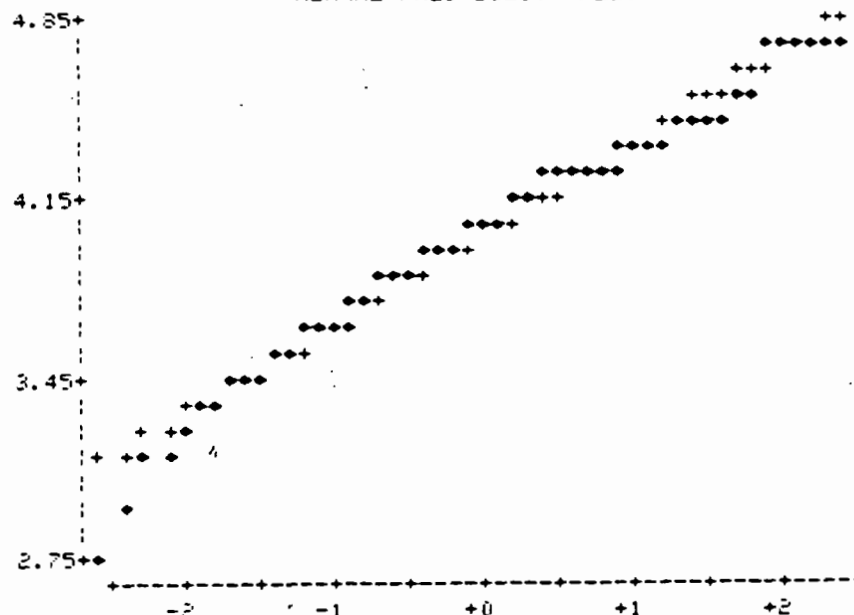
PB19 BACKGROUND DATA

UNIVARIATE

VARIABLE=LOG_BACK

LOG TRANSFORM BACKGROUND SUS. PART.

NORMAL PROBABILITY PLOT



TOP OUTPUT CHARGE: \$.08

PB-19 LOG DOMAIN
 1978-80
 (4)

ESE AIR QUALITY PROJECT--SUGAR MILL
DISTRIBUTIONAL PROPERTIES OF BACKGROUND DATA

1978-80

14:23 MONDAY, JULY 13, 1981

PB19 BACKGROUND DATA

UNIVARIATE

VARIABLE=BACKGRND

BACKGROUND SUS. PART. (UG/M3)

MOMENTS

QUANTILES (DEF=4)

	169	SUM WGTs	169	100% MAX	121	99%	121
MEAN	56.7278	SUM	9587	75% Q3	69	95%	89.5
STD DEV	18.9987	VARIANCE	360.949	50% MED	53	90%	81
KENNESS	0.68127	KURTOSIS	0.850495	25% Q1	42.5	10%	34
CS	604489	CS	60639.5	0% MIN	16	5%	30
V	33.4909	STD MEAN	1.46144			1%	18.8
MEAN=0	38.8165	PROB>IT	0.0001	RANGE	105		
NORMAL	0.0859325	PROB>D	<0.01	Q3-Q1	26.5		
				MODE	48		

EXTREMES

LOWEST	HIGHEST
16	97
20	110
23	110
24	121
25	121

STEM LEAF

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8 1134

7 567789

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6 000002222344

5 667889999999

5 0000000111111122233344

4 555567888888889999

4 0011112223444

3 5666667788889999

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ESE AIR QUALITY PROJECT--SUGAR MILL
DISTRIBUTIONAL PROPERTIES OF BACKGROUND DATA

1978-80

14:23 MONDAY, JULY 13, 1981

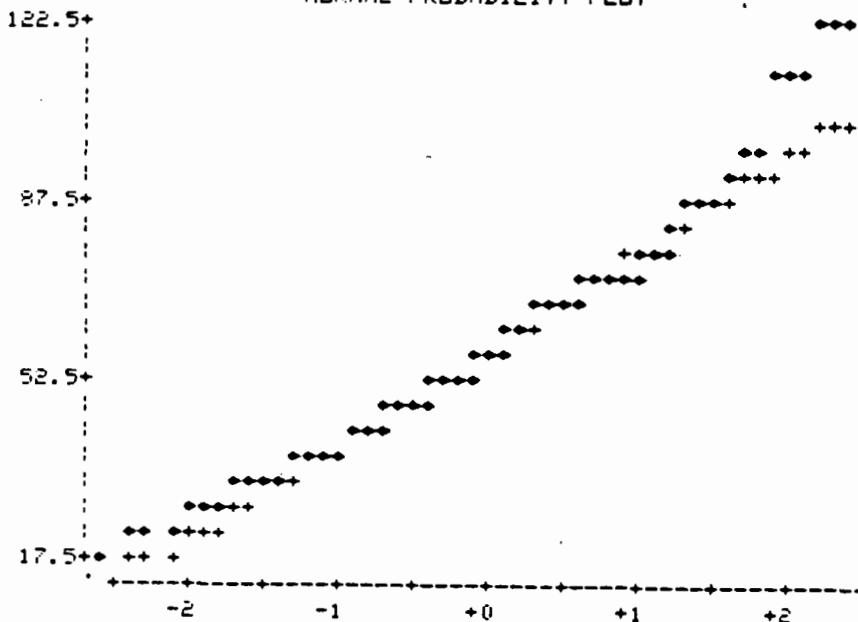
PB19 BACKGROUND DATA

UNIVARIATE

VARIABLE=BACKGRND

BACKGROUND SUS. PART. (UG/M3)

NORMAL PROBABILITY PLOT



PB-19 REAL DOMAIN

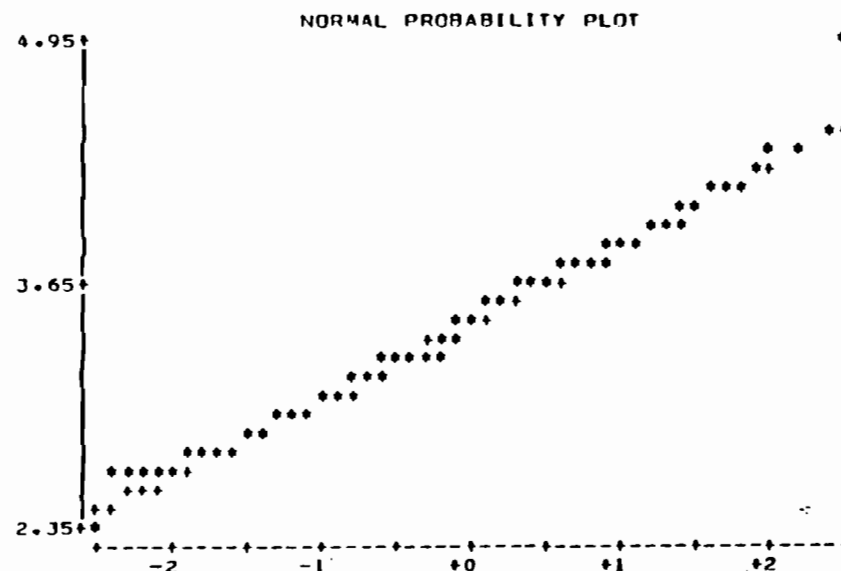
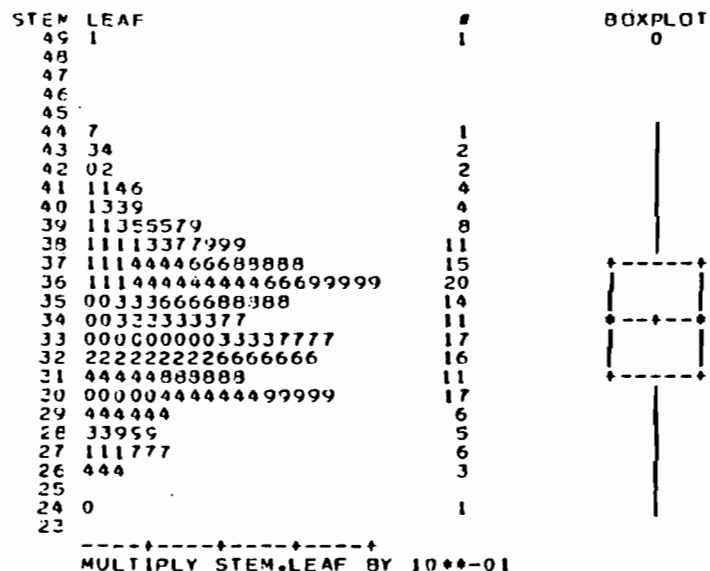
1978-80

3

UNIVARIATE ② 1978-80 PB-16 LOG DOMAIN

VARIABLE=LOG_BACK LOG TRANSFORM BACKGROUND SUS. PART.

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
N	175	SUM WGTs	175	100% MAX	4.91265	99%	4.57312	LOWEST	HIGHEST
MEAN	3.44742	SUM	603.299	75% Q3	3.73767	95%	4.11733	2.39789	4.21951
STD DEV	0.410649	VARIANCE	0.168797	50% MED	3.43399	90%	3.95124	2.63906	4.33073
SKEWNESS	0.229241	KURTOSIS	0.189925	25% Q1	3.17805	10%	2.94444	2.63906	4.34381
USS	2109.19	CSS	29.3706	0% MIN	2.39789	5%	2.77259	2.63906	4.46591
CV	11.9176	STD MEAN	0.0310573			1%	2.58118	2.70805	4.91265
T:MEAN=0	111.002	PROB> T	0.0001	RANGE	2.51476				
D:NORMAL	0.0667754	PROB>D	0.055	Q3-Q1	0.559616				
				MODE	3.21887				



①

1978-80

PB-16

REAL Domain

UNIVARIATE

VARIABLE=BACKGROUND BACKGROUND SUS. PART. (UG/M3)

MOMENTS

	175	SUM WGTs	175
N	175	SUM	5997
MEAN	34.2686	VARIANCE	246.244
STD DEV	15.6921	KURTOSIS	9.84367
SKEWNESS	2.17195	CSS	42046.4
LSS	248355	STD MEAN	1.18621
CV	45.7917	PRON> T	0.0001
T:MEAN=0	28.889	PROB>0	<0.01
D:NCRMAL	0.102499		

QUANTILES(DEF=4)

	136	99%	98.7595
100% MAX	136	95%	61.4
75% Q3	42	90%	52
50% MED	31	10%	19
25% Q1	24	5%	16
0% MIN	11	1%	13.28
RANGE	125		
Q3-Q1	19		
MCDE	25		

EXTREMES

LOWEST	HIGHEST
11	68
14	76
14	77
14	87
15	136

STEM LEAF

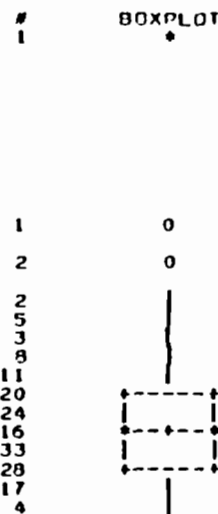
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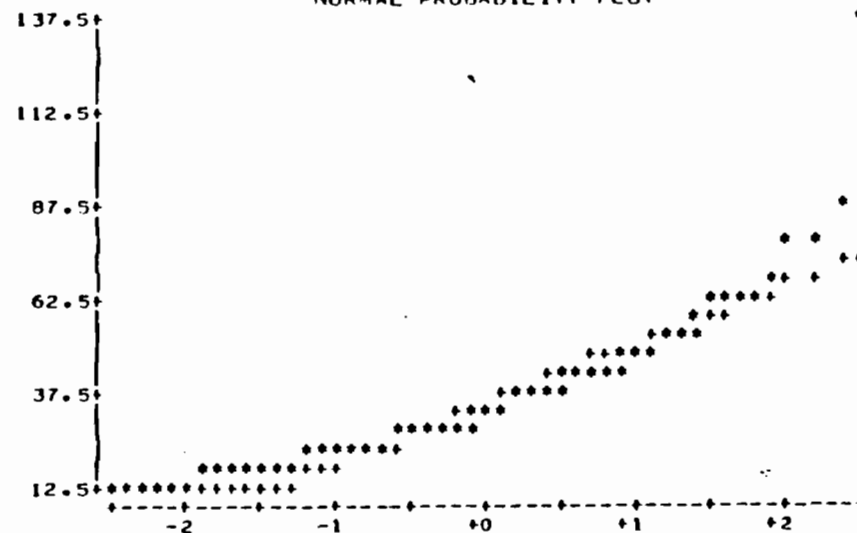
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MULTIPLY STEM.LEAF BY 10**+01

BOXPLOT



NORMAL PROBABILITY PLOT





ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

July 15, 1981
ESE No. 80-190-100

Mr. Clair Fancy
Deputy Bureau Chief
Central Air Permitting Section
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32301

Re: Sugar Cane Growers Cooperative, Boiler #5
Federal PSD Permit Application, PSD-FL-077
Air Construction Permit Application, AC-42476

Dear Mr. Fancy:

This letter serves to document the agreements reached during the 10 July 1981 meeting in Tallahassee relating to the questions in your letter of 25 June 1981 to Enrique Arias.

Questions 1 and 2

The PSD report and addenda demonstrate that AAQS for sulfur dioxide (SO_2) will be met if plantwide emissions are limited to 14 tons per day (tons/day). Sugar Cane Growers Cooperative's (SCGC) original proposal for ensuring that this limit would be met assumed that the sulfur content for bagasse and residue was 0.1 and 0.4 percent, respectively. However, the Department was concerned that the higher values of 0.2 and 0.5 percent, reflected in certain individual tests, might more accurately reflect the sulfur content of these fuels, and therefore, indicate the potential for exceeding the 14-ton limit. As we discussed, the number of significant figures of the above-referenced fuel measurements and the relatively limited number of tests point to the conclusion that additional tests would be valuable. Moreover, as we also discussed, the 40-percent systemwide removal of SO_2 when bagasse and/or residue is combusted is believed to be a conservative figure.

At the meeting, SCGC suggested that one approach would be to limit the amount of residue which could be burned, consistent with the higher fuel sulfur content assumption, until further tests could justify raising the residue limit. The Department indicated a desire to establish emission limitations and allow the source latitude to ensure that the limit would be met. Upon further reflection, SCGC completely concurs with the Department and proposes that the permit establish a minimum SO_2 removal for the system of 40 percent when burning residue and/or bagasse and a maximum emission rate of 14 tons, without

Mr. Clair Fancy
July 15, 1981
Page 2

setting specific limits on the amount of each fuel which may be burned. We would anticipate obtaining more detailed information on actual SO₂ removal performance and fuel sulfur content prior to enduring the initial performance test in order to further confirm the ability of the new boiler to meet these two requirements.

Recalculation of SO₂ emissions due to oil consumption resulted in lower emissions when 18,500 Btu/lb was substituted for 17,500 Btu/lb. This change was minimal.

Question 3

The NO_x calculations were corrected in Tables 18A and 18B, Attachment A, and Section IIIC, and were distributed at the meeting.

Question 4

No additional modeling is required since emission rates are not changed.

Question 5

The discrepancy in the bagasse moisture content is due to initial drying of bagasse samples prior to shipment to the laboratory. This drying is necessary to prevent fermentation of the sugar in the bagasse during shipment. The average bagasse moisture content as measured at the mill is approximately 55 percent.

Question 6

A diagram of the bagasse and residue handling system was distributed. This diagram located the belt scales. The fuel supplied to the mill is measured either directly or by heat balance. The fuel rate to an individual boiler cannot be measured directly because it is not possible to feed the boiler by belt conveyor. Heat input during a compliance test will be determined by the heat balance method used in the industry.

Question 7

Oil consumption will be recorded by oil meters and reported on a 24-hour basis.

Mr. Clair Fancy
July 15, 1981
Page 3

Question 8

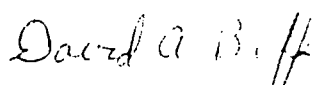
A reply to the question on choice of background values had been submitted previous to the meeting. Further analysis was proposed by Larry George. The results of this analysis are included in a report under separate cover.

In addition to the information requested in the aforementioned letter, comments from the South Florida District and the Palm Beach County Health Department were addressed. In response to these comments, (1) it was stated that the current provisions for control of fugitive emissions from bagasse handling and storage are sufficient, (2) SCCG agreed to provide the Department with a copy of the manufacturer's boiler performance test, and (3) it was explained that a vendor guarantee of scrubber performance based on inlet loading and particle size distribution is not feasible and would be of no practical value.

This information should suffice to resolve any questions concerning compliance enforcement and the maintenance of Air Quality Standards and allow final processing toward approval of the construction permit. If any issue requires further clarification, do not hesitate to telephone Mr. Arias or me.

On behalf of our client we appreciate your continuing cooperation and attention in this matter.

Sincerely,



David A. Buff, P.E.
Senior Engineer
Project Operations

DAB/kc

cc: Bill Green
Enrique Arias
Mirza Baig
Michael Martin

CANE GROWERS

7/10/81

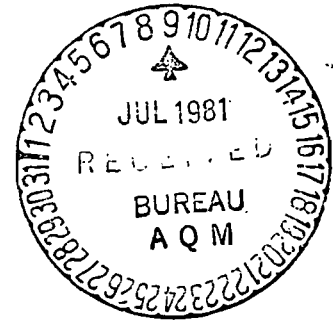
Incompleteness

<u>NAME</u>	<u>ORGANIZATION</u>	<u>PHONE</u>
CLAIR FANCY	BAQM	904 488 1344
Larry George	BAQM	904/ 488-1344
Cleve Holladay	BAQM	904 488-1344
WILLARD HANES	BAQM	904 488-1344
ER HENDRICKSON	EJC	904/372-3318
D.A. Buff	ESE	904 /372-3318
E. R. Grieg	Sugar Cane Growers	305/996-5556
Bill Green	HBCGS	904/222-7500
MURZA P. BAIG	DER-Ft. Myers	813-332-2667
MIKE DYBEVICK	ESE	
Bob KING	BAQM	904/488-1344
Bill Thomas	"	"



ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

July 6, 1981
ESE No. 80-190-100



Steve Smallwood, P.E.
Chief, Bureau of Air Quality Management
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

Re: Sugar Cane Growers Coop, Boiler #8
Federal PSD Permit Application, PSD-FL-077
Air Construction Permit Application, AC-42476

Dear Mr. Smallwood:

This letter is in response to Question No. 30, relating to TSP background concentrations, of the information request received from you by letter dated May 21, 1981.

Based upon Florida DER's letter of June 5, 1981, to Sugar Cane Growers Coop (SCGC), the PSD application has been declared substantially complete before June 8, 1981, and the 1978 PSD regulations concerning ambient data requirements will apply. It is our opinion, therefore, that the guidelines which implemented those regulations (i.e., Ambient Monitoring Guidelines for Prevention of Significant Deterioration, EPA-450/2-78-019, May 1978 and Guidelines on Air Quality Models, EPA-45-/2-78-027, April 1978) should govern any ambient data submittals for this application. Both of these documents recommend using data from regional monitoring stations to assess preconstruction air quality when it is not possible to determine uninfluenced levels from monitors near the subject source. Both documents also recommend using background TSP levels of 30 to 40 ug/m³ when all other significant sources are modeled (making the subject source effectively remote), and no current representative data are available. The chosen background level of 40 ug/m³ is, therefore, the maximum recommended under the 1978 guidelines.

The arithmetic and geometric mean values observed at the stations chosen as representative of background (Sugar League 2 and 9, Palm Beach 16) were all below 35 ug/m³ in 1980. Since the maximum values observed during 1980 for each of these stations are as much as twice the mean, some impact from man-made sources probably occurs. In the case of SL-9 and PB-16, impact from cane field burning probably occurs as these stations are bordered on at least two sides by cane fields and special precautions are not taken with respect to wind direction while burning the fields (i.e., burning is not curtailed when winds are directed toward West Palm Beach). The higher overall values observed at PB-16 may possibly be accounted for by its proximity to US 98 and the Atlantic Sugar mill, both of which could potentially impact this monitor.

The data from each of these three stations very closely follow a lognormal distribution. Since the ratio of the maximum and minimum values is characteristically three to one at these stations, there is no single value which can clearly describe the background concentration. From a statistical standpoint, if the observed, every sixth-day values are considered representative of the distribution of 24-hour TSP values which actually occurs at the monitor, this distribution being lognormal, then there is some finite probability that air quality standards are exceeded without the influence of any new source. In fact, a value of 136 ug/m^3 was recorded at PB-16 during 1978.

There is no generally accepted method to describe background concentrations with a single value when the recorded data varies over such a wide range, and detailed correlation with modeling is not possible. When designing plant stack configurations to meet AAQS, a single number must be chosen as a design criterion for modeling purposes. The new stack and modifications at the SCGC mill were designed to meet AAQS under worst-case dispersion conditions occurring simultaneously with a background level of 40 ug/m^3 .

The attached report by Dr. Jim McClave of Info Tech, Inc. documents a statistical analysis of 3 years (1978, 1979, and 1980) of measured TSP levels at PB-16 and 5 years of model-projected, 24-hour concentrations at the point of highest, second-highest TSP impact from the SCGC mill. This analysis was made conservative by assuming the SCGC mill was in full operation 365 days per year. All model input parameters were the same as the projected TSP model runs presented in the PSD application, except that year-round operation and only one receptor point was modeled, that being the receptor in the PSD modeling results where the highest, second-highest TSP impact due to SCGC occurred.

The results of this analysis show that a single exceedence of the AAQS of 150 ug/m^3 can be expected during a period of 6 to 7 years. This result is the same as that predicted by the PSD modeling study and demonstrates the appropriateness of a 40 ug/m^3 continuous background as a modeling design criterion for describing expected real conditions.

On behalf of our client, this information should suffice to answer your comments concerning the background TSP value and allow the speedy processing of the PSD permit.

Sincerely,

David A. Buff

David A. Buff, P.E.
Senior Engineer
Project Operations

DAB/ljh

cc: Bill Green
Enrique Arias
Mirza Baig
Mike Martin

AIR QUALITY STATISTICAL ANALYSIS

Prepared by: James T. McClave, Ph.D.

1 July 1981

Probability Evaluation

The data analyzed consisted of 175 daily background measurements and 1827 modeled 24 hour TSP concentrations. The objective is to estimate the probability that the sum of these measurements exceeds 150 on any given day.

The first step is to describe the distribution of the two random variables. The distribution of the background measurements is markedly skewed to the right, while that for the logarithmic transform is symmetric, with a single extreme value. The fit of the lognormal seems reasonable, with the test statistic only significant at the .055 level, even with the outlier.

The modeled concentrations due to plant emissions proved more difficult to describe. The best fit found was a two-part distribution, with a mass at zero and a continuous component exceeding zero. Since 622 of 1827 values were zero, the estimated probability mass at zero is $\frac{622}{1827} = .340$. The distribution of the 1205 positive values appears to follow an exponential distribution which is a distribution with substantial rightward skewness, and the property that the mean and standard deviation are equal. The sample mean and standard deviation are 16.36 and 16.78, respectively.

Now consider the event that the sum of background and plant emission exceeds 150. This event can be decomposed into two mutually exclusive events:

$$\begin{aligned} & \{\text{Sum of background and plant emissions exceeds 150}\} \\ &= \{\text{Background exceeds 150, plant emission immaterial}\} \\ &+ \{\text{Background less than 150, and plant emission} \\ &\quad \text{exceeds (150 - background)}\} \end{aligned}$$

To estimate the component probabilities, we first find

$$\begin{aligned} & P\{\text{Background exceeds 150}\} \\ &= P\{\text{Lognormal}(\text{mean} = 3.4474, \text{std. dev.} = .41085) > \log(150)\} \\ &= P\{\text{Normal}(\text{mean } 0, \text{std. dev.} = 1) > 3.805\} \end{aligned}$$

using the equation

$$z = \frac{\log(150) - 3.4474}{.41085} = 3.805$$

This normal probability is .000071 (obtained from the SAS normal probability function).

The second component is more difficult:

$$\begin{aligned} & P\{\text{Background less than 150 and plant emission} \\ &\quad \text{exceeds (150 - background)}\} \\ &= P\{E > 0\} \cdot P\{E > (150 - B), 0 < B < 150\} \end{aligned}$$

using $B = \text{Background}$, $E = \text{Emission}$. This is estimated by

$$\begin{aligned} & (1 - .340) \int_0^{150} \exp\{- (150 - B)/16.36\} \cdot \frac{1}{\sqrt{2\pi} s \cdot B} \times \\ & \quad \exp\{-(\log B - m)^2 / (2 \cdot s^2)\} dB \end{aligned}$$

where m and s are the estimated mean and standard deviation of the lognormal distribution (3.4474 and .41085, respectively). The first term in the integral is the exponential distribution probability that E exceeds $(150 - B)$, and the remainder is the lognormal density function. The background is integrated between 0 and 150, the given range in the probability statement being evaluated. No closed form was found for this integral, so a numerical solution was obtained using the IMSL (International Mathematical Subroutine Library) numerical integration algorithm DCADRE. This subroutine used the adaptive Romberg extrapolation technique. The integral is evaluated as .000502, and the estimated error is reported to be 0, indicating that this value is very precise. The second component is then estimated to be

$$(1 - .340)(.000502) = .000331$$

Putting the components together,

$$\begin{aligned} P\{\text{Sum exceeds } 150\} &= .000071 + .000331 \\ &= .000402 \end{aligned}$$

Thus, the probability that the 150 level is exceeded on any given day is approximately 4 in 10,000. This means that the average number of days between exceedances is $(.000402)^{-1}$, or 2488 days (approx. 6.8 years). In addition, the probability distribution on the number of days per year on which exceedances occur, assuming the day-to-day emissions are independent, is as follows:

<u>Days Exceeding 150</u>	<u>Probability</u>
0	.864
1	.127
2	.009
3 or more	.000

In words, there is an 86% chance that no exceedences occur in a given year, a 13% chance that 1 occurs, and a 1% chance that two occur. The chances of 3 or more is less than 5 in 10,000.

A violation is defined as two exceedences in a given year. Note that the probability that the second largest value exceeds 150 is equal to the probability that the total of background and modeled concentrations exceeds 150 on 2 or more days in a year, i.e., .009. Thus, the average number of years between violations is $(.009)^{-1}$, or 111.1 years.



James T. McClave, Ph.D.
INFO TECH, INC.

Table 18A. Crop Season Emissions from Existing Boilers

Boiler	Capacity lb steam/hr	Ton/Day Bagasse (10 ⁶ Btu)	Ton/Day Residue (10 ⁶ Btu)	Gallons/Day Oil (10 ⁶ Btu)	Total Btu (10 ⁶ Btu/hr)	Crop Season Emissions (tons)†				
						PM	SO ₂	NO _x	CO	HC
1 and 2	240,000	165.6 (2,650)	398.4 (7,092)	1,392 (195)	414	226	424	122	190	190
3	100,000	278.4 (4,454)	—	576 (81)	189	103	77	72	114	114
4	240,000	165.6 (2,650)	398.4 (7,092)	1,392 (195)	414	181	424	122	190	190
5	160,000	110.4 (1,766)	266.4 (4,742)	936 (131)	277	151	283	81	127	127
6 and 7	150,000	—	—	33,312 (4,664)	194	43	896	184	15	3
TOTAL						704	2,104	581	636	624

* Based on Table A-3.

† PM: Boilers 1, 2, 3, and 5 at 0.25 lb/10⁶ Btu, Boiler 4 at 0.2 lb/10⁶ Btu, all oil at 0.1 lb/10⁶ Btu

SO₂: Based on Table A-3

NO_x: 1.2 lb/ton wet bagasse, 2.67 lb/ton dry bagasse, 2.0 lb/ton dry residue, 60 lb/10³ gal fuel oil

CO: 5 lb/10³ gallons fuel oil; 2 lb/ton wet bagasse; 4.44 lb/ton dry bagasse; 3.33 lb/ton dry residue.

HC: 2 lb/ton wet bagasse, 4.44 lb/ton dry bagasse, 3.33 lb/ton dry residue, 1 lb/10³ gal fuel oil.

184-day crop season.

Source: ESE, 1981.

Table 18B. Off-Season Emissions from Existing Boilers

Boiler	Capacity lb steam/hr	Ton/Day Residue (10 ⁶ Btu)	Gallons/Day Oil (10 ⁶ Btu)	Total Btu (10 ⁶ Btu/hr)	Off-Season Emissions (tons)*				
					PM	SO ₂	NO _x	CO	HC
Combination of Boilers 1, 2, 4, or 5 to produce:	400,000	882 (15,700)	2,328 (326)	6,681	236	548	114	177	177
CROP SEASON TOTAL					<u>704</u>	<u>2,104</u>	<u>581</u>	<u>636</u>	<u>624</u>
ANNUAL EMISSIONS					940	2,652	695	813	801

* Emission rates on same basis as Table 18A; particulate assumed worst-case 0.25 lb/10⁶Btu; 120-day maximum off-season operation.

Source: ESE, 1981.

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		
Not applicable				

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

1. Total Process Input Rate (lbs/hr): Not Applicable

2. Product Weight (lbs/hr): 240,000-lb steam/hr rated capacity
264,000-lb steam/hr peak capacity

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	
Particulate	100.8	324.5	0.2 lb/MM Btu, ^{17-2.05} ₍₆₎	100.8	1,121.4	4,091	A
Sulfur Dioxide	539	829.1	NA	NA	472	1,719	A
Nitrogen Oxides	123	209	NA	NA	123	450	A
Hydrocarbons	140	325	NA	NA	140	429	A
Carbon Monoxide	140	326	NA	NA	140	429	A

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)
Joy Turbulaire Type D	Particulate	+90%	See Attachment B	manufacturer's literature
Impingement Scrubber, or equivalent	SO ₂	40%	NA	Test data
				see Attachment C

¹ See Section V, Item 2.

² References: 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

7/9/81

ATTACHMENT A

PROPOSED BOILER NO. 8
EMISSION ESTIMATESFUEL USAGE CALCULATIONS

Peak Steam Capacity = 264,000 lb/hr
 Btu requirements per lb steam = 1,050 Btu/lb
 Boiler efficiencies: Bagasse - 55%
 Residue - 62.5%
 Oil - 80%
 System SO₂ loss: Bagasse - 40%
 Residue - 40%
 Oil - 0%

Fuel Analysis:

	<u>Bagasse</u>	<u>Residue</u>	<u>No. 6 Fuel Oil</u>
Btu/lb	8,000 (dry)	8,900 (dry)	18,500
lbs/gal			8.1
% S	0.1 (dry)	0.4 (dry)	1.0
% N	0.3 (dry)	0.4 (dry)	0
% Ash	0.5-0.3 (dry)	1.9-3.8 (dry)	0.1
% H ₂ O	55	40	0.2

Bagasse Burning: $264,000 \text{ lb/hr steam} \times 1,050 \text{ Btu/lb} \div 0.55 = 504.0 \times 10^6 \text{ Btu/hr}$
 $504.0 \times 10^6 \text{ Btu/hr} \div 8,000 \text{ Btu/lb} = 63,000 \text{ lb/hr dry bagasse}$

Residue Burning: $264,000 \text{ lb/hr steam} \times 1,050 \text{ Btu/lb} \div 0.625 = 443.5 \times 10^6 \text{ Btu/hr}$
 $443.5 \times 10^6 \text{ Btu/hr} \div 8,900 \text{ Btu/lb} = 49,834 \text{ lb/hr dry residue}$

Oil Burning: Limited to $250 \times 10^6 \text{ Btu/hr heat input}$
 $250 \times 10^6 \text{ Btu/hr} \div 18,500 \text{ Btu/lb} = 13,500 \text{ lb/hr}$
 $= 1,667 \text{ gal/hr}$

EMISSION CALCULATIONS

BURNING 100-PERCENT RESIDUE

1. Particulate

Allowable and maximum emissions = $443.5 \times 10^6 \text{ Btu/hr} \times 0.2 \text{ lb particulate}/10^6 \text{ Btu} = 88.7 \text{ lb/hr}$

Potential (uncontrolled) emissions: assume same as bagasse in AP-42 on a "dry" basis. Factor is 16 lb/ton bagasse on a wet basis.

Convert to dry basis: $16 \text{ lbs/ton wet bagasse} \times 1 \text{ ton wet}/0.6 \text{ ton dry} = 26.7 \text{ lb/ton dry} \times 49,834 \text{ lb/hr residue (dry)} \div 2,000 = 664 \text{ lb/hr}$.

2. Sulfur Dioxide (based on scrubber removal of 40%)

Maximum emissions = $49,834 \text{ lb/hr residue (dry)} \times 0.004 \times 2 \times 0.6 = 239.2 \text{ lb/hr}$

Potential (uncontrolled) emissions = $239.2 \text{ lb/hr} \div 0.6 = 398.7 \text{ lb/hr}$

3. Nitrogen Oxides

Maximum and Potential (uncontrolled) emissions: assume same factor as bagasse. Factor 1.2 lb/ton bagasse on a wet basis.

Convert to dry basis: $1.2 \text{ lb/ton wet bagasse} \times 1 \text{ ton wet}/0.6 \text{ ton dry} = 2.0 \text{ lb/ton} \times 49,834 \text{ lb/hr residue (dry)} \div 2,000 = 49.8 \text{ lb/hr}$

4. Carbon Monoxide and Hydrocarbons

AP-42: $2 \text{ lb/ton wet bagasse} \times 1/0.6 = 3.33 \text{ lb/ton dry residue}$
 $3.33 \times 49,834 \div 2,000 = 83.1 \text{ lb/hr}$

BURNING FUEL OIL AT $250 \times 10^6 \text{ Btu/hr}$

1. Particulate

Allowable and maximum emissions = $250 \times 10^6 \text{ Btu/hr} \times 0.1 \text{ lb particulate}/10^6 \text{ Btu} = 25.0 \text{ lb/hr}$

Potential (uncontrolled) emissions: from AP-42 Table 1.3-1
 $1 \text{ lb}/10^3 \text{ gal} = 10(\text{S}) + 3 = 10(1.5) + 3 = 13$
 $1,667 \text{ gal/hr} \times 13 \text{ lb}/10^3 \text{ gal} = 21.7 \text{ lb/hr}$

2. Sulfur Dioxide

Maximum and Potential Emissions: from AP-42 Table 1.3-1
 $1 \text{ lb}/10^3 \text{ gal} = 157(\text{S}) = 157(1.8) = 283$
 $1,667 \text{ gal/hr} \times 283 \text{ lb}/10^3 \text{ gal} = 472 \text{ lb/hr}$

3. Nitrogen Oxides

Maximum and Potential Emissions: from AP-42 Table 1.3-1
 $60 \text{ lb}/10^3 \text{ gal} \times 1,667 \text{ gal/hr} = 100 \text{ lb/hr}$

4. Hydrocarbons

Maximum and potential (uncontrolled) emissions: from AP-42,
Table 1.3-1

$$1 \text{ lb}/10^3 \text{ gal} \times 1,667 \text{ gal/hr} = 1.7 \text{ lb/hr}$$

5. Carbon Monoxide

Maximum and potential (uncontrolled) emissions: from AP-42,
Table 1.3-1

$$5 \text{ lb}/10^3 \times 1,667 \text{ gal/hr} = 8.3 \text{ lb/hr}$$

7/9/81

BURNING 100-PERCENT BAGASSE

1. Particulate

Allowable and maximum emissions = 504.0×10^6 Btu/hr x
 $0.2 \text{ lb particulate}/10^6 \text{ Btu} = 100.8 \text{ lb/hr}$

Potential (uncontrolled) emissions: from AP-42, Table 1.8-1
 $16 \text{ lb/ton bagasse (wet)} \times 63,000 \text{ lb/hr bagasse (dry)} \div 0.45 \div$
 $2,000 = 1,120 \text{ lb/hr}$

2. Sulfur Dioxide (based on scrubber removal of 40%)

Maximum Emissions = $63,000 \text{ lb/hr bagasse (dry)} \times 0.001 \times 2 \times 0.6$
 $= 75.6 \text{ lb/hr}$

Potential (uncontrolled) emissions = $1,120 \text{ lb/hr} \div 0.6 = 1,867 \text{ lb/hr}$

3. Nitrogen Oxides

Maximum and potential (uncontrolled) emissions: from AP-42,
 Table 1.8-1

$1.2 \text{ lb/ton bagasse (wet)} \times 63,000 \div 0.45 \text{ lb/hr bagasse} \div 2,000$
 $= 84.0 \text{ lb/hr}^*$

4. Carbon Monoxide and Hydrocarbons

AP-42: $2 \text{ lb/ton wet bagasse} \times 1/0.45 = 4.44 \text{ lb/ton dry bagasse}$
 $4.44 \times 63,000 \div 2,000 = 140 \text{ lb/hr}$

* This figure could be greatly overestimated since a recent EPA study reported NO_x levels of $0.002 \text{ lb}/10^6 \text{ Btu}$, equivalent to 1.0 lb/hr for this boiler ("Emission Test Report, U.S. Sugar Company, Bryant, Florida," Monsanto Research Corp., May 1980).

MAXIMUM EMISSIONS CALCULATIONS

1. Particulate

Maximum emissions occur when burning 100-percent bagasse since heat input is greatest = 100.8 lb/hr

2. Sulfur Dioxide

Maximum emissions occur when burning oil up to $250 \times 10^6 \text{ MM Btu/hr}$ with remainder of steam capacity supplied by bagasse residue

SO_2 due to oil = 472 lb/hr

Steam due to oil = $250 \times 10^6 \text{ MM Btu/hr} \div 1,050 \text{ Btu/lb steam} \times$
 $0.8 = 190,476 \text{ lb/steam/hr}$

Steam due to residue = $264,000 - 190,476 = 73,524 \text{ lb/steam/hr}$

Residue required = $73,524 \times 1,050 \div 0.625 \div 8,900 =$

$13,879 \text{ lb/hr (dry)}$

SO_2 due to residue = $13,879 \times 0.004 \times 2 \times 0.6 = 66.6 \text{ lb/hr}$

Total $\text{SO}_2 = 472 + 66.6 = 538.6 \text{ lb/hr}$

472

302

66.6

538.6

538.6 lb/hr

13,879

0.004

2

0.6

66.6

472

538.6

538.6 lb/hr

261.7
66.6
328.3

7/9/81

3. Nitrogen Oxides

Fuel-oil burning produces maximum NO_x emissions, with bagasse next. Therefore, maximum NO_x occurs when burning maximum fuel with the rest of the steam supplied by bagasse.

$$\text{NO}_x \text{ due to oil} = 100 \text{ lb/hr}$$

$$\text{Steam due to oil} = 190,746 \text{ lb steam/hr (see SO}_2 \text{ above)}$$

$$\text{Steam due to bagasse} = 73,524 \text{ lb steam/hr}$$

$$\text{Bagasse required} = 73,524 \times 1,050 \div 0.55 \div 8,000$$

$$= 17,546 \text{ lb/hr (dry)}$$

$$\text{NO}_x \text{ due to bagasse} = 17,546 \times 2.67 \div 2,000 = 23.4 \text{ lb/hr}$$

$$\text{Total NO}_x = 105.8 + 23.4 = 123 \text{ lb/hr}$$

4. Carbon Monoxide and Hydrocarbons

Maximum emissions when burning all bagasse = 140 lb/hr

ACTUAL EMISSIONS CALCULATIONS

Annual emissions for proposed Boiler 8 based on fuel mix presented in Table A-3 of PSD report for 184 day/yr. For off-season operation (120 days/yr), bagasse is not available; therefore, emissions based upon average fuel oil consumption with remainder of steam produced from residue and assuming maximum steam production of 264,000 lb/hr. This figure is much higher than will actually occur on average during off season.

1. Particulate (based upon allowables)

Crop season:

$$18.3 \text{ ton/hr residue} \times 2,000 \times 8,900 \times 0.2 \text{ lb/MM Btu} \times 24 \times 184 \div 2,000 = 143.8 \text{ ton/yr}$$

$$7.5 \text{ ton/hr bagasse} \times 2,000 \times 8,000 \times 0.2 \text{ lb/MM Btu} \times 24 \times 184 \div 2,000 = 53.0 \text{ ton/yr}$$

$$64 \text{ gal/hr} \times 8.1 \times 18,500 \times 0.1 \text{ lb/MM Btu} \times 24 \times 184 \div 2,000 = 2 \text{ ton/yr}$$

Off season:

$$\text{Average steam due to oil} = 6,900 \text{ lb/hr}$$

$$\text{Average steam due to residue} = 264,000 - 6,900 = 257,100 \text{ lb/hr}$$

$$\text{Residue required} = 257,100 \times 1,050 \div 0.625 \div 8,900 = 48,531 \text{ lb/hr}$$

$$48,531 \text{ lb/hr residue} \times 8,900 \times 0.2 \text{ lb/MM Btu} \times 24 \times 120 \div 2,000 = 124.4 \text{ ton/yr}$$

$$64 \text{ gal/hr} \times 8.1 \times 18,500 \times 0.1 \text{ lb/MM Btu} \times 24 \times 120 \div 2,000 = 1 \text{ ton/yr}$$

$$\text{Total} = 324 \text{ ton/yr}$$

2. Sulfur Dioxide

Crop season:

$$18.3 \text{ ton/hr residue} \times 0.004 \times 2 \times 0.6 \times 24 \times 184 = 387.9 \text{ ton/yr}$$

$$7.5 \text{ ton/hr bagasse} \times 0.001 \times 2 \times 0.6 \times 24 \times 184 = 39.7 \text{ ton/yr}$$

$$64 \text{ gal/hr} \times 283 \text{ lb/10}^3 \text{ gal} \times 24 \times 184 \div 2,000 = 40 \text{ ton/yr}$$

181

256

240 lb SO₂/hr

7/9/81

Off season: ^{18.6}
 $64 \text{ gal/hr} \times 283 \div 1,000 \times 24 \times 120 \div 2,000 = 26 \text{ ton/yr}$
 $48,531 \text{ lb/hr residue} \times 0.004 \times 2 \times 0.6 \times 24 \times 120 \div 2,000 =$
 335.4 ton/yr

Total = 829 tons/yr

3. Nitrogen Oxides

Crop season:

$18.3 \text{ ton/hr residue} \times 2.0 \text{ lb/ton} \times 24 \times 184 \div 2,000 = 80.8 \text{ ton/yr}$
 $7.5 \text{ ton/hr bagasse} \times 2.67 \text{ lb/ton} \times 24 \times 184 \div 2,000 = 44.2 \text{ ton/yr}$
 $64 \text{ gal/hr} \times 60 \text{ lb/10}^3 \text{ gal} \times 24 \times 184 \div 2,000 = 8.5 \text{ ton/yr}$

Off season:

$64 \text{ gal/hr} \times 60 \div 1,000 \times 24 \times 120 \div 2,000 = 5.5 \text{ tons/yr}$
 $48,531 \text{ lb/hr residue} \div 2,000 \times 2.0 \times 24 \times 120 \div 2,000$
 $= 69.9 \text{ tons/yr}$

Total = 209 tons/yr

4. Carbon Monoxide and Hydrocarbons

Crop Season:

$18.3 \text{ ton/hr residue} \times 24 \times 3.33 \times 184 \div 2,000 = 135$
 $7.5 \text{ ton/hr bagasse} \times 24 \times 4.44 \times 184 \div 2,000 = 74$
 $64 \text{ gal fuel oil/hr} \times 24 \times 1/10^3 \times 184 \div 2,000 = 0.1$
 $64 \text{ gal fuel oil/hr} \times 24 \times 5/10^3 \times 184 \div 2,000 = 0.7$

Off Season:

$24.27 \text{ ton/hr residue} \times 24 \times 3.33 \times 120 \div 2,000 = 116$
 $64 \text{ gal fuel oil/hr} \times 24 \times 1/10^3 \times 120 \div 2,000 = 0.1$
 $64 \text{ gal fuel oil/hr} \times 24 \times 5/10^3 \times 120 \div 2,000 = 0.5$

Total HC = 325 ton/yr

Total CO = 326 ton/yr

POTENTIAL EMISSIONS CALCULATIONS

Potential emissions based upon burning worst-case emitting fuel all the time and 304-day operation per year. No controls considered.

1. Particulate

Worst-case fuel is bagasse at maximum steam production.

$63,000 \text{ lb/hr bagasse (dry)} \div 2,000 \times 35.6 \text{ lb/ton} = 1,121.4 \text{ lb/hr}$
 $1,121.4 \text{ lb/hr} \times 24 \times 304 \div 2,000 = 4,091 \text{ ton/yr}$

2. Sulfur Dioxide

Worst-case fuel is oil, burning up to 250 MM Btu/hr.

Remainder of steam produced from residue. ^{See}

Oil: $1,667 \text{ gal/hr} \times 283 \text{ lb/10}^3 \text{ gal} = 472 \text{ lb/hr} = 1,719 \text{ ton/yr}$
Residue: $13,879 \text{ lb/hr} \times 0.004 \times 2 = 111.0 \text{ lb/hr} = 405.0 \text{ ton/yr}$

Totals = 373 lb/hr = 1,360 ton/yr

7/9/81

3. Nitrogen Oxides

Worst-case fuel is oil, with bagasse next.

Oil = 100 lb/hr (see Maximum Emissions Calculations) = 365 ton/yr

Bagasse = 23.4 lb/hr = 85.4 ton/yr

Totals = 123 lb/hr = 450 ton/yr

4. Carbon Monoxide and Hydrocarbons

Crop season: 100-percent bagasse

 $140 \text{ lb/hr} \times 24 \times 184 \div 2,000 = 309 \text{ ton/yr}$

Off season: 100-percent residue

 $83.1 \text{ lb/hr} \times 24 \times 120 \div 2,000 = 120 \text{ ton/yr}$

Total = 429 ton/yr

DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices
And/Or To Other Than The Addressee

To: _____	Loctn.: _____
To: _____	Loctn.: _____
To: _____	Loctn.: _____
From: _____	Date: _____

TO: Steve Smallwood

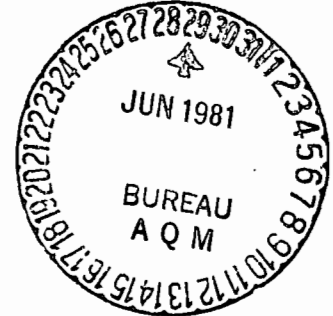
THRU: Bill Thomas

THRU: Philip R. Edwards *PRE*

FROM: Mirza Baig *MB*

DATE: June 25, 1981

SUBJECT: Sugar Cane Growers Co-op - Boiler #8
Permit Number: AC50-7614



A response to our letter of May 21, 1981, was received on June 1, 1981, for the above referenced project. Following are our comments:

1) Question 5

It is not clear what is the overall boiler efficiency being used. The boiler efficiency is of significant importance when computing the particulate allowable emissions based on the total heat input to the boiler when converting allowable emissions from pounds per million BTU heat input to pounds per hour.

The response states that "reported boiler efficiencies are ideal and are not realized in practice". It is strongly recommended that a boiler efficiency test be performed before a stack test is scheduled and use the resulting efficiency.

2) Question 6

The estimated 40 percent removal of SO₂ from scrubbing operation is too low. The SO₂ limitation should not exceed 0.8 pounds per million BTU's of heat input for fuel oil.

A stack test for SO₂ should be required along with particulate test simultaneously using EPA reference methods. Our SO₂ limitation is recommended in the BACT Section.

Continued

3) Question 12

A proper log should be maintained of the amount of fuel oil and residue used in this boiler. This is important to verify compliance of SO₂ emissions.

4) Question 19

The transferring operation of bagasse and residue is relatively clean since all conveyor belts and transfer points are covered. However, the excess bagasse/residue storage operation is extremely dusty at times. The current procedure can and should be upgraded. The applicant should be required to submit a plan to control fugitive bagasse/residue dust generated from storage operations.

5) Question 20

The answer provided by the applicant is unacceptable. The performance guarantee letter from the manufacturer dated February 8, 1974, does not address this boiler #8. The application also states "Joy Turbulaire Type D Impingement Scrubber or Equivalent".

The Department cannot approve a control device which has not been specified and/or a reasonable assurance from the manufacturer has not been provided as to the performance of the scrubber.

- 6) The BACT Determination recommended by the Ft. Myers District office is as follows:

<u>POLLUTANT</u>	<u>EMISSION LIMIT</u>
Particulates	
Bagasse/Residue	0.15 #/Million BTU Heat Input
No. 6 Fuel oil	0.10 #/Million BTU Heat Input
Sulfur Dioxide	
Bagasse	0.15 #/Million BTU Heat Input
Residue	0.54 #/Million BTU Heat Input
No. 6 oil	0.80 #/Million BTU Heat Input
NO _x , CO, HC	LEAR
Visible Emissions	Not to exceed 30% opacity at anytime.

Continued

Steve Smallwood
Page Three
June 22, 1981

JUSTIFICATION

The limitation for Particulates -0.15 #/Million BTU Heat Input and SO₂ - 0.80 pounds per Million BTU Heat Input is currently being met by U.S. Sugar Corporation, Bryant Mill Boiler #5 and we see no reason that this boiler, when maintained and operated properly, will have any difficulty in meeting above limits.

MBP/lb

Gulf + Western Food Prod.

Boiler #5

Stack Tested by South Fl Envr. Services

1/8/81

CALCULATION OF

ALLOWABLE EMISSIONS

RUN NUMBER 333-S-1

TOTAL BTU VALUE OF STEAM 565°F AND 2100 PSIA = 1299.6 BTU/LB.

BTU VALUE OF FEED WATER 2100°F AND 415 PSIA = 229.7 BTU/LB.

NET BTU VALUE OF STEAM = 1069.9 BTU/LB.

STEAM PRODUCTION RATE (21026-24516)/60 112 1350 = 1229410 BTU/LB.

FURNACE EFFICIENCY = 55 %

HEAT INPUT TO FURNACE = 239.2 x 10⁶ BTU/HR.

HEAT INPUT FROM FUEL OIL 150,000 (BTU/GAL.) x (68640-67740)/60 112 (GAL./HR.) = 72.3 x 10⁶ BTU/HR.

HEAT INPUT FROM BAGASSE = 1166.9 x 10⁶ BTU/HR.

ALLOWABLE PARTICULATES FOR OIL 72.3 x 10⁶ x 0.1/10⁶ BTU = 7.23 LB./HR.

ALLOWABLE PARTICULATES FOR BAGASSE (NEW BOILERS) 1166.9 x 10⁶ x 0.2/10⁶ BTU = 233.38 LB./HR.

ALLOWABLE PARTICULATES FOR BAGASSE (EXISTING BOILERS) 1166.9 x 10⁶ x 0.3/10⁶ BTU = 350.07 LB./HR.

TOTAL ALLOWABLE PARTICULATES = 57.30 LB./HR.



STATE OF FLORIDA

DEPARTMENT OF

Health & Rehabilitative Services

District Nine
P. O. Box 29

Bob Graham, Governor

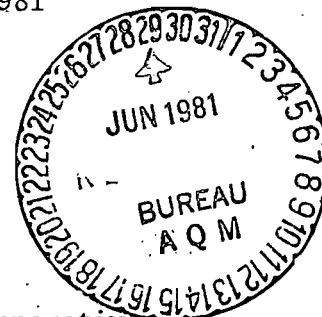
Palm Beach County Health Dept.
West Palm Beach, Florida 33402

Please Address

Reply to:

June 24, 1981

Mr. Edward Palagyi
BACT Coordinator
Bureau of Air Quality Management
Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301



Re: BACT Determination - Sugar Cane Growers Cooperative
Boiler # 8

Dear Mr. Palagyi:

Our staff has reviewed the BACT application for the above-referenced boiler.

The review was conducted in accordance with the BACT definition set forth in Chapter 17-2 FAC, considering (1) an emission limitation based on the maximum degree of reduction of pollutants generated by the boiler; (2) energy requirements; (3) environmental impact; (4) economic impact; and (5) cost.

The BACT determination recommended by the Palm Beach County Health Department is the following:

POLLUTANT

EMISSION LIMIT

Particulate

- (a) Carbonaceous Fuel
- (b) No. 6 Fuel Oil

0.15 lbs/MMBTU Heat input
0.10 lbs/MMBTU Heat input

Sulfur Dioxide

- (a) Residue
- (b) Bagasse
- (c) No. 6 Fuel Oil

0.54 lbs/MMBTU Heat input
0.15 lbs/MMBTU Heat input
0.80 lbs/MMBTU Heat input
(Equivalent to 0.7% S content fuel)

Hydrocarbons

LAER

Visible Emissions

30% opacity

Control Device

Venturi or spray impingement.
Scrubber preceded with a multicyclone
dry dust collector.

Particulate and Sulfur Dioxide compliance shall be determined by the referenced test methods described in 40 CFR 60, Appendix A, reference methods 1, 2, 3, 4, 5, 6, and 9 while burning bagasse residue. Composite bagasse residue sampling for an ultimate analysis will be required during the SO₂ compliance test to be submitted with the SO₂ test data.

Oil analysis by the applicant's fuel oil supplier may be used in lieu of a compliance test to determine Sulfur Dioxide emissions from fossil fuel.

Our BACT determination with regard to the control of particulate and SO₂ emissions from carbonaceous fuel was based on several factors:

1. The BACT is consistent with previous determinations by FDER for carbonaceous boilers. No significant technical improvements have occurred since the previous BACT determination for this type of source was completed.

2. Total Suspended Particulate (TSP) sampling procedures in the western part of Palm Beach County show that the TSP concentrations are approaching the Florida annual geometric mean standard for TSP.

3. Florida's standard for fossil fuel steam generators and the New Source Performance Standard (NSPS) for fossil or combination fired industrial generators is 0.10 lbs/MMBTU heat input. Florida's emission limitation for "new" carbonaceous boilers is 0.2 lbs/MMBTU heat input. The average emission for both types of sources is 0.15 lbs/MMBTU heat input.

4. The BACT standard of 0.15 lbs/MMBTU's can be met with properly designed, maintained and operated control devices. Examples of this are United States Sugar Corporations - Boiler #5; Bryant Sugar Mill; Talisman Sugar Corporations - Boiler #6, which has an average emission of 0.123 lbs/MMBTU heat input; Gulf and Western - Boiler 10, which has an average emission of 0.137 lbs/MMBTU heat input utilizing a Ducon Vertical Venturi preceded by a multi cyclone dust collector.

5. Scrubber efficiency for controlling SO₂ emissions is stated to be 40%. Verification of efficiency and emission limitation is required.

It is incumbent upon our agency to require a control technology that will not degrade but rather protect the current air quality in western Palm Beach County. Further deterioration could cause a TSP ambient air quality violation, which is of primary concern to this agency to prevent.

Your cooperation in this matter is appreciated.

Sincerely,


MICHAEL J. MARTIN

Environmental Specialist

MJM/o

Cc: C. Fancy, B.A.Q.M. ✓
M. Baig, D.E.R., Fort Myers

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

June 25, 1981

Enrique R. Arias
Executive Vice President
Sugar Cane Growers Cooperative
of Florida
Post Office Box 666
Belle Glade, Florida 33430

Dear Mr. Araais:

RE: Air Construction State Permit Application, AC 50-42476

The Department has received your response to our letter of May 21, 1981 that requested additional information for the application for permit to construct a bagasse boiler in Palm Beach County, Florida. Based on our review of your May 29, 1981 response, it has been determined that more information is needed before we can process the application. The information required to complete the application is listed below.

1. The Department can not agree or accept a 40% loss in the system of the potential SO₂ emissions while burning bagasse and residue. There are not enough tests and documents in the application to support the system SO₂ loss. Please recalculate the SO₂ emissions based on maximum sulfur in the fuels and using no system SO₂ loss.
2. Based on your response to question #7, SO₂ emissions from burning bagasse and residue should be recalculated using 0.2% and 0.5% sulfur content respectively, instead of 0.1% and 0.4%. Recalculate the SO₂ emissions from burning oil using 18,500 Btu/lb, the actual² heat value, instead of 17,500 Btu/lb.
3. The response to question #8 was not correct. The factor for residue should be 1 ton wet/0.6 ton dry, not 1 ton wet/0.55 ton dry. Recalculate the particulate and NO_x emissions from residue with the correct factor, 1 ton wet/0.6 ton dry.
4. Based on the above questions, recalculations are required for Attachment A (Proposed Boiler No. 8 Emission Estimated), Appendix A (Emission Calculations, including Table A-1, A-2 and A-3) and Table 18A, 18B of your application and incompleteness response.

Enrique A. Arais
June 29, 1981
Page Two

These recalculations are required for all boilers in Tables A-3, 18A and 18B; recalculated values in these tables will affect the inputs to the computer modeling. Please include printouts from any additional modeling required by these recalculations.

5. The normal moisture content for bagasse (wet) is approximately 55%. Why was the percent moisture of the two bagasse samples for test analysis so low (3.7% and 4.6%)?
6. Question #12 on your response states that residue is weighed on belt scales. Where are these belt scales located? Can bagasse fuel to the boilers be measured in this manner? If not, how will the heat input to the boiler be obtained during compliance test?
7. Based on oil consumption listed in the boiler specification and the actual Btu content of the oil, the maximum heat input to the boiler from oil will be 290×10^6 Btu/hr. How will the heat input from oil to the proposed boiler be limited to 250×10^6 Btu/hr? Please describe any mechanical devices, such as an orifice, that will be used to restrict oil flow.
8. We understand that a response to question #30 from the first incompleteness letter is being prepared by ESE. We have not received this response yet.

As soon as the requested information is received, we will resume processing your application. If you have any questions on the data requested, please contact this office. Cleve Holladay should be contacted on any questions related to modeling and Willard Hanks/Bob King on the other data requested.

Sincerely,

Clair Fancy

Clair Fancy
Deputy Bureau Chief
Central Air Permitting Section

CF:BK:dav

cc: Mirza Baig, South Florida District
Michael Martin, Palm Beach County Health Department
William Green, Hopping, Boyd, Green and Sams
David Buff, ESE

INTEROFFICE MEMORANDUM

For Routing To District Offices
And/Or To Other Than The Addressee

To: _____	Locn.: _____
To: _____	Locn.: _____
To: _____	Locn.: _____
From: _____	Date: _____

TO: Ed Palagyi

FROM: Willard Hanks *W.H.*

DATE: June 24, 1981

SUBJ: Sugar Cane Growers Cooperative - BACT Determination

I recommend the following emission standards for BACT for Sugar Cane Growers Cooperative new bagasse/oil boiler No. 8.

1. <u>Particulate Matter</u>	<u>BACT Recommendation</u>	<u>Justification</u>
Fuel Oil	0.10 lb/MBTU in	NSPS
Bagasse/Residue	0.15 lb/MBTU in	Some existing units meet this standard with bagasse
2. <u>Sulfur Dioxide</u>		
Fuel Oil	Max. 1.0% in oil	Proposed by Applicant
Bagasse/Residue	None	No feasible control
3. <u>Opacity</u>	30% except 40% for 2 minutes/hr.	Chapter 17-2.05(6)I
4. NO_x , CO, VOC (LAER)	1.20 lb NO_x /Ton fuel	Good firing and operational practice
	2.00 lb CO/Ton fuel	
	2.00 lb VOC/Ton fuel	

Some existing plants are reporting emissions of 0.15 lb PM/MBTU while burning bagasse in boilers controlled with Joy types scrubbers. Particulate emissions from burning furfural residue assumed to be similar to that of bagasse. Scrubber designs with higher efficiencies than the Joy type unit are available although none are being used

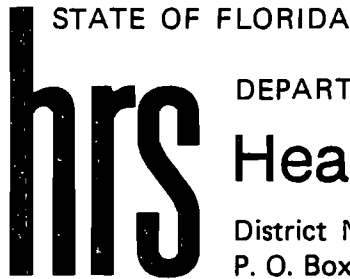
by the sugar industry in Florida. The more efficient units will have a higher initial and operating cost.

The only feasible controls for sulfur dioxide emissions from oil/bagasse/residue fired boilers are use of low sulfur oil and raising the stack heights. I recommend low sulfur oil (max. 1.0%S) for the new boiler as BACT. The plant presently burns a mixture of 2.5% and 1.0%S in all boilers at the plant. The current fuel mixture averages about 1.8% sulfur. If modeling shows an ambient air standard or PSD impact violation with the new boiler on stream, the average per cent sulfur in the fuel used by all of the boilers may have to be reduced and the height of all the stacks may have to be increased.

The opacity standard for carbonaceous fuel burning equipment (Chapter 17-2.05(6)I) should be one of the standards for the new boiler. Water vapor in the emissions will make it difficult to obtain a valid visible emission test on this boiler. Thus, no emphasis should be placed on this standard.

The only feasible control for NO_x, CO, and VOC that I am aware of is good firing and operational practice of the boiler. The BACT proposed are emission estimates listed with the Source Classification Codes. More accurate standards could be established after the boiler is in service by a series of tests under various operation conditions.

WH:dav



DEPARTMENT OF

Health & Rehabilitative Services

District Nine
P. O. Box 29

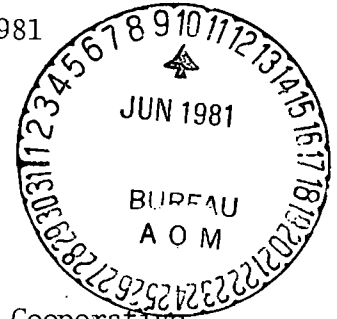
Bob Graham, Governor

Palm Beach County Health Dept.
West Palm Beach, Florida 33402

Please Address
Reply to:

June 8, 1981

Mr. Willard Hanks
Department of Environmental Regulation
Bureau of Air Quality Management
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301



RE: PSD/BACT/NON-ATTAINMENT PERMITTING-Sugar Cane Growers Cooperative
Boiler No. 8

Dear Mr. Hanks:

As per our conversation on the afternoon of June 5, 1981, please find additional comments and clarifications from this agency regarding the above-referenced source:

1. Question 5 Attachment: Please explain Furfural Residue (Future).
2. Attachment to Question 7: Please explain % Moisture figure of 3.7% and 4.6% as received for the two Bagasse analyses submitted. Also, Heating value of 4,698 BTU/wet (7,985 BTU/Dry) and 7,017 BTU/wet (7,910 BTU/Dry). Riley Stoker's Predicted Performance data indicates a BTU value of 3,856 BTU/# for Bagasse/wet.
3. Predicted Performance data from Riley Stoker for fuel oil #6 @ 1.5%S burning 15,688 pounds of fuel per hour @ 18,500 BTU per pound gives this boiler the capability of generating a heat input of 290,228,000 BTU/hr. N.S.P.S is required for any fossil fuel boiler over 250MMBTU/hr. Please address.
4. Attachment to Question 7: Data submitted for Beloil, supplied from Belcher oil, is not the same analysis of 1% sulfur. No. 6 Fuel Oil (see attached analysis from S.C.G.C. supplied by Belcher oil.) Beloil is #5 Residual Oil, or a blend of #2 distillate oil and #6 residual oil. Both analyses supplied do not reflect "as burned" analysis of 1.8%S Residual fuel oil. No. 6 fuel oil has an average density of 7.7 lbs/gal and 18,780 BTU/lb which is close to the specifications outlined in the Predicted Performance data enclosed in the revisions to the application.
5. Question 14:- Particle size distribution should be addressed. Pilot Plant data for the Joy Scrubber during the 1972-73 season at U.S.S.C. - Clewiston plant should have addressed this item.

6. Question 27 ~ Page Question 9:

Moore Haven Sugar Mill was never asked to be model due to the fact that it is not operational.

7. Page 3 of 10, Revised Airborne Contaminants Emitted:

Sulfur Dioxide emissions of 565.1 #/hr does not agree with revision on page Atta. 4, 5/28/81, which states 343.5 #/hr. SO₂ for Actual T/yr of 829.1 T/yr does not agree with that found on page Atta. 6, being 799.7 Tons/yr.

8. Page 3 of 10, Revised Airborne Contaminants:

SO₂ Potential Emissions of 608.5 #/hr and 2,220 T/yr do not agree with revisions on page Atta. 6 of 387.9 #/hr and 1,415.3 T/yr. Please clarify.

9. Emission factor for NO_x of 2.18 #./Ton dry residue as found in Table 18A, revised 5/26/81 and also found on page Atta. 2 appears to be based on 45% Moisture. Attachment A, Atta. 1, 5/28/81, states % Moisture to be 40%. Inconsistencies still exist. Please recalculate, using the correct factor for 40% Moisture for residue.

10. Question 12, page Question 5, states that residue is weighed on belt scales. Where is the location of these scales with respect to flow of residue from Quaker Oats to boilers? Why can't bagasse be measured in this manner?

11. Question 5: It is noted in Attachment to Question 5 that a more realistic heat of combustion for fuel oil is used than the one used in the application. Also noted is the heat input from oil is over 290×10^6 BTU/hr., which will require compliance with N.S.P.S.

12. Question 6: Part of the response to Question 6 is incorrect. In the application on Page 3 of 10, Item D, Control Devices states the Joy Turbulaire Type D Impingement Scrubber, or equivalent, has an efficiency of 40 percent for the removal of SO₂. However, the response to Question 6 states that nowhere in the application does this imply that impingement scrubbers remove 40% of the SO₂ produced.

13. Question 7: Assuming a lower than actual heat of combustion for fuel oil may reflect SO₂ emission greater than actual -- It will also reflect a heat input (BTU/hr) lower than actual.

14. Question 10: At 120 gpm fuel oil pumping capacity Boiler #8 could operate at design rate (i.e.: 240,000 lbs. steam/hr.) with over 5,000 gallons/hr. fuel oil remaining for use in other boilers.

Should you have any questions concerning any of the above, please contact me at 305/837-3070.

Sincerely,


MICHAEL J. MARTIN

MJM/o

Cc: C. Fancy
M. Baig

Belcher

ANALYSIS 1% SULFUR NO. 6 FUEL OIL

PORT EVERGLADES, FLORIDA

DECEMBER 12, 1980

DELIVERED INTO YOUR FACILITY AT BELLE GLADE, FLA.

API GRAVITY @ 60* F	21.9
B S & W, %	0.05
POUR POINT, *F	40
SULFUR, WT. %	.95
FLASH POINT PMCC	162
VISCOSITY	17.0
VANADIUM, PPM	66

Carl Bloomberg
CARL BLOOMBERG
AREA MANAGER

copy - Mr. Area
1/3/81

Belcher

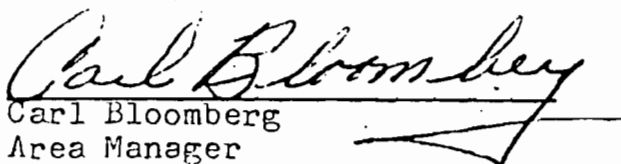
ANALYSIS 1% SULFUR NO. 6 FUEL OIL

PORT EVERGLADES, FLORIDA

SEPTEMBER 30, 1980

DELIVERED INTO YOUR FACILITY AT BELLE GLADE, FLA.

API GRAVITY @ 60* F	20.6
FLASH POINT, *F	195
VISCOSITY, SSF @ 122* F	69.0
POUR POINT, *F	60
SULFUR, WT. %	.95
ASH WT. %	.006
ASPHALTENES, WT. %	.04


Carl Bloomberg
Area Manager

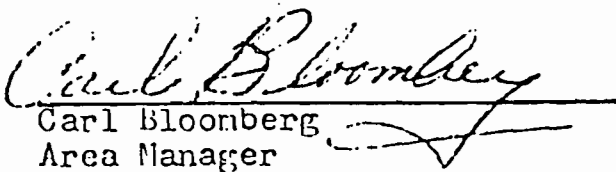
Belcher

ANALYSIS 1% SULFUR NO. 6 FUEL OIL
TANK #210, PORT EVERGLADES, FLORIDA

MARCH 12, 1980

DELIVERED INTO YOUR FACILITY AT BELLE GLADE, FLA.

API GRAVITY @ 60°F	19.7
FLASH POINT, °F	230
VISCOSITY, SF@ 122°F	34.8
POUR POINT, °F	60
SULFUR, TOTAL WT. %	.99
BSW %	0.1


Carl Bloomberg
Area Manager

ANALYSIS 1% SULFUR NO. 6 FUEL OILPORT EVERGLADES, FLORIDADELIVERED INTO YOUR FACILITY AT BELLE GLADE, FLA.DECEMBER 20, 1979

API Gravity @ 60°F	20.5
Flash Point, p.m. °F	200
Viscosity, SF @ 122°F	30.6 Secs.
Pour Point, °F	40
Sulfur, Total Wt. %	1.0%
Water by Distillation	0.30%
Sediment by Extraction	0.03%
Ash Content	0.04%

Rec'd
1/17/80

917 250

ANALYSIS BUNKER C FUEL

JANUARY 19, 1979

Gravity, A. P. I. @ 60°F	16.3
Flash Point, p.m. °F	200
Pour Point, °F	45
Sulfur, Total, Wt. %	2.41
Vanadium, p.p.m.	177
Viscosity	
SSF @ 122 °F	198.6
Water & Sediment, Vol. %	0.05

W. C. Stickel

copy:- Mr. F. R. Arin
2/2/79

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee		
To: _____	Locn.: _____	
To: _____	Locn.: _____	
To: _____	Locn.: _____	
From: _____	Date: _____	
Reply Optional []	Reply Required []	Info. Only []
Date Due: _____	Date Due: _____	

TO: Clair Fancy
THROUGH: Phil Edwards *PE*
FROM: Mirza Baig *MB*
SUBJECT: Sugar Mills - Stack Testing
DATE: November 23, 1982

DER
NOV 29 1982
BAQM

Recently a letter was sent to all the Sugar Mills in our district expressing the concern over boiler efficiency, scrubber opacities and the need to complete all stack testing prior to January 1 of each year (copy attached).

A response was received (copy attached) and as expected the sugar industry would like to leave things as is.

It is our understanding that a boiler efficiency test will be necessary along with the stack tests for all new boilers.

We would appreciate receiving your comments within the next thirty (30) days to initiate further action, if any.

MPB/mm

10/1 Mirza,
Your approach is fine. The new permits required boiler efficiency be submitted for information & we should require it. Steve Smallwood thinks in the long run, the boiler efficiency question will need to be addressed in the source sampling rule. Good luck with them.

Clair Fancy

DEPARTMENT OF ENVIRONMENTAL REGULATION

file: Sugar Cane Growers

ROUTING AND TRANSMITTAL SLIP

ACTION NO.

ACTION DUE DATE

1. TO: (NAME, OFFICE, LOCATION)

Clair Fancy

12/1 Stone Smellwood

INITIAL

DATE

2.

Env Pgm- Bur AQM

INITIAL

DATE

3.

Suite 601

INITIAL

DATE

4.

Tallahassee

INITIAL

DATE

REMARKS:

On new bagasse bldg permits we required that bldg efficiency tests be submitted for information. Sugar League doesn't want to give up 55% limit.

Some day these efficiency tests for compliance should be resolved one way or another.

Any comments?

Clair

I agree these issues need to be resolved.

I think the 5. Sampling rule is the best way to do it. That probably won't happen until summer. For now, I would support Phil's approach unless you see a problem with it.

INFORMATION

REVIEW & RETURN

REVIEW & FILE

INITIAL & FORWARD

DISPOSITION

REVIEW & RESPOND

PREPARE RESPONSE

FOR MY SIGNATURE

FOR YOUR SIGNATURE

LET'S DISCUSS

SET UP MEETING

INVESTIGATE & REPT

INITIAL & FORWARD

DISTRIBUTE

CONCURRENCE

FOR PROCESSING

INITIAL & RETURN

FROM:

mirza Baq - Ft. Myers

DATE

11/23/82

PHONE

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTH FLORIDA
DISTRICT2269 BAY STREET
FORT MYERS, FLORIDA 33901-2896BOB GRAHAM
GOVERNORVICTORIA J. TSCHINKEL
SECRETARY
Philip R. Edwards
DISTRICT MANAGER

September 24, 1982

Certified Mail #P34 2960148
Return Receipt RequestedDalton Yancey
Vice President and General Manager
Florida Sugar Cane League, Inc.
Post Office Box 1148
Clewiston, Florida 33440

Re: Annual Stack Test

Dear Mr. Yancey:

As in the past, before the start of the grinding season, this letter is concerning the upcoming annual stack testing of all air pollution sources. Our letter of October 15, 1981 had addressed all the problem areas and to the most part stack tests were conducted in accordance with the Department requirements. However the following items need further discussion.

1. Regarding the boiler efficiencies your letter of October 23, 1981 states that "It is the experience of all mills that 55 percent represents a practical efficiency value for bagasse burning boilers." Information in files indicate that such an efficiency test has not been performed on any of the boilers. Please schedule a boiler efficiency test before conducting a stack test so that this matter may be resolved amicably.
2. It is realized that sometimes it is difficult to conduct a visible emissions test due to the nature of the location of the stacks and the downstream distance needed for the water vapor to dissipate. Therefore a more practical approach would be to look at the combined plume opacity on a mill wide basis. Since all scrubbers have an opacity limitation, we would like to resolve this matter in a meeting as to what combined opacity reading would reflect a clean boiler operation.
3. One of the permit condition requires that all stack testing be completed prior to February 15th of each year. Our experience in the past few years indicates that in many cases these dates are not being

Continued. . .

Dalton Yancey
September 24, 1982
Page 2

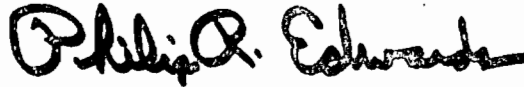
met due to the freeze and adverse weather conditions. Therefore a stack test should be scheduled prior to January 1st of each year for all the border-line boilers.

4. Particulate and visible emissions tests shall be conducted as outlined in 17-2.700. A latest copy of 17-2 Florida Administrative Code, (F.A.C.) can be obtained from our Tallahassee office. Straightening vanes must be installed to correct any cyclonic flows. Boilers with cyclonic flow which barely pass the stack test may be required to re-test this season. During the following season stack tests performed under cyclonic flows will not be accepted. Also all test facilities must comply with F.A.C. Chapter 17-2.700(4). Reference is being made to the sampling port locations. In the future please submit two copies of each stack test report to this office.

Please arrange for a meeting by contacting Mr. Mirza Baig at 813/332-2667 within two weeks of receipt of this letter so that we may resolve the items mentioned above.

Your cooperation in this matter will be appreciated.

Sincerely,



Philip R. Edwards
District Manager

PRE/MB/mm

cc: Langley Adair
Clair Fancy
Mike Martin
Dalton Yancey

Florida Sugar Cane League, Inc.

POST OFFICE BOX 1148

CLEWISTON, FLORIDA 33440

(813) 983-9151

October 8, 1982

Mr. Philip R. Edwards
District Manager
South Florida District
Florida Department of Environmental Regulation
2269 Bay Street
Fort Myers, Florida 33902

Dear Mr. Edwards:

RE: Annual Stack Test

This letter is in response to your letter dated September 24, 1982, which was received by the industry on or about September 28. The member companies of the Florida Sugar Cane League and Talisman Sugar Corporation have completed a review of the items contained in your letter and on their behalf we are offering the following comments:

- Item #1 The industry's position was outlined in our response to Item 4 of our letter to you dated October 23, 1981, and has not changed concerning the 55% efficiency assumption. This matter was thoroughly discussed with the B.A.Q.M. by correspondence and in Tallahassee last year during the permit review process for several new boilers in the industry. Our position was accepted by the Bureau and it is reflected in permits issued as late as October, 1981. We consider that conducting efficiency tests would produce results that would be unreliable and the tests would be costly, time consuming and unnecessary. Also, the results produced would not deviate significantly from the 55% efficiency assumption. We believe that our current procedure utilizing 55% efficiency represents the best method for determining heat input during stack testing.
- Item #2 We do not understand the nature of your request concerning visible emissions. It appears that you could be suggesting a new standard which would require rule-making procedure. Would you please be more specific in your request concerning opacity.
- Item #3 Due to the more restrictive emission limitations which have been placed upon a considerable number of old boilers and all new boilers, it appears that there will be more "border-

Mr. Philip R. Edwards
October 8, 1982

Page Two

line boilers." Therefore, conducting tests on these boilers prior to January 1 would be too restrictive since our season will have only been under way for 45-75 days at that time. We will exercise every effort to see that these borderline boilers are given a high priority and we will endeavor to begin testing as soon as practical. This may require extending the testing schedule to Saturdays and Sundays in order to expedite stack testing.

We appreciate your observation concerning freeze and adverse weather conditions and would like to point out that last year's weather was unique. Not only did our industry experience a once in 700-year drought, but also the most devastating freeze in the fifty-year history of Florida's sugar industry. The record will indicate that with the exception of last year's season, we have not had a real problem in meeting the February 15 deadline in previous years.

Item #4 We have taken due note of the statements contained in Item #4 and intend to fully follow the regulations as outlined in Chapter 17-2 of the Florida Administrative Code. As a matter of information, we have made many required changes to comply. Stacks have been raised, platforms and sampling ports have been changed, and straightening vanes have been installed. We agree that we may be required to re-test boilers with cyclonic flow which barely passed the stack test. We will also be happy to submit two copies of each stack test report to your office as requested.

We believe this letter addresses the items which you have outlined and that a meeting should not be necessary. However, if you wish additional information, we will be happy to cooperate further with you.

Sincerely,



Dalton Yancey
Vice President & General Manager

DY:cmf

RECEIVED

OCT 14 1982

D. E. R. SO. 100-100000



Gulf + Western
Food Products Company
A DIV. OF GULF + WESTERN INDUSTRIES, INC.

Okeelanta Sugar Division
P.O. Box 86
South Bay, Florida 33493
(305) 996-9072

October 11, 1982

Mr. Philip R. Edwards
District Manager
South Florida District
Department of Environmental Regulation
2269 Bay Street
Fort Myers, Florida 33902

RE: Annual Stack Testing

Dear Mr. Edwards:

This letter is in response to your letter dated September 24, 1982, which was received on or about September 28th. We have completed a review of the items contained in your letter and we are offering the following comments:

- Item #1 Our position has not changed concerning the 55% efficiency assumption. This matter was thoroughly discussed with the B.A.Q.M. by correspondence and in Tallahassee last year during the permit review process for several new boilers in the industry. Our position was accepted by the Bureau and it is reflected in permits issued as late as October 1981. We consider that conducting efficiency tests would produce results that would be unreliable and the tests would be costly, time consuming and unnecessary. Also, the results produced would not deviate significantly from the 55% efficiency assumption. We believe that our current procedure utilizing 55% efficiency represents the best method for determining heat input during stack testing.
- Item #2 We do not understand the nature of your request concerning visible emissions. It appears that you could be suggesting a new standard which would require rule changing procedure. Would you please be more specific in your request concerning opacity.
- Item #3 Due to the more restrictive emission limitations which have been placed upon a considerable number of old boilers and all new boilers, it appears that there will be more "border-line boilers". Therefore, conducting tests on these boilers prior to January 1 would be too restrictive since our season will have only been under way for 58 days at that time.

MR. PHILIP R. EDWARDS

Page 2

October 11, 1982

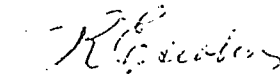
We will exercise every effort to see that these border-line boilers are given a high priority and we will endeavor to begin testing as soon as practical. This may require extending the testing schedule to Saturdays and Sundays in order to expedite stack testing.

We appreciate your observation concerning freeze and adverse weather conditions and would like to point out that last year's weather was unique. Not only did our Sugar Mill experience a one in 700 year drought but also the most devastating freeze in the fifty year history of Florida's sugar industry. The record will indicate that with the exception of last year's season, we have not had a consistent problem in meeting the February 15 deadline in previous years.

Item #4 We have taken due note of the statements contained in Item #4 and intend to fully follow the regulations as outlined in Chapter 17-2 of the Florida Administrative Code. Last year we made the required changes to comply. Stacks were raised, platforms and sampling ports were changed and all scrubbers were checked and none had cyclonic flow. We agree that we may be required to retest boilers with cyclonic flow which barely passed the stack test. We will also be happy to submit two copies of each stack test report to your office as requested.

We believe this letter addresses the items which you have outlined and that a meeting should not be necessary. However, if you wish additional information we will be happy to cooperate further with you.

Sincerely,



Rodolfo Escobar
Executive Vice-President

RE/vjc

RECEIVED

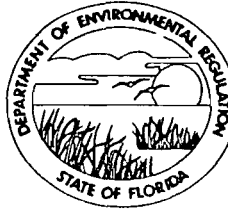
OCT 13 1982

D. E. R. SM. FLA. DISTRICT

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

October 28, 1981

Mr. Enrique R. Arias
Executive Vice President
Sugar Cane Growers Cooperative
P. O. Box 666
Belle Glade, Florida 33430

Note:
See Comment No. 9
Specific Condition No. 14

RE: Final Determination - Sugar Cane Growers Cooperative,
Application for State and Federal PSD Permits to Con-
struct New Bagasse Boiler (AC 50-42476, PSD-FL-077)

Dear Mr. Arias:

Enclosed please find one copy of the referenced Final Determination. State Permit Number AC 50-42476 is hereby issued as of October 28, 1981, pursuant to Section 403, Florida Statutes. Final approval of the Federal PSD permit, which is incorporated with the state permit, is contingent upon review and acceptance of the permit conditions by the Environmental Protection Agency Region IV office in Atlanta. Questions concerning final issuance of the Federal permit should be directed to Mr. T. Michael Taimi of the EPA office, at (404) 881-2017.

Acceptance of the state permit constitutes notice and agreement that the Department will periodically review this permit for compliance, including site inspections where applicable, and may initiate enforcement actions for violation of the conditions and requirements thereof.

Sincerely,

C. H. Fancy, Deputy Chief
Bureau of Air Quality Manage-
ment

cc: T. Michael Taimi, EPA Region IV
Michael Martin, Palm Beach Co. Health Department
Phil Edwards, FDER, South Florida District
David Buff, ESE Consultants

CHF/TP/bjm

RECEIVED

NOV 02 1981

D. E. R. SO. FLA. DISTRICT

Response to Public Comment

Sugar Cane Growers Cooperative of Florida

(AC 50-42476) (PSD-FL-077)

Comments were received from William H. Green, Counsel for Sugar Cane Growers Cooperative of Florida. Mr. Green requested revision of some specific conditions of the Preliminary Determination. The significant portion of his comments and DFR's response are as follows:

Comments 1 and 2 Specific Conditions No. 2 and 3

Mr. Green suggested that the maximum allowable PM emissions should be 276 ton/yr, and that the maximum allowable SO₂ emissions should be 555 lb/hr and 2,025 ton/yr if the emission calculations are based on 0.5% 0.2%, and 1.8 sulfur content in residue, bagasse, and fuel oil, respectively. He also requested that the option listed in the BACT determination, giving the permittee the right to seek revision if the 0.15 lb/MMBTU PM emission limit cannot be met on a continuous basis be addressed in the permit.

Response

Most of this comment is accepted except for the SO₂ maximum allowable emission limits: 555 lb/hr and 2,025 tons/year. The assumed 1.8% sulfur content of the fuel oil has no basis in fact and is unacceptable. Based on projected oil usage the resultant blend in the storage tank should contain 1.15% sulfur. SCGC has pointed out that boiler usage will vary in normal operation, in turn affecting the normal blend required for compliance with overall SO₂ limits. BAQM agrees and has rewritten specific conditions 2 and 3 to provide for fuel purchases resulting in a blend which will reflect the actual fuel usage by specific boiler. Daily oil usage has been limited to provide a daily SO₂ emission cap of 14.0 tons with associated permit changes and verification procedures to facilitate compliance verification.

Comment 3: Specific Condition No. 4

SCGC requested deletion of the specific condition No. 4 which requires installation of a flue gas oxygen monitor for control of VOC and CO emissions.

Response

BAQM feels that the variability of operation of this boiler will be such that additional monitoring is required to verify proper operation of combustion controls and that insufficient evidence was presented to support the request for deletion. The requirement was modified to allow the option of installing either an oxygen or CO₂ meter.

Comment 8: Specific Condition No. 9

SCGC requested use of 0.5% and 0.2% sulfur content for residue and bagasse in the calculation of SO₂ emissions.

Response

Allowable total fuel oil consumption 61,000 gal/day was derived from 0.4% and 0.1% sulfur content of residue and bagasse. Total oil consumption should be 31,500 gal/day, if calculations are based on 0.5% and 0.2% sulfur content in residue and bagasse. The revised condition has been incorporated into specific condition No. 3.

Comment 9: Specific Condition No. 14

SCGC requested deletion of the requirement that the boiler efficiency of the new unit be determined and used to establish the heat input during the compliance test. Because the variability of bagasse and associated handling problems DER and the sugar industry has previously agreed to establish 55% as the assumed efficiency of all boilers for the purpose of carrying out heat input calculations and for compliance testing.

Response

SCGC's request has been accepted by the Bureau with the understanding that boiler efficiency determined during acceptance testing will be submitted for information.

Conclusion

These comments received from SCGC, were considered in the development of the Department's Final Determination. No other comments were received.

GLADES SUGAR HOUSE

Sugar Cane Growers Cooperative of Florida



POST OFFICE BOX 666

BELLE GLADE, FLORIDA

ZIP CODE 33430

APR 25 1983

BAQM

April 21, 1983

Bill

Mr. C. H. Fancy, Deputy Chief
Bureau of Air Quality Management
Florida Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Re: Permit No. AC 50-42476

Dear Mr. Fancy:

I am enclosing an executed original of the Certificate of Completion of Construction of our Boiler No. 8, signed by David A. Buff, P.E., dated April 12, 1983.

Copies of all compliance tests have been forwarded to the Florida Department of Environmental Regulation in Fort Myers, Florida.

Sincerely,

E. R. Arias
Executive Vice President

ERA/st

Enc.

cc: Mr. T. Michael Taimi, EPA Region IV
Mr. William H. Green, no attachments
Mr. David Buff, no attachments

ok for revision
of VOC limit &
deposition of
new source allowance



Talcahuano

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
AIR POLLUTION SOURCES
CERTIFICATE OF COMPLETION OF CONSTRUCTION*

PERMIT NO. AC 50-42476 DATE: October 28, 1981
Company Name: Sugar Cane Growers Cooperative County: Palm Beach
of Florida
Source Identification(s): Boiler No. 8
Actual costs of serving pollution control purpose: > \$2,000,000
Operating Rates: _____ Design Capacity: 264,000 lb/hr steam; 504x10⁶ Btu/hr
Expected Normal 264,000 lb/hr steam During Compliance Test 248,000 lb/hr steam avg.
Date of Compliance Test: February 4, 1983 (Attach detailed test report)

Test Results:	Pollutant	Actual Discharge	Allowed Discharge
	<u>Particulate</u>	<u>0.12 lb/MM Btu</u>	<u>0.144-0.19 lb/MM Btu*</u>
	<u>Particulate</u>	<u>56.52 lb/hr</u>	<u>69.55-88.55 lb/hr*</u>
	<u>Sulfur Dioxide</u>	<u>2.0 lb/hr</u>	<u>152 lb/hr⁺</u>

Date plant placed in operation: November 15, 1982

This is to certify that, with the exception of deviations noted**, the construction of the project has been completed in accordance with the application to construct and Construction Permit No. AC 50-42476 dated October 28, 1981.

A. Applicant:

Enrique R. Arias
Name of Person Signing (Type) Signature of Owner or Authorized Representative and Title

Date: _____ Telephone: 305-996-5556

B. Professional Engineer:

David A. Buff
Name of Person Signing (Type) Signature of Professional Engineer

Environmental Science & Engineering, Inc. Florida Registration No. 19011
Company Name

Date: April 12, 1983

(Seal)

P.O. Box ESE, Gainesville, Fl. 32602

Mailing Address

904/332-3318

Telephone Number

*This form, satisfactorily completed, submitted in conjunction with an existing application to construct permit and payment of application processing fee will be accepted in lieu of an application to operate.

**As built, if not built as indicated include process flow sketch, plot plan sketch, and updates of applicable pages of application form.

*Construction permit allows revision of the BACT limit up to 0.20 lb/MM Btu for bagasse if the lower limit of 0.15 lb/MM Btu cannot be met on a continuous basis. Lower limit shown reflects bagasse at 0.15 lb/MM Btu, whereas upper limit reflects bagasse at 0.20 lb/MM Btu.



STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
AIR POLLUTION SOURCES
CERTIFICATE OF COMPLETION OF CONSTRUCTION*

PERMIT NO. _____ DATE: _____

Company Name: _____ County: _____

Source Identification(s): _____

Actual costs of serving pollution control purpose: \$ _____

Operating Rates: _____ Design Capacity: _____

Expected Normal _____ During Compliance Test _____

Date of Compliance Test: _____ (Attach detailed test report)

Test Results:	Pollutant	Actual Discharge	Allowed Discharge
	<u>Nitrogen Oxides</u>	<u>58 lb/hr</u>	<u>123 lb/hr</u>
	<u>Carbon Monoxide</u>	<u>40.1%</u>	<u>140 lb/hr</u>
	<u>Volatile Organic</u> Compounds	<u>42.9 lb/hr</u>	<u>140 lb/hr</u>

Date plant placed in operation: _____

This is to certify that, with the exception of deviations noted**, the construction of the project has been completed in accordance with the application to construct and Construction Permit No. _____ dated _____.

A. Applicant:

Name of Person Signing (Type) Signature of Owner or Authorized Representative and Title

Date: _____ Telephone: _____

B. Professional Engineer:

Name of Person Signing (Type) Signature of Professional Engineer

Company Name Florida Registration No. _____

Date: _____

(Seal)

Mailing Address

Telephone Number

*This form, satisfactorily completed, submitted in conjunction with an existing application to construct permit and payment of application processing fee will be accepted in lieu of an application to operate.

**As built, if not built as indicated include process flow sketch, plot plan sketch, and updates of applicable pages of application form.

Sugar Cane Growers Cooperative of Florida

POST OFFICE BOX 666

BELLE GLADE, FLORIDA

RECEIVED

November 4, 1988

NOV 7 1988

Mr. Stephen Smallwood
Bureau Chief
Bureau of Air Quality Management
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

DER-BAQM

Re: Sugar Cane Growers Cooperative of Florida,
Belle Glade, Florida; Boiler No. 8 (AO-50-68945)
(PSD-FL-077)

Dear Mr. Smallwood:

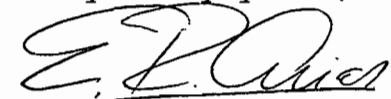
As you will recall, the Florida Department of Environmental Regulation (Department) and the United States Environmental Protection Agency (EPA), issued PSD permits for the above-referenced boiler a few years back. Those permits authorized the construction of a boiler capable of burning various combinations of bagasse, fuel oil, and residue. When the PSD permits were issued, the Sugar Cane Growers Cooperative of Florida (Coop), in concurrence with the Department and EPA, delayed for economic reasons the installation and/or utilization of certain facility components needed to burn residue. The Coop has now completed the installation of equipment necessary to burn bagasse residue at the boiler and will begin burning residue after the season begins this fall.

You will note in reviewing the attached correspondence that the Department and EPA interpreted the compliance testing provisions for this boiler as requiring that a compliance test for residue burning must be made within 60 days following the initial startup of such burning. The Coop will provide you and the Environmental Protection Agency with written notice of startup and the planned test date no later than 30 days after startup occurs. We expect to start up this month.

Mr. Stephen Smallwood
Page 2
November 4, 1988

The purpose of this letter is to apprise the Department and EPA that we are going ahead with the bagasse residue burning capability this season. Please do not hesitate to call if you have any questions regarding this matter.

Very truly yours,

A handwritten signature in dark ink, appearing to read "E. R. Arias", written over a horizontal line.

E. R. Arias
Executive Vice President

ERA:jm

Enclosure

cc: Clair H. Fancy, DER Bureau of Air Quality Management
Winston Smith, EPA Region IV
William H. Green, Esq.
David Buff, P.E.

HOPPING BOYD GREEN & SAMS

ATTORNEYS AND COUNSELLORS
SUITE 420, LEWIS STATE BANK BUILDING
POST OFFICE BOX 6526
TALLAHASSEE, FLORIDA 32301
(904) 222-7500

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March 12, 1982

OF COUNSEL
W. ROBERT FOXES
JOHN C. WHITE

Mr. Steve Smallwood, Chief
Bureau of Air Quality Management
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

Dr. Kent Williams
Air Facilities Branch
U.S. Environmental Protection Agency
Region IV
345 Courtland Street
Atlanta, Georgia 30365

Re: Sugar Cane Growers Cooperative, Belle Glade, Florida
PSD-FL-077
AC50-42476

Dear Sirs:

Our client, Sugar Cane Growers Cooperative of Florida (SCGC), was recently issued federal and Florida PSD permits for the construction of a new bagasse boiler at its existing plant near Belle Glade, Florida. The permits authorized the construction of a boiler capable of burning various combinations of bagasse, residue, and fuel oil.

Certain facility components needed for burning residue, such as residue handling and feeding systems, titanium stack-lining, etc., may not be installed and/or utilized until the boiler has operated on bagasse and/or oil for a season or two. Of course, in such a case, residue burning would be delayed correspondingly. The potential delay in the installation of these items is due primarily to economic factors.

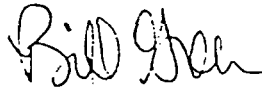
In compliance with General Condition 3 of the federal PSD permit and Specific Condition 6 of the Florida permit, SCGC will conduct performance tests to insure compliance with the established emission limits within sixty (60) days of achieving the maximum production rate or within one hundred eighty (180) days after initial startup of the bagasse and fuel oil burning operations. It is our under-

Mr. Steve Smallwood
Dr. Kent Williams
Page 2
March 8, 1982

standing that the analogous compliance deadlines for residue burning required by federal General Condition 3 and Florida Specific Condition 6 will not kick in until either sixty (60) days after achieving the maximum production rate while burning residue or within one hundred eighty (180) days after the initial startup of residue burning.

We believe that the delayed residue burning and compliance periods described above are consistent with both the federal and state PSD permits and the applicable regulations at 40 C.F.R. §§52.21, 51.24, and Ch. 17-2, Florida Administrative Code. If you disagree with our interpretation or foresee any difficulties with this course of action, please advise us accordingly as soon as possible.

Sincerely,



William H. Green
Counsel for Sugar Cane Growers
Cooperative of Florida

LA/lsd

cc: Mr. C. H. Fancy, Deputy Chief
Bureau of Air Quality Management

Mr. E. R. Arias
Executive Vice President

(HOPPING BOYD GREEN & SAMS)

ATTORNEYS AND COUNSELLORS
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April 7, 1982

OF COUNSEL
W. ROBERT FOKES
JOHN C. WHITE

Mr. Steve Smallwood
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

Re: Sugar Cane Growers Coop. of Florida, Belle Glade,
Florida - AC 50-42476; PSD-FL-077

Dear Mr. Smallwood:

By letter dated March 12, 1982, we corresponded with you and Dr. Kent Williams of EPA on behalf of our client Sugar Cane Growers Coop. of Florida (SCGC). The purpose of that correspondence was to apprise DER and EPA that SCGC might delay the burning of residue for a season or two at its recently permitted new multi-fuel boiler at Belle Glade, Florida. In view of the delay, SCGC sought concurrence from the agencies that compliance testing under Federal General Condition No. 3 and Florida Specific Condition No. 6 would not be required until after residue burning is commenced in the future.

Please find attached a response to our inquiry dated March 25, 1982 from Mr. Tommie A. Gibbs, Chief of EPA Region IV's Air Facilities Branch. As you will note, Mr. Gibbs interprets Federal General Condition No. 3 to allow compliance testing for residue burning within 60 days following initial startup thereof. The 180-day fine tuning period ordinarily allowed for new sources was not believed by Mr. Gibbs to be necessary. SCGC concurs with the position of EPA as stated by Mr. Gibbs, but of course, would reserve the right to seek more than 60 days time for compliance testing in the unlikely event that it should prove necessary.

Today I discussed this matter with Mr. Clare Fancy, Deputy Chief of the Department's Bureau of Air Quality Management. Mr. Fancy advised that DER concurred with EPA's position, but that DER would not rule out an extension of the 60-day compliance deadline should that become necessary.

Thank you for your continued assistance and consideration in this matter.

Sincerely,

Bill Green

William H. Green

WHG/gs
Enclosure

Mr. Steve Smallwood
April 7, 1982
Page 2

cc: Mr. C. H. Fancy, Deputy Chief
Bureau of Air Quality Management

Mr. E. R. Arias
Executive Vice President

Tommie A. Gibbs, Chief
Air Facilities Branch

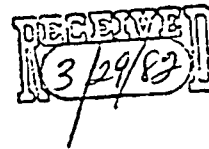


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

MAR 25 1982



REF: 4AW-AF

Mr. William H. Green
Hopping Boyd Green and Sams
Suite 420, Lewis State Bank Building
P.O. Box 6526
Tallahassee, Florida 32301

Dear Mr. Green:

My staff has reviewed your March 12, 1982, request delaying the compliance testing required when burning residue in Sugar Cane Growers' recently permitted bagasse boiler.

EPA's interpretation of Federal General Condition #3 is that the compliance deadline for residue burning will be 60 days following the initial startup of the residue burning. EPA feels that, since maximum production rates will have already been reached for the bagasse and oil boiler fuels, the 180 day fine tuning period should not be necessary in order to reach the maximum residue burning rates.

If you have any questions concerning this matter, please contact Mr. Kent Williams of my staff at (404) 881-4552.

Sincerely yours,

Tommie A. Gibbs

Tommie A. Gibbs, Chief
Air Facilities Branch

AO 50-147870 exp. 05/09/93
504 mmBtu/hr Boiler

APIS ALLOWABLE EMISSIONS

PM 75.6 lbs/hr (0.15 lbs/mmBtu)
SO₂ 565.1 lbs/hr (AP-42)*
NO₂ No entry*
CO 140.0 lbs/hr (AP-42)
VOC 140.0 lbs/hr (AP-42)

* NO_x - 123 lbs/hr in AC 50-42476
* SO₂ limit in AC: 299 lb/hr - residue
152 lb/hr - bagasse

SUGAR CANE GROWERS COOPERATIVE OF FLORIDA

STACK TESTS FOR PARTICULATE, NO_x, SO₂ AND CO EMISSIONS

BOILER No. 8

REPORT 1231-S

JANUARY 27, 1989

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Project Participants	

INTRODUCTION

Sugar Cane Growers Cooperative of Florida operates a raw sugar mill located on Airport Road in Belle Glade, Florida. On January 27, 1989, tests for particulate, carbon monoxide, oxides of nitrogen, and sulfur dioxide were performed on the exhaust stack servicing Boiler No. 8.

The testing was performed in order to comply with the operating permit conditions set forth in Florida Department of Environmental Regulation Operating Permit No. AO 50-147870, and to determine compliance with Chapter 17-2 of the Florida Administrative Code.

Due to the plume from Boiler No. 8 combining with the plumes from surrounding boilers, a visible emission test was not performed.

During the testing period, records of the boiler data were maintained by plant personnel and are presented in the Appendix.

The average emissions during the testing period, were .11 lb./mm btu. The allowable emissions, as determined according to the Thermal Balance Method, were .15 lb./mm btu.

The results of this test verify compliance with the Florida Department of Environmental Regulation, and Chapter 17-2 of the Florida Administrative Code.

SOUTH FLORIDA ENVIRONMENTAL SERVICES, INC.
STACK TESTS FOR PARTICULATE, CO, NOx and SO2 EMISSIONS

Sugar Cane Growers Cooperative of Florida
Post Office Box 666
Belle Glade, Florida 33430

Type Process - Raw Sugar Manufacturing

Boiler No. 8

Abatement Device - Impingement Scrubber

Compliance Stack Test

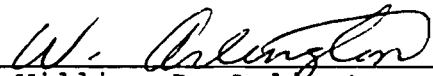
Report 1231-S

January 27, 1989

Run Numbers 1, 2 and 3

All testing and analysis was performed in accordance with the Florida Department of Environmental Regulation, and Chapter 17-2 of the Florida Administrative Code.

I hereby certify that to my knowledge, all data submitted in this report is true and correct.



William D. Arlington
Project Director

ALLOWABLE EMISSION DETERMINATION

The allowable emissions were determined in accordance with Florida Department of Environmental Regulation Operating Permit No. AO 50-147870 and Chapter 17-2 of the the Florida Administrative Code.

Substantiating data and calculations are presented in the Appendix.

<u>Pollutant</u>	<u>Allowable Emissions</u>
Particulate	.15 lb./mm btu 75.6 lbs./hr.
* SO2	299 lbs./hr.
NOx	123 lbs./hr.
CO	140 lbs./hr.
* Non-fossil fuel while burning residue.	

CYCLONIC FLOW DETERMINATION

Due to the configuration of the system, cyclonic flow is considered to be non-existent at the sampling site.

SUMMARY OF RESULTS
 SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
 BOILER NO. 8
 REPORT 1230-S

PARTICULATE

Run	Emission Rate		Allowable Emission Rate	
	lb./mm btu	lb./hr.	lb./mm btu	lb./hr.
1	.12	52.24	.15	62.43
2	.10	41.80	.15	63.37
3	.12	49.51	.15	62.85
Average	.11	47.85	.15	62.88 ✓

OXIDES OF NITROGEN

Run	Emission Rate	Allowable Emission Rate
	lb./hr.	lb./hr.
1	117.86	123
2	118.83	123
3	117.71	123
Average	118.13	123 ✓

SULFUR DIOXIDE

Run	Emission Rate		Allowable Emission Rate	Scrubber Collection Efficiency Percent
	Inlet lb./hr.	Outlet lb./hr.	Outlet lb./hr.	
1	281.79	111.12	299	60.57
2	268.11	127.40	299	52.48
3	277.62	124.24	299	55.25
Average	275.84	120.92	299 ✓	56.16

CARBON MONOXIDE

Run	Emission Rate	Allowable Emission Rate
	Percent	lb./hr.
1	<0.1	140
2	0.0	140
3	<0.1	140
Average	<0.1	140 ✓

TEST RESULTS - PARTICULATE
SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
BOILER NO. 8
REPORT NUMBER 1231-S

	RUN 1	RUN 2	RUN 3
AREA (SQ.FT.)	70.88	70.88	70.88
SAMPLE VOLUME (CU.FT.)	42.92	40.70	40.56
WATER VAPOR (CU.FT.)	11.28	10.24	11.55
SAMPLE MOISTURE (%)	20.82	20.10	22.17
SATURATION MOISTURE (%)	19.64	18.60	19.49
MOLECULAR WEIGHT	27.64	27.77	27.66
VELOCITY (FPM)	2104	1942	1959
VOL.FLOW RATE (ACFM)	149115	137629	138845
VOL.FLOW RATE (SCFM-DRY)	106321	99744	99234
CONCENTRATION (GR/DSCF)	.0573	.0489	.0582
EMISSION RATE (LBS/HR)	52.24	41.80	49.51
% ISOKINETIC	94.45	95.47	95.62

$$CO \text{ EMISSION} = 106,321 \frac{FT^3}{MIN} \times \frac{60 MIN}{HR} \times .001 \text{ CO} \times \frac{28 \# CO}{370 FT^3} = 483 \frac{\# CO}{HR}$$

TEST RESULTS
OXIDES OF NITROGEN
REPORT 1231-S

Calculations

$$VSC = 17.64 (V_f - 25) (P_r/T_f - P_i/T_i)$$

$$M = 2 K_c A F$$

$$C = \frac{(6.243 \times 10^{-5}) M}{VSC}$$

VSC - Sample Volume at Standard Conditions, Dry Basis, ml.
M - Mass of NO_x as NO₂ in Gas Sample, Mg.
C - Concentration of NO_x as NO₂, Dry Basis, Corrected to Standard Conditions, lb./DSCF
E - Emission Rate, lbs./hr.
K_c - 704.8
F - 5

Run	VSC	M	C	Emissions
1	1867.0	559.3	1.87E-05	114.20
2	1870.0	573.6	1.91E-05	116.92
3	1856.7	586.4	1.97E-05	120.40
4	1777.8	559.3	1.96E-05	119.93
5	1808.4	549.3	1.90E-05	115.79
6	1808.0	557.9	1.93E-05	117.62
7	1878.6	595.0	1.98E-05	120.73
8	1835.5	583.6	1.98E-05	121.19
9	1807.2	536.5	1.85E-05	113.16
10	1782.8	560.7	1.96E-05	119.90
11	1771.0	553.6	1.95E-05	119.16
12	1756.4	546.5	1.94E-05	118.60
Average				118.13

TEST RESULTS
SULFUR DIOXIDE
REPORT 1231-S-INLET

Calculations

$$WSO_2 = K_2 (VT - VTB) N (VSOL / VA)$$

$$CSO_2 = (WSO_2 / VM)$$

$$E = CSO_2 \times QS \times 60$$

WSO₂ - Sulfur Dioxide Captured in Sample, lbs.

K₂ - 7.061 x 10⁻⁵ lbs./meg.

VT - Volume of Titrate Sample, mls.

VTB - Volume of Titrate Blank, mls.

N - Normality of Titrate

VSOL - Volume of Solution, mls.

VA - Volume of Aliquot Titrated

CSO₂ - Concentration of Sulfur Dioxide, lbs./DSCF

VM - Volume at the Meter, std. cu./ft.

QS - Volumetric Flow Rate, SCFM

E - Emissions, lbs./hr.

Blank (VTB) = 0.0

Normality (N) = .010185

Date	Run	VT	VSOL	VA	VM	CSO ₂	QS	Emissions
1/27/89	1	35.6	250	5	28.98	4.42E-05	106321	281.79
1/27/89	2	37.9	250	5	30.42	4.48E-05	99744	268.11
1/27/89	3	36.8	250	5	28.38	4.66E-05	99234	277.62
Average								275.84

TEST RESULTS
SULFUR DIOXIDE
REPORT 1231-S-OUTLET

Calculations

$$WSO_2 = K_2 (VT - VTB) N (VSOL / VA)$$

$$CSO_2 = (WSO_2 / VM)$$

$$E = CSO_2 \times QS \times 60$$

WSO₂ - Sulfur Dioxide Captured in Sample, lbs.

K₂ - 7.061 x 10⁻⁵ lbs./meg.

VT - Volume of Titrate Sample, mls.

VTB - Volume of Titrate Blank, mls.

N - Normality of Titrate

VSOL - Volume of Solution, mls.

VA - Volume of Aliquot Titrated

CSO₂ - Concentration of Sulfur Dioxide, lbs./DSCF

VM - Volume at the Meter, std. cu./ft.

QS - Volumetric Flow Rate, SCFM

E - Emissions, lbs./hr.

Blank (VTB) = 0.0

Normality (N) = .010185

Date	Run	VT	VSOL	VA	VM	CSO ₂	QS	Emissions
1/27/89	1	20.8	250	5	43.36	1.74E-05	106321	111.12
1/27/89	2	24.6	250	5	41.96	2.13E-05	99744	124.40
1/27/89	3	24.4	250	5	42.46	2.09E-05	99234	124.24
Average								120.94

FIELD AND ANALYTICAL PROCEDURES
EPA METHOD 5
DETERMINATION OF PARTICULATE EMISSIONS
FROM STATIONARY SOURCES

This method is used in conjunction with Methods 1 through 4 and is applicable for the determination of Particulate Emissions from Stationary Sources.

SUMMARY

A gas sample is extracted isokinetically from the stack through a heated probe and filter. Particulate matter collected in the probe and on the filter is measured gravimetrically. The mass of particulate matter includes any material that condenses at or above the specified temperature.

Volumetric flow rate, moisture and other pertinent parameters are determined simultaneous to particulate collection. Mass concentration and emission rate are then determined based on standard cubic feet of dry gas.

FIELD PROCEDURE

Stack dimensions are determined, including upstream and downstream distances. The number of sampling points and position of each point is layed out in accordance with Method 1. These positions are indicated in this report on the Sampling Point Determination sheet.

The sampling train is assembled as depicted in the Diagram of Stack Sampling Equipment. Impingers are packed in ice to maintain a temperature of <69 degrees fahrenheit. In order to choose the appropriate nozzle size and K factor (sampling rate factor), assumptions are made of stack gas moisture, molecular weight and velocity (based on prior data or an initial traverse). A cyclonic flow determination is performed, if required, according to Method 1.

A leak check of the sampling system and pitots is performed, correcting any leaks encountered.

After the appropriate warm-up of the heated components, the nozzle is unblocked and the probe inserted in the the stack to the first sampling point. The pump is immediately turned on and the sampling rate adjusted to provide an isokinetic flow rate.

Each point is then sampled at an even interval of between two to five minutes, adjusting the flow rate and recording all indicated data on the Field Data Sheet.

A sample of the gas is extracted after leaving the orifice meter for analysis of CO₂, O₂ and CO, where applicable.

After all sampling points have been sampled, observing both minimum sampling time and sample volume as specified, the pump is shut off and the probe removed from the stack. A final leak check is performed on the system and the leakage rate recorded on the Field Data Sheet.

The probe and filter are removed from the sampling train to the clean-up area where all particulates are washed from the probe, nozzle and filter holder front half, then sealed in a bottle marking the liquid level. The filter is removed and sealed in a separate container.

The impingers are removed from the ice bath, all moistures are measured volumetrically. The silica gel is removed and placed in a sealed plastic container .

All samples, including a blank filter, are identified by report and run number or as a blank.

At the conclusion of the last test run a calibration check on the dry gas meter and orifice meter (Y/Yi) is performed. The result is logged on the Field Data Sheets.

LABORATORY PROCEDURES

Upon receipt of the samples, the liquid level is checked for any loss. These solutions are then quantatively transfered to pre-tared beakers and placed along with the filters in an oven at 105 degrees centigrade until dry, then placed in a desicator until cool and weighed to 0.1 mg.

The silica gel is weighed and reported to 0.1 gm.

Prior to field operations, all filters and beakers are pre-conditioned in the same manner as described above, numbered for identification, and weighed to the appropriate tolerance.

The silica gel is pre-dried at 175 degrees centigrade, weighed to 200.0 g. and is placed in a sealed plastic bottle.

The balances are checked using Class-S Weights as specified in the U.S. EPA Quality Assurance Procedures.

Acetone residues are used as specified by the supplier (not to exceed .001%).

CALCULATIONS

All calculations are identical to those given in reference Methods 1 through 5.

FIELD SAMPLING EQUIPMENT

Probe Nozzle - 316 Stainless steel, button hook configuration with a sharp leading edge.

Probe - 316 Stainless steel inner core wrapped with heating wire and insulation to maintain a temperature of 250 degrees fahrenheit.

Pitot Tubes - Stainless steel, Type S, attached to the probe.

Filter Holder - Borosilicate glass with a stainless steel frit filter support and 28/15 joints attached directly to the probe.

Impingers - Glass with ball joints and glass U-tube connectors connected in series. The first, third and fourth being modified Greenburg-Smith type. The second, Greenburg-Smith with standard tip. The first and second impingers containing 100 mls. of distilled water, the third impinger left empty, and the fourth containing 200.0 g of silica gel.

Control Box - Contains a dual inclined manometer, Rockwell 175-S dry gas meter, orifice meter, vacuum gauge, thermocouples to measure the dry gas meter, impinger outlet, stack and filter temperatures, and the necessary tubing and valves to maintain leak-free sampling.

Pump - Sliding vane type, maintained leak free to move the sample gas through the system.

Thermocouple Probes - Copper constantan with stainless steel outer sheath. The stack thermocouple probe is attached directly to the main probe. The filter probe is inserted in the lower portion of the filter holder directly in the gas stream.

Umbilical Cord - Of sufficient length to connect the probe and filter to the control box and impingers, including all necessary wiring and tubing for temperature control, sample transfer, and pitot pressures. All tubing and fittings are leak free.

Barometer - Aneroid type capable of measuring atmospheric pressure to plus or minus 0.1" hg.

Orsat Gas Analyzer - Used to determine CO₂ and O₂ when required for molecular weight determination and when Method 19 is not required.

*** All equipment is designed in accordance with "Maintenance, Calibration, and Operation of Source-Sampling Equipment," (APTD-0576).

CALIBRATION

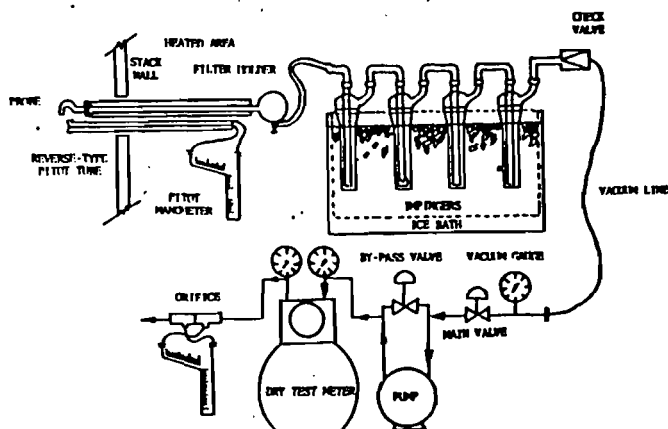
All equipment calibrations are performed in accordance with the procedures outlined in EPA - Quality Assurance Manual, Volume III and logged in the Calibration Log Book.

Calibrations are performed periodically to comply with the frequency of calibrations specified by the State of Florida Department of Environmental Regulation and the appropriate reference method. Additional calibrations are performed whenever equipment is damaged.

The latest calibrations are included in this report.

*** The procedures described above are not to be considered as complete test procedures used, but as a general overview of the methods employed.

Diagram of Method 5 Sampling Train



All laboratory and field procedures were performed in accordance with EPA Reference Method 7. Calibrations and Quality Assurance was performed as described in the EPA Quality Assurance Handbook III.

Figure 1 is a schematic diagram of the apparatus for the study of the effect of the rate of flow of gas on the rate of reaction. The diagram shows a gas supply system with a pressure gauge, a flowmeter, and a reaction vessel. The reaction vessel is a glass flask containing a solid sample, with a gas inlet and outlet. The gas inlet is connected to a gas supply line, and the gas outlet is connected to a gas flowmeter. The reaction vessel is surrounded by a cooling jacket. The diagram is labeled with various components and their functions:

- Pressure Gauge:** Located at the top left, connected to the gas supply line.
- Flowmeter:** Located at the top right, connected to the gas supply line.
- Reaction Vessel:** A glass flask containing a solid sample, with a gas inlet and outlet.
- Cooling Jacket:** Surrounds the reaction vessel, with a gas inlet and outlet.
- Gas Supply Line:** Connects the pressure gauge and flowmeter to the reaction vessel.
- Gas Inlet:** Connects the gas supply line to the reaction vessel.
- Gas Outlet:** Connects the reaction vessel to the flowmeter.
- Labels:**
 - Pressure Gauge
 - Flowmeter
 - Reaction Vessel
 - Cooling Jacket
 - Gas Supply Line
 - Gas Inlet
 - Gas Outlet

* Values 1-4, Sampling tests, based on 1000 and 2000.

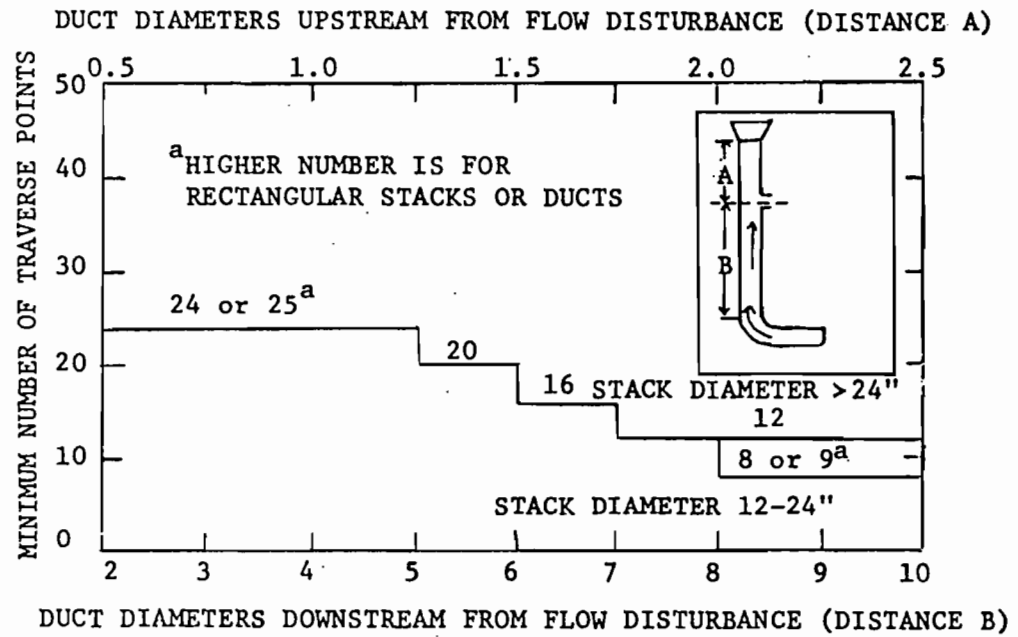
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FIELD AND ANALYTICAL PROCEDURES
EPA METHOD 6
DETERMINATION OF SULFUR DIOXIDE EMISSIONS
FROM STATIONARY SOURCES

Determination of sulfur dioxide was accomplished by utilizing the option of simultaneous determination with Method 5. The water in the impingers is replaced with 3% H_2O_2 as specified in the reference method.

Upon completion of each test run, the H_2O_2 solution was removed from the impingers, measured and titrated with standard barium chloride.

SAMPLING POINT DETERMINATION



CIRCULAR STACKS

Number of points equal next higher multiple of four.

RECTANGULAR STACKS

Number Traverse Points	Subarea Layout Matrix
9	3 x 3
12	4 x 3
16	4 x 4
20	5 x 4
25	5 x 5
30	6 x 5
36	6 x 6
42	7 x 6
49	7 x 7

SAMPLING POINT DETERMINATION
SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
BOILER NO. 8

STACK CONFIGURATION: CIRCULAR

DIAMETER (INCHES): 114

DISTANCE A - PORT TO DOWNSTREAM DISTURBANCE (INCHES): 339

DISTANCE B - PORT TO UPSTREAM DISTURBANCE (INCHES): 570

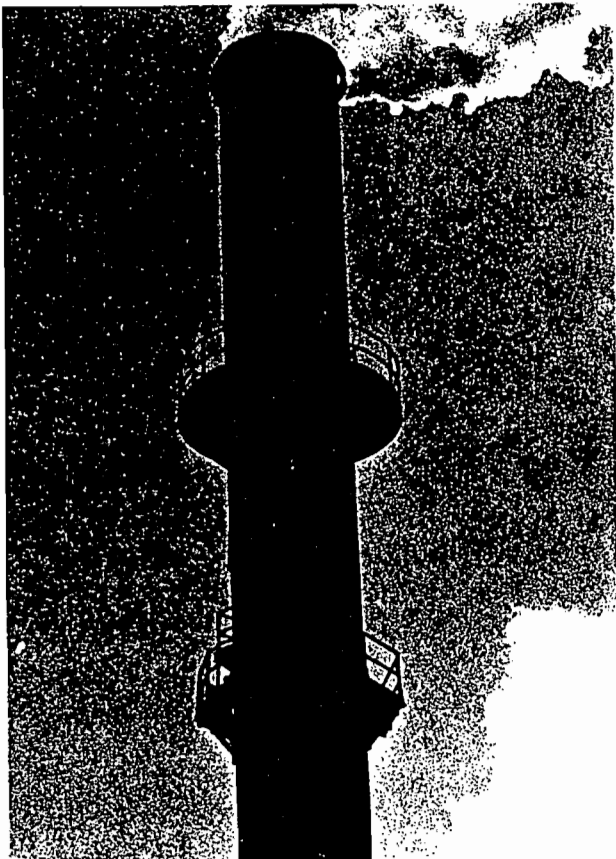
NUMBER OF SAMPLING POINTS: 20

NUMBER OF TEST PORTS: 4

NUMBER OF POINTS ON A TRAVERSE: 5

POINT LOCATION ON A TRAVERSE:

TRAVERSE POINT NUMBER	INCHES TO STACK WALL
1	2.9
2	9.3
3	16.7
4	25.8
5	39



SUMMARY OF FIELD AND LABORATORY DATA
 SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
 BOILER NO. 8
 REPORT NUMBER 1231-S

	RUN 1	RUN 2	RUN 3
DATE	1-27-89	1-27-89	1-27-89
START TIME	0915	1150	1407
STOP TIME	1100	1356	1513
CP FACTOR	.806	.806	.806
Y	.9935	.9935	.9935
Y/YI	.9937	.9937	.9937
^HA	1.704	1.704	1.704
DIAMETER OF NOZZLE (IN.)	.3043	.3043	.3043
DIAMETER OF STACK (IN.)	114	114	114
NO. STACKS	1	1	1
STATIC PRES. (IN. H2O)	-.22	-.22	-.22
BAROMETRIC PRES. (IN. HG)	30.21	30.21	30.21
TEST TIME (MIN.)	60	60	60
METER VOLUME (CU.FT.)	43.36	41.96	42.46
SQ.RT.^P (IN.H2O)	.600	.556	.559
ORFICE PRES. ^H (IN.H2O)	2.024	1.720	1.742
AVG.METER TEMP. (DEG.F)	77.5	88.1	96.6
AVG.STACK TEMP. (DEG.F)	140.3	138.2	140.0
TOTAL PARTICULATE WT. (GMS)	.1595	.1290	.1530
WATER COLLECTED (MLS)	239.7	217.5	245.4
MOLECULAR WT. (DRY)	30.00	30.00	30.00
SATURATION MOISTURE (%)	19.64	18.60	19.49

Field Data Sheets

R

Y/Y_i 1.9937
 ΔH_a 1.704
Dn 3043
DIAMETER (in) 114
NO. DUCT 1
STATIC PRES. - .22
BAR. PRES. (in. Hg) 30.21
TEST TIME (min) 60
METERED VOL. 43.36
AVE. $\sqrt{\Delta P}$.60
AVG. ΔH 2.024
AVG. METER TEMP. 77.5
AVG. STACK TEMP. 140.3

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	DRY GAS METER CU. FT.	VELOCITY HEAD (Δp) in. H_2O	PRESSURE ORIFICE METER ΔH in H_2O	DRY GAS TEMP. (°F)	PUMP VACUUM (in. Hg.)	IMPINGER (°F)	FILTER TEMP. (°F)	STACK TEMP. (°F)
		159.32							
1	3	160.21	.24	1.33	75	6	57	200	142
2	}	162.31	.29	1.60	75	6	50	220	143
3		164.31	.34	1.88	74	6	52	226	142
4		166.81	.37	2.05	73	9	53	242	140
5		168.97	.37	2.05	73	9	53	250	141
	—	—	—	—	—	—	—	—	—
1	3	170.165	.19	1.05	74	7	54	225	140
2	}	172.55	.28	1.55	74	8	52	252	140
3		174.45	.30	1.66	74	8	52	255	139
4		176.45	.31	1.71	74	9	52	255	140
5		178.12	.34	1.88	75	10	52	258	140
	—	—	—	—	—	—	—	—	—
1	3	179.68	.21	1.16	80	8	66	227	139
2	}	181.99	.38	2.10	80	10	58	230	140
3		184.27	.39	2.16	80	11	57	242	139
4		186.41	.44	2.43	80	11	59	252	139
5		189.17	.48	2.65	80	12	60	256	139
	—	—	—	—	—	—	—	—	—
1	3	191.54	.42	2.32	81	12	62	231	140
2	}	193.92	.46	2.54	82	12	60	245	140
3		196.32	.49	2.71	82	14	59	246	141
4		199.11	.51	2.82	82	14	58	252	141
5		201.68	.51	2.82	82	14	57	259	140
* Pump out for		20 min	(10:10 to 10:30)						

2

Y/Y_i 0.9937
 ΔH_a 1.704
Dn 3043
DIAMETER (in) 114
NO. DUCT 1
STATIC PRES. - .22
BAR. PRES. (in. Hg) 30.21
TEST TIME (min) 60
METERED VOL. 41.96
AVE. $\sqrt{\Delta P}$.556
AVG. ΔH 1.72
AVG. METER TEMP. 88.1
AVG. STACK TEMP. 138.2

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	DRY GAS METER CU. FT.	VELOCITY HEAD (Δp) in. H ₂ O	PRESSURE ORIFICE METER ΔH in H ₂ O	DRY GAS TEMP. (°F)	PUMP VACUUM (in. Hg.)	IMPINGER (°F)	FILTER TEMP. (°F)	STACK TEMP. (°F)
5432	3	201.97	29	1.60	85	2	68	200	139
5432	3	203.92	32	1.77	85	6	59	228	138
5432	3	206.02	32	1.77	85	6	59	228	138
5432	3	208.30	36	1.99	84	7	60	232	139
5432	3	210.61	37	2.05	85	7	60	250	138
5432	3	212.88	39	2.16	85	9	59	257	138
5432	3	214.87	24	1.33	85	7	60	250	139
5432	3	216.92	29	1.60	84	8	59	254	138
5432	3	219.02	31	1.71	86	8	59	260	139
5432	3	221.02	31	1.71	87	8	59	260	138
5432	3	223.15	34	1.88	87	8	59	259	137
5432	3	224.91	20	1.11	88	7	62	222	135
5432	3	226.91	28	1.55	89	9	60	250	138
5432	3	228.95	24	1.33	89	9	60	252	138
5432	3	231.00	29	1.60	90	10	60	254	139
5432	3	232.99	32	1.77	90	10	59	253	137
5432	3	235.11	29	1.60	91	10	62	227	138
5432	3	237.30	34	1.88	92	10	59	246	138
5432	3	239.47	34	1.88	92	11	58	251	139
5432	3	241.71	33	1.82	93	12	58	251	139
5432	3	243.93	37	2.05	93	12	58	249	140

PARTICULATE FIELD DATA

PLANT Sugar Cane Growers
 REPORT 1231-5-3
 DATE January 27, 1959
 OPERATOR A
 TIME 1407-1513
 K FACTOR 5.53
 ASSUMED MOISTURE % 20
 DRY GAS METER NO. 4
 NOZZLE ID NO. #10
 WET BULB TEMP. —
 POST LEAK CHECK .005 CFM @ 15"
 Cp 806 (24)
 Y 9935

Y/Y_i .9937
 ΔH_a 1.704
 Dn 3043
 DIAMETER (in) 114
 NO. DUCT 1
 STATIC PRES. -.22
 BAR. PRES. (in. Hg) 30.21
 TEST TIME (min) 60
 METERED VOL. 42.46
 AVE. $\sqrt{\Delta p}$.559
 AVG. ΔH 1.742
 AVG. METER TEMP. 96.6
 AVG. STACK TEMP. 140.0

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	DRY GAS METER CU. FT.	VELOCITY HEAD (Δp) in. H ₂ O	PRESSURE ORIFICE METER ΔH in H ₂ O	DRY GAS TEMP. (°F)	PUMP VACUUM (in. Hg.)	IMPINGER (°F)	FILTER TEMP. (°F)	STACK TEMP. (°F)
1	3	244.31							
2		246.51	30	1.66	95	7	64	239	151
3		248.68	32	1.77	95	7	55	239	140
4		250.91	35	1.94	95	8	57	252	140
5		253.21	37	2.05	95	9	59	242	140
5		255.48	38	2.10	96	9	59	233	140
1	3	257.42	24	1.33	96	8	62	230	140
2		259.51	28	1.55	96	8	59	244	140
3		261.56	30	1.66	96	9	59	252	140
4		263.98	32	1.77	96	10	59	258	140
5		265.95	35	1.94	96	10	59	260	140
1	3	269.72	20	1.11	97	8	62	226	140
2		269.81	20	1.11	97	8	60	250	140
3		271.71	34	1.88	97	10	60	244	140
4		274.01	35	1.94	97	11	59	240	139
5		276.15	34	1.88	97	11	59	235	139
1	3	278.10	24	1.33	98	10	61	240	134
2		280.10	31	1.71	98	10	58	242	138
3		282.37	36	1.99	98	11	58	250	140
4		284.62	37	2.05	98	12	59	259	139
5		286.77	38	2.10	98	12	54	263	140

31.2
2.5

OXIDES OF NITROGEN

FIELD DATA

REPORT 1231-S

OPERATOR WA

SAMPLE LOCATION Ports

DATE 1-27-89

INSTALLATION Boiler # 8

BAROMETRIC PRESSURE 30.21

SAMPLE NUMBER	FLASK & VALVE NUMBER	SAMPLE TIME	PROBE TEMPERATURE	LEG A _i	LEG B _i	INITIAL PRESSURE	INITIAL TEMPERATURE
1	1	0924	140°F	31.5	2.5	1.21	73
2	2	0941	140°F	31.5	2.5	1.21	73
3	3	0955	139°F	31.5	2.5	1.21	73
4	4	1010	140°F	31.5	2.5	1.21	74
5	5	1202	138°F	31.6	2.4	1.01	77
6	6	1218	137°F	31.7	2.3	.81	78
7	7	1230	138°F	31.7	2.3	.81	79
8	8	1244	138°F	31.7	2.3	.81	81
9	9	1422	140°F	31.6	2.4	1.01	82
10	10	1437	140°F	31.7	2.3	.81	82
11	11	1450	139°F	31.7	2.3	.81	83
12	12	1505	138°F	31.6	2.4	1.01	83

PARTICULATE FIELD DATA

PLANT Sugar Cane Growers

REPORT 1231-S-1-Inlet-SO₂

DATE January 27, 1989

OPERATOR WDA

TIME 0915-1055

K FACTOR 1

ASSUMED MOISTURE % _____

DRY GAS METER NO. 5

NOZZLE ID NO.

WET BULB TEMP. _____

POST LEAK CHECK ccy CF @ 15'

Cp _____

$$Y \quad 1.025$$
$$Y/Y_i \quad .9981$$
$$\Delta H_a \quad \underline{\quad 2.107 \quad}$$

Dn _____

DIAMETER (in) _____

NO. DUCT 1

STATIC PRES. _____

BAR. PRES. (in. Hg) 30.21

TEST TIME (min) 60

METERED VOL. 28.98

AVE. $\sqrt{\Delta p}$ _____

AVG. ΔH 1.000

AVG. METER TEMP. 76.0

AVG. STACK TEMP.

Boiler # 8 inlet

[illegible]

PARTICULATE FIELD DATA

REPORT 1231-8-2-Intel-502

OPERATOR Wf

K FACTOR 1

DRY GAS METER NO. 5

WET BULB TEMP.

Cp _____

Y 1.025

ΔH_a 2.107

DIAMETER (in) _____

NO. D001 _____

STATIC PRES _____

BAR PRES (in Hg) 30.21

TEST TIME (min) 60

METERED VOL 30.42

METERED VOL. 25.0

AVE $\sqrt{A \cdot B}$ 1

AVG ΔH 1.000

AVG. METER TEMP 81.3

AVG. METEOTEMP. 54.5

AVG. STACK TEMP

[illegible]

PARTICULATE FIELD DATA

PLANT Sugar Cane Growers Coop.

REPORT 1231-8-3-Tale SO₂

DATE 1-27-89

OPERATOR W

TIME 1400 - 1500

K FACTOR

ASSUMED MOISTURE %

DRY GAS METER NO. 5

NOZZLE ID NO.

WET BULB TEMP. →

POST LEAK CHECK 006 cfm @ 15"

Cp _____

Y 1.025

Y/Y: .9981

$$\Delta H_a \quad \underline{2.107}$$

Dn _____

DIAMETER (in) _____

NO. DUCT _____

STATIC PRES. _____

BAR. PRES. (in. Hg) 30.21

TEST TIME (min) 60

METERED VOL. 28.38

AVE. $\sqrt{\Delta p}$ _____

AVG. ΔH .956

AVG. METER TEMP. 87.3

AVG. STACK TEMP.

[illegible]

GAS ANALYSIS DATA FORM

PLANT Sugar Cane Growers Cooperative of Florida
 DATE 1/27/89 TEST NO. 1231-S-1
 SAMPLING TIME (24-hr CLOCK) 0913 - 1058
 SAMPLING LOCATION Exhaust Stack Sample Ports
 SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated Bag
 ANALYTICAL METHOD Orsat
 AMBIENT TEMPERATURE 73°F
 OPERATOR WDA

COMMENTS:

RUN GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M _d .
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO ₂	8.5		8.5		8.5		8.5	44/100	3.740
O ₂ (NET IS ACTUAL O ₂ READING MINUS ACTUAL CO ₂ READING)	19.6	11.1	19.6	11.1	19.6	11.1	11.1	32/100	3.552
CO (NET IS ACTUAL CO READING MINUS ACTUAL O ₂ READING)	19.6		19.7		19.6		40.1	28/100	
N ₂ (NET IS 100 MINUS ACTUAL CO READING)	80.4		80.3		80.4		80.4	28/100	22.512
TOTAL									29.804

GAS ANALYSIS DATA FORM

PLANT Sugar Cane Growers Cooperative of Florida

COMMENTS:

DATE 1/27/89 TEST NO. 1231-S- 2SAMPLING TIME (24-hr CLOCK) 1153 - 1255SAMPLING LOCATION Exhaust Stack Sample PortsSAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated BagANALYTICAL METHOD OrsatAMBIENT TEMPERATURE 77° FOPERATOR WDA

RUN GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO ₂	9.1		9.1		8.9		9.0	44/100	3.960
O ₂ (NET IS ACTUAL O ₂ READING MINUS ACTUAL CO ₂ READING)	19.3	10.2	19.6	10.5	19.3	10.4	10.4	32/100	3.328
CO (NET IS ACTUAL CO READING MINUS ACTUAL O ₂ READING)	19.3	0	19.6	0	19.3	0	0	28/100	0
N ₂ (NET IS 100 MINUS ACTUAL CO READING)	80.7		80.4		80.7		80.6	28/100	22.568
TOTAL								29.856	

GAS ANALYSIS DATA FORM

PLANT Sugar Cane Growers Cooperative of Florida
 DATE 1/27/89 TEST NO. 1231-S-3
 SAMPLING TIME (24-hr CLOCK) 1400 - 1500
 SAMPLING LOCATION Exhaust Stack Sample Ports
 SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated Bag
 ANALYTICAL METHOD Orsat
 AMBIENT TEMPERATURE 80 °F
 OPERATOR WDA

COMMENTS:

RUN GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M _d
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO ₂	8.8		8.8		8.8		8.8	44/100	3.872
O ₂ (NET IS ACTUAL O ₂ READING MINUS ACTUAL CO ₂ READING)	19.6	10.8	19.6	10.8	19.6	10.8	10.8	32/100	3.456
CO (NET IS ACTUAL CO READING MINUS ACTUAL O ₂ READING)	19.6	0	19.6	0	19.6	0	0	28/100	
N ₂ (NET IS 100 MINUS ACTUAL CO READING)	80.4		80.4		80.4		80.4	28/100	22.512
TOTAL									29.84

Laboratory Data Sheets

LABORATORY DATA

SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
BOILER NO. 8
REPORT NUMBER 1231-S-1

DATE 1-30-89

FILTER NUMBER 3525

FINAL WEIGHT	.4827	GRAMS
TARE WEIGHT	.3405	GRAMS
DIFFERENCE	.1422	GRAMS

BEAKER NUMBER 21

FINAL WEIGHT	97.4742	GRAMS
TARE WEIGHT	97.4553	GRAMS
DIFFERENCE	.0189	GRAMS

FILTER BLANK NO 3533

FINAL WEIGHT	.3454	GRAMS
TARE WEIGHT	.3454	GRAMS
DIFFERENCE	0.0000	GRAMS

WASH DOWN BLANK

VOLUME OF RINSE	210	MLS
SOLUTION RESIDUE	7.843E-06	GR/ML
TOTAL RESIDUE	1.6E-03	GRAMS

TOTAL PARTICULATE WEIGHT	.1595	GRAMS

WATER COLLECTED

TOTAL WATER	428.3	MLS
INITIAL WATER	200.0	MLS
FINAL SILICA	211.4	GRAMS
INITIAL SILICA	200.0	GRAMS

TOTAL WATER COLLECTED	239.7	MLS

ANALYST



LABORATORY DATA

SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
BOILER NO. 8
REPORT NUMBER 1231-S-2

DATE 1-30-89

FILTER NUMBER 3526

FINAL WEIGHT	.4598	GRAMS
TARE WEIGHT	.3420	GRAMS
DIFFERENCE	.1178	GRAMS

BEAKER NUMBER 22

FINAL WEIGHT	83.6618	GRAMS
TARE WEIGHT	83.6491	GRAMS
DIFFERENCE	.0127	GRAMS

FILTER BLANK NO 3533

FINAL WEIGHT	.3454	GRAMS
TARE WEIGHT	.3454	GRAMS
DIFFERENCE	0.0000	GRAMS

WASH DOWN BLANK

VOLUME OF RINSE	195	MLS
SOLUTION RESIDUE	7.843E-06	GR/ML
TOTAL RESIDUE	1.5E-03	GRAMS

TOTAL PARTICULATE WEIGHT .1290 GRAMS

WATER COLLECTED

TOTAL WATER	406.3	MLS
INITIAL WATER	200.0	MLS
FINAL SILICA	211.2	GRAMS
INITIAL SILICA	200.0	GRAMS

TOTAL WATER COLLECTED 217.5 MLS

ANALYST *CA*

LABORATORY DATA

SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
BOILER NO. 8
REPORT NUMBER 1231-S-3

DATE 1-30-89

FILTER NUMBER 3528

FINAL WEIGHT	.4817	GRAMS
TARE WEIGHT	.3437	GRAMS
DIFFERENCE	.1380	GRAMS

BEAKER NUMBER 23

FINAL WEIGHT	103.6739	GRAMS
TARE WEIGHT	103.6573	GRAMS
DIFFERENCE	.0166	GRAMS

FILTER BLANK NO 3533

FINAL WEIGHT	.3454	GRAMS
TARE WEIGHT	.3454	GRAMS
DIFFERENCE	0.0000	GRAMS

WASH DOWN BLANK

VOLUME OF RINSE	205	MLS
SOLUTION RESIDUE	7.843E-06	GR/ML
TOTAL RESIDUE	1.6E-03	GRAMS

TOTAL PARTICULATE WEIGHT .1530 GRAMS

WATER COLLECTED

TOTAL WATER	432.3	MLS
INITIAL WATER	200.0	MLS
FINAL SILICA	213.1	GRAMS
INITIAL SILICA	200.0	GRAMS

TOTAL WATER COLLECTED 245.4 MLS

ANALYST

A

Optimum Wavelength Determination Data Form

Spectrophotometer number 7122 Date 1-28-89Calibrated by ut Reviewed by _____

Spectrophotometer setting, nm	Absorbance of standard OD ^a	Absorbance of blank OD ^b	Actual absorbance of OD ^c
399	.277	.013	.265
400	.278	.013	.265
401	.279	.012	.267
402	.280	.011	.269
403	.281	.011	.276
404	.282	.010	.272
405	.283	.009	.274
406	.284	.009	.275
407	.284	.008	.276
408	.282	.009	.273
409	.282	.009	.273
410	.281	.010	.271
411	.280	.011	.269
412	.278	.012	.266
413	.277	.012	.265
414	.277	.013	.264
415	.276	.014	.262
416	.275	.016	.259

^a Absorbance of the 200 µg NO₂ standard in a single beam spectrophotometer.^b Absorbance of the blank in a single-beam spectrophotometer.^c For a single-beam spectrophotometer — absorbance of the standard minus absorbance of the blank.
For a double beam spectrophotometer — absorbance of the 200 µg NO₂ standard with the blank in the reference cell.Spectrophotometer setting for maximum actual absorbance of standard 407 nm.

If the maximum actual absorbance occurs at the spectrophotometer setting of 399 or 416 nm, the spectrophotometer must be repaired or recalibrated.

Standard Solution and Control Sample
Analytical Data Form

Plant Sugar Cane Growers Coop. Date 1-28-89

Analyst WA Optimum wavelength 407 nm

Blank used as reference? yes

Sample number	Sample, μg	Working solution	Control sample	Measured, absorbance, OD	Calculated absorbance, ^a OD	Absorbance comparison error, ^b %
A1	100	x		.140	—	—
A2	200	x		.281	—	—
A3	300	x		.417	—	—
A4	400	x		.563	—	—
S1	100		x	.139	.140	- 0.84%
S2	200		x	.277	.280	- 1.19%
S3	300		x	.409	.421	- 2.74%
						Avg ^c 1.59

$$K_c = 100 \left[\frac{A_1 + 2A_2 + 3A_3 + 4A_4}{A_1^2 + A_2^2 + A_3^2 + A_4^2} \right] = \underline{713.4}$$

^aCalculated absorbance: $OD = (\mu\text{g})/K_c$ i.e., S1 calculated absorbance = $100/K_c$.

^bAbsorbance comparison errors:

$$\% = 100 \times \frac{(\text{measured absorbance, OD}) - (\text{calculated absorbance, OD})}{\text{calculated absorbance, OD}}$$

^cAverage of absolute values.

OXIDES OF NITROGENLABORATORY DATAREPORT 1231-5ANALYST UAkc 713.4DATE 1-28-89BAROMETRIC PRESSURE 30.29Ph ADJUSTMENT MADE yes

SAMPLE NUMBER	FLASK & VALVE NUMBER	TIME	LEG A _f	LEG B _f	FINAL PRESSURE P _f	FINAL TEMPERATURE T _f	FLASK VOLUME V _f	ABSORBANCE A	DILUTION FACTOR f
1	1	0720	17.6	16.5	29.19	76.2	2053	.392	1
2	2	0722	17.5	16.5	29.29	76	2049	.402	1
3	3	0724	17.6	16.4	29.09	76	2049	.411	1
4	4	0726	18.2	15.8	27.89	76	2050	.392	1
5	5	0728	18.1	15.9	28.09	76	2054	.385	1
6	6	0730	18.2	15.9	27.99	76	2046	.391	1
7	7	0732	17.6	16.4	29.09	77	2047	.417	1
8	8	0734	18.0	16.0	28.29	76	2054	.409	1
9	9	0736	18.1	15.9	28.09	76	2052	.376	1
10	10	0738	18.3	15.6	27.59	77	2051	.393	1
11	11	0740	18.4	15.6	27.49	77	2045	.388	1
12	12	0742	18.5	15.6	27.39	77	2051	.383	1
Blank	13	0744	18.1	15.9	28.09	77	2048	0.00	1

Allowable Emission Data Sheets

ALLOWABLE EMISSIONS

SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
BOILER NO. 8
RUN NUMBER 1231-S-1

BTU OF STEAM @ 600 F & 463 PSIA	1301.2 BTU/LB
BTU OF FEED WATER @ 260 F & 613 PSIA	229.7 BTU/LB
NET BTU VALUE OF STEAM	1071.5 BTU/LB

INITIAL INTEGATOR READING 2373

FINAL INTEGATOR READING 2497

INTEGATOR FACTOR 3500

TOTAL TIME (MIN.) 105

STEAM PRODUCTION RATE	248000 LB/HR

FURNACE EFFICENCY	62.5%

TOTAL HEAT INPUT	425.2 MBTU/HR

INITIAL OIL READING 2953

FINAL OIL READING 3266

HEAT INPUT - OIL	26.8 MBTU/HR

HEAT INPUT - RESIDUE	398.3 MBTU/HR

ALLOWABLES - OIL @ .1 LB/MBTU	2.68 LB/HR

ALLOWABLES - RESIDUE @ .15 LB/MBTU	59.75 LB/HR

TOTAL ALLOWABLES @ .147 LB/MBTU	62.43 LB/HR

ALLOWABLE EMISSIONS

SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
BOILER NO. 8
RUN NUMBER 1231-S-2

BTU OF STEAM @ 600 F & 463 PSIA	1301.2 BTU/LB
BTU OF FEED WATER @ 260 F & 613 PSIA	229.7 BTU/LB
NET BTU VALUE OF STEAM	1071.5 BTU/LB
INITIAL INTEGATOR READING	2554
FINAL INTEGATOR READING	2639
INTEGATOR FACTOR	3500
TOTAL TIME (MIN.)	71
STEAM PRODUCTION RATE	251408.5 LB/HR
FURNACE EFFICENCY	62.5%
TOTAL HEAT INPUT	431 MBTU/HR
INITIAL OIL READING	3417
FINAL OIL READING	3620
HEAT INPUT - OIL	25.7 MBTU/HR
HEAT INPUT - RESIDUE	405.3 MBTU/HR
ALLOWABLES - OIL @ .1 LB/MBTU	2.57 LB/HR
ALLOWABLES - RESIDUE @ .15 LB/MBTU	60.79 LB/HR
TOTAL ALLOWABLES @ .147 LB/MBTU	63.37 LB/HR

ALLOWABLE EMISSIONS

SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
BOILER NO. 8
RUN NUMBER 1231-S-3

BTU OF STEAM @ 600 F & 465 PSIA	1301.2 BTU/LB
BTU OF FEED WATER @ 260 F & 615 PSIA	229.7 BTU/LB
NET BTU VALUE OF STEAM	1071.5 BTU/LB

INITIAL INTEGATOR READING 2704

FINAL INTEGATOR READING 2799

INTEGATOR FACTOR 3500

TOTAL TIME (MIN.) 80

STEAM PRODUCTION RATE	249375 LB/HR

FURNACE EFFICENCY	62.5%

TOTAL HEAT INPUT	427.5 MBTU/HR

INITIAL OIL READING 3791

FINAL OIL READING 4018

HEAT INPUT - OIL	25.5 MBTU/HR

HEAT INPUT - RESIDUE	402 MBTU/HR

ALLOWABLES - OIL @ .1 LB/MBTU	2.55 LB/HR

ALLOWABLES - RESIDUE @ .15 LB/MBTU	60.3 LB/HR

TOTAL ALLOWABLES @ .147 LB/MBTU	62.85 LB/HR

Process Data

PROCESS DATA

COMPANY Sugar Cane Growers INSTALLATION Boiler No 8
 DATE January 27, 1989 REPORT NO. 1231-5

TYPE OF INSTALLATION Boiler

TYPE OF MATERIAL PROCESSED Steam

TYPE(S) OF FUEL USED Residue and Oil

TYPE OF POLLUTION CONTROL SYSTEM Impingement Scrubber

GENERAL CONDITION OF CONTROL EQUIPMENT Good

	NORMAL	RUN 1	RUN 2	RUN 3
FUEL USED	<u>- See Attached -</u>			

SCRUBBER WATER FLOW RATE GPM	1000-1500		1310		1304		1298	
	N	S	N	S	N	S	N	S
PRESSURE DROP (INCHES)	8-10	8-10	9	9 1/2	9	10	9 1/2	10
TOTAL OPERATING CURRENT	n/a		n/a		n/a		n/a	
MATERIALS PROCESSED	<u>- See Attached -</u>							

COMPANY REPRESENTATIVE Dennis Sellers

TITLE Elect. Engr

BOILER DATA SHEETCOMPANY Sugar Cane GrowersBOILER NUMBER 8DATE January 27, 1989REPORT NO. 1231-5INTEGRATOR FACTOR 3500OIL METER FACTOR —

TIME	INTEGRATOR	OIL METER	STEAM			FEED WATER	
			FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
9:13	162373	262953	250000	600	445	260	590
9:33			245000	600	450	260	600
9:53			250000	600	450	260	600
10:13			250000	600	445	260	600
10:33			245000	600	445	260	600
10:43			250000	600	440	260	600
10:58	162497	263266	FINISH				
11:49	162554	263417	245000	600	450	260	600
12:09			250000	600	450	260	600
12:29			245000	600	440	260	590
12:49			250000	600	450	260	600
1:00	162639	263620					
1:56	162704	263791	250000	600	450	260	600
2:16			245000	600	450	260	600
2:36			245000	600	450	260	600
2:56			240000	600	450	260	600
~~3:00~~							
3:16	162799	264018					

SIGNED

Dennis MillerD/F
N
9

9

9

[illegible]

Calculations for Run 1 - Particulate

CALCULATIONS FOR RUN 1

STACK AREA

(DIAMETER / 24)SQ. X 3.1416 X NO. OF STACKS

(114 / 24)SQ. X 3.1416 X 1

70.882

STACK PRESSURE

BAROMETRIC PRESSURE + (STATIC PRESSURE / 13.6)

30.21 + (-.22 / 13.6)

30.194

SAMPLE VOLUME

17.64 X (Y) X METER VOLUME X STACK PRESURE / (METER TEMP. + 460)

17.64 X .9935 X 43.36 X 30.194 / (77.5 + 460)

42.92

WATER VAPOR VOLUME

.04707 X WATER COLLECTED

.04707 X 239.72

11.284

PERCENT MOISTURE

100 X WATER VAPOR VOLUME / (WATER VAPOR VAPOR VOLUME + SAMPLE VOLUME)

100 X 11.284 / (11.284 + 42.92)

20.817

CALCULATIONS FOR RUN 1

SATURATION MOISTURE

100 X (VAPOR PRESSURE @ STACK TEMP. / STACK PRESSURE)

100 X (5.93 / 30.194)

19.638

STACK MOISTURE FRACTION

THE LESSOR OF SAMPLE MOISTURE OR SATURATION MOISTURE / 100

19.638 / 100

.19638

MOLECULAR WEIGHT OF STACK GAS

29.00 (DRYERS) OR 30.00 (BOILERS) X (1 - MOISTURE) + (18 X MOISTURE)

30 X (1 - .19638) + (18 X .19638)

27.643

STACK VELOCITY

85.49 X CP X 60 X $\sqrt{P}$ X $\sqrt{(STACK\ TEMP. + 460)}$ / $\sqrt{(STACK\ PRESSURE \times MOLECULAR\ WT.)}$

85.49 X .806 X 60 X .6 X $\sqrt{(140.3 + 460)}$

$\sqrt{(30.194 \times 27.643)}$

2103.7

VOLUMETRIC FLOW RATE (ACFM)

STACK AREA X STACK VELOCITY

70.882 X 2103.7

149114.6

CALCULATIONS FOR RUN 1

VOLUMETRIC FLOW RATE (SCFM DRY)

$$17.64 \times (\text{ACFM}) \times \text{STACK PRESSURE} \times (1 - \text{MOISTURE}) / (\text{STACK TEMP.} + 460)$$

$$17.64 \times 149114.6 \times 30.194 \times (1 - .19638) / (140.3 + 460)$$

$$106320.8$$

PARTICULATE CONCENTRATION

$$15.43 \times \text{PARTICULATE WEIGHT} / \text{SAMPLE VOLUME}$$

$$15.43 \times .1595 / 42.92$$

$$.05732$$

EMISSION RATE

$$\text{CONCENTRATION} \times (\text{SCFM DRY}) \times 60 / 7000$$

$$.05732 \times 106320.8 \times 60 / 7000$$

$$52.241$$

PERCENT ISOKINETIC

$$.0945 \times (\text{STACK TEMP.} + 460) \times \text{SAMPLE VOLUME} \times 60$$

$$\text{STACK PRES.} \times \text{VELOCITY} \times \text{NOZZLE AREA} \times \text{TEST TIME} \times (1 - \text{MOISTURE})$$

$$.0945 \times 140.3 + 460 \times 42.92 \times 60$$

$$30.194 \times 2103.7 \times 5.1\text{E-}04 \times 60 \times (1 - .19638)$$

$$94.445$$

Calibration Data

CALIBRATION DATA

August 24, 1988

Meter No. 4

Barometric Pressure 30.19

$\hat{H}$	0.1	0.3	0.5	1.0	2.0	4.0	8.0
CFw	2.50	2.47	4.95	4.95	9.93	10.10	10.28
CFd	2.50	2.50	5.00	5.00	10.00	10.00	10.00
Tw	92	92	92	93	93	92	94
Td	90	91	92	93	93	91	95
Time	12.74	7.50	11.73	8.55	12.33	8.97	6.45
Y	.9961	.9855	.9888	.9876	.9882	.9984	1.0102
$\hat{H}_a$	1.51	1.61	1.63	1.73	1.79	1.83	1.83

Average $\hat{H}_a = 1.70$

Average Y = .9935

Thermocouple Calibrations

	TC-1	TC-2	ASTM
Ice	33	33	32
Boiling Water	212	212	212
Oil	470	471	471

Barometer Calibration

Aneroid - 30.19

Hg - 30.18

Pitot No. 4

	1	2	3
Std.	.29	.30	.31
Side A	.43	.45	.48
Side B	.41	.45	.48
CPs	.813	.808	.796
Deviation	.007	.002	.010

Average CPs = .806

Nozzle Calibration

Date January 27, 1989

#10 = .304, .304, .305, .304 = .3043

Audit Results

RESULTS OF COMPLIANCE SOURCE AUDIT

Method 6 - Sulfur Dioxide

Sample No.	Result
AO0400	804.0 mg./DSCM

Method 7 - Oxides of Nitrogen

Sample No.	Result
BO4068	430.9 mg./DSCM

These samples were analyzed by William D. Arlington on January 28, 1989.

The results were reported to Mr. David Knowles of the Florida Department of Environmental Regulation in Fort Myers and are within the acceptable tolerance.

METHOD 7 (NO_x) COMPLIANCE SOURCE AUDIT

Date Issued 1-27-89 Sample No. B04068
Auditee: _____ Audit Date 1-27-89
Name South Florida Environmental Services
Address 8211-G Bama Lane W. Palm Beach
Analyst W. Arlington

Emission Test Audit Identification Card

Audit results in mg/DSCM and compliance test results in total µg of NO₂ are to be transmitted to the agency requiring the test.

METHOD 6 (SO₂) COMPLIANCE SOURCE AUDIT

Date Issued 1-27-89 Sample No. 100400
Auditee: _____ Audit Date 1-27-89
Name South Florida Environmental Services
Address 8211-G Bama Lane W. Palm Beach
Analyst W. Arlington

Emission Test Audit Identification Card

Audit results in mg/DSCM and compliance test results in total mg of SO₂ are to be transmitted to the agency requiring the test.

Project Participants

PROJECT PARTICIPANTS

South Florida Environmental Services, Inc.

Bill Arlington	Project Director
Gerard P. Gauthreaux	Field Technician
Kaye Barker	Laboratory Technician

Sugar Cane Growers Cooperative of Florida

Antonio Arvesu	Test Coordinator
Dennis Sellers	Electrical Engineer

Florida Department of Environmental Regulation

Ken Tucker	Observer

Sugar Cane Growers Co-op

<u>Source</u>	<u>X(m)</u>	<u>Y(m)</u>	<u>H(m)</u>	<u>T(K)</u>	<u>V(m/s)</u>	<u>d(m)</u>	<u>Allowed E(s/s)</u>
Boiler #1	0	0	24.4	341	13.7	1.32	6.23
#2	0	12.2	24.4	337	12.8	1.32	6.24
#3	0	24.4	24.4	340	19.1	1.63	5.75
#4	4.6	38.1	35.1	337	9.1	2.88	10.41
#5	-3.0	60.0	24.4	340	12.3	1.63	9.12
#8	-36.6	9.1	49.2	340	10.6	2.90	8.95

Bldg. Dimensions!

	<u>H(m)</u>	<u>L(m)</u>	<u>W(m)</u>	<u>Pkts (m)</u>
Boilers 1, 2, 3	27.6			} 76.2
Boilers 4, 5	23.1			
Boiler 8	23.8			~ 49.8
Boiling House	31.1			} 72.4
Mill Bldg	20.1			

Sugar Cane Growers Co-op

	<u>H</u>	<u>L</u>	<u>W</u>	
all stacks	31.1	~~64.1~~ 64.1	~~64.1~~ 64.1	^{.78%} = (~~64.1~~) (72.4)

Downwash dominated by Boiler House - Mill
bldg. dimensions.

~~72.4~~

0 0 0 ————— 0²²
0 0 0 ————— 0²²

12F6.0

0 31.1 31.1 ————— 31.1²²

Best Available Copy

Is your RETURN ADDRESS completed on the reverse side?

SENDER

- Complete items 1 through 5.
- Complete items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

- ☐ Addressee's Address
- ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:

Jose F. Alvarez, VP
Planning & Plant Operation
Sugar Cane Growers Coop of FL
P O Box 666
Belle Glade, FL 33430-0666

4a. Article Number

Z 311 902 903

4b. Service Type

☐ Registered	☐ Insured
☒ Certified	☐ COD
☐ Express Mail	☐ Return Receipt for Merchandise

7. Date of Delivery

5/6/95

5. Signature (Addressee)

Venten Hella

6. Signature (Agent)

8. Addressee's Address (Only if requested and fee is paid)

PS Form 3811, December 1991

U.S. GPO: 1993-352-714

DOMESTIC RETURN RECEIPT

Thank you for using Return Receipt Service.

Z 311 902 903



Receipt for Certified Mail

No Insurance Coverage Provided
Do not use for International Mail
(See Reverse)

PS Form 3800, March 1993

Sent to Jose F. Alvarez	
Serial and No. Sugar Cane Growers	
F.O. Stamp and ZIP Code Belle Glade, FL	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	\$
Postmark or Date 5-12-95	



Department of Environmental Protection

Lawton Chiles
Governor

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

Virginia B. Wetherell
Secretary

May 12, 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Jose F. Alvarez
Vice President of Planning & Plant Operation
Sugar Cane Growers Cooperative of Florida
Post Office Box 666
Belle Glade, Florida 33430-0666

Dear Mr. Alvarez:

Re: Stacks for Boilers Nos. 3 and 5

Per our discussion of May 4, 1995, no air construction permit is required to raise various stacks on the existing bagasse boilers at your Belle Glade sugar mill facility. The higher stacks will reduce the local ground-level concentrations of air pollutants emitted from these boilers.

This permitting decision does not constitute a judgment by the Department regarding the stack heights necessary to avoid localized exceedances of ground-level ambient air concentrations and increments nor does it insure that the entire final height may be used to estimate dispersion of air pollutants from this facility.

The stack height and modeling issues will be addressed during the review of your application for permit to increase carbon monoxide emissions from boiler No. 8.

Sincerely,

A. A. Linero, P.E.
Administrator
New Source Review Section

AL/wh/h

cc: David Knowles, SD
Jeff Koerner, PBCHD

3/16/89

*** SUGAR CANE GROWERS CO-OP

CALCULATE (CONCENTRATION=1, DEPOSITION=2)	ISW(1) = 1
RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)	ISW(2) = 4
DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1, POLAR=2)	ISW(3) = 1
TERRAIN ELEVATIONS ARE READ (YES=1, NO=0)	ISW(4) = 0
CALCULATIONS ARE WRITTEN TO TAPE (YES=1, NO=0)	ISW(5) = 0
LIST ALL INPUT DATA (NO=0, YES=1, MET DATA ALSO=2)	ISW(6) = 1
COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)	
WITH THE FOLLOWING TIME PERIODS:	
HOURLY (YES=1, NO=0)	ISW(7) = 0
2-HOUR (YES=1, NO=0)	ISW(8) = 0
3-HOUR (YES=1, NO=0)	ISW(9) = 1
4-HOUR (YES=1, NO=0)	ISW(10) = 0
6-HOUR (YES=1, NO=0)	ISW(11) = 0
8-HOUR (YES=1, NO=0)	ISW(12) = 0
12-HOUR (YES=1, NO=0)	ISW(13) = 0
24-HOUR (YES=1, NO=0)	ISW(14) = 1
PRINT 'N'-DAY TABLE(S) (YES=1, NO=0)	ISW(15) = 1
PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE SPECIFIED BY ISW(7) THROUGH ISW(14):	
DAILY TABLES (YES=1, NO=0)	ISW(16) = 0
HIGHEST & SECOND HIGHEST TABLES (YES=1, NO=0)	ISW(17) = 1
MAXIMUM 50 TABLES (YES=1, NO=0)	ISW(18) = 0
METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1, CARD=2)	ISW(19) = 1
RURAL-URBAN OPTION (RU.=0, UR. MODE 1=1, UR. MODE 2=2, UR. MODE 3=3)	ISW(20) = 0
WIND PROFILE EXPONENT VALUES (DEFAULTS=1, USER ENTERS=2, 3)	ISW(21) = 1
VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1, USER ENTERS=2, 3)	ISW(22) = 1
SCALE EMISSION RATES FOR ALL SOURCES (NO=0, YES=0)	ISW(23) = 0
PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1, NO=2)	ISW(24) = 1
PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2, NO=1)	ISW(25) = 1
PROGRAM USES BUOYANCY INDUCED DISPERSION (YES=1, NO=2)	ISW(26) = 0
CONCENTRATIONS DURING CALM PERIODS SET = 0 (YES=1, NO=2)	ISW(27) = 0
REG. DEFAULT OPTION CHOSEN (YES=1, NO=2)	ISW(28) = 2
TYPE OF POLLUTANT TO BE MODELLED (1=SO2, 2=OTHER)	ISW(29) = 2
DEBUG OPTION CHOSEN (YES=1, NO=2)	ISW(30) = 2
ABOVE GROUND (FLAGPOLE) RECEPTORS USED (YES=1, NO=0)	ISW(31) = 0
NUMBER OF INPUT SOURCES	NSOURC = 6
NUMBER OF SOURCE GROUPS (=0, ALL SOURCES)	NGROUP = 0
TIME PERIOD INTERVAL TO BE PRINTED (=0, ALL INTERVALS)	IPERD = 0
NUMBER OF X (RANGE) GRID VALUES	NXPNTS = 7
NUMBER OF Y (THETA) GRID VALUES	NYPNTS = 16
NUMBER OF DISCRETE RECEPTORS	NXWYPT = 0
SOURCE EMISSION RATE UNITS CONVERSION FACTOR	TK = .10000E+07
HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED	ZR = 7.00 METERS
LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA	IMET = 9
DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION	DECAY = 0.000000E+00
SURFACE STATION NO.	ISS = 12844
YEAR OF SURFACE DATA	ISY = 85
UPPER AIR STATION NO.	IUS = 12844
YEAR OF UPPER AIR DATA	IUY = 85
ALLOCATED DATA STORAGE	LIMIT = 43500 WORDS
REQUIRED DATA STORAGE FOR THIS PROBLEM RUN	MIMIT = 3201 WORDS

*** SUGAR CANE GROWERS CO-OP

*** RANGES OF POLAR GRID SYSTEM ***
(METERS)

50.0, 100.0, 200.0, 300.0, 400.0, 500.0, 600.0,

*** RADIAL ANGLES OF POLAR GRID SYSTEM ***

(DEGREES)

22.5, 45.0, 67.5, 90.0, 112.5, 135.0, 157.5, 180.0, 202.5, 225.0,
247.5, 270.0, 292.5, 315.0, 337.5, 360.0,

*** SOURCE DATA ***

		EMISSION RATE						TEMP.	EXIT VEL.				
		TYPE=0,1						TYPE=0	TYPE=0				
		(GRAMS/SEC)						(DEG.K);	(M/SEC);			BLDG.	BLDG.
		TYPE=2						VERT.DIM	HORZ.DIM	DIAMETER	HEIGHT	LENGTH	WIDTH
SOURCE P K	PART.	(GRAMS/SEC)	X	Y	ELEV.	HEIGHT	TYPE=1	TYPE=1,2	TYPE=0	TYPE=0	TYPE=0	TYPE=0	TYPE=0
NUMBER E E	CATS.	*PER METER**2	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)

10	0 0	0	0.62300E+01	0.0	0.0	0.0	24.40	341.00	13.70	1.32	0.00	0.00	0.00
20	0 0	0	0.62400E+01	0.0	12.2	0.0	24.40	337.00	12.80	1.32	0.00	0.00	0.00
30	0 0	0	0.57500E+01	0.0	24.4	0.0	24.40	340.00	19.10	1.63	0.00	0.00	0.00
40	0 0	0	0.10410E+02	4.6	38.1	0.0	35.10	337.00	9.10	2.88	0.00	0.00	0.00
50	0 0	0	0.91200E+01	-3.0	61.0	0.0	24.40	340.00	12.30	1.63	0.00	0.00	0.00
60	0 0	0	0.89500E+01	-36.6	9.1	0.0	47.20	340.00	10.60	2.90	0.00	0.00	0.00

*** SUGAR CANE GROWERS CO-OP

* 365-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)

*

* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 14.12364 AND OCCURRED AT (600.0, 270.0) *

DIRECTION / (DEGREES) /	RANGE (METERS)						
	50.0	100.0	200.0	300.0	400.0	500.0	600.0

360.0 /	0.00000	0.00410	0.67012	2.32217	3.74733	4.60941	5.02558
337.5 /	0.00000	0.00742	1.08827	3.71165	5.68973	6.68191	7.00852
315.0 /	0.00000	0.01389	2.11396	6.95037	10.37387	12.01449	12.50754
292.5 /	0.00000	0.01684	2.27857	6.79753	9.71969	10.99993	11.24500
270.0 /	0.00000	0.02256	2.22618	6.80494	10.57273	12.96596	14.12364
247.5 /	0.00007	0.03286	1.78073	5.16021	7.93481	9.68444	10.53589
225.0 /	0.00021	0.03101	1.16765	3.15982	4.59654	5.35151	5.60826
202.5 /	0.00050	0.02432	0.49453	1.18541	1.64418	1.88458	1.97287
180.0 /	0.00122	0.03854	0.63314	1.59135	2.33728	2.79500	3.01929
157.5 /	0.00151	0.04643	0.78103	1.95910	2.85904	3.40725	3.68510
135.0 /	0.00079	0.03877	0.90430	2.31541	3.40889	4.11192	4.49477
112.5 /	0.00019	0.02257	0.81088	2.09985	2.99920	3.49670	3.70306
90.0 /	0.00001	0.01176	0.80600	2.07684	2.85894	3.22479	3.32495
67.5 /	0.00000	0.00789	0.76159	2.02509	2.79260	3.15725	3.28129
45.0 /	0.00000	0.00248	0.51656	1.70043	2.58164	3.04176	3.20760
22.5 /	0.00000	0.00234	0.43819	1.49818	2.30437	2.72598	2.89079

*** SUGAR CANE GROWERS CO-OP

* HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 364.07007 AND OCCURRED AT (500.0, 337.5) *

DIRECTION / (DEGREES) /	RANGE (METERS)				
	50.0	100.0	200.0	300.0	400.0
360.0 /	0.00000 (192, 4)	1.65527 (192, 4)	88.50677 (194, 5)	257.69861 (194, 5)	338.72958 (194, 5)
337.5 /	0.00000 (216, 4)	3.46815 (216, 4)	155.76781 (216, 4)	294.25214 (223, 4)	345.85239 (223, 4)
315.0 /	0.00000 (144, 5)	2.05372 (188, 5)	118.47137 (188, 5)	251.40515 (188, 5)	303.25513 (151, 5)
292.5 /	0.00001 (183, 4)	1.96768 (189, 4)	105.65070 (198, 5)	241.74876 (286, 5)	303.54224 (286, 5)
270.0 /	0.00465 (183, 4)	3.11739 (97, 5)	131.47830 (288, 5)	271.05927 (288, 5)	316.30829 (113, 5)
247.5 /	0.04927 (266, 5)	6.54376 (189, 4)	122.73442 (136, 5)	265.25562 (136, 5)	332.25266 (256, 5)
225.0 /	0.19694 (178, 5)	9.37914 (147, 4)	105.12569 (184, 4)	218.32414 (184, 4)	252.24414 (184, 4)
202.5 /	0.30027 (154, 5)	10.50048 (178, 5)	95.69417 (178, 5)	171.42772 (122, 4)	235.09866 (122, 4)
180.0 /	1.27200 (154, 5)	20.23494 (154, 5)	127.14912 (190, 4)	189.11185 (190, 4)	227.51122 (19, 5)
157.5 /	1.62023 (154, 5)	25.41447 (154, 5)	119.88924 (154, 5)	156.20410 (7, 4)	222.45294 (7, 4)
135.0 /	0.64301 (154, 5)	17.65760 (160, 4)	151.59258 (106, 4)	251.47345 (106, 4)	260.13907 (106, 4)
112.5 /	0.18225 (160, 4)	6.75989 (160, 4)	122.34710 (153, 5)	254.76999 (153, 5)	292.79791 (153, 5)
90.0 /	0.01183 (160, 4)	2.18996 (198, 4)	114.62158 (197, 4)	223.96843 (197, 4)	246.55620 (197, 4)
67.5 /	0.00003 (118, 4)	2.44506 (161, 4)	123.60013 (222, 4)	261.57745 (222, 4)	296.72083 (222, 4)
45.0 /	0.00000 (175, 4)	1.06300 (180, 4)	59.04077 (180, 4)	144.19077 (133, 4)	194.38792 (133, 4)
22.5 /	0.00000 (104, 4)	1.86559 (104, 4)	123.42190 (104, 4)	265.83368 (104, 4)	305.93005 (104, 4)

*** SUGAR CANE GROWERS CO-OP

* HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 364.07007 AND OCCURRED AT (500.0, 337.5) *

DIRECTION /	RANGE (METERS)	
(DEGREES) /	500.0	600.0

360.0 /	346.98105 (194, 5)	320.09271 (194, 5)
337.5 /	364.07007 (284, 5)	359.75146 (284, 5)
315.0 /	314.06149 (151, 5)	293.92358 (151, 5)
292.5 /	322.38977 (245, 5)	330.08954 (116, 5)
270.0 /	328.39728 (113, 5)	309.04330 (113, 5)
247.5 /	355.45776 (256, 5)	342.20837 (256, 5)
225.0 /	248.96109 (266, 4)	241.24716 (266, 4)
202.5 /	246.69804 (122, 4)	224.14024 (122, 4)
180.0 /	229.75885 (19, 5)	228.71384 (312, 4)
157.5 /	249.19333 (29, 4)	261.17343 (29, 4)
135.0 /	235.77177 (106, 4)	255.36172 (308, 6)
112.5 /	284.39792 (153, 5)	258.82111 (137, 4)
90.0 /	230.94611 (197, 4)	228.33037 (179, 3)
67.5 /	289.79327 (61, 4)	292.03064 (61, 4)
45.0 /	202.79436 (133, 4)	190.46880 (133, 4)
22.5 /	282.24933 (104, 4)	246.49248 (171, 3)

*** SUGAR CANE GROWERS CO-OP

* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 332.72751 AND OCCURRED AT (500.0, 247.5) *

DIRECTION / (DEGREES) /	RANGE (METERS)				
	50.0	100.0	200.0	300.0	400.0
360.0 /	0.00000 (171, 4)	1.10170 (171, 4)	78.19752 (196, 4)	193.19412 (196, 4)	240.33887 (303, 5)
337.5 /	0.00000 (182, 4)	1.62202 (182, 4)	122.72881 (223, 4)	284.91235 (216, 4)	325.74643 (284, 5)
315.0 /	0.00000 (192, 4)	1.47690 (187, 4)	111.12677 (229, 4)	247.49533 (229, 4)	290.29977 (187, 5)
292.5 /	0.00001 (122, 4)	1.55097 (160, 4)	104.58488 (110, 4)	239.59839 (198, 5)	286.32654 (245, 5)
270.0 /	0.00322 (266, 5)	2.33882 (189, 4)	113.14880 (184, 5)	248.27100 (251, 4)	303.78101 (251, 4)
247.5 /	0.04255 (147, 4)	5.40031 (183, 4)	110.86458 (128, 4)	236.25914 (256, 5)	303.30725 (136, 5)
225.0 /	0.10148 (174, 4)	7.99432 (266, 5)	104.96456 (147, 4)	182.03874 (266, 4)	234.99976 (266, 4)
202.5 /	0.25830 (178, 5)	6.17988 (174, 4)	85.89315 (147, 4)	164.56470 (267, 4)	206.96896 (84, 4)
180.0 /	0.56549 (190, 4)	14.74011 (190, 4)	102.04565 (154, 5)	185.81743 (19, 5)	198.12326 (312, 4)
157.5 /	0.69306 (118, 4)	15.22034 (190, 4)	101.85995 (160, 4)	139.34271 (265, 4)	211.73376 (29, 4)
135.0 /	0.46052 (160, 4)	8.64913 (118, 5)	129.91698 (160, 4)	172.90140 (119, 4)	190.19211 (11, 4)
112.5 /	0.06743 (118, 5)	5.71219 (155, 4)	105.05815 (154, 4)	209.12131 (154, 4)	248.29666 (155, 4)
90.0 /	0.00739 (119, 4)	2.04555 (197, 5)	112.27614 (198, 4)	208.45213 (198, 4)	220.10117 (198, 4)
67.5 /	0.00003 (119, 4)	2.05982 (198, 4)	122.80579 (198, 4)	234.79129 (198, 4)	252.97906 (61, 4)
45.0 /	0.00000 (180, 4)	1.00885 (175, 4)	57.88458 (222, 4)	134.04393 (222, 4)	158.81833 (178, 3)
22.5 /	0.00000 (192, 4)	0.65984 (214, 5)	78.59296 (214, 5)	199.70494 (214, 5)	243.61392 (214, 5)

*** SUGAR CANE GROWERS CO-OP

* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 332.72751 AND OCCURRED AT (500.0, 247.5) *

DIRECTION /	RANGE (METERS)	
(DEGREES) /	500.0	600.0

360.0 /	255.12180 (303, 5)	257.47272 (203, 4)
337.5 /	328.76422 (223, 4)	323.54993 (284, 4)
315.0 /	298.84839 (187, 5)	291.37109 (72, 5)
292.5 /	321.01450 (116, 5)	323.00339 (245, 5)
270.0 /	318.56015 (114, 5)	305.00220 (114, 5)
247.5 /	332.72751 (65, 5)	329.68011 (65, 5)
225.0 /	245.90186 (184, 4)	226.59924 (256, 6)
202.5 /	216.83183 (84, 4)	208.17401 (84, 4)
180.0 /	224.63403 (312, 4)	214.45117 (19, 5)
157.5 /	243.88896 (7, 4)	241.69397 (7, 4)
135.0 /	222.13664 (11, 4)	228.23367 (11, 4)
112.5 /	262.60611 (137, 4)	256.49634 (153, 5)
90.0 /	221.75790 (215, 3)	219.32904 (215, 3)
67.5 /	280.16693 (222, 4)	273.72684 (81, 4)
45.0 /	186.35636 (178, 3)	188.82843 (178, 3)
22.5 /	238.19263 (214, 5)	237.86241 (104, 4)

*** SUGAR CANE GROWERS CO-OP

* HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 131.10568 AND OCCURRED AT (600.0, 270.0) *

DIRECTION / (DEGREES) /	RANGE (METERS)				
	50.0	100.0	200.0	300.0	400.0
360.0 /	0.00000 (192, 1)	0.20691 (192, 1)	13.78232 (194, 1)	42.33947 (194, 1)	58.96194 (194, 1)
337.5 /	0.00000 (216, 1)	0.43352 (216, 1)	19.47701 (216, 1)	49.77387 (284, 1)	77.99554 (284, 1)
315.0 /	0.00000 (144, 1)	0.26273 (187, 1)	23.85424 (187, 1)	65.43739 (187, 1)	86.70040 (187, 1)
292.5 /	0.00000 (183, 1)	0.25652 (189, 1)	18.91808 (117, 1)	56.87206 (245, 1)	90.85638 (245, 1)
270.0 /	0.00058 (183, 1)	0.53332 (97, 1)	25.41888 (253, 1)	59.37642 (253, 1)	74.12010 (251, 1)
247.5 /	0.00637 (266, 1)	0.87058 (136, 1)	26.65761 (128, 1)	68.46692 (156, 1)	90.34035 (156, 1)
225.0 /	0.02462 (178, 1)	1.36258 (147, 1)	24.72113 (266, 1)	51.15799 (266, 1)	68.64311 (257, 1)
202.5 /	0.03753 (154, 1)	1.31256 (178, 1)	16.15765 (267, 1)	38.19072 (267, 1)	46.85958 (267, 1)
180.0 /	0.15900 (154, 1)	2.52937 (154, 1)	15.89365 (190, 1)	27.62572 (268, 1)	39.76395 (268, 1)
157.5 /	0.20253 (154, 1)	3.17945 (154, 1)	15.51339 (154, 1)	25.38604 (78, 1)	37.95063 (29, 1)
135.0 /	0.08042 (154, 1)	2.20720 (160, 1)	22.72978 (106, 1)	42.75949 (106, 1)	47.83752 (106, 1)
112.5 /	0.02278 (160, 1)	0.85820 (118, 1)	25.16766 (153, 1)	49.77562 (153, 1)	64.15875 (155, 1)
90.0 /	0.00148 (160, 1)	0.49326 (197, 1)	24.15269 (197, 1)	46.37057 (197, 1)	57.47575 (179, 1)
67.5 /	0.00000 (118, 1)	0.35714 (161, 1)	18.50261 (198, 1)	41.14661 (222, 1)	61.75569 (81, 1)
45.0 /	0.00000 (175, 1)	0.13419 (180, 1)	13.06752 (144, 1)	36.13222 (144, 1)	46.93315 (144, 1)
22.5 /	0.00000 (104, 1)	0.25562 (104, 1)	20.13065 (104, 1)	46.40367 (104, 1)	56.00955 (104, 1)

*** SUGAR CANE GROWERS CO-OP

* HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 131.10568 AND OCCURRED AT (600.0, 270.0) *

DIRECTION /	RANGE (METERS)	
(DEGREES) /	500.0	600.0

360.0 /	71.92453 (203, 1)	76.48286 (203, 1)
337.5 /	88.74731 (284, 1)	89.08948 (284, 1)
315.0 /	90.80327 (186, 1)	97.36812 (57, 1)
292.5 /	107.39935 (245, 1)	112.18242 (245, 1)
270.0 /	107.92668 (53, 1)	131.10568 (53, 1)
247.5 /	93.63058 (156, 1)	96.84994 (66, 1)
225.0 /	79.43845 (257, 1)	82.20660 (257, 1)
202.5 /	47.26486 (267, 1)	47.59816 (99, 1)
180.0 /	46.62012 (268, 1)	49.68078 (268, 1)
157.5 /	44.99206 (29, 1)	51.09738 (340, 1)
135.0 /	59.51685 (21, 1)	73.06300 (21, 1)
112.5 /	67.70612 (155, 1)	64.84174 (155, 1)
90.0 /	61.14849 (179, 1)	59.16351 (179, 1)
67.5 /	71.07616 (81, 1)	72.65044 (81, 1)
45.0 /	47.78761 (144, 1)	49.14097 (123, 1)
22.5 /	54.04578 (104, 1)	47.48982 (104, 1)

*** SUGAR CANE GROWERS CO-OP

* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 95.35564 AND OCCURRED AT (600.0, 315.0) *

DIRECTION / (DEGREES) /	RANGE (METERS)				
	50.0	100.0	200.0	300.0	400.0

360.0 /	0.00000 (171, 1)	0.14008 (171, 1)	11.28307 (177, 1)	33.35469 (203, 1)	58.34814 (203, 1)
337.5 /	0.00000 (182, 1)	0.21948 (182, 1)	16.92843 (171, 1)	42.50129 (171, 1)	56.67017 (242, 1)
315.0 /	0.00000 (192, 1)	0.25917 (188, 1)	23.15575 (186, 1)	61.51334 (186, 1)	83.38524 (186, 1)
292.5 /	0.00000 (122, 1)	0.24889 (160, 1)	18.13231 (210, 1)	53.46400 (224, 1)	80.13577 (224, 1)
270.0 /	0.00043 (266, 1)	0.32377 (136, 1)	20.23109 (251, 1)	56.09528 (251, 1)	72.30257 (253, 1)
247.5 /	0.00536 (147, 1)	0.81817 (189, 1)	24.34431 (136, 1)	55.11555 (128, 1)	65.03378 (128, 1)
225.0 /	0.01268 (174, 1)	1.27001 (266, 1)	19.84400 (147, 1)	46.35632 (257, 1)	65.38956 (266, 1)
202.5 /	0.03229 (178, 1)	0.77249 (174, 1)	14.83909 (147, 1)	30.33337 (147, 1)	35.42311 (107, 1)
180.0 /	0.07069 (190, 1)	1.84251 (190, 1)	12.75571 (154, 1)	25.49463 (19, 1)	34.50358 (364, 1)
157.5 /	0.09080 (118, 1)	1.94876 (118, 1)	14.65324 (118, 1)	24.43372 (29, 1)	34.67726 (78, 1)
135.0 /	0.05757 (160, 1)	1.43200 (118, 1)	16.33290 (214, 1)	28.47855 (155, 1)	39.41073 (21, 1)
112.5 /	0.00959 (118, 1)	0.85506 (155, 1)	20.89868 (155, 1)	49.51379 (155, 1)	58.84567 (153, 1)
90.0 /	0.00092 (119, 1)	0.34893 (153, 1)	16.92421 (198, 1)	43.55084 (179, 1)	50.96288 (197, 1)
67.5 /	0.00000 (119, 1)	0.28500 (152, 1)	18.40662 (152, 1)	39.18929 (81, 1)	51.99199 (222, 1)
45.0 /	0.00000 (180, 1)	0.12611 (175, 1)	9.82694 (180, 1)	25.66597 (180, 1)	40.12744 (123, 1)
22.5 /	0.00000 (192, 1)	0.08394 (214, 1)	11.16792 (214, 1)	30.58648 (214, 1)	39.34946 (214, 1)

*** SUGAR CANE GROWERS CO-OP

* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *

* FROM ALL SOURCES *

* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 95.35564 AND OCCURRED AT (600.0, 315.0) *

DIRECTION /	RANGE (METERS)	
(DEGREES) /	500.0	600.0

360.0 /	63.30321 (194, 1)	60.72218 (194, 1)
337.5 /	68.73961 (242, 1)	73.87456 (242, 1)
315.0 /	89.38176 (187, 1)	95.35564 (241, 1)
292.5 /	89.48345 (224, 1)	88.30432 (224, 1)
270.0 /	85.11961 (294, 1)	93.49489 (294, 1)
247.5 /	84.25406 (66, 1)	88.65681 (156, 1)
225.0 /	72.45969 (258, 1)	75.55817 (258, 1)
202.5 /	42.74928 (107, 1)	46.54759 (51, 1)
180.0 /	39.92801 (364, 1)	47.05568 (38, 1)
157.5 /	42.44770 (354, 1)	47.54295 (29, 1)
135.0 /	45.86906 (106, 1)	46.07343 (22, 1)
112.5 /	59.98293 (153, 1)	57.88647 (137, 1)
90.0 /	48.60441 (269, 1)	46.99631 (269, 1)
67.5 /	55.02186 (222, 1)	53.67027 (222, 1)
45.0 /	47.20805 (123, 1)	46.14065 (164, 1)
22.5 /	41.94393 (306, 1)	42.31833 (306, 1)

CALCULATE (CONCENTRATION=1,DEPOSITION=2)	ISW(1) = 1
RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)	ISW(2) = 4
DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)	ISW(3) = 1
TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)	ISW(4) = 0
CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)	ISW(5) = 0
LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)	ISW(6) = 1

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)

WITH THE FOLLOWING TIME PERIODS:

HOURLY (YES=1,NO=0)	ISW(7) = 0
2-HOUR (YES=1,NO=0)	ISW(8) = 0
3-HOUR (YES=1,NO=0)	ISW(9) = 1
4-HOUR (YES=1,NO=0)	ISW(10) = 0
6-HOUR (YES=1,NO=0)	ISW(11) = 0
8-HOUR (YES=1,NO=0)	ISW(12) = 0
12-HOUR (YES=1,NO=0)	ISW(13) = 0
24-HOUR (YES=1,NO=0)	ISW(14) = 1
PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)	ISW(15) = 1

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE

SPECIFIED BY ISW(7) THROUGH ISW(14):

DAILY TABLES (YES=1,NO=0)	ISW(16) = 0
HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)	ISW(17) = 1
MAXIMUM 50 TABLES (YES=1,NO=0)	ISW(18) = 0
METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)	ISW(19) = 1
RURAL-URBAN OPTION (RU.=0,UR. MODE 1=1,UR. MODE 2=2,UR. MODE 3=3)	ISW(20) = 0
WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)	ISW(21) = 1
VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)	ISW(22) = 1
SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES=0)	ISW(23) = 0
PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)	ISW(24) = 1
PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)	ISW(25) = 2
PROGRAM USES BUOYANCY INDUCED DISPERSION (YES=1,NO=2)	ISW(26) = 1
CONCENTRATIONS DURING CALM PERIODS SET = 0 (YES=1,NO=2)	ISW(27) = 1
REG. DEFAULT OPTION CHOSEN (YES=1,NO=2)	ISW(28) = 1
TYPE OF POLLUTANT TO BE MODELLED (1=SO2,2=OTHER)	ISW(29) = 2
DEBUG OPTION CHOSEN (YES=1,NO=2)	ISW(30) = 2
ABOVE GROUND (FLAGPOLE) RECEPTORS USED (YES=1,NO=0)	ISW(31) = 0

NUMBER OF INPUT SOURCES	NSOURC = 6
NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)	NGROUP = 0
TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)	IPERD = 0
NUMBER OF X (RANGE) GRID VALUES	NXPNTS = 7
NUMBER OF Y (THETA) GRID VALUES	NYPNTS = 16
NUMBER OF DISCRETE RECEPTORS	NXWYPT = 0
SOURCE EMISSION RATE UNITS CONVERSION FACTOR	TK = .10000E+07
HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED	ZR = 7.00 METERS
LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA	IMET = 9
DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION	DECAY = 0.000000E+00
SURFACE STATION NO.	ISS = 12844
YEAR OF SURFACE DATA	ISY = 85
UPPER AIR STATION NO.	IUS = 12844
YEAR OF UPPER AIR DATA	IUY = 85
ALLOCATED DATA STORAGE	LIMIT = 43500 WORDS
REQUIRED DATA STORAGE FOR THIS PROBLEM RUN	MIMIT = 3201 WORDS

*** SUGAR CANE GROWERS CO-OP

*** RANGES OF POLAR GRID SYSTEM ***
(METERS)

50.0, 100.0, 200.0, 300.0, 400.0, 500.0, 600.0,

*** RADIAL ANGLES OF POLAR GRID SYSTEM ***

(DEGREES)

22.5, 45.0, 67.5, 90.0, 112.5, 135.0, 157.5, 180.0, 202.5, 225.0,
247.5, 270.0, 292.5, 315.0, 337.5, 360.0,

*** SOURCE DATA ***

			EMISSION RATE						TEMP.	EXIT VEL.			
			TYPE=0,1						TYPE=0	TYPE=0			
			(GRAMS/SEC)							(M/SEC);	BLDG.	BLDG.	BLDG.
			TYPE=2							VERT.DIM	HORZ.DIM	DIAMETER	HEIGHT
SOURCE	P K	PART.	(GRAMS/SEC)	X	Y	ELEV.	HEIGHT	TYPE=1	TYPE=1,2	TYPE=0	TYPE=0	TYPE=0	TYPE=0
NUMBER	E E	CATS.	*PER METER**2	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)

10	0 0	0	0.62300E+01	0.0	0.0	0.0	24.40	341.00	13.70	1.32	-31.10	64.10	64.10
20	0 0	0	0.62400E+01	0.0	12.2	0.0	24.40	337.00	12.80	1.32	-31.10	64.10	64.10
30	0 0	0	0.57500E+01	0.0	24.4	0.0	24.40	340.00	19.10	1.63	-31.10	64.10	64.10
40	0 0	0	0.10410E+02	4.6	38.1	0.0	35.10	337.00	9.10	2.88	-31.10	64.10	64.10
50	0 0	0	0.91200E+01	-3.0	61.0	0.0	24.40	340.00	12.30	1.63	-31.10	64.10	64.10
60	0 0	0	0.89500E+01	-36.6	9.1	0.0	47.20	340.00	10.60	2.90	31.10	64.10	64.10

SOURCE 1

SOURCE 2

SOURCE 3

SOURCE 4

SOURCE 5

IFV	BH	BW	IFV	BH	BW	IFV	BH	BW	IFV	BH	BW	IFV	BH	BW	IFV	BH	BW
1	31.1,	64.1,	2	31.1,	64.1,	3	31.1,	64.1,	4	31.1,	64.1,	5	31.1,	64.1,	6	31.1,	64.1,
7	31.1,	64.1,	8	31.1,	64.1,	9	31.1,	64.1,	10	31.1,	64.1,	11	31.1,	64.1,	12	31.1,	64.1,
13	31.1,	64.1,	14	31.1,	64.1,	15	31.1,	64.1,	16	31.1,	64.1,	17	31.1,	64.1,	18	31.1,	64.1,
19	31.1,	64.1,	20	31.1,	64.1,	21	31.1,	64.1,	22	31.1,	64.1,	23	31.1,	64.1,	24	31.1,	64.1,
25	31.1,	64.1,	26	31.1,	64.1,	27	31.1,	64.1,	28	31.1,	64.1,	29	31.1,	64.1,	30	31.1,	64.1,
31	31.1,	64.1,	32	31.1,	64.1,	33	31.1,	64.1,	34	31.1,	64.1,	35	31.1,	64.1,	36	31.1,	64.1,

* SOURCE-RECEPTOR COMBINATIONS LESS THAN 001 METERS OR THREE BUILDING
HEIGHTS IN DISTANCE. NO AVERAGE CONCENTRATION IS CALCULATED *

SOURCE NUMBER	-- RECEPTOR LOCATION --		DISTANCE BETWEEN (METERS)
	X OR RANGE (METERS)	Y (METERS) OR DIRECTION (DEGREES)	
10	50.0	22.5	50.00
10	50.0	45.0	50.00
10	50.0	67.5	50.00
10	50.0	90.0	50.00
10	50.0	112.5	50.00
10	50.0	135.0	50.00
10	50.0	157.5	50.00
10	50.0	180.0	50.00
10	50.0	202.5	50.00
10	50.0	225.0	50.00
10	50.0	247.5	50.00
10	50.0	270.0	50.00
10	50.0	292.5	50.00
10	50.0	315.0	50.00
10	50.0	337.5	50.00
10	50.0	360.0	50.00
20	50.0	22.5	38.96
20	100.0	22.5	88.81
20	50.0	45.0	42.26
20	100.0	45.0	91.78
20	50.0	67.5	46.61
20	50.0	90.0	51.47
20	50.0	112.5	55.73
20	50.0	135.0	59.26
20	50.0	157.5	61.42
20	50.0	180.0	62.20
20	50.0	202.5	61.48
20	50.0	225.0	59.26
20	50.0	247.5	55.91
20	50.0	270.0	51.47
20	50.0	292.5	46.82
20	50.0	315.0	42.26
20	100.0	315.0	91.78
20	50.0	337.5	39.06
20	100.0	337.5	88.90
20	50.0	360.0	37.80
20	100.0	360.0	87.80
30	50.0	22.5	28.86
30	100.0	22.5	77.91
30	50.0	45.0	37.01
30	100.0	45.0	84.53

* SOURCE-RECEPTOR COMBINATIONS LESS THAN 001 METERS OR THREE BUILDING HEIGHTS IN DISTANCE. NO AVERAGE CONCENTRATION IS CALCULATED *

SOURCE NUMBER	-- RECEPTOR LOCATION --		DISTANCE BETWEEN (METERS)
	X OR RANGE (METERS)	Y (METERS) OR DIRECTION (DEGREES)	
30	50.0	67.5	46.28
30	100.0	67.5	93.21
30	50.0	90.0	55.64
30	50.0	112.5	63.32
30	50.0	135.0	69.43
30	50.0	157.5	73.08
30	50.0	180.0	74.40
30	50.0	202.5	73.20
30	50.0	225.0	69.43
30	50.0	247.5	63.63
30	50.0	270.0	55.64
30	50.0	292.5	46.70
30	50.0	315.0	37.01
30	100.0	315.0	84.53
30	50.0	337.5	29.14
30	100.0	337.5	78.12
30	50.0	360.0	25.60
30	100.0	360.0	75.60
40	50.0	22.5	16.37
40	100.0	22.5	63.74
40	50.0	45.0	30.88
40	100.0	45.0	73.72
40	50.0	67.5	45.39
40	100.0	67.5	87.46
40	50.0	90.0	59.27
40	50.0	112.5	70.52
40	50.0	135.0	79.63
40	50.0	157.5	85.44
40	50.0	180.0	88.22
40	50.0	202.5	87.62
40	50.0	225.0	83.62
40	50.0	247.5	76.71
40	50.0	270.0	66.58
40	50.0	292.5	54.52
40	50.0	315.0	40.05
40	100.0	315.0	82.07
40	50.0	337.5	25.40
40	100.0	337.5	69.41
40	50.0	360.0	12.76
40	100.0	360.0	62.07
50	50.0	22.5	26.20

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*** SUGAR CANE GROWERS CO-OP

* 365-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *

* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 229.32954 AND OCCURRED AT (100.0, 270.0) *

DIRECTION / (DEGREES) /	RANGE (METERS)						
	50.0	100.0	200.0	300.0	400.0	500.0	600.0

360.0 /	0.00000	40.47300	106.99519	67.50605	50.09931	39.74163	32.84402
337.5 /	0.00000	42.78782	122.45788	71.07294	49.71110	37.91147	30.32789
315.0 /	0.00000	58.90643	159.93625	102.36835	74.76249	58.67514	47.98165
292.5 /	0.00000	198.73433	150.51958	93.93890	67.00620	51.81727	41.90770
270.0 /	0.00000	229.32954	143.70035	99.29097	75.23196	60.26441	49.96684
247.5 /	0.00000	145.38164	92.04077	64.45441	49.04248	39.45659	32.85570
225.0 /	18.67519	76.02932	45.55426	31.60193	23.94665	19.15592	15.81444
202.5 /	18.29360	46.42898	21.86261	14.36145	10.71439	8.53900	7.05098
180.0 /	24.33562	66.45815	35.31342	24.61728	18.80700	15.26483	12.78908
157.5 /	31.92029	111.72112	61.80063	43.05177	32.52342	26.20875	21.85612
135.0 /	41.58459	136.96489	79.10588	56.96765	43.85908	35.91459	30.31921
112.5 /	50.06323	141.70514	73.14006	49.32797	36.36483	28.56754	23.28250
90.0 /	0.00000	130.02287	61.93487	42.15350	31.18028	24.90076	20.62617
67.5 /	0.00000	100.80440	58.32374	38.53428	28.42276	22.52908	18.52384
45.0 /	0.00000	30.60778	71.68384	48.60265	36.05033	28.43451	23.44417
22.5 /	0.00000	32.73053	75.21702	48.33655	36.05444	28.52840	23.47558

*** SUGAR CANE GROWERS CO-OP

* HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 4164.46680 AND OCCURRED AT (100.0, 157.5) *

DIRECTION / (DEGREES) /	RANGE (METERS)				
	50.0	100.0	200.0	300.0	400.0
360.0 /	0.00000 (0, 0)	1699.84375 (105, 1)	3693.80957 (105, 1)	2682.10303 (105, 1)	2130.14111 (105, 1)
337.5 /	0.00000 (0, 0)	1169.53076 (277, 1)	2396.30542 (335, 6)	1392.64038 (335, 6)	1142.86035 (301, 2)
315.0 /	0.00000 (0, 0)	1095.27319 (211, 8)	1757.97009 (116, 7)	1248.32263 (276, 8)	1126.39539 (185, 8)
292.5 /	0.00000 (0, 0)	1863.78198 (321, 1)	1438.81091 (272, 1)	1292.61169 (246, 1)	1082.22437 (246, 1)
270.0 /	0.00000 (0, 0)	1982.82227 (299, 1)	1407.80688 (273, 7)	1246.53223 (64, 7)	1222.92578 (274, 2)
247.5 /	0.00000 (0, 0)	1629.55652 (205, 6)	1321.12842 (265, 7)	1050.01025 (48, 8)	814.53503 (48, 8)
225.0 /	2027.77539 (327, 6)	1888.14600 (312, 6)	1430.35229 (156, 1)	960.31348 (349, 6)	829.21704 (349, 6)
202.5 /	2044.29431 (232, 2)	3221.92529 (327, 6)	2216.31836 (327, 6)	1686.82764 (327, 6)	1369.80310 (327, 6)
180.0 /	1359.12769 (84, 7)	3325.33691 (84, 7)	1900.01221 (84, 7)	1446.71509 (84, 7)	1118.97180 (84, 7)
157.5 /	1553.00952 (212, 8)	4164.46680 (271, 2)	2944.98120 (271, 2)	2266.59717 (271, 2)	1688.23755 (271, 2)
135.0 /	1784.15564 (271, 2)	2154.09668 (354, 3)	1785.01855 (355, 7)	1367.63965 (354, 3)	1132.01831 (354, 3)
112.5 /	2088.35303 (27, 3)	2263.87183 (70, 2)	1427.10339 (7, 3)	1631.98267 (278, 2)	1197.87585 (278, 2)
90.0 /	0.00000 (0, 0)	2129.37305 (61, 2)	1474.08203 (6, 8)	1285.78394 (116, 2)	1061.16748 (116, 2)
67.5 /	0.00000 (0, 0)	1992.20312 (266, 1)	1463.44421 (81, 8)	1162.74512 (81, 8)	1084.41150 (357, 1)
45.0 /	0.00000 (0, 0)	1071.00000 (230, 1)	1980.12146 (93, 8)	1970.21167 (93, 8)	1777.34985 (93, 8)
22.5 /	0.00000 (0, 0)	1628.73865 (221, 2)	2037.87244C(162, 1)	1728.87476C(162, 1)	1477.66785C(162, 1)

*** SUGAR CANE GROWERS CO-OP

* HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 4164.46680 AND OCCURRED AT (100.0, 157.5) *

DIRECTION / RANGE (METERS)
(DEGREES) / 500.0 600.0

360.0 /	1710.42773 (105, 1)	1432.00610 (105, 1)
337.5 /	973.31537 (264, 7)	864.20105C(58, 7)
315.0 /	1097.16382 (185, 8)	985.28827 (185, 8)
292.5 /	921.36023 (246, 1)	795.82416 (246, 1)
270.0 /	1113.60889 (274, 2)	998.36145 (274, 2)
247.5 /	669.96814 (68, 7)	617.34570 (328, 3)
225.0 /	730.79333 (349, 6)	649.18646 (349, 6)
202.5 /	1153.36560 (327, 6)	983.22961 (327, 6)
180.0 /	916.24878 (84, 7)	780.42297 (84, 7)
157.5 /	1348.13257 (271, 2)	1126.52280 (271, 2)
135.0 /	976.69208 (354, 3)	868.95300 (130, 2)
112.5 /	944.47656 (352, 2)	815.04968 (352, 2)
90.0 /	982.65088 (61, 2)	904.17761 (61, 2)
67.5 /	1086.72583 (223, 1)	1043.73096 (223, 1)
45.0 /	1450.68298 (93, 8)	1254.68921 (93, 8)
22.5 /	1297.63062C(162, 1)	1161.84521C(162, 1)

*** SUGAR CANE GROWERS CO-OP

* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 3505.47266 AND OCCURRED AT (100.0, 157.5) *

DIRECTION / (DEGREES) /	RANGE (METERS)				
	50.0	100.0	200.0	300.0	400.0

360.0 /	0.00000 (0, 0)	1215.01404 (28, 3)	2941.69604 (28, 3)	1866.37927 (171, 1)	1580.13306 (171, 1)
337.5 /	0.00000 (0, 0)	967.46448C(58, 7)	1874.23560 (222, 8)	1261.87085 (332, 2)	1138.94482 (264, 7)
315.0 /	0.00000 (0, 0)	1070.98376C(264, 8)	1536.58044 (245, 2)	1157.21716 (168, 6)	1081.80664 (194, 7)
292.5 /	0.00000 (0, 0)	1735.75488 (68, 1)	1419.02869 (246, 1)	1232.75378 (272, 1)	993.76880 (250, 1)
270.0 /	0.00000 (0, 0)	1708.26953 (289, 3)	1380.46912 (249, 8)	1241.70923 (274, 2)	1068.97498 (320, 2)
247.5 /	0.00000 (0, 0)	1625.28687 (297, 7)	1306.07410 (157, 1)	983.08594 (65, 5)	785.97546 (65, 5)
225.0 /	947.95428 (183, 8)	1719.25366 (337, 5)	1358.51672 (352, 6)	933.04578 (156, 1)	727.45966 (327, 5)
202.5 /	1141.61755 (361, 8)	2102.20410 (267, 7)	1214.70923C(199, 1)	1087.98425C(199, 1)	941.07538C(199, 1)
180.0 /	1258.36182 (252, 2)	2655.00391 (163, 7)	1778.09119 (163, 7)	1290.39209 (163, 7)	1051.27539 (163, 7)
157.5 /	1423.63721C(168, 2)	3505.47266 (249, 3)	2306.03394 (353, 8)	1945.60352 (353, 8)	1504.99500 (353, 8)
135.0 /	1379.11511 (353, 8)	2119.61914 (350, 3)	1659.15405 (354, 3)	1345.02148 (355, 7)	999.45837 (355, 7)
112.5 /	1703.24683 (355, 3)	1997.76208 (352, 2)	1376.11475 (358, 2)	1159.52820 (352, 2)	1068.64844 (352, 2)
90.0 /	0.00000 (0, 0)	2075.97607 (185, 2)	1467.20447 (139, 1)	1278.42078 (270, 1)	1042.67615 (61, 2)
67.5 /	0.00000 (0, 0)	1982.16797 (115, 2)	1408.38135 (223, 1)	1155.71008 (223, 1)	1073.89697 (223, 1)
45.0 /	0.00000 (0, 0)	1066.49609 (134, 8)	1788.76147 (153, 1)	1528.48584 (153, 1)	1383.51953 (72, 1)
22.5 /	0.00000 (0, 0)	1269.83215 (326, 8)	1872.62183 (326, 8)	1594.82178 (160, 8)	1346.93237 (221, 2)

*** SUGAR CANE GROWERS CO-OP

* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 3505.47266 AND OCCURRED AT (100.0, 157.5) *

DIRECTION / RANGE (METERS)
(DEGREES) / 500.0 600.0

360.0 /	1383.86719 (171, 1)	1238.06055 (171, 1)
337.5 /	971.03577C (58, 7)	822.60144 (264, 7)
315.0 /	815.75647 (331, 6)	780.21307 (332, 1)
292.5 /	888.32654 (250, 1)	788.51978 (250, 1)
270.0 /	948.20331 (320, 2)	882.82422 (331, 2)
247.5 /	668.02509 (261, 7)	615.42480 (294, 1)
225.0 /	626.26282 (259, 2)	552.48871 (259, 2)
202.5 /	834.02478C (199, 1)	751.19623C (199, 1)
180.0 /	891.67822 (163, 7)	775.06903 (163, 7)
157.5 /	1195.20630 (353, 8)	976.88763 (353, 8)
135.0 /	923.77930 (130, 2)	864.01038 (354, 3)
112.5 /	822.20300 (314, 2)	739.41907 (314, 2)
90.0 /	931.98920 (215, 2)	867.70251 (215, 2)
67.5 /	1019.00537 (357, 1)	959.45898 (357, 1)
45.0 /	1291.92090 (72, 1)	1181.52991 (72, 1)
22.5 /	1189.54309 (221, 2)	1065.76074 (221, 2)

*** SUGAR CANE GROWERS CO-OP

* HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 1355.63159 AND OCCURRED AT (100.0, 157.5) *

DIRECTION / (DEGREES) /	RANGE (METERS)				
	50.0	100.0	200.0	300.0	400.0
360.0 /	0.00000 (0, 0)	373.72714C(34, 1)	1087.85986 (304, 1)	741.56873 (304, 1)	540.16772 (304, 1)
337.5 /	0.00000 (0, 0)	291.66528C(332, 1)	1031.47229C(332, 1)	649.21057C(332, 1)	455.13339C(332, 1)
315.0 /	0.00000 (0, 0)	430.06427C(229, 1)	862.53296C(188, 1)	636.58063 (331, 1)	490.69098 (331, 1)
292.5 /	0.00000 (0, 0)	833.67261 (295, 1)	849.85248 (330, 1)	597.71216 (330, 1)	445.63416 (227, 1)
270.0 /	0.00000 (0, 0)	1143.83423 (329, 1)	863.14783 (320, 1)	644.64032 (320, 1)	517.65253 (320, 1)
247.5 /	0.00000 (0, 0)	991.36560 (157, 1)	787.05383 (281, 1)	539.22131 (281, 1)	406.90695 (298, 1)
225.0 /	311.46082 (327, 1)	686.55530 (337, 1)	555.82190 (337, 1)	401.07492 (337, 1)	302.99530 (337, 1)
202.5 /	259.60034 (232, 1)	730.04553 (51, 1)	401.17065 (267, 1)	281.91302 (51, 1)	221.51793 (51, 1)
180.0 /	277.24881C(38, 1)	839.05255C(38, 1)	531.77496C(38, 1)	369.45013C(38, 1)	282.19553C(38, 1)
157.5 /	331.31558 (353, 1)	1355.63159 (353, 1)	852.79883 (353, 1)	636.44641 (353, 1)	487.02695 (353, 1)
135.0 /	459.23972 (353, 1)	1109.35437 (354, 1)	694.73462 (354, 1)	538.80463 (21, 1)	418.69794 (21, 1)
112.5 /	611.00574 (355, 1)	865.42133C(82, 1)	572.26166C(7, 1)	433.88953C(7, 1)	298.77747C(7, 1)
90.0 /	0.00000 (0, 0)	838.27698 (269, 1)	522.45264C(6, 1)	371.62564C(215, 1)	300.23737C(215, 1)
67.5 /	0.00000 (0, 0)	715.71808C(197, 1)	650.95410 (363, 1)	471.99402 (363, 1)	342.54135 (363, 1)
45.0 /	0.00000 (0, 0)	235.25900 (18, 1)	806.74402C(28, 1)	565.46167C(28, 1)	387.06711C(28, 1)
22.5 /	0.00000 (0, 0)	317.53049C(221, 1)	782.77466C(347, 1)	478.02884C(347, 1)	331.74258C(104, 1)

*** SUGAR CANE GROWERS CO-OP

* HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 1355.63159 AND OCCURRED AT (100.0, 157.5) *

DIRECTION / RANGE (METERS)
(DEGREES) / 500.0 600.0

360.0 /	426.52313 (304, 1)	352.35388 (304, 1)
337.5 /	344.96393 (31, 1)	284.32834 (31, 1)
315.0 /	395.14435 (331, 1)	336.56689 (87, 1)
292.5 /	365.60995 (208, 1)	309.27649 (208, 1)
270.0 /	428.07907 (320, 1)	362.38947 (320, 1)
247.5 /	341.12637 (298, 1)	294.71692 (298, 1)
225.0 /	241.46198 (337, 1)	198.61667 (337, 1)
202.5 /	182.58682 (51, 1)	152.46805 (51, 1)
180.0 /	228.67792 (38, 1)	191.57066 (38, 1)
157.5 /	391.97559 (353, 1)	326.79803 (353, 1)
135.0 /	347.38190 (354, 1)	300.51733 (354, 1)
112.5 /	231.00421 (7, 1)	189.32053 (7, 1)
90.0 /	253.25143 (215, 1)	219.13812 (215, 1)
67.5 /	277.47925 (363, 1)	234.84756 (363, 1)
45.0 /	285.35522 (28, 1)	255.20654 (72, 1)
22.5 /	270.52243 (104, 1)	221.22241 (104, 1)

*** SUGAR CANE GROWERS CO-OP

* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 1198.54248 AND OCCURRED AT (100.0, 157.5) *

DIRECTION / (DEGREES) /	RANGE (METERS)				
	50.0	100.0	200.0	300.0	400.0
360.0 /	0.00000 (0, 0)	315.83923C(105, 1)	1028.47485C(358, 1)	649.81799C(358, 1)	477.36542C(358, 1)
337.5 /	0.00000 (0, 0)	261.22855 (277, 1)	871.33850 (31, 1)	610.18884 (31, 1)	443.20148 (31, 1)
315.0 /	0.00000 (0, 0)	346.17145C(35, 1)	860.63074 (55, 1)	619.35205 (55, 1)	472.29132C(57, 1)
292.5 /	0.00000 (0, 0)	819.41040 (330, 1)	737.45422 (227, 1)	576.28882 (227, 1)	436.93268 (208, 1)
270.0 /	0.00000 (0, 0)	963.19995 (321, 1)	782.71265 (329, 1)	637.57745 (318, 1)	515.84290 (318, 1)
247.5 /	0.00000 (0, 0)	988.14642 (281, 1)	759.85852 (157, 1)	512.74390 (298, 1)	387.84180 (281, 1)
225.0 /	274.52438 (51, 1)	681.63025 (267, 1)	489.63470 (156, 1)	348.15814 (257, 1)	270.58627C(266, 1)
202.5 /	247.68321 (268, 1)	704.18994 (267, 1)	393.96094 (51, 1)	263.43567 (267, 1)	207.69604 (327, 1)
180.0 /	239.96770C(163, 1)	690.90839 (268, 1)	413.53571 (39, 1)	288.94403 (39, 1)	219.17114 (39, 1)
157.5 /	288.80457 (354, 1)	1198.54248 (354, 1)	724.88416 (354, 1)	485.46729 (354, 1)	357.68665 (354, 1)
135.0 /	395.66721C(356, 1)	1061.23120 (355, 1)	694.10425 (21, 1)	520.81989 (354, 1)	413.59943 (354, 1)
112.5 /	397.13187C(27, 1)	748.25995 (308, 1)	540.14313C(82, 1)	372.45526C(82, 1)	275.10681C(82, 1)
90.0 /	0.00000 (0, 0)	787.29877C(82, 1)	514.60242 (269, 1)	368.19775C(6, 1)	269.70822C(6, 1)
67.5 /	0.00000 (0, 0)	580.18823 (363, 1)	604.55341 (81, 1)	446.56125 (81, 1)	333.37695 (81, 1)
45.0 /	0.00000 (0, 0)	226.20221 (123, 1)	695.49683 (18, 1)	478.22815 (18, 1)	354.42847 (18, 1)
22.5 /	0.00000 (0, 0)	285.47916C(105, 1)	560.60223C(303, 1)	407.67450 (160, 1)	325.34702C(347, 1)

*** SUGAR CANE GROWERS CO-OP

* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 1198.54248 AND OCCURRED AT (100.0, 157.5) *

DIRECTION /	RANGE (METERS)	
(DEGREES) /	500.0	600.0

360.0 /	385.43350C(358, 1)	321.72949C(358, 1)
337.5 /	340.25140C(332, 1)	265.94171C(332, 1)
315.0 /	392.71655C(87, 1)	333.97559C(56, 1)
292.5 /	359.09204 (227, 1)	308.16162C(224, 1)
270.0 /	425.61023 (318, 1)	359.99512 (318, 1)
247.5 /	297.27014 (281, 1)	260.10309 (262, 1)
225.0 /	220.52533C(266, 1)	184.57269C(266, 1)
202.5 /	175.25443 (327, 1)	150.13274 (327, 1)
180.0 /	177.69261 (39, 1)	154.94722C(107, 1)
157.5 /	282.35248 (354, 1)	230.66045 (354, 1)
135.0 /	339.83359 (21, 1)	284.37448 (21, 1)
112.5 /	213.38745 (308, 1)	183.99425 (308, 1)
90.0 /	211.30745C(6, 1)	183.02283C(61, 1)
67.5 /	262.13116 (81, 1)	221.52536 (25, 1)
45.0 /	283.62430C(72, 1)	242.48869C(17, 1)
22.5 /	256.37219C(105, 1)	218.02715C(105, 1)



STATE OF FLORIDA
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

DISTRICT IX

March 6, 1989

RECEIVED
MAR 14 1989
DER-BAQM

Mr. Jim Pennington, P.E.
Division of Air Resources Management
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: Sugar Mill Complaint

Dear Mr. Pennington:

Enclosed you will find the information you have requested, on the Sugar Cane Growers Co-op, Belle Glade. This information is extracted from the recent stack tests reports. A layout of the Sugar Cane Growers Co-op and the QO Chemical, Inc. is also attached. Wind development pattern was recorded some 23 miles east of Belle Glade.

Please call me at Suncom 273-3070 or at (407) 355-3070, if you need any other information.

Sincerely,
For the Division Director
Environmental Science Engineering

Ajaya K. Satyal
Environmental Specialist

FJG/AKS/slb

DEPARTMENT OF ENVIRONMENTAL REGULATION

**ROUTING AND
TRANSMITTAL SLIP**

ACTION NO

ACTION DUE DATE

1. TO: (NAME, OFFICE, LOCATION)

TOM ROGERS

Initial

Date

2.

THREE LARRY C. ~~TEORELL~~

Initial

Date

3.

Initial

Date

4.

Initial

Date

REMARKS:

ATTACHED IS THE INFO ON
SUGAR CAVE GROWERS COOP,
AS WE DISCUSSED TWO WEEKS
AGO. PLEASE MODEL TO SEE IF
THE STACKS NEED RAISED.

INFORMATION

Review & Return

Review & File

Initial & Forward

DISPOSITION

Review & Respond

Prepare Response

For My Signature

For Your Signature

Let's Discuss

Set Up Meeting

Investigate & Report

Initial & Forward

Distribute

Concurrence

For Processing

Initial & Return

FROM:

Jim P.

DATE

3/15/89

PHONE

113

Sugar Cane Growers Co-op, Belle Glade

Boilers with ID

	#8	#5	#4	#3	#2	#1
Allow emission	71.04 lbs/hr	72.42	82.64	45.64	49.55	49.42
Actual	69.22 lbs/hr	56.38	66.69	41.53	41.28	42.1bs
Stack Dia	114"	64" x 2 stacks	113.5"	64"	52"x 2 stacks	52"x 2 stacks
Stack Ht.	155'	80'	115'	80'	80'	80'
Velocity	2081 FPM	2419	1796	3759	2514	2692
Stack Temp	152 F	152 F	147 F	153 F	147 F	154 F

Temperature - High 80 F
Low 68 F

PREVIOUS DAILY SUMMARY

Sun
01/29/89

29

WMD

CHANNEL NUMBER	01	02	03	04	05
CHANNEL NAME	03	WDR/DEV	WSP	TIN	RCV
CHANNEL UNITS	PPM	DEG	MPH	DGC	VLT
FULL SCALE VALUE	.509	360	100	43.3	5.00
ZERO VALUE	.006	0	0	-23.3	.00
INPUT RANGE	.1	.1	.1	5	5

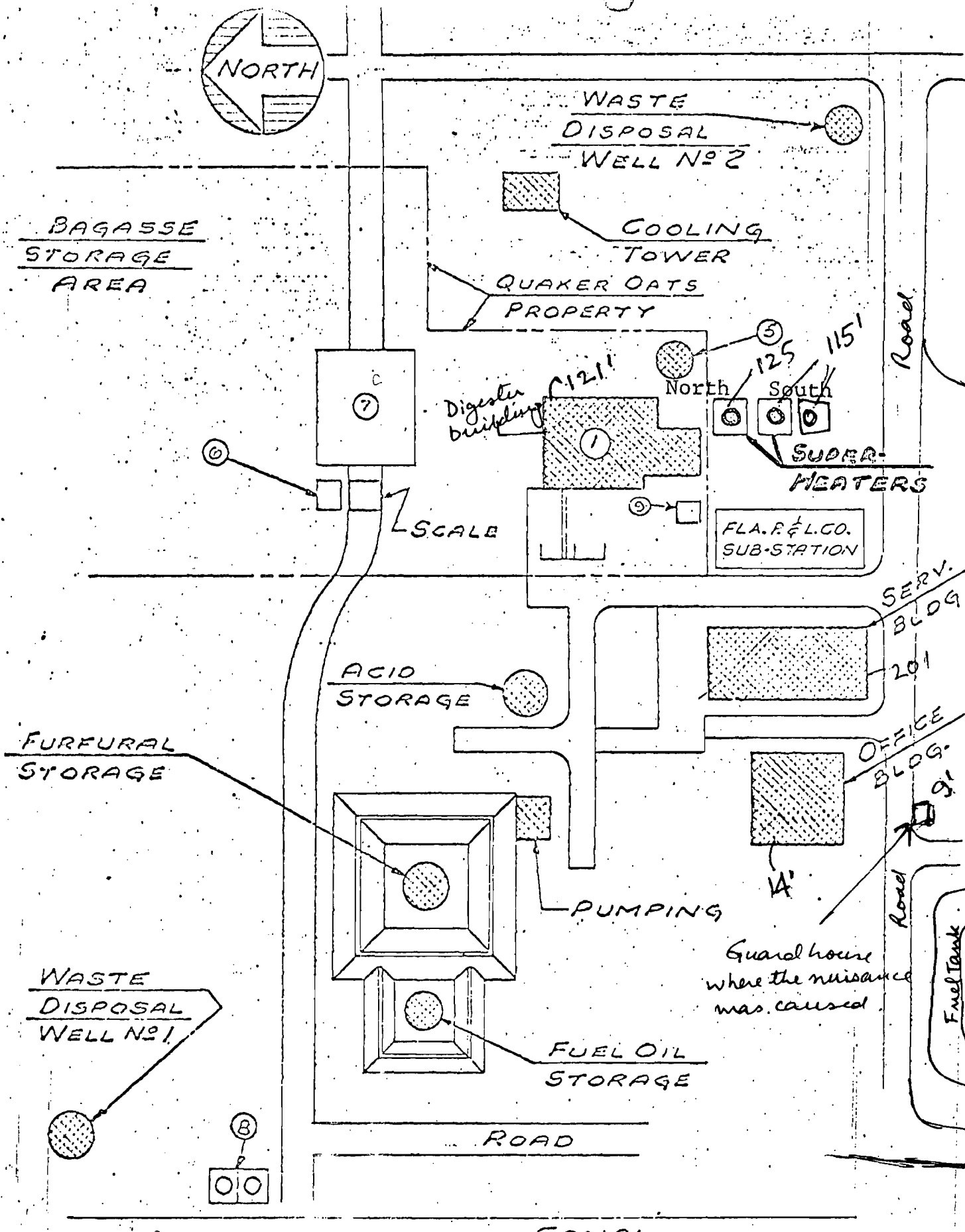
01:00	.000	0 / 15	0	25.8	4.96
02:00	.000	0 / 12	0	25.4	4.97
03:00	.000	0 / 13	0	25.8	4.97
04:00	.000	~~35.4 / 19~~	0	25.5	4.97
05:00	.001	15 / 15	1	25.7	4.97
06:00	.003	10 / 20	1	25.5	4.97
07:00	.006	~~37 / 26~~	0	25.6	4.97
08:00	.003	~~36 / 24~~	0	25.6	4.97
09:00	.011	140 / 19	1	25.5	4.97
10:00	.021	152 / 18	2	25.5	4.97
11:00	.029	152 / 24	4	25.6	4.97
12:00	.032	134 / 23	4	25.6	4.97
13:00	.034	122 / 23	6	25.6	4.97
14:00	.036	128 / 23	6	25.6	4.97
15:00	.031	127 / 20	7	25.6	4.97
16:00	.029	130 / 19	5	25.5	4.97
17:00	.029	136 / 18	4	25.6	4.97
18:00	.021	139 / 17	1	25.5	4.97
19:00	.012	129 / 12	1	25.4	4.97
20:00	.011	128 / 11	1	25.5	4.97
21:00	.009	~~110 / 10~~	0	25.4	4.97
22:00	.001	~~5.6 / 3.8~~	0	25.4	4.97
23:00	.000	~~20 / 20~~	0	25.5	4.97
00:00	.000	~~21 / 24~~	0	25.6	4.96
AVERAGE	.013	127 / 19	2	25.5	4.97

SITE : WMD

RSC

PARAMETERS READ : 4
RECORDS READ : 24
RECORDS WRITTEN : 8

QO Chemical Plant

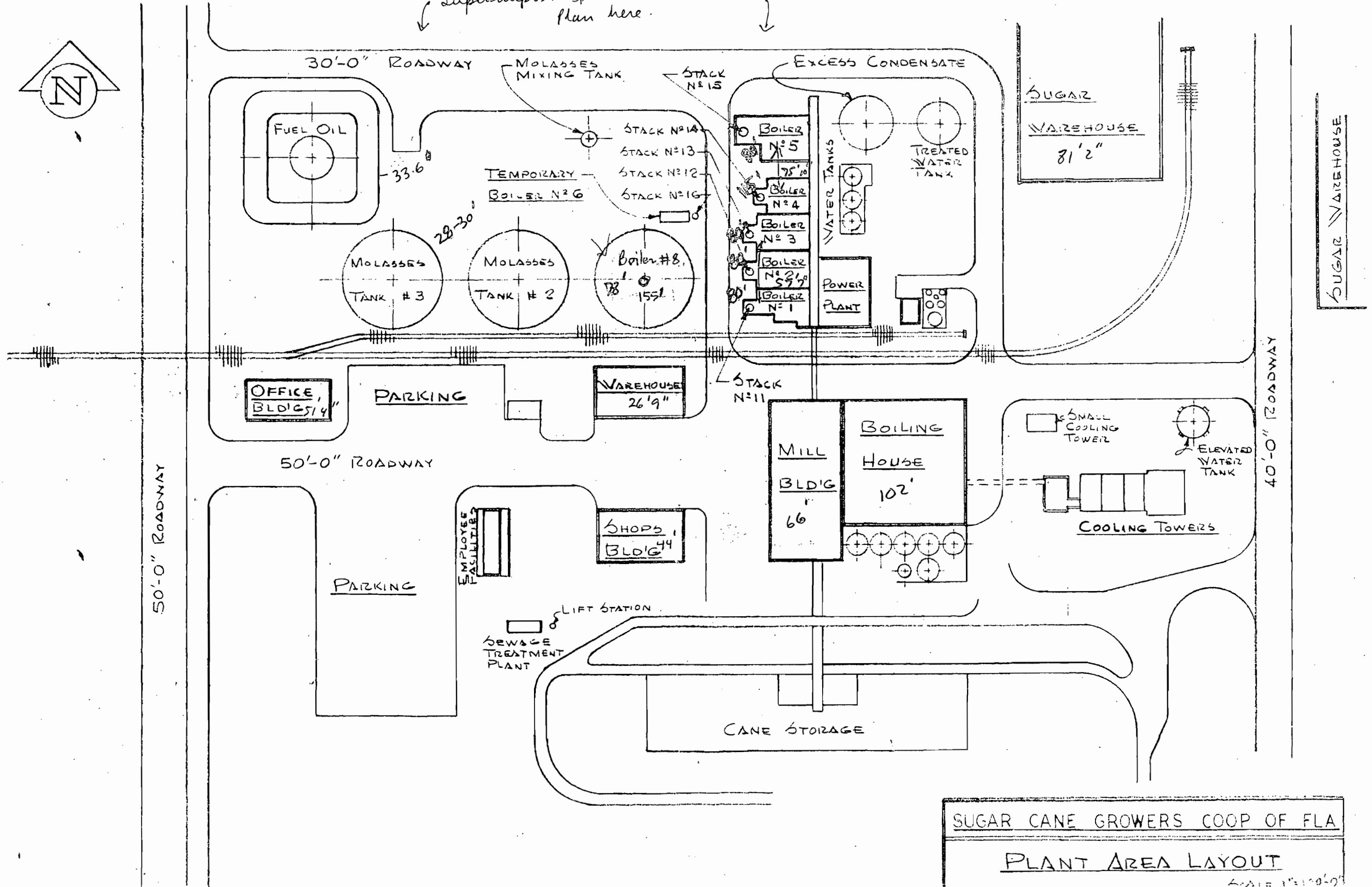
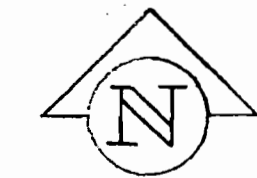


FORM NO. 4303P

FILE NO.		REVISIONS			THE QUAKER OATS COMPANY, CHICAGO, ILL.		SHEET NO.	
		NO.	DATE	BY	ANT BELLEGLADE		PLOT PLAN SHOWING LOCATION OF OIL	
					C.H.S.			
7 JON NO.		2	1/12/51	C.H.S.			2	

BEST AVAILABLE COPY

Superimpose G.O. Chemicals
plan here.



SUGAR CANE GROWERS COOP OF FLA

PLANT AREA LAYOUT

SCALE 1"=100'-0"



3760 MORROW LANE SUITE F, CHICO, CALIFORNIA 95928-8865 • TEL (916) 893-0308 • FAX (916) 893-4517

March 10, 1989

RECEIVED

MAR 13 1989

Mr. Jim Pennington
Sugar Cane Coordinator
Florida D.E.R.
2600 Blairstone Road
Tallahassee, FL 32399-2400

DER-baq...

Dear Mr. Pennington:

Thank you for your interest in Weather Network, Inc. and our sugar cane and rice burning program.

Weather Network, Inc./Nowcasting has been involved in providing the weather forecasting support for the burning of the rice fields in the Sacramento Valley since 1981. The program has greatly reduced the number of complaints from citizens and has brought the farming and urban communities closer together.

In 1988, Weather Network, Inc. installed twenty automatic weather stations on four islands in Hawaii. Eleven of these stations are located in the central Valley of Maui where they are used for weather forecasting during the burning of the fields and also in the cultivation of the sugar cane throughout its growing cycle.

Please find enclosed information on our company and reports of the programs we are involved in both in Hawaii and in California.

After you have had an opportunity to review the enclosed materials, please contact me if you have any questions.

Sincerely,

A handwritten signature in dark ink, appearing to read "Don Schukraft", is written over the typed name.

Donald F. Schukraft
Certified Consulting Meteorologist
General Manager

DFS/sdh
Enclosures



N O W C A S T I N G

A division of Weather Network, Inc., an Occidental company

3760 Morrow Lane • Suite F

Chico, California 95928-8865

916 • 893 • 0308

**SACRAMENTO VALLEY
1988 FALL AGRICULTURAL BURNING
PROGRAM**

**Prepared for: Rice Research Board
P.O. Box 507
Yuba City, CA 95991**

**Prepared by: Weather Network, Inc.
3760 Morrow Lane
Suite F
Chico, CA 95928**

December 1988

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EXECUTIVE SUMMARY

The 1988 Fall Agricultural Burn program got underway on September 15 and continued through November 23 when heavy rains over the two previous days created widespread fuel moisture problems. With little prognosis for adequate drying, the formal phase of the Fall Burn was ended at that time. Control of the basinwide allocation of burn acreage returned back to the Air Resources Board.

During the seventy day period the Fall Burn program was in operation, approximately 222,000 acres were burned. The total represents an increase of roughly 5,000 acres over the previous Fall Burn season. Figure 1A shows how this year's acreage compares with previous years the program has been active. Table 1, below, illustrates how effective the Fall Burn program has been, since expansion of the program to include September.

Table 1.
A Comparison 1985-1988

<u>Year</u>	<u>Acreage Burned</u>	<u>Total*</u> <u>Complaints</u>	<u>ARB **</u> <u>Complaints</u>	<u>Average Basin</u> <u>COH</u>
1985	275,480	153	51	2.77
1986	287,183	161	59	2.49
1987	216,980	50	13	2.97
1988	221,826	90	11	2.47

* Complaints received by the county air pollution control offices and Air Resources Board. The lack of standardization between the counties as to what constitutes a complaint makes the validity of many of these complaints open to question.

**Complaints received by the Air Resources Board (ARB) in Sacramento.

The 1988 Fall Burn was characterized by an unusually high number of south wind days, which proved not to have as beneficial an effect on burning as might be initially thought. This September, a record amount of acreage was burned. This was followed by exceptionally stable atmospheric conditions for much of October and a consistently wet November, which conspired to put a considerable constraint on the amount of acreage burned over this portion of the season. Daily average coefficient of haze (COH) followed the usual trend of gradually increasing in variability as the burn season progresses (see figure 1B). Unlike the previous Fall Burn, non-basin generated smoke, though present early in the season, proved to have a much smaller adverse impact on the valley this year.

This was the second year the Weather Network computer database system was used to collect and disseminate weather information and allocation files. The Air Resources Board, the Central Computer Operator, Fife Environmental and Weather Network, Inc. placed files on the computer data base which were then distributed to participating counties. Overall this proved to be a very successful method of file transfer with system downtime limited to a portion of a few mornings.

Total Acreage burned, Season

FALL BURN 1981-1988

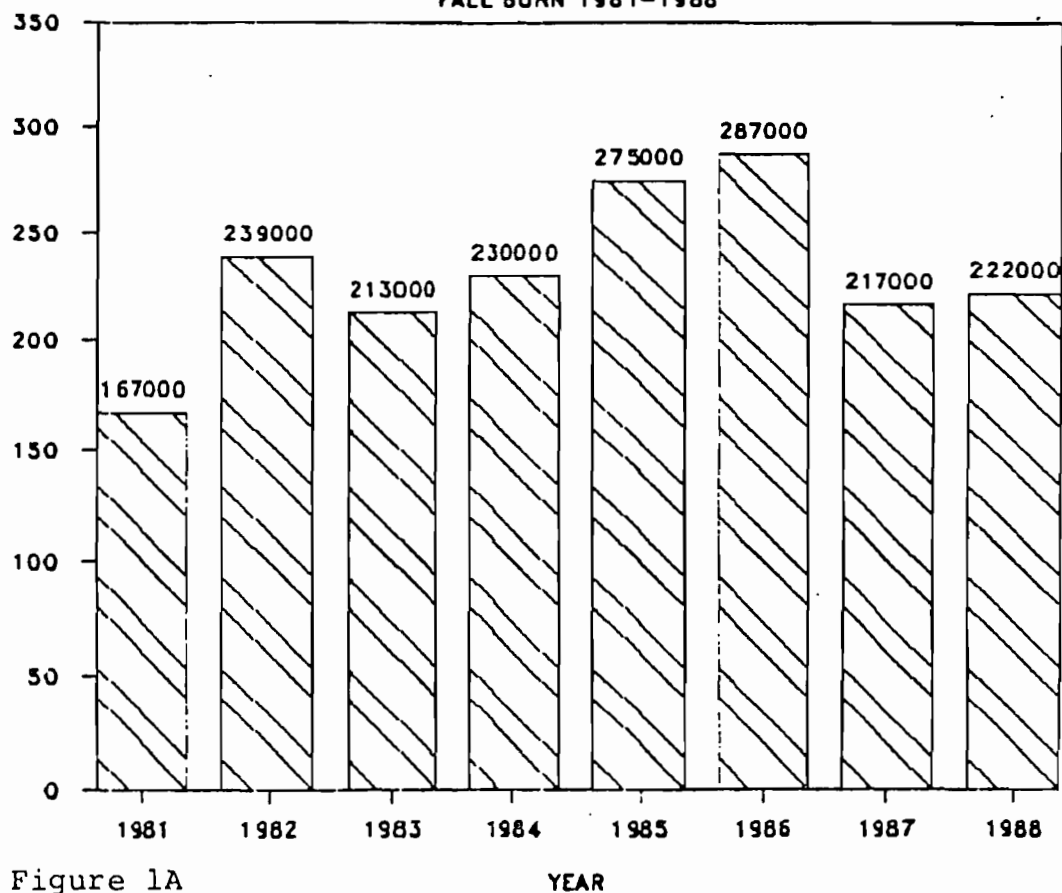
acreage burned
(Thousands)

Figure 1A

Daily Average Basin COH

FALL BURN 1988

basin average COH

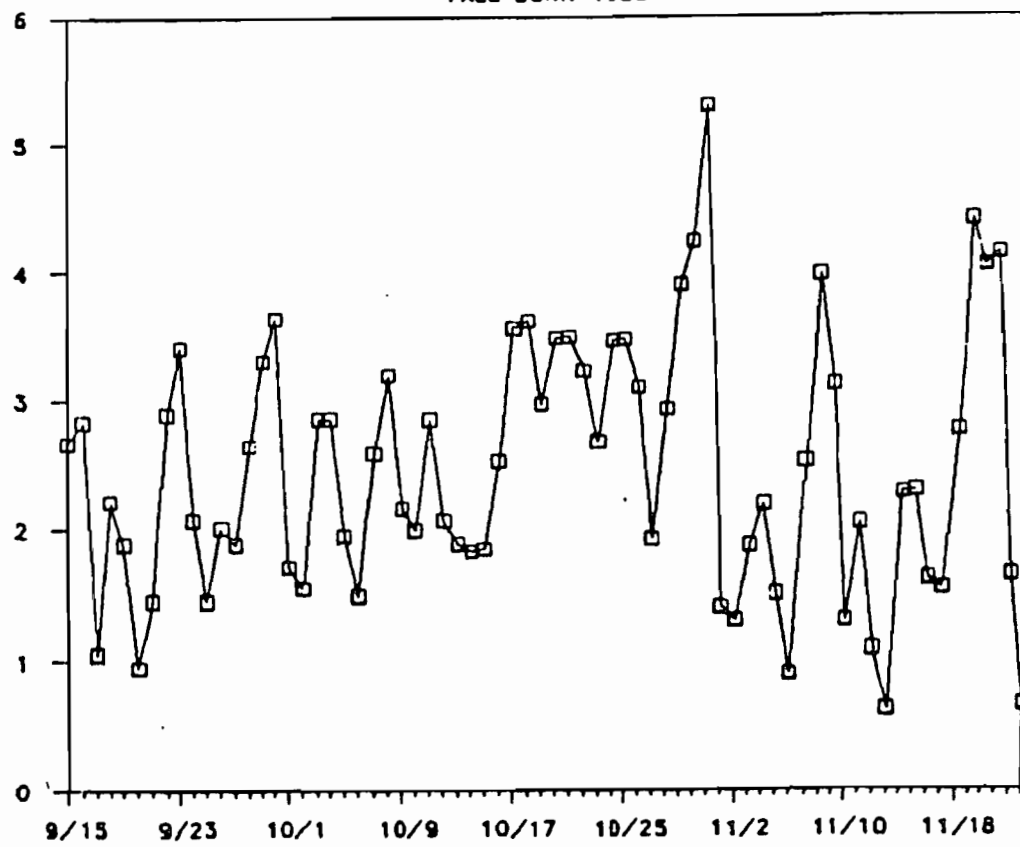


Figure 1B

DATE

No changes were made in the placement of Automatic Meteorological Observation Stations (AMOS) within the valley from the previous year. However due to advanced age, the Natomas echosonde was replaced by an upgraded system recently developed by Radian. Some problems were encountered with the polling of the AMOS network due to radio interference during the daylight hours. Steps were initiated this fall to correct the problem.

INTRODUCTION

This report was prepared by Weather Network, Inc for the Rice Research Board in accordance with our contract dated March 15, 1988.

This report reviews the 1988 Fall Agricultural Burning Program. Specifically mentioned are a summary of the tasks performed by Weather Network, Inc., a meteorological description of the planting, growing, harvest and burn seasons, meteorological instrumentation installed, repaired or utilized during this year's burn program and the method of file/data transfer and dissemination. Also included is a sample of the 9AM Fall Burn file (appendix A) and Fall Burn Communication information (appendix E).

FALL BURN OVERVIEW

Weather Network began making initial preparations for the 1988 Fall Agricultural Burning program last May when the Rice Research Board (RRB) asked for proposals on equipment upgrades and other changes which would aid this and subsequent burn seasons. Two proposals were submitted, the first would upgrade one of the valley echosondes and the second was to develop a model to forecast surface wind flow patterns. On June 9th, both proposals were accepted by the RRB.

The echosonde equipment was purchased from Radian Corporation, received and installed by the end of August along side the existing automatic meteorological observing station (AMOS) at Natomas. Otherwise no other changes were made from the previous year in regards to echosonde or AMOS placement. The resumption of weather observations from Red Bluff earlier in the year, allowed this station to be included in the daily burn files and the summary table included within this report (appendix A,C).

During the month of August, all weather stations and the other two echosonde sites were visited and routine maintenance performed. Communication software on Weather Network database was put in place and tested. A letter was sent to all participants on Weather Network procedures, (see appendix E). A coordination meeting between Five Environmental, representatives from the participating counties, Don Schukraft from our office along with interested growers was undertaken August 10th.

Further in house testing of the file collection and dissemination on Weather Network was undertaken in early September. Final bugs were worked out during the pre-Burn testing period of September 12-14 with all participating agencies. The formal Fall Burn Program began on Thursday September 15. Daily dispersion forecasts were issued by Weather Network, Inc. in two stages followed by a late morning update. Appendix B shows the procedure followed by Weather Network forecasters during the course of the Fall Burn.

The first of these two main files was issued at 8am and contained a file describing the day's expected dispersion within the valley with specific mention made of surface and transport winds, morning inversions, expansion of the mixing layer and areas of caution. The second file was

issued by 9am and contained zone ventilation ratings along with morning and afternoon winds (direction and average speed) for each burn zone within the valley. Also included with this file was an updated version of the 8am file. An update was issued at 11am, detailing any changes in dispersion or winds.

All three files contained the latest AMOS and Airport wind, visibility and relative humidity readings from the 27 valley observing stations. A sample of the entire 9am file is shown in Appendix A with files from the Air Resources Board (ARB) and Central Computer Operator (CCO) included. This is a typical file received by all participating counties during the Fall Burn program via the Weather Network database system.

Each county in the Sacramento Valley is broken down into zones. For each of the 37 zones, a zone ventilation rating and morning/afternoon average wind direction/speed forecast was issued. The zone ventilation rating is used as an indicator of the expected dispersion and transport direction of any generated smoke within that zone. These ratings range between one and five, with one indicating poor ventilation and/or unfavorable transport direction and five indicating excellent ventilation and/or favorable transport direction. A map of the zones for all participating counties is shown in Figure 2.

During the Fall Burn period, a total of 221,826 acres of rice stubble were burned over the 70 days the program ran for an average of 3,169 acres per day. The largest amount burned on a single day was 15,998 acres on October 13th. The least amount burned occurred on November 13th when no acreage was burned due to excessive fuel moisture. The seasonal progression of daily acreage burned is shown in Figure 3. Daily acreage burned along with several meteorological and dispersion parameters are displayed in Appendix C.

Very stable conditions for much of the burn season resulted in the total acreage burned to be only about 5,000 acres greater than last year despite the burn program lasting nearly a week longer. However, the number of ARB recorded complaints reached an all time low as shown in Figure 4.

Up until last year, the monthly average Coefficient of Haze (COH) readings normally increased during the course of the burn season. However last year for the first time, COH readings, after increasing from September to October, decreased in November. This year the trend was even more pronounced, resulting in burn season average COH being the lowest since expansion of the program to include September in 1985. (see Figure 5)

The formal Fall Burn program was officially terminated November 23 by the Technical Advisory Committee (TAC) after successive storms over the previous 48 hours dumped from one to three inches of rain on the valley. Control of the daily acreage allocation allowed to be burned was returned to the ARB at that time.

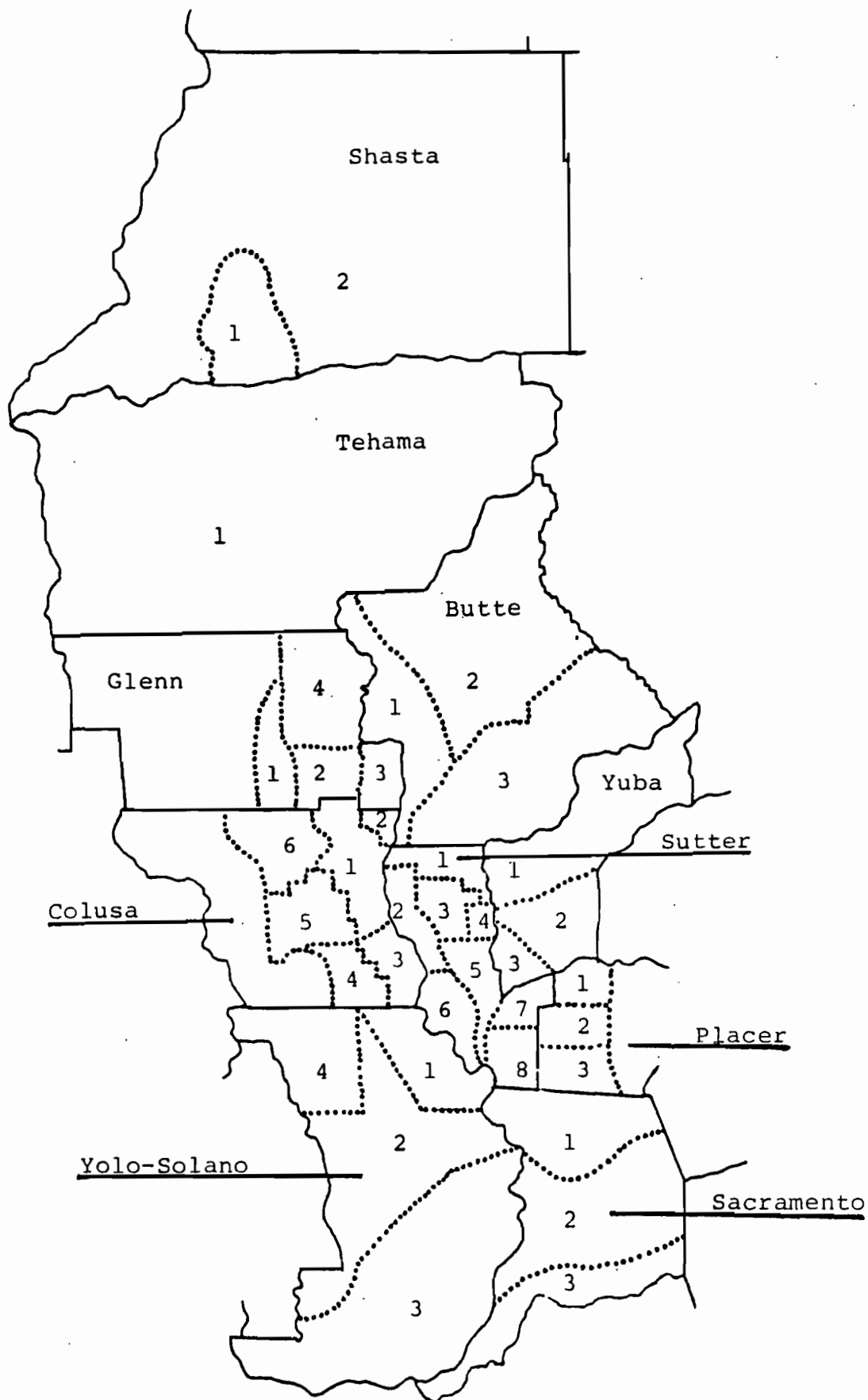


Figure 2

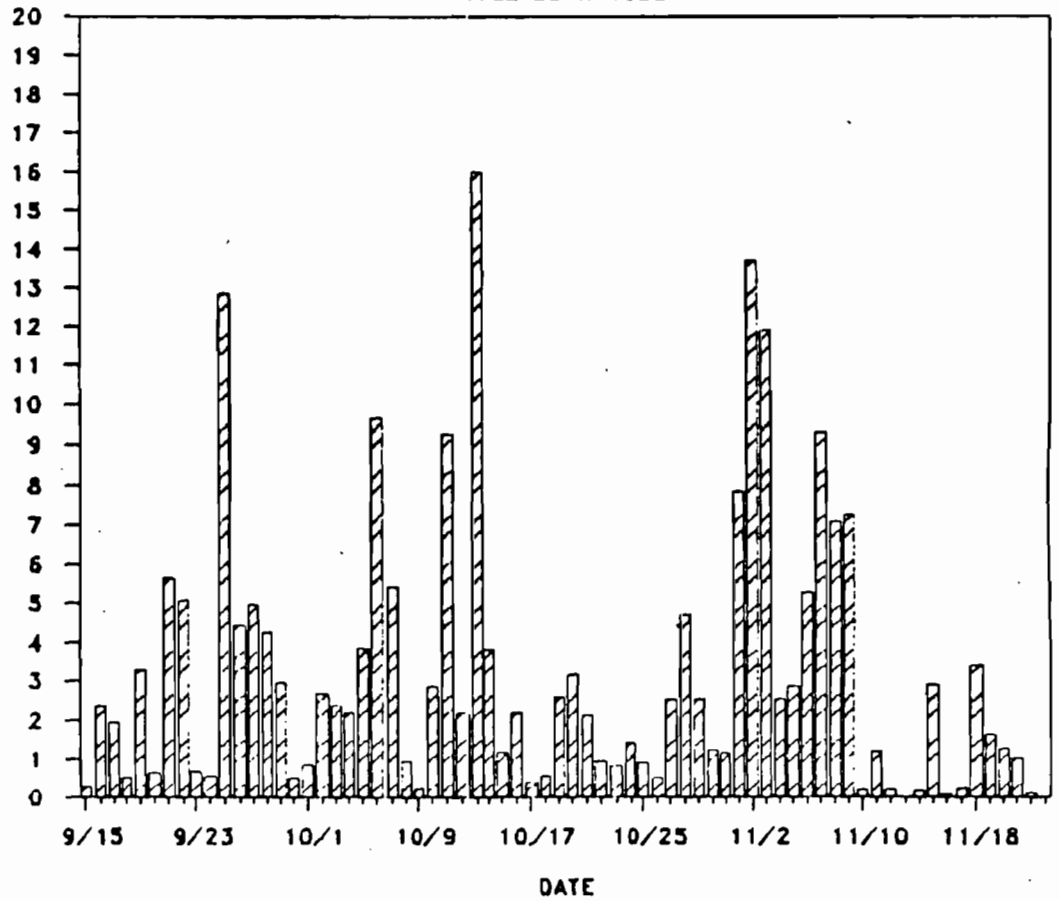
Sacramento Valley Burn Zones

Figure 3

Daily Acreage Burned

FALL BURN 1988

reported acreage burned
(Thousands)

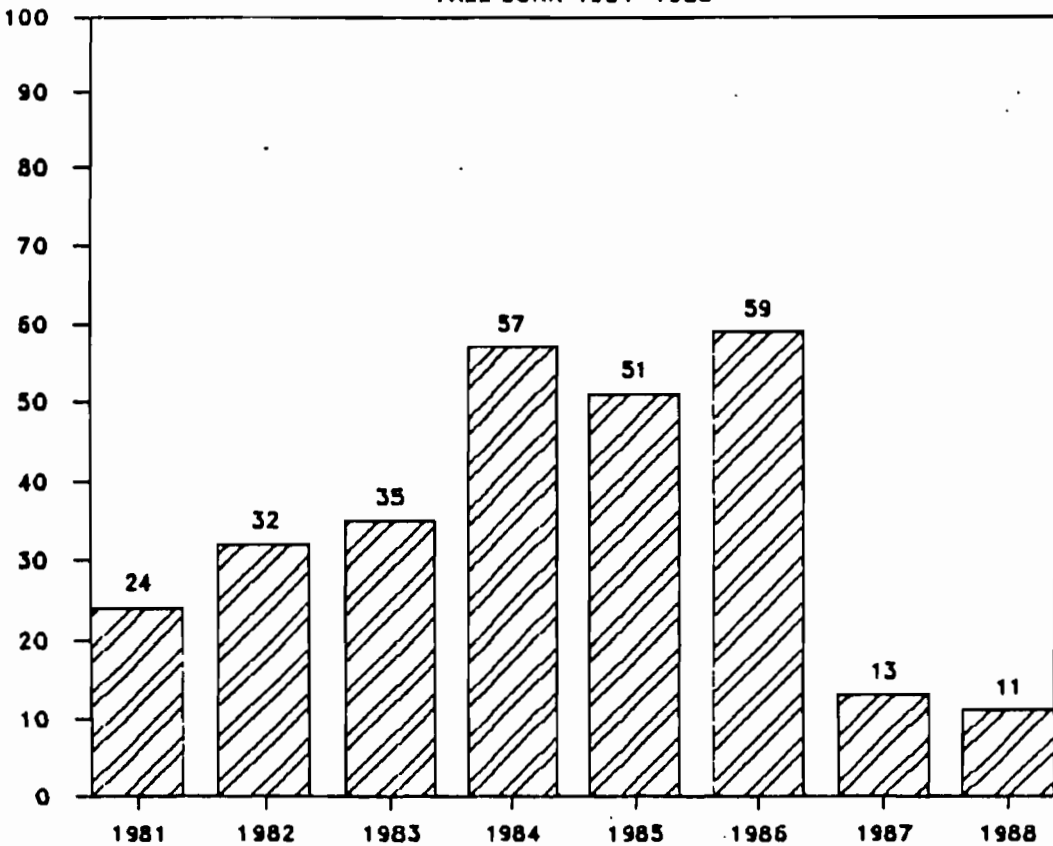


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AAS Recorded Complaints, Season

FALL BURN 1981-1988

number of complaints



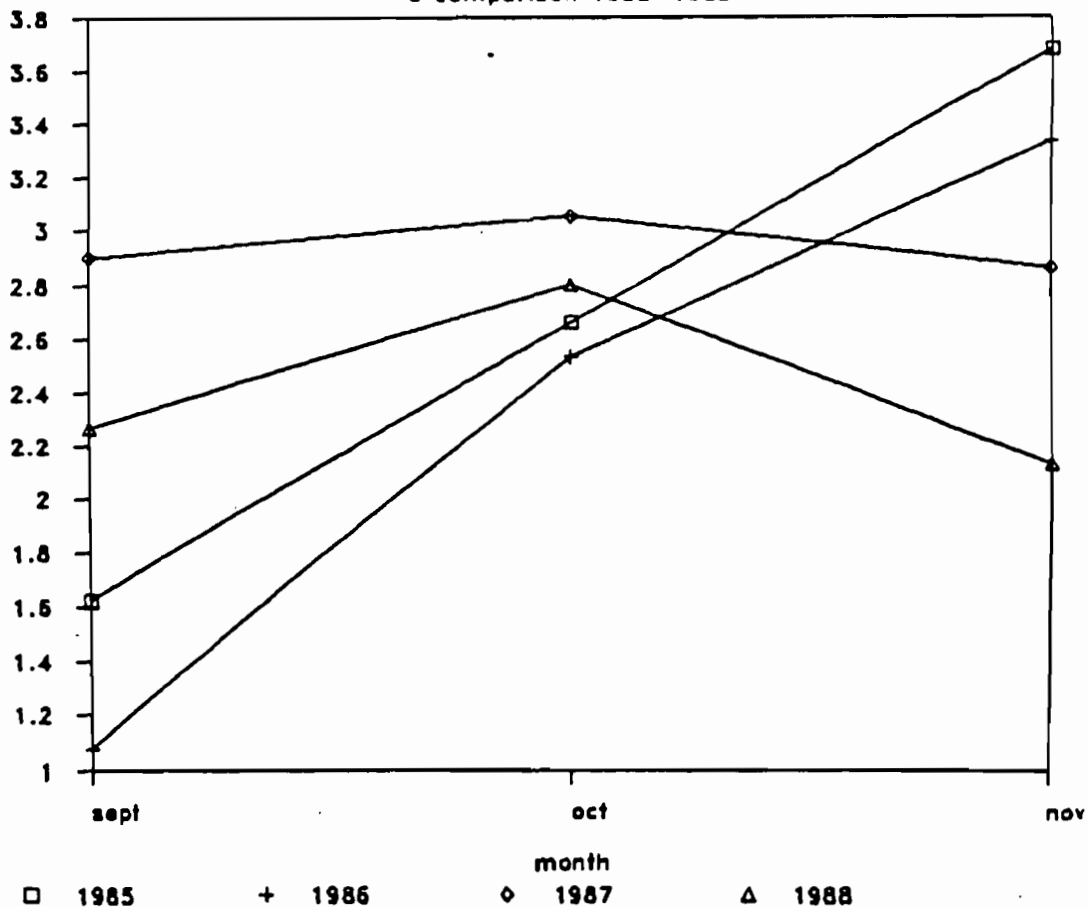
Handwritten notes: 6/1/82, 1/4/89, 6/2/86, 1985 YEAR, 1/2/87, 1/2/88

Figure 5

Monthly Average COH

a comparison 1985-1988

basin average COH



WEATHER SUMMARY 1988

A cool wet May followed by the continuation of relatively damp weather through the first half of June, forced numerous growers to retill, reseed, and respray their fields due to poor germination or stalled growth of newly emerged rice shoots. Even growers less seriously affected by the weather, saw their rice experience a period of unusually slow growth as the temperatures necessary to sustain normal growth were just not there.

Warmer weather the rest of June and most of July pushed crop development to near or slightly ahead of normal by the end of July. However another downturn in temperatures in early August, stalled development at the critical pollination/fertilization stage. Pronounced warming over the later half of August, followed by only slightly less intense readings through most of September, pushed many early varieties to harvest. Once again, highly variable weather in late September delayed harvest of many slower maturing varieties until October. Unusually hot weather during the later half of October provided excellent drying conditions, allowing late harvested fields to become rapidly available for burning.

Despite the wide variation in late spring and summer weather, more rice was harvested and fields available for burning during September this year, since the Fall Burn was expanded to begin mid month (1985). Because this high amount of acreage available occurred during a period of relatively favorable burning conditions, this proved to be the most successful September, in terms of acreage burned since addition of this month to the program four years ago. Very warm weather interspersed with cooling periods associated with weak and generally dry frontal passages sustained good enough ventilation allowing a record 50,936 acres to be burned during the month. For the first time in September, in excess of 10,000 acres were burned on a single day, when 12,836 acres were burned September 25th. This was accomplished without adversely impacting the valley.

Table 2
SEPTEMBER

<u>Year</u>	<u>Number of Days</u>	<u>Average COH</u>	<u>Acreage Burned</u>	<u>Total Complaints</u>	<u>Rain Days</u>
1985	15	1.62	30,470	8	1
1986	16	1.08	19,058	7	10
1987	17	2.90	29,512	19	0
1988	16	2.27	50,936	25*	0

* Fifteen of these complaints were generated on a single day (9/27) when poor field placement on a north wind day brought smoke into Sacramento.

Unseasonably warm, dry and very stable conditions for much of October resulted in a much less productive burn schedule. Long stretches of days with elevated relative humidities, strong morning inversion and with little or no wind greatly curtailed the amount of burning done during the month. The few favorable burn days occurred early in the month. They were predominantly prefrontal days where low level

stability decreases substantially during the day while surface and transport winds increased to moderate strength out of a southerly direction.

Of the three days with the most acreage burned during the month, only one exceeded the ventilation capacity of the basin, as noted by the large jump in basin COH and the numerous complaints generated. This day, October 11, was not a prefrontal day. On this day moderate south winds were present along with a relatively strong marine inversion capping the mixing layer at around 2000 feet. Together these factors kept smoke from lifting effectively off the ground during the day. The other two days were prefrontal days. These two days, October 6 and 13, were characterized by moderate south winds and good mixing much of the day. The first front proved to be dry while the second system brought only modest rainfall amounts to the valley. Despite burning nearly 10,000 acres on the 6th and almost 16,000 acres on the 13th, basin COH, a measure of air quality, decreased following the frontal passage. Because these days were not taken complete advantage of, and the rest of the month was too stable to allow much more than minimal daily burning to be undertaken, October's total acreage burning showed sizeable decline from the previous years (see table 3 below).

Table 3
OCTOBER

<u>Year</u>	<u>Number of Days</u>	<u>Average COH</u>	<u>Acreage Burned</u>	<u>Total Complaints</u>	<u>Rain Days</u>
1985	31	2.66	159,302	92	2
1986	31	2.53	157,758	110	8
1987	31	3.05	117,190	31	6
1988	31	2.80	91,074	45*	1

* Nine complaints were generated on a single day (10/11) when fires were concentrated on a day with moderate south winds and a strong and relatively low marine inversion.

The very dry and unseasonably warm October was followed by a much cooler and wetter November. Initially weak frontal activity caused only limited fuel moisture problems. This allowed three of the largest acreage burn days of the season to be accomplished within the first week of the month. The rest of the month was characterized by a consistent procession of stronger frontal activity which allowed little drying in between. This kept the valley too wet to sustain much burning and was eventually responsible for the suspension of the burn program on November 23.

Table 4
NOVEMBER

<u>Year</u>	<u>Number of Days</u>	<u>Average COH</u>	<u>Acreage Burned</u>	<u>Total Complaints</u>	<u>Rain Days</u>
1985	23	3.68	85,708	53	6
1986	26	3.33	106,532	44	5
1987	16	2.86	68,579	1	9
1988	23	2.13	79,816	20	11

The 1988 burn season was unusual for a number of reasons. First, north winds were much less dominate during the season, occurring on less than 25% of the days during this year's burn, compared to the previous three year average of close to 50%. Conversely, south wind days occurred with much greater regularity, rising from the previous three year average occurrence rate of approximately 25% to an excess of 40%. (see figure 6,7). Second, the winds were significantly stronger, particularly during the afternoon than has been observed over the previous couple of years in which records are available (see figures 8,9).

What is truly remarkable about this change in the wind flow pattern during this year's Fall Burn is that it holds true even when November's wet weather is not considered (although adding November does significantly strengthen the seasons average wind speed). It is also interesting to note that this large increase in south wind days had little or no effect on the amount of acreage released or burned.

Predominate Daily Wind Flow Pattern
FALL BURN 1985-1987

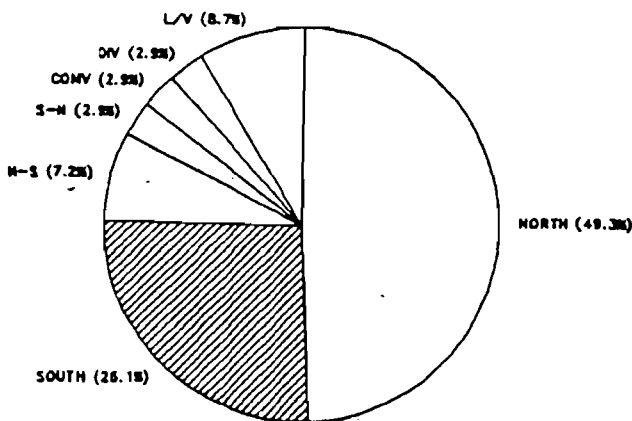


Figure 6

Predominate Daily Wind Flow Pattern
FALL BURN 1988

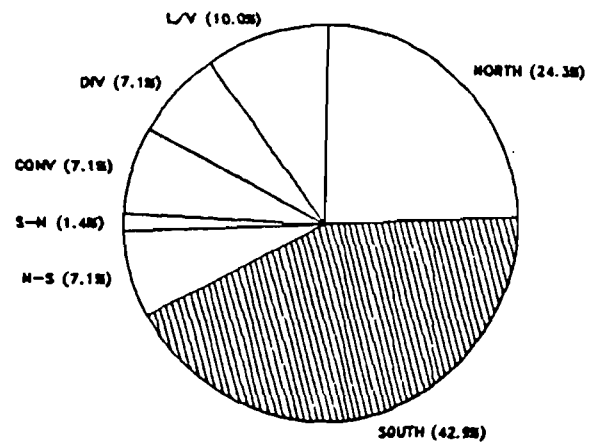


Figure 7

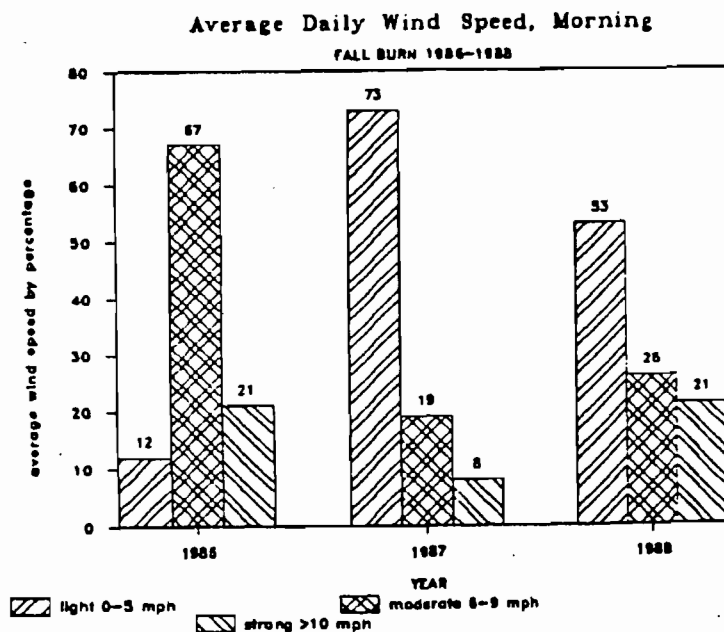


Figure 8

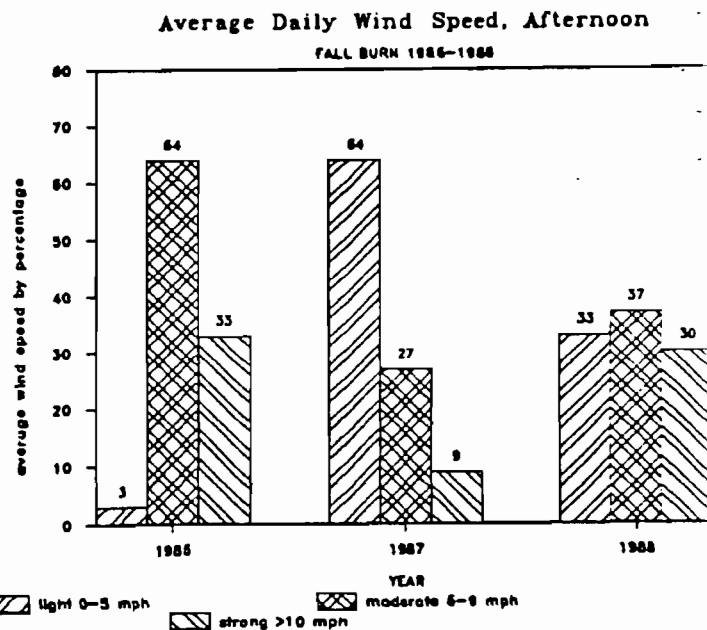


Figure 9

WEATHER NETWORK DATABASE SYSTEM

The Weather Network database system was used as the primary mode of information and file transfer between the participants of the Fall Burn program. Weather Network is a computerized information system, with access available via a microcomputer with telephone communications.

All participants to the Fall Burn program were given unique passwords to the system. The Air Resources Board, the Central Computer Operator, Fife Environmental as well as our office, all had the ability to upload files into the Weather Network database. These files were then linked together so that each of the participating counties could, after logging on, type a simple command and receive the appropriate files.

For the second year in a row, Weather Network proved to be a viable solution for participants in the Fall Burn program to receive meteorological, air quality, dispersion forecast information in a timely and reliable manner.

METEOROLOGICAL INSTRUMENTATION

Sixteen Automatic Meteorological Observing Stations (AMOS) were used during the 1988 Fall Burn program to supplement observations from the eleven valley airports. The AMOS sites were the same as during the previous year's burn program. See appendix D for locations of all Sacramento valley weather stations.

A new PS/2 driven echosonde system, developed and manufactured by Radian Corporation, was purchased with Rice Research Board approval in early Summer. The equipment was received by our office in mid August. After a period of extensive in-house testing and software development, the new echosonde was placed out in the field adjacent to the Natomas weather station. The installation of this new echosonde greatly increases the accuracy, reliability and depth of view in detecting low level inversions and stable layers when compared to the older system. It also allows the echosonde formerly at this site to be used as a backup in servicing the other two aging echosondes.

The two older echosondes were placed at Codora and North Yuba. Their performance was rather poor initially. However by using parts derived from the former Natomas unit, the Codora echosonde was returned to full service by October 11. A persistent weak trace by the North Yuba echosonde was overcome by replacement of the sound driver and preamp on October 19. All three echosondes performed well the rest of the Burn.

Regular weather station maintenance was undertaken as needed. These repairs included replacement of a radio, RF modem, and various wind, temperature and relative humidity sensors. Repairs to the removed sensors were performed either in-house or through the appropriate manufacturer. Once repaired these sensors will be used to replace subsequent sensor failures. A record of the maintenance performed is listed in Table 5.

Radio link problems between Chico State Farm and the Sutter Buttes, and the Sutter Buttes and various weather stations, were encountered to varying degrees during the Fall Burn program. Additionally, spluttering of our radio signal on other radio users at the Sutter Buttes necessitated our looking into long term solutions to these problems. One possible solution being investigated includes the use of a more powerful radio, more sophisticated radio interference screening devices and connection to a taller antenna. Working with Campbell Scientific and Motorola, it is hoped that the radio interference problems can be solved.

TABLE 5
STATION MAINTENANCE RECORD

Site(s) Date Visited Work performed

8/11	in house tested old echosonde equipment
8/12	CDA activate and test Codora echosonde
8/15	STB replaced radio, wind speed and direction sensors also replaced with original Skyvane that had been repaired
8/23	NAT install new foam in echosonde tub at Natomas site 8/24 in house test new PS/2 echosonde system
8/25	in house more testing of new PS/2 echosonde system
8/26	in house further testing of PS/2 echosonde system
8/29	in house further testing of PS/2 echosonde system
8/30	in house further testing of PS/2 echosonde system
8/31	in house further testing of PS/2 echosonde system
9/1	in house prepare for North Yuba echosonde installation 9/2 NYU install North Yuba echosonde
9/7	in house final testing of PS/2 echosonde system
9/12	NAT install PS/2 echosonde at Natomas
9/20	CDA,NYU,NAT repair work done all three valley echosonde sites
9/21	CDA further echosonde repair work done at Codora
9/22	ABK,MAX replace Arbuckle wind direction sensor, sensor check performed at Maxwell
9/28	DXN,EPO replaced wind speed sensor at Dixon, replaced RF modem at Esparto
10/4	CDA,NYU repair work done on Codora and North Yuba echosondes
10/11	CDA,NYU,KRK replaced Codora echosonde, replaced CDA temperature and RH sensor, replaced wind speed sensor at KRK, replaced wind speed sensor at NYU
10/12	CSF sensor check performed at Chico State Farm
10/19	NAT,NYU cleared program on PS/2 at Natomas, replaced sound driver and preamp at North Yuba

SUMMARY OF FALL BURN PROGRAM

In general, the 1988 Fall Burn season was another favorable chapter in a very successful program. The season basin averaged COH was the lowest since expansion of the program from October 1st to mid September. In addition, total burn generated complaints remained very low (under 100) with complaints recorded by the ARB at an all time low (11).

This does not mean the program is without its glitches. More than a quarter of the entire season's complaints were generated on two days. On September 27th, a north wind day, fires were set just north of Sacramento, with the generated smoke intruding into the urban area to the south. The second instance, occurred October 11, a south wind day with a strong, persistent and relatively low marine inversion. Under these circumstances, smoke from fires concentrated too close together and too close to urban areas generated numerous complaints.

The high preponderance of south wind days this year taken into account the fact that daily average acreage burned continued to decrease suggests several things. First, south wind days are not necessarily good burn days, and second, the program takes a conservative approach in releasing acreage. The predominate view by many participants of the program is that all south wind days are good and all north wind days are bad is not an entirely correct one. Many instances the best dispersion days in most burn seasons are on post frontal days when gusty north winds first return to the valley. Conversely, south wind days, which are usually more humid than north winds days can be relatively poor days to burn if the winds remain very light and an increasing cloud cover restricts daytime heating.

Better coordination between the involved parties is needed to avoid instances where too much or too little acreage is released on any given day. It is believed the best times to burn are when the smoke generated during the day will rapidly exit the valley. But these days are very rare, and are usually too wet or possess an unfavorable wind direction to significantly reduce the amount of ready acreage. However days prior to an overnight frontal passage could be used more effectively, knowing with a fair degree of certainty that most of the smoke generated during day will exit the valley overnight with the passage of the front. During the daylight hours smoke will linger in the valley to a certain extent under this scenario.

For the fourth year in a row, the average daily acreage burned has declined, while average basin COH for the season does not show this trend (see figures 10,11). Zone ventilation ratings play a big role in acreage allocation for each county. These zone ratings are made by experienced meteorologists at Weather Network, Inc. after careful review of the weather pattern. The zone ventilation ratings are subjective. They take into consideration a particular zone's dispersion ability and where the dispersing smoke will travel. The ratings only take into account meteorological parameters and how the smoke, influenced by these parameters, affects urban areas and major roadways. The ratings do not take into account ready acreage in any one county. Better acreage allocations may be accomplished by redefining the zones within the counties and better understanding of the meteorological conditions by the central computer operator.

Daily Average Acreage Burned, Season

FALL BURN 1981-1988

number of acres
(Thousands)

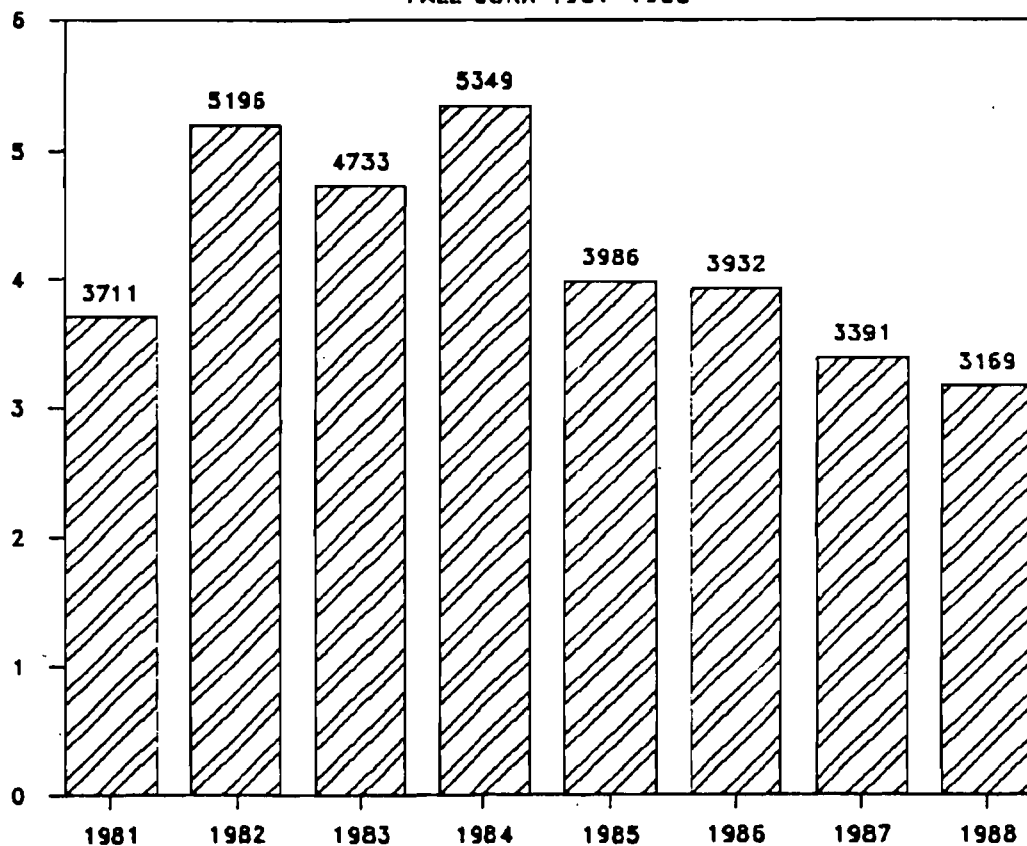


Figure 10

YEAR

Average Basin COH, Season

FALL BURN 1981-1988

average basin COH

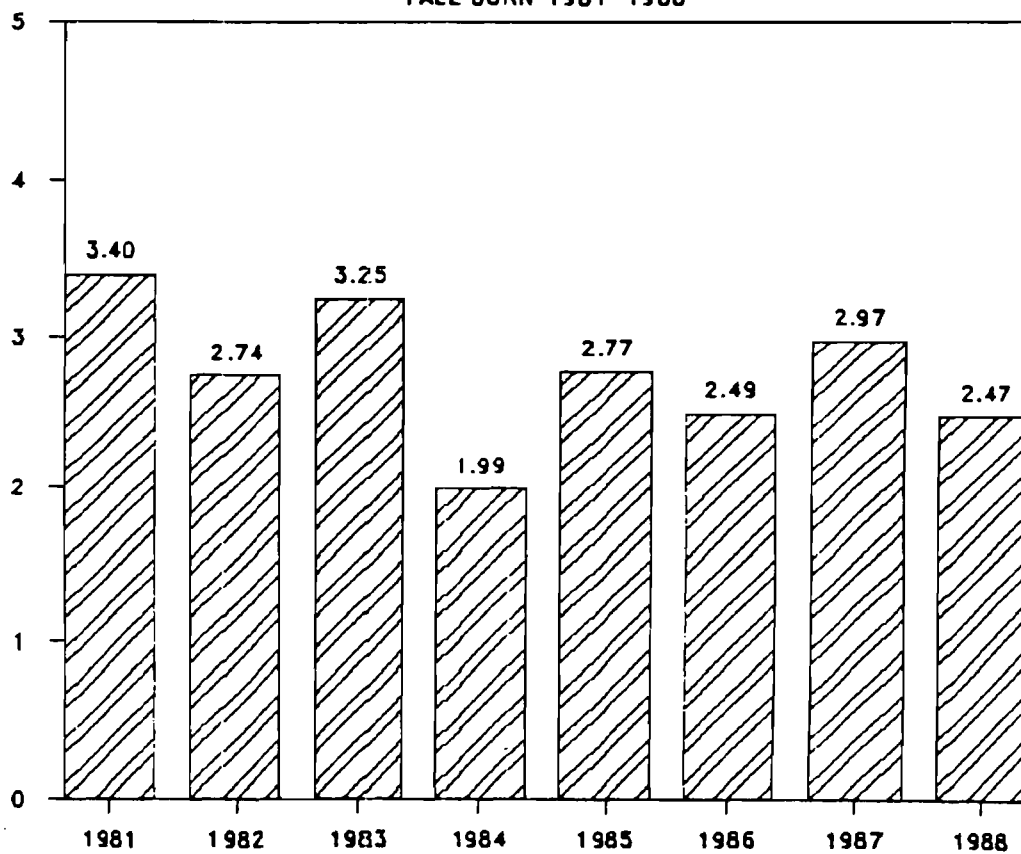


Figure 11

YEAR

APPENDIX A

005

CCOB KCIC 021712

CCO 9 November 2, 1988

10 % SOUTH SHIFT IN EFFECT 400 AC PERSCRIPTION BURN IN YOLO, WATCH TO MAKE SURE FIELD MOISTURE IS RIGHT FOR BURNING. FUMIGATION WILL BE A PROBLEM WITH THE S.WIND .DO NOT BURN DIRECTLY SOUTH OF POPULATED AREAS DONT GET TO EXCITED PLACE BURNS CAREFULLY. PL

PLEASE DO TEST BURNS AND CALL US TO LET US KNOW HOW THEY ARE DOING PLEASE TRY TO LET US KNOW BY 11AM IF POSSIBLE

THANKYOU

KEVIN & SCOTT

===== BASIN DISTRIBUTION

Date : 11/02/88 Time : 10:17 AM

0.1 south shift in effect		Ventilation		
	Allocation	COH	Ratings	Ready
Butte	1709	2.70	4.60	44787
Colusa	2303	1.00	4.25	67569
Glenn	1775	2.10	4.82	45020
Placer	348	0.80	3.70	2450
Sacto	491	1.30	3.42	8145
Shasta	66	***	4.83	200
Sutter	1631	0.70	3.55	46139
Tehama	69	***	5.00	200
Yolo/Sol.	1098	1.30	3.85	27228
Yuba	509	1.50	3.40	13987
BASIN	10000	1.39	4.08	255725

----- Historical Synopsis

	Yesterday			Season-to-Date			
	Complaints		Acres Burned	Complaints		TOTAL	Acres Burned
	ARB	DIST.		ARB	DISTRICT		
Butte	0	1	766	1	38	39	23862
Colusa	0	0	2325	1	0	1	40164
Glenn	0	0	1197	1	0	1	26774
Placer	0	0	225	0	1	1	4063
Sacto	0	1	273	3	18	21	5872
Shasta	0	0	0	0	0	0	0
Sutter	0	0	1825	0	1	1	23276
Tehama	0	0	0	0	0	0	0
Yolo/Sol.	0	0	678	0	2	2	12902
Yuba	0	0	516	2	4	6	12902
BASIN	0	2	7805	8	64	72	149815

=====

LESF KCIC 020056

LES FIFE HAS NO COMMENTS AT THIS TIME

002

WEATHER INFORMATION FOR NOVEMBER 2
1988 FALL AGRICULTURAL BURN PROGRAM
SACRAMENTO VALLEY

(ALL TIMES LOCAL, WINDS ARE IN MPH AND VISIBILITY IN MILES)

MORNING AMOS WIND AND RELATIVE HUMIDITY OBSERVATIONS

STATION	0700	%RH	0800	%RH	0900	%RH	1000	%RH
CAPAY	SE 11	86	SE 10	86				
CHICO	SE 12	88	SSE11	88				
DURHAM	SE 7	86	SSE 6	86				
OROVILLE	SE 8	--	SSE 8	--				
BIGGS	SSE11	81	SSE12	81				
CODORA	SE 12	91	SE 12	91				
NORTH YUBA	SSE13	83	SSE13	83				
WHEATLAND	SSE 6	89	SSE 9	89				
KIRKVILLE	S 6	92	S 6	92				
LINCOLN	S 7	89	N/A					
NATOMAS	S 8	92	SSE10	91				
DIXON	SSE 5	93	N/A					
ESPARTO	SE 12	92	SSE11	91				
ARBUCKLE	SSE 6	84	SSE 6	85				
MAXWELL	SSE15	88	SSE12	88				

AIRPORT OBSERVATIONS (WIND DIR/SPD, VISIBILITY, OBSERVED WEATHER)

STATIONS	0700	0800	0900	1000
REDDING	SSW12 10RW-	S 10 15RW-		
RED BLUFF	SE 12 7	N/A		
CHICO	ESE21 10RW-	N/A		
BEALE AFB	SSE 7 7	N/A		
MARYSVILLE	SE 12 10	SE 12 7		
SAC METRO	S 9 10	N/A		
SAC EXECUTIVE	S 6 5FH	N/A		
MCCLELLAN AFB	S 6 7	N/A		
MATHER AFB	SE 3 3F	N/A		
TRAVIS AFB	N/A	N/A		
STOCKTON	NNE 3 10	N/A		

K=SMOKE, H=HAZE, D=DUST, F=FOG, GF=GROUND FOG, R=RAIN, L=DRIZZLE,
RW=RAIN SHOWERS, T=THUNDER

SUTTER BUTTES AND PIBAL WIND DISCUSSION:

Sutter Butte winds have been southerly at 10-15 mph since midnight.
The Chico pibal indicated the presence of S-SE'erly winds of 15-25
mph until it was lost in the clouds beyond 1000 feet. Valley transport
winds will be SE-S'erly at 15-30 mph this entire day.

INVERSION HEIGHTS IN FEET*

ECHOSONDE SITE	CODORA	NORTH YUBA	NATOMAS
	OBSERVED FORECAST	OBSERVED FORECAST	OBSERVED FORECAST
0700	700	1100	1300
0900	1500	1500	1500
1200	2500	2400	2300
1500	3300	3400	3500

* expected top of mixing layer

Valley dispersion, FAIR/GOOD this morning due to weak low level inversions and moderate strength southerly surface/transport winds will improve to GOOD/EXCELLENT this afternoon as daytime heating, further strengthen of the southerly winds and an unstable atmosphere combine to expand the mixing layer well beyond 3000 feet.

STRENGTH/CHARACTERISTICS OF INVERSIONS AND DEPTH OF MIXING LAYER:

Of the three valley echosondes, only Codora was reporting a ground based inversion (with a top near 700 feet). Both Natomas and North Yuba showed only a weakly stable layer in the lower 1000 feet. This stable layer will disappear by midmorning as daytime heating, cooling aloft and strengthening of surface/transport winds expand the mixing layer to a depth near 3500 feet this afternoon.

CAUTIONARY NOTES FOR TODAY:

Overnight rainfall, elevated humidities and scattered shower activity during the day may cause some fuel moisture problems, make sure all fuels are adequately dry before burning. Fumigation will be a problem today although an unstable atmosphere will limit the problem to locations directly downwind of any fire. If dry fuels are available, this is an excellent day to burn.

TOMORROW'S DISPERSION OUTLOOK:

An overnight frontal passage should cause more widespread fuel moisture problems, particularly for the northern half of the valley. However dryer conditions should prevail thursday as continued south winds and an unstable atmosphere maintain good valley dispersion. Cushman

YESTERDAY'S AIRPORT OBSERVED VISIBILITIES, WEATHER AND RAINFALL*

STATION									24HR RAINFALL INCHES
	1200	1300	1400	1500	1600	1700	1800	1900	
REDDING	5H	7	7	7	7	7	7	7	.02
RED BLUFF	7	7	10	10	8	7	7	7	.02
CHICO	6H	9	10	8	8	10	10	10	.02
BEALE AFB	6H	7	7	7	7	10	7	7	TR
MARYSVILLE	10	6HK	7	10	10	N/A	12	N/A	N/A
SAC METRO	10	20	20	20	30	50	50	30	N/A
SAC EXECUTIVE	10	20	30	35	30	35	30	15	TR
MCCLELLAN AFB	7	7	10	15	15	15	10	10	TR
MATHER AFB	7	12	12	12	50	50	20	20	.04
TRAVIS AFB	10	25	N/A	25	N/A	25	10	N/A	.05
STOCKTON	4H	4H	6H	10	10	10	10	10	TR

*AS MEASURED AT 4AM THIS MORNING.

F=FOG, GF=GROUND FOG, H=HAZE, L=DRIZZLE, R=RAIN, RW=RAIN SHOWERS
K=SMOKE, BD=BLOWING DUST, TR=TRACE

BUTTE

ZONE	1	2	3
RATING	5	4	4
AM WIND	SSE11	SSE12	SSE11
PM WIND	S 16	SSE17	SSE16

COLUSA

ZONE	1	2	3	4	5	6
RATING	4	5	4	4	4	5
AM WIND	SSE11	SSE12	SE 10	SE 11	SSE12	SSE13
PM WIND	SSE15	SSE16	SSE14	S 13	S 15	S 16

GLENN

ZONE	1	2	3	4
RATING	5	4	5	5
AM WIND	SSE10	SSE11	SSE11	SE 12
PM WIND	S 15	S 16	SSE16	SSE17

PLACER

ZONE	1	2	3
RATING	3	4	4
AM WIND	SE 9	SSE 8	S 8
PM WIND	SSE15	S 14	S 14

SACRAMENTO

ZONE	1	2	3
RATING	4	2	3
AM WIND	S 8	SSW 7	SW 7
PM WIND	S 15	SSW14	SW 14

SHASTA

ZONE	1	2
RATING	4	5
AM WIND	SSW14	SE 18
PM WIND	S 18	SSE21

SUTTER

ZONE	1	2	3	4	5	6	7	8
RATING	4	5	4	2	3	4	3	4
AM WIND	SSE12	SSE11	SE 12	SE 12	SE 11	SSE10	SE 10	S 9
PM WIND	SSE16	SSE15	S 16	SSE16	SSE15	S 14	SSE15	S 14

TEHEMA

ZONE	1
RATING	5
AM WIND	S 13
PM WIND	S 17

YOLO/SOLANO

ZONE	1	2	3	4
RATING	4	4	3	4
AM WIND	SSE10	S 8	S 7	S 9
PM WIND	SSE14	S 14	SSW15	S 15

YUBA

ZONE	1	2	3
RATING	4	3	2
AM WIND	SE 11	SE 10	SSE12
PM WIND	SSE16	SSE14	S 15

THE AIR RESOURCES BOARD HAS DECLARED TODAY A NO BURN DAY FOR SAN JOAQUIN AND STANISLAUS COUNTIES.

ARBA KCIC 021701
type bap1.wf

CALIFORNIA AIR RESOURCES BOARD
AEROMETRIC DATA ACQUISITION, ANALYSIS & DISPLAY SYSTEM
SACRAMENTO VALLEY AIR BASIN

BASINWIDE AG BURN ACREAGE ALLOCATION

DATE/TIME- 2 NOV 1988 / 0927 LOCAL TIME METEOROLOGIST-LINSE

BURN DECISION ABOVE 3000 FEET- PERMISSIVE BURN

A.M.STABILITY(DEG.F.)=-1 P.M.STABILITY(DEG.F.)=2.5 WIND SPEED(MPH)=10

METEOROLOGICAL(MET) FACTOR..... = 0.63

AIR QUALITY(AQ) FACTOR (BASINWIDE 24-HR AVERAGE SOILING INDEX X 10) = 1.39

EQUATION: 10600 AC + 17550 AC (0.63) -2085 AC (1.39) = 18758 ACRES

*** BASINWIDE ALLOCATION = 18758 ACRES

DISTRICT	(A) 24-HR AVG COH X 10 (0600 PST)	(B) REDUCTION FACTOR* (A.Q.)	MAX COH X 10 (PAST 24 HRS)	HOUR OF MAX COH : (PST)	SOILING INDEX 0600 PST STN COH X 10
COLUSA	1.0	1.00	6	8	: CIC 1
SUTTER	0.7	1.00	2	14	: COL 1
BUTTE	2.7	1.00	9	14	: WLW 1
YOLO/SOLANO	1.3	1.00	4	10	: SRS 1
GLENN	2.1	1.00	9	8	: WOD 1
SACRAMENTO	1.3	1.00	4	10	: BTH 3
YUBA	1.5	1.00	9	14	: YUB 1
PLACER	0.8	1.00	2	12	: ROC 0
					: SAC 1
*REDUCTION: IF A<=5 THEN B=1					: ABK 1
IF 5<A<10 THEN B=0.2(10-A)					: DAV 1
IF A GREATER THAN OR =10 THEN B=0					: PLG 1
					: GRY 1

PLEASE WATCH OUT FOR WET FUEL AND FUMIGATION.

ARB RECOMMENDS AN ALLOCATION FOR TODAY WHICH DOES NOT
EXCEED 15577 ACRES. [ARB MET-TEST]

APPENDIX B
 WEATHER NETWORK, INC. (NOWCASTING)
 DAILY WEATHER AND DISPERSION FORECASTING PROCEDURES
 FOR THE 1988 SACRAMENTO VALLEY FALL BURNING PROGRAM

Time procedure

- 0330-0530 issue general agricultural weather forecasts for northern and central Sacramento Valley via telephone recording and Weather Network, a computer database.
- 0530-0645 Correlate satellite imagery and computer generated forecast weather charts with
- Sacramento Valley surface winds
 - Visibilities reported at valley airports
 - Temperatures and winds atop the Sutter Buttes and in Chico pibal wind information
- 0645-0715 Make contact with Air Resources Board and receive:
- Chico and Sacramento airplane temperature soundings
 - Sacramento pibal wind information when available
- Plot and analyze above information
- Record and analyze atmospheric stability information from instruments at
- Codora
 - North Yuba
 - Natomas
- Make forecast for the day's mixing height (the depth of the layer which any generated smoke will mix with)
- Begin to prepare text portion of the day's Fall Burn forecast file
- 0715-0755 Consult with Air Resources Board meteorologists on weather and wind conditions likely to be encountered during the day.
- Prepare written forecast for dissemination, include:
- Latest hourly AMOS wind and relative humidities from the Sacramento Valley
 - Latest hourly winds, visibilities and weather from the Sacramento valley airports, military and civilian.
 - Discussion of upper level winds, atmospheric stability, areas of caution, the outlook on tomorrow's dispersion.
 - Visibilities reported by valley airports the previous afternoon.
- Place on Weather Network database system by 0755 for dissemination to the Central Computer operator and the participating counties by 8am
- 0755-0815 Review and analyze Sacramento valley wind flow pattern and the valley's atmospheric stability.

0815-0845 Prepare forecast of ventilation ratings, morning and afternoon winds for each on the valley's burn zones.

 Send ventilation ratings to Central Computer operator

0845-0855 Input ventilation ratings and surface wind forecasts into the appropriate files, update forecast discussions and observation tables.

 Send to Weather Network database for dissemination to Central Computer operator and the participating counties by 9am

0855-1045 Review latest synoptic weather charts, satellite imagery, surface winds and echosonde stability data.

 Update AMOS and airport observations, write forecast update

1045-1055 Send updated file to Weather Network database for dissemination to Central Computer operator and the participating counties by 11am.

1055-1600 Continue to monitor and record hourly winds, temperatures, visibilities and atmospheric stability. Be prepared for additional discussions with Central Computer operator or updated them as needed

 Summarize and record daily atmospheric parameters

Date	(1)		(2)		(3)		(4)		(5)		(6)		(7)		
	Acres burned	Basin COH	Complaints ARB Dist		Wind Dir Spd am pm		RH am pm		Basin Stability am pm		Average visibility am pm		Daily Precipitation RDD CSF SAC		
9/15	288	2.67	0	0	S 5 6	--	--		16 -9		9 9		---	---	---
9/16	2375	2.83	0	2	S 5 5	58	20		13 -6	NA	10		---	---	---
9/17	1928	1.05	0	0	N 11 14	31	16		10 -12	14	13		---	---	---
9/18	493	2.21	0	0	N 16 13	19	12		1 -15	20	15		---	---	---
9/19	3297	1.88	0	0	S-C 7 12	27	21		16 -5	12	10		---	---	---
9/20	619	0.94	0	0	N 14 12	35	19		1 -12	27	24		---	---	---
9/21	5659	1.44	0	0	CMV 9 7	30	16		6 -10	31	25		---	---	---
9/22	5066	2.90	1	4	S 6 5	63	30		9 -6	13	10		---	---	---
9/23	667	3.42	0	0	V-S 3 5	51	24		13 -7	11	10		---	---	---
9/24	548	2.07	0	0	S 5 9	42	20		15 -7	16	15		---	---	---
9/25	12836	1.44	0	0	S 8 6	69	40		-6 -8	19	19		---	---	---
9/26	4458	2.00	0	0	N-S 4 6	62	34		7 -6	10	9		---	---	---
9/27	4981	1.88	1	14	N 6 10	61	25		8 -14	26	29		---	---	---
9/28	4248	2.65	0	1	N 8 8	26	11		12 -13	33	26		---	---	---
9/29	2961	3.31	0	2	N 5 5	27	10		20 -8	25	23		---	---	---
9/30	512	3.65	0	0	DIV 2 4	30	10		24 -10	22	22		---	---	---
September															
AVE/TOT	50936	2.27	2	23	7 8	39	19		10 -9	18	17		0	0	0
10/1	834	1.70	0	0	C-S 4 9	38	14		22 -6	20	17		---	---	---
10/2	2673	1.54	0	0	S 6 5	68	26		18 -6	28	24		---	---	---
10/3	2356	2.86	0	0	L/V 2 3	61	21		15 -7	10	13		---	---	---
10/4	2172	2.86	0	1	N-S 3 6	61	30		16 -8	11	11		---	---	---
10/5	3873	1.94	0	1	C-S 5 7	57	24		9 -8	23	23		---	---	---
10/6	9667	1.48	1	3	S 10 10	62	44		10 -10	14	16		---	---	---
10/7	5404	2.59	0	2	S-V 5 5	75	42		5 -8	14	13		---	---	---
10/8	946	3.20	0	0	N 3 4	63	26		14 -5	13	14		---	---	---
10/9	208	2.15	0	0	V-S 3 4	49	17		18 -7	14	16		---	---	---
10/10	2872	1.98	0	0	S 6 9	56	25		14 -10	17	13		---	0.01	---
10/11	9275	2.85	2	7	S 8 6	78	41		3 -8	17	14		---	---	---
10/12	2172	2.06	0	7	S 5 9	78	41		7 -10	8	10		---	---	---
10/13	15998	1.88	1	3	S 9 10	76	61		2 -8	13	12		0.03	TR	0.19
10/14	3838	1.82	0	3	N 8 10	83	45		-2 -13	8	19		---	---	---
10/15	1153	1.84	0	0	V-N 4 10	64	22		14 -10	23	23		---	---	---
10/16	2162	2.52	1	0	DIV 4 6	50	24		15 -4	18	22		---	---	---
10/17	371	3.57	0	4	N 3 6	52	16		18 -9	21	19		---	---	---
10/18	542	3.63	0	1	N-S 3 4	46	16		17 -8	20	21		---	---	---
10/19	2593	2.97	0	3	N 4 10	48	12		16 -13	24	27		---	---	---
10/20	3185	3.49	0	0	N 5 6	46	13		16 -11	29	31		---	---	---
10/21	2136	3.50	0	2	N-S 3 6	52	20		18 -9	20	16		---	---	---
10/22	946	3.23	0	0	N 2 4	60	20		19 -6	14	18		---	---	---
10/23	819	2.68	0	0	N-D 4 4	62	22		17 -8	15	16		---	---	---
10/24	1396	3.47	1	0	V-S 4 5	57	19		20 -6	17	18		---	---	---
10/25	894	3.48	0	1	N-S 3 4	67	23		18 -6	10	15		---	---	---
10/26	490	3.10	0	0	S 4 5	81	38		18 -6	6	9		---	---	---
10/27	2513	1.91	0	0	S 7 10	86	46		10 -10	7	8		---	---	---
10/28	4692	2.93	0	0	S 4 7	86	60		1 -12	7	10		---	---	---
10/29	2515	3.90	0	0	DIV 3 4	87	51		7 -8	6	7		---	---	---
10/30	1224	4.23	0	0	N-V 3 3	67	35		11 -6	7	10		---	---	---
10/31	1155	5.30	0	1	N-D 5 3	59	35		16 -8	6	9		---	---	---
October															
AVE/TOT	91074	2.80	6	39	5 6	64	30		13 -8	15	16		0.03	0.01	0.19

11/1	7805	1.39	0	2	S	13	14	70	45	8	-8	6	15	TR	0.02	TR	
11/2	13698	1.30	0	1	S	11	9	86	79	-2	-10	9	15	0.11	0.05	TR	
11/3	11881	1.86	1	0	S	13	13	84	62	-7	-9	11	13	0.01	---	0.01	
11/4	2512	2.18	0	1	N	7	11	93	51	2	-12	3	19	---	---	---	
11/5	2873	1.49	0	0	S	4	8	65	47	14	-10	15	14	---	---	---	
11/6	5249	0.89	0	5	N	14	12	43	25	-3	-11	59	31	TR	0.01	---	
11/7	9316	2.52	0	0	S-C	7	8	54	38	6	-8	29	22	---	---	---	
11/8	7045	3.98	0	0	S	8	7	81	63	2	-9	16	17	---	---	---	
11/9	7216	3.12	0	0	E-S	4	4	83	75	6	-9	5	7	0.55	0.41	0.05	
11/10	183	1.29	0	0	S	9	6	88	53	-7	-10	9	23	---	0.09	0.04	
11/11	1194	2.03	0	0	S	5	6	82	60	2	-9	22	22	0.04	0.01	---	
11/12	178	1.08	0	0	S	13	11	89	89	-3	-10	3	6	0.16	0.11	0.03	
11/13	0	0.61	0	0	S	18	14	86	72	-4	-8	9	24	0.29	0.18	0.20	
11/14	158	2.27	0	0	S-W	7	5	82	49	3	-7	24	27	---	---	---	
11/15	2902	2.28	0	0	S	12	10	75	71	0	-10	14	11	0.03	---	---	
11/16	56	1.60	0	0	S	14	23	91	92	-4	-8	4	2	0.52	0.36	0.24	
11/17	231	1.53	0	5	S-N	5	7	78	46	5	-9	38	46	---	---	---	
11/18	3380	2.76	2	3	N	13	8	56	33	6	-11	66	63	---	---	---	
11/19	1606	4.40	0	0	N	2	3	59	34	7	-7	59	34	---	---	---	
11/20	1259	4.04	0	0	N	3	5	71	53	3	-10	9	9	---	---	---	
11/21	988	4.13	0	0	S	7	7	87	83	9	-11	5	4	0.67	0.56	0.02	
11/22	86	1.63	0	0	S	18	19	92	87	-4	-9	4	5	1.71	1.08	0.24	
11/23	n/a	0.65	0	0	W	10	13	74	48	-5	-12	28	39	---	---	---	
November																	
AVE/TOT	79816	2.13	3	17			9	10	77	59	1	-9	19	20	4.09	2.88	0.83
Season																	
TOT/AVG	221826	2.47	11	79			7	8	64	38	9	-9	18	18	4.12	2.89	1.02

(1) COH - 24 hour basin averaged Coefficient of Haze as measured at 6am the following day by the Air Resources Board.

(2) Complaints - total daily burn generated complaints as measured by the Air Resources Board (ARB) and the individual air pollution control districts (Dist).

(3) Wind Dir - predominate wind direction or regime in the valley as observed at 10am and 3pm where N (north), S (south), V (variable, no dominate wind direction), W (west), E (east), DIV or D (divergence, south winds in the north valley but north winds in the south valley), CONV or C (convergence, north winds in the north valley and south winds in the south valley). Hyphenated values in form X-Y is where X is morning wind direction which shift to Y during the afternoon.

Wind Spd - daily basin averaged wind speed for 10am and 3pm as derived from observations from the Sacramento valley airport and automatic weather stations.

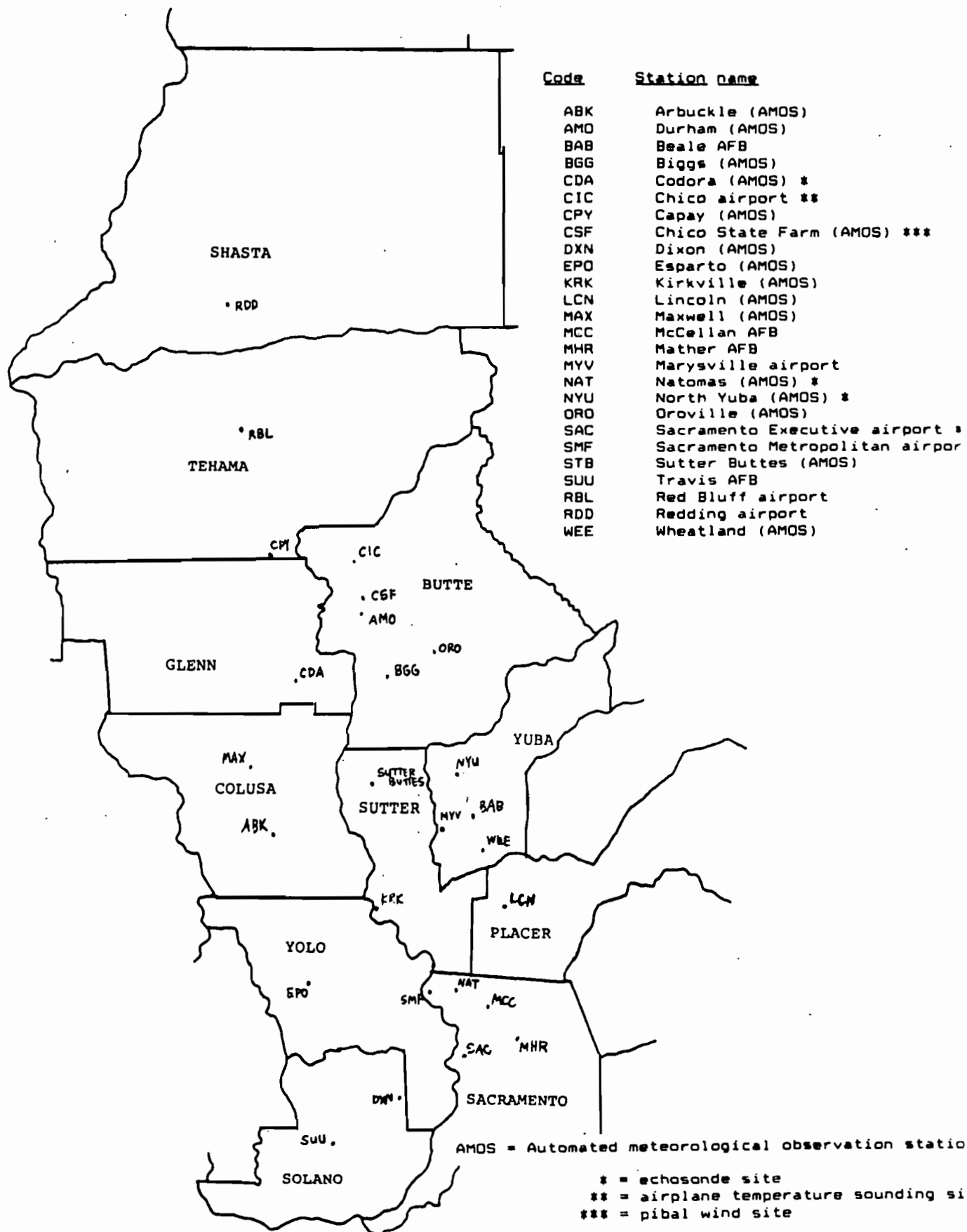
(4) RH - average morning (10am) and afternoon (3pm) relative humidities using data from Durham, Maxwell and Natomas automatic weather stations.

(5) Basin Stability - average temperature difference between the surface and 2000 feet as measured at 5am (AM) and 3pm (PM).

(6) Average visibility - average visibility as reported by the ten valley airports at 10am (AM) and 3pm (PM).

(7) Daily Precipitation - 24 hour rainfall totals as measured at 4am PST or 5am PDT for Red Bluff (RBL) and Sacramento Executive (SAC) airports. Chico (CSF) is for a 24 hour period ending at midnight.

APPENDIX D
Locations of Sacramento valley weather observing stations
used during the 1988 Fallburn program



APPENDIX E

Sample of letter sent to all participants of
1988 Fall Burn on Weather Network procedures

August 31, 1988

Mr. Jeff Mott
A.P.C.O.
P.O. Box 1229
Oroville, CA 95965

Dear Jeff:

Subject: 1988 Fall Burn Program

The 1988 Fall Rice Straw Burning Program will begin shortly. Like last year, the Weather Network data base will be utilized to transmit the Fall Burn files to each of the counties and other agencies involved in the program.

Enclosed are logon procedures to Weather Network and a list of commands to be used on the system to access the various files. Tymnet is the communications network used to dial into the Weather Network data base. Below are your confidential Tymnet and Weather Network usernames and passwords.

Tymnet Telephone Number :	343-4401
Tymnet Username :	NIN23
Tymnet Password :	NOWNET
Weather Network Username:	RBDOR
Weather Network Password:	BUTTE

Please note that for those of you who used the Weather Network system during the Spring Burn this year, the Tymnet Username has changed from NIN to NIN23. If you are using an automatic logon sequence this change will have to be made in your script file before accessing the system.

The Fall Burn Program will officially begin on September 15th, 1988 with testing of the system and transferring of files taking place on September 12th through the 14th. Please logon to the Weather Network system prior to September 12th to test your logon procedures. If you have any problems logging onto the Weather Network data base, please contact me at Nowcasting.

We at Nowcasting look forward to a successful Fall Burn and look forward to working with you.

Sincerely,

Donald F. Schukraft
Certified Consulting Meteorologist
General Manager

1988 FALL RICE STRAW BURNING PROGRAM

WEATHER NETWORK COMMANDS FOR ACCESSING FORECAST FILES

The Weather Network data base will again be used during the 1988 Fall Rice Straw Burning Program to transmit files to each of the counties. Following are the commands to be used on Weather Network to access individual files. You can type a command at the arrow prompt (->). If you make a typing error when inputting a command, the backspace key on your keyboard can be used to correct the mistake.

WEATHER NETWORK <u>COMMAND</u>	FILE TO BE <u>RETRIEVED</u>
FB8AM	8AM FORECAST FILE Contains: Central Computer Operator Comments Comments by Les Fife Nowcasting's Dispersion Forecast ARB 24 hour COH Reading
FB9AM	9AM FORECAST FILE Contains: Central Computer Operator Basin Distribution File & Comments Comments by Les Fife Nowcasting's Dispersion Forecast and Zone Ventilation Ratings ARB Basin Allocation
FB11AM,	11AM FORECAST FILE Contains: Central Computer Operator Comments Comments by Les Fife Nowcasting's Updated Weather and Dispersion Forecast ARB Trend Analysis Report
SVAIRPORTS	LATEST SACRAMENTO VALLEY AIRPORT OBSERVATIONS
SVAMOSOBS	LATEST SACRAMENTO VALLEY AMOS OBSERVATIONS
WX SVAMOS @10L	WEATHER OBSERVATIONS FROM THE AMOS STATIONS AT 10AM LOCAL TIME (Note: In place of 10L you may use any hour of the day i.e. 15L for 3PM. Using the option @05- will give the hourly observations over the last five hours)
WX SVAIR @12L	WEATHER OBSERVATIONS FROM THE AIRPORT STATIONS AT 12PM LOCAL TIME(See note above for other options)

Weather Forecasting Support
For the Management of Sugar Cane
Burning Operations on
the Island of Maui, Hawaii

Prepared for: Hawaiian Sugar Planters' Association
99-193 Aiea Heights Drive
Aiea, Hawaii 96701

Prepared by: Weather Network, Inc.
dba Nowcasting
3760 Morrow Lane
Suite F
Chico, California 95928

May 25, 1988

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I. INTRODUCTION

This report outlines the procedures currently being utilized to prepare detailed weather forecasts for the central valley of Maui for the purpose of smoke management in the burning of sugar cane.

In December 1987, a proposal was presented to Hawaiian Sugar Planters' Association by Weather Network, Inc. for daily weather forecasting support in the cane burning management program. The weather forecasting program utilizes the eleven automatic weather stations installed on Maui by Weather Network, Inc. in April of 1988.

The general weather patterns of the Hawaiian Islands, local climatology and the topographic affects on the weather in Maui were studied, prior to issuing the first forecast. On April 18, 1988 the first test forecast was issued. By April 25, the weather forecasters had access to all the weather observations from the automataic weather stations on Maui. The first operational weather forecasts began the first of May, 1988.

These detailed weather forecasts include a discussion of the synoptic (large scale) weather situation, a discussion of the ability of the atmosphere to disperse smoke from the fires, notes of caution to be taken when lighting fires, dispersion factor and zone dispersion ratings. Each of these topics within the weather forecasts are discussed in this report.

II. WEATHER STATIONS

Eleven automatic weather stations have been installed on the island of Maui for Hawaiian Commercial and Sugar Company (HC&S) and Hawaiian Sugar Planters' Association (HSPA) for the purpose of managing the smoke and ash generated by the burning of the sugar cane fields, as well as for other cultural practices associated with the production of sugar cane. The weather stations are:

Table 1

Location of Automatic Weather Stations

<u>Station Code</u>	<u>Station Name</u>
717	Mill Tower
KIH	Kihei
110	Hamakuapoko
301	Pukalani
201	Haliimaile
711	Pu'unene
208	Upper Paia
906	Ma'alaea
813	Lowrie
414	Pulehu
602	Spreckelsville

The location of each of these stations is shown in Figure 1.

The automatic weather stations contain the following instrumentation:

Table 2

Weather Station Instrumentation

Datalogger
Radio and modem
Antenna
Air temperature
Relative humidity
Wind speed
Wind direction
Pyranometer (solar radiation) - not at Mill Tower
Raingage - not at Mill Tower
COH Meter (air quality) - Kihei and Pukalani only

The station at Spreckelsville contains a Licor PAR sensor in addition to the above instrumentation. The "heart" of the automatic weather stations is the Campbell Scientific CR10 datalogger which is a small on site computer that controls the sampling of sensors and communications.

Wind speed and direction observations are taken at approximately ten meters to avoid the surface friction layer for the purpose of weather forecasting. Other measurements are taken between two and three meters. The Tables 3 and 4 display the hourly and daily weather observations

Figure 1

Location of Weather Stations and Zones

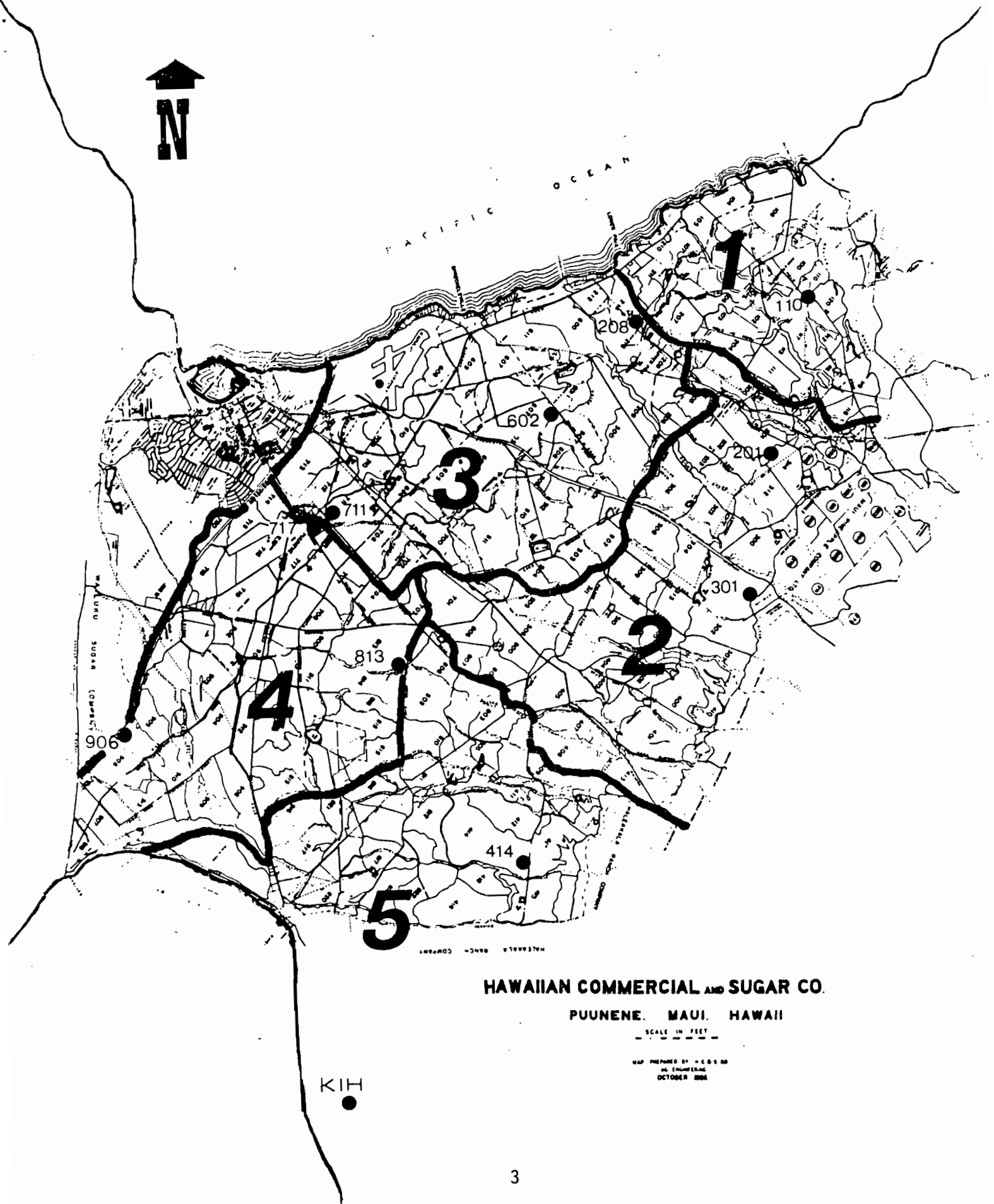


Table 3
Hourly Weather Observations

HAWAIIAN COMMERCIAL AND SUGAR COMPANY
Hourly Meteorological and Air Quality Observations
For 05/19/88 09:00

Station	Temp F	Dew Point F	RH %	Wind Dir	MPH	Max. Wind MPH	Pcp. In.	AvSol. Cal/ cm2/ min	PAR mE/ hour/ m2	COH
Mill Tower	79.8	68.4	68	N	5	10				
Kihei	81.4	68.1	64	NNW	5	8	0.00	0.7		0.7
Hamakuapoko	78.0	69.8	76	NE	8	15	0.00	0.8		
Pukalani	75.7	67.6	76	WSW	4	7	0.00	0.5		
Haliimaile	81.2	70.1	69	SSE	4	9	0.00			
Pu'unene	78.0	69.4	75	N	5	10	0.00	0.3		
Upper Paia	81.2	70.5	70	ENE	5	14	0.00	0.8		
Ma'alaea	79.8	69.6	71	NE	7	14	0.00	0.7		
Lownie	79.9	70.8	74	NNW	3	7	0.00	0.8		
Pulehu	79.5	69.9	73	W	3	6	0.00	0.5		
Spreckelsville	77.7	69.5	76	SSW	3	8	0.00	0.8	621	

Table 4
Daily Weather Observations

HAWAIIAN COMMERCIAL AND SUGAR COMPANY
Daily Meteorological and Air Quality Data
For 05/19/88

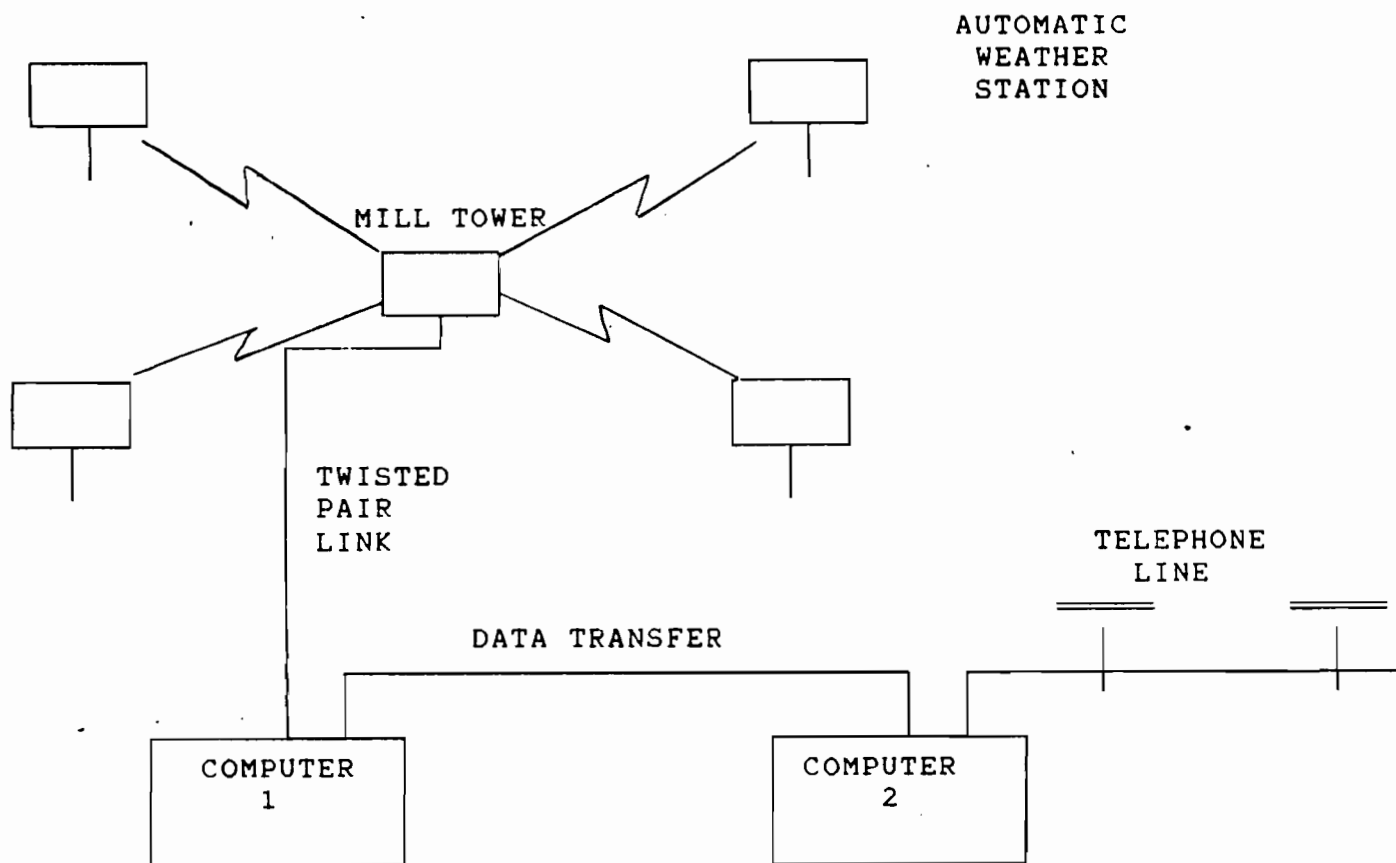
Station	Max. Temp F	Time Occur HST	Min. Temp F	Time Occur HST	Max. Wind MPH	Time Occur HST	Avg. Temp F	Avg. RH %	Total Precip. Inches	24Hr. Avg. COH
Mill Tower	81.8	7:51	70.3	4:34	29.4	16:27	76.8	76.3		
Kihei	84.9	14:23	67.9	3:50	32.4	14:52	76.9	73.3	0.00	0.5
Hamakuapok	80.7	14:24	69.5	3:15	30.3	13:48	74.8	80.0	0.00	
Pukalani	81.5	15:37	63.4	5:04	35.6	16:47	72.4	78.3	0.00	
Haliimaile	82.6	9:23	64.5	5:36	30.8	14:13	73.0	79.0	0.00	
Pu'unene	84.1	14:11	63.9	5:48	26.1	16:24	74.5	81.1	0.00	
Upper Paia	83.5	14:13	67.0	6:14	30.3	13:35	76.1	76.4	0.00	
Ma'alaea	82.7	10:55	67.8	6:16	28.2	14:23	75.8	78.5	0.00	
Lownie	84.6	14:55	63.2	5:55	29.2	14:14	74.5	79.1	0.00	
Pulehu	88.7	14:58	66.5	6:10	26.9	15:44	75.7	76.0	0.00	
Spreckelsv	83.7	14:19	66.1	6:17	32.9	13:49	75.3	78.6	0.00	
Avg/Tot	83.5		66.4		30.2		75.1	77.9		0.5
Max/Min	88.7	5/19	63.2	5/19	35.6	5/19				

obtained from the automatic weather stations that are used in the weather forecasting process. These observations are available at both the HC&S office in Pu'unene and to remote users such as Weather Network, Inc. in Chico, California. Remote users access the weather data using a microcomputer with telephone communications and call the computer at HC&S in Pu'unene.

The collection and retrieval of the weather observations for the weather forecasting project is accomplished by two "AT" microcomputers and can be summarized as follows:

Figure 2

Weather Station Data Retrieval



Computer 1 controls the data gathering functions of the system. At predetermined times, generally every hour, the computer "wakes-up" and begins the process of accessing the latest weather information from each of the stations. A short haul calling modem is connected to a short haul answer modem at the Mill Tower station by a dedicated twisted pair of wires. Software controls the data collection process in an unattended mode.

At the time designated to access data from the weather stations, Computer 1 calls the Mill Tower station, from there a radio signal is utilized to "wake-up" the first station in the network to be called. Data from that station is transferred back to the Mill Tower via radio signal then down the dedicated line to the computer. Once the data is written to a file at the computer the same process is followed until data from each of the stations is obtained. The entire process to obtain data from all eleven stations takes approximately ten minutes.

After collection of the raw data from the weather stations, the data is automatically processed and stored in the data base for later retrieval by the user. At the same time the data is transferred to Computer 2 and stored in a similar data base for retrieval by remote users using a microcomputer with telephone communications.

The entire system runs unattended collecting data at times predetermined by the user.

III. WEATHER FORECASTING

The objectives of the weather forecasting program are to mitigate the intrusion of smoke into populated areas while maintaining an acceptable harvest schedule.

To accomplish these objectives a daily detailed weather forecast designed specifically for the burning of the sugar cane fields is prepared by Weather Network, Inc. each morning and placed on the computer at the HC&S office in Pu'unene by 0530 HST.

Weather Network, Inc. operates a complete weather forecasting center in their office in Chico, California. Here the latest weather charts, alphanumeric data and satellite pictures are received around the clock.

Weather charts of the North Pacific Ocean are received via satellite and printed on a dot matrix printer for analysis by the forecasters. Satellite pictures are received on an hourly basis and stored on a microcomputer with color graphics capability. Here the satellite pictures can be enlarged, looped and panned for a fine detailed analysis. The alphanumeric data is gathered by Weather Network's own computerized weather information data base. This data base is used by private meteorological firms, environmental and utility companies and the media (television and radio stations) as a source of real-time weather information.

To issue weather forecasts for the central valley of Maui detailed information from the area must be gathered to initialize and verify the forecasts. This is accomplished by the network of automatic weather stations installed on the island and the associated computer system.

At 6 AM daily, the Weather Network forecaster uses a microcomputer to call the computer (Computer 2) at the HC&S office in Pu'unene to access the current and previous hourly and daily weather observations. This data is then analyzed and used in the decision making process of formulating the weather forecast. The data also helps in verifying the previous day's forecast.

Weather charts, satellite pictures and local weather forecasts, discussions, and observations issued by the National Weather Service are also utilized in the decision making process. The upper air soundings taken at Lihue and Hilo are analyzed for the changes in temperatures and winds above the surface. Using all the tools available to him, the forecaster fills out a worksheet (Figure 3) as he begins to formalize his forecast.

MAUI BURN WORKSHEET

BEST AVAILABLE COPY

Date _____

Consult discuss HNL, FP3, HNL
zonefcst HNL, Pacific sfc anal,
local OGG, 500mb hemispheric anal,
and all relevant progs.

Winds aloft

00Z	Yesterday afternoon				MAUI AMOS (SFC ONLY)
	LIH		ITO		
	SFC	850	SFC	850	
TEMP	_____	_____	_____	_____	_____ (AVE MAX)
WIND(KTS)	_____	_____	_____	_____	_____ (3PM AVE)

This morning

12Z	LIH		ITO		2 OR 3AM MAUI AMOS (SFC ONLY)
	SFC	850	SFC	850	
TEMP	_____	_____	_____	_____	_____
WIND(KTS)	_____	_____	_____	_____	_____

This afternoon (fcst)

00Z	LIH	ITO	MAUI
	850 MB	850 MB	3PM AMOS (SFC ONLY)
TEMP	_____	_____	_____
WIND (KTS)	_____	_____	_____

MAX/MIN RH YTD (OGG) _____/_____

24 HOUR PRECIPITATION by station (zone)

OGG(3)_____	301(2)_____	906(4)_____
717(4)_____	201(2)_____	813(4)_____
KIH(5)_____	711(3)_____	417(5)_____
110(1)_____	208(3)_____	602(3)_____

YTD DISPERSION FACTOR (YDF) _____

TDY DISPERSION FACTOR (TDF) _____

A dispersion factor (ability for the atmosphere to disperse the smoke) is computed from information on the worksheet. The dispersion factor is figured as follows:

$$\text{Dispersion factor} = (3A + B)/2 * \%STAB * COH \text{ factor}$$

A = Average wind speed of all Maui surface weather stations in knots

B = 00Z 850mb wind speed (LIH,ITO) in knots

Percent stability

$$\%STAB = \frac{\text{average 850mb T (LIH,ITO)} - \text{average sfc T (Maui)}}{-15.4 \text{ degrees C (adiabatic lapse rate/5000 ft)}}$$

Dispersion Factor Ranges	<10.0 - poor
	10.0-19.9 - fair
	20.0-29.9 - good
	>30.0 - excellent

After computing the dispersion factor the zone ventilation ratings and wind forecasts are produced.

The Hawaiian Commercial and Sugar Company plantation on Maui has been divided into five burning zones, (see Figure 1). Each zone was chosen with respect to the prevailing winds, location to urban and residential areas and relation to local topography.

A daily zone ventilation rating for the morning and afternoon hours is given for each zone dependent on the day's forecasted winds and atmospheric conditions.

Table 5

Zone Ventilation Ratings

R/U = Residential/Urban

<u>Rating Number</u>	<u>Explanation</u>
1	Poor dispersion. Widespread impact on R/U areas. Fumigation directed toward R/U areas.
2	Poor/fair dispersion. Considerable impact on R/U areas. Some fumigation can be expected.
3	Fair dispersion. Minor or brief impact on R/U areas. Some fumigation problems.
4	Good dispersion. Minimal impact on R/U areas. Minor fumigation problems.

Excellent dispersion. No impact on R/U areas. No fumigation problems.

For each zone, a wind forecast for both morning and afternoon is provided along with the morning 9 AM and afternoon 3 PM ventilation rating. The ventilation ratings point out the best zones for burning each day and at what time (morning or afternoon).

The weather forecast (Figure 4) is finally assembled from the data analyzed and computations made. The forecast consists of:

1. Synoptic Situation (Large scale weather features)
2. Dispersion Discussion (Ability of atmosphere to disperse smoke)
3. Cautionary Note (Potential problems to watch for)
4. Dispersion Factor
5. Zone Ventilation Ratings (AM and PM)
6. Zone Wind Forecast (AM and PM)

After typing out the forecast, the forecaster uses a microcomputer in Chico to call the computer at HC&S (Computer 2) in Pu'unene and downloads the forecast into the database. The forecast is also automatically printed on the printer in the HC&S office at this time. The forecast is placed in the HC&S computer and on their printer by 0530 HST and is now ready to be used in the days operational burning decisions.

~~~~~

WEATHER NETWORK, INC  
 HC&S BURN PROJECT  
 MAUI FORECAST  
 MONDAY MAY 23 1988 5:30 AM HST

## SYNOPTIC SITUATION:

A LARGE HIGH PRESSURE CELL REMAINS SITUATED TO THE NORTH OF HAWAII. THIS WILL MAINTAIN TRADEWINDS ACROSS MAUI TODAY IN THE 15-25 MPH RANGE MUCH OF THE DAY. LITTLE CHANGE IN WIND SPEEDS ARE EXPECTED TUESDAY BUT SOME STRENGTHENING IS LIKELY LATER IN THE WEEK. LIMITED AMOUNTS OF MOISTURE WILL CONFINE SHOWER ACTIVITY TO MAUKA AND WINDWARD AREAS TODAY.

## DISPERSION DISCUSSION:

GOOD/EXCELLENT DISPERSION IS EXPECTED TODAY WITH GOOD DAYTIME HEATING AND WELL DEVELOPED TRADE WINDS. THE WINDS ARE EXPECTED TO BE OF SIMILAR STRENGTH TO SUNDAY WHICH SUGGESTS THAT EARLIER BURNS WILL EXPERIENCE THE BEST PLUME RISE WHILE MINIMIZING FUMIGATION PROBLEMS.

## CAUTIONARY NOTES:

EXPECT SOME FUMIGATION PROBLEMS TODAY, BECOMING MOST SEVERE DURING THE AFTERNOON ESPECIALLY FOR ZONES 1 & 3. SOME PLUME EDDYING WILL CONTINUE TO OCCUR IN ZONE 5, PARTICULARLY DURING THE MORNING BEFORE THE TRADES STRENGTHEN, WHICH WILL CAUSE SMOKE TO REMAIN NEAR POINT OF ORIGIN OR MOVE IN AN APPARENT UPWIND (NORTHWARD) DIRECTION. HOWEVER FOR OTHER ZONES SMOKE AND ASH WILL DRIFT TOWARDS THE SOUTHWEST THROUGHOUT THE DAY.

## DISPERSION FACTOR

approximate ranges

|                      |                    |            |
|----------------------|--------------------|------------|
|                      |                    | <10 - poor |
| 2 PM YESTERDAY: 28.8 | 10.0 - 19.9 - fair |            |
| 2 PM TODAY: 32.1     | 20.0 - 29.9 - good |            |
|                      | >30 - excellent    |            |

## ZONE DISPERSION RATINGS AND WINDS

|                 |       |       |       |      |       |
|-----------------|-------|-------|-------|------|-------|
| ZONE            | 1     | 2     | 3     | 4    | 5     |
| 6AM-NOON RATING | 3     | 5     | 4     | 5    | 3     |
| NOON-6PM RATING | 2     | 4     | 3     | 4    | 2     |
| 9 AM WINDS      | ENE14 | ENE13 | ENE14 | N 15 | SE 8  |
| 3 PM WINDS      | ENE19 | ENE18 | ENE19 | N 20 | NW 15 |

FORECASTER: CUSHMAN

#### IV. SUMMARY

The detailed wind and smoke dispersion weather forecasts for the central valley of Maui are able to be produced in large part from the network of automatic weather stations in the area. The unique software which allows for data from these stations to be collected and processed unattended and for remote users to access the data at any time of the day using a microcomputer, further enhances the weather forecasting capabilities.

The central valley of Maui has a unique microclimate all its own with mountain ranges both to the east and west. From a synoptic weather situation, the movement and strength of the high pressure cell which dominates the weather pattern over the Hawaiian Islands determines the strength of the trades and subsequent wind flow pattern across the Valley. When the trades become weak the diurnal flux between the onshore and offshore flow of marine air becomes more pronounced.

As more data is gathered and analyzed, the forecasting techniques currently being used can be refined to better understand the complex wind patterns of the area allowing for even further improvement in the management of sugar cane smoke and its impact on urban and residential areas of Maui.

GLADES SUGAR HOUSE

# Sugar Cane Growers Cooperative of Florida

POST OFFICE BOX 666

BELLE GLADE, FLORIDA

March 10, 1989

Department of Environmental Regulation  
Bureau of Air Quality Management  
2600 Blair Stone Road  
Tallahassee, Florida 32301

Attention: Mr. Clair H. Fancy

RE: Compliance Testing on  
Boiler No. 8 - A050-147870  
(PSD-FL-077)

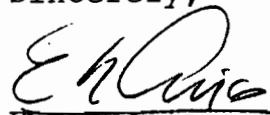
Gentlemen:

Pursuant to fulfilling the provisions of the permits referred to above, we are enclosing one set of compliance test reports on Boiler No. 8 while burning bagasse residue.

The compliance tests were performed simultaneously on January 27, 1989 by South Florida Environmental Services, Inc. and Air Consulting and Engineering, Inc.

Also enclosed is a certificate of calibration of the flowmeter installed in this boiler.

Sincerely,



E. R. Arias  
Executive Vice President

ERA:jm

Enclosures

cc: David Knowles, DER - Ft. Myers  
Winston Smith, EPA Region IV  
Jim Stormer, Palm Beach County Health Department  
William H. Green  
David A Buff, KBN Engineering

SOURCE TEST REPORT  
for  
VOLATILE ORGANIC COMPOUNDS EMISSIONS

NUMBER 8 BOILER  
RESIDUE FIRING

JANUARY 27, 1989

Prepared for:

SUGARCANE GROWERS COOPERATIVE OF FLORIDA  
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236-89-02

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To the best of my knowledge, all applicable field and analytical procedures comply with Florida Department of Environmental Regulation requirements and all test data and plant operating data are true and correct.

*Stephen L. Neck*

Stephen L. Neck, P.E.

State of Florida  
Registration No. 20020

*February 9, 1989*

Date



SEAL

## 1.0 INTRODUCTION

Air Consulting and Engineering, Inc. (ACE), performed United States Environmental Protection Agency (EPA) Method 25 emission testing for Volatile Organic Compounds (VOC) on the Number 8 Boiler at the Sugarcane Growers Cooperative of Florida facility in Belle Glade, Florida. Testing was performed on January 27, 1989.

The boiler was firing residue fuel during testing.

Three test runs were conducted using duplicate samples to be analyzed by separate laboratories.

Mr. Ken Tucker of the Florida Department of Environmental Regulation South District was present during the test period.

## 2.0 SUMMARY AND DISCUSSION OF RESULTS

Results of the emission testing are summarized in Table 1. Emissions average 44.82 pounds per hour as carbon against an allowable emission rate of 140 pounds per hour.

All EPA Method 25 samples (Section 3.0) were taken in duplicate with analyses performed by two different laboratories. Research Triangle Laboratories (RTL) of Research Triangle Park, North Carolina, performed one set of samples while Clean Air Engineering (CAE) of Palatine, Illinois, analyzed the other set. Laboratory analyses are provided in Appendix B. The analyses of all six analyzers were used to compute an emission average.

Because the source is wet scrubber controlled, the EPA Method 25 sample trains plugged with ice on occasion. The sample analyses also showed a good deal of variance, indicating that a degree of contamination occurred due to particulate laden scrubber water or other sources. Actual VOC emission is certainly much less than indicated. Blank analyses values were not subtracted from the reported emissions.

Volumetric flow data and heat inputs reported in Table 1 were compiled by South Florida Environmental Services, who performed simultaneous particulate, sulfur dioxide, carbon monoxide, and oxides of nitrogen testing.

APPENDIX A  
EPA METHOD 25

# **METHOD 25—DETERMINATION OF TOTAL GASEOUS NONMETHANE ORGANIC EMISSIONS AS CARBON**

## **1. Applicability and Principle**

**1.1 Applicability.** This method applies to the measurement of volatile organic compounds (VOC) as total gaseous nonmethane organics (TGNMO) as carbon in source emissions. Organic particulate matter will interfere with the analysis and therefore, in some cases, an in-stack particulate filter is required. This method is not the only method that applies to the measurement of TGNMO. Costs, logistics, and other practicalities of source testing may make other test methods more desirable for measuring VOC of certain effluent streams. Proper judgment is required in determining the most applicable VOC test method. For example, depending upon the molecular weight of the organics in the effluent stream, a totally automated semi-continuous nonmethane organic (NMO) analyzer interfaced directly to the source may yield accurate results. This approach has the advantage of providing emission data semi-continuously over an extended time period.

Direct measurement of an effluent with a flame ionization detector (FID) analyzer may be appropriate with prior characterization of the gas stream and knowledge that the detector responds predictably to the organic compounds in the stream. If present, methane will, of course, also be measured. In practice, the FID can be applied to the determination of the mass concentration of the total molecular structure of the organic emissions under the following limited conditions: (1) Where only one compound is known to exist; (2) when the organic compounds consist of only hydrogen and carbon; (3) where the relative percentage of the compounds is known or can be determined, and the FID response to the compounds is known; (4) where a consistent mixture of compounds exists before and after emission control and only the relative concentrations are to be assessed; or (5) where the FID can be calibrated against mass standards of the compounds emitted (solvent emissions, for example).

Another example of the use of a direct FID is as a screening method. If there is enough information available to provide a rough estimate of the analyzer accuracy, the FID analyzer can be used to determine the VOC content of an uncharacterized gas stream. With a sufficient buffer to account for possible inaccuracies, the direct FID can be a useful tool to obtain the desired results without costly exact determination.

In situations where a qualitative/quantitative analysis of an effluent stream is desired or required, a gas chromatographic FID system may apply. However, for sources emitting numerous organics, the time and expense of this approach will be formidable.

**1.2 Principle.** An emission sample is withdrawn from the stack at a constant rate through a chilled condensate trap by means of an evacuated sample tank. TGNMO are determined by combining the analytical results obtained from independent analyses of the condensate trap and sample tank fractions. After sampling is completed, the organic contents of the condensate trap are oxidized to carbon dioxide ( $\text{CO}_2$ ) which is quantitatively collected in an evacuated vessel; then a portion of the  $\text{CO}_2$  is reduced to methane ( $\text{CH}_4$ ) and measured by a FID. The organic content of the sample fraction collected in the sampling tank is measured by injecting a portion into a gas chromatographic (GC) column to achieve separation of the nonmethane organics from carbon monoxide ( $\text{CO}$ ),  $\text{CO}_2$ , and  $\text{CH}_4$ ; the nonmethane organics (NMO) are oxidized to  $\text{CO}_2$ , reduced to  $\text{CH}_4$ , and measured by a FID. In this manner, the variable response of the FID associated with different types of organics is eliminated.

## **2. Apparatus**

The sampling system consists of a condensate trap, flow control system, and sample tank (Figure 1). The analytical system consists of two major sub-systems: an oxidation system for the recovery and conditioning of the condensate trap contents and a NMO analyzer. The NMO analyzer is a GC with backflush capability for NMO analysis and is equipped with an oxidation catalyst, reduction catalyst, and FID. (Figures 2 and 3 are schematics of a typical NMO analyzer.) The system for the recovery and conditioning of the organics captured in the condensate trap consists of a heat source, oxidation catalyst, nondispersive infrared (NDIR) analyzer and an intermediate collection vessel (Figure 4 is a schematic of a typical system.) TGNMO sampling equipment can be constructed from commercially available components and components fabricated in a machine shop. NMO analyzers are available commercially or can be constructed from available components by a qualified instrument laboratory.

**2.1 Sampling.** The following equipment is required:

**2.1.1 Probe.** 3.2-mm OD (1/8-in.) stainless steel tubing.

**2.1.2 Condensate Trap.** Constructed of 316 stainless steel; construction details of a suitable trap are shown in Figure 5.

**2.1.3 Flow Shut-off Valve.** Stainless steel control valve for starting and stopping sample flow.

**2.1.4 Flow Control System.** Any system capable of maintaining the sampling rate to within  $\pm 10$  percent of the selected flow rate (50 to 100 cc/min range).

**2.1.5 Vacuum Gauge.** Gauge for monitoring the vacuum of the sample tank during leak checks and sampling.

**2.1.6 Sample Tank.** Stainless steel or aluminum tank with a volume of 4 to 8 liters, equipped with a stainless steel female quick connect for assembly to the sample train and analytical system.

**2.1.7 Mercury Manometer.** U-tube mercury manometer capable of measuring pressure to within 1 mm Hg in the 0-900 mm range.

**2.1.8 Vacuum Pump.** Capable of evacuating to an absolute pressure of 10 mm Hg.

**2.2 Analysis.** The following equipment is required:

**2.2.1 Condensate Recovery and Conditioning Apparatus.** An apparatus for recovering and catalytically oxidizing the condensate trap contents is required. Figure 4 is a schematic of such a system. The analyst must demonstrate prior to initial use that the analytical system is capable of proper oxidation and recovery, as specified in section 5.1. The condensate recovery and conditioning apparatus consists of the following major components:

**2.2.1.1 Heat Source.** A heat source sufficient to heat the condensate trap (including probe) to a temperature where the trap turns a "dull red" color. A system using both a propane torch and an electric muffle-type furnace is recommended.

**2.2.1.2 Oxidation Catalyst.** A catalyst system capable of meeting the catalyst efficiency criteria of this method (section 5.1.2). Addendum I of this method lists a catalyst system found to be acceptable.

**2.2.1.3 Water Trap.** Any leak-proof moisture trap capable of removing moisture from the gas stream.

**2.2.1.4 NDIR Detector.** A detector capable of indicating  $\text{CO}_2$  concentration in the zero to 1 percent range. This detector is required for monitoring the progress of combustion of the organic compounds from the condensate trap.

**2.2.1.5 Pressure Regulator.** Stainless steel needle valve required to maintain the trap conditioning system at a near constant pressure.

**2.2.1.6 Intermediate Collection Vessel.** Stainless steel or aluminum collection vessel equipped with a female quick connect. Tanks with nominal volumes in the 1 to 4 liter range are recommended.

**2.2.1.7 Mercury Manometer.** U-tube mercury manometer capable of measuring pressure to within 1 mm Hg in the 0-900 mm range.

**2.2.1.8 Gas Purifiers.** Gas purification systems sufficient to maintain  $\text{CO}_2$  and organic impurities in the carrier gas and auxiliary oxygen at a level of less than 10 ppm (may not be required depending on quality of cylinder gases used).

**2.2.2 NMO Analyzer.** Semi-continuous GC/FID analyzer capable of: (1) separating  $\text{CO}$ ,  $\text{CO}_2$ , and  $\text{CH}_4$  from nonmethane organic compounds, (2) reducing the  $\text{CO}$  to  $\text{CH}_4$  and quantifying as  $\text{CH}_4$ , and (3) oxidizing the nonmethane organic compounds to  $\text{CO}_2$ , reducing the  $\text{CO}_2$  to  $\text{CH}_4$ , and quantifying as  $\text{CH}_4$ . The analyst must demonstrate prior to initial use that the analyzer is capable of proper separation, oxidation, reduction, and measurement (section 5.2). The analyzer consists of the following major components:

2.2.2.1 Oxidation Catalyst. A catalyst system capable of meeting the catalyst efficiency criteria of this method (section 5.2.1). Addendum I of this method lists a catalyst system found to be acceptable.

2.2.2.2 Reduction Catalyst. A catalyst system capable of meeting the catalyst efficiency criteria of this method (section 5.2.3). Addendum I of this method lists a catalyst system found to be acceptable.

2.2.2.3 Separation Column(s). Gas chromatographic column(s) capable of separating CO, CO<sub>2</sub>, and CH<sub>4</sub> from NMO compounds as demonstrated according to the procedures established in this method (section 5.2.5). Addendum I of this method lists a column found to be acceptable.

2.2.2.4 Sample Injection System. A GC sample injection valve fitted with a sample loop properly sized to interface with the NMO analyzer (1 cc loop recommended).

2.2.2.5 FID. A FID meeting the following specifications is required.

2.2.2.5.1 Linearity. A linear response ( $\pm 5\%$ ) over the operating range as demonstrated by the procedures established in section 2.2.

2.2.2.5.2 Range. Signal attenuators shall be available to produce a minimum signal response of 10 percent of full scale for a full scale range of 10 to 50000 ppm CH<sub>4</sub>.

2.2.2.6 Data Recording System. Analog strip chart recorder or digital integration system compatible with the FID for permanently recording the analytical results.

2.2.3 Barometer. Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 1 mm Hg.

2.2.4 Thermometer. Capable of measuring the laboratory temperature within 1°C.

2.2.5 Vacuum Pump. Capable of evacuating to an absolute pressure of 10 mm Hg.

2.2.6 Syringe (2). 10  $\mu$ l and 100  $\mu$ l liquid injection syringes.

2.2.7 Liquid Sample Injection Unit. 316 U-tube fitted with a Teflon injection septum, see Figure 8.

### 3. Reagents

3.1 Sampling. Crushed dry ice is required for sampling.

3.2 Analysis.

3.2.1 NMO Analyzer. The following gases are needed:

3.2.1.1 Carrier Gas. Zero grade gas containing less than 1 ppm C. Addendum I of this method lists a carrier gas found to be acceptable.

3.2.1.2 Fuel Gas. Pure hydrogen, containing less than 1 ppm C.

3.2.1.3 Combustion Gas. Zero grade air or oxygen as required by the detector.

3.2.2 Condensate Recovery and Conditioning Apparatus.

3.2.2.1 Carrier Gas. Five percent O<sub>2</sub> in N<sub>2</sub>, containing less than 1 ppm C.

3.2.2.2 Auxiliary Oxygen. Zero grade oxygen containing less than 1 ppm C.

3.2.2.3 Hexane. ACS grade, for liquid injection.

3.2.2.4 Toluene. ACS grade, for liquid injection.

3.3 Calibration. For all calibration gases, the manufacturer must recommend a maximum shelf life for each cylinder (i.e., the length of time the gas concentration is not expected to change more than  $\pm 5$  percent

from its certified value). The date of gas cylinder preparation, certified organic concentration and recommended maximum shelf life must be affixed to each cylinder before shipment from the gas manufacturer to the buyer. The following calibration gases are required.

3.3.1 Oxidation Catalyst Efficiency Check Calibration Gas. Gas mixture standard with nominal concentration of 1 percent methane in air.

3.3.2 Flame Ionization Detector Linearity and Nonmethane Organic Calibration Gases (3). Gas mixture standards with nominal propane concentrations of 20 ppm, 200 ppm, and 3000 ppm, in air.

3.3.3 Carbon Dioxide Calibration Gases (3). Gas mixture standards with nominal CO<sub>2</sub> concentrations of 50 ppm, 500 ppm, and 1 percent, in air.

NOTE: total NMO less than 1 ppm required for 1 percent mixture.

3.3.4 NMO Analyzer System Check Calibration Gases (4).

3.3.4.1 Propane Mixture. Gas mixture standard containing (nominal) 50 ppm CO, 50 ppm CH<sub>4</sub>, 2 percent CO<sub>2</sub>, and 20 ppm C<sub>2</sub>H<sub>6</sub>, prepared in air.

3.3.4.2 Hexane. Gas mixture standard containing (nominal) 50 ppm hexane in air.

3.3.4.3 Toluene. Gas mixture standard containing (nominal) 20 ppm toluene in air.

3.3.4.4 Methanol. Gas mixture standard containing (nominal) 100 ppm methanol in air.

### 4. Procedure

#### 4.1 Sampling.

4.1.1 Sample Tank Evacuation and Leak Check. Either in the laboratory or in the field, evacuate the sample tank to 10 mm Hg absolute pressure or less (measured by a mercury U-tube manometer); then leak check the sample tank by isolating the tank from the vacuum pump and allowing the tank to sit for 10 minutes. The tank is acceptable if no change in tank vacuum is noted.

4.1.2 Sample Train Assembly. Just prior to assembly, measure the tank vacuum using a mercury U-tube manometer. Record this vacuum ( $P_t$ ), the ambient temperature ( $T_a$ ), and the barometric pressure ( $P_b$ ) at this time. Assuring that the flow shut-off valve is in the closed position, assemble the sampling system as shown in Figure 1. Immerse the condensate trap body in dry ice to within 2.5 or 5 cm of the point where the inlet tube joins the trap body.

4.1.3. Pretest Leak Check. A pretest leak check is required. After the sampling train is assembled, record the tank vacuum as indicated by the vacuum gauge. Wait a minimum period of 10 minutes and recheck the indicated vacuum. If the vacuum has not changed, the portion of the sampling train behind the shut-off valve does not leak and is considered acceptable. To check the front portion of the sampling train, assure that the probe tip is tightly plugged and then open the sample train flow shut-off valve. Allow the sample train to sit for a minimum period of 10 minutes. The leak check is acceptable if no visible change in the tank vacuum gauge occurs. Record the pretest leak rate (cm/Hg per 10 minutes). At the completion of the leak check period, close the sample flow shut-off valve.

4.1.4. Sample Train Operation. Place the probe into the stack such that the probe is perpendicular to the direction of stack gas flow; locate the probe tip at a single preselected point. If a probe extension which will not be analyzed as part of the condensate trap is being used, assure that at least a 15 cm section of the probe which will be analyzed with the trap is in the stack effluent. For stacks having a negative static pressure, assure that the sample port is sufficiently sealed to prevent air in-leakage around the probe. Check the dry ice level and add ice if necessary. Record the clock time and sample tank gauge vacuum. To begin sampling, open the flow shut-off valve and adjust (if applicable) the control valve of the flow control system used in the sample train; maintain a constant flow rate ( $\pm 10$  percent) throughout the duration of the sampling period. Record the gauge vacuum and flowmeter setting (if applicable) at 5-minute intervals. Select a total sample time greater than or equal to the minimum sampling time specified in the applicable subpart of the regulation; end the sampling when this time period is reached or when a constant flow rate can no longer be maintained due to reduced sample tank vacuum. When the sampling is completed, close the flow shut-off valve and record the final sample time and gauge vacuum readings.

NOTE: If the sampling had to be stopped before obtaining the minimum sampling time (specified in the applicable subpart) because a constant flow rate could not be maintained, proceed as follows: After removing the probe from the stack, remove the used sample tank from the sampling train (without disconnecting other portions of the sampling train) and connect another sample tank to the sampling train. Prior to attaching the new tank to the sampling train, assure that the tank vacuum (measured on-site by the U-tube manometer) has been recorded on the data form and that the tank has been leak-checked (on-site). After the new tank is attached to the sample train, proceed with the sampling until the required minimum sampling time has been exceeded.

4.1.5 Post Test Leak Check. A leak check is mandatory at the conclusion of each test run. After sampling is completed, remove the probe from the stack and plug the probe tip. Open the sample train flow shut-off valve and monitor the sample tank vacuum gauge for a period of 10 minutes. The leak check is acceptable if no visible change in the tank vacuum gauge occurs. Record the post test leak rate (cm Hg per 10 minutes). If the sampling train does not pass the post leak check, invalidate the run or use a procedure acceptable to the Administrator to adjust the data.

4.2 Sample Recovery. After the post test leak check is completed, disconnect the condensate trap at the flow metering system and tightly seal both ends of the condensate trap. Keep the trap packed in dry ice until the samples are returned to the laboratory for analysis. Remove the flow metering system from the sample tank. Attach the U-tube manometer to the tank (keep length of connecting line to a minimum) and record the final tank vacuum ( $P_t$ ); record the tank temperature ( $T_t$ ) and barometric pressure at this time. Disconnect the manometer from the tank. Assure that the test run number is properly identified on the condensate trap and the sample tank(s).

4.3 Condensate Recovery and Conditioning. Prepare the condensate recovery and conditioning apparatus by setting the carrier gas flow rate and heating the catalyst to its operating temperature. Prior to initial use of the condensate recovery and conditioning apparatus, a system performance test must be conducted according to the procedures established in section 5.1 of this method. After successful completion of the initial performance test, the system is routinely used for sample conditioning according to the following procedures:

4.3.1 System Blank and Catalyst Efficiency Check. Prior to and immediately following the conditioning of each set of sample traps, or on a daily basis (whichever occurs first) conduct the carrier gas blank test and catalyst efficiency test as specified in sections 5.1.1 and 5.1.2 of this method. Record the carrier gas initial and final blank values,  $B_i$  and  $B_f$ , respectively. If the criteria of the tests cannot be met, make the necessary repairs to the system before proceeding.

4.3.2 Condensate Trap Carbon Dioxide Purge and Sample Tank Pressurization. The first step in analysis is to purge the condensate trap of any  $CO_2$  which it may contain and to simultaneously pressurize the sample tank. This is accomplished as follows: Obtain both the sample tank and condensate trap from the test run to be analyzed. Set up the condensate recovery and conditioning apparatus so that the carrier flow bypasses the condensate trap hook-up terminals, bypasses the oxidation catalyst, and is vented to the atmosphere. Next, attach

the condensate trap to the apparatus and pack the trap in dry ice. Assure that the valves isolating the collection vessel connection from the atmospheric vent and the vacuum pump are closed and then attach the sample tank to the system as if it were the intermediate collection vessel. Record the tank vacuum on the laboratory data form. Assure that the NDIR analyzer indicates a zero output level and then switch the carrier flow through the condensate trap; immediately switch the carrier flow from vent to collect. The condensate trap recovery and conditioning apparatus should now be set up as indicated in Figure 8. Monitor the NDIR: when  $CO_2$  is no longer being passed through the system, switch the carrier flow so that it once again bypasses the condensate trap. Continue in this manner until the gas sample tank is pressurized to a nominal gauge pressure of 800 mm Hg. At this time, isolate the tank, vent the carrier flow, and record the sample tank pressure ( $P_t$ ), barometric pressure ( $P_b$ ), and ambient temperature ( $T_a$ ). Remove the sample tank from the system.

4.3.3 Recovery of Condensate Trap Sample. Oxidation and collection of the sample in the condensate trap is now ready to begin. From the step just completed in section 4.3.1.2 above, the system should be set up so that the carrier flow bypasses the condensate trap, bypasses the oxidation catalyst, and is vented to the atmosphere. Attach an evacuated intermediate collection vessel to the system and then switch the carrier so that it flows through the oxidation catalyst. Switch the carrier from vent to collect and open the valve to the collection vessel; remove the dry ice from the trap and then switch the carrier flow through the trap. The system should now be set up to operate as indicated in Figure 9. During oxidation of the condensate trap sample, monitor the NDIR to determine when all

the sample has been removed and oxidized (indicated by return to baseline of NDIR analyzer output). Begin heating the condensate trap and probe with a propane torch. The trap should be heated to a temperature at which the trap glows a "dull red" (approximately 500°C). During the early part of the trap "burn out," adjust the carrier and auxiliary oxygen flow rates so that an excess of oxygen is being fed to the catalyst system. Gradually increase the flow of carrier gas through the trap. After the NDIR indicates that most of the organic matter has been purged, place the trap in a muffle furnace (500°C). Continue to heat the probe with a torch or some other procedure (e.g., electrical resistance heater). Continue this procedure for at least 5 minutes after the NDIR has returned to baseline. Remove the heat from the trap but continue the carrier flow until the intermediate collection vessel is pressurized to a gauge pressure of 800 mm Hg (nominal). When the vessel is pressurized, vent the carrier, measure and record the final intermediate collection vessel pressure ( $P_f$ ) as well as the barometric pressure ( $P_b$ ), ambient temperature ( $T_a$ ), and collection vessel volume ( $V_c$ ).

4.4 Analysis. Prior to putting the NMO analyzer into routine operation, an initial performance test must be conducted. Start the analyzer and perform all the necessary functions in order to put the analyzer in proper working order, then conduct the performance test according to the procedures established in section 5.2. Once the performance test has been successfully completed and the  $CO_2$  and NMO calibration response factors determined, proceed with sample analysis as follows:

4.4.1 Daily operations and calibration checks. Prior to and immediately following the analysis of each set of samples or on a daily basis (whichever occurs first) conduct a calibration test according to the procedures established in section 5.3. If the criteria of the daily calibration test cannot be met, repeat the NMO analyzer performance test (section 5.2) before proceeding.

4.4.2 Analysis of Recovered Condensate Sample. Purge the sample loop with sample and then inject a preliminary sample in order to determine the appropriate FID attenuation. Inject triplicate samples from the intermediate collection vessel and record the values obtained for the condensable organics as  $CO_2$  ( $C_{CO_2}$ ).

4.4.3 Analysis of Sample Tank. Purge the sample loop with sample and inject a preliminary sample in order to determine the appropriate FID attenuation for monitoring the backflushed non-methane organics. Inject triplicate samples from the sample tank and record the values obtained for the nonmethane organics ( $C_{NM}$ ).

#### 5. Calibration and Operational Checks

Maintain a record of performance of each item.

5.1 Initial Performance Check of Condensate Recovery and Conditioning Apparatus

5.1.1 Carrier Gas and Auxiliary Oxygen Blank. Set equal flow rates for both the carrier gas and auxiliary oxygen. With the trap switching valves in the bypass position and the catalyst in-line, fill an evacuated intermediate collection vessel with carrier gas. Analyze the collection vessel for  $CO_2$ ; the carrier blank is acceptable if the  $CO_2$  concentration is less than 10 ppm.

5.1.2 Catalyst Efficiency Check. Set up the condensate trap recovery system so that the carrier flow bypasses the trap inlet and is vented to the atmosphere at the system outlet. Assure that the valves isolating the collection system from the atmospheric vent and vacuum pump are closed and then attach an evacuated intermediate collection vessel to the system. Connect the methane standard gas cylinder (section 3.3.1) to the system's condensate trap connector (probe end, Figure 4). Adjust the system valving so that the standard gas cylinder acts as the carrier gas and adjust the flow rate to the rate normally used during trap sample recovery. Switch off the auxiliary oxygen flow and then switch from vent to collect in order to begin collecting a sample. Continue collecting a sample in a normal manner until the intermediate vessel is filled to a nominal gauge pressure of 300 mm Hg. Remove the intermediate vessel from the system and vent the carrier flow to the atmosphere. Switch the valving to return the system to its normal carrier gas and normal operating conditions. Analyze the collection vessel for  $CO_2$ ; the catalyst efficiency is acceptable if the  $CO_2$  concentration is within  $\pm 5$  percent of the expected value.

5.1.3 System Performance Check. Construct a liquid sample injection unit similar in design to the unit shown in Figure 8. Insert this unit into the condensate recovery and conditioning system in place of a condensate trap and set the carrier gas and auxiliary oxygen flow rates to normal operating levels. Attach an evacuated intermediate collection vessel to the system and switch from system vent to collect. With the carrier gas routed through the injection unit and the oxidation catalyst, inject a liquid sample (see 5.1.3.1 to 5.1.3.4) via the injection septum. Heat the injection unit with a torch while monitoring the oxidation reaction on the NDIR. Continue the purge until the reaction is complete. Measure the final collection vessel pressure and then analyze the vessel to determine the  $CO_2$  concentration. For each injection, calculate the percent recovery using the equation in section 6.6.

The performance test is acceptable if the average percent recovery is  $100 \pm 10$  percent with a relative standard deviation (section 6.7) of less than 5 percent for each set of triplicate injections as follows:

- 5.1.3.1 100  $\mu$ l hexane.
- 5.1.3.2 10  $\mu$ l hexane.
- 5.1.3.3 100  $\mu$ l toluene.
- 5.1.3.4 10  $\mu$ l toluene.

#### 5.2 Initial NMO Analyzer Performance Test

5.2.1 Oxidation Catalyst Efficiency Check. Turn off or bypass the NMO analyzer reduction catalyst. Make triplicate injections of the high level methane standard (section 3.3.1). The oxidation catalyst operation is acceptable if no FID response is noted.

5.2.2 Analyzer Linearity Check and NMO Calibration. Operating both the oxidation and reduction catalysts, conduct a linearity check of the analyzer using the propane standards specified in section 3.3. make triplicate injections of each calibration gas and then calculate the average response factor (area/ppm C) for each gas, as well as the overall mean of the response factor values. The instrument linearity is acceptable if the average response factor of each calibration gas is within  $\pm 5$  percent of the overall mean value and if the relative standard deviation (section 6.7) for each set of triplicate injections is less than  $\pm 5$  percent. Record the overall mean of the propane response factor values as the NMO calibration response factor ( $RF_{NMO}$ ).



5.2.3 Reduction Catalyst Efficiency Check and CO Calibration. An exact determination of the reduction catalyst efficiency is not required. Instead, proper catalyst operation is indirectly checked and continuously monitored by establishing a CO response factor and comparing it to the NMO response factor. Operating both the oxidation and reduction catalysts make triplicate injections of each of the CO calibration gases (section 3.3.3). Calculate the average response factor (area/ppm) for each calibration gas, as well as the overall mean of the response factor values. The reduction catalyst operation is acceptable if the average response factor of each calibration gas is within  $\pm 5$  percent of the overall mean value and if the relative standard deviation (section 6.7) for each set of triplicate injections is less than  $\pm 5$  percent. Additionally, the CO overall mean response factor must be within  $\pm 10$  percent of the NMO calibration response factor ( $RF_{NMO}$ ) calculated in section 5.2.2. Record the overall mean of the response factor values as the CO calibration response factor ( $RF_{CO}$ ).

5.2.4 NMO System Blank. For the high level CO calibration gas (section 3.3.3) record the NMO value measured during the CO calibration conducted in section 5.2.3. This value is the NMO blank value for the analyzer ( $B_a$ ) and should be less than 10 ppm.

5.2.5 System Performance Check. Check the column separation and overall performance of the analyzer by making triplicate injections of the calibration gases listed in section 3.3.4. The analyzer performance is acceptable if the measured NMO value for each gas (average of triplicate injections) is within  $\pm 12$  percent of the expected value.

### 5.3 NMO Analyzer Daily Calibration

5.3.1 NMO Blank and CO. Inject triplicate samples of the high level CO calibration gas (section 3.3.3) and calculate the average response factor. The system operation is adequate if the calculated response factor is within  $\pm 10$  percent of the  $RF_{CO}$  calculated during the initial performance test (section 5.2.2). Use the daily response factor ( $DRF_{CO}$ ) for analyzer calibration and the calculation of measured CO concentrations in the collection vessel samples. In addition, record the NMO blank value ( $B_a$ ); this value should be less than 10 ppm.

5.3.2 NMO Calibration. Inject triplicate samples of the mixed propane calibration cylinder (section 3.3.4.1) and calculate the average NMO response factor. The system operation is adequate if the calculated response factor is within  $\pm 10$  percent of the  $RF_{NMO}$  calculated during the initial performance test (section 5.2.1). Use the daily response factor ( $DRF_{NMO}$ ) for analyzer calibration and calculation of NMO concentrations in the sample tanks.

5.4 Sample Tank. The volume of the gas sampling tanks used must be determined. Prior to putting each tank in service, determine the tank volume by weighing the tanks empty and then filled with deionized distilled water; weigh to the nearest 5 gm and record the results. Alternatively, measure the volume of water used to fill the tanks to the nearest 5 ml.

5.5 Intermediate Collection Vessel. The volume of the intermediate collection vessels used to collect CO during the analysis of the condensate traps must be determined. Prior to putting each vessel into service, determine the volume by weighing the vessel empty and then filled with deionized distilled water; weigh to the nearest 5 gm and record the results. Alternatively, measure the volume of water used to fill the tanks to the nearest 5 ml.

## 6. Calculations

Note: All equations are written using absolute pressure; absolute pressures are determined by adding the measured barometric pressure to the measured gauge pressure.

6.1 Sample Volume. For each test run, calculate the gas volume sampled:

$$V_s = 0.386 V \left( \frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right)$$

6.2 Noncondensable Organics. For each sample tank, determine the concentration of nonmethane organics (ppm C):

$$C_t = \left[ \frac{\frac{P_{tf}}{T_{tf}}}{\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}}} \right] \left[ \frac{1}{r} \sum_{j=1}^r C_{tmj} - B_a \right]$$

6.3 Condensible Organics. For each condensate trap determine the concentration of organics (ppm C):

$$C_c = 0.386 \frac{V_v P_f}{V_s T_f} \left[ \frac{1}{q} \sum_{k=1}^q C_{cmk} - B_t \right]$$

6.4 Total Gaseous Nonmethane Organics (TGNMO). To determine the TGNMO concentration for each test run, use the following equation:

$$C = C_t + C_c$$

6.5 Total Gaseous Nonmethane Organics (TGNMO) Mass Concentration. To determine the TGNMO mass concentration as carbon for each test run, use the following equation:

$$M_r C = 0.498 C$$

6.6 Percent Recovery. To calculate the percent recovery for the liquid injections to the condensate recovery and conditioning system use the following equation:

$$\text{percent recovery} = 1.6 \frac{M}{L} \frac{V_v}{\rho} \frac{P_f}{T_f} \frac{C_{cm}}{N}$$

6.7 Relative Standard Deviation.

$$RSD = \frac{100}{\bar{x}} \sqrt{\frac{\sum (x_i - \bar{x})^2}{n - 1}}$$

Where:

B<sub>1</sub> = Measured NMO blank value for NMO analyzer, ppm C.  
 B<sub>2</sub> = Measured CO<sub>2</sub> blank value for condensate recovery and conditioning system carrier gas, ppm CO<sub>2</sub>.  
 C = total gaseous nonmethane organic (TGNMO) concentration of the effluent, ppm C equivalent.  
 C<sub>1</sub> = Calculated condensable organic (condensate trap) concentration of the effluent, ppm C equivalent.  
 C<sub>2</sub> = Measured concentration (NMO analyzer) for the condensate trap (intermediate collection vessel), ppm CO<sub>2</sub>.  
 C<sub>3</sub> = Calculated noncondensable organic concentration (sample tank) of the effluent, ppm C equivalent.  
 C<sub>4</sub> = Measured concentration (NMO analyzer) for the sample tank, ppm NMO.  
 L = Volume of liquid injected, microliters.  
 M = Molecular weight of the liquid injected, g/g-mole.

M<sub>1</sub> = total gaseous non-methane organic (TGNMO) mass concentration of the effluent, mg C/dscm.  
 N = Carbon number of the liquid compound injected (N=7 for toluene, N=6 for hexane).  
 P<sub>1</sub> = Final pressure of the intermediate collection vessel, mm Hg absolute.  
 P<sub>2</sub> = Gas sample tank pressure prior to sampling, mm Hg absolute.  
 P<sub>3</sub> = Gas sample tank pressure after sampling, but prior to pressurizing, mm Hg absolute.  
 P<sub>4</sub> = Final gas sample tank pressure after pressurizing, mm Hg absolute.  
 T<sub>1</sub> = Final temperature of intermediate collection vessel, °K.  
 T<sub>2</sub> = Sample tank temperature prior to sampling, °K.  
 T<sub>3</sub> = Sample tank temperature at completion of sampling, °K.

T<sub>4</sub> = Sample tank temperature after pressurizing, °K.  
 V = Sample tank volume, cm.  
 V<sub>1</sub> = Intermediate collection vessel volume, cm.  
 V<sub>2</sub> = Gas volume sampled, dscm.  
 n = Number of data points.  
 q = Total number of analyzer injections of intermediate collection vessel during analysis (where k = injection number, 1 . . . q).  
 r = Total number of analyzer injections of sample tank during analysis (where j = injection number, 1 . . . r).  
 x<sub>i</sub> = Individual measurements.  
 $\bar{x}$  = Mean value.  
 ρ = Density of liquid injected, g/cc.

#### 7. Bibliography

7.1 Salo, Albert E., Samuel Witz, and Robert D. MacPhee, Determination of Solvent Vapor Concentrations by Total Com-

Combustion Analysis: A Comparison of Infrared with Flame Ionization Detectors. Paper No. 5-33.2 (Presented at the 68th Annual Meeting of the Air Pollution Control Association, Boston, MA, June 15-20, 1975.) 14 p.

7.2 Saio, Albert E., William L. Oaks, and Robert D. MacPhee. Measuring the Organic Carbon Content of Source Emissions for Air Pollution Control. Paper No. 74-190. (Presented at the 67th Annual Meeting of the Air Pollution Control Association, Denver, CO, June 9-13, 1974.) 25 p.

#### METHOD 25—APPENDUM I. SYSTEM COMPONENTS

In test Method 25 several important system components are not specified; instead minimum performance specifications are provided. The method is written in this manner to permit individual preference in choosing components, as well as to encourage development and use of improved components. This addendum is added to the method in order to provide users with some specific information regarding components which have been found satisfactory for use with the method. This listing is given only for the purpose of providing information and does not constitute an endorsement of any product by the Environmental Protection Agency. This list is not meant to imply that other components not listed are not acceptable.

1. Condensate Recovery and Conditioning System Oxidation Catalyst.  $\frac{1}{2}$ " OD $\times$ 14" inconel tubing packed with 8 inches of hopcalite\* oxidizing catalyst and operated at 800°C in a tube furnace.

NOTE: At this temperature, this catalyst must be purged with carrier gas at all times to prevent catalyst damage.

2. NMO Analyzer Oxidation Catalyst.  $\frac{1}{2}$ " OD $\times$ 14" inconel tubing packed with 8 inches of hopcalite oxidizing catalyst and operated at 800°C in a tube furnace. (See note above.)

3. NMO Analyzer Reduction Catalyst. Reduction Catalyst Module; Byron Instruments, Raleigh, N.C.

4. Gas Chromatographic Separation Column.  $\frac{1}{8}$  inch OD stainless steel packed with 3 feet of 10 percent methyl silicone, Sp 2100 (or equivalent) on Supelcoport (or equivalent), 80/100 mesh, followed by 1.5 feet Porapak Q (or equivalent) 60/80 mesh. The inlet side is to the silicone. Condition the column for 24 hours at 200°C with 20 cc/min N<sub>2</sub> purge.

During analysis for the nonmethane organics the separation column is operated as follows: First, operate the column at -78°C (dry ice bath) to elute CO and CH<sub>4</sub>. After

the CH<sub>4</sub> peak operate the column at 0°C to elute CO<sub>2</sub>. When the CO<sub>2</sub> is completely eluted, switch the carrier flow to backflush the column and simultaneously raise the column temperature to 100°C in order to elute all nonmethane organics (exact timings for column operation are determined from the calibration standard).

NOTE: The dry ice operating condition may be deleted if separation of CO and CH<sub>4</sub> is unimportant.

NOTE: Ethane and ethylene may or may not be measured using this column; whether or not ethane and ethylene are quantified will depend on the CO<sub>2</sub> concentration in the gas sample. When high levels of CO<sub>2</sub> are present, ethane and ethylene will elute under the tail of the CO<sub>2</sub> peak.

5. Carrier Gas. Zero grade nitrogen or helium or zero air.

\*MSA registered trademark.

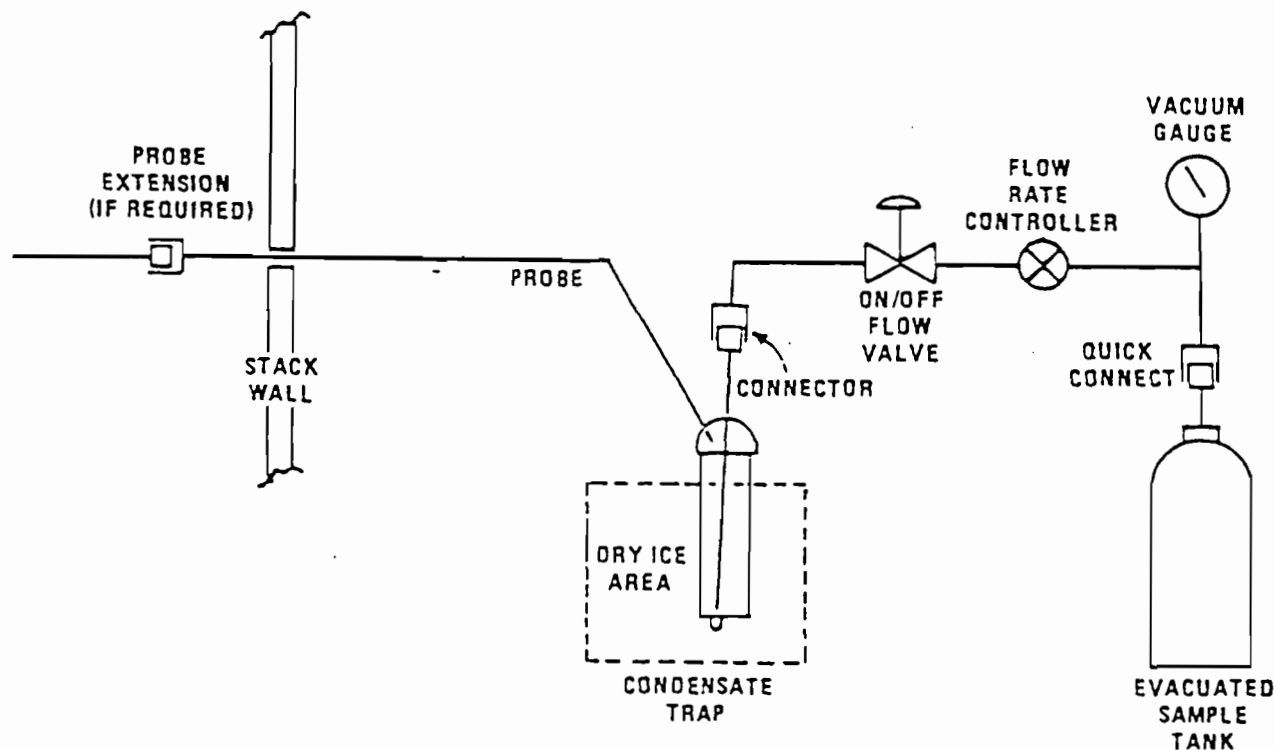


Figure 1. Sampling apparatus.

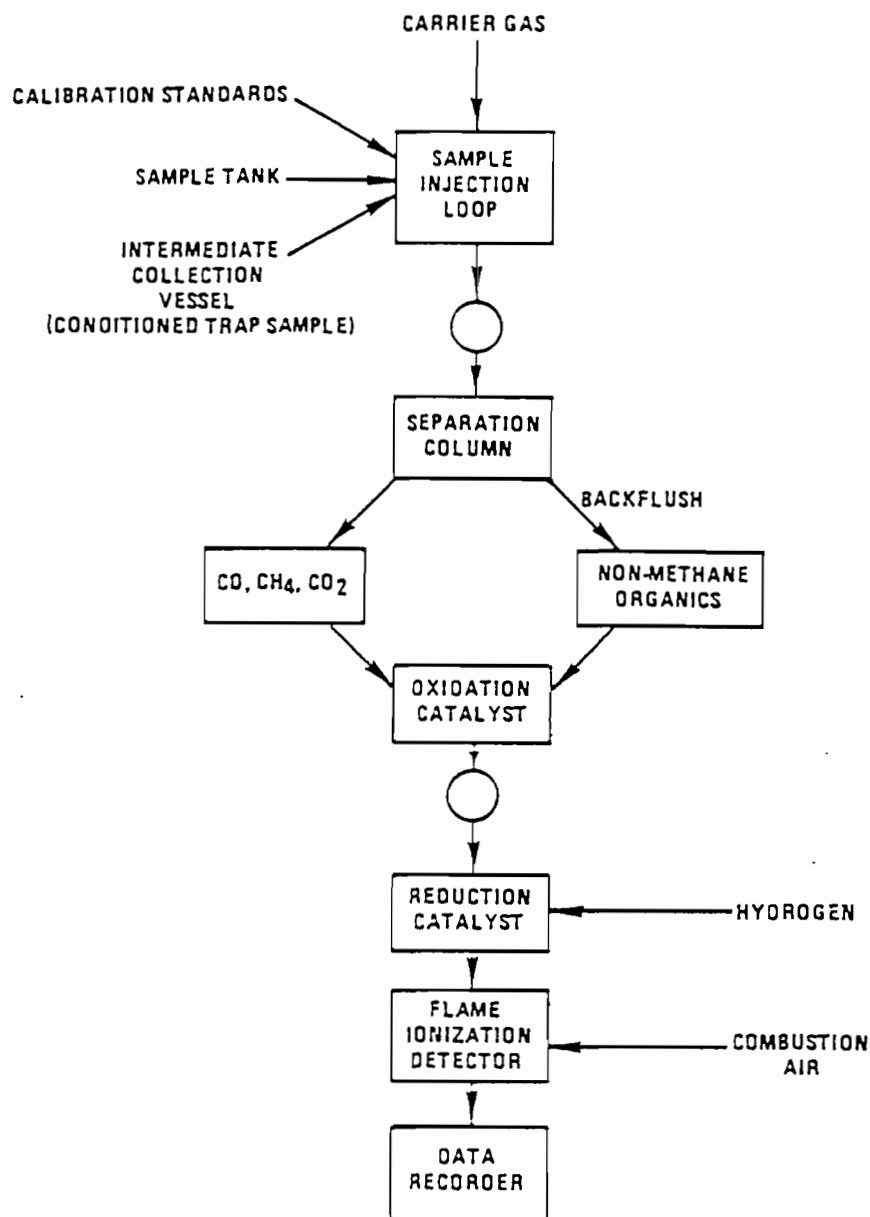


Figure 2. Simplified schematic of non-methane organic (NMO) analyzer.

Table 1      Emission Summary  
 Number 8 Boiler--Residue Firing  
 Sugar Cane Growers Cooperative of Florida  
 January 6, 1989

| Run<br>Number | Time      | RTL Analyses |        | CAE Analyses |       | Volumetric Flow<br>SCFMD | Heat Input<br>10 <sup>6</sup> BTU |
|---------------|-----------|--------------|--------|--------------|-------|--------------------------|-----------------------------------|
|               |           | ppm C        | lb/Hr* | ppm C        | lb/Hr |                          |                                   |
| 1             | 0925-1025 | 180          | 35.76  | 259          | 51.45 | 106321                   | 425.2                             |
| 2             | 1155-1255 | 194          | 36.15  | 68           | 12.67 | 99744                    | 431.0                             |
| 3             | 1415-1515 | 601          | 111.43 | 116          | 21.51 | 99234                    | 427.5                             |
| Average       | -----     | 325          | 61.11  | 148          | 28.54 | 101770                   | 427.9                             |

\* lb/Hr = (2.595 x 10<sup>-6</sup>) (12) (ppm C) (SCFMD) (60)

### 3.0 SAMPLING POINT LOCATION

The outlet stack has four test ports located at 90° intervals around the stack circumference. ACE utilized one of these ports for EPA Method 25 testing.

#### 4.0 FIELD AND ANALYTICAL PROCEDURES--EPA METHOD 25

Non-methane volatile organic compounds (VOC) are determined through use of gas chromatography with flame ionization detection (FID) after sample collection in which heavy and light volatile compounds are separated.

Samples are taken (usually in duplicate) by withdrawing a constant rate of stack gases (50-100 milliliters per minute) over a nominal one hour test period for each of three replicates. Heavy volatiles are removed in a stainless steel trap (Figure 1) which has been submerged in dry ice (carbon dioxide) while lighter volatiles and other dry stack gases are allowed to pass through a rotameter into a four liter evacuated sample tank. Both fractions are subsequently analyzed by first separating CO, CO<sub>2</sub>, and CH<sub>4</sub>; oxidation of remaining compounds to CO<sub>2</sub>; reduction to CH<sub>4</sub>; and finally measurement of response on an FID calibrated with methane. Test results are then reported as ppm carbon and as total carbon based on the total volume of sample. A schematic of the sampling and analytical system are provided in Figures 1 and 2.

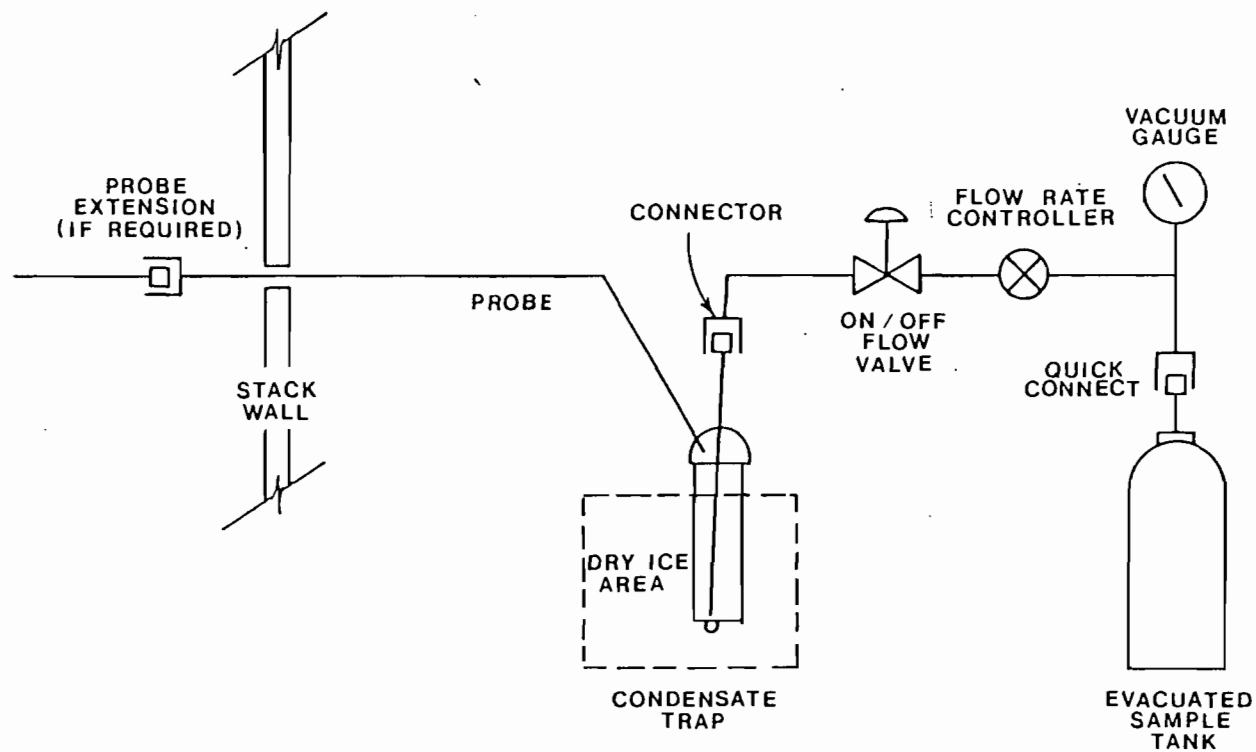


FIGURE I  
EPA METHOD 25  
SAMPLING SYSTEM

AIR CONSULTING  
and  
ENGINEERING



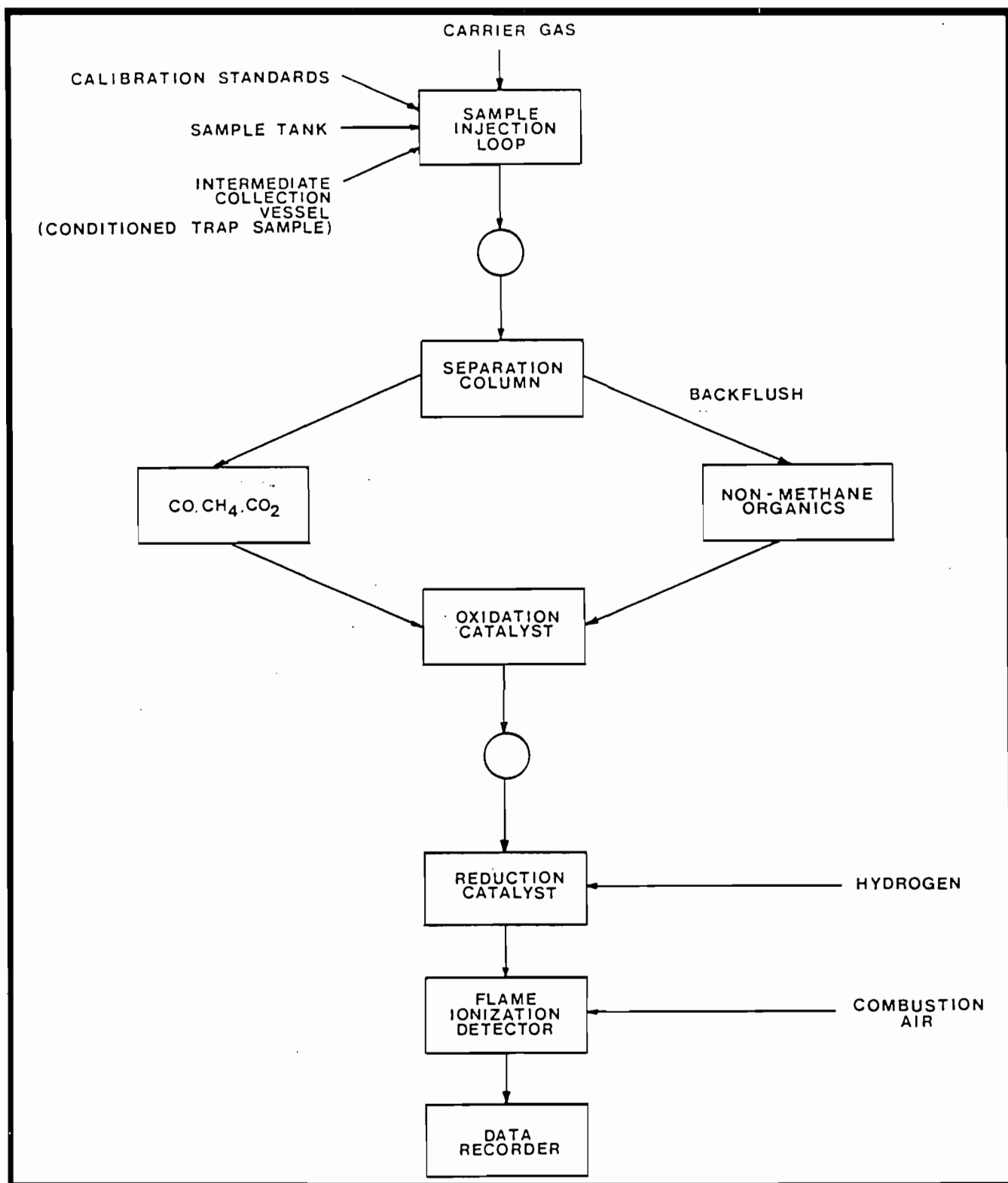


FIGURE 2  
EPA METHOD 25  
ANALYTICAL SYSTEM

AIR CONSULTING  
and  
ENGINEERING

APPENDIX B  
LABORATORY ANALYSES

RTL

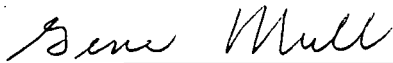
RESEARCH TRIANGLE  
LABORATORIES, INC.  
RESEARCH TRIANGLE PARK, N.C.

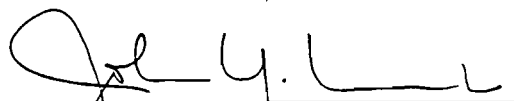
prepared for

AIR CONSULTING AND ENGINEERING

prepared by

RESEARCH TRIANGLE LABORATORIES, INC.

  
\_\_\_\_\_  
Gene Mull  
Chemist

  
\_\_\_\_\_  
John Y. Morimoto, Ph.D.  
Chemist

RTL ID #89-126  
February 1, 1989

# Research Triangle Laboratories, Inc.

February 1, 1989

Mr. Steve Neck  
Air Consulting & Engineering  
Suite 4  
2106 N.W. 67th Place  
Gainesville, FL 32607

Dear Mr. Neck:

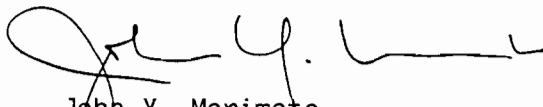
We enclose the report for the Method 25 samples analyzed January 30th. The report consists of a summary table of results, an experimental procedure, a sample calculation, a calibration data sheet, and a set of data reports.

Please note that for the analysis of Sample #4 (RTL-3), there appeared to be an ice plug in the trap, which necessitated the heating of the trap during the CO<sub>2</sub> flush.

Let us know if you have any problems. Thank you for choosing us for your Method 25 analyses.

Sincerely,

RESEARCH TRIANGLE LABORATORIES, INC.



John Y. Morimoto  
Chemist

JYM

Enclosures

## RESEARCH TRIANGLE LABORATORIES

## METHOD 25 TABLE OF RESULTS

Name: Air Consulting and Engineering

ID #89-102-126

Date: 01/30/89

| Sample<br>Number | Sample<br>Description | Concentrations (ppmC) |        |                      |                   |       | Mass Conc.<br>(mgC/cu.m) |
|------------------|-----------------------|-----------------------|--------|----------------------|-------------------|-------|--------------------------|
|                  |                       | CO+CH4                | CO2    | Noncon-<br>densibles | Conden-<br>sibles | TGNMO |                          |
| 1                | RTL-B                 | 3                     | 13511  | 27                   | 20                | 48    | 24                       |
| 2                | RTL-1                 | 233                   | 109243 | 130                  | 50                | 180   | 90                       |
| 3                | RTL-2                 | 94                    | 113311 | 32                   | 163               | 194   | 97                       |
| 4                | RTL-3                 | 630                   | 181070 | 195                  | 406               | 601   | 299                      |

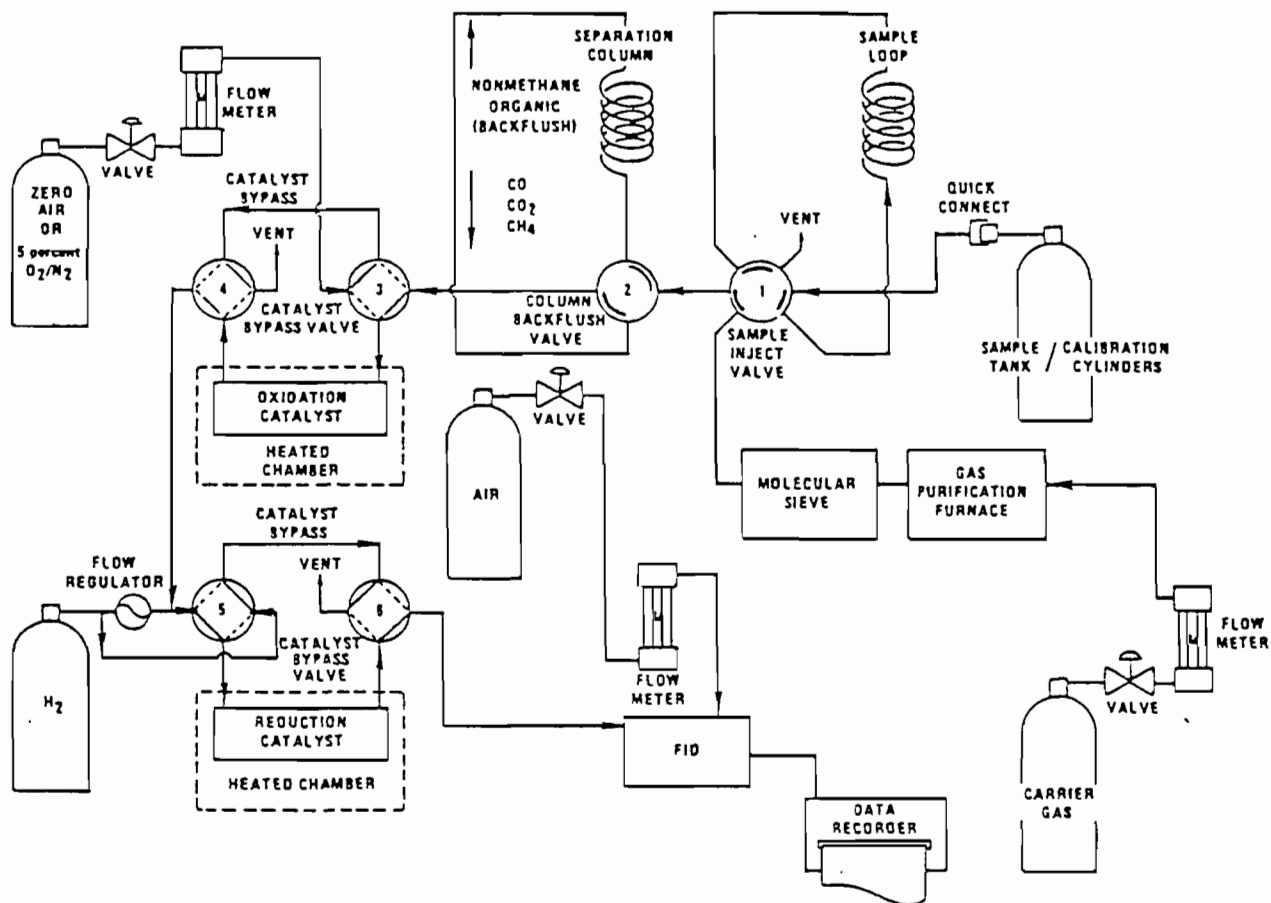


Figure 3. Nonmethane organic (NMO) analyzer.

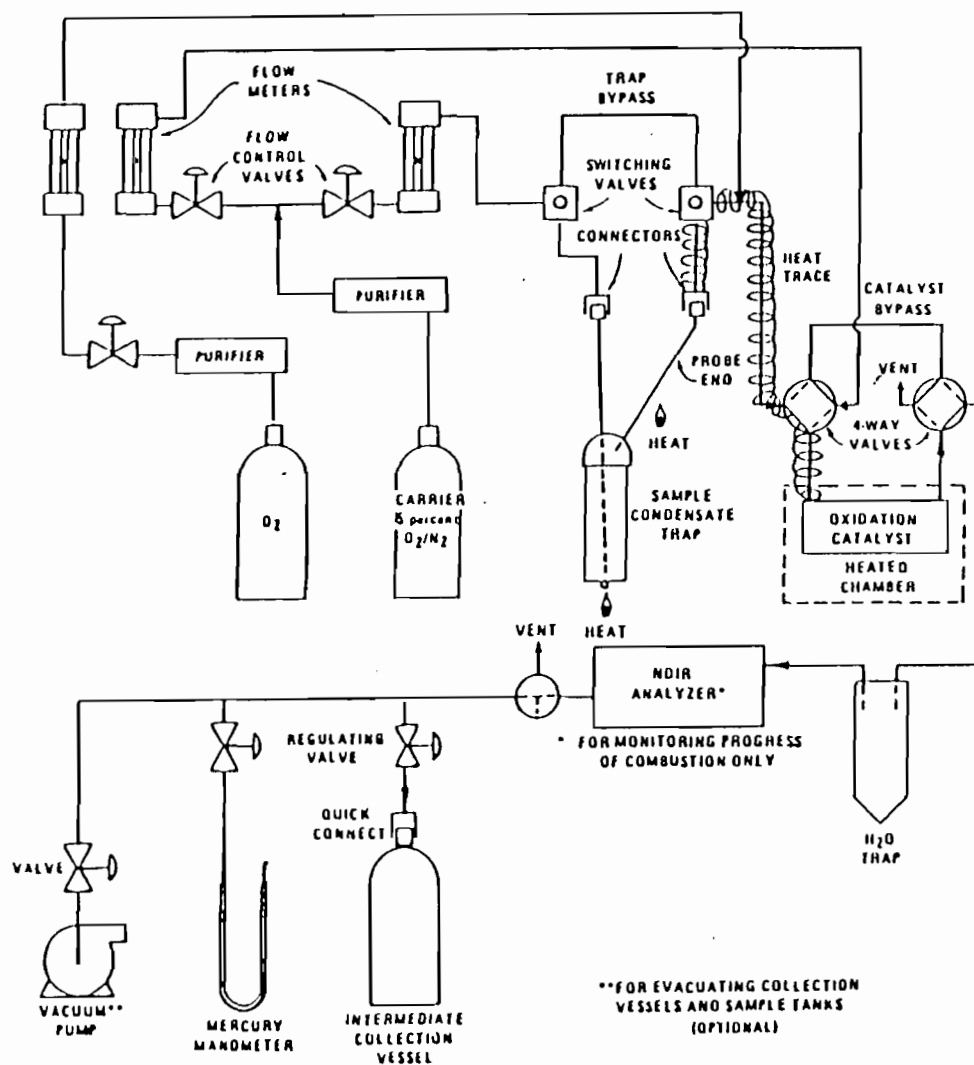
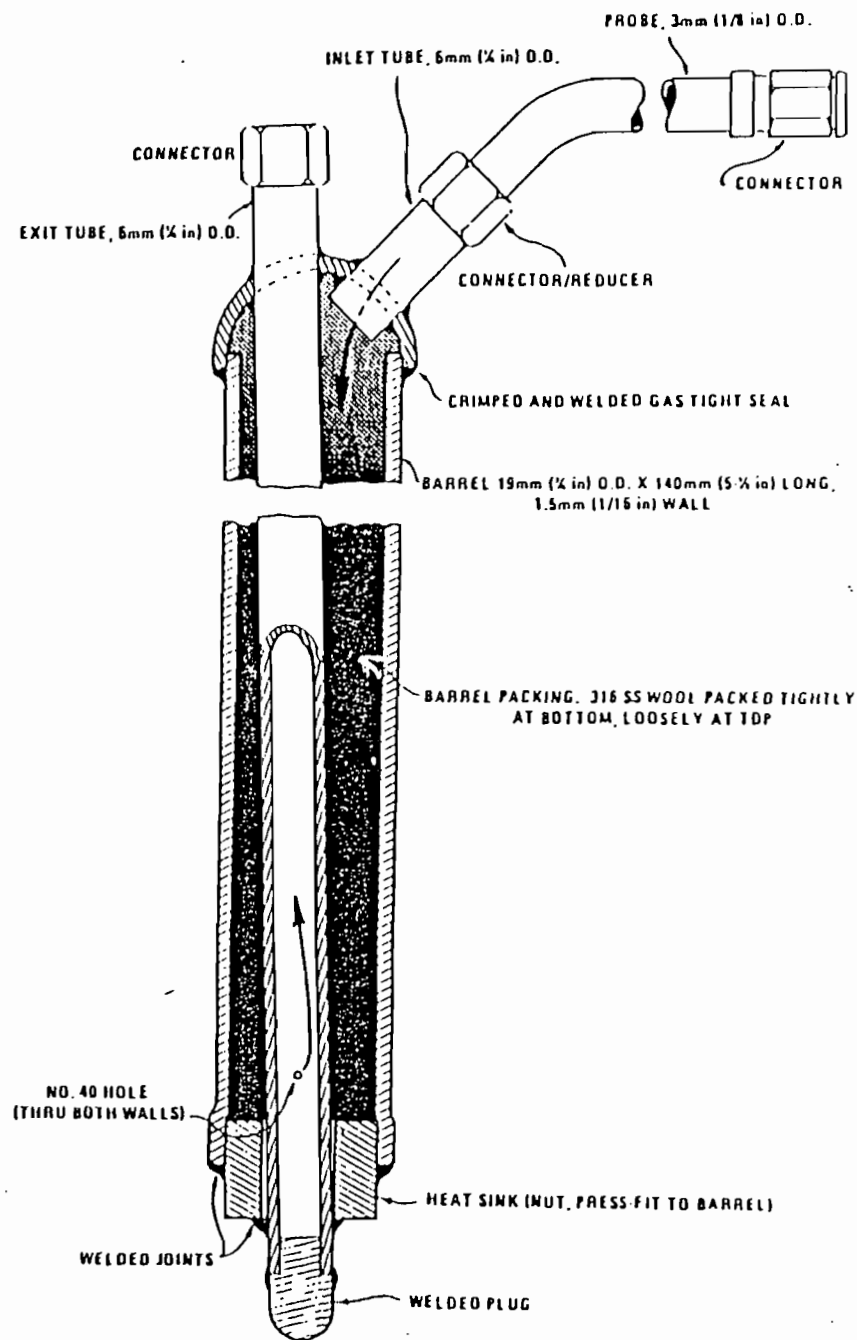


Figure 4. Condensate recovery and conditioning apparatus.



MATERIAL: TYPE 316 STAINLESS STEEL

Figure 5. Condensate trap<sup>2</sup>.





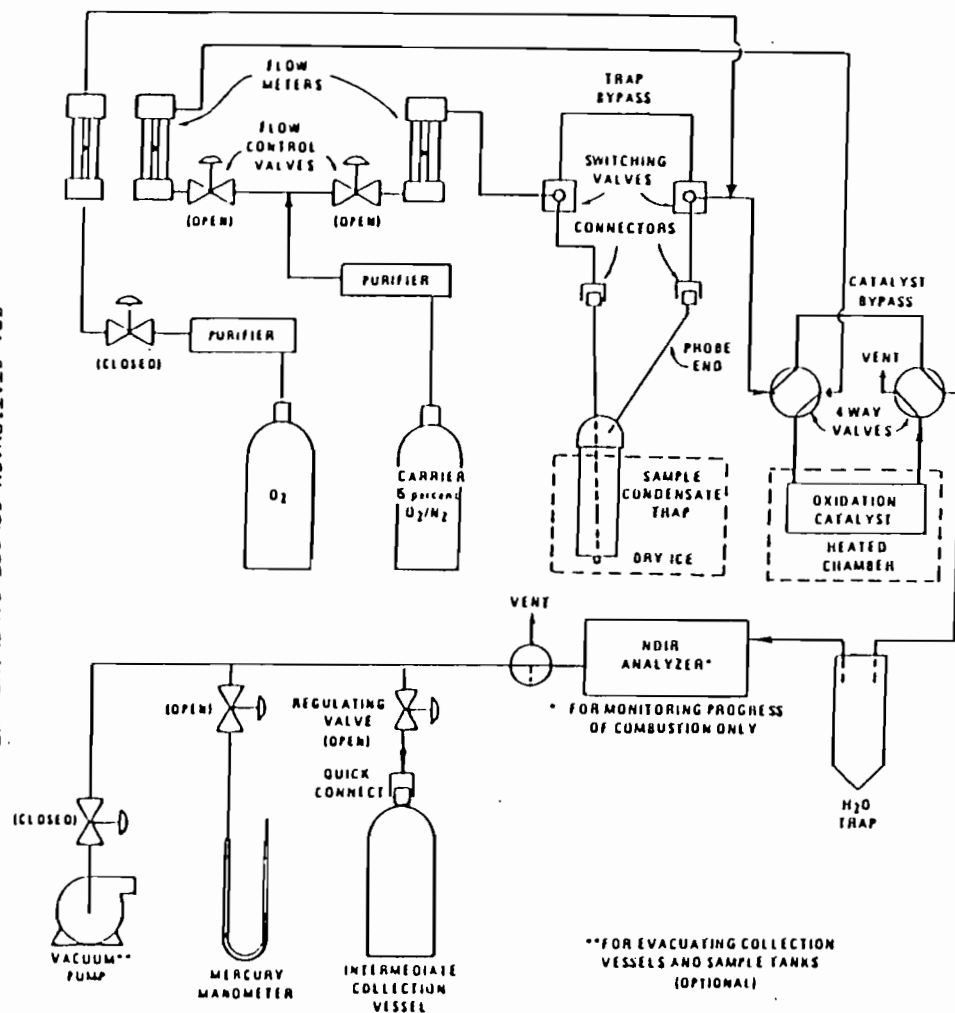


Figure 8. Condensate recovery and conditioning apparatus, carbon dioxide purge.

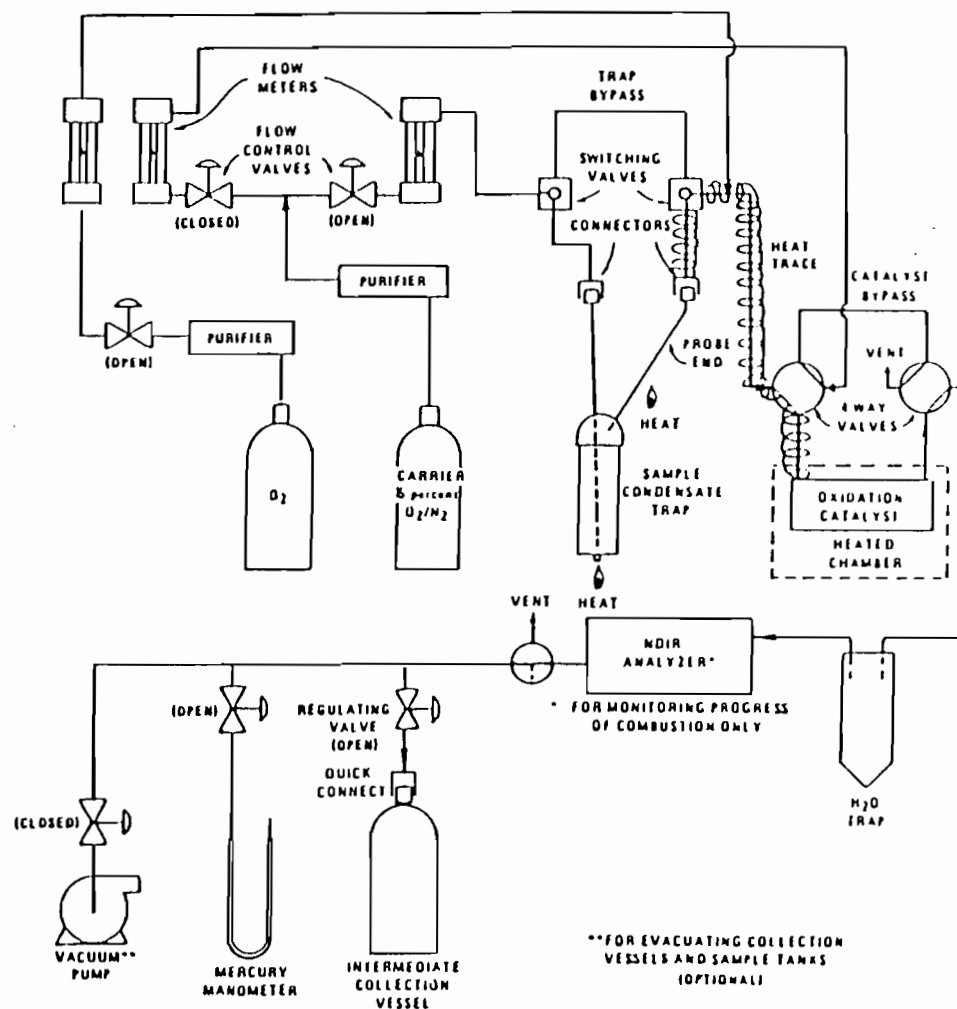


Figure 9. Condensate recovery and conditioning apparatus, collection of trap organics.

DOES NOT REPLACE EXISTING RULES AND REGULATIONS  
UNTIL PROMULGATED.

It is proposed that 40 CFR Part 60 be amended by revising Method 25 of Appendix A as follows:

1. The authority citation for Part 60 continues to read as follows:

Authority: Sec. 101, 111, 114, 116, and 301 of the Clean Air Act, as amended (42 U.S.C. 7401, 7411, 7414, 7416, 7601).

2. By revising Method 25 of Appendix A to read as follows:

#### Appendix A—Reference Method

• • • • •

#### Method 25—Determination of Total Gaseous Nonmethane Organic Emissions as Carbon

##### 1. Applicability and Principle

**1.1 Applicability.** This method applies to the measurement of volatile organic compounds (VOC) as total gaseous nonmethane organics (TCNMO) as carbon in source emissions. Organic particulate matter will interfere with the analysis and, therefore, a particulate filter is required.

When carbon dioxide (CO<sub>2</sub>) and water vapor are present together in the stack, they can produce a positive bias in the sample. The magnitude of the bias depends on the concentrations of (CO<sub>2</sub>) and water vapor. As a guideline, multiply the (CO<sub>2</sub>) concentration, expressed as volume percent, by the water vapor concentration. If this product does not exceed 100, the bias can be considered insignificant. For example, the bias is not

significant for a source having 10 percent (CO<sub>2</sub>) and 10 percent water vapor, but it might be significant for a source having 10 percent (CO<sub>2</sub>) and 20 percent water vapor.

This method is not the only method that applies to the measurement of TCNMO. Costs, logistics, and other practicalities of source testing may make other test methods more desirable for measuring VOC contents of certain effluent streams. Proper judgment is required in determining the most applicable VOC test method. For example, depending upon the molecular weight of the organics in the effluent stream, a totally automated semicontinuous nonmethane organics (NMO) analyzer interfaced directly to the source may yield accurate results. This approach has the advantage of providing emission data semicontinuously over an extended time period.

Direct measurement of an effluent with a flame ionization detector (FID) analyzer may be appropriate with prior characterization of the gas stream and knowledge that the detector responds predictably to the organic compounds in the stream. If present, methane (CH<sub>4</sub>) will, of course, also be measured. The FID can be applied to the determination of the mass concentration of the total molecular structure of the organic emissions under any of the following limited conditions: (1) Where only one compound is known to exist; (2) when the organic compounds consist of only hydrogen and carbon; (3) where the relative percentages of the compounds are known or can be determined, and the FID responses to the compounds are known; (4) where a consistent mixture of the compounds exists before and after emission control and only the relative concentrations are to be assessed; or (5) where the FID can be calibrated against mass standards of the compounds emitted (solvent emissions, for example).

Another example of the use of a direct FID is as a screening method. If there is enough information available to provide a rough estimate of the analyzer accuracy, the FID analyzer can be used to determine the VOC content of an uncharacterized gas stream. With a sufficient buffer to account for possible inaccuracies, the direct FID can be a useful tool to obtain the desired results without costly exact determination.

In situations where a qualitative/quantitative analysis of an effluent stream is desired or required, a gas chromatographic FID system may apply. However, for sources emitting numerous organics, the time and expense of this approach will be formidable.

**1.2 Principle.** An emission sample is withdrawn from the stack at a constant rate through a heated filter and a chilled condensate trap by means of an evacuated sample tank. After sampling is completed, the TCNMO are determined by independently analyzing the condensate trap and sample tank fractions and combining the analytical results. The organic content of the

condensate trap fraction is determined by oxidizing the NMO to CO<sub>2</sub> and quantitatively collecting the effluent in an evacuated vessel, then a portion of the CO<sub>2</sub> is reduced to CH<sub>4</sub> and measured by an FID. The organic content of the sample tank fraction is measured by

injecting a portion of the sample into a gas chromatographic column to separate the NMO from carbon monoxide (CO), CO<sub>2</sub>, and CH<sub>4</sub>; the NMO are oxidized to CO<sub>2</sub>, reduced to CH<sub>4</sub>, and measured by an FID. In this manner, the variable response of the FID associated with different types of organics is eliminated.

## 2. Apparatus

**2.1 Sampling.** The sampling system consists of a heated probe, heated filter,

condensate trap, flow control system, and sample tank (Figure 25-1). The TGNMO sampling equipment can be constructed from commercially available components and components fabricated in a machine shop. The following equipment is required:

**2.1.1 Heated Probe.** 8.4-mm (1/4-in.) Outside diameter (OD) stainless steel tubing with a heating system capable of maintaining a gas temperature at the exit end of at least 129°C (265°F). The probe shall be equipped

with a thermocouple at the exit end to monitor the gas temperature.

A suitable probe is shown in Figure 25-1. The nozzle is an elbow fitting attached to the front end of the probe while the thermocouple is inserted in the side arm of a tee fitting attached to the rear of the probe. The probe is wrapped with a suitable length of high temperature heating tape, and then covered with two layers of glass cloth insulation and one layer of aluminum foil.

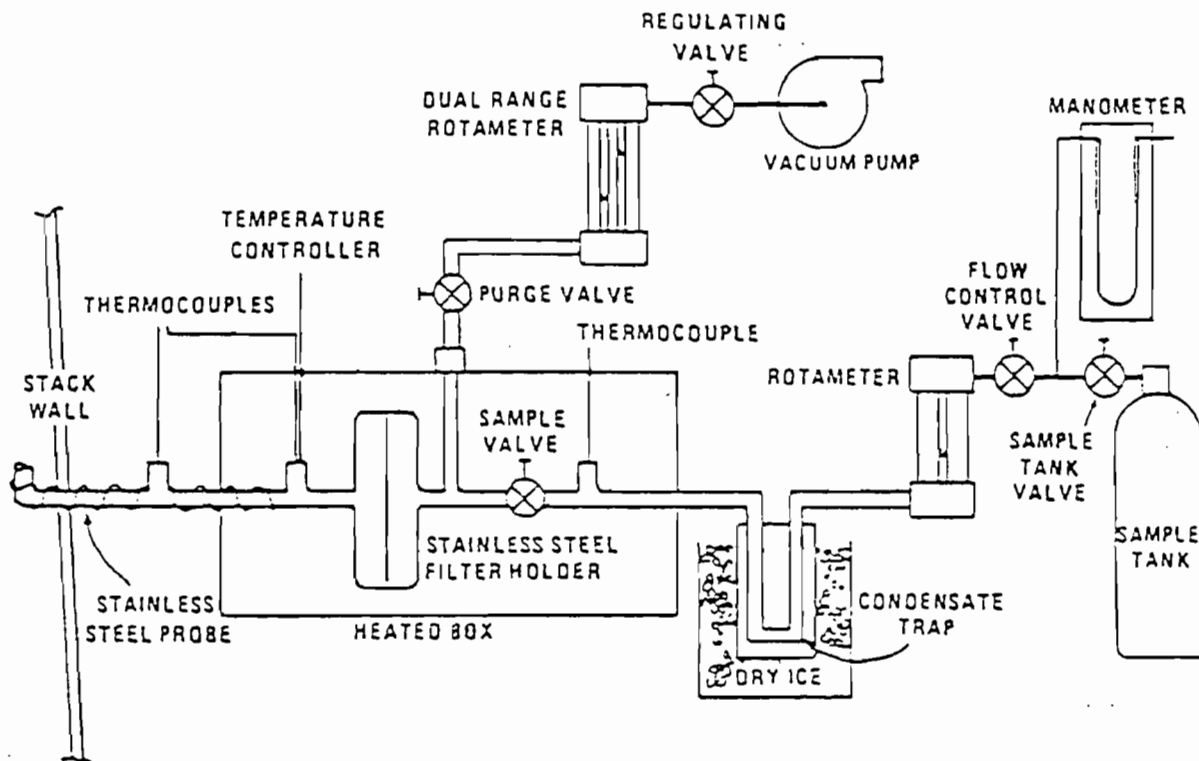


Figure 25-1. Sampling train.

**Note.**—If it is not possible to use a heating system for safety reasons, an unheated system with an in-stack filter may be a suitable alternative.

**2.1.2 Filter Holder.** 25-mm (15/16-in.) Inside diameter (ID) Gelman filter holder with 303 stainless steel body and 316 stainless steel support screen with the Viton O-ring replaced by a Teflon O-ring.

**Note.**—Mention of trade names or specific

products does not constitute endorsement by the Environmental Protection Agency.

**2.1.3 Filter Heating System.** A metal box consisting of an inner and an outer shell separated by insulating material with a heating element in the inner shell capable of maintaining a gas temperature at the filter of 121±3°C (250±5°F).

A suitable heating box is shown in Figure 25-2. The outer shell is a metal box that measures 102 mm x 280 mm x 292 mm (4 in. x

11 in. x 11 1/4 in.), while the inner shell is a metal box measuring 78 mm x 229 mm x 241 mm (3 in. x 9 in. x 9 1/4 in.). The inner box is supported by 13-mm (1/2-in.) phenolic rods. The void space between the boxes is filled with fibertrax insulation which is sealed in place by means of a silicon rubber bead around the upper sides of the box. A removable lid made in a similar manner, with a 25-mm (1-in.) gap between the parts, is used to cover the heating chamber.

ILLUSTRATION CODE 25-10-14

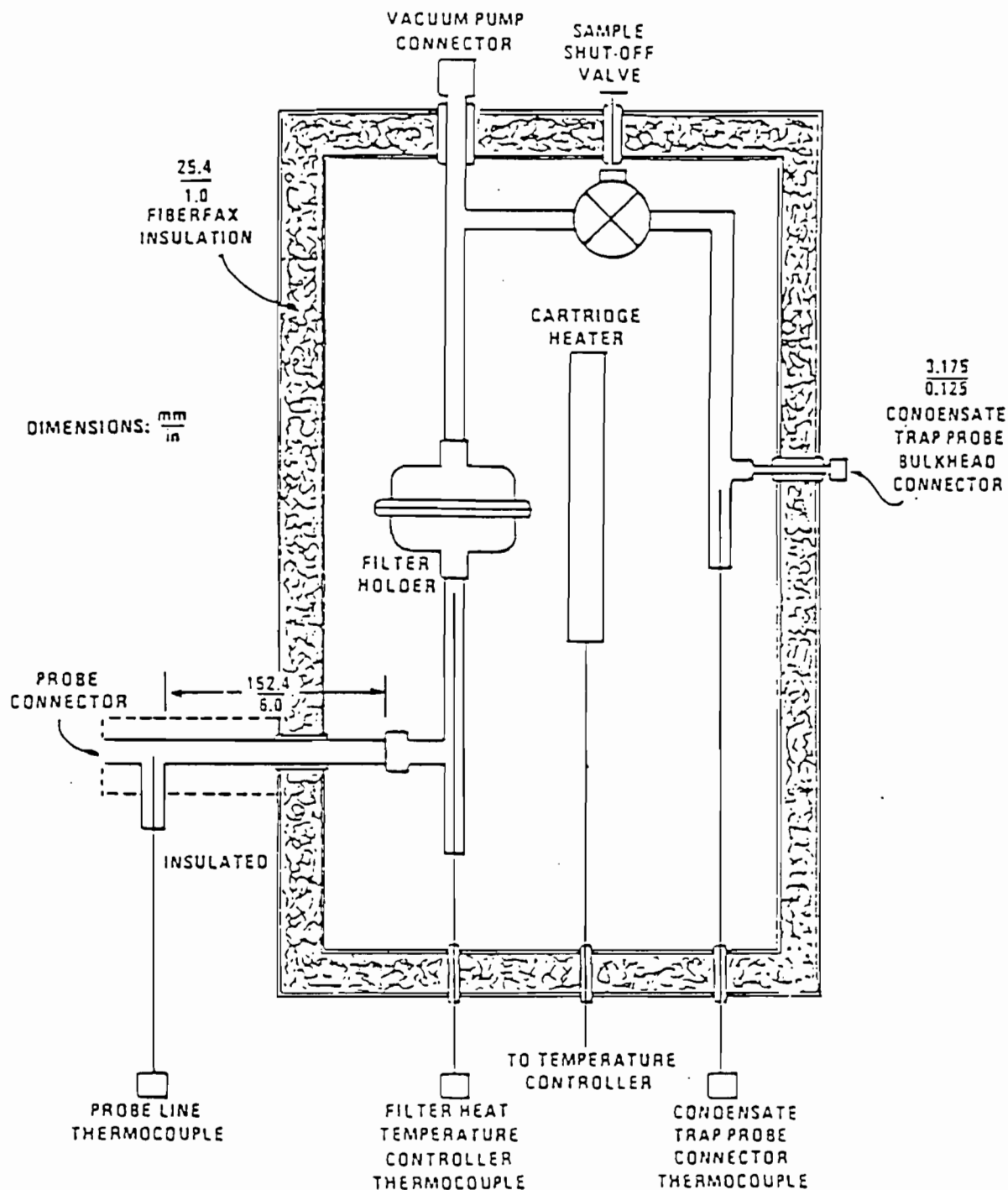


Figure 25-2. Out-of-stack filter box.

The inner box is heated with a 250-watt cartridge heater, shielded by a stainless steel shroud. The heater is regulated by a thermostatic temperature controller which is set to maintain a temperature of 121°C as measured by a thermocouple in the gas line just before the filter. An additional thermocouple is used to monitor the temperature of the gas behind the filter.

Note.—If it is not possible to use a heating for safety reasons, an unheated system with an in-stack filter may be a suitable alternative.

2.1.4 *Condensate Trap.* 9.5-mm (3/8-in.) OD 316 stainless steel tubing bent into a U-shape. Exact dimensions are shown in figure 25-3. The tubing shall be packed with coarse quartz wool, to a density of approximately 0.11 g/cc before bending. While the

condensate trap is packed with dry ice in the Dewar, an ice bridge may form between the arms of the condensate trap making it difficult to remove the condensate trap. This problem can be prevented by attaching a steel plate between the arms of the condensate trap in the same plane as the arms to completely fill the intervening space.

BILLING CODE 6840-50-M

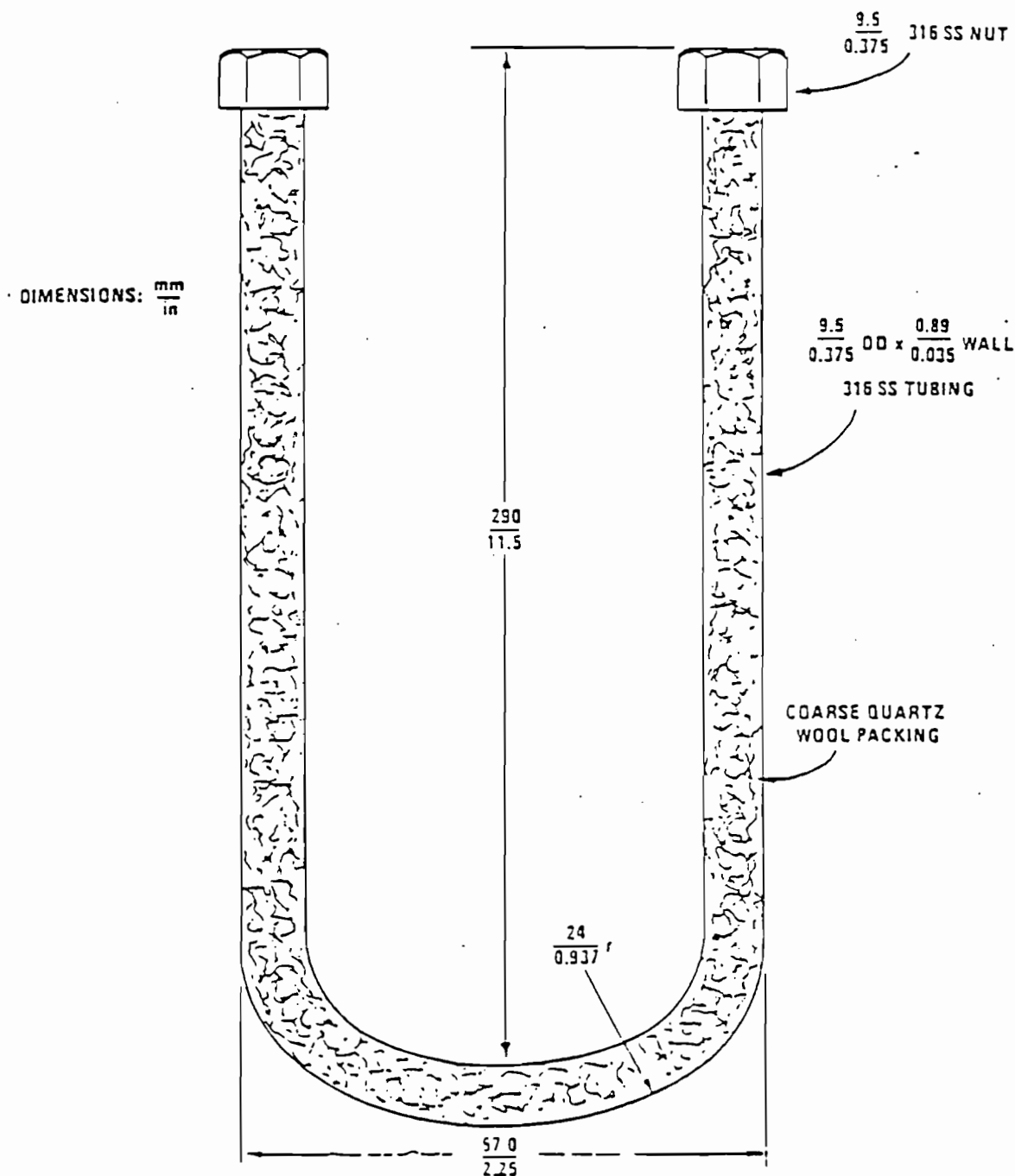


Figure 25-3. Condensate trap.

2.1.5 Valve. Stainless steel control valve for starting and stopping sample flow.

2.1.8 Metering Valve. Stainless steel valve for regulating the sample flow rate through the sample train.

2.1.7 Rotameter. Glass tube with stainless steel fittings, capable of measuring sample flow in the range of 80 to 100 cc/min.

2.1.8 Sample Tank. Stainless steel or aluminum tank with a minimum volume of 4 liters.

2.1.9 Mercury Manometer or Absolute Pressure Gauge. Capable of measuring pressure to within 1 mm Hg in the range of 0 to 900 mm.

2.1.10 Vacuum Pump. Capable of evacuating to an absolute pressure of 10 mm Hg.

2.2 Condensate Recovery Apparatus. The system for the recovery of the organics captured in the condensate trap consists of a heat source, oxidation catalyst, nondispersive infrared (NDIR) analyzer and an intermediate collection vessel (ICV). Figure 25-4 is a schematic of a typical system. The system shall be capable of proper oxidation and recovery, as specified in Section 5.1. The following major components are required:

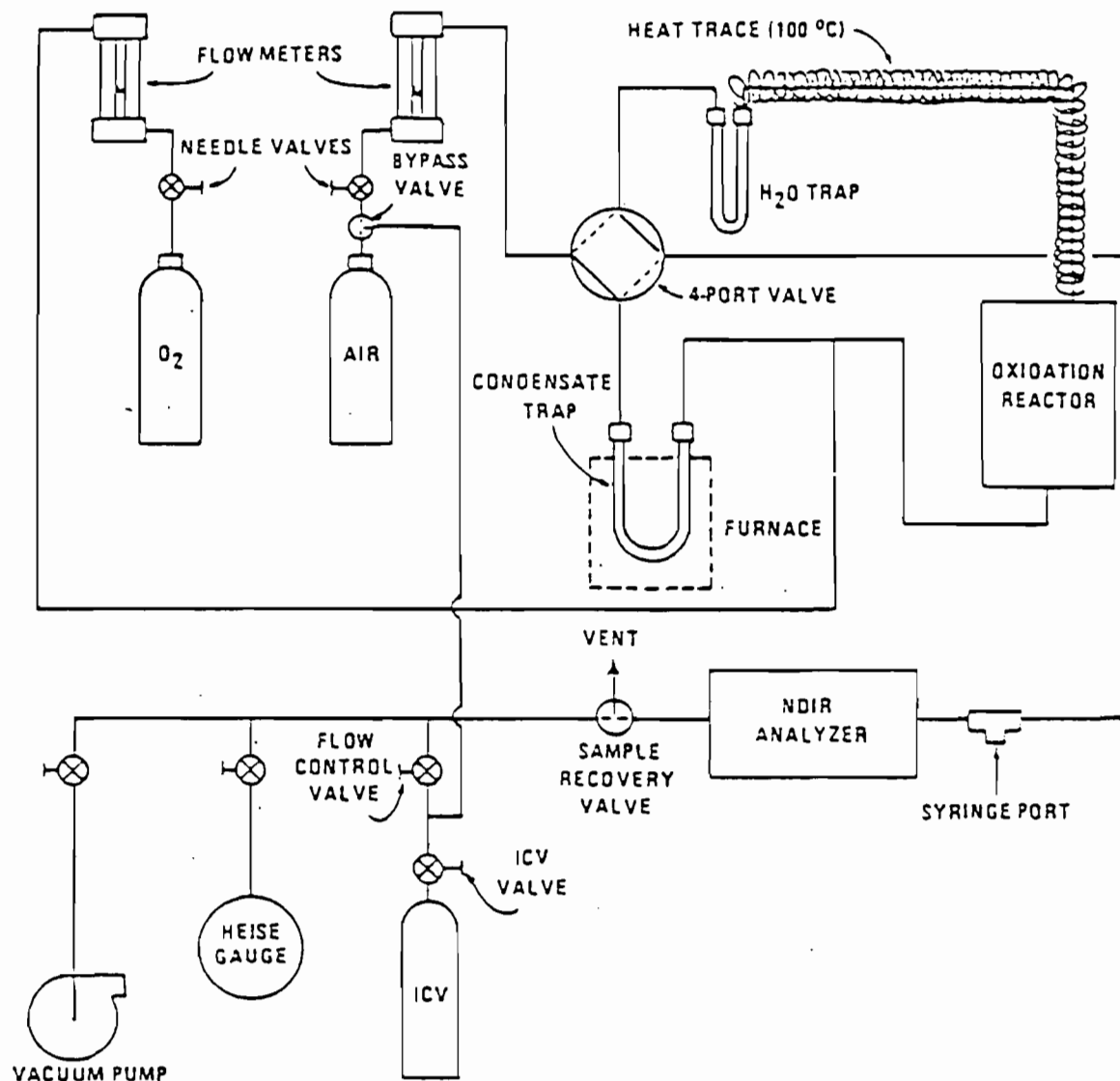


Figure 25-4. Condensate recovery system.

2.2.1 Heat Source. Sufficient to heat the condensate trap (including connecting tubing) to a temperature of 200 °C. A system using both a heat gun and an electric tube furnace is recommended.

2.2.2 Heat Tape. Sufficient to heat the connecting tubing between the water trap

and the oxidation catalyst to 100 °C.

2.2.3 Oxidation Catalyst. A suitable length of 9.5 mm (3/8-in.) OD Inconel 800 tubing packed with 15 cm (6 in.) of 3.2 mm (1/8 in.) diameter 19 percent chromia on alumina pellets. The catalyst material is packed in the

center of the catalyst tube with quartz wool packed on either end to hold it in place. The catalyst tube shall be mounted vertically in a 650 °C tube furnace.

2.2.4 Water Trap. Leak proof, capable of removing moisture from the gas stream.

2.2.5 *Syringe Port.* A 8.4-mm (1/4-in.) OD stainless steel tee fitting with a rubber septum placed in the side arm.

2.2.6 *NDIR Detector.* Capable of indicating  $\text{CO}_2$  concentration in the range of zero to 5 percent, to monitor the progress of combustion of the organic compounds from the condensate trap.

2.2.7 *Flow-Control Valve.* Stainless steel, to maintain the trap conditioning system near atmospheric pressure.

2.2.8 *Intermediate Collection Vessel.* Stainless steel or aluminum, equipped with a

female quick connect. Tanks with nominal volumes of at least 8 liters are recommended.

2.2.9 *Mercury Manometer or Absolute Pressure Gauge.* Capable of measuring pressure to within 1 mm Hg in the range of 0 to 900 mm.

2.2.10 *Syringe.* 10-ml gas-tight glass syringe equipped with an appropriate needle.

2.3 *NMO Analyzer.* The NMO analyzer is a gas chromatograph (GC) with backflush capability for NMO analysis and is equipped with an oxidation catalyst, reduction catalyst, and FID. Figures 25-5 and 25-6 are

schematics of a typical NMO analyzer. This semicontinuous GC/FID analyzer shall be capable of: (1) Separating  $\text{CO}$ ,  $\text{CO}_2$ , and  $\text{CH}_4$  from NMO, (2) reducing the  $\text{CO}_2$  to  $\text{CH}_4$  and quantifying as  $\text{CH}_4$ , and (3) oxidizing the NMO to  $\text{CO}_2$ , reducing the  $\text{CO}_2$  to  $\text{CH}_4$  and quantifying as  $\text{CH}_4$ , according to Section 5.2. The analyzer consists of the following major components:

SELLING CODE 6560-60-M

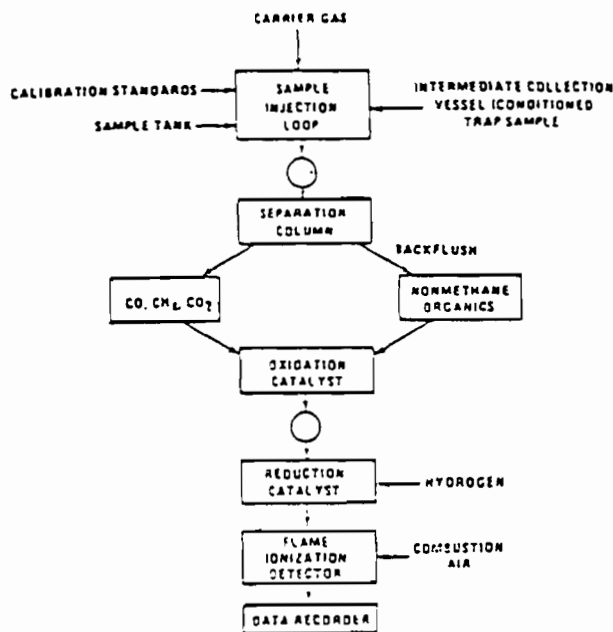


Figure 25-5. Simplified schematic of nonmethane organic (NMO) analyzer.

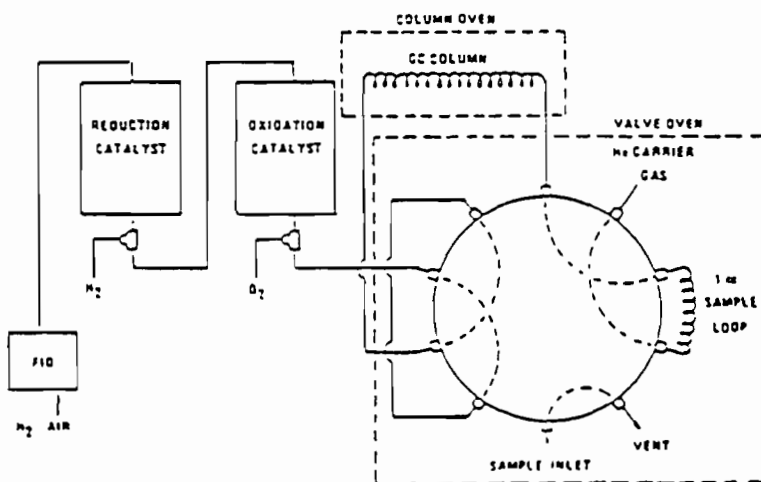


Figure 25-6. Nonmethane organic analyzer (NMO).



**2.3.1 Oxidation Catalyst.** A suitable length of 9.5-mm ( $\frac{3}{8}$ -in.) OD Inconel 800 tubing packed with 5.1 cm (2 in.) of 19 percent chromia on 3.2-mm ( $\frac{1}{8}$ -in.) alumina pellets. The catalyst material is packed in the center of the tube supported on either side by quartz wool. The catalyst tube must be mounted vertically in a 850 °C furnace.

**2.3.2 Reduction Catalyst.** A 7.6-cm (3-in.) length of 6.4-mm ( $\frac{1}{4}$ -in.) OD Inconel tubing fully packed with 100-mesh pure nickel powder. The catalyst tube must be mounted vertically in a 400 °C furnace.

**2.3.3 Separation Column(s).** A 30-cm (1-ft) length of 3.2-mm ( $\frac{1}{8}$ -in.) OD stainless steel tubing packed with 60/80 mesh Unibeads 1S followed by a 81-cm (2-ft) length of 3.2-mm ( $\frac{1}{8}$ -in.) OD stainless steel tubing packed with 60/80 mesh Carbosieve G. The Carbosieve

and Unibeads columns must be baked separately at 200 °C with carrier gas flowing through them for 24 hours before initial use.

**2.3.4 Sample Injection System.** A 10-port GC sample injection valve fitted with a sample loop properly sized to interface with the NMO analyzer (1-cc loop recommended).

**2.3.5 FID.** An FID meeting the following specifications is required:

**2.3.5.1 Linearity.** A linear response ( $\pm 5$  percent) over the operating range as demonstrated by the procedures established in section 5.2.1.

**2.3.5.2 Range.** A full scale range of 10 to 50,000 ppm  $\text{CH}_4$ . Signal attenuators shall be available to produce a minimum signal response of 10 percent of full scale.

**2.3.6 Data Recording System.** Analog strip chart recorder or digital integration system

compatible with the FID for permanently recording the analytical results.

**2.4 Other Analysis Apparatus.**

**2.4.1 Barometer.** Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 1 mm Hg.

**2.4.2 Thermometer.** Capable of measuring the laboratory temperature within 1 °C.

**2.4.3 Vacuum Pump.** Capable of evacuating to an absolute pressure of 10 mm Hg.

**2.4.4 Syringes.** 10- $\mu\text{l}$  and 50- $\mu\text{l}$  liquid injection syringes.

**2.4.5 Liquid Sample Injection Unit.** 316 SS U-tube fitted with an injection septum, see Figures 25-7.

BILLING CODE 6540-50-M

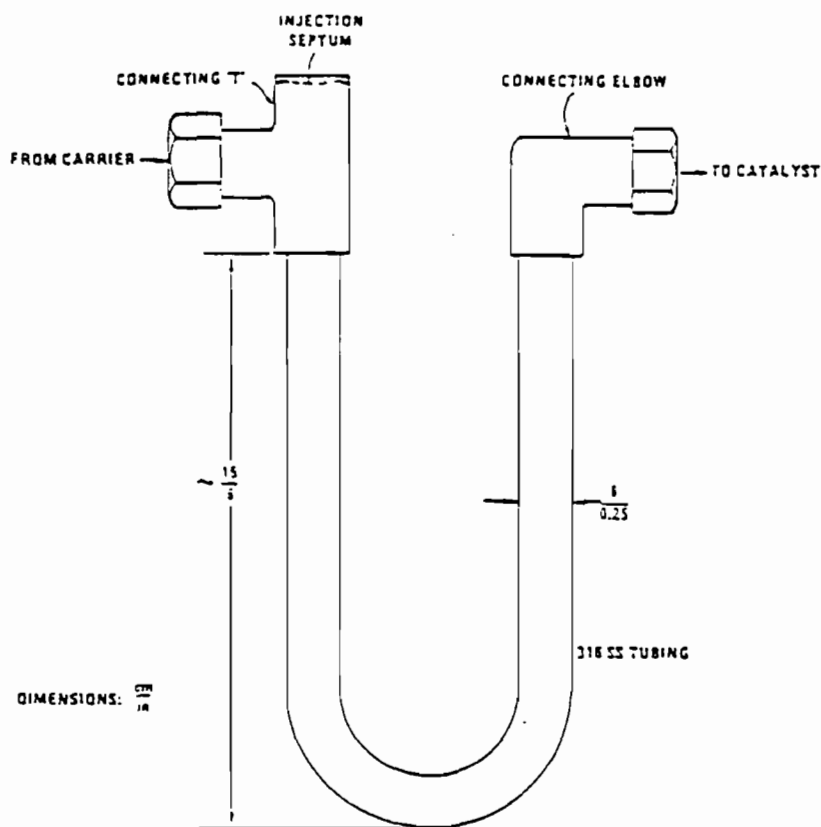


Figure 25-7. Liquid sample injection unit.

### 3. Reagents

3.1 *Sampling.* The following are required for sampling:

3.1.1 *Crushed Dry Ice.*

3.1.2 *Coarse Quartz Wool.* 8 to 15  $\mu\text{m}$ .

3.2 *NMO Analysis.* The following gases are needed:

3.2.1 *Carrier Gases.* Zero grade helium (He) and oxygen ( $\text{O}_2$ ) containing less than 1 ppm  $\text{CO}$ , and less than 0.1 ppm C as hydrocarbon.

3.2.2 *Fuel Gas.* Zero grade hydrogen ( $\text{H}_2$ ), 99.999 percent pure.

3.2.3 *Combustion Gas.* Zero grade air or  $\text{O}_2$  as required by the detector.

3.3 *Condensate Analysis.* The following gases are needed:

3.3.1 *Carrier Gas.* Zero grade air, containing less than 1 ppm C.

3.3.2 *Auxiliary  $\text{O}_2$ .* Zero grade  $\text{O}_2$ , containing less than 1 ppm C.

3.3.3 *Hexane.* ACS grade, for liquid injection.

3.3.4 *Decane.* ACS grade, for liquid injection.

3.4 *Calibration.* For all calibration gases, the manufacturer must recommend a maximum shelf life for each cylinder (i.e., the length of time the gas concentration is not expected to change more than  $\pm 5$  percent from its certified value). The date of gas cylinder preparation, certified organic concentration, and recommended maximum shelf life must be affixed to each cylinder before shipment from the gas manufacturer to the buyer. The following calibration gases are required.

3.4.1 *Oxidation Catalyst Efficiency Check Calibration Gas.* Gas mixture standard with nominal concentration of 1 percent methane in air.

3.4.2 *FID Linearity and NMO Calibration Gases.* Three gas mixture standards with nominal propane concentrations of 20 ppm, 200 ppm, and 3000 ppm, in air.

3.4.3  *$\text{CO}_2$  Calibration Gases.* Three gas mixture standards with nominal  $\text{CO}_2$  concentrations of 50 ppm, 500 ppm, and 1 percent, in air.

Note.—Total NMO less than 1 ppm required for 1 percent mixture.

3.4.4 *NMO Analyzer System Check Calibration Gases.* Four calibration gases are needed as follows:

3.4.4.1 *Propane Mixture.* Gas mixture standard containing (nominal) 50 ppm  $\text{CO}$ , 50 ppm  $\text{CH}_4$ , 2 percent  $\text{CO}_2$ , and 20 ppm  $\text{C}_2\text{H}_6$ , prepared in air.

3.4.4.2 *Hexane.* Gas mixture standard containing (nominal) 50 ppm hexane in air.

3.4.4.3 *Toluene.* Gas mixture standard containing (nominal) 20 ppm toluene in air.

3.4.4.4 *Methanol.* Gas mixture standard containing (nominal) 100 ppm methanol in air.

#### 4. Procedure

##### 4.1 Sampling.

4.1.1 *Sample Tank Evacuation and Leak Check.* Evacuate the sample tank to 10 mm Hg absolute pressure or less. Then close the sample tank valve, and allow the tank to sit for 30 minutes. The tank is acceptable if a change in tank vacuum of less than 2 mm Hg is noted. The evacuation and leak check may be conducted either in the laboratory or the field.

4.1.2 *Sample Train Assembly.* Just before assembly, measure the tank vacuum using a mercury U-tube manometer. Record this vacuum, the ambient temperature, and the barometric pressure at this time. Close the sample tank valve and assemble the sampling system as shown in Figure 25-1. Immerse the condensate trap body in dry ice. The point where the inlet tube joins the trap body should be 2.5 to 5 cm above the top of the dry ice.

4.1.3 *Pretest Leak Check.* A pretest leak check is required. Calculate or measure the approximate volume of the sampling train from the probe tip to the sample tank valve. After assembling the sampling train, plug the probe tip, and make certain that the sample tank valve is closed. Turn on the vacuum pump, and evacuate the sampling system from the probe tip to the sample tank valve to an absolute pressure of 10 mm Hg or less. Close the purge valve, turn off the pump, wait a minimum period of 10 minutes, and recheck the indicated vacuum. Calculate the

maximum allowable pressure change based on a leak rate of 1 percent of the sampling rate using Equation 25-1, section d.2. If the measured pressure change exceeds the calculated limit, correct the problem and repeat the leak check before beginning sampling.

4.1.4 *Sample Train Operation.* Unplug the probe tip, and place the probe into the stack such that the probe is perpendicular to the duct or stack axis; locate the probe tip at a single preselected point of average velocity facing away from the direction of gas flow. For stacks having a negative static pressure, seal the sample port sufficiently to prevent air in-leakage around the probe. Set the probe temperature controller to 129°C (265°F) and the filter temperature controller to 121°C (250°F). Allow the probe and filter to heat for about 30 minutes before purging the sample train.

Close the sample valve, open the purge valve, and start the vacuum pump. Set the flow rate between 60 and 100 cc/min, and purge the train with stack gas for at least 10 minutes. When the temperatures at the exit ends of the probe and filter are within their specified range, sampling may begin.

Check the dry ice level around the condensate trap, and add dry ice if necessary. Record the clock time. To begin sampling, close the purge valve and stop the pump. Open the sample valve and the sample tank valve. Using the flow control valve, set the flow through the sample train to the proper rate. Adjust the flow rate as necessary to maintain a constant rate ( $\pm 10$  percent) throughout the duration of the sampling period. Record the sample tank vacuum and flowmeter setting at 5-minute intervals (see Figure 25-3). Select a total sample time greater than or equal to the minimum sampling time specified in the applicable subpart of the regulation; end the sampling when this time period is reached or when a constant flow rate can no longer be maintained because of reduced sample tank vacuum.

BILLING CODE 6560-60-M

|                   |  |                        |  |
|-------------------|--|------------------------|--|
| FACILITY _____    |  | SAMPLE LOCATION _____  |  |
| LOCATION _____    |  | OPERATOR _____         |  |
| DATE _____        |  | RUN NUMBER _____       |  |
| TANK NUMBER _____ |  | TRAP NUMBER _____      |  |
|                   |  | SAMPLE ID NUMBER _____ |  |

| TANK VACUUM,<br>mm Hg                     | BAROMETRIC<br>PRESSURE,<br>mm Hg | AMBIENT<br>TEMPERATURE,<br>°C |
|-------------------------------------------|----------------------------------|-------------------------------|
| PRETEST (MANOMETER) _____ (GAUGE) _____   | _____                            | _____                         |
| POST TEST (MANOMETER) _____ (GAUGE) _____ | _____                            | _____                         |

|                 |                |
|-----------------|----------------|
| LEAK RATE _____ | cm Hg / 10 min |
|-----------------|----------------|

|               |
|---------------|
| PRETEST _____ |
|---------------|

[illegible]

EPA STATIONARY SOURCE SAMPLING METHODS  
Page 25-20 2/87

## VOLATILE ORGANIC CARBON BY METHOD 25

Facility: SUGAR GROWER'S CO-OP Sample Location: UNIT 8  
Location: BELGARD, FL. Operator: CARTER  
Date: 1-27-89 Run number: BLANK  
Tank number: 6106 Trap number: PP Sample ID: \_\_\_\_\_

B-R 72

| PRESSURE<br>READINGS | TANK VACUUM        |                      | BAROMETRIC<br>PRESSURE,<br>mm Hg/in Hg | AMBIENT<br>TEMPERATURE,<br>C/F |
|----------------------|--------------------|----------------------|----------------------------------------|--------------------------------|
|                      | Manometer<br>mm Hg | Gauge<br>cm Hg/in Hg |                                        |                                |
| PRETEST              | 30.1               |                      | 30.3                                   | 58                             |
| POST TEST            | 3.25               |                      | 30.2                                   | 84                             |

| LEAK RATE | TANK<br>cm Hg/10 min | TRAP<br>Flowmeter reading (black ball) |
|-----------|----------------------|----------------------------------------|
| PRETEST   |                      |                                        |
| POST TEST |                      |                                        |

[illegible]

SAMPLING TRAIN ID#

SIDE: Left/Right  
voc25 - 6/11/87

%C02

 $\frac{1}{3}\text{H}_2\text{O}$

## VOLATILE ORGANIC CARBON BY METHOD 25

RTL

Facility: SCGC Sample Location: Boiler #8  
 Location: Belle Glade FL Operator: CARTER  
 Date: 1-27-89 Run number: 1  
 Tank number: 6186 Trap number: 0W Sample ID: CAE 12

RTL 1

| PRESSURE READINGS | TANK VACUUM     |                   | BAROMETRIC PRESSURE, mm Hg/in Hg | AMBIENT TEMPERATURE, C/F |
|-------------------|-----------------|-------------------|----------------------------------|--------------------------|
|                   | Manometer mm Hg | Gauge cm Hg/in Hg |                                  |                          |
| PRETEST           | 30.1            | 30                | 30.30                            | 58°F                     |
| POST TEST         | 7.2             | 6                 | 30.20                            | 75°F                     |

| LEAK RATE | TANK         | TRAP                           |
|-----------|--------------|--------------------------------|
|           | cm Hg/10 min | Flowmeter reading (black ball) |
| PRETEST   | 0.00         | 0.0                            |
| POST TEST | 0.0          | 0.0                            |

| TIME CLOCK/SAMPLE | GAUGE VACUUM cm Hg | FLOWMETER SETTING (silver ball) | COMMENTS |
|-------------------|--------------------|---------------------------------|----------|
| 0925              | 30                 | 70                              |          |
| 0930              | 28                 | 70                              |          |
| 0935              | 26                 | 70                              |          |
| 0940              | 25                 | 70                              |          |
| 0945              | 23                 | 70                              |          |
| 0950              | 22                 | 70                              |          |
| 0955              | 20                 | 70                              |          |
| 1000              | 18                 | 70                              |          |
| 1005              | 16                 | 70                              |          |
| 1010              | 14                 | 70                              |          |
| 1015              | 11                 | 70                              |          |
| 1020              | 9                  | 70                              |          |
| 1025              | 10                 | 70                              |          |
|                   |                    |                                 |          |
|                   |                    |                                 |          |
|                   |                    |                                 |          |

SAMPLING TRAIN ID# CAE 12

%CO2 \_\_\_\_\_

DE: Left/Right  
C25 - 6/11/87Right

%H2O \_\_\_\_\_

## VOLATILE ORGANIC CARBON BY METHOD 25

Facility: \_\_\_\_\_ Sample Location: Boiler #8  
 Location: Belle Glades F/A Operator: CARTER  
 Date: 1-27-89 Run number: 2  
 Tank number: 6183 Trap number: DP Sample ID: RTL 2

| PRESSURE READINGS | TANK VACUUM     |                   | BAROMETRIC PRESSURE, mm Hg/in Hg | AMBIENT TEMPERATURE, C/F |
|-------------------|-----------------|-------------------|----------------------------------|--------------------------|
|                   | Manometer mm Hg | Gauge cm Hg/in Hg |                                  |                          |
| PRETEST           | 30.10           | 30                | 30.30                            | 58°F                     |
| POST TEST         | 14.1            | 14                | 30.20                            | 90°F                     |

| LEAK RATE | TANK         | TRAP                           |
|-----------|--------------|--------------------------------|
|           | cm Hg/10 min | Flowmeter reading (black ball) |
| PRETEST   | 0.00         | 0.0                            |
| POST TEST | 0.0          | 0.4                            |

| TIME CLOCK/SAMPLE | GAUGE VACUUM cm Hg | FLOWMETER SETTING (silver ball) | COMMENTS |
|-------------------|--------------------|---------------------------------|----------|
| 1165              | 30                 | 70                              |          |
| 1200              | 28                 | 70                              |          |
| 1205              | 26                 | 70                              |          |
| 1210              | 24                 | 70                              |          |
| 1215              | 22                 | 70                              |          |
| 1220              | 20                 | 70                              |          |
| 1225              | 19                 | 70                              |          |
| 1230              | 17                 | 70                              |          |
| 1235              | 15                 | 70                              |          |
| 1240              | 13                 | 70                              |          |
| 1245              | 14                 | 70                              |          |
| 1250              | PLUG UP            | UP                              |          |
| 1255              |                    |                                 |          |
|                   |                    |                                 |          |
|                   |                    |                                 |          |
|                   |                    |                                 |          |

SAMPLING TRAIN ID# ACE 15

%CO2 \_\_\_\_\_

 DE: Left/Right LEFT  
 25 - 6/11/87

%H2O \_\_\_\_\_

## VOLATILE ORGANIC CARBON BY METHOD 25

|                                  |                                                             |
|----------------------------------|-------------------------------------------------------------|
| Facility: _____                  | Sample Location: <u>Boiler #8</u>                           |
| Location: <u>Brick Glaze Flt</u> | Operator: <u>CHARTER</u>                                    |
| Date: <u>1-27-89</u>             | Run number: <u>3</u>                                        |
| Tank number: <u>6134</u>         | Trap number: <u>IP</u> Sample ID: <u><del>CHARTER</del></u> |

RTL 3

| PRESSURE READINGS | TANK VACUUM     |                   | BAROMETRIC PRESSURE, mm Hg/in Hg | AMBIENT TEMPERATURE, C/F |
|-------------------|-----------------|-------------------|----------------------------------|--------------------------|
|                   | Manometer mm Hg | Gauge cm Hg/in Hg |                                  |                          |
| PRETEST           | 30.0            | 30                | 30.2                             | 82                       |
| POST TEST         | 4.9             | 4.5               | 30.20                            | 82                       |

| LEAK RATE | TANK         | TRAP                           |
|-----------|--------------|--------------------------------|
|           | cm Hg/10 min | Flowmeter reading (black ball) |
| PRETEST   | 0.00         | 0.00                           |
| POST TEST | 0.00         | 0.00                           |

| TIME CLOCK/SAMPLE | GAUGE VACUUM cm Hg | FLOWMETER SETTING (silver ball) | COMMENTS |
|-------------------|--------------------|---------------------------------|----------|
| 1415              | 30                 | 70                              |          |
| 1420              | 28                 | 70                              |          |
| 1425              | 26                 | 70                              |          |
| 1430              | 24                 | 70                              |          |
| 1435              | 22                 | 70                              |          |
| 1440              | 20                 | 70                              |          |
| 1445              | 17                 | 70                              |          |
| 1450              | 15                 | 70                              |          |
| 1455              | 13                 | 70                              |          |
| 1500              | 10                 | 70                              |          |
| 1505              | 8                  | 70                              |          |
| 1510              | 6                  | 70                              |          |
| 1515              | 4                  | 70                              |          |
|                   |                    |                                 |          |
|                   |                    |                                 |          |
|                   |                    |                                 |          |

SAMPLING TRAIN ID# CPE 12

%CO2 \_\_\_\_\_

SIDE: Left/Right  
voc25 - 6/11/87

%H2O \_\_\_\_\_

# Research Triangle Laboratories, Inc.

## METHOD 25 EXPERIMENTAL PROCEDURE

### Calibration

A propane calibration gas mixture of 74.7 ppm CO, 70.5 ppm CH<sub>4</sub>, 2.10% CO<sub>2</sub> and 67.2 ppm propane is injected via a 1 mL sampling loop into the analyzer. The injections are repeated until three integrated areas indicate reasonable (<5%) agreement. A 1.00% CO<sub>2</sub> standard is run daily with the same requirement. The average daily response factors must agree within 5% of the RF(CO<sub>2</sub>) and the RF(NMO) from the initial performance check.

Duplicate injections of the propane calibration mix are made prior to each sample analysis. Two injections of the propane mix standard are made after the final sample each day.

Response factors (average integrated area/concentration in ppmC) are calculated daily from the initial triplicate injections.

### Analysis

Each trap is stored with dry ice until just prior to analysis and is flushed of CO<sub>2</sub> by passing zero air through it at -78 °C and via the CO<sub>2</sub> NDIR to the sample tank. Flushing is continued until no NDIR response is noted. The trap is baked at 200 °C with zero air flushing through the trap and via the oxidation catalyst and the NDIR into the collection vessel. Collection is continued until no NDIR response is noted. The trap is transferred to an oven set at 350 °C and baking is continued for 30 minutes. This ensures the cleanliness of the trap for a subsequent sampling. The trap is taken out of the oven and allowed to cool; it is then capped and stored for shipment.

The sample tank is analyzed by injecting an aliquot via a 1 mL sample loop into the GC column, which is held at 85 °C to elute the CO+CH<sub>4</sub> and then the CO<sub>2</sub> which is passed to the oxidation catalyst, reduction catalyst, and FID. The column is then backflushed at 195 °C to elute the organic fraction. The collection vessel is analyzed identically. In both cases, triplicate injections are made.

The sample tank is pumped for 5 minutes (to less than 5 mmHg) and air is then allowed in via a paper fiber filter; this procedure is repeated. The tank is pumped 10 minutes and allowed to stand overnight. The tank is then connected to a pressure gauge to test for leaks (maximum permissible leak rate = 10 mmHg/day). If the tank passes the leak test, it is filled with zero air to slightly greater than atmospheric pressure and stored for shipment.

### Calculations

Calculations are done in accord with EPA Method 25 procedures. A sample calculation is provided using client/RTL data.



# RESEARCH TRIANGLE LABORATORIES

## METHOD 25 SAMPLE CALCULATION

Note: All pressure values have been converted when necessary to mm Hg and all temperature values to Kelvin.

Name: Air Consulting and Engineering

ID #89-102-126 Date: 01/30/89

Sample # 2 RTL-1

### DATA

|                          |          |          |                          |
|--------------------------|----------|----------|--------------------------|
| Tank 6186:               |          | Trap LV  | Collection Vessel:       |
| Volume (cu.m) = 0.005415 |          |          | Volume (cu.m) = 0.004551 |
|                          | Pressure | Temp.(K) | Pressure Temp.(K)        |
|                          | (mm Hg)  |          | (mm Hg)                  |
| Presampling              | 5.1      | 287.6    |                          |
| Postsampling             | 584.2    | 297.0    |                          |
| Final                    | 1023.0   | 301.2    | Final 1060.0 302.2       |

### Calibration Data:

|                                   |       |           |
|-----------------------------------|-------|-----------|
|                                   | CO2   | Backflush |
| Response Factor (area units/ppmC) | 191.9 | 208.9     |
| Blank (ppmC)                      | 2.0   |           |
| Blank Area (area units)           |       | 1136      |

### Areas:

|                 |            |            |            |
|-----------------|------------|------------|------------|
| CO + CH4        | 25,435     | 25,157     | 26,360     |
| CO2             | 12,054,000 | 12,111,000 | 11,920,000 |
| Noncondensibles | 16,750     | 16,750     | 16,750     |
| Condensibles    | 6,456      | 6,444      | 7,103      |

### CALCULATIONS

#### Measured Concentrations, corrected for blank:

$$\begin{aligned}
 C_m(CO+CH_4) &= \text{Area}(CO+CH_4) / RF(CO_2) \\
 &= 25435 / 192 = 132.5 \\
 &= 25157 / 192 = 131.1 \\
 &= 26360 / 192 = 137.4
 \end{aligned}$$

$$\begin{aligned}
 C_m(CO_2) &= \text{Area}(CO_2) / RF(CO_2) \\
 &= 1.2054E+07 / 192 = 62814.0 \\
 &= 1.2111E+07 / 192 = 63111.0 \\
 &= 1.192E+07 / 192 = 62115.7
 \end{aligned}$$

$$\begin{aligned}
 C_m(\text{Noncondensibles}) &= [\text{Area}(\text{Noncondensibles}) - \text{Blank Area(NMO)}] / RF(NMO) \\
 &= (16750 - 1136) / 209 = 74.7 \\
 &= (16750 - 1136) / 209 = 74.7 \\
 &= (16750 - 1136) / 209 = 74.7
 \end{aligned}$$

$$\begin{aligned}
 C_m(\text{Condensibles}) &= \text{Area}(\text{Condensibles}) / RF(CO_2) - \text{Blank}(CO_2) \\
 &= 6456 / 192 - 2.0 = 31.6 \\
 &= 6444 / 192 - 2.0 = 31.6 \\
 &= 7103 / 192 - 2.0 = 35.0
 \end{aligned}$$

Pressure-Temperature Ratio,  $Q(i) = P(i)/T(i)$ :

postsampling tank:  $Q(1) = 584.2 / 297.0389 = 1.966746$   
presampling tank:  $Q(2) = 5.079971 / 287.5945 = 1.766366E-02$   
final tank:  $Q(3) = 1023 / 301.15 = 3.396979$   
final CV:  $Q(4) = 1060 / 302.15 = 3.508191$

Volume Sampled (dscm) =  $0.386 \times \text{Tank Volume} \times [Q(1)-Q(2)]$   
=  $0.386 \times .005415 \times [1.9667 - 0.0177]$   
= 0.004074

Averages and % Relative Standard Deviations (%RSD) of  $C_m$ 's are calculated.  
(%RSD of C = %RSD of  $C_m$ )

Calculated Concentrations:

$C(\text{CO}+\text{CH}_4) = Q(3)/[Q(1)-Q(2)] \times C_m(\text{CO}+\text{CH}_4)$   
=  $3.3970/(1.9667 - 0.0177) \times 133.7 = 233.0$

$C(\text{CO}_2) = Q(3)/[Q(1)-Q(2)] \times C_m(\text{CO}_2)$   
=  $3.3970/(1.9667 - 0.0177) \times 62680.2 = 109242.9$

$C(\text{Noncondensibles}) = Q(3)/[Q(1)-Q(2)] \times C_m(\text{Noncondensibles})$   
=  $3.3970/(1.9667 - 0.0177) \times 74.7 = 130.3$

$C(\text{Condensibles})$   
=  $\text{Volume}(\text{CV})/\text{Volume}(\text{Tank}) \times Q(4)/[Q(1)-Q(2)] \times C_m(\text{Condensibles})$   
=  $0.004551/0.005415 \times 3.5082/(1.9667 - 0.0177) \times 32.7 = 49.5$

Total Gaseous Non-Methane Organics(TGNMO)= $C(\text{Noncondensibles})+C(\text{Condensibles})$   
=  $130.3 + 49.5$   
= 179.8

Mass Concentration =  $0.498 \times \text{TGNMO}$   
=  $0.498 \times 179.8 = 89.5$

# Research Triangle Laboratories, Inc.

## SAMPLE QA / QC DATA

### METHOD 25 CALIBRATION CHECK

5.1.1 Carrier gas and auxiliary oxygen blank (9/29/87)  
 $\text{CO} + \text{CH}_4 + \text{CO}_2 + \text{NMO} = 0 \text{ ppm}$  Requirement:  $<5 \text{ ppm}$

5.1.2 Catalyst Efficiency Check (10/1/87)  
 $\text{CO}_2 \text{ ppmC} = 10036$  Requirement:  $(\text{CO}_2 \text{ ppmC} = 10000 \pm 200)$

5.1.3 System Performance Check (10/1-2/87)

|              | Average percent<br>Recovery ( $100 \pm 5\%$ ) | % RSD<br>( $<2\%$ ) |
|--------------|-----------------------------------------------|---------------------|
| 50 uL Hexane | 100.6%                                        | 0.2                 |
| 10 uL Hexane | 100.9%                                        | 0.2                 |

5.2.1 Oxidation Catalyst Efficiency Check (10/2/87)

FID Response with Reduction Catalyst out = 0.85%  
Requirement:  $<1\%$  FID Response

5.2.2 Reduction Catalyst Efficiency Check (10/2-9/87)  
Response factor of  $\text{CO}_2$  with Oxidation Catalyst and Reduction Catalyst operative was 121.2% of response with Catalysts out.  
Requirement: Response Factor  $>95\%$

5.2.3 Analyzer Linearity Check and NMO Calibration (Initial, 10/4-6/87).

RF Values agree within 2% Requirement: Agree within 2.5%  
% RSD values for triplicates  $<2\%$  Requirement: % RSD values  $<2\%$

$$\frac{\text{RF}(\text{NMO})}{\text{RF}(\text{CO}_2)} = 1.018 \quad \text{Requirement: } \frac{\text{RF}(\text{NMO})}{\text{RF}(\text{CO}_2)} = 1.0 \pm 0.1$$

5.2.4 System Performance check (10/4/87)

|             | Measured Value | Expected Value | Requirement        |
|-------------|----------------|----------------|--------------------|
| Propane Mix | 56.6 ppm       | 56.7 ppm       | Expected $\pm 5\%$ |
| Hexane      | 54.2 ppm       | 51.8 ppm       | Expected $\pm 5\%$ |
| Toluene     | 60.7 ppm       | 60.5 ppm       | Expected $\pm 5\%$ |
| Methanol    | 94.2 ppm       | 92.7 ppm       | Expected $\pm 5\%$ |

5.3 NMO Analyzer Daily Calibration  
Mixed propane gas plus high level  $\text{CO}_2$  triplicate injections are made at the beginning of the day.

Requirement:

$$\text{DRF}(\text{CO}_2) = \text{RF}(\text{CO}_2) \pm 5\%$$
$$\text{DRF}(\text{NMO}) = \text{RF}(\text{NMO}) \pm 5\%$$

# RESEARCH TRIANGLE LABORATORIES

## METHOD 25 DATA REPORT

Name: Air Consulting and Engineering

ID #89-102-126 Date: 01/30/89

Sample # 1 RTL-B

TANK 6106:

TRAP PP

COLLECTION VESSEL:

Volume (cu.m) = 0.005788

Volume (cu.m) = 0.004551

|              | Pressure<br>(mm Hg) | Temp.(K) |       | Pressure<br>(mm Hg) | Temp.(K) |
|--------------|---------------------|----------|-------|---------------------|----------|
| Presampling  | 5.1                 | 287.6    |       |                     |          |
| Postsampling | 684.5               | 302.0    |       |                     |          |
| Final        | 1026.0              | 301.2    | Final | 1220.0              | 305.2    |

Volume Sampled (dscm) = 0.005024

### Calibration Data:

|                                   | CO2   | Backflush |
|-----------------------------------|-------|-----------|
| Response Factor (area units/ppmC) | 191.9 | 208.9     |
| Blank (ppmC)                      | 2.0   |           |
| Blank Area (area units)           |       | 1136      |

### Areas:

|                 | 0         | 645       | 577       |
|-----------------|-----------|-----------|-----------|
| CO + CH4        |           |           |           |
| CO2             | 1,711.900 | 1,708.500 | 1,713.400 |
| Noncondensibles | 3.748     | 4.429     | 6.473     |
| Condensibles    | 3.199     | 3.108     | 3.270     |

### Concentrations (ppmC):

|                 |            | %RSD    |
|-----------------|------------|---------|
| CO + CH4        | 3.2159     | 87.0039 |
| CO2             | 13510.6300 | 0.1467  |
| Noncondensibles | 27.1780    | 37.8449 |
| Condensibles    | 20.4610    | 2.8914  |
| TGNMO           | 47.6389    |         |

(= 23.7242 mgC/cu.m)

# RESEARCH TRIANGLE LABORATORIES

## METHOD 25 DATA REPORT

Name: Air Consulting and Engineering

ID #89-102-126 Date: 01/30/89

Sample # 2 RTL-1

TANK 6186:

TRAP LV

COLLECTION VESSEL:

Volume (cu.m) = 0.005415

Volume (cu.m) = 0.004551

|              | Pressure<br>(mm Hg) | Temp.(K) |       | Pressure<br>(mm Hg) | Temp.(K) |
|--------------|---------------------|----------|-------|---------------------|----------|
| Presampling  | 5.1                 | 287.6    |       |                     |          |
| Postsampling | 584.2               | 297.0    |       |                     |          |
| Final        | 1023.0              | 301.2    | Final | 1060.0              | 302.2    |

Volume Sampled (dscm) = 0.004074

Calibration Data:

|                                   | CO2   | Backflush |
|-----------------------------------|-------|-----------|
| Response Factor (area units/ppmC) | 191.9 | 208.9     |
| Blank (ppmC)                      | 2.0   |           |
| Blank Area (area units)           |       | 1136      |

Areas:

|                 |            |            |            |
|-----------------|------------|------------|------------|
| CO + CH4        | 25.435     | 25.157     | 26.360     |
| CO2             | 12,054,000 | 12,111,000 | 11,920,000 |
| Noncondensibles | 16,750     | 16,750     | 16,750     |
| Condensibles    | 6,456      | 6,444      | 7,103      |

Concentrations (ppmC):

|                 | %RSD        |
|-----------------|-------------|
| CO + CH4        | 232.9627    |
| CO2             | 109242.9000 |
| Noncondensibles | 130.2682    |
| Condensibles    | 49.5384     |
| TGNMO           | 179.8066    |

(= 89.5437 mgC/cu.m)

## RESEARCH TRIANGLE LABORATORIES

## METHOD 25 DATA REPORT

Name: Air Consulting and Engineering

ID #89-102-126 Date: 01/30/89

Sample # 3 RTL-2

TANK 6183:

TRAP OP

COLLECTION VESSEL:

Volume (cu.m) = 0.005849

Volume (cu.m) = 0.004551

|              | Pressure<br>(mm Hg) | Temp.(K) |       | Pressure<br>(mm Hg) | Temp.(K) |
|--------------|---------------------|----------|-------|---------------------|----------|
| Presampling  | 5.1                 | 287.6    |       |                     |          |
| Postsampling | 408.9               | 305.4    |       |                     |          |
| Final        | 1000.0              | 300.2    | Final | 1000.0              | 301.2    |

Volume Sampled (dscm) = 0.002984

## Calibration Data:

|                                   | CO2   | Backflush |
|-----------------------------------|-------|-----------|
| Response Factor (area units/ppmC) | 191.9 | 208.9     |
| Blank (ppmC)                      | 2.0   |           |
| Blank Area (area units)           |       | 1136      |

## Areas:

|                 | 6.877     | 7.363     | 7.161     |
|-----------------|-----------|-----------|-----------|
| CO + CH4        |           |           |           |
| CO2             | 8,450,300 | 8,782,300 | 8,641,800 |
| Noncondensibles | 4,088     | 3,748     | 3,407     |
| Condensibles    | 16,316    | 16,070    | 16,677    |

## Concentrations (ppmC):

|                 |             | %RSD    |
|-----------------|-------------|---------|
| CO + CH4        | 93.7208     | 3.4225  |
| CO2             | 113311.0000 | 1.9322  |
| Noncondensibles | 31.5194     | 13.0377 |
| Condensibles    | 162.7241    | 1.9117  |
| TGNMO           | 194.2435    |         |

(= 96.7332 mgC/cu.m)

## RESEARCH TRIANGLE LABORATORIES

## METHOD 25 DATA REPORT

Name: Air Consulting and Engineering

ID #89-102-126 Date: 01/30/89

Sample # 4 RTL-3

TANK 6134:

TRAP IP

COLLECTION VESSEL:

Volume (cu.m) = 0.005786

Volume (cu.m) = 0.004551

|              | Pressure<br>(mm Hg) | Temp.(K) |       | Pressure<br>(mm Hg) | Temp.(K) |
|--------------|---------------------|----------|-------|---------------------|----------|
| Presampling  | 5.1                 | 300.9    |       |                     |          |
| Postsampling | 647.7               | 300.9    |       |                     |          |
| Final        | 1000.0              | 297.2    | Final | 1431.0              | 302.2    |

Volume Sampled (dscm) = 0.004769

## Calibration Data:

|                                   | CO2   | Backflush |
|-----------------------------------|-------|-----------|
| Response Factor (area units/ppmC) | 191.9 | 208.9     |
| Blank (ppmC)                      | 2.0   |           |
| Blank Area (area units)           |       | 1136      |

## Areas:

|                 |            |            |            |
|-----------------|------------|------------|------------|
| CO + CH4        | 102,240    | 63,527     | 64,228     |
| CO2             | 21,486,000 | 22,266,000 | 22,395,000 |
| Noncondensibles | 23,346     | 26,984     | 30,621     |
| Condensibles    | 51,279     | 44,822     | 39,162     |

## Concentrations (ppmC):

|                 |             | %RSD    |
|-----------------|-------------|---------|
| CO + CH4        | 629.5852    | 28.8937 |
| CO2             | 181069.9000 | 2.2306  |
| Noncondensibles | 194.9913    | 14.0728 |
| Condensibles    | 406.3987    | 13.5623 |
| TGNMO           | 601.3900    |         |

(= 299.4922 mgC/cu.m)

CAE

CLEAN AIR ENGINEERING, INC.  
PALATINE, ILLINOIS



## Clean Air Engineering

2/3/89

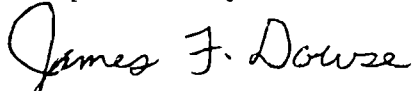
Air Consulting and Engineering  
2106 NW 67th Place, Suite 4  
Gainesville, FL. 32606  
Attn: Mr. Steve Neck

Dear Mr. Neck,

Enclosed you will find results of the Method 25 analysis performed by Clean Air Engineering. Samples from the Sugar Grower's Co-Op were received on January 30th and were analyzed on February 1-2. For the noncondensable organic analysis, 10.01 and 23.25ppm propane standards were used to calibrate the system. In the condensable organic analysis, 69.33 and 5099ppm carbon dioxide standards were used. It should be noted that tank 4T106 contained a large amount of water, which could affect the noncondensable organic analysis in that sample. Also, the blank values were very high compared to the condensable organic values, so the accuracy of those numbers is questionable.

If you have any questions regarding these results, please contact me at (312) 934-8961.

Respectfully Submitted,



Manager, VOC Systems

## (M25 3 RUNS)

|            |            |             |                     |
|------------|------------|-------------|---------------------|
| Job No.    | 850810     | Plant       | Sugar Growers Co-op |
| Client     | ACE        | Sample Loc. | Boiler #8           |
| Disk/File# | ACE.SGCO.J | ( in/out )  |                     |
| Page No.   | 1          | Date        | 1/27/89             |

## Preliminary Data-----

| Run No.             | Run 1 | Run 2 |
|---------------------|-------|-------|
| Tank No.            | 4T136 | 4T65  |
| Trap No.            | B52   | B211  |
| Tank Volume, V (cc) | 4049  | 4029  |

## Field Data-----

|            |      |      |
|------------|------|------|
| PTI (mmHg) | -762 | -767 |
| TTI (F)    | 58   | 58   |
| PbI (mmHg) | 770  | 770  |
| PT (mmHg)  | -111 | -139 |
| TT (F)     | 75   | 90   |
| Pb (mmHg)  | 767  | 767  |

## Noncondensable Organics-----

|                   |      |      |
|-------------------|------|------|
| PT (Lab) (mmHg)   | -60  | -86  |
| TT (Lab) (F)      | 83   | 70   |
| Pb (Lab) (mmHg)   | 730  | 740  |
| PTF (mmHg)        | 882  | 900  |
| TTF (F)           | 82   | 70   |
| PbF (mmHg)        | 730  | 740  |
| Ba (ppmv C)       | 0.0  | 0.0  |
| Ctm 1 (ppmv C)    | 12.0 | 13.9 |
| Ctm 2 (ppmv C)    | 18.5 | 12.5 |
| Ctm 3 (ppmv C)    | 12.5 | 13.0 |
| Avg. Ctm (ppmv C) | 14.3 | 13.1 |
| RSD Ctm (%)       | 25.2 | 5.4  |

## Condensable Organics-----

|                   |       |      |
|-------------------|-------|------|
| ICV Tank No.      | 4T62  | 4T16 |
| ICV Tank, Vv (cc) | 4003  | 4011 |
| PFI (mmHg)        | -703  | -711 |
| TFI (F)           | 82    | 70   |
| PbFI (mmHg)       | 730   | 740  |
| PF (mmHg)         | 914   | 914  |
| TF (F)            | 82    | 70   |
| PbFf (mmHg)       | 730   | 740  |
| Bt (ppmv C)       | 45.0  | 45.0 |
| Ccm 1 (ppmv C)    | 138.7 | 58.6 |
| Ccm 2 (ppmv C)    | 132.1 | 55.0 |
| Ccm 3 (ppmv C)    | 135.4 | 56.5 |
| Avg. Ccm (ppmv C) | 135.4 | 56.7 |
| RSD Ccm (%)       | 2.4   | 3.2  |

## =====

|                                           |        |        |
|-------------------------------------------|--------|--------|
| Total Gaseous Nonmethane Organics (TGNMO) |        |        |
| Vs (cc)                                   | 3405.2 | 3179.3 |
| Dil. Factor (Non-cond)                    | 2.457  | 2.724  |
| Dil. Factor (Condnsble)                   | 2.477  | 2.735  |
| Ct (ppmv C)                               | 35.2   | 35.8   |
| Cc (ppmv C)                               | 223.9  | 32.0   |
| Ct+Cc=C (ppmv C)                          | 259.1  | 67.8   |
| Mc (mg C/dscm)                            | 129.4  | 33.8   |

Note:—If sampling has to be stopped before obtaining the minimum sampling time (specified in the applicable subpart) because a constant flow rate cannot be maintained, proceed as follows: After closing the sample tank valve, remove the used sample tank from the sampling train (without disconnecting other portions of the sampling train). Take another evacuated and leak-checked sample tank, measure and record the tank vacuum, and attach the new tank to the sampling train. After the new tank is

attached to the sample train, proceed with the sampling until the required minimum sampling time has been exceeded.

4.2 *Sample Recovery.* After sampling is completed, close the flow control valve, and record the final tank vacuum; then record the tank temperature and barometric pressure. Close the sample tank valve, and disconnect the sample tank from the sample system. Disconnect the condensate trap at the flowmetering system, and tightly seal both ends of the condensate trap. Do not include

the probe from the stack to the filter as part of the condensate sample. Keep the trap packed in dry ice until the samples are returned to the laboratory for analysis. Ensure that the test run number is properly identified on the condensate trap and the sample tank(s).

4.3 *Condensate Recovery.* See Figure 25-9. Set the carrier gas flow rate, and heat the catalyst to its operating temperature to condition the apparatus.

BILLING CODE 6560-60-M

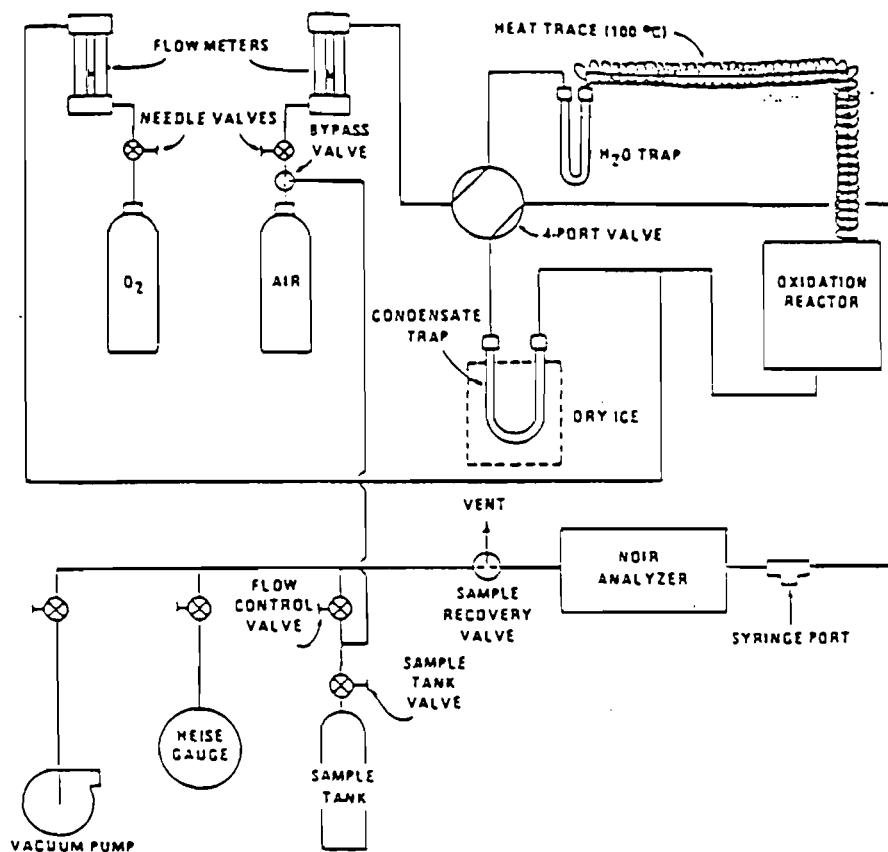


Figure 25-9. Condensate recovery system, CO<sub>2</sub> purge.

4.3.1 Daily Performance Checks. Each day before analyzing any samples, perform the following tests:

4.3.1.1 Leak Check. With the carrier gas inlets and the flow control valve closed, install a clean condensate trap in the system, and evacuate the system to 10 mm Hg absolute pressure or less. Close the vacuum pump valve and turn off the vacuum pump. Monitor the system pressure for 10 minutes. The system is acceptable if the pressure change is less than 2 mm Hg.

4.3.1.2 System Background Test. Adjust the carrier gas and auxiliary oxygen flow rate to their normal values of 100 cc/min and 150 cc/min, respectively, with the sample recovery valve in vent position. Using a 10-ml syringe withdraw a sample from the system effluent through the syringe port. Inject this sample into the NMO analyzer, and measure the CO<sub>x</sub> content. The system background is acceptable if the CO<sub>x</sub> concentration is less than 10 ppm.

4.3.1.3 Oxidation Catalyst Efficiency Check. Conduct a catalyst efficiency test as specified in section 5.1.2 of this method. If the criterion of this test cannot be met, make the necessary repairs to the system before proceeding.

4.3.2 Condensate Trap CO<sub>2</sub> Purge and Sample Tank Pressurization. After sampling is completed, the condensate trap will contain condensed water and organics and a small volume of sampled gas. This gas from the stack may contain a significant amount of CO<sub>2</sub> which must be removed from the condensate trap before the sample is recovered. This is accomplished by purging the condensate trap with zero air and collecting the purged gas in the original sample tank.

Begin with the sample tank and condensate trap from the test run to be analyzed. Set the four-port valve of the condensate recovery system in the CO<sub>2</sub> purge position as shown in Figure 25-9. With the sample tank valve closed, attach the sample tank to the sample recovery system. With the sample recovery valve in the vent position and the flow control valve fully open, evacuate the manometer or pressure gauge to the vacuum of the sample tank. Next, close the vacuum pump valve, open the sample tank valve, and record the tank pressure.

Attach the dry-ice-cooled condensate trap to the recovery system, and initiate the purge by switching the sample recovery valve from vent to collect position. Adjust the flow

control valve to maintain atmospheric pressure in the recovery system. Continue the purge until the CO<sub>2</sub> concentration of the trap effluent is less than 5 ppm. CO<sub>2</sub> concentration in the trap effluent should be measured by extracting syringe samples from the recovery system and analyzing the samples with the NMO analyzer. This procedure should be used only after the NDIR response has reached a minimum level. Using a 10-ml syringe, extract a sample from the syringe port prior to the NDIR, and inject this sample into the NMO analyzer.

After the completion of the CO<sub>2</sub> purge, use the carrier gas bypass valve to pressurize the sample tank to approximately 1.060 mm Hg absolute pressure with zero air.

4.3.3 Recovery of the Condensate Trap Sample. See Figure 25-10. Attach the ICV to the sample recovery system. With the sample recovery valve in a closed position, between vent and collect, and the flow control and ICV valves fully open, evacuate the manometer or gauge, the connecting tubing, and the ICV to 10 mm Hg absolute pressure. Close the flow-control and vacuum pump valves.

ILLING CODE 6880-60-M

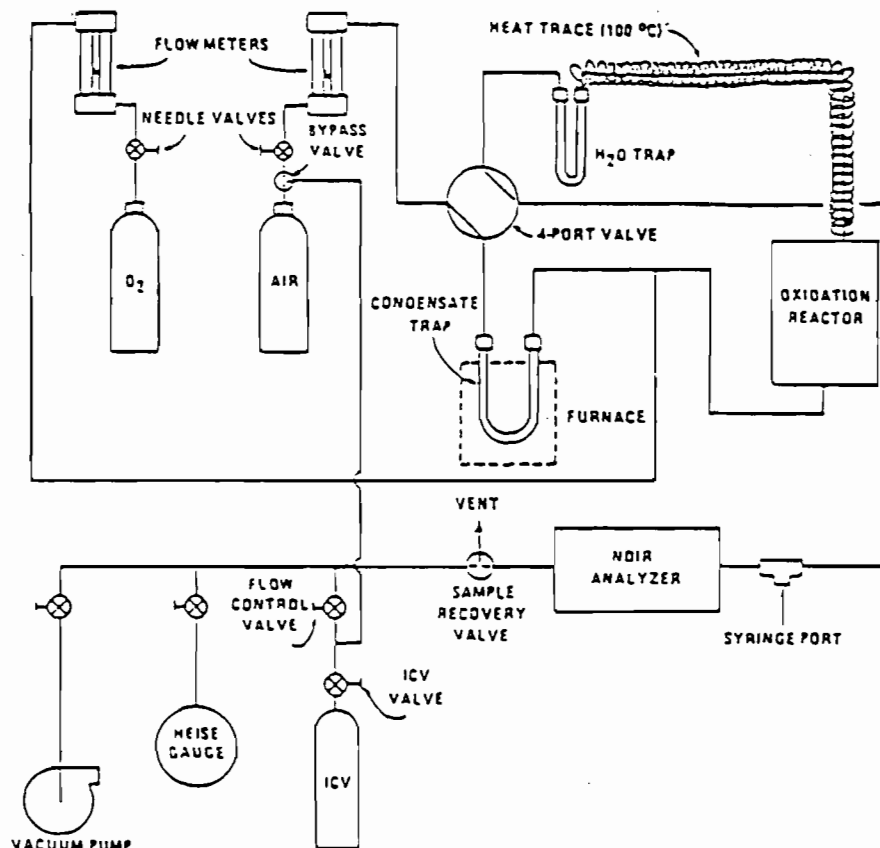


Figure 25-10. Condensate recovery system, collection of trap organics.

Begin auxiliary oxygen flow to the oxidation catalyst at a rate of 150 cc/min, then switch the four-way valve to the trap recovery position and the sample recovery valve to collect position. The system should now be set up to operate as indicated in Figure 25-10. After the manometer or pressure gauge begins to register a slight positive pressure, open the flow control valve. Adjust the flow-control valve to maintain atmospheric pressure in the system within 10 percent.

Now, remove the condensate trap from the dry ice, and allow it to warm to ambient temperature while monitoring the NDIR response. If after 5 minutes, the  $\text{CO}_2$  concentration of the catalyst effluent is below 10,000 ppm, discontinue the auxiliary oxygen flow to the oxidation catalyst. Begin heating the trap by placing it in a furnace preheated to 200°C. Once heating has begun, carefully monitor the NDIR response to ensure that the catalyst effluent concentration does not exceed 50,000 ppm. Whenever the  $\text{CO}_2$  concentration exceeds 50,000 ppm, supply auxiliary oxygen to the catalyst at the rate of 150 cc/min. Begin heating the tubing that connected the heated sample box to the condensate trap only after the  $\text{CO}_2$  concentration falls below 10,000 ppm. This tubing may be heated in the same oven as the condensate trap or with an auxiliary heat source such as a heat gun. Heating temperature must not exceed 200°C. If a heat gun is used, heat the tubing slowly along its entire length from the upstream end to the downstream end, and repeat the pattern for a total of three times. Continue the recovery until the  $\text{CO}_2$  concentration drops to less than 10 ppm as determined by syringe injection as described under the condensate trap  $\text{CO}_2$  purge procedure, section 4.3.2.

After the sample recovery is completed, use the carrier gas bypass valve to pressurize the ICV to approximately 1060 mm Hg absolute pressure with zero air.

**4.4 Analysis.** Before putting the NMO analyzer into routine operation, conduct an initial performance test. Start the analyzer, and perform all the necessary functions in order to put the analyzer into proper working order; then conduct the performance test according to the procedures established in section 5.2. Once the performance test has been successfully completed and the  $\text{CO}_2$  and NMO calibration response factors have been determined, proceed with sample analysis as follows:

**4.4.1 Daily Operations and Calibration Checks.** Before and immediately after the analysis of each set of samples or on a daily basis (whichever occurs first), conduct a calibration test according to the procedures established in section 5.3. If the criteria of the daily calibration test cannot be met, repeat the NMO analyzer performance test (Section 5.2) before proceeding.

**4.4.2 Operating Conditions.** The carrier gas flow rate is 29.5 cc/min He and 2.2 cc/min  $\text{O}_2$ . The column oven is heated to 85°C. The order of elution for the sample from the column is  $\text{CO}$ ,  $\text{CH}_4$ ,  $\text{CO}_2$ , and NMO.

**4.4.3 Analysis of Recovered Condensate Sample.** Purge the sample loop with sample, and then inject the sample. Under the specified operating conditions, the  $\text{CO}_2$  in the

sample will elute in approximately 100 seconds. As soon as the detector response returns to baseline following the  $\text{CO}_2$  peak, switch the carrier gas flow to backflush, and raise the column oven temperature to 195°C as rapidly as possible. A rate of 30°C/min has been shown to be adequate. Record the value obtained for the condensable organic material ( $\text{C}_{\text{org}}$ ) measured as  $\text{CO}_2$  and any measured NMO. Return the column oven temperature to 85°C in preparation for the next analysis. Analyze each sample in triplicate, and report the average  $\text{C}_{\text{org}}$ .

**4.4.4 Analysis of Sample Tank.** Perform the analysis as described in section 4.4.3, but record only the value measured for NMO ( $\text{C}_{\text{NMO}}$ ).

**4.5 Audit Samples.** Analyze a set of two audit samples concurrently with any compliance samples and in exactly the same manner to evaluate the analyst's technique and the instrument calibration. The same analysts, analytical reagents, and analytical system shall be used for the compliance samples and the EPA audit samples; if this condition is met, auditing of subsequent compliance analyses for the same enforcement agency within 30 days is not required. An audit sample set may not be used to validate different sets of compliance samples under the jurisdiction of different enforcement agencies, unless prior arrangements are made with both enforcement agencies.

Calculate the concentrations of the audit samples in ppm using the specified sample volume in the audit instructions. (Note.—Indication of acceptable results may be obtained immediately by reporting the audit results in ppm and compliance results in ppm by telephone to the responsible enforcement agency.) Include the results of both audit samples, their identification numbers, and the analyst's name with the results of the compliance determination samples in appropriate reports to the EPA regional office or the appropriate enforcement agency during the 30-day period.

The concentration of the audit samples obtained by the analyst shall agree within 20 percent of the actual concentrations. Failure to meet the 20-percent specification may require retests until the audit problems are resolved. However, if the audit results do not affect the compliance or noncompliance status of the affected facility, the Administrator may waive the reanalysis requirement, further audits, or retests and accept the results of the compliance test. While steps are being taken to resolve audit analysis problems, the Administrator may also choose to use the data to determine compliance or noncompliance of the affected facility.

#### 5. Calibration and Operational Checks

Maintain a record of performance of each item.

**5.1 Initial Performance Check of Condensate Recovery Apparatus.** Perform these tests before the system is first placed in operation, after any shutdown of 6 months or more, and after any major modification of the system, or at the specified frequency.

**5.1.1 Carrier Gas and Auxiliary  $\text{O}_2$  Blank Check.** Analyze each new tank of carrier gas or auxiliary  $\text{O}_2$  with the NMO analyzer to

check for contamination. Treat the gas cylinders as noncondensable gas samples, and analyze according to the procedure in section 4.4.3. Add together any measured  $\text{CH}_4$ ,  $\text{CO}$ ,  $\text{CO}_2$ , or NMO. The total concentration must be less than 5 ppm.

**5.1.2 Catalyst Efficiency Check.** With a clean condensate trap installed in the recovery system, replace the carrier gas cylinder with the high level methane standard gas cylinder (section 3.4.1). Set the four-port valve to the recovery position, and attach an ICV to the recovery system. With the sample recovery valve in vent position and the flow-control and ICV valves fully open, evacuate the manometer or gauge, the connecting tubing, and the ICV to 10 mm Hg absolute pressure. Close the flow-control and vacuum pump valves.

After the NDIR response has stabilized, switch the sample recovery valve from vent to collect. When the manometer or pressure gauge begins to register a slight positive pressure, open the flow-control valve. Keep the flow adjusted so that atmospheric pressure is maintained in the system within 10 percent. Continue collecting the sample in a normal manner until the ICV is filled to a nominal gauge pressure of 300 mm Hg. Close the ICV valve, and remove the ICV from the system. Place the sample recovery valve in the vent position, and return the recovery system to its normal carrier gas and normal operating conditions. Analyze the ICV for  $\text{CO}_2$  using the NMO analyzer; the catalyst efficiency is acceptable if the  $\text{CO}_2$  concentration is within 2 percent of the methane standard concentration.

#### 5.1.3 System Performance Check

Construct a liquid sample injection unit similar to design to the unit shown in Figure 25-7. Insert this unit into the condensate recovery and conditioning system in place of a condensate trap, and set the carrier gas and auxiliary  $\text{O}_2$  flow rates to normal operating levels. Attach an evacuated ICV to the system, and switch from system vent to collect. With the carrier gas routed through the injection unit and the oxidation catalyst, inject a liquid sample (see sections 5.1.3.1 to 5.1.3.4) into the injection port. Operate the trap recovery system as described in section 4.3.3. Measure the final ICV pressure, and then analyze the vessel to determine the  $\text{CO}_2$  concentration. For each injection, calculate the percent recovery using the equation in section 6.8.

The performance test is acceptable if the average percent recovery is  $100 \pm 5$  percent with a relative standard deviation (section 6.9) of less than 2 percent for each set of triplicate injections as follows:

5.1.3.1 50% Hexane.

5.1.3.2 50% Hexane.

5.1.3.3 50% Decane.

5.1.3.4 50% Decane.

**5.2 Initial NMO Analyzer Performance Test.** Perform these tests before the system is first placed in operation, after any shutdown longer than 6 months, and after any major modification of the system.

**5.2.1 Oxidation Catalyst Efficiency Check.** Turn off or bypass the NMO analyzer reduction catalyst. Make triplicate injections of the high level methane standard (section

3.4.1.). The oxidation catalyst operation is acceptable if the FID response is less than 1 percent of the injected methane concentration.

**5.2.2 Reduction Catalyst Efficiency Check.** With the oxidation catalyst unheated or bypassed and the heated reduction catalyst bypassed, make triplicate injections of the high level methane standard (section 3.4.1). Repeat this procedure with both catalysts operative. The reduction catalyst operation is acceptable if the response under both conditions agree within 5 percent.

**5.2.3 Analyzer Linearity Check and NMO Calibration.** While operating both the oxidation and reduction catalysts, conduct a linearity check of the analyzer using the propane standards specified in section 3.4.2. Make triplicate injections of each calibration gas, and then calculate the average response factor (area/ppm C) for each gas, as well as the overall mean of the response factor values. The instrument linearity is acceptable if the average response factor of each calibration gas is within 2.5 percent of the overall mean value and if the relative standard deviation (section 6.9) for each set of triplicate injections is less than 2 percent. Record the overall mean of the propane response factor values as the NMO calibration response factor ( $RF_{NMO}$ ).

Repeat the linearity check using the  $CO_2$  standards specified in section 3.4.3. Make triplicate injections of each gas, and then calculate the average response factor (area/ppm C) for each gas, as well as the overall mean of the response factor values. Record the overall mean of the response factor values as the  $CO_2$  calibration response factor ( $RF_{CO_2}$ ). The  $RF_{CO_2}$  must be within 10 percent of the  $RF_{NMO}$ .

**5.2.4 System Performance Check.** Check the column separation and overall performance of the analyzer by making triplicate injections of the calibration gases listed in section 3.4.4. The analyzer performance is acceptable if the measured NMO value for each gas (average of triplicate injections) is within 5 percent of the expected value.

### 5.3 NMO Analyzer Daily Calibration.

**5.3.1  $CO_2$  Response Factor.** Inject triplicate samples of the high level  $CO_2$  calibration gas (section 3.4.3), and calculate the average response factor. The system operation is adequate if the calculated response factor is within 5 percent of the  $RF_{CO_2}$  calculated during the initial performance test (section 5.2.3). Use the daily response factor ( $DRF_{CO_2}$ ) for analyzer calibration and the calculation of measured  $CO_2$  concentrations in the ICV samples.

**5.3.2 NMO Response Factors.** Inject triplicate samples of the mixed propane calibration cylinder (section 3.4.4.1), and calculate the average NMO response factor. The system operation is adequate if the calculated response factor is within 5 percent of the  $RF_{NMO}$  calculated during the initial performance test (section 5.2.4). Use the daily response factor ( $DRF_{NMO}$ ) for analyzer calibration and calculation of NMO concentrations in the sample.

**5.4 Sample Tank and ICV Volume.** The volume of the gas sampling tanks used must be determined. Determine the tank and ICV

volumes by weighing them empty and then filled with deionized distilled water; weigh to the nearest 5 g. and record the results.

Alternatively, measure the volume of water used to fill them to the nearest 5 ml.

### 6. Calculations

All equations are written using absolute pressure; absolute pressures are determined by adding the measured barometric pressure to the measured gauge or manometer pressure.

#### 6.1 Nomenclature.

$C$  = TGMNO concentration of the effluent, ppm C equivalent.

$C_c$  = Calculated condensable organic (condensate trap) concentration of the effluent, ppm C equivalent.

$C_{me}$  = Measured concentration (NMO analyzer) for the condensate trap ICV, ppm  $CO_2$ .

$C_n$  = Calculated noncondensable organic concentration (sample tank) of the effluent, ppm C equivalent.

$C_{mo}$  = Measured concentration (NMO analyzer) for the sample tank, ppm NMO.

$F$  = Sampling flow rate, cc/min.

$L$  = Volume of liquid injected,  $\mu$ l.

$M$  = Molecular weight of the liquid injected, g/g-mole.

$M_e$  = TGMNO mass concentration of the effluent, mg C/dsm<sup>3</sup>.

$N$  = Carbon number of the liquid compound injected ( $N=12$  for decane,  $N=6$  for hexane).

$P_i$  = Final pressure of the intermediate collection vessel, mm Hg absolute.

$P_b$  = Barometric pressure, cm Hg.

$P_u$  = Gas sample tank pressure before sampling, mm Hg absolute.

$P_t$  = Gas sample tank pressure after sampling, but before pressurizing, mm Hg absolute.

$P_a$  = Final gas sample tank pressure after pressurizing, mm Hg absolute.

$T_i$  = Final temperature of intermediate collection vessel, °K.

$T_u$  = Sample tank temperature before sampling, °K.

$T_t$  = Sample tank temperature at completion of sampling, °K.

$T_a$  = Sample tank temperature after pressurizing, °K.

$V$  = Sample tank volume, m<sup>3</sup>.

$V_t$  = Sample train volume, cc.

$V_i$  = Intermediate collection vessel volume, m<sup>3</sup>.

$V_s$  = Gas volume sampled, dsm<sup>3</sup>.

$n$  = Number of data points.

$q$  = Total number of analyzer injections of intermediate collection vessel during analysis (where  $k$  = injection number, 1 ...  $q$ ).

$r$  = Total number of analyzer injections of sample tank during analysis (where  $j$  = injection number, 1 ...  $r$ ).

$x_i$  = Individual measurements.

$\bar{x}$  = mean value.

$\rho$  = Density of liquid injected, g/cc.

$\theta$  = Leak check period, min.

$\Delta P$  = Allowable pressure change, cm Hg.

**6.2 Allowable Pressure Change.** For the pretest leak check, calculate the allowable pressure change:

$$\text{Eq. 25-1}$$

$$\Delta P = 0.01 \frac{FP_{59}}{V_t}$$

**6.3 Sample Volume.** For each test run, calculate the gas volume sampled:

$$\text{Eq. 25-2}$$

$$V_s = 0.3857 V \left[ \frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right]$$

**6.4 Noncondensable Organics.** For each sample tank, determine the concentration of nonmethane organics (ppm C):

$$\text{Eq. 25-3}$$

$$C_t = \left[ \frac{P_{tf}}{T_{tf}} - \frac{P_{ti}}{T_{ti}} \right] \left[ \frac{1}{F} \sum_{j=1}^r C_{tmj} \right]$$

**6.5 Condensable organics.** For each condensate trap determine the concentration of organics (ppm C):

$$\text{Eq. 25-4}$$

$$C_c = 0.3857 \frac{V_t P_f}{V_s T_f} \left[ \frac{1}{q} \sum_{k=1}^q C_{cmk} \right]$$

**6.6 TGMNO.** To determine the TGMNO concentration for each test run, use the following equation:

$$\text{Eq. 25-5}$$

$$C = C_t + C_c$$

**6.7 TGMNO Mass Concentration.** To determine the TGMNO mass concentration as carbon for each test run, use the following equation:

$$\text{Eq. 25-6}$$

$$M_c = 0.4993 C$$

**6.8 Percent Recovery.** To calculate the percent recovery for the liquid injections to the condensate recovery and conditioning system use the following equation:

Percent recovery =

$$1.604 \frac{M}{L} \frac{V_v}{p} \frac{P_f}{T_f} \frac{C_{cm}}{N}$$

Eq. 25-7

6.9 Relative Standard Deviation.

$$RSD = \frac{100}{x} \frac{\sum (x_i - \bar{x})^2}{n - 1}$$

Eq. 25-8

7. Bibliography

1. Salo, Albert E., Samuel Witz, and Robert D. MacPhee. Determination of Solvent Vapor Concentrations by Total Combustion Analysis: A Comparison of Infrared with Flame Ionization Detectors. Paper No. 75-33.2. (Presented at the 68th Annual Meeting of the Air Pollution Control Association, Boston, Massachusetts, June 15-20, 1975.) 14 p.
2. Salo, Albert E., William L. Oaks, and Robert D. MacPhee. Measuring the Organic Carbon Content of Source Emissions for Air Pollution Control. Paper No. 74-190. (Presented at the 67th Annual Meeting of the Air Pollution Control Association, Denver, Colorado June 9-13, 1974.) 25 p.

[FR Doc. 86-25192 Filed 11-6-86; 8:45 am]

## {M25 3 RUNS}

|            |            |             |                     |
|------------|------------|-------------|---------------------|
| Job No.    | 850810     | Plant       | Sugar Growers Co-Op |
| Client     | ACE        | Sample Loc. | Boiler #8           |
| Disk/File# | ACE.SGCO.J | ( in/out )  |                     |
| Page No.   | 2          | Date        | 1/27/89             |

## Preliminary Data-----

|                     |       |       |
|---------------------|-------|-------|
| Run No.             | Run 3 | Blank |
| Tank No.            | 4T122 | 4T106 |
| Trap No.            | B103  | B31   |
| Tank Volume, V (cc) | 4016  | 4019  |

## Field Data-----

|            |      |      |
|------------|------|------|
| PTI (mmHg) | -762 | -764 |
| TTI (F)    | 82   | 58   |
| PbI (mmHg) | 767  | 769  |
| PT (mmHg)  | -25  | -68  |
| TT (F)     | 82   | 84   |
| Pb (mmHg)  | 767  | 767  |

## Noncondensable Organics-----

|                   |      |      |
|-------------------|------|------|
| PT (Lab) (mmHg)   | -7   | -50  |
| TT (Lab) (F)      | 71   | 82   |
| Pb (Lab) (mmHg)   | 741  | 730  |
| PTF (mmHg)        | 910  | 898  |
| TTF (F)           | 71   | 82   |
| PbF (mmHg)        | 741  | 730  |
| Ba (ppmv C)       | 0.0  | 0.0  |
| Ctm 1 (ppmv C)    | 12.5 | 5.8  |
| Ctm 2 (ppmv C)    | 10.4 | 3.4  |
| Ctm 3 (ppmv C)    | 11.8 | 3.8  |
| Avg. Ctm (ppmv C) | 11.6 | 4.3  |
| RSD Ctm (%)       | 9.2  | 29.7 |

## Condensable Organics-----

|                   |      |      |
|-------------------|------|------|
| ICV Tank No.      | 4T53 | 4T15 |
| ICV Tank, Vv (cc) | 4027 | 4006 |
| PFI (mmHg)        | -711 | -698 |
| TFI (F)           | 71   | 82   |
| PbFI (mmHg)       | 741  | 730  |
| PF (mmHg)         | 914  | 914  |
| TF (F)            | 71   | 81   |
| PbFf (mmHg)       | 741  | 730  |
| Bt (ppmv C)       | 45.0 | 45.0 |
| Ccm 1 (ppmv C)    | 81.0 | 51.0 |
| Ccm 2 (ppmv C)    | 84.4 | 50.8 |
| Ccm 3 (ppmv C)    | 36.1 | 47.6 |
| Avg. Ccm (ppmv C) | 83.8 | 49.8 |
| RSD Ccm (%)       | 3.1  | 3.8  |

## =====

|                                           |        |        |
|-------------------------------------------|--------|--------|
| Total Gaseous Nonmethane Organics (TGNMO) |        |        |
| Vs (cc)                                   | 3793.2 | 3560.1 |
| Dil. Factor (Non-cond)                    | 2.287  | 2.355  |
| Dil. Factor (Condnsble)                   | 2.298  | 2.375  |
| Ct (ppmv C)                               | 26.4   | 10.2   |
| Cc (ppmv C)                               | 89.3   | 11.4   |
| Ct+Cc=C (ppmv C)                          | 115.7  | 21.6   |
| Mc (mg C/dscm)                            | 57.8   | 10.8   |



# Method 25 Analytical Data

Client  
Job #  
Report #  
Page #  
Disk #

ACE  
850810

Plant  
City, State  
Sample location  
Sample operator  
Sample Date

SUGAR GROWER'S CO-OP  
Belle Grande, FL.  
BELLER #8  
CARTER  
1-27-89

## IDENTIFICATION

Run .... ID number  
Tank .... ID number  
Trap .... ID number  
..... ml

Raw Data

Computer Data

|        |
|--------|
| Run 1  |
| 4T1310 |
| 6582   |
| 4049   |

Raw Data

Computer Data

|       |
|-------|
| Run 2 |
| 4T165 |
| 13211 |
| 4029  |

Raw Data

Computer Data

|       |
|-------|
| Run 3 |
| 4T122 |
| 13123 |
| 4016  |

## FIELD DATA

TI ..... mm Hg  
TII ..... deg F  
PbI ..... mm Hg  
T ..... mm Hg  
T ..... deg F  
PbT ..... mm Hg

|      |
|------|
| -762 |
| 58   |
| 770  |
| -111 |
| 75   |
| 767  |

|      |
|------|
| 767  |
| 58   |
| 770  |
| -139 |
| 40   |
| 767  |

|      |
|------|
| -762 |
| 82   |
| 767  |
| -25  |
| 82   |
| 767  |

## LAB DATA

### PURGE

Prep date/Operator  
T ..... mm Hg  
T ..... deg F  
PbT ..... mm Hg  
PTF ..... mm Hg  
TF ..... deg F  
PbF ..... mm Hg

|         |
|---------|
| 1-31 AC |
| 30/30   |
| -60     |
| 83      |
| 730     |
| 441/441 |
| 882     |
| 82      |
| 730     |

|         |
|---------|
| 2/1 Q32 |
| 42/44   |
| -86     |
| 70      |
| 740     |
| 450/450 |
| 406     |
| 70      |
| 740     |

|         |
|---------|
| 2/1 Q32 |
| 2/58    |
| -7      |
| 71      |
| 741     |
| 455/455 |
| 910     |
| 71      |
| 741     |

## LAB DATA

### BURN

Prep date/Operator  
ICV .. Tank number  
TV ..... ml  
FI ..... mm Hg  
TFI ..... deg F  
PbFi ..... mm Hg  
F ..... mm Hg  
F ..... deg F  
PbFf ..... mm Hg  
FA ..... ppm C  
T ..... ppm C

|         |
|---------|
| 1-31 AC |
| 4T162   |
| 4003    |
| 350/353 |
| -103    |
| 82      |
| 730     |
| 457/457 |
| 914     |
| 82      |
| 730     |

|         |
|---------|
| 2/1 Q32 |
| 4T16    |
| 4011    |
| 354/357 |
| -711    |
| 70      |
| 740     |
| 457/457 |
| 914     |
| 70      |
| 740     |

|         |
|---------|
| 2/1 Q32 |
| 4T53    |
| 4027    |
| 354/357 |
| -711    |
| 71      |
| 741     |
| 457/457 |
| 914     |
| 71      |
| 741     |

## ANALYSIS DATA

CTM 1 ..... ppm C  
CTM 2 ..... ppm C  
CTM 3 ..... ppm C  
Purge standard file  
Date/Operator  
CCM 1 ..... ppm C  
CCM 2 ..... ppm C  
CCM 3 ..... ppm C  
Burn standard file  
Date/Operator

|                |
|----------------|
| 12.0           |
| 18.5           |
| 12.5           |
| S=.00514896563 |
| 138.7          |
| 132.1          |
| 135.4          |
| S=.030989484   |

|                |
|----------------|
| 13.9           |
| 12.5           |
| 13.0           |
| S=.00514896563 |
| 59.6           |
| 55.0           |
| 56.5           |
| S=.030989484   |

|                |
|----------------|
| 12.5           |
| 10.4           |
| 11.8           |
| S=.00514896563 |
| 81.0           |
| 84.4           |
| 86.0           |
| S=.030989484   |

Comments

\* Purge tank<sup>106</sup> contained substantial amount of water

# Method 25 Analytical Data

Client  
Job #  
Report #  
Page #  
Disk #

AOE  
850810  
2

Plant  
City, State  
Sample location  
Sample operator  
Sample Date

SGCD  
Bellevue, FL  
UNIT 8  
CARTER  
1-27-89

Raw Data

Computer Data

Raw Data

Computer Data

Raw Data

Computer Data

## IDENTIFICATION

Run .... ID number  
Tank .... ID number  
Trap .... ID number  
V ..... ml

Blank  
4T106  
B331  
4019

Blank  
B103

## FIELD DATA

PTI ..... mm Hg  
TTI ..... deg F  
bI ..... mm Hg  
TT ..... mm Hg  
TT ..... deg F  
bT ..... mm Hg

-764  
58  
769  
-168  
84  
767

## LAB DATA

### PURGE

Prep date/Operator  
T ..... mm Hg  
TT ..... deg F  
PbT ..... mm Hg  
TF ..... mm Hg  
TTF ..... deg F  
PbF ..... mm Hg

1-31 AC  
25/25  
-50  
82  
730  
898  
82  
730

## LAB DATA

### BURN

Prep date/Operator  
CV .. Tank number  
V ..... ml  
PFI ..... mm Hg  
TFI ..... deg F  
bFi ..... mm Hg  
PF ..... mm Hg  
TF ..... deg F  
PbFf ..... mm Hg  
BA ..... ppm C  
BT ..... ppm C

1-31 AC  
4715  
4006  
353/345  
-698  
82  
730  
457/457  
914  
81  
730

21, QED  
4791  
4029  
348/350  
-698  
72  
741  
457/457  
914  
72  
741

## ANALYSIS DATA

CTM 1 ..... ppm C  
CTM 2 ..... ppm C  
CTM 3 ..... ppm C  
Purge standard file  
Date/Operator  
CCM 1 ..... ppm C  
CCM 2 ..... ppm C  
CCM 3 ..... ppm C  
Burn standard file  
Date/Operator

5.8  
3.4  
3.8  
S=00514896563  
51.0  
50.8  
47.6  
S=030989464

49.9  
38.0  
47.3  
S=1030989464

Comments

APPENDIX C  
FIELD DATA SHEETS

## VOLATILE ORGANIC CARBON BY METHOD 25

Facility: Sugar Grower's Co-op Sample Location: UNIT 8  
Location: BELGLADE, FL. Operator: CARTER  
Date: 1-27-89 Run number: B BLANK  
Tank number: 4T106 Trap number: B31 Sample ID: ~~3CAF~~

B-CALF

| PRESSURE<br>READINGS | TANK VACUUM        |                      | BAROMETRIC<br>PRESSURE,<br>mm Hg/in Hg | AMBIENT<br>TEMPERATURE,<br>C/F |
|----------------------|--------------------|----------------------|----------------------------------------|--------------------------------|
|                      | Manometer<br>mm Hg | Gauge<br>cm Hg/in Hg |                                        |                                |
| PRETEST              | 30.1               |                      | 30.3                                   | 58                             |
| POST TEST            | 2.7                |                      | 30.2                                   | 84                             |

| LEAK RATE | TANK<br>cm Hg/10 min | TRAP<br>Flowmeter reading (black ball) |
|-----------|----------------------|----------------------------------------|
| PRETEST   |                      |                                        |
| POST TEST |                      |                                        |

[illegible]

SAMPLING TRAIN ID# \_\_\_\_\_

%CO2 \_\_\_\_\_

SIDE: Left/Right  
voc25 - 6/11/87

%H<sub>2</sub>O \_\_\_\_\_

## VOLATILE ORGANIC CARBON BY METHOD 25

Facility: SCGC Sample Location: Boiler #8  
 Location: Belle Glade FL Operator: Carter  
 Date: 1-27-89 Run number: 1  
 Tank number: 47136 Trap number: B52 Sample ID: CAE18

| PRESSURE READINGS | TANK VACUUM     |                   | BAROMETRIC PRESSURE, mm Hg/in Hg | AMBIENT TEMPERATURE, C/F |
|-------------------|-----------------|-------------------|----------------------------------|--------------------------|
|                   | Manometer mm Hg | Gauge cm Hg/in Hg |                                  |                          |
| PRETEST           | 30.0            | 30                | 30.30                            | 58°F                     |
| POST TEST         | 4.4             | 4.0               | 30.20                            | 75°F                     |

| LEAK RATE | TANK         | TRAP                           |
|-----------|--------------|--------------------------------|
|           | cm Hg/10 min | Flowmeter reading (black ball) |
| PRETEST   | 0.00         | 0.00                           |
| POST TEST | 0.00         | 0.00                           |

| TIME CLOCK/SAMPLE | GAUGE VACUUM cm Hg | FLOWMETER SETTING (silver ball) | COMMENTS |
|-------------------|--------------------|---------------------------------|----------|
| 0925              | 30                 | 70                              |          |
| 0930              | 28                 | 70                              |          |
| 0935              | 25                 | 70                              |          |
| 0940              | 23                 | 70                              |          |
| 0945              | 20                 | 70                              |          |
| 0950              | 18                 | 70                              |          |
| 0955              | 15                 | 70                              |          |
| 1000              | 13                 | 70                              |          |
| 1005              | 11                 | 70                              |          |
| 1010              | 9                  | 70                              |          |
| 1015              | 7                  | 70                              |          |
| 1020              | 6                  | 70                              |          |
| 1025              | 4                  | 70                              |          |
|                   |                    |                                 |          |
|                   |                    |                                 |          |
|                   |                    |                                 |          |

SAMPLING TRAIN ID# CAE 12  
 DE: Left/Right LEFT  
 c25 - 6/11/87

%CO2 \_\_\_\_\_  
 %H2O \_\_\_\_\_

## VOLATILE ORGANIC CARBON BY METHOD 25

CA

Facility: \_\_\_\_\_ Sample Location: Boiler II8  
 Location: Belle Glades FIA Operator: Carter  
 Date: 1-27-89 Run number: 1  
 Tank number: 4765 Trap number: B211 Sample ID: CAE2

| PRESSURE READINGS | TANK VACUUM     |                   | BAROMETRIC PRESSURE, mm Hg/in Hg | AMBIENT TEMPERATURE, C/F |
|-------------------|-----------------|-------------------|----------------------------------|--------------------------|
|                   | Manometer mm Hg | Gauge cm Hg/in Hg |                                  |                          |
| PRETEST           | <u>30.2</u>     | <u>30</u>         | <u>30.3</u>                      | <u>580</u>               |
| POST TEST         | <u>5.5</u>      | <u>3.0</u>        | <u>30.2</u>                      | <u>90°F</u>              |

| LEAK RATE | TANK         | TRAP                           |
|-----------|--------------|--------------------------------|
|           | cm Hg/10 min | Flowmeter reading (black ball) |
| PRETEST   | <u>0.00</u>  | <u>0.00</u>                    |
| POST TEST | <u>0.0</u>   | <u>0.00</u>                    |

| TIME CLOCK/SAMPLE | GAUGE VACUUM cm Hg | FLOWMETER SETTING (silver ball) | COMMENTS |
|-------------------|--------------------|---------------------------------|----------|
| <u>1155</u>       | <u>30</u>          | <u>70</u>                       |          |
| <u>1200</u>       | <u>28</u>          | <u>70</u>                       |          |
| <u>1205</u>       | <u>26</u>          | <u>70</u>                       |          |
| <u>1210</u>       | <u>24</u>          | <u>70</u>                       |          |
| <u>1215</u>       | <u>21</u>          | <u>70</u>                       |          |
| <u>1220</u>       | <u>18</u>          | <u>70</u>                       |          |
| <u>1225</u>       | <u>17</u>          | <u>70</u>                       |          |
| <u>1230</u>       | <u>15</u>          | <u>70</u>                       |          |
| <u>1235</u>       | <u>13</u>          | <u>70</u>                       |          |
| <u>1240</u>       | <u>11</u>          | <u>70</u>                       |          |
| <u>1245</u>       | <u>9</u>           | <u>70</u>                       |          |
| <u>1250</u>       | <u>7</u>           | <u>70</u>                       |          |
| <u>1255</u>       | <u>4</u>           | <u>70</u>                       |          |
|                   |                    |                                 |          |
|                   |                    |                                 |          |
|                   |                    |                                 |          |

SAMPLING TRAIN ID# ACE 15

%CO2 \_\_\_\_\_

DE: Left/Right  
625 - 6/11/87Right

%H2O \_\_\_\_\_

# VOLATILE ORGANIC CARBON BY METHOD 25

|                                   |                                                    |
|-----------------------------------|----------------------------------------------------|
| Facility: _____                   | Sample Location: <u>Boiler #8</u>                  |
| Location: <u>Relle Glacier Pk</u> | Operator: <u>Carter</u>                            |
| Date: <u>1-27-84</u>              | Run number: <u>3</u>                               |
| Tank number: <u>4T122</u>         | Trap number: <u>E-123</u> Sample ID: <u>CKE 23</u> |

| PRESSURE READINGS | TANK VACUUM        |                      | BAROMETRIC PRESSURE,<br>mm Hg/in Hg | AMBIENT TEMPERATURE,<br>C/F |
|-------------------|--------------------|----------------------|-------------------------------------|-----------------------------|
|                   | Manometer<br>mm Hg | Gauge<br>cm Hg/in Hg |                                     |                             |
| PRETEST           | 30.0               | 30                   | 30.2                                | 82                          |
| POST TEST         | 1.0                | 1.0                  | 30.2                                | 82                          |

| LEAK RATE | TANK         | TRAP                           |
|-----------|--------------|--------------------------------|
|           | cm Hg/10 min | Flowmeter reading (black ball) |
| PRETEST   | 0.00         | 0.00                           |
| POST TEST | 0.00         | 0.00                           |

| TIME<br>CLOCK/SAMPLE | GAUGE VACUUM<br>cm Hg | FLOWMETER SETTING<br>(silver ball) | COMMENTS |
|----------------------|-----------------------|------------------------------------|----------|
| 1415                 | 30                    | 70                                 |          |
| 1420                 | 27                    | 70                                 |          |
| 1425                 | 25                    | 70                                 |          |
| 1430                 | 23                    | 70                                 |          |
| 1435                 | 20                    | 70                                 |          |
| 1440                 | 17                    | 70                                 |          |
| 1445                 | 14                    | 70                                 |          |
| 1450                 | 11                    | 70                                 |          |
| 1455                 | 9                     | 70                                 |          |
| 1500                 | 7                     | 70                                 |          |
| 1505                 | 4                     | 70                                 |          |
| 1510                 | 2                     | 70                                 |          |
| 1515                 | 0                     | 70                                 |          |
|                      |                       |                                    |          |
|                      |                       |                                    |          |
|                      |                       |                                    |          |

SAMPLING TRAIN ID# 04112

SIDE: Left/Right Left

voc25 - 6/11/87

%CO2 \_\_\_\_\_

%H2O \_\_\_\_\_

APPENDIX D  
PROJECT PARTICIPANTS



PROJECT PARTICIPANTS

ACE

Stephen L. Neck, P.E.

Field Testing  
Report Preparation

Sidney J. Carter

Field Participant

Karie L. Philman

Document Production

SUGARCANE GROWERS COOPERATIVE OF FLORIDA

Enrique R. Arias, Executive Vice-President

Test Coordinator

RESEARCH TRIANGLE LABORATORIES

John Y. Morimoto, Ph.D.

EPA Method 25 Analysis

CLEAN AIR ENGINEERING

James F. Dowse

EPA Method 25 Analysis

SOUTH FLORIDA ENVIRONMENTAL SERVICES

Bill Arlington

EPA Method 1-4 Sampling

FDER

Ken Tucker

Test Observer

Bill  
I believe this is  
what we need.  
dan



May 7, 1981

HAND DELIVERY

Mr. Clair Fancy  
Chief, Permitting Section  
Bureau of Air Quality Management  
Department of Environmental Regulation  
Twin Towers  
2600 Blair Stone Road  
Tallahassee, FL 32301

Re: Boiler No. 8/Sugar Cane Growers Cooperative/  
Federal PSD Permit Application

Dear Mr. Fancy:

Pursuant to our conversation at the meeting today, we are herewith requesting that the Florida Department of Environmental Regulation process the Permit Application and Prevention of Significant Deterioration Report, dated April, 1981, as an application for a federal PSD permit. It is our understanding that this application will be processed concurrently with the application for a Florida PSD permit, supported by the same document, filed on April 24, 1981 with the South Florida District Office of the Department. We intend to supplement both of these applications in the near future with a proposed compliance plan.

Please feel free to call David Buff of Environmental Science and Engineering or Bill Green with any questions you might have with regard to the attached.

Your continued cooperation in the expeditious processing of this application is greatly appreciated.

Very truly yours,

Enrique R. Arias  
Executive Vice President  
Sugar Cane Growers Cooperative  
of Florida  
Post Office Box 666  
Belle Glade, Florida 33430

djp

cc: Michael Martin  
Mirza P. Baig  
Steve Smallwood

RECEIVED

APR 28 1981

DEPARTMENT OF ENVIRONMENTAL REGULATION

DIVISION ROUTING AND TRANSMITTAL SLIP  
ENVIRONMENTAL PERMITTING

ACTION NO.

ACTION DUE DATE

1. TO: (NAME, OFFICE, LOCATION)

Steve Smallwood

INITIAL

DATE

2.

Bill Thomas

INITIAL

DATE

3.

Marshall - Mott Smith

INITIAL

DATE

4.

BAA M - Tallahassee

INITIAL

DATE

REMARKS:

Dear Marshall:

Enclosed, please find 4 copies of the P.S.D. permit application for new Boiler # 8 at Sugar Cane Growers Co Op. Each envelop contains one copy.

Ft. Myers office has its copy and Mr. Arias will hand-deliver a copy to Mike Martin PBCHD today.

If you have any questions please call me.

INFORMATION

REVIEW & RETURN

REVIEW & FILE

INITIAL & FORWARD

DISPOSITION

REVIEW & RESPOND

PREPARE RESPONSE

FOR MY SIGNATURE

FOR YOUR SIGNATURE

LET'S DISCUSS

SET UP MEETING

INVESTIGATE & REPT

INITIAL & FORWARD

DISTRIBUTE

CONCURRENCE

FOR PROCESSING

INITIAL & RETURN

FROM:

Murja Bair.

DATE 4/24/81

PHONE 5.C. 552-7900

STATE OF FLORIDA  
**DEPARTMENT OF ENVIRONMENTAL REGULATION**

TWIN TOWERS OFFICE BUILDING  
2600 BLAIR STONE ROAD  
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM  
GOVERNOR  
VICTORIA J. TSCHINKEL  
SECRETARY

M E M O R A N D U M

TO: Mirza Baig, South Florida District  
Michael Martin, Palm Beach County Health Department  
Larry George, BAQM  
Bob King, BAQM —

FROM: Edward Palagyi, BACT Coordinator

DATE: June 5, 1981

SUBJ: Sugar Cane Growers Cooperative, Draft BACT Determination

Attached is a partial BACT Determination for the subject applicant. Please send your recommended BACT with justification to my attention before June 26, 1981. This is the second recent application received to install a bagasse boiler, the other being Atlantic Sugar Association.

A final determination will be made based on the comments received. Your willingness to be on the BACT review panel for the two bagasse boilers is greatly appreciated.

EP:dav

# Best Available Control Technology (BACT) Determination

## Sugar Cane Growers Cooperative

### Palm Beach County

The proposed installation is a 240,000 pound per hour steam generating unit designed to fire, singly or in combination, Bagasse and/or Bagasse residue. No. 6 fuel oil will be used for start-up and as a supplementary fuel not to exceed 42 barrels per hour. Bagasse is a plant residue remaining from the processing of sugar cane. Bagasse residue is the hydrolysate from the furfural process. Both are burned in the boiler to eliminate a solid waste disposal problem and produce steam required in the processing plant.

The trade uses the terms "Bagasse" and "Residue" to differentiate between the two by-product fuels, which differ in composition. This nomenclature will be used in this determination.

The proposed unit is rated at 504.0, 443.5, 250.0 million Btu heat input when firing 100 percent Bagasse, Residue or No. 6 fuel oil, respectively, and will be designated as Boiler No. 8. The unit is scheduled to operate around-the-clock 7 days per week for a total of 6552 hours at the existing facility located in Belle Glade, Florida.

Emissions when burning 100% residue (dry basis):

| <u>Pollutant</u> | <u>Potential</u> |               | <u>Controlled</u> |               |
|------------------|------------------|---------------|-------------------|---------------|
|                  | <u>lb/hr</u>     | <u>ton/yr</u> | <u>lb/hr</u>      | <u>ton/yr</u> |
| Particulate      | 724.9            | 2374.7        | 88.7              | 290.6         |
| SO <sub>2</sub>  | 398.7            | 1306.1        | 239.2             | 783.6         |
| NO <sub>x</sub>  | 54.4             | 178.2         | 54.4              | 178.2         |

Page Two

Burning 100% bagasse (dry basis):

| <u>Pollutant</u> | <u>Potential</u> |        | <u>Controlled</u> |        |
|------------------|------------------|--------|-------------------|--------|
|                  | lb/hr            | ton/yr | lb/hr             | ton/yr |
| Particulate      | 1120.0           | 3669.1 | 100.8             | 330.2  |
| SO <sub>2</sub>  | 126.0            | 412.8  | 75.6              | 247.7  |
| NO <sub>x</sub>  | 84.0             | 275.2  | 84.0              | 275.2  |

Burning fuel oil at maximum 42 bbl/hr.

|                 |       |       |       |       |
|-----------------|-------|-------|-------|-------|
| Particulate     | 22.9  | 75.0  | 25.0  | 81.9  |
| SO <sub>2</sub> | 276.9 | 907.1 | 276.9 | 907.1 |
| NO <sub>x</sub> | 105.8 | 346.6 | 105.8 | 346.6 |
| HC              | 1.8   | 5.9   | 1.8   | 5.9   |
| CO              | 8.8   | 28.8  | 8.8   | 28.8  |

BACT Determination Requested by the Applicant:

| <u>Pollutant</u>         | <u>Emission Limit</u>              |
|--------------------------|------------------------------------|
| Particulate              |                                    |
| Bagasse/Residue          | 0.2 lb/million Btu heat input      |
| No. 6 Oil                | 0.1 lb/million Btu heat input      |
| Sulfur Dioxide           |                                    |
| Bagasse                  | 0.15 lb/million Btu heat input     |
| Residue                  | 0.54 lb/million Btu heat input     |
| No. 6 Oil                | 2.10 lb/million Btu heat input     |
| NO <sub>x</sub> , CO, HC | Good firing practice & operation   |
| Visible Emissions        | 30% except 40% up to 2 minutes/hr. |

A Joy Turbulaire Type D impingement scrubber will be used to control particulate emissions. Low sulfur fuel will be used to control SO<sub>2</sub> emissions.

Page Three

Date of Receipt of a BACT Application:

April 27, 1981

Date of Publication in the Florida Administrative Weekly:

May 22, 1981

DER Determination and Justification:

Please send your recommendation for BACT to Ed Palagyi,  
BAQM, by June 26, 1981. A determination will be made  
based on the comments received.

EP:dav

# HOPPING BOYD GREEN & SAMS

ATTORNEYS AND COUNSELLORS  
SUITE 420, LEWIS STATE BANK BUILDING  
POST OFFICE BOX 6526  
TALLAHASSEE, FLORIDA 32301  
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CARLOS ALVAREZ  
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WILLIAM H. GREEN  
WADE L. HOPPING  
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GARY P. SAMS

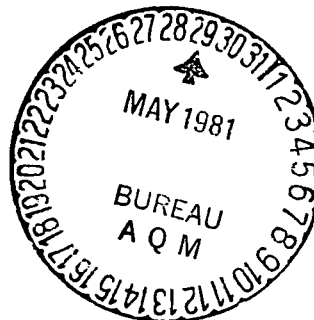
BRIAN H. BIBEAU  
CALVIN J. LIVINGSTON  
WILLIAM D. PRESTON

May 29, 1981

OF COUNSEL,  
W. ROBERT FOKES  
JOHN C. WHITE

HAND DELIVERED THIS DATE

Steve Smallwood, P.E.  
Chief, Bureau of Air Quality Management  
Department of Environmental Regulation  
2600 Blair Stone Road  
Tallahassee, Florida 32301



Re: Air Construction Permit Application, AC-42476

Dear Mr. Smallwood:

Please find attached the response of the Sugar Cane Growers Cooperative (SCGC) to the information request received from yourself by letter dated May 21, 1981. Each of your questions is, in our opinion, fully addressed with the exception of No. 30 relating to assumed background levels of total suspended particulate matter. Representatives of SCGC have discussed this matter with Larry George and Cleve Holladay and have been advised that Question 30 will be the subject of further discussions and an answer to it is not needed at this time for the application to be deemed complete.

It is our understanding that upon receipt of the attached information, the Department can now determine that SCGC's application for the above referenced permit is complete. We request at this time that this determination be made, effective today, and forwarded to us for our files at your convenience. Of course, the primary reason for this request is SCGC's desire to achieve certainty and to avoid delays, in view of changing regulatory requirements.

In order to facilitate your review and to further supplement the application as discussed at our recent meeting, you will also find attached the following three items:

1. Executive Summary of permit application and PSD Report, Sugar Cane Growers Cooperative, Boiler #8.
2. Proposed LAER for Sugar Cane Growers Cooperative, Boiler #8.
3. Proposed method of showing compliance of sulfur dioxide air quality standards.



Steve Smallwood, P.E.  
May 29, 1981  
Page 2

As we have discussed, SCGC is greatly desirous of receiving final approval from the Department in early August, 1981 so that it can make necessary arrangements to construct a facility and bring it on line at the start of the 1982 - 1983 crop season.

We are highly appreciative of the continued cooperation and assistance that is being extended to SCGC by you and your staff and the representatives of the South Florida District and Palm Beach County Health Department. Please do not hesitate to call either me or David Buff of Environmental Science & Engineering if you have any questions with regard to the attached information.

Very truly yours,

A handwritten signature in black ink, appearing to read "Bill Green", written in a cursive style.

William H. Green

WHG/gs  
Enclosure

cc: Mirza Baig, South Florida District  
Michael Martin, Palm Beach County Health Department  
David Buff, Environmental Science & Engineering

RESPONSE TO  
INFORMATION REQUEST  
OF MAY 21, 1981

QUESTION 1

The oil consumption of each boiler is not measured on a routine basis. Only the total low sulfur fuel for Boilers 6 and 7 and the high sulfur fuel for Boilers 1 through 5 are measured as a total for each group. These consumptions are reported in the two accompanying attachments (see Attachment to Question 1).

QUESTION 2

No plant expansions that would increase air pollution emissions are planned in conjunction with the proposed boiler.

QUESTION 3

No, they are not. Only the sketches attached to Questions 23 are available at this time. Final design and application will be completed as soon as the Department makes a determination to approve this application.

QUESTION 4

Section II.F should be corrected to read 7 days per week operation. The source operates seasonally, generally November through March. The permit is based on a 184-day crop season to provide worst-case estimates and to cover all conceivable future operations. A corrected Page 2 of 10 is attached.

QUESTION 5

See attached performance sheet. Reported boiler efficiencies are ideal and are not realized in practice.

QUESTION 6

Although some removal of SO<sub>2</sub> from fuel oil combustion probably occurs, there have been no tests to document this; thus, no removal from fuel oil emissions was considered. The 40-percent figure for reduction from theoretical emissions from bagasse and residue combustion is based on stack tests carried out at three sites on four separate occasions; all these tests are documented in Attachment C. To our knowledge, no

other SO<sub>2</sub>-specific testing has been performed on bagasse- or residue-fired boilers.

Concerning the inlet/outlet test on SCGC Boiler 2, Attachment C states "The scrubber itself is seen to remove 27 percent of its inlet SO<sub>2</sub>, which accounts for 11 percent out of the total 70-percent theoretical loss." In other words, 59-percent of the theoretical sulfur was lost before the scrubber inlet, and of that introduced to the scrubber, 27-percent was removed. It is nowhere implied that the impingement scrubber is capable of 40-percent SO<sub>2</sub> removal. Rather, the 40-percent figure reflects a conservative estimate of total system-wide removal (corresponding to the 70-percent in that particular test), the mechanism of which is not exactly known but is probably a combination of retention in bottom ash, and scrubber removal both in the gaseous state and in particulate form combined with fly ash.

#### QUESTION 7

The attached analyses from Riley Stoker (see Attachment to Question 7) and the analyses reported in Attachment C show that residue sulfur content ranges from 0.4 to 0.5 percent and bagasse sulfur content ranges from 0.1 to 0.2 percent. These results were obtained by analytical procedures measuring total sulfur. Some sulfur is present as sulfate which will not be converted to SO<sub>2</sub>.

The range of theoretical SO<sub>2</sub> loss when burning bagasse and residue is 39 percent to 96 percent. Estimates of SO<sub>2</sub> emissions were calculated assuming a theoretical loss of 40 percent, which is the extreme low end of this range. The mass flow rate of SO<sub>2</sub> emissions was over-estimated for modeling purposes.

No matter what the actual sulfur content of bagasse and residue, or the actual removal percentage of the theoretical SO<sub>2</sub> in these fuels, at any one time, the proposed SO<sub>2</sub> emission limits of 0.54 lb/10<sup>6</sup> Btu for residue, 0.15 lb/10<sup>6</sup> Btu for bagasse, and 2.1 lb/10<sup>6</sup> Btu

for oil will be met. Compliance with the proposed emissions limits will protect ambient air quality.

The attached fuel oil analyses indicate that the assumption of 8.1 lb/gallon and 17,500 Btu/lb result in greater SO<sub>2</sub> emissions per Btu heat input than would be obtained with the actual density and heat content (see Attachment to Question 7). Thus, the figures used in the report are again conservative estimates.

#### QUESTION 8

The corrected calculations are given in the attached revisions to Attachment A. In addition, Section III C of the permit should be revised to show actual NO<sub>x</sub> emissions of 239.6 tons per year (TPY). A revised Page 3 of 10 is attached.

#### QUESTION 9

The fuel actually burned in Boiler 8 will be 1.8-percent sulfur, and the emissions from oil specifically from Boiler 8 will be 1.8 times those calculated in Attachment A:

#### MAXIMUM OIL CONSUMPTION

|                                                      |                                   |
|------------------------------------------------------|-----------------------------------|
| 1,764 gal/hr x 157 (1.8) lb/10 <sup>3</sup> gal =    | 498.5 lb SO <sub>2</sub> /hr      |
| 13,879 lb/hr residue to provide remaining capacity = | <u>66.6 lb SO<sub>2</sub>/hr</u>  |
| Maximum SO <sub>2</sub> emissions =                  | <u>565.1 lb SO<sub>2</sub>/hr</u> |

#### POTENTIAL (UNCONTROLLED) EMISSIONS

|                                                            |                                   |
|------------------------------------------------------------|-----------------------------------|
| 1,764 gal fuel oil/hr =                                    | 498.5 lb SO <sub>2</sub> /hr      |
| 13,879 lb/hr residue, no SO <sub>2</sub> loss considered = | <u>110.0 lb SO<sub>2</sub>/hr</u> |
|                                                            | <u>608.5 lb SO<sub>2</sub>/hr</u> |
|                                                            | <u>2,220 TPY</u>                  |

ACTUAL EMISSIONS

Crop Season:

Residue = 387.9 TPY

Bagasse = 39.7 TPY

Fuel Oil (22.2 x 1.8) = 40.0 TPY

Off Season:

Residue = 335.4 TPY

Fuel Oil (14.5 x 1.8) = 26.1 TPY

Total = 829.1 TPY SO<sub>2</sub>

In practice, sufficient oil of 1-percent sulfur content will be purchased to provide for the oil consumption of Boilers 6, 7, and 8, and 2.4-percent sulfur oil in Boilers 1 through 5. These fuels will be blended and burned in all boilers. While the specific SO<sub>2</sub> emission rate of Boiler 8 is reflected in preceding figures, the actual plant-wide increase in SO<sub>2</sub> emissions is correctly reflected under the actual emissions heading in Attachment A as is.

QUESTION 10

The working capacity of the fuel oil storage tank is 400,000 gallons. The design capacity of the existing fuel oil pump and heater is 60 GPM per set. There are two identical sets. One is used continuously while the other one is used as a spare. If required, both sets could operate at the same time with a total capacity of 120 GPM. This is the maximum amount of fuel oil that could be pumped to all boilers, including new Boiler 8.

QUESTION 11

The fuel mix used for SO<sub>2</sub> modeling is worse than the mix actually fired. During the crop season, the present boilers (1 through 7) consume 600 to 800 tons of residue per day and approximately 25,000 gallons of fuel oil per day. Table A-3 shows that Boilers 1 through 7 were modeled at 1,060 tons residue and 37,600 gallons of fuel oil per day to provide a substantial margin of safety.

Attachment A shows how boiler efficiency varies for each type of fuel burned according to the firing characteristics of that fuel. Accordingly, to produce a given amount of steam, the heat input from a low efficiency fuel must be greater than from a fuel which burns with a higher efficiency.

Heat input to the boiler is not directly controlled; rather, the feed rate of each fuel, which is directly related to heat input from that fuel, is varied as necessary according to availability and required steam production rates. The fuels, in order of preference, are: residue, bagasse, and fuel oil.

#### QUESTION 12

Bagasse is carried directly from the mills to the boilers by drag-type conveyors. It is fed into each boiler through variable speed rotary feeders, which are mechanical drums that deliver the bagasse to the furnaces.

Residue is carried from the furfural plant to temporary storage bins by belt conveyors. From there it is carried by screw conveyors and finally fed into each boiler through variable speed screw feeders.

Fuel oil is measured with volumetric flowmeters. The residue going to the boiler plant is weighed on belt scales. The bagasse itself is not measured. It is calculated by means of a heat balance, which takes into consideration the total steam generated and the steam generated by each different kind of fuel.

#### QUESTION 13

The SO<sub>2</sub> emissions tests at US Sugar Clewiston were conducted during the 1979 to 1980 crop season. The results are contained in Table C-1 of Attachment C under the "average" column.

QUESTION 14

As stated in Attachment D, the efficiency of particulate removed for an ESP or baghouse on bagasse/residue/oil-fired boilers is not known; no test data are available. It was assumed that the efficiency would be 91 percent or greater. So that cost effectiveness on an equal basis could be evaluated, operational costs at control efficiencies achievable by scrubbers were assumed. Since no economic superiority was shown at this level of control, analysis at higher efficiencies, where costs would be higher, was not carried out. Information about particle size distribution from the boiler is not available.

QUESTION 15

A fan full-operating curve is not available at this time. However the fan that we intend to purchase in the near future has the following characteristics:

|                               | <u>Fan Design</u> |
|-------------------------------|-------------------|
| Pounds of flue gas per hour   | 619,200           |
| Flue gas temperature, °F      | 520               |
| Flue gas volume, CFM          | 272,700           |
| Total static i.w.g.           | 27.45             |
| Fan R.P.M.                    | 880               |
| Horsepower input to fan shaft | 1,738             |

Buffalo Forge Company, Size 2175, Type H-14; Arrgt. 3; double inlet, double width, independent pedestals, outlet damper, inlet damper, scroll liners, blade liners.

Fan driven by a steam turbine. Dual shaft extension for future motor.

QUESTION 16

No additives will be used in oil burned in the new boiler.



Boilers 6 and 7 are using BETZ 81-C fuel oil additive at the rate of 1 pint per 1,000 gallons of oil.

QUESTION 17

Furfural may be produced from a number of plant materials containing pentosans. In the case of bagasse, more than 90 percent of the pentosans are xylan. On acid hydrolysis, the xylan yields xylose, which subsequently loses three water molecules to form furfural. Other volatile organic materials are produced simultaneously.

The ash content increases for two reasons: (1) loss of organic material translates into an increase in percentage of ash, and (2) carbonate radicals are converted to the heavier sulfate radicals in the process.

The sulfur content increases because sulfuric acid is one of the acids used for the hydrolysis.

QUESTION 18

See attached Tables 18A and 18B.

QUESTION 19

The storage and transfer of excess bagasse is going to be achieved by the methods which are standard throughout the sugar industry.

Fugitive particulate matter emissions, if any, will be controlled by the same method used in our present operation (i.e., covering all belt conveyors, enclosing all transfer points, and periodically wetting the bagasse pile).

QUESTION 20

The only letter of performance of the scrubbers obtained from Joy Manufacturing Company is the attached letter dated February 8, 1974 (see Attachment to Question 20). Grain loadings to the scrubbers are of questionable value because of the variability of their magnitude.

Therefore, the guarantee was impossible to enforce. Since that letter was written, many improvements and modifications have been made in the design and operation of the Joy scrubbers installed in the Florida sugar industry. The performance obtainable by the scrubber under Florida conditions is reflected in the many compliance tests conducted during the past 6 years. We have never been able to obtain from Joy any other commitments on their part, except those contained in the above letter and in their literature on the subject which has been attached to the application. Scrubber performance in relation to particle size cannot be directly related to boiler heat input.

QUESTION 21

See sketch (Attachment to Question 21).

QUESTION 22

See sketch (Attachment to Question 22).

QUESTION 23

See sketch (Attachment to Question 23).

QUESTION 24

The efficiency curves for the mechanical dust collection are attached (see Attachment to Question 24). These correspond to inlet loadings from 2 to 5 grains per cubic foot. The outlet loading will be affected by change in particle size. However, the final emission from the scrubbers seem to be independent of the installation of a mechanical dust collector, as shown by the boilers at the SCGC mill, which have been permitted with and without mechanical collectors.

As stated before, this unit is being installed for the sole purpose of protecting the induced draft fan, not as a particulate control device.

The approximate total cost of this dust collector will be \$80,000.

QUESTION 25

See sketch (Attachment to Question 25).

QUESTION 26

The flow rates in Table 2-4 are based on calculations in Appendices A and B of the PSD report. The calculations in Appendices A and B are based on plant records and manufacturer's performance data. It is not known on what basis the flow rates given in the original permits were determined.

QUESTION 27

PARTICULATE SOURCES

The sugar industry sources of particulate matter which were omitted in the TSP modeling are package oil-fired units whose particulate emissions are negligible compared to the emissions from nonfossil fuel combustion. All sources in the direction of maximum impact are accounted for. Under meteorological conditions aligning the surrounding sources with SCGC, none of these facilities contributed more than  $2 \text{ ug/m}^3$  to the TSP concentration in the area of impact of the proposed SCGC boiler; this contribution is included in all reported impact values. Including the package unit emissions would not alter the results of the interaction analysis.

Both Pratt & Whitney and FPL Martin are greater than 35 km from the SCGC mill. Pratt & Whitney's emission rate was considered too low to have a significant effect at this range, and previous modeling experience indicates that the effect of FPL Martin's particulate emissions at this range and in the interacting direction would be less than  $2 \text{ ug/m}^3$  (24-hour).

Moore Haven Sugar Mill is no longer operating. ?

#### SULFUR DIOXIDE SOURCES

Talisman Sugar Boiler 4 was not omitted (see Page 60 of Appendix C, Source No. 138). SO<sub>2</sub> emissions from GCI and City of Pahokee sources were omitted because their low emission rate and high stack exit temperature preclude any significant ground level impacts.

Both Pratt & Whitney and FPL Martin are greater than 35 km from the SCGC mill. Pratt & Whitney's emission rate was considered too low to have a significant effect at this range, and previous modeling experience indicates that the effect of FPL Martin's SO<sub>2</sub> emissions at this range and in the interacting direction would be less than 10 ug/m<sup>3</sup> (24-hour).

The sugar industry sources were omitted from SO<sub>2</sub> interaction modeling because theoretical emissions of SO<sub>2</sub> from bagasse combustion are generally less than the permitted allowable emissions of particulate matter, and the maximum interactive TSP contribution found was less than 2 ug/m<sup>3</sup>. The inventory published in the 1980 Palm Beach County Annual Report shows that even when oil consumption is considered, and theoretical SO<sub>2</sub> emissions are assumed, that SO<sub>2</sub> emission from the mills would not contribute more than 4 ug/m<sup>3</sup> of SO<sub>2</sub> on a 24-hour basis in the area of impact of SCGC. Stack tests discussed previously indicate that actual SO<sub>2</sub> emissions from these sources are significantly less than reported in the Palm Beach County inventory.

SO<sub>2</sub> emissions from the Florida Refinery Kiln (Pt. 03) were not listed in APIS 1981; the emission rate input to the refined grid model run for the other points at this facility is actually greater than that given for the total source in the 1981 Palm Beach County Annual report.

#### QUESTION 28

No Question 28 found.

QUESTION 29

The stack diameter for the modified Boilers 6 and 7 configuration is 7.0 feet (2.13 meters). The computer modeling is not affected, as the modeled exit velocity results in the same volumetric flow rate and plume rise.

The position of Everglades Refinery relative to SCGC should be 0 meters north and 19,000 meters east. The results of the refined modeling will not be affected, since critical meteorology causes greatest impacts in a direction not influenced by this facility during that 24-hour or 3-hour period.

QUESTION 30

A response to this question is being prepared, however, we understand through conversation with Larry George and Cleve Holladay that although this is a subject for further discussion it is not necessary for the application to be deemed complete.

ATTACHMENT TO QUESTION 1  
SUGAR CANE GROWERS COOPERATIVE OF FLORIDA

#1

Monthly Fuel Oil Consumption for Year 1980

| <u>Month</u>                | <u>Boilers #6 &amp; 7</u><br><u>Low Sulfur Fuel Oil</u><br><u>(Gals.)</u>       | <u>Boilers #1, 2, 3, 4 &amp; 5</u><br><u>Fuel Oil</u><br><u>(Gals.)</u> |
|-----------------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Jan. 1 - 27'80              | 348,770                                                                         | 357,502                                                                 |
| 1/28 - Feb. 24'80           | 288,560                                                                         | 301,333                                                                 |
| 2/25 - Mar. 30'80           | 455,120                                                                         | 401,405                                                                 |
| 3/31 - Apr. 3'80            | 26,340                                                                          | 76,222                                                                  |
| Nov. 1 - 30'80              | 292,740                                                                         | 110,433                                                                 |
| Dec. 1 - 31'80              | 332,700                                                                         | 101,801                                                                 |
| TOTAL                       | <u>1,744,230</u>                                                                | <u>1,348,696</u>                                                        |
|                             | Average S % = <span style="border: 1px solid black; padding: 2px;">1.6 %</span> |                                                                         |
| Apr. 4 through Jun. 21'80 * | --0--                                                                           | <u>318,140</u>                                                          |
| GRAND TOTAL                 | 1,744,230                                                                       | <u>1,666,836</u>                                                        |

\* Off-season operation by the furfural plant.

$$1,667 \text{ gals/hr} \times 24 = 40,000 \text{ gals/day} \times 300 \text{ day} \\ = 12,000,000 \text{ gal/yr}$$

AOV:mg  
5/26/81

ATTACHMENT TO QUESTION 1  
SUGAR CANE GROWERS COOPERATIVE OF FLORIDA

#1

Monthly Fuel Oil Consumption for Year 1979

| <u>Month</u>       | <u>Boilers #6 &amp; 7</u><br><u>Low Sulfur Fuel Oil</u><br>(Gals.) | <u>Boilers #1, 2, 3, 4 &amp; 5</u><br><u>Fuel Oil</u><br>(Gals.) |
|--------------------|--------------------------------------------------------------------|------------------------------------------------------------------|
| Jan. 1 - 28'79     | 389,595                                                            | 78,170                                                           |
| 1/29 - Feb. 25'79  | 414,165                                                            | 100,594                                                          |
| 2/26 - Mar. 25'79  | 365,180                                                            | 142,762                                                          |
| 3/26 - Apr. 3'79   | 77,260                                                             | 59,704                                                           |
| Nov. 1 - 25'79     | 289,850                                                            | 140,398                                                          |
| 11/26 - Dec. 31'79 | <u>428,581</u>                                                     | <u>136,065</u>                                                   |
| TOTAL              | <u>1,964,631</u>                                                   | <u>657,693</u>                                                   |

$3 + 2 = 5$   
 $\frac{5.6}{4} = 1.4$   
 $1.4 \times 2.6 = 3.64$

## 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.

Addition of 240,000-lb/hr rated steam capacity boiler capable of burning  
bagasse, bagasse residue, and oil. Modification of existing plant along with new  
source will result in net air quality improvement and full compliance (see Project  
description Section 1.0 of PSD report).

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

Start of Construction July 1981 Completion of Construction November 1982

- 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.)

Scrubber system for new boiler (including ducts, fans, ports, etc.): \$1.1 to 1.6 million  
Boiler No.4 stack modification: \$200,000.  
Boilers No.6 and No.7 stack modification: \$175,000.

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

NA - New emission point

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 39 ; if power plant, hrs/yr \_\_\_\_\_ ;  
 if seasonal, describe: Source operates during crop season, generally November through March  
May also operate on occasion during off season (October, April, May, and June)

- 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, ozone

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

NA

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

NA

c. If yes, list non-attainment pollutants.

Ozone

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI.

Yes

3. Does the State "Prevention of Significant Deterioration" (PSD) 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.



ATTACHMENT TO QUESTION 5

Predicted performance data - One steam generating unit, 240,000 lbs. of steam per hour maximum continuous capacity; 400 psig operating pressure; 240 F feedwater; steam temperature 550 F.  
 Fuel - Bagasse: Moist. 54.00; Ash 0.69; 3,856 Btu per pound; C 21.27; O 21.10; H 2.94  
 #6 Oil: C 87.00; H 10.50; S 1.50; N 0.30; O 0.60; Ash 0.10; 18,500 Btu per pound  
 Furfural Residue (Future): C 31.80; H 3.12; S 0.36; O 22.98; Ash 1.74; Moist. 40.00;  
 5,394 Btu per pound

|                                                                        | Oil     | Bagasse | Residue (Future) |         |
|------------------------------------------------------------------------|---------|---------|------------------|---------|
|                                                                        |         |         |                  | 2 Hours |
| 1. Pounds of steam per hour actual evap.                               | 240,000 | 240,000 | 240,000          | 264,000 |
| 2. K Btu in steam above F.W. temp.                                     | 253,135 | 256,195 | 254,683          | 280,484 |
| 3. Temp. of gases leaving furnace, F                                   | 1,775   | 1,760   | 1,730            | 1,775   |
| 4. % excess air in boiler exit gases                                   | 15      | 40      | 40               | 40      |
| 5. Temp. of boiler exit gases, F                                       | 650     | 725     | 690              | 715     |
| 6. Temp. of economizer exit gases                                      | 570     | 650     | 615              | 635     |
| 7. Temp. of air heater exit gases, F                                   | 340     | 450     | 410              | 425     |
| 8. Temp. of air ent. heater (room temp.) F                             | 80      | 80      | 80               | 80      |
| 9. Temp. of air leaving heater, F                                      | 346     | 463     | 428              | 437     |
| 10. Total steam temp. leaving superheater, F                           | 530     | 550     | 540              | 542     |
| 11. Steam pressure drop thru superheater, psi                          | 19      | 19      | 19               | 23      |
| 12. Boiler drum pressure, psig                                         | 419     | 419     | 419              | 423     |
| 13. Furnace draft                                                      | .25     | .25     | .25              | .25     |
| 14. Draft loss thru blr., superheater, and econ.                       | .91     | 2.85    | 2.00             | 2.45    |
| 15. Draft loss thru air heater                                         | .57     | 1.80    | 1.26             | 1.55    |
| 16. Draft loss thru scrubber & D.C.                                    | 3.15    | 9.92    | 6.95             | 8.53    |
| 17. Draft loss thru ducts & dampers                                    | .45     | 1.43    | 1.00             | 1.23    |
| 18. Total static suction at fan (i.w.g.)                               | 5.33    | 16.25   | 11.46            | 14.01   |
| 19. Air pressure drop thru air heater                                  | 1.05    | 2.30    | 1.87             | 2.29    |
| 20. Air pressure drop thru ducts & dampers (including air measurement) | 1.86    | 2.00    | 1.63             | 1.99    |
| 21. Air pressure drop thru firing equipment                            | 4.10    | 3.10    | 2.52             | 3.08    |
| 22. Total static pressure at fan (i.w.g.)                              | 7.01    | 7.40    | 6.02             | 7.36    |
| 23. Pounds of fuel per hour                                            | 15,688  | 111,740 | 66,529           | 73,946  |
| 24. Pounds of air per hour                                             | 248,500 | 368,500 | 332,000          | 367,500 |
| 25. Pounds of gas per hour leaving unit                                | 264,000 | 469,000 | 392,500          | 435,000 |
| 26. Overall efficiency complete unit                                   | 87.22   | 59.46   | 70.97            | 70.32   |
| 27. Heat release in furnace Btu/cu.ft./hr.                             | 13,750  | 19,840  | 16,680           | 18,500  |
| 28. Heat release in furnace Btu/sq.ft./hr.                             | 68,450  | 80,100  | 74,700           | 83,100  |
| 29. K Btu per sq.ft. grate surface per hour                            | --      | 775     | 652              | 723     |

HEAT BALANCE %

|                                            |       |       |       |       |
|--------------------------------------------|-------|-------|-------|-------|
| 30. Dry flue gas loss at exit              | 5.33  | 8.66  | 8.16  | 8.54  |
| 31. Loss due to hydrogen and fuel moisture | 5.92  | 25.25 | 15.11 | 15.20 |
| 32. Loss due to moisture in air            | .18   | .28   | .26   | .27   |
| 33. Loss due to radiation                  | .35   | .35   | .35   | .32   |
| 34. Loss due to unburned combustibles      | --    | 4.50  | 3.65  | 3.85  |
| 35. Manufacturer's margin                  | 1.00  | 1.50  | 1.50  | 1.50  |
| 36. Total losses                           | 12.78 | 40.54 | 29.03 | 29.68 |
| 37. Efficiencies of complete unit          | 87.22 | 59.46 | 70.97 | 70.32 |

The unit consists of RX-35 boiler, H.S. 23,500 sq.ft.; projected waterwalls, H.S. 3585 sq.ft.; air heater, H.S. 29,400 sq.ft.; superheater for 550 F; traveling grate spreader stoker 24 x 24, 540 sq.ft.; 3 #4 Riley burners; furnace volume 21,100 cu.ft.; furnace area 4200 sq.ft.  
 Drawing LP-2377

RILEY STOKER CORPORATION  
 WORCESTER, MASSACHUSETTS

1/23/81 W.J.W.  
 2/25/81 REVISED W.J.W.  
 3/2/81 REVISED W.J.W.  
 4/2/81 REVISED W.J.W.  
 4/15/81

ATTACHMENT TO QUESTION 5  
SUGAR CANE GROWERS COOPERATIVE OF FLORIDA  
BELLE GLADE, FLORIDA

Bagasse (2 hours)

|                                                                           |         |
|---------------------------------------------------------------------------|---------|
| 1. Pounds of steam per hour actual evap.                                  | 264,000 |
| 2. K Btu in steam above F.W. temp.                                        | 282,150 |
| 3. Temp. of gases leaving furnace, F.                                     | 1,805   |
| 4. % excess air in boiler exit gases                                      | 40      |
| 5. Temp. of boiler exit gases, F                                          | 750     |
| 6. Temp. of economizer exit gases                                         | 670     |
| 7. Temp. of air heater exit gases, F.                                     | 465     |
| 8. Temp. of air ent. heater (room temp.) F.                               | 80      |
| 9. Temp. of air leaving heater, F.                                        | 473     |
| 10. Total steam temp. leaving superheater, F                              | 553     |
| 11. Steam pressure drop thru superheater, psi                             | 23      |
| 12. Boiler drum pressure, psig                                            | 423     |
| 13. Furnace draft                                                         | 25      |
| 14. Draft loss thru blr., superheater, and econ.                          | 3.49    |
| 15. Draft loss thru air heater                                            | 2.21    |
| 16. Draft loss thru scrubber & D.C.                                       | 12.18   |
| 17. Draft loss thru ducts & dampers                                       | 1.76    |
| 18. Total static suction at fan (i.w.g.)                                  | 19.89   |
| 19. Air pressure drop thru air heater                                     | 2.82    |
| 20. Air pressure drop thru ducts & dampers<br>(including air measurement) | 2.44    |
| 21. Air pressure drop thru firing equipment                               | 3.79    |
| 22. Total static pressure at fan (i.w.g.)                                 | 9.05    |
| 23. Pounds of fuel per hour                                               | 124,696 |
| 24. Pounds of air per hour                                                | 408,000 |
| 25. Pounds of gas per hour leaving unit                                   | 516,000 |
| 26. Overall efficiency complete unit                                      | 58.68   |
| 27. Heat release in furnace Btu/cu.ft./hr.                                | 22,140  |
| 28. Heat release in furnace Btu/sq.ft./hr.                                | 89,400  |
| 29. K Btu per sq. ft. grate surface per hour                              | 865     |

HEAT BALANCE %

|                                            |       |
|--------------------------------------------|-------|
| 30. Dry flue gas loss at exit              | 9.06  |
| 31. Loss due to hydrogen and fuel moisture | 25.40 |
| 32. Loss due to moisture in air            | .29   |
| 33. Loss due to radiation                  | .32   |
| 34. Loss due to unburned combustibles      | 4.75  |
| 35. Manufacturer's margin                  | 1.50  |
| 36. Total losses                           | 41.32 |
| 37. Efficiencies of complete unit          | 58.68 |

RILEY STOKER CORPORATION  
WORCESTER, MASSACHUSETTS

4-13-81

W.J.W.

**RILEY****RILEY STOKER  
CORPORATION**POST OFFICE BOX 547, WORCESTER, MASS. 01613  
A SUBSIDIARY OF THE RILEY COMPANY**FUELS LABORATORY****TEST REPORT**

Laboratory No. 22,425

Sample of Bagasse

Date Rec'd 3/1/79

Received From Sugar Cane Growers Belle Glade, Fla

Sample Data Bagasse 9 8-500124

Contract No. (641-91110) P.O. # 44837M Field Sample By Customer

Air Drying Loss 0.0 %

Proximate Analysis

As Rec'd

Dry

Ultimate Analysis

As Rec'd

Dry

Moisture

3.7%

-----

Moisture

%

-----

Volatile

83.4%

86.6 %

Carbon

%

48.5 %

Ash

0.8%

0.8 %

Hydrogen

%

6.1 %

Fixed Carbon

12.1%

12.6 %

Nitrogen \*

%

0.29 %

100.0 %

100.0 %

Oxygen (diff.)

%

44.21 %

British Thermal Units

7,617

7,910

Sulfur

%

0.1 %

Fusibility of Ash

Ash

%

0.8 %

Initial Deformation

F

100.0 %

100.0 %

Softening

F

Free Swelling Index

Fluid

F

Grindability Index

(\* Skinner &amp; Sherman)

Date April 27, 1979

Thomas J. Gallagher

RILEY

RILEY STOKER  
CORPORATIONPOST OFFICE BOX 547, WORCESTER, MASS. 01613  
A SUBSIDIARY OF THE RILEY COMPANY

## FUELS LABORATORY

TEST REPORT

Laboratory No. 22,418 Sample of Bagasse Date Rec'd 3/1/79

Received From Sugar Cane Growers Belle Glade, Fla

Sample Data Bagasse 2 8 - 580170

Contract No. (641-91110) P.O. #44837M Field Sample By Customer

Air Drying Loss

1.0 %

Proximate Analysis

As Rec'd

Dry

Ultimate Analysis

As Rec'd

Dry

Moisture

4.6 %

-----

Moisture

%

-----

Volatile

81.3 %

84.3 %

Carbon

%

47.3 %

Ash

2.2 %

2.3 %

Hydrogen ✓

%

6.0 %

Fixed Carbon

12.9 %

13.4 %

Nitrogen \*

%

0.36 %

100.0 %

100.0 %

Oxygen (diff.)

%

43.84 %

British Thermal Units

7,698..

7,985

Sulfur

%

0.2 %

Fusibility of Ash

Initial Deformation

F

Ash

%

2.3 %

Softening

F

100.0 %

100.0 %

Free Swelling Index

Fluid

F

Grindability Index

(\* Skinner &amp; Sherman)

April 27, 1979

Thomas J. Gallagher

Date

## ATTACHMENT TO QUESTION 7 FUELS LABORATORY

TEST REPORT

Laboratory No. 22,059

Sample of Furfural

Date Rec'd 1/23/79

Received From Sugar Cane Growers Belle Glade, Fla

Sample Data ~~Furfural~~ <sup>Bagasse Residue</sup> Sample Blr.#4 Test 2

Contract No. P.O.#44837M (641-91110) Field Sample By Customer

Air Drying Loss

33.5 %

Proximate Analysis

As Rec'd

Dry

Ultimate Analysis

As Rec'd

Dry

Moisture

37.3 %

-----

Moisture

%

-----

Volatile

48.5 %

77.3 %

Carbon

%

52.8 %

Ash

1.4 %

2.2 %

Hydrogen

%

5.7 %

Fixed Carbon

12.8 %

20.5 %

Nitrogen \*

%

0.49 %

100.0 %

100.0 %

Oxygen (diff.)

%

38.41 %

British Thermal Units 5,605

8,940

Sulfur

%

0.4 %

Fusibility of Ash

Ash

%

2.2 %

Initial Deformation

F

100.0 %

100.0 %

Softening

F

Free Swelling Index

Fluid

F

Grindability Index

(\* Skinner &amp; Sherman)

February 8, 1979

Thomas J. Gallagher

Date \_\_\_\_\_



ATTACHMENT TO QUESTION 7

POST OFFICE BOX 547, WORCESTER, MASS. 01613  
A SUBSIDIARY OF THE RILEY COMPANY

## FUELS LABORATORY

TEST REPORT

Laboratory No. 22,394 Sample of Furfural Date Rec'd 2/28/79

Received From Sugar Cane Growers Belle Glade, Florida

Sample Data *Baystate Reserve*  
Furfural Sample Boiler 3 Test #6

Contract No. (641-91110) P.O. 44837M Field Sample By Customer

Air Drying Loss 29.7 %

Proximate Analysis

As Rec'd

Dry

Ultimate Analysis

As Rec'd

Dry

Moisture

36.9 %

-----

Moisture

%

-----

Volatile

47.6 %

75.4 %

Carbon

%

53.6 %

Ash

2.0 %

3.2 %

Hydrogen

%

5.5 %

Fixed Carbon

13.5 %

21.4 %

Nitrogen \*

%

0.37 %

100.0 %

100.0 %

Oxygen (d9ff.)

%

36.83 %

British Thermal Units

5,726

9,075

Sulfur

%

0.5 %

Fusibility of Ash

Initial Deformation

F

Ash

%

3.2 %

Softening

F

100.0 %

100.0 %

Free Swelling Index

Fluid

F

Grindability Index

(\*Skinner &amp; Sherman)

Date April 23, 1979

Thomas J. Gallagher

## ATTACHMENT TO QUESTION 7

ANALYSIS BUNKER C FUELDISCHARGED AT RIVIERA TANK "B"  
JULY 24, 1978

|                                |         |
|--------------------------------|---------|
| Gravity, A. P. I. @ 60°F       | 13.4    |
| Ash, Water Soluble, Wt. %      | 0.05    |
| Ash, Total Wt. %               | 0.084   |
| Flash, p.m. °F                 | 152     |
| Heat of Combustion/BTU/LB      | * 18400 |
| BS&W. Vol. %                   | 0.1     |
| Viscosity                      |         |
| SSU @ 100°F                    | 3952    |
| SSF @ 122°F                    | 187     |
| Sulfur, Wt. %                  | 2.30    |
| Pour Point, °F                 | 35      |
| Sediment by Hot Filtration, °F | 0.08    |
| Water by Distillation, Vol. %  | 0.35    |

W. C. Stickel

cc: J. F. Roehl, Jr.  
J. A. Belcher, Jr.  
G. G. Williams  
E. J. Travers  
J. E. Cashon  
Carl Bloomberg  
Ed Troost  
Phil Chapman  
Harry Bruneau  
Jim Hiers  
Clete Jones  
Frank Stopinski

ATTACHMENT TO QUESTION 7

Analysis of Belloil (1% Residual Fuel Oil) in Inventory being delivered to your facility at this time.

|                                     |         |
|-------------------------------------|---------|
| Gravity, A.P.I. @ 60°F              | 21.5    |
| Ash, Total, Wt., %                  | 0.06    |
| Ash, Water Soluble                  | 0.04    |
| Concarbon Residue, Wt., %           | 5.8     |
| Flow Point                          | 50      |
| Flash Point, P.M.C.C., °F           | 200     |
| Heat Combustion, BTU/USG            | 144,596 |
| Sediment by Hot Filtration, Wt., %  | 0.04    |
| Sulfur Content, Wt., %              | 0.95    |
| Vanadium, PPM                       | 190     |
| Viscosity, SSU @ 100°F, Sec.        | 484     |
| Viscosity, SSU @ 122°F, Sec.        | 268     |
| Water and Sediment, (BS&W), Vol., % | 0.05    |

$\frac{18,700}{17,850}$



### 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 |                           |                        |
| Not applicable |              |      |                           |                        |
|                |              |      |                           |                        |
|                |              |      |                           |                        |
|                |              |      |                           |                        |
|                |              |      |                           |                        |

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

1. Total Process Input Rate (lbs/hr): Not Applicable

2. Product Weight (lbs/hr): 240,000-lb steam/hr rated capacity  
264,000-lb steam/hr peak capacity

**C. Airborne Contaminants Emitted:**

| Name of Contaminant | Emission <sup>1</sup> |                | Allowed Emission <sup>2</sup><br>Rate per<br>Ch. 17-2, F.A.C. | Allowable <sup>3</sup><br>Emission<br>lbs/hr | Potential Emission <sup>4</sup> |       | Relate<br>to Flow<br>Diagram |
|---------------------|-----------------------|----------------|---------------------------------------------------------------|----------------------------------------------|---------------------------------|-------|------------------------------|
|                     | Maximum<br>lbs/hr     | Actual<br>T/yr |                                                               |                                              | lbs/hr                          | T/yr  |                              |
| Particulate         | 100.8                 | 324.5          | 0.2 lb/MM Btu, <sup>17-2.05</sup> <sub>(6)</sub>              | 100.8                                        | 1,121.4                         | 4,091 | A                            |
| Sulfur Dioxide      | 565.1                 | 829.1          | NA                                                            | NA                                           | 608.5                           | 2,220 | A                            |
| Nitrogen Oxides     | 129.2                 | 239.6          | NA                                                            | NA                                           | 129.2                           | 471.4 | A                            |
| Hydrocarbons        | 140                   | 348            | NA                                                            | NA                                           | 140                             | 440   | A                            |
| Carbon Monoxide     | 140                   | 349            | NA                                                            | NA                                           | 140                             | 440   | A                            |

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

| Name and Type<br>(Model & Serial No.)  | Contaminant     | Efficiency | Range of Particles <sup>5</sup><br>Size Collected<br>(in microns) | Basis for<br>Efficiency<br>(Sec. V, It <sup>5</sup> ) |
|----------------------------------------|-----------------|------------|-------------------------------------------------------------------|-------------------------------------------------------|
| Joy Turbulaire Type D                  | Particulate     | +90%       | See Attachment B                                                  | manufacturer's literature                             |
| Impingement Scrubber, or<br>equivalent | SO <sub>2</sub> | 40%        | NA                                                                | Test data                                             |
|                                        |                 |            |                                                                   | see Attachment C                                      |
|                                        |                 |            |                                                                   |                                                       |
|                                        |                 |            |                                                                   |                                                       |

<sup>1</sup> See Section V, Item 2.

<sup>2</sup> 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)

<sup>3</sup> Calculated from operating rate and applicable standard

<sup>4</sup> Emission, if source operated without control (See Section V, Item 3)

<sup>5</sup> If Applicable

Table 18A. Crop Season Emissions from Existing Boilers

| Boiler  | Capacity<br>lb steam/hr | Ton/Day<br>Bagasse<br>(10 <sup>6</sup> Btu) | Ton/Day<br>Residue<br>(10 <sup>6</sup> Btu) | Gallons/Day<br>Oil<br>(10 <sup>6</sup> Btu) | Total Btu<br>(10 <sup>6</sup> Btu/hr) | Crop Season Emissions (tons)† |                 |                 |     |     |
|---------|-------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------|-------------------------------|-----------------|-----------------|-----|-----|
|         |                         |                                             |                                             |                                             |                                       | PM                            | SO <sub>2</sub> | NO <sub>x</sub> | CO  | HC  |
| 1 and 2 | 240,000                 | 165.6<br>(2,650)                            | 398.4<br>(7,092)                            | 1,392<br>(195)                              | 414                                   | 226                           | 424             | 128             | 209 | 201 |
| 3       | 100,000                 | 278.4<br>(4,454)                            | —                                           | 576<br>(81)                                 | 189                                   | 103                           | 77              | 72              | 117 | 114 |
| 4       | 240,000                 | 165.6<br>(2,650)                            | 398.4<br>(7,092)                            | 1,392<br>(195)                              | 414                                   | 181                           | 424             | 128             | 209 | 201 |
| 5       | 160,000                 | 110.4<br>(1,766)                            | 266.4<br>(4,742)                            | 936<br>(131)                                | 277                                   | 151                           | 283             | 86              | 139 | 134 |
| 6 and 7 | 150,000                 | —                                           | —                                           | 33,312<br>(4,664)                           | 194                                   | 43                            | 896             | 184             | 15  | 3   |
| TOTAL   |                         |                                             |                                             |                                             |                                       | 704                           | 2,104           | 598             | 689 | 653 |

\* Based on Table A-3.

† PM: Boilers 1, 2, 3, and 5 at 0.25 lb/10<sup>6</sup> Btu, Boiler 4 at 0.2 lb/10<sup>6</sup> Btu, all oil at 0.1 lb/10<sup>6</sup> Btu

SO<sub>2</sub>: Based on Table A-3

NO<sub>x</sub>: 1.2 lb/ton wet bagasse, 2.67 lb/ton dry bagasse, 2.18 lb/ton dry residue, 60 lb/10<sup>3</sup> gal fuel oil

CO: 5 lb/10<sup>3</sup> gallons fuel oil; 2 lb/ton wet bagasse; 4.44 lb/ton dry bagasse; 3.64 lb/ton dry residue.

HC: 2 lb/ton wet bagasse, 4.44 lb/ton dry bagasse, 3.64 lb/ton dry residue, 1 lb/10<sup>3</sup> gal fuel oil.

184-day crop season.

Source: ESE, 1981.

Table 18B. Off-Season Emissions from Existing Boilers

| Boiler                                                 | Capacity<br>lb steam/hr | Ton/Day<br>Residue<br>(10 <sup>6</sup> Btu) | Gallons/Day<br>Oil<br>(10 <sup>6</sup> Btu) | Total Btu<br>(10 <sup>6</sup> Btu/hr) | Off-Season Emissions (tons)* |                 |                 |            |            |
|--------------------------------------------------------|-------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------|------------------------------|-----------------|-----------------|------------|------------|
|                                                        |                         |                                             |                                             |                                       | PM                           | SO <sub>2</sub> | NO <sub>x</sub> | CO         | HC         |
| Combination of<br>Boilers 1, 2, 4,<br>or 5 to produce: | 400,000                 | 882<br>(15,700)                             | 2,328<br>(326)                              | 6,681                                 | 236                          | 548             | 124             | 193        | 193        |
| CROP SEASON TOTAL                                      |                         |                                             |                                             |                                       | <u>704</u>                   | <u>2,104</u>    | <u>598</u>      | <u>689</u> | <u>653</u> |
| ANNUAL EMISSIONS                                       |                         |                                             |                                             |                                       | 940                          | 2,652           | 722             | 882        | 846        |

\* Emission rates on same basis as Table 18A; particulate assumed worst-case 0.25 lb/10<sup>6</sup>Btu; 120-day maximum off-season operation.

Source: ESE, 1981.



ATTACHMENT TO QUESTION 20

WESTERN PRECIPITATION DIVISION

JOY MANUFACTURING COMPANY  
4045 COLORADO BOULEVARD  
LOS ANGELES, CALIFORNIA 90038  
Phone: (213) 240-2300

February 8, 1974

Florida Sugar Cane League, Inc.  
P.O. Box 1148  
Clewiston, Florida 33440

Attention: Mr. J. Nelson Fairbanks  
Vice President & General Manager

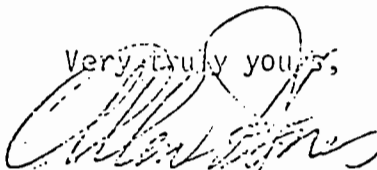
Gentlemen:

Confirming our conversations of January 30, 1974, we wish to present, herewith, the guarantees we are prepared to make to any member of the Sugar Cane League on the performance of our Type D "TURBULAIRE" Scrubber when used in conjunction with bagasse fired boilers.

With an inlet loading to the scrubber of 1 gr/dry standard CFM (DSCFM), we will guarantee a particulate outlet not to exceed .05 gr/DSCFM. If the condensables are to be included with particulate emission, we will then guarantee an outlet not to exceed .06 gr/DSCFM. These guarantees are based on operating the equipment at a pressure drop across the unit of not less than 5" water column (w.c.) and not more than 9" w.c. In addition, these guarantees are based on sampling with the EPA Train, Method 5, described in the Federal Register, Volume 36, No. 247, Thursday, December 23, 1971, copy enclosed.

The aforementioned guarantees are made on our equipment as originally designed or as modified with our approval. Any unauthorized modifications will abrogate these guarantees.

Very truly yours,

  
Allen H. Jones  
Vice President, Standard Products

AHJ:js

Encl. EPA Train, Method 5.

cc: F. Arroyo - Arroyo Process Equipment  
cc: L. Newton - Western Precipitation  
cc: R. Fernandez - Western Precipitation

GLADES SUGAR HOUSE  
 BELLE GLADE FLORIDA  
 MAY 20, 1981

21

# SCRUBBER DETAIL BOILER No 8

GAS OUTLET  
TO STACK

3'-10"

30'-0"

15'-0" I.D.

## DATA

$\Delta P$  = FROM 5' TO 9' W.G.  
 WATER PRESSURE TO  
 NOZZLE = 95 FT = 41 PSI  
 EVAPORATION = 111 GPM \*  
 BLOWDOWN = 182 " \*  
 MAKE-UP = 293 " \*

\* FOR TWO (2) SCRUBBERS

VANES

6" DRAIN

WATER SPRAY  
NOZZLES  
3 APPROX.GAS  
INLETWATER  
SPRAY

QUENCHER

BLOWDOWN  
TO POND

7'-6"

ROTAMETER

WEIR BOX

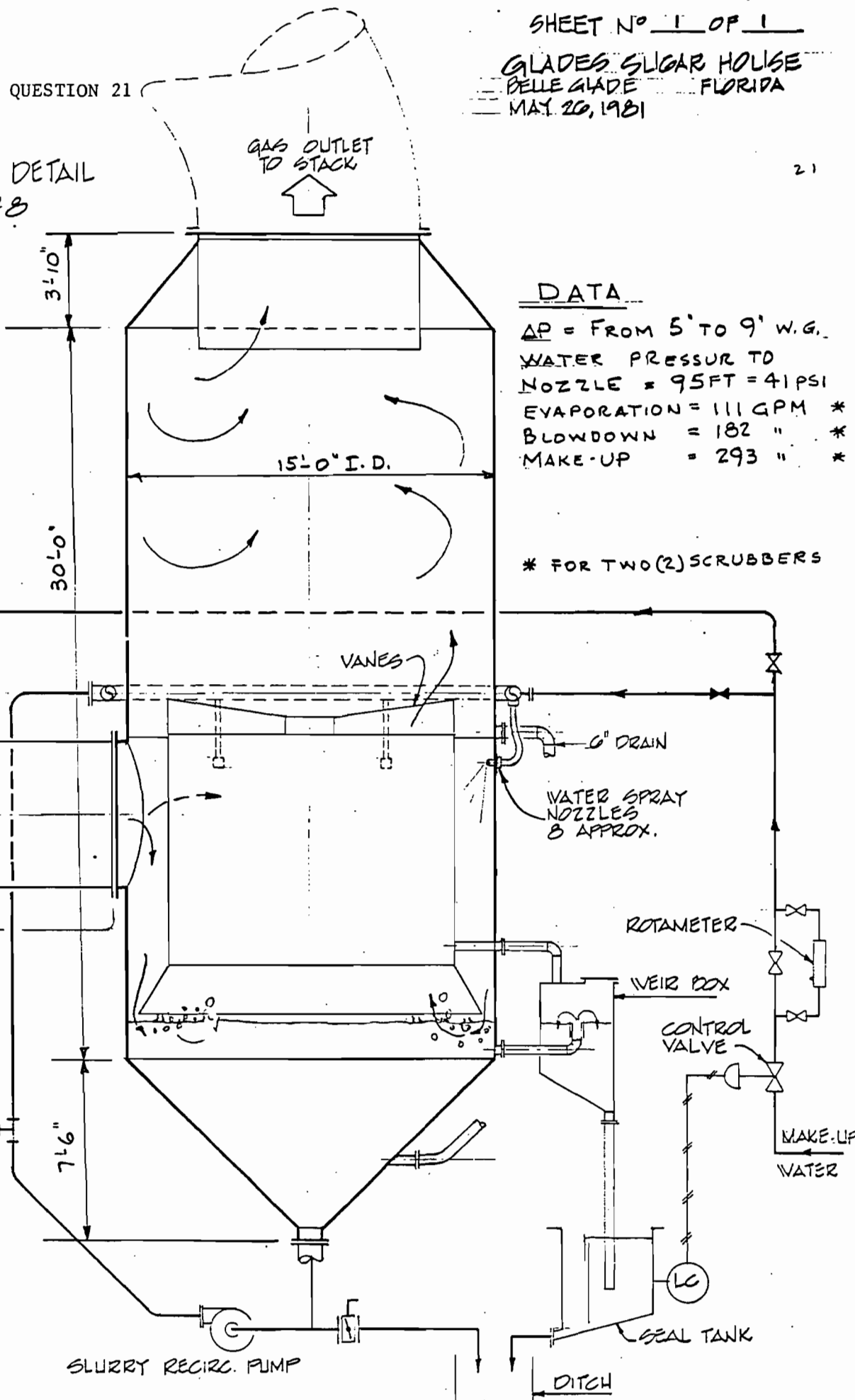
CONTROL  
VALVEMAKE-UP  
WATER

SLURRY RECIRC. PUMP

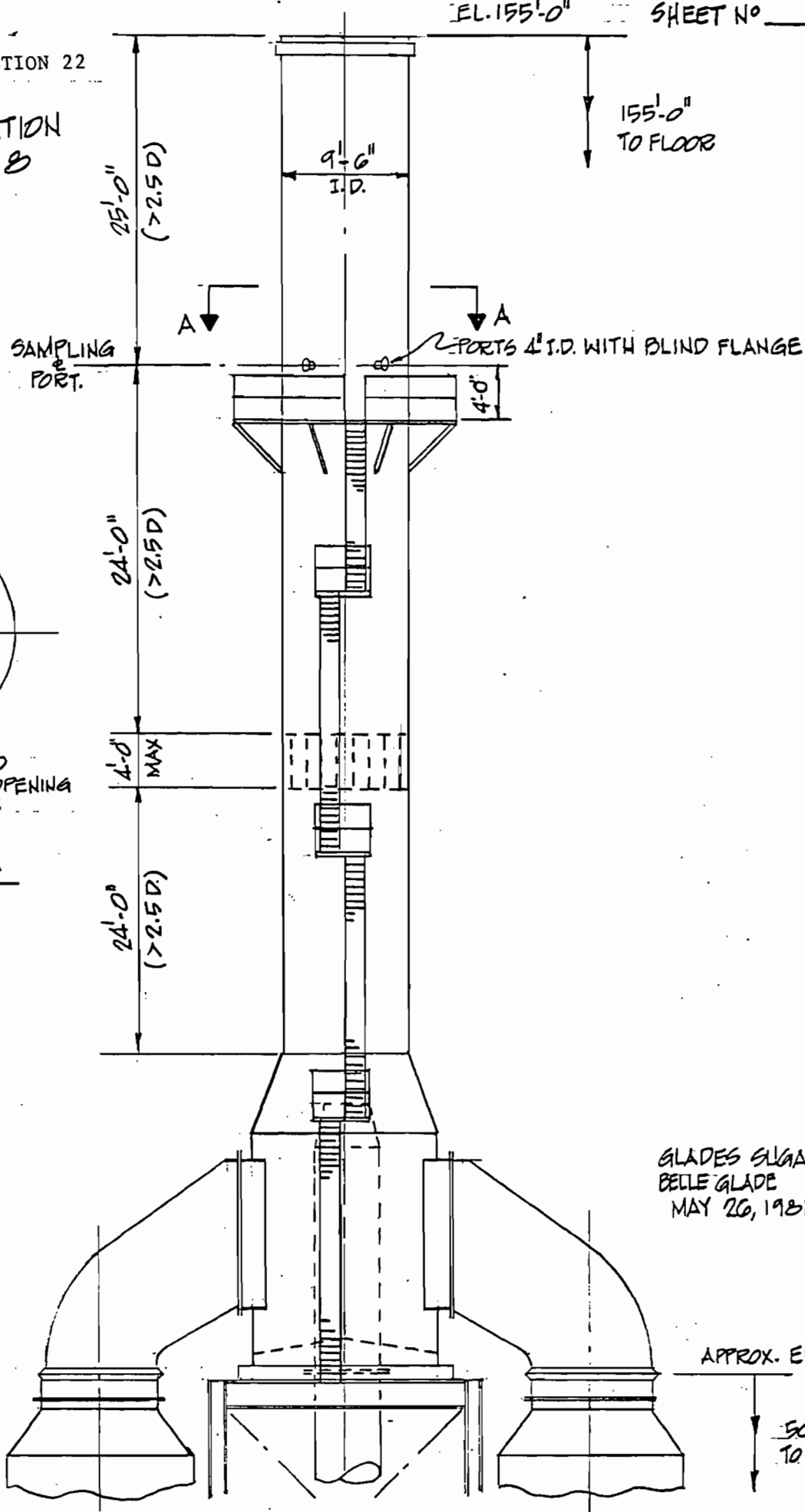
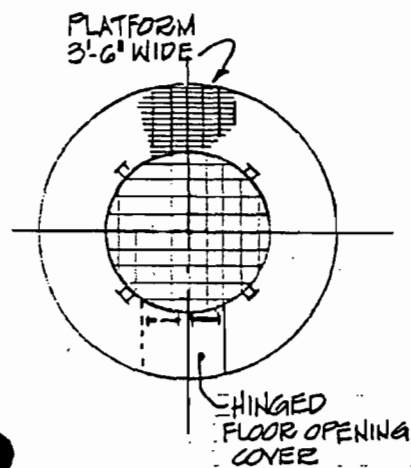
SEAL TANK

DITCH

LC



STACK  
CONFIGURATION  
BOILER N° 8

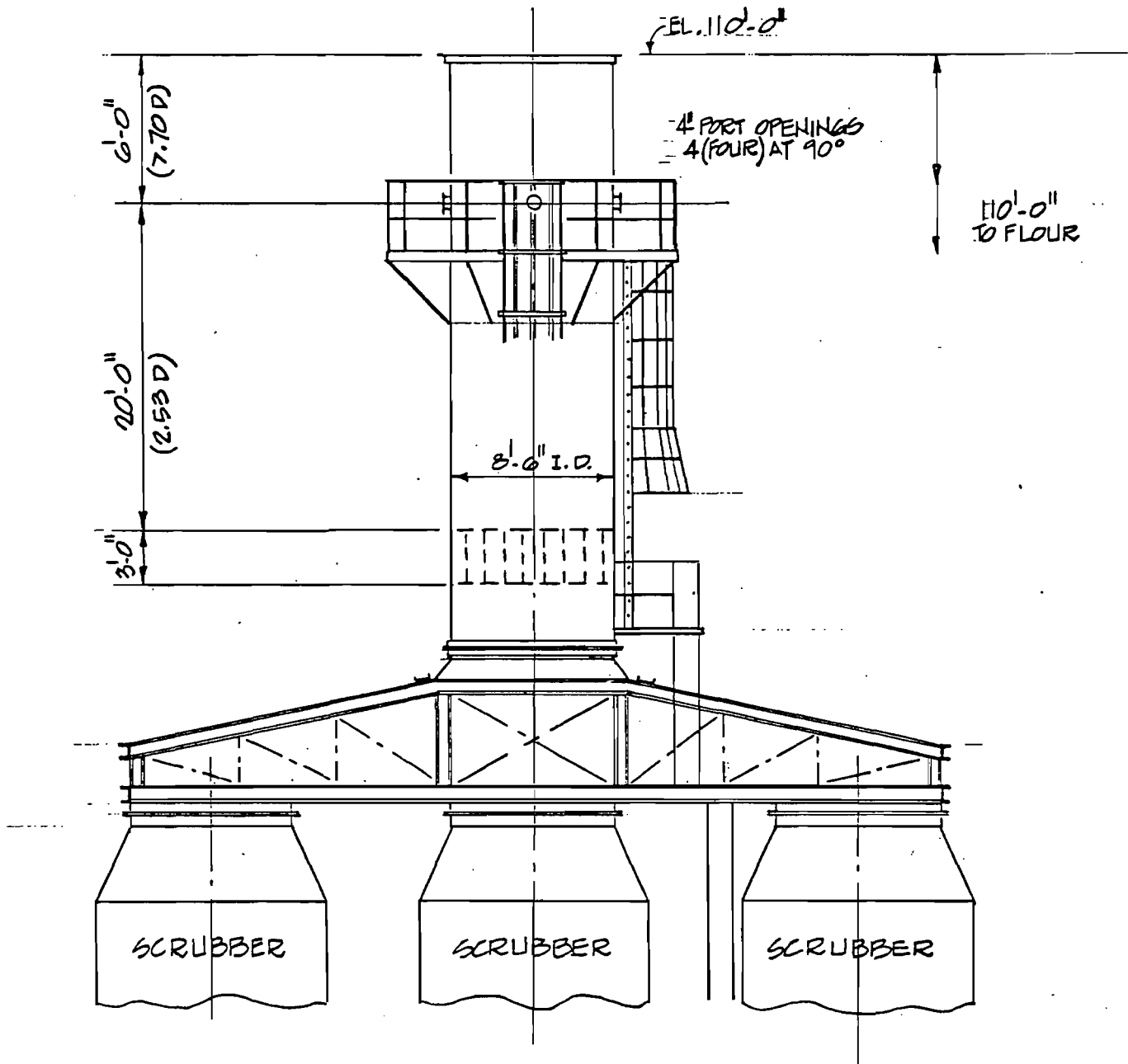


GLADES SUGAR HOUSE  
BELLE GLADE FLORIDA  
MAY 26, 1981

ATTACHMENT TO QUESTION 23

STACK CONFIGURATION  
BOILER NO 4

23

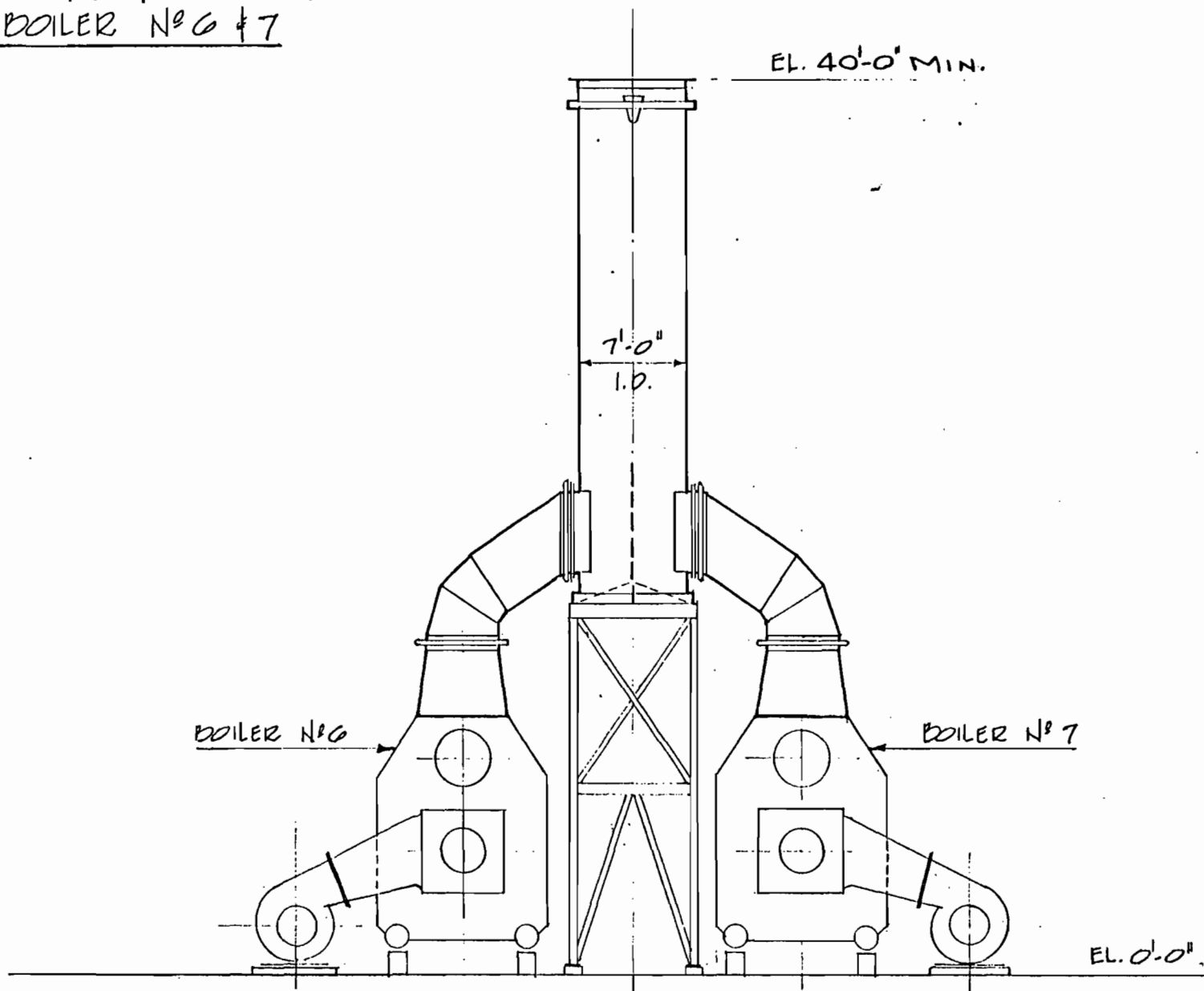
GLADES SUGAR HOUSE  
BELLE GLADE FLORIDA  
MAY 26, 1981

ATTACHMENT TO QUESTION 23

STACK CONFIGURATION.

BOILER N<sup>o</sup> 6 & 7

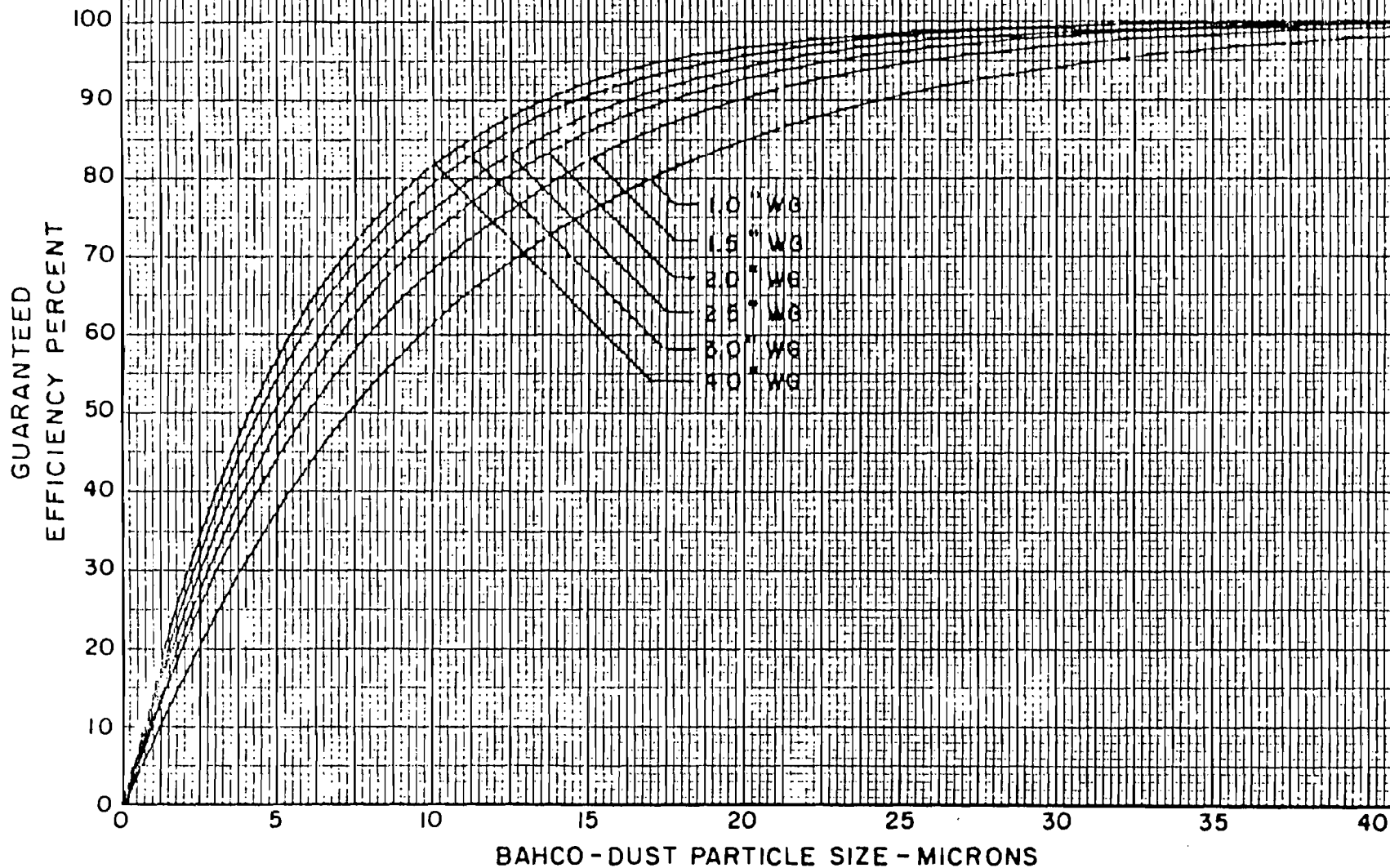
23



GLADES SUGAR HOUSE  
BELLE GLADE FLORIDA  
MAY 26, 1981

SHEET NO 2 OF 2





ATTACHMENT TO QUESTION 24

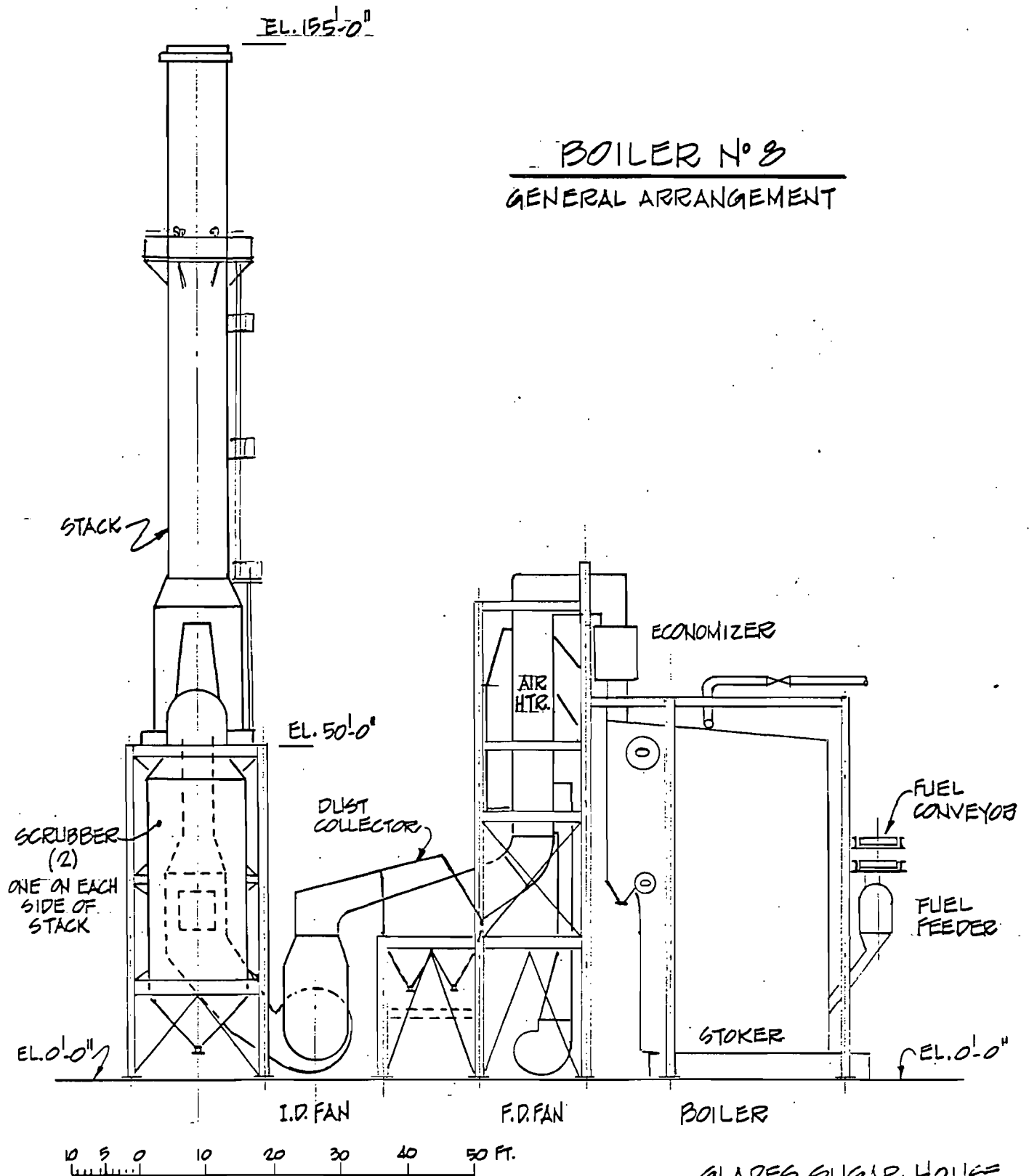
**Air Correction Division**  
 Universal Oil Products Company  
 Tokeneke Road - Danon, Connecticut 06820 203-655-8711  
**uop**

NOTE - THESE DATA ARE CONFIDENTIAL AND THE PROPERTY OF UNIVERSAL OIL PRODUCTS COMPANY AND SHALL NOT BE DISCLOSED TO OTHERS OR REPRODUCED IN ANY MANNER OR USED FOR ANY PURPOSE WHATSOEVER EXCEPT BY WRITTEN PERMISSION OR AS PROVIDED IN A SIGNED AGREEMENT WITH UNIVERSAL OIL PRODUCTS COMPANY RELATING TO SUCH DATA.

CONDITIONS OF CURVE  
 DUST SPECIFIC GRAVITY - 2.5  
 DUST CONCENTRATION - 2 TO 5 GR./CU. FT.  
 GAS TEMPERATURE - 70 - 800 °F

**MICRON EFFICIENCY CURVES**  
**TUBULAR DUST COLLECTOR**  
 DESIGN 104B OR 105A

|                     |                |                         |                |                                |                 |
|---------------------|----------------|-------------------------|----------------|--------------------------------|-----------------|
| COMPUTED BY<br>A.C. | DATE<br>1-9-67 | APPROVED BY<br>TECH. EP | DATE<br>1-9-67 | APPROVED BY<br>MKTG. <i>EP</i> | DATE<br>1-10-67 |
|---------------------|----------------|-------------------------|----------------|--------------------------------|-----------------|



GLADES SUGAR HOUSE  
BELLE GLADE FLORIDA  
MAY 26, 1981

ATTACHMENT A

PROPOSED BOILER NO. 8  
EMISSION ESTIMATES

FUEL USAGE CALCULATIONS

Peak Steam Capacity = 264,000 lb/hr  
Btu requirements per lb steam = 1,050 Btu/lb  
Boiler efficiencies: Bagasse - 55%  
Residue - 62.5%  
Oil - 80%  
System SO<sub>2</sub> loss: Bagasse - 40%  
Residue - 40%  
Oil - 0%

Fuel Analysis:

|                    | Bagasse                  | Residue                  | No. 6 Fuel Oil |
|--------------------|--------------------------|--------------------------|----------------|
| Btu/lb             | 8,000 (dry)              | 8,900 (dry)              | 18,500         |
| lbs/gal            | --                       | --                       | 17,500         |
| % S                | 0.2 <del>0.1</del> (dry) | 0.5 <del>0.4</del> (dry) | 8.1            |
| % N                | 0.3 (dry)                | 0.4 (dry)                | 1.0 1.8        |
| % Ash              | 0.5-0.3 (dry)            | 1.9-3.8 (dry)            | 0              |
| % H <sub>2</sub> O | 55                       | 40                       | 0.1            |
|                    |                          |                          | 0.2            |

Bagasse Burning:  $264,000 \text{ lb/hr steam} \times 1,050 \text{ Btu/lb} \div 0.55 = 504.0 \times 10^6 \text{ Btu/hr}$   
 $504.0 \times 10^6 \text{ Btu/hr} \div 8,000 \text{ Btu/lb} = 63,000 \text{ lb/hr dry bagasse}$

Residue Burning:  $264,000 \text{ lb/hr steam} \times 1,050 \text{ Btu/lb} \div 0.625 = 443.5 \times 10^6 \text{ Btu/hr}$   
 $443.5 \times 10^6 \text{ Btu/hr} \div 8,900 \text{ Btu/lb} = 49,834 \text{ lb/hr dry residue}$

Oil Burning: Limited to  $250 \times 10^6 \text{ Btu/hr heat input}$   
 $250 \times 10^6 \text{ Btu/hr} \div 18,500 \text{ Btu/lb} = 14,286 \text{ lb/hr}$   
 $= 1,764 \text{ gal/hr}$  13,513

# EMISSION CALCULATIONS

## BURNING 100-PERCENT RESIDUE

### 1. Particulate

Allowable and maximum emissions =  $443.5 \times 10^6 \text{ Btu/hr} \times 0.2 \text{ lb particulate}/10^6 \text{ Btu} = 88.7 \text{ lb/hr}$  ✓

Potential (uncontrolled) emissions: assume same as bagasse in AP-42 on a "dry" basis. Factor is 16 lb/ton bagasse on a wet basis.

Convert to dry basis:  $16 \text{ lbs/ton wet bagasse} \times 1 \text{ ton wet}/0.55 \text{ ton dry} = 29.1 \text{ lb/ton dry} \times 49,834 \text{ lb/hr residue (dry)} \div 2,000 = 724.9 \text{ lb/hr}$   
 $664.5$

### 2. Sulfur Dioxide (based on scrubber removal of 40%) 0.005

Maximum emissions =  $49,834 \text{ lb/hr residue (dry)} \times 0.004 \times 2 \times 0.6 = 239.2 \text{ lb/hr}$

Potential (uncontrolled) emissions =  $239.2 \text{ lb/hr} \div 0.6 = 398.7 \text{ lb/hr}$  (566.3)

### 3. Nitrogen Oxides

Maximum and Potential (uncontrolled) emissions: assume same factor as bagasse. Factor 1.2 lb/ton bagasse on a wet basis.

Convert to dry basis:  $1.2 \text{ lb/ton wet bagasse} \times 1 \text{ ton wet}/0.55 \text{ ton dry} = 2.18 \text{ lb/ton} \times 49,834 \text{ lb/hr residue (dry)} \div 2,000 = 54.4 \text{ lb/hr}$   
 $49.8$

### 4. Carbon Monoxide and Hydrocarbons

AP-42:  $2 \text{ lb/ton wet bagasse} \times 1/0.55 = 3.64 \text{ lb/ton dry residue}$   
 $3.64 \times 49,834 \div 2,000 = 90.7 \text{ lb/hr}$

## BURNING FUEL OIL AT $250 \times 10^6 \text{ Btu/hr}$

### 1. Particulate

Allowable and maximum emissions =  $250 \times 10^6 \text{ Btu/hr} \times 0.1 \text{ lb particulate}/10^6 \text{ Btu} = 25.0 \text{ lb/hr}$

Potential (uncontrolled) emissions: from AP-42 Table 1.3-1

$1 \text{ lb}/10^3 \text{ gal} = 10(S) + 3 = 10(18) + 3 = 183$   
 $1,708 \text{ gal/hr} \times 183 \text{ lb}/10^3 \text{ gal} = 312.6 \text{ lb/hr}$   
 $1708$   $21$   $35.9$

### 2. Sulfur Dioxide

Maximum and Potential Emissions: from AP-42 Table 1.3-1

$1 \text{ lb}/10^3 \text{ gal} = 157(S) = 157(18) = 282.6$  181  
 $1,764 \text{ gal/hr} \times 282.6 \text{ lb}/10^3 \text{ gal} = 498.7 \text{ lb/hr}$   
 $1708$   $282.6$   $482.7$

### 3. Nitrogen Oxides

Maximum and Potential Emissions: from AP-42 Table 1.3-1

$60 \text{ lb}/10^3 \text{ gal} \times 1,764 \text{ gal/hr} = 105.8 \text{ lb/hr}$   
 $1708$   $102.5$

4. Hydrocarbons

Maximum and potential (uncontrolled) emissions: from AP-42,

Table 1.3-1

$$1 \text{ lb}/10^3 \text{ gal} \times 1,764 \text{ gal/hr} = 1.8^7 \text{ lb/hr}$$

5. Carbon Monoxide

Maximum and potential (uncontrolled) emissions: from AP-42,

Table 1.3-1

$$5 \text{ lb}/10^3 \times \frac{1,764}{1,708} \text{ gal/hr} = \frac{8.8}{8.5} \text{ lb/hr}$$

BURNING 100-PERCENT BAGASSE

1. Particulate

Allowable and maximum emissions =  $504.0 \times 10^6$  Btu/hr x  
 $0.2 \text{ lb particulate}/10^6 \text{ Btu} = 100.8 \text{ lb/hr}$

Potential (uncontrolled) emissions: from AP-42, Table 1.8-1  
 $16 \text{ lb/ton bagasse (wet)} \times 63,000 \text{ lb/hr bagasse (dry)} \div 0.45 \div$   
 $2,000 = 1,120 \text{ lb/hr}$

2. Sulfur Dioxide (based on scrubber removal of 40%)

Maximum Emissions =  $63,000 \text{ lb/hr bagasse (dry)} \times 0.001 \times 2 \times 0.6 = 252.0$   
 $= 75.6 \text{ lb/hr}$  1b/hr

Potential (uncontrolled) emissions =  $75.6 \text{ lb/hr} \div 0.6 = 126.0 \text{ lb/hr}$

3. Nitrogen Oxides

Maximum and potential (uncontrolled) emissions: from AP-42,  
Table 1.8-1  
 $1.2 \text{ lb/ton bagasse (wet)} \times 63,000 \div 0.45 \text{ lb/hr bagasse} \div 2,000$   
 $= 84.0 \text{ lb/hr}^*$

4. Carbon Monoxide and Hydrocarbons

AP-42:  $2 \text{ lb/ton wet bagasse} \times 1/0.45 = 4.44 \text{ lb/ton dry bagasse}$   
 $4.44 \times 63,000 \div 2,000 = 140 \text{ lb/hr}$

\* This figure could be greatly overestimated since a recent EPA study reported  $\text{NO}_x$  levels of  $0.002 \text{ lb}/10^6 \text{ Btu}$ , equivalent to  $1.0 \text{ lb/hr}$  for this boiler ("Emission Test Report, U.S. Sugar Company, Bryant, Florida," Monsanto Research Corp., May 1980).

MAXIMUM EMISSIONS CALCULATIONS

1. Particulate

Maximum emissions occur when burning 100-percent bagasse since heat input is greatest =  $100.8 \text{ lb/hr}$  (actual)

2. Sulfur Dioxide

Maximum emissions occur when burning oil up to  $250 \times 10^6 \text{ MM Btu/hr}$  with remainder of steam capacity supplied by bagasse residue

$\text{SO}_2$  due to oil =  $276.9 \text{ lb/hr}$  482.7

Steam due to oil =  $250 \times 10^6 \text{ MM Btu/hr} \div 1,050 \text{ Btu/lb steam} \times$   
 $0.8 = 190,476 \text{ lb/steam/hr}$

Steam due to residue =  $264,000 - 190,476 = 73,524 \text{ lb/steam/hr}$

Residue required =  $73,524 \times 1,050 \div 0.625 \div 8,900 =$

$13,879 \text{ lb/hr (dry)}$

$\text{SO}_2$  due to residue =  $13,879 \times 0.004 \times 2 \times 0.6 = 66.6 \text{ lb/hr}$  138.8

Total  $\text{SO}_2 = 276.9 + 66.6 = 343.5 \text{ lb/hr}$

$482.7 + 138.8 = 621.5 \text{ lb/hr}$

3. Nitrogen Oxides

Fuel-oil burning produces maximum  $\text{NO}_x$  emissions, with bagasse next. Therefore, maximum  $\text{NO}_x$  occurs when burning maximum fuel with the rest of the steam supplied by bagasse.

$$\text{NO}_x \text{ due to oil} = 105.8 \text{ lb/hr}$$

$$\text{Steam due to oil} = 190,746 \text{ lb steam/hr (see SO}_2 \text{ above)}$$

$$\text{Steam due to bagasse} = 73,524 \text{ lb steam/hr}$$

$$\text{Bagasse required} = 73,524 \times 1,050 \div 0.55 \div 8,000$$

$$= 17,546 \text{ lb/hr (dry)}$$

$$\text{NO}_x \text{ due to bagasse} = 17,546 \times 2.67 \div 2,000 = 23.4 \text{ lb/hr}$$

$$\text{Total NO}_x = 105.8 + 23.4 = 129.2 \text{ lb/hr}$$

4. Carbon Monoxide and Hydrocarbons

Maximum emissions when burning all bagasse = 140 lb/hr

ACTUAL EMISSIONS CALCULATIONS

Annual emissions for proposed Boiler 8 based on fuel mix presented in Table A-3 of PSD report for 184 day/yr. For off-season operation (120 days/yr), bagasse is not available; therefore, emissions based upon average fuel oil consumption with remainder of steam produced from residue and assuming maximum steam production of 264,000 lb/hr. This figure is much higher than will actually occur on average during off season.

1. Particulate (based upon allowables)

Crop season:

$$18.3 \text{ ton/hr residue} \times 2,000 \times 8,900 \times 0.2 \text{ lb/MM Btu} \times 24 \times 184 \div 2,000 = 143.8 \text{ ton/yr}$$

$$7.5 \text{ ton/hr bagasse} \times 2,000 \times 8,000 \times 0.2 \text{ lb/MM Btu} \times 24 \times 184 \div 2,000 = 53.0 \text{ ton/yr}$$

$$64 \text{ gal/hr} \times 8.1 \times 17,500 \times 0.1 \text{ lb/MM Btu} \times 24 \times 184 \div 2,000 = 2.0 \text{ ton/yr}$$

Off season:

$$\text{Average steam due to oil} = 6,900 \text{ lb/hr}$$

$$\text{Average steam due to residue} = 264,000 - 6,900 = 257,100 \text{ lb/hr}$$

$$\text{Residue required} = 257,100 \times 1,050 \div 0.625 \div 8,900 = 48,531 \text{ lb/hr}$$

$$48,531 \text{ lb/hr residue} \times 8,900 \times 0.2 \text{ lb/MM Btu} \times 24 \times 120 \div 2,000 = 124.4 \text{ ton/yr}$$

$$64 \text{ gal/hr} \times 8.1 \times 17,500 \times 0.1 \text{ lb/MM Btu} \times 24 \times 120 \div 2,000 = 1.3 \text{ ton/yr}$$

$$\text{Total} = 324.5 \text{ ton/yr}$$

2. Sulfur Dioxide

Crop season:

$$18.3 \text{ ton/hr residue} \times 0.004 \times 2 \times 0.6 \times 24 \times 184 = 387.9 \text{ ton/yr}$$

$$7.5 \text{ ton/hr bagasse} \times 0.001 \times 2 \times 0.6 \times 24 \times 184 = 39.7 \text{ ton/yr}$$

$$64 \text{ gal/hr} \times 157 \text{ lb}/10^3 \text{ gal} \times 24 \times 184 \div 2,000 = 22.2 \text{ ton/yr}$$

Off season:

$$\begin{aligned} 64 \text{ gal/hr} \times 157 \div 1,000 \times 24 \times 120 \div 2,000 &= 14.5 \text{ ton/yr} \\ 48,531 \text{ lb/hr residue} \times 0.004 \times 2 \times 0.6 \times 24 \times 120 \div 2,000 &= \\ 335.4 \text{ ton/yr} \end{aligned}$$

Total = 799.7 tons/yr

3. Nitrogen Oxides

Crop season:

$$\begin{aligned} 18.3 \text{ ton/hr residue} \times 2.18 \text{ lb/ton} \times 24 \times 184 \div 2,000 \\ &= 88.1 \text{ ton/yr} \\ 7.5 \text{ ton/hr bagasse} \times 2.67 \text{ lb/ton} \times 24 \times 184 \div 2,000 &= 44.2 \text{ ton/yr} \\ 64 \text{ gal/hr} \times 60 \text{ lb}/10^3 \text{ gal} \times 24 \times 184 \div 2,000 &= 8.5 \text{ ton/yr} \end{aligned}$$

Off season:

$$\begin{aligned} 64 \text{ gal/hr} \times 60 \div 1,000 \times 24 \times 120 \div 2,000 &= 5.5 \text{ tons/yr} \\ 48,531 \text{ lb/hr residue} \div 2,000 \times 2.67 \times 24 \times 120 \div 2,000 \\ &= 93.3 \text{ tons/yr} \end{aligned}$$

Total = 239.6 tons/yr

4. Carbon Monoxide and Hydrocarbons

Crop Season:

$$\begin{aligned} 18.3 \text{ ton/hr residue} \times 24 \times 3.64 \times 184 \div 2,000 &= 147 \\ 7.5 \text{ ton/hr bagasse} \times 24 \times 4.44 \times 184 \div 2,000 &= 74 \\ 64 \text{ gal fuel oil/hr} \times 24 \times 1/10^3 \times 184 \div 2,000 &= 0.1 \\ 64 \text{ gal fuel oil/hr} \times 24 \times 5/10^3 \times 184 \div 2,000 &= 0.7 \end{aligned}$$

Off Season:

$$\begin{aligned} 24.27 \text{ ton/hr residue} \times 24 \times 3.64 \times 120 \div 2,000 &= 127 \\ 64 \text{ gal fuel oil/hr} \times 24 \times 1/10^3 \times 120 \div 2,000 &= 0.1 \\ 64 \text{ gal fuel oil/hr} \times 24 \times 5/10^3 \times 120 \div 2,000 &= 0.5 \end{aligned}$$

Total HC = 348 ton/yr

Total CO = 349 ton/yr

POTENTIAL EMISSIONS CALCULATIONS

Potential emissions based upon burning worst-case emitting fuel all the time and 304-day operation per year. No controls considered.

1. Particulate

Worst-case fuel is bagasse at maximum steam production.

$$\begin{aligned} 63,000 \text{ lb/hr bagasse (dry)} \div 2,000 \times 35.6 \text{ lb/ton} &= 1,121.4 \text{ lb/hr} \\ 1,121.4 \text{ lb/hr} \times 24 \times 304 \div 2,000 &= 4,091 \text{ ton/yr} \end{aligned}$$

2. Sulfur Dioxide

Worst-case fuel is oil, burning up to 250 MM Btu/hr.

Remainder of steam produced from residue.

$$\begin{aligned} \text{Oil: } 1,764 \text{ gal/hr} \times 157 \text{ lb}/10^3 \text{ gal} &= 276.9 \text{ lb/hr} = 1,010.3 \text{ ton/yr} \\ \text{Residue: } 13,879 \text{ lb/hr} \times 0.004 \times 2 &= 111.0 \text{ lb/hr} = 405.0 \text{ ton/yr} \end{aligned}$$

Totals = 387.9 lb/hr = 1,415.3 ton/yr



3. Nitrogen Oxides

Worst-case fuel is oil, with bagasse next.

Oil = 105.8 lb/hr (see Maximum Emissions Calculations)

= 386.0 ton/yr

Bagasse = 23.4 lb/hr = 85.4 ton/yr

Totals = 129.2 lb/hr = 471.4 ton/yr

4. Carbon Monoxide and Hydrocarbons

Crop season: 100-percent bagasse

140 lb/hr x 24 x 184 ÷ 2,000 = 309 ton/yr

Off season: 100-percent residue

90.7 lb/hr x 24 x 120 ÷ 2,000 = 131 ton/yr

Total = 440 ton/yr

EXECUTIVE SUMMARY OF PERMIT  
APPLICATION AND PSD REPORT,  
SUGAR CANE GROWERS  
COOPERATIVE, BOILER # 8.

5/27/81

EXECUTIVE SUMMARY OF PERMIT APPLICATION AND  
PSD REPORT--SUGAR CANE GROWERS COOPERATIVE, BOILER 8

The Sugar Cane Growers Cooperative (SCGC) mill currently generates steam with seven boilers: two package boilers burning oil only, each rated at 120,000 pounds of steam per hour; one boiler burning bagasse and oil to produce 100,000 pounds of steam per hour; and four triple-fuel boilers capable of burning bagasse (ground cane), bagasse residue, and oil to produce a total of 640,000 pounds of steam per hour. Construction of a fifth triple-fuel boiler rated at 240,000 pounds of steam per hour is proposed. This new boiler is designated Boiler 8.

The steam produced by these boilers is used in three areas: steam turbines to move equipment and equipment auxiliaries; processing of juice to produce sugar; and furfural extraction from bagasse at an adjacent, independently owned and operated plant. The fuel of preference is the bagasse residue, that remains after fufural extraction. The capacity of the furfural plant will limit available residue to 1,500 tons/day. Bagasse is burned as necessary to supplement steam requirements. Under normal operating conditions, oil is burned only to aid in stable boiler operation, and to meet steam demands with the two package units.

At times, the furfural plant is inoperative and/or there is a brief shortage of cane. Steam demands for grinding or furfural extraction are then reduced or non-existent. Processing of juice that is already extracted must be completed, and when the production of bagasse or residue ceases, the steam demands for the juice processing are met by firing oil. Under these short-term conditions, steam demands are less than 500,000 pounds per hour.

During the off season when no cane is ground, SCGC provides process steam to the furfural extraction plant to complete processing of stock-piled bagasse. This steam is produced by burning the bagasse residue and minimal oil in three or fewer boilers. Maximum steam demands during

this period are approximately 400,000 pounds per hour. Off season operations may be carried out during the month preceding and 3 months following the crop season, although they are not necessarily continuous over this period. Steam requirements, fuel mix, plant operation, and total emissions during the off season will not change as a result of adding Boiler 8. If Boiler 8 is used during the off season, improved dispersion of emissions over the existing situation will be realized.

With Boiler 8 burning its allotment of bagasse residue, typical daily fuel consumption of Boiler 8 during the crop season is projected to be 439 tons of residue, 180 tons of bagasse, and 1,536 gallons of oil. Sulfur dioxide ( $\text{SO}_2$ ) emissions at this rate are 2.5 tons per day. If only bagasse were burned, maximum particulate emissions at  $0.2 \text{ lb}/10^6 \text{ Btu}$  would be 1.2 tons per day. These figures include a 10-percent peak capacity factor. Emissions from the existing boilers will not increase. Thus, the net plant-wide increases in annual emissions due to the proposed change, based on a maximum anticipated crop season of 184 days, are 460 tons  $\text{SO}_2$  and 221 tons of particulate matter (PM). The higher figures given in Section IIIC of the permit reflect actual emissions from Boiler 8 as if it were operated continuously throughout the crop season and off season (304 days). As previously discussed, any off-season emissions from Boiler 8 will be offset by a reduction from the other boilers.

The existing boilers are permitted at  $0.2$  or  $0.3 \text{ lb PM}/10^6 \text{ Btu}$ , and the package oil-firing boilers, each rated at 120,000 pounds of steam per hour, are permitted at  $0.1 \text{ lb PM}/10^6 \text{ Btu}$ . In actual operation, the boilers permitted at  $0.3 \text{ lb PM}/10^6 \text{ Btu}$  have never exceeded  $0.25 \text{ lb}/10^6 \text{ Btu}$ , and the package units each have been derated to 75,000 pounds of steam per hour. These actual conditions were used in modeling the existing plant to determine the net change in air quality, and it is agreed that they should be included as enforceable limits in the permit conditions. These changes reflect permit conditions only and are not creditable according to EPA definitions.

Modification of the existing stack configuration is necessary to improve dispersion sufficiently to allow operation of Boiler 8 without causing a modeled violation of air quality standards. Concurrent with the construction of Boiler 8, the three stacks serving Boiler 4 will be ducted into a common stack 110 feet tall, and the exit gases from Boilers 6 and 7 will share a common stack. Combining exit gas streams in this manner increases the thermal buoyancy of the plume over that of the plume from the separate stacks.

The greatest particulate emissions from all combination boilers (oil and non-fossil fuel) occur when total steam production is from non-fossil fuel combustion. Modeling of maximum emissions over the crop year shows that the highest, second-highest 24-hour impact,  $149 \text{ ug/m}^3$ , does not exceed Florida's standard of  $150 \text{ ug/m}^3$ . Impacts during the off season were not modeled, since emissions will be less than half those during the crop season.

At maximum steam production when oil usage is at a minimum, the greatest  $\text{SO}_2$  impacts will occur when the most residue is burned. Modeling was performed with a worst-case fuel mix, including sufficient oil to fire each of the package boilers at a maximum capacity of 175,000 lb steam/hr and to stabilize the combination boilers. Under these conditions, the projected highest, second-highest 24-hour concentration is  $249 \text{ ug/m}^3$  and the highest, second-highest 3-hour concentration is  $492 \text{ ug/m}^3$ .

When bagasse or residue is not available for combustion and steam demand is decreased as discussed previously, additional oil may be burned. The steam required to complete processing of the already extracted juice (no more than 500,000 lb/hr) can be produced totally from oil without increasing emissions over those during full plant operation. Investigation of the critical 3-hour meteorological period identified for the full steam production scenario shows that up to 550,000 pounds of steam

per hour can be produced from oil and that exit gases can be cooled by passing through the scrubbers without violating the 3-hour standard of 1,300 ug/m<sup>3</sup>.

The effects of such short-term operation on the 24-hour SO<sub>2</sub> standard were investigated by modeling with the critical 24-hour meteorological period. Without exceeding 260 ug/m<sup>3</sup>, up to 120,000 gallons of oil per day (3 times the modeled average) can be burned while producing steam at 89-percent rated capacity if the steam rate reduction is decreasing the residue consumption from 1,500 to 1,200 tons per day.

The improved dispersion from the proposed stack modifications provides a net air quality improvement over existing conditions for both TSP and SO<sub>2</sub>; thus, no explicit analysis of increment consumption was performed.

The range of conditions required for operation of the SCGC mill is within the range of conditions that ensures compliance with AAQS. These conditions have been expressed as allowable emission factors for each fuel burned in the new boiler, and a plant-wide limit on total SO<sub>2</sub> emissions. The emission factors for the new boiler in lb/10<sup>6</sup> Btu are:

|                 | <u>Oil</u> | <u>Bagasse</u> | <u>Residue</u> |
|-----------------|------------|----------------|----------------|
| PM              | 0.1        | 0.2            | 0.2            |
| SO <sub>2</sub> | 2.1        | 0.15           | 0.54           |

These values are based on a 40-percent removal of theoretical SO<sub>2</sub> while burning non-fossil fuel; and on an average oil sulfur content of 1.8 percent with the assumption that no SO<sub>2</sub> from oil combustion is removed by the scrubbers.

Total plant-wide SO<sub>2</sub> emissions will be limited to 14 tons per day and 2.1 tons per 3-hour period. The proposed method of showing compliance with SO<sub>2</sub> standards is to monitor usage of each fuel and use the emission factors to calculate total emissions for comparison with allowable limits. Compliance with particulate standards will be determined by conventional stack testing.

BACT for particulate emissions was determined to be impingement scrubbing. Baghouse filtration and ESP were rejected for lack of demonstrated operational capability on bagasse or residue-fired boilers. Venturi scrubbing was rejected since no conclusive evidence exists that its performance is superior to impingement scrubbing, and installation and operating costs of a venturi scrubber are greater than those of an impingement scrubber.

An emission limit of  $0.2 \text{ lb PM}/10^6 \text{ Btu}$  while burning non-fossil fuel is proposed. This number results from the same methodology used to determine BACT for the U.S. Sugar Bryant mill. It is the emission level achieved 80 percent of the time during stack tests performed at the SCGC mill over the past 5 years. This emission rate reflects operation according to manufacturer's recommendations and is believed to be the lowest practically achievable with the particle size characteristics encountered.

The impingement scrubber was also chosen as BACT for  $\text{SO}_2$ . Comparison of stack test results with theoretically calculated  $\text{SO}_2$  emissions from bagasse and residue indicate an  $\text{SO}_2$  loss of about 40 percent during the combustion and scrubbing processes. This reduction is achieved at no incremental cost above that for particulate control. Additionally, effluent from the proposed impingement scrubber can be handled by the existing wastewater treatment system. The additional  $\text{SO}_2$  removed from the new boiler emissions by an add-on scrubber system does not justify the high capital and operating costs of such a system or the separate waste handling facilities which would be required, particularly since the project will result in a net improvement over existing  $\text{SO}_2$  air quality.

PROPOSED LAER FOR  
SUGAR CANE GROWERS  
COOPERATIVE, BOILER # 8.



1,500 tons/day residue

39,100 gallons/day oil (1.2%)

900 tons/day bagasse

$$1,500 \text{ tons/day} \times \overset{0.004}{0.005} \times 2 \times 0.6 = \overset{7.2}{9} \text{ tons/day}$$

$$39,100 \text{ gallons/day} \times 283 \text{ lb/100 gal} = 11065 \text{ lb/day} = 5.5 \text{ tons/day}$$

$$900 \text{ tons/day} \times \underset{2.001}{0.002} \times 2 \times 0.6 = \underset{1.1}{2.2} \text{ tons/day}$$

16.7 tons/day

PROPOSED METHOD OF SHOWING COMPLIANCE  
WITH SULFUR DIOXIDE AIR QUALITY STANDARDS

The Sugar Cane Growers Cooperative (SCGC) will produce steam with a total of eight boilers: two burning exclusively oil, one capable of burning oil and bagasse, and five capable of burning oil, bagasse, and bagasse residue. The capacity of the mill and adjacent furfural extraction plant limits available residue to 1,500 tons per day.

On a 24-hour basis, the greatest sulfur dioxide (SO<sub>2</sub>) impacts will occur when the maximum amount of residue is burned. While the plant is producing steam at or near capacity, residue and bagasse usage is maximized and oil usage is minimized. Under certain adverse conditions, supplies of residue and bagasse may be limited for several hours, and steam to complete processing of the extracted sugar must be provided by increasing oil usage above the average hourly rate. No new materials are being processed during such periods, and total steam generation, as well as total SO<sub>2</sub> emissions, ~~are~~ reduced.

15

Dispersion modeling has shown that SO<sub>2</sub> standards will not be violated when the mill is operated under conditions producing maximum SO<sub>2</sub> emissions on a 24-hour basis. [The conditions include consumption of 1,500 tons per day of residue, 39,100 gallons per day of oil at 1.8-percent sulfur content, and 900 tons per day of bagasse. Total SO<sub>2</sub> emissions under these conditions are 14 tons per day.] This limit will never be operationally exceeded, since any increase in oil consumption above that used in the model will always occur simultaneously with a decrease in residue and bagasse consumption. An investigation of critical dispersion conditions shows that oil usage could be increased three times, to an uneconomical amount of 120,000 gallons per day, while 89-percent total steam generating capacity is maintained on each boiler without exceeding 24-hour SO<sub>2</sub> standards or emitting more than 14 tons of SO<sub>2</sub> per day.

16.7 tons/day  
(40% bagasse  
residue  
SO<sub>2</sub> removal)

5.5 tons/day x 3 = 16.5 tons/day  
16.5 tons/day > 14 tons/day

5/22/81

The practical limit of oil consumption is reached when no residue or bagasse is available and steam is produced exclusively from oil. The PSD report shows that 3-hour SO<sub>2</sub> impacts under worst-case daily fuel conditions are 492 ug/m<sup>3</sup>, which is 38 percent of the AAQS of 1,300 ug/m<sup>3</sup>. Under the flow conditions described in Appendices A and B, Boilers 6 and 7 (package units burning oil only) could continue producing 150,000 pounds per hour of steam, and Boilers 1 through 5 could produce an additional 400,000 pounds per hour from oil alone without violating the 3-hour standard. Plant-wide SO<sub>2</sub> emissions under these conditions would be 2.1 tons during a 3-hour period. The particular combination of boilers producing the 400,000 pounds per hour does not affect these results, since they were obtained by assuming minimum buoyancy conditions, which would occur when the emissions are apportioned over all available stacks. Practically, SO<sub>2</sub> impacts occurring while burning oil alone could be mitigated further by bypassing the scrubbers, thus avoiding an unnecessary cooling of exit gases (modeling assumed no removal of SO<sub>2</sub> from oil-burning emissions).

The preceding analysis was based on the SO<sub>2</sub> emission factors proposed as BACT: 0.15 lb/10<sup>6</sup> Btu from bagasse, 0.54 lb/10<sup>6</sup> Btu from bagasse residue, and 2.1 lb/10<sup>6</sup> Btu from oil for the proposed boiler. These factors include a 40-percent loss in theoretical SO<sub>2</sub> while burning bagasse and residue; the factor for oil is based on a sulfur content of 1.8 percent and heating value of 17,500 Btu per pound.

Compliance with air quality standards is assured if plant-wide SO<sub>2</sub> emissions are limited to 14 tons per day and 2.1 tons per 3-hour period. The proposed method of showing compliance is the most direct: total fuel usage shall be recorded and the individual emission factors applied to determine total emissions for comparison with the plant-wide limit according to the equation:

$$\begin{aligned} &0.00120 \times (\text{tons dry bagasse}) + 0.00481 \times (\text{tons dry residue}) \\ &+ 0.147 \times (1,000 \text{ gallons oil}) \leq \begin{array}{l} 14 \text{ on a 24-hour basis} \\ 2.1 \text{ on a 3-hour basis.} \end{array} \end{aligned}$$

Records of the sulfur content of oil as received shall be kept to document that the daily average is not greater than 1.8-percent sulfur.

PROPOSED METHOD OF  
SHOWING COMPLIANCE  
OF SULFUR DIOXIDE AIR  
QUALITY STANDARDS.

PROPOSED LAER FOR SUGAR CANE GROWERS COOPERATIVE BOILER 8

No emission factors specific to bagasse- or residue-fired boilers is available for hydrocarbons. Appendix C of AP-42 lists 2 lb/ton of bagasse burned, but no reference or basis for this figure is provided. It is not known whether the factor refers to total or non-methane hydrocarbons, or whether the bagasse is to be measured on a dry or wet basis. On the basis of this figure, the net plant-wide increase in hydrocarbon emissions due to the addition of Boiler 8 is 306 tons/year (see attachment).

Since the SCGC mill is located in an area classified as nonattainment for ozone, an increase in reactive hydrocarbon emissions of 306 tons/year subjects the new boiler to LAER requirements.

The attached letter from the boiler manufacturer documents that the equipment is designed for maximum thermal efficiency, which is directly related to the most complete combustion possible of volatilized hydrocarbons. A recent report to the Florida Public Service Commission indicates that while coal and oil boilers are operated within the range recommended by the manufacturer, optimization of such parameters as air register settings and burner position results in improvements of no more than 1 percent.<sup>1</sup>

A report to the Technical Association of the Pulp and Paper Industry indicates that hydrocarbon emissions from wood-waste-fired boilers decrease as the percent over-fire air is increased.<sup>2</sup> The proposed boiler design has provisions for over-fire air and it is expected to be operated at optimum over-fire air, consistent with best combustion efficiency.

The proposed LAER for Boiler 8 is that achieved by good boiler design and proper operation.

There is sufficient new source allowance in Palm Beach County to assign 306 tons to SCGC without obtaining emissions offsets. If source testing discloses that actual emissions from bagasse and bagasse residue are significantly less than this, the unneeded allowance will be made available for reassignment.

---

<sup>1</sup>Boiler Efficiency Improvement. Prepared by KVB, Inc., Houston, Texas, for the Florida Public Service Commission. 1980.

<sup>2</sup>Volatile Organic Compound Emissions from Pacific Northwest Pulp and Paper Industry Combustion Sources. Dallons, V. and Simon, C. Proceedings of the Technical Association of the Pulp and Paper Industry 1981 Environmental Conference April 27-29, New Orleans, LA.

ATTACHMENT

Additional Hydrocarbon Emissions from SCGC Boiler #8

Basis: 1) Crop season 184 days  
2) Worst case fuel: bagasse has highest required Btu input per  
lb steam

$$(264,000 \text{ lb steam/hr}) \times (1050 \text{ Btu/lb steam}) \times \frac{1}{0.55} = 504 \times 10^6 \text{ Btu/hr}$$

$$(504 \times 10^6 \text{ Btu/hr}) \times (1 \text{ lb dry bagasse}/8000 \text{ Btu}) \times (2.2 \text{ lb wet/lb dry}) \times$$

$$(1 \text{ ton}/2000 \text{ lb}) = 69.3 \text{ ton wet bagasse/hr}$$

AP-42 Appendix C NEDS SCC and Emission Factor Listing (11/78)

External Combustion Boilers - Bagasse

Hydrocarbon Emissions: 2 lb/ton burned

$$(2 \text{ lb/ton}) \times (69.3 \text{ ton/hr}) \times (24) \times (184) \times (1/2000) = 306 \text{ tons } \underline{\text{total}} \text{ hydrocarbon/year}$$



HEYWARD INCORPORATED  
Almand Building, Suite 6  
Address reply to: 2105 Park Avenue  
Orange Park, Florida 32073  
Tel.: (904) 264-3555

POST OFFICE BOX 547  
WORCESTER, MASSACHUSETTS 01613  
(617) 852-7100

May 13, 1981

Sugar Cane Growers Cooperative of Florida  
P. O. Box 666  
Belle Glade, Florida 33430

Attention: Mr. Enrique Arias, Vice President

Subject: Sugar Cane Growers Cooperative of Florida  
Boiler No. 8  
Riley Contract No. 81002

---

Gentlemen:

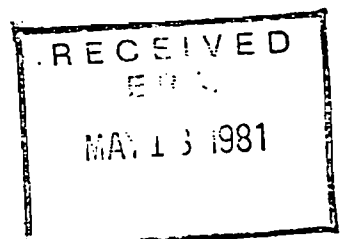
In response to your questions, concerning the improvement of the efficiency of the new unit, Riley Stoker Corporation has designed a state of the art steam generator for the fuel to be burned. This unit includes all of the known heat recovery devices, such as economizer, air heater and a large conservative furnace. We do not feel that any significant improvement in the efficiency of the units can be made mechanically.

Very truly yours,

HEYWARD INCORPORATED  
FOR: RILEY STOKER CORPORATION

E. H. Pearch  
Jacksonville Office

EHP/G





STATE OF FLORIDA  
**DEPARTMENT OF ENVIRONMENTAL REGULATION**

WIN TOWERS OFFICE BUILDING  
2600 BLAIR STONE ROAD  
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM  
GOVERNOR  
VICTORIA J. TSCHINKEL  
SECRETARY

May 21, 1981

Mr. Enrique R. Arias  
Executive Vice President  
Sugar Cane Growers  
Cooperative of Florida 33430

Dear Mr. Arias:

RE: Air Construction Permit Application, AC-42476

The Department has received your application for a permit to construct a boiler at the Sugar Cane Growers Cooperative (SCGC) mill in Palm Beach County, Florida. Based on our initial review of your proposal, it has been determined that additional information is needed before we can process the application. The information required to complete the application is listed below.

1. Provide actual monthly fuel oil consumption during 1979 and 1980 for each existing boiler (units 1 to 7).
2. Is any plant expansion that would increase air pollutant emissions planned in conjunction with the proposed boiler?
3. Are applications for the proposed modifications to boilers #4, #6, and #7 prepared?
4. Is 5 days/week operation correct (Section II.F)? Seasonal operation from November through March does not reflect 184 crop season days; please explain.
5. Provide a copy of the boiler manufacturer's performance specification addressing excess air, oil burner capacity, steam temperature and pressure, construction and predicted performance data, etc.
6. Explain why the system's SO<sub>2</sub> loss (Attachment A-1) is 40% for bagasse residue but 0% for fuel oil. The test results of boiler #2 while burning 100% residue (Table C-1) indicate 27% SO<sub>2</sub> loss, not 40% loss. Are more stack test data available to substantiate the 40% SO<sub>2</sub> removal efficiency?

Mr. Enrique R. Arias  
May 21, 1981  
Page Two

7. Provide fuel analysis reports on bagasse (wet and dry), bagasse residue (wet and dry) and fuel oils. All analyses should be based on actual fuel used. Based on the attached analysis reports, the sulfur contents of bagasse and residue are 0.2% and 0.63% respectively. Average density and heating value for No. 6 fuel oil (information from Belcher Oil Co.) are 7.7 lbs/gal and 18,780 Btu/lb for 1% S oil; 8.22 lbs/gal and 18,330 Btu/lb for 2.4% S oil. Values in Attachment A01; Tables A-1, A-2 and A-3 in Appendix A; and inputs to the computer modeling could be affected by any changes in the fuel analysis reports
8. The calculations of particulate matter and NO<sub>x</sub> emissions while burning 100% residue (Attachment A-2) are not correct. The factor of 1 ton wet/0.45 ton dry is for bagasse, not for residue.
9. In Attachment A, 1% S fuel oil is used for emission calculations. We believe the actual fuel used will contain 1.8% S. Recalculate using analysis of actual fuel proposed.
10. What is the size of fuel oil tank and the maximum oil supply flow rate from the tank?
11. Does the average fuel consumption represent the normal fuel mix? Explain why the total heat input to the boiler will vary for different fuels. How is maximum heat input controlled for each fuel burned?
12. Describe equipment used to feed bagasse and residue to the boiler. What methods will be used to measure oil, bagasse and residual feed to the boiler?
13. What are the SO<sub>2</sub> emission results of the tests for the bagasse-burning boilers conducted by EPA at the U.S. Sugar Mill in Clewiston during the 1978 to 1979 crop season (Attachment C)?
14. What is the basis for using the same particulate removal efficiency for the four different types of control systems (Table D-3)? Provide information on the particulate matter emission size distribution from the boiler.
15. Provide the scrubber I.D. fan operating curve. Include the fan speed (R.P.M.), motor H.P. and amperage of the exhaust fan at designated conditions. What are the temperature and pressure of the flue gas at the scrubber I.D. fan?

16. Will any additive be used while burning oil?
17. What happens to the bagasse at the furfural extraction plant? (If possible, avoid confidential information in your answer). Why are the ash and sulfur contents higher in residue than in bagasse?
18. What are the maximum emissions of all criteria pollutants and heat input rates for each existing boiler? List information in a table.
19. How will fugitive particulate matter emissions from the storage and transfer of excess bagasse be controlled?
20. Provide a letter from the scrubber manufacturer on the performance of the scrubber giving efficiency and the particulate emission limits (pounds per million Btu heat input) which can be met for varying particle sizes.
21. What pressure drop, water pressures, and flow rates will be used by the proposed scrubber? Provide a drawing of the scrubber showing all internal components, water piping, etc.
22. Furnish a drawing of the stack configuration indicating sampling port locations, safety platforms, inlet ducting, etc.
23. Give similar information and drawings, as mentioned above, for the proposed stacks for boilers #4, #6, and #7.
24. Give the control efficiency, cost, and inlet and outlet loadings of the multi-cyclone dust collector which was not specifically addressed as part of the control equipment in the application.
25. Provide a drawing of the boiler, dust collector and wet control device as proposed to meet the emission limitation.
26. Are the flow rates (ACFM) used in Table 2-4 based on design conditions or actual stack testing reports? For all boilers the ACFM value in the stack test reports is different from the ACFM mentioned in the original permit application; please explain.
27. The following sources within 50 km of SCGC were not included in the computer modeling contained in Appendix C. Please include them in the modeling or explain why they should not be included.

Mr. Enrique R. Arias  
May 21, 1981  
Page Four

SO<sub>2</sub> Sources

Gulf and Western, Boiler #14 (pt. 12)  
Osceola Farms, Boiler #5 (pt. 05)  
    Proposed Boiler #6 (pt. 06)

Florida Sugar Refinery, Kiln (pt. 03)  
U.S. Sugar Corp. - Bryant, Boiler #1 (pt. 01)  
    Boiler #2 (pt. 02)  
    Boiler #3 (pt. 03)

Talisman Sugar, Boiler #4 (pt. 04)  
G.C.I. Cannery, Boiler #1 (pt. 03)  
    #2 (pt. 04)

City of Pahokee Incinerator (pt. 01)  
    (pt. 02)

Pratt & Whitney, All Points  
F.P.L. - Martin, Boiler #1 (pt. 01)  
    Boiler #2 (pt. 02)

TSP Sources

Gulf and Western, Boiler #9 (pt. 08)  
Florida Sugar Refinery, Boiler #1 (pt. 01)  
    Boiler #2 (pt. 02)

U.S.S.C. - Bryant, Boiler #4 (pt. 04)  
Pratt and Whitney, All Points  
F.P.L. - Martin, Boiler 1 (pt. 01)  
    Boiler 1 (pt. 02)

Everglades Sugar Refinery, Boiler (pt. 02)  
New Haven Sugar, Inc., Milling Facility (pt. 01)

29. In Table 2-4 the stack diameter of Boilers 6 and 7 with modifications is given as 7.1 ft (2.16 m). This boiler combination was actually modeled with a diameter of 5.0 ft (1.52 m). Our calculations show the exit velocity should be 11.00 m/sec, not 22.40 m/sec as shown in the computer printout. The computer printout also seems to mislocate the Everglades Sugar Refinery sources; please explain.

Mr. Enrique R. Arias  
May 21, 1981  
Page Five

30. Based on the latest EPA ambient monitoring guidelines (Ambient Monitoring Guidelines for Prevention of Significant Deterioration, EPA-450/4-80-012, Section 2), we believe that ESE's procedure to determine a TSP background concentration is not justified. We suggest two alternatives for developing this background. Data collected from the Palm Beach County Health Department (PBCHD) TSP monitor PB-16 could be used. This monitor would be considered a "regional" monitor. Because of its remote location, with the Everglades to the north and Loxahatchee Wildlife Refuge to the south, the impact of cane field burning would probably not be reflected in data from this monitor. Therefore, a modeling analysis of the impact of cane field burning would need to be included in order to supplement the data from PB-16. The other alternative would be to use data from an existing monitor within 10 km of SCGC. PBCHD TSP monitor PB-19 in Belle Glade or Florida Sugar Cane League monitors SL-13 or SL-5 could be used. If a Sugar Cane League monitor were used, the data would have to meet all FDER and EPA quality assurance requirements, and the data would have to be submitted to FDER for verification. Since data from any of these monitors may be impacted by point source emissions from SCGC, the modeled impact of these sources at the location of the monitor could be subtracted out. For either alternative, we suggest that three years of monitor data be used if available.

Mr. Enrique R. Arias  
May 21, 1981  
Page Six

As soon as we have received the requested information, we will continue processing your application. If you have any questions, please contact this office. Cleve Holladay should be contacted on any question related to modeling or ambient monitoring and Willard Hanks on the other information requested.

Sincerely,



Steve Smallwood, P.E.  
Chief  
Bureau of Air Quality  
Management

SS:RK:CH:caa

Attachment

cc: Mirza Baig, South Florida District  
Michael Martin, Palm Beach County Health Department  
William Green, Hopping, Boyd, Green, and Sams  
David Buff, Environmental Science and Engineering

State of Florida  
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

| For Routing To District Offices<br>And/Or To Other Than The Addressee |                    |                |
|-----------------------------------------------------------------------|--------------------|----------------|
| To: _____                                                             | Locn.: _____       |                |
| To: _____                                                             | Locn.: _____       |                |
| To: _____                                                             | Locn.: _____       |                |
| From: _____                                                           | Date: _____        |                |
| Reply Optional [ ]                                                    | Reply Required [ ] | Info. Only [ ] |
| Date Due: _____                                                       | Date Due: _____    |                |

TO: Steve Smallwood

THRU: Bill Thomas

THRU: Phil Edwards *PE*

FROM: Mirza Baig *MB*

DATE: May 12, 1981

SUBJECT: Sugar Cane Growers Co-op - Boiler #8 - Permit No. AC50-7614



Following are the comments/questions from the District Office, for the above referenced project.

✓ 1) Please submit a scrubber drawing including water pressure and flow rates, stack dimensions and port locations. The sampling ports shall be located in the stack at least two stack diameters or equivalent diameters downstream and at least 0.5 stack diameters or equivalent diameters upstream from any fan, bend, constriction or other flow disturbances.

✓ 2) Submit similar stack information and drawings as mentioned above for Boilers #4, #6 and #7.

✓ 3) Please submit the scrubber I. D. Fan operating curve including the fan speed (RPM), Motor H. P., and amperage of exhaust fan at designed conditions.

✓ 4) What is the temperature of system gas at the scrubber I. D. fan? How much excess air is the boiler operation designed for?

Mod 5) Are the flow rates (ACFM) used in Table 2-4, stack parameters based on designed conditions or on actual stack testing reports? For all boilers the ACFM value in the stack test reports is different than the ACFM mentioned in original permit applications. Please explain.

Mod 6) Some sources were not included in the PSD modeling such as "Everglades Sugar Refinery", "New Haven Sugar, Inc.", "North American Spagnum Type Peat Corporation" and the new FPL plant in Martin County, which are all within 50 Km radius. For further details check the Central Files in Tallahassee.

✓ 7) More stack test data is required to substantiate the 40% SO<sub>2</sub> removal efficiency.

continued . . . . .

Steve Smallwood

-2-

May 12, 1981

26 ✓ 8) Please provide a letter from the <sup>See memo</sup> ~~manufacturer for this boiler #8~~ as to the performance of the scrubber, the scrubber efficiency and particulate emissions limits (pounds/Mm BTU heat input) it is capable of meeting.

Several other issues were discussed during the meeting which I understand are to be included in the ~~incompleteness~~ letter along with comments from Palm Beach County local program.

If there are any questions please call.

MPB/med



*Copy given to modeling staff*



STATE OF FLORIDA

DEPARTMENT OF

# Health & Rehabilitative Services

District Nine  
P. O. Box 29



Bob Graham, Governor

Palm Beach County Health Dept.  
West Palm Beach, Florida 33402

Please Address

Reply to:

May 15, 1981

Mr. Bill Thomas  
Department of Environmental Regulation  
Bureau of Air Quality Management  
Twin Towers  
2600 Blair Stone Road  
Tallahassee, Florida 32301

RE: BOILER NO. 8 - SUGAR CANE GROWERS COOPERATIVE

Dear Mr. Thomas:

As per our conversation on the afternoon of May 7, 1981, regarding P.S.D./B.A.C.T./Non-Attainment permitting of the above-referenced source, please find additional comments from this agency which make the application incomplete. Please include these comments below in your agency's request for additional information:

1. Review of the E.S. & E's procedure to determine a T.S.P. background concentration (Table 2-2, Page HTB2-2.1) is not acceptable to this agency. Required quality assurance procedures outlined in State and Federal requirements state that a site must perform Precision and accuracy audits. Precision requirements as stated in Section 6.2.5.1 of E.P.A. Guideline Series, Ambient Monitoring Guidelines for Prevention of Significant Deterioration, E.P.A.-450/2-78-019, requires co-located samplers. Currently, the Florida Sugar Cane League, whose data was used to establish a background concentration, has not met minimum Q.A. requirements. Therefore, this data cannot be used to establish a background for T.S.P. Additionally, from a statistical standpoint, one does not take an average (background of  $40 \text{ ug/m}^3$ ) of an average (84th percentile figures of 42, 32, 46). Both reasons above invalidate the proposed background figure of  $40 \text{ ug/m}^3$  established by E.S. & E.

2. Data calculated from Palm Beach County Health Department T.S.P. Station # P.B.-16, indicates that the 84th percentile figure for data collected at this site since 1976 through 1980 will give us a background concentration of  $47 \text{ ug/m}^3$ . The Health Department's data meets all F.D.E.R. and E.P.A. quality assurance requirements (Data attached). This agency, therefore, recommends a background concentration of  $47 \text{ ug/m}^3$ . Modeling requirements must address this change in background.

3. Computer Model Printouts for  $\text{SO}_2$ , Appendix C of the application, does not include  $\text{SO}_2$  emissions from the combustion of bagasse. An emission factor of 2 lbs/ton based upon ultimate analysis of bagasse submitted to this agency should be used. (Copy of analysis attached.)

*Check analysis  
bagasse to  
see if  
2 lbs/ton  
is correct  
5 analysis  
may vary*

4. The following sources were left out of both SO<sub>2</sub> and T.S.P. Computer Model Printout found in Appendix C.

SO<sub>2</sub> Sources Left Out:

0042 Riviera #1 pt. 01  
                  #2 pt. 02  
0086 G.C.I. Cannery Boiler #1 pt. 03  
                  "      "      #2 pt. 04  
  
0088 City of Pahokee Incinerator pt. 01  
                                          pt. 02  
  
0090 Good Samaritan Hospital #1 Boiler pt. 02  
                                  #2 Boiler pt. 03  
                                  #3 Boiler pt. 04

Why was pt. 06 Incinerator included in SO<sub>2</sub> sources?

0005 Gulf & Western Boiler #14 pt. 12  
  
0019 Osceola Farms Boiler #5 pt. 05  
      Proposed Boiler #6 pt. 06  
  
0050 Florida Sugar Refinery Kiln pt. 03  
  
0061 U.S. Sugar Corp. - Bryant Boiler #1 pt. 01  
                                  Boiler #2 pt. 02  
                                  Boiler #3 pt. 03  
  
0073 Talisman Sugar Boiler #4 pt. 04  
      Check to see if pt. 04 is  
      Boiler #4 - 125,000 lbs/hr.

SO<sub>2</sub> Sources - Continued:

APIS - 051-43 0001 F.P.L. - Indiantown Boiler 1 pt. 01  
                  # 10 2620 050 0001 Boiler 2 pt. 02  
  
0021 Pratt & Whitney All points  
      plus jet fuel usage not permitted.  
      1980 jet fuel usage not permitted - 10,671.798 x 10<sup>3</sup> gal.  
      Emission Factor - 13 lbs/10<sup>3</sup> gal.

T.S.P. Sources Left Out:

0042 F.P.L. Riviera Boiler #1 pt. 01  
#2 pt. 02

0045 Lake Worth Utilities Boiler #2 pt. 02  
#3 pt. 03  
G.T.-1 pt. 06  
Also S-5 Unit - Power Plant Siting Permit

0005 Gulf & Western Boiler 9 pt. 08

0050 Florida Sugar Refinery Boiler #1 pt. 01  
Boiler #2 pt. 02

0061 U.S.S.C. Bryant Boiler #4 pt. 04

0088 City of Pahokee Incinerators #1 pt. 01  
#2 pt. 02

APIS 051-43-0001 F.P.L. Indiantown #1 pt.  
10-2620-050-0001 #2 pt.

0021 Pratt & Whitney All points  
plus jet fuel usage  
not permitted.  
1980 jet fuel usage not permitted -  $10,671.798 \times 10^3$  gal.  
Emission Factor 11.8 lbs/ $10^3$  gal.

5. Please find enclosed a copy of the bagasse residue analysis from Sugar Cane Growers Cooperatives' file.
6. Need detailed plans of the proposed scrubber showing all internal components, water piping, etc.
7. A detailed plan of the stack configuration indicating sampling port locations, safety platforms, inlet ducting, etc., to comply with new F.D.E.R. requirements - (to :)
8. A copy of the boiler manufacturer's performance specifications addressing design, and the Construction and Predicted Performance Data is requested.
9. It is felt that short-term models should also include the impact of cane field burning. Accordingly, an analysis of cane field burning conducted upwind of the "worst" case day on the "hot-spot" receptor is requested to determine the incremental impact of the field burning. A 24-hour emission rate corresponding to 2000 acres burned and 46.2 lbs of particulate per acre burned should be reflected in the modeling.

- ? 10. Make model of multi-cyclone dust collector which was not specifically addressed as a piece of control equipment in the application.
- Confidential  
Q 6 11. Drawing of the boiler, dust collector, and wet control device as determined to meet the emission limitation.
- Confidential  
Q 49 12. Analysis of the bagasse, bagasse residue as stated in the application.
13. The following is information obtained from Belcher Oil Co. on the average density and heating value for No. 6 fuel oil containing (a) 1% sulfur, and (b) 2.4% sulfur.
- |     |        |                 |
|-----|--------|-----------------|
| (a) | 1% =   | 7.7 lbs/gal.    |
|     |        | 18,780-BTU/lb.  |
| (b) | 2.4% = | 8.22 lbs/gal.   |
|     |        | 18,360 BTU/gal. |

Should you have any questions concerning any of the above, please contact me at 305/837-3070.

Sincerely,  
  
MICHAEL J. MARTIN  
Environmental Specialist

MJM/o  
Enclosures

Cc: C. Fancy, D.E.R., Tallahassee  
M. Baig, D.E.R. - Fort Myers

FCD.

03 416

|    |           | 1          | 2            | 3                | 4              | 5           | 6  |    |
|----|-----------|------------|--------------|------------------|----------------|-------------|----|----|
|    | Geometric |            |              |                  |                |             |    |    |
|    | n         | $\Sigma x$ | $\Sigma x^2$ | $\bar{x}_{mean}$ | $\bar{x}_{sd}$ | $84^{th}\%$ |    |    |
| 1  | 1980      | 60         | 90.36335     | 137.55749        | 32             | 1.441       | 46 |    |
| 2  | 1979      | 56         | 25.65208     | 133.11447        | 34             | 1.57        | 53 |    |
| 3  | 1978      | 59         | 86.04434     | 127.27255        | 29             | 1.50        | 43 |    |
| 4  | 1977      | 54         | 78.35107     | 115.41944        | 28             | 1.52        | 42 |    |
| 5  | 1976      | 58         | 86.47238     | 131.32083        | 31             | 1.60        | 50 |    |
| 6  |           | 287        | 426.88322    | 644.68498        | 31             | 1.53        | 47 | 47 |
| 7  |           |            |              |                  |                |             |    |    |
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**COMMERCIAL TESTING & ENGINEERING CO.**

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 728-8434



May 4, 1973

**THE QUAKER OATS COMPANY**  
**POB 759**  
**Belle Glade, Florida**

MAIL ADDRESS  
 16130 VAN DRUNEN ROAD  
 SOUTH HOLLAND, ILLINOIS  
 (CHICAGO) 60473  
 PHONE 312 264 1171

Sample identification  
 by

**The Quaker Oats Co.**

**P. O. No. C 45166**

**residue - March 1 to April 2, 1973**

Kind of sample  
 reported to us

----

Sample taken at

----

Sample taken by

**The Quaker Oats Co.**

Date sampled

----

Analysis report no. **71- 41 2228**  
 PROXIMATE ANALYSIS

|                | <u>As received</u> | <u>Dry basis</u> |
|----------------|--------------------|------------------|
| % Moisture     | 35.01              | XXXX             |
| % Ash          | 1.57               | 2.41             |
| % Volatile     | 41.53              | 73.14            |
| % Fixed Carbon | 15.89              | 24.45            |
|                | 100.00             | 100.00           |
| Btu            | 5875               | 9040             |
| % Sulfur       | 0.41               | 0.63             |

## FUSION TEMPERATURE OF ASH

|                     | <u>Reducing</u> | <u>Oxidizing</u> |
|---------------------|-----------------|------------------|
| Initial Deformation | XXXXXX          | XXXXXX           |
| Softening (H W)     | XXXXXX          | XXXXXX           |
| Softening (H ½ W)   | XXXXXX          | XXXXXX           |
| Fluid               | XXXXXX          | XXXXXX           |

**RECEIVED**  
 JUN 6 1973

Division of Environmental Services  
 PALM BEACH COUNTY  
 HEALTH DEPT.

H is Cone Height  
 W is Cone Width

Respectfully submitted,  
**COMMERCIAL TESTING & ENGINEERING CO.**

*J. O. Foster*

**IOF:scc**



Charter Member

**COMMERCIAL TESTING & ENGINEERING CO.**

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434



March 10, 1973

**THE QUAKER OATS COMPANY**  
 P. O. Box 759  
 Belle Glade, Florida

MAIL ADDRESS  
 18130 VAN DRUNEN ROAD  
 SOUTH HOLLAND, ILLINOIS  
 (CHICAGO) 60473  
 PHONE 312 264-1173

**RECEIVED**  
 MAR 19 1973

Sample identification

by

**The Quaker Oats Co.****P. O. No. C 43820****Residue Composite Sample**

Kind of sample  
 reported to us -----

Sample taken at -----

Sample taken by **The Quaker Oats Co.**

Date sampled **1-23-73 to 2-23-73**

Analysis report no. **71- 410436**

## • PROXIMATE ANALYSIS

|                | <u>As received</u> | <u>Dry basis</u> |
|----------------|--------------------|------------------|
| % Moisture     | 37.52              | XXXX             |
| % Ash          | 1.51               | 2.41             |
| % Volatile     | 45.79              | 73.29            |
| % Fixed Carbon | 15.18              | 24.30            |
|                | 100.00             | 100.00           |
| Blu            | 5746               | 9196             |
| % Sulfur       | 0.37               | 0.60             |

## FUSION TEMPERATURE OF ASH

|                     | <u>Reducing</u> | <u>Oxidizing</u> |
|---------------------|-----------------|------------------|
| Initial Deformation | XXXXXX          | XXXXXX           |
| Softening (H W)     | XXXXXX          | XXXXXX           |
| Softening (H 1/2 W) | XXXXXX          | XXXXXX           |
| Fluid               | XXXXXX          | XXXXXX           |

H is Cone Height

W is Cone Width

**IOF:scc**

Respectfully submitted,  
**COMMERCIAL TESTING & ENGINEERING CO.**

*J. O. Foster*

Charter Member

Gulf Western (Mr. Stanley Hooks)

(J.R. Orsenigo)

| ALN (PID) | Raw | Lab | TJG |
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RILEY

**RILEY STOKER  
CORPORATION**

POST OFFICE BOX 27, WINCHESTER, MASS. 01890  
A SUBSIDIARY OF THE GILLES COMPANY

## FUELS LABORATORY

# TEST REPORT

Laboratory No. 22,447

**Sample of Bagasse**

Date Rec'd. 3/6/79

Received From Gulf Western (Sugar Cane Growers)

South Bay, Fla

Sample Data      Bagasse Sample #10    2/9/79

Contract No. (641-91110)

Field Sample By Customer

|                                                                                  |  |          |       |                     |  |          |       |
|----------------------------------------------------------------------------------|--|----------|-------|---------------------|--|----------|-------|
| Air Drying Loss                                                                  |  |          | 53.0  | %                   |  |          |       |
| Proximate Analysis                                                               |  | As Rec'd | Dry   | Ultimate Analysis   |  | As Rec'd | Dry   |
| Moisture                                                                         |  | 54.9%    | —     | Moisture            |  | %        | —     |
| Volatile                                                                         |  | 38.9%    | 85.3  | Carbon              |  | %        | 48.5  |
| Ash                                                                              |  | 0.4%     | 0.9   | Hydrogen            |  | %        | 5.0   |
| Fixed Carbon                                                                     |  | 5.8%     | 12.8  | Nitrogen            |  | %        | 0.31  |
|                                                                                  |  | 100.0    | 100.0 | Oxygen (diff.)      |  | %        | 44.19 |
| British Thermal Units                                                            |  | 3,673    | 8,145 | Sulfur              |  | %        | 0.1   |
| <u>Fusibility of Ash</u><br><br>Initial Deformation F<br>Softening F<br>Fluid. F |  |          |       | Ash                 |  | %        | 0.9   |
|                                                                                  |  |          |       |                     |  | 100.0    | 100.0 |
|                                                                                  |  |          |       | Free Swelling Index |  |          |       |
|                                                                                  |  |          |       | Grindability Index  |  |          |       |

RECEIVED

MAK 12 1980

(\*Skinner & Sherman)

SEP 20 1964

Date April 27, 1979

Thomas J. Callagher



# ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

May 18, 1981  
ESE No. 80-190-100

Mr. Clair Fancy  
Chief, Permitting Section  
Bureau of Air Quality Management  
Department of Environmental Regulation  
Twin Towers Building  
2600 Blair Stone Road  
Tallahassee, Florida 32301

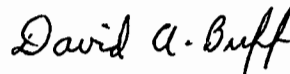
Subject: Boiler No. 8/Sugar Cane Growers Cooperative/Construction  
Permit Application

Dear Mr. Fancy:

As no specific hydrocarbon or volatile organic compound (VOC) emission factors are available for bagasse or residue fired boilers, a worst case estimate of 306 tons per year of total hydrocarbons should be substituted for the 6 tons per year in the original permit submittal. This estimate is based on an unreferenced factor for bagasse boilers in Appendix C of AP-42 of 2.0 lb/ton of bagasse burned (assumed wet basis), total bagasse burning, and 184 day per year operation (since total plant steam generation and therefore VOC's produced in off-season will not increase).

Since this emission rate is greater than 50 tons per year and the plant is located in Palm Beach County, a non-attainment area for ozone, the new boiler is subject to LAER determination under FAC 17-2.17. A description of the proposed LAER will be forthcoming shortly.

Sincerely,



David A. Buff, M.E., P.E.  
Project Director

DAB/sn

cc: Bill Green, HPS&G  
Enrique Arias, SCGC  
Mike Martin, PBCAD  
Mirza Baig, FDER-Ft. Myers

BOILER NO. 8 AT  
SUGAR CANE GROWERS COOPERATIVE

PERMIT APPLICATION AND PREVENTION OF  
SIGNIFICANT DETERIORATION REPORT

Prepared for:

SUGAR CANE GROWERS COOPERATIVE  
Belle Glade, Florida

Prepared by:

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.  
Gainesville, Florida

April 1981

ESE No. 80-190-100

APPLICATION TO CONSTRUCT AIR POLLUTION SOURCES

FDER Form 17-1.222(16)

Attachment A--Emissions Estimates

Attachment B--Manufacturer's Literature

Attachment C--Basis for SO<sub>2</sub> Removal Efficiency

Attachment D--BACT Justification

Attachment E--BACT Determination for U.S. Sugar, Bryant

Attachment F--SO<sub>2</sub> Stack Test Report



STATE OF FLORIDA  
DEPARTMENT OF ENVIRONMENTAL REGULATION  
APPLICATION TO OPERATE/CONSTRUCT  
AIR POLLUTION SOURCES

SOURCE TYPE: Carbonaceous fuel boiler ☒ New<sup>1</sup> ☐ Existing<sup>1</sup>

APPLICATION TYPE: ☒ Construction ☐ Operation ☐ Modification

COMPANY NAME: Sugar Cane Growers Cooperative of Florida COUNTY: Palm Beach

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) Boiler 8 with impingement scrubbers

SOURCE LOCATION: Street 1/2 mile north of Airport Road City Belle Glade

UTM: East 534.9 North 2953.3

Latitude 26 ° 42 ' 30 "N Longitude 80 ° 39 ' 00 "W

APPLICANT NAME AND TITLE: Enrique R. Arias, Executive Vice President

APPLICANT ADDRESS: Post Office Box 666, Belle Glade, Florida 33430

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative\* of Sugar Cane Growers Cooperative of Florida

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: Enrique R. Arias

Enrique R. Arias, Executive Vice President  
Name and Title (Please Type)

Date: 4/24/81 Telephone No. (305) 996-5556

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: David A. Buff

David A. Buff

Name (Please Type)

Environmental Science and Engineering, Inc.

Company Name (Please Type)

P.O. Box ESE, Gainesville, FL 32601

Mailing Address (Please Type)

Date: 4-23-81 Telephone No. (904) 372-3318

(Affix Seal)

Florida Registration No. 19011

<sup>1</sup>See Section 17-2.02(15) and (22), Florida Administrative Code, (F.A.C.)

## SECTION II: GENERAL PROJECT INFORMATION

- Max 264,500*
- 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.
- Addition of 240,000-lb/hr rated steam capacity boiler capable of burning bagasse, bagasse residue, and oil. Modification of existing plant along with new source will result in net air quality improvement and full compliance (see Project description Section 1.0 of PSD report).
- B. Schedule of project covered in this application (Construction Permit Application Only)
- Start of Construction July 1981 Completion of Construction November 1982
- 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.)
- Scrubber system for new boiler (including ducts, fans, ports, etc.): \$1.1 to 1.6 million
- Boiler No.4 stack modification: \$200,000.
- Boilers No.6 and No.7 stack modification: \$175,000.
- D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.
- NA - New emission point
- 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 ☒ No
- F. Normal equipment operating time: hrs/day 24 ; days/wk 5 ; wks/yr 39 ; if power plant, hrs/yr \_\_\_\_\_ ; if seasonal, describe: Source operates during crop season, generally November through March. May also operate on occasion during off season (October, April, May, and June).
- October → June 1 permit condition*
- 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, ozone  |
| a. If yes, has "offset" been applied?                                                                                                 | ? <u>NA</u> |
| b. If yes, has "Lowest Achievable Emission Rate" been applied?                                                                        | <u>NA</u>   |
| c. If yes, list non-attainment pollutants.                                                                                            |             |
| <u>Ozone</u>                                                                                                                          |             |
| 2. Does best available control technology (BACT) apply to this source? If yes, see Section VI.                                        | <u>Yes</u>  |
| 3. Does the State "Prevention of Significant Deterioration" (PSD) requirements apply to this source? If yes, see Sections VI and VII. | <u>Yes</u>  |
| 4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source?                                              | <u>No</u>   |
| 5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source?                                       | <u>No</u>   |

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 |                           |                        |
| Not applicable |              |      |                           |                        |
|                |              |      |                           |                        |
|                |              |      |                           |                        |
|                |              |      |                           |                        |
|                |              |      |                           |                        |

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

1. Total Process Input Rate (lbs/hr): Not Applicable

2. Product Weight (lbs/hr): 240,000-lb steam/hr rated capacity

264,000-lb steam/hr peak capacity

**C. Airborne Contaminants Emitted:**

336,400 lb/hr x 70 lb/hr

| Name of Contaminant | Emission <sup>1</sup>  |                | Allowed Emission <sup>2</sup><br>Rate per<br>Ch. 17-2, F.A.C. | Allowable <sup>3</sup><br>Emission<br>lbs/hr | Potential Emission <sup>4</sup> |       | Relate to Flow Diagram |
|---------------------|------------------------|----------------|---------------------------------------------------------------|----------------------------------------------|---------------------------------|-------|------------------------|
|                     | Maximum<br>lbs/hr      | Actual<br>T/yr |                                                               |                                              | lbs/hr                          | T/yr  |                        |
| Particulate         | 100.8 <sup>367.7</sup> | 324.5          | 0.2 lb/MM Btu, <sup>17-2.05</sup> (6)                         | 100.8                                        | 1,121.4                         | 4,091 | A                      |
| Sulfur Dioxide      | 343.5 <sup>1253</sup>  | 799.7          | NA                                                            | NA                                           | 387.9                           | 1,415 | A                      |
| Nitrogen Oxides     | 129.2 <sup>471</sup>   | 259.4          | NA                                                            | NA                                           | 129.2                           | 471.4 | A                      |
| Hydrocarbons        | 1.8                    | 0.2            | NA                                                            | NA                                           | 1.8                             | 6.6   | A                      |
| Carbon Monoxide     | 8.8                    | 1.2            | NA                                                            | NA                                           | 8.8                             | 32.1  | A                      |

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

| Name and Type<br>(Model & Serial No.)  | Contaminant     | Efficiency | Range of Particles <sup>5</sup><br>Size Collected<br>(in microns) | Basis for<br>Efficiency<br>(Sec. V, It <sup>5</sup> |
|----------------------------------------|-----------------|------------|-------------------------------------------------------------------|-----------------------------------------------------|
| Joy Turbulaire Type D                  | Particulate     | +90%       | See Attachment B                                                  | manufacturer's literature                           |
| Impingement Scrubber, or<br>equivalent | SO <sub>2</sub> | 40%        | NA                                                                | Test data                                           |
|                                        |                 |            |                                                                   | see Attachment C                                    |
|                                        |                 |            |                                                                   |                                                     |
|                                        |                 |            |                                                                   |                                                     |

<sup>1</sup> See Section V, Item 2.

<sup>2</sup> 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)

<sup>3</sup> Calculated from operating rate and applicable standard

<sup>4</sup> Emission, if source operated without control (See Section V, Item 3)

<sup>5</sup> If Applicable

E. Fuels

| Type (Be Specific) | Consumption*    |                  | Maximum Heat Input<br>(MMBTU/hr) |
|--------------------|-----------------|------------------|----------------------------------|
|                    | avg/hr          | max./hr          |                                  |
| Bagasse            | 15,000 lb (dry) | 63,000 lb (dry)* | 504.0                            |
| Residue            | 36,600 lb (dry) | 49,834 lb (dry)* | 443.5                            |
| No.6 Fuel Oil      | 1.5 bbls        | 42 bbls*         | 250.0                            |
|                    |                 |                  |                                  |

\*Max when fired singly, not in combination with other fuels

\*Units Natural Gas, MMCF/hr; Fuel Oils, barrels/hr; Coal, lbs/hr

Fuel Analysis: See Attachment A

Percent Sulfur: \_\_\_\_\_ Percent Ash: \_\_\_\_\_

Density: \_\_\_\_\_ lbs/gal Typical Percent Nitrogen: \_\_\_\_\_

Heat Capacity: \_\_\_\_\_ BTU/lb 141,723 BTU/gal

Other Fuel Contaminants (which may cause air pollution): \_\_\_\_\_

F. If applicable, indicate the percent of fuel used for space heating. Annual Average NA Maximum NA

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

Liquid and solid wastes generated from scrubbers will be routed to settling pond.

Water pollution control permit?

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

Stack Height: 155 ft Stack Diameter: 10.0 ft

Gas Flow Rate: 170,000 ACFM Gas Exit Temperature: 160 °F

Water Vapor Content: 29 % Velocity: 36 FPS

#### SECTION IV: INCINERATOR INFORMATION

Not Applicable

| Type of Waste         | Type O<br>(Plastics) | Type I<br>(Rubbish) | Type II<br>(Refuse) | Type III<br>(Garbage) | Type IV<br>(Pathological) | Type V<br>(Liq & Gas<br>By-prod.) | Type VI<br>(Solid<br>By-prod.) |
|-----------------------|----------------------|---------------------|---------------------|-----------------------|---------------------------|-----------------------------------|--------------------------------|
| Lbs/hr<br>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<br>(ft) <sup>3</sup> | Heat Release<br>(BTU/hr) | Fuel |        | Temperature<br>(°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.

- Total process input rate and product weight — show derivation.  
See Attachment A and PSD report
- 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.  
See Attachment A and PSD Report
- Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).  
See Attachment A and PSD Report
- 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.).  
See BACT discussion, Attachments B and D
- 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).  
See BACT discussion, Attachments B and D
- 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.  
See PSD Report
- 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).  
See PSD Report
- 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.  
See PSD Report



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 ☒ No

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

- B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy) ☐ Yes ☒ No  
 See Note below\*

| Contaminant       | Rate or Concentration               |
|-------------------|-------------------------------------|
| Particulate       | 0.15 #/MMBtu from carbonaceous fuel |
| Particulate       | 0.1 #/MMBtu from fossil fuel        |
| SO <sub>2</sub>   | 0.8 #/MMBtu from fossil fuel        |
| Visible Emissions | 30% except 40% up to 2 minutes/hour |

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

| Contaminant              | Rate or Concentration                                                    |
|--------------------------|--------------------------------------------------------------------------|
| Particulate              | 0.20 lb/MMBtu from carbonaceous fuel                                     |
| Particulate              | 0.10 lb/MMBtu from fossil fuel                                           |
| SO <sub>2</sub>          | 0.15 lb/MM Btu (bag.), 0.54lb/MM Btu (bag. res.),<br>2.1 lb/MM Btu (oil) |
| NO <sub>x</sub> , CO, HC | Good firing practices and operation                                      |
| Visible Emissions        | 30 % except 40% up to 2 minutes/hour                                     |

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

1. *Particulate* Control Device/System: Joy Turbulaire Type D Impingement Scrubber.
2. Operating Principles: Impaction of large particles on water droplets, removal of small particles by venturi effect, inertial separation of droplets from gas stream by use of swirl vanes.
3. Efficiency: Approximately 91%
4. Capital Costs:
5. Useful Life: 5 to 10 years
6. Operating Costs: See Attachment D
7. Energy: 500 KW
8. Maintenance Cost:
9. Emissions:

| Contaminant | Rate or Concentration                     |
|-------------|-------------------------------------------|
| Particulate | 0.23 lb/MMBtu maximum at this site (SCGC) |
|             |                                           |
|             |                                           |
|             |                                           |

\*Explain method of determining D 3 above.

Based on AP-42 estimates and allowable emission rates of 0.2 lb/MM Btu.

\*Note: The BACT determination was made by Florida DER for a bagasse boiler at a specific site (not at SCGC) with different fuel characteristics. Determination is attached.

## 10. Stack Parameters

- |                             |      |                            |     |
|-----------------------------|------|----------------------------|-----|
| a. Height: 85               | ft.  | b. Diameter: 3 @ 5 ft 4 in | ft. |
| c. Flow Rate: 149,000 total | ACFM | d. Temperature: 160        | °F  |
| e. Velocity: 37             | FPS  |                            |     |

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

### 1. Particulate

- a. Control Device: Electrostatic Precipitator
- b. Operating Principles: Particle charging by high voltage corona. Particles collected by migration to oppositely-charged electrode.
- c. Efficiency\*: +91%
- d. Capital Cost:
- e. Useful Life: 5-10 years
- f. Operating Cost: See Attachment D
- g. Energy\*: 167 KW
- h. Maintenance Cost:
- i. Availability of construction materials and process chemicals:  
Availability of construction materials is good. No process chemicals required.
- j. Applicability to manufacturing processes: Has never been applied to bagasse- or bagasse residue-fired boilers. Possible fire hazard and explosion potential.
- k. Ability to construct with control device, install in available space, and operate within proposed levels:  
Ability to construct and install is good. Operation within proposed levels has not been demonstrated.

### 2. Particulate

- a. Control Device: Fabric Filter (baghouse)
- b. Operating Principles: Particulates entrained on fibrous bags forming filter cakes. Cake periodically removed by mechanical shakers.
- c. Efficiency\*: +91%
- d. Capital Cost:
- e. Useful Life: 15 to 20 years
- f. Operating Cost: See Attachment D
- g. Energy\*: 350 KWH
- h. Maintenance Costs:
- i. Availability of construction materials and process chemicals:  
Available
- j. Applicability to manufacturing processes: Not good--subject to fire hazard. Has not been demonstrated on bagasse boilers.
- k. Ability to construct with control device, install in available space, and operate within proposed levels:  
Requires more space than a scrubber. Will meet the required limitations if installed. However, emission levels have not been demonstrated for this

\*Explain method of determining efficiency. application.

Literature sources  
\*\*Energy to be reported in units of electrical power -- KWH design rate.

### 3. Particulate

- a. Control Device: Venturi Scrubber
- b. Operating Principles: Particulates removed by impaction on water droplets sprayed perpendicular to gas stream at venturi throat
- c. Efficiency\*: +91%
- d. Capital Cost:
- e. Life: 5 to 10 years
- f. Operating Cost: See Attachment D
- g. Energy: 1,150 KW
- h. Maintenance Cost:

\*Explain method of determining efficiency above.

Current literature.

i. Availability of construction materials and process chemicals:

Available

j. Applicability to manufacturing processes: Currently used in the Sugar Industry. However, are subject to plugging without initial particle removal devices.

k. Ability to construct with control device, install in available space and operate within proposed levels: Able to be constructed within space limitations and will attain required particulate emission levels.

4. Particulate

a. Control Device

Joy Turbulaire Type D Impingement Scrubber

b. Operating Principles: Impaction of large particulates on water droplets, removal of small particles by venturi effect; initial separation of droplets from gas stream by use of swirl vanes.

c. Efficiency\*: 91%

d. Capital Cost:

e. Life: 5-10 year

f. Operating Cost: See Attachment D

g. Energy: 500 KW

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

Readily available

j. Applicability to manufacturing processes: Excellent. Type D impingement separators are widely used in the sugar industry.

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

F. Describe the control technology selected: Particulate

1. Control Device: Joy Turbulaire Type D Impingement Scrubber

2. Efficiency\*: 91%

3. Capital Cost:

4. Life: 5-10 year

5. Operating Cost: See Attachment D

6. Energy: 500 KW

7. Maintenance Cost:

8. Manufacturer: Joy Industrial Equipment Company

9. Other locations where employed on similar processes:

a.

(1) Company: Osceola Farms Company

(2) Mailing Address: P.O. Box 679

(3) City: Pahokee

(4) State: Florida 33476

(5) Environmental Manager: Mr. Alberto Recio

(6) Telephone No.: (305) 924-7156

\*Explain method of determining efficiency above.

(7) Current literature.

Emissions:

| Contaminant                              | Rate or Concentration        |
|------------------------------------------|------------------------------|
| Particulate (Avg. all boilers) 1975-1976 | 0.193 lb/10 <sup>6</sup> Btu |
| Particulate (Avg. all boilers) 1976-1977 | 0.265 lb/10 <sup>6</sup> Btu |
| Particulate (Avg. all boilers) 1977-1978 | 0.177 lb/10 <sup>6</sup> Btu |
| Particulate (Avg. all boilers) 1978-1979 | 0.283 lb/10 <sup>6</sup> Btu |

(8) Process Rate\*:

300,000 lb steam/hour

b.

(1) Company:

U.S. Sugar (Clewiston)

(2) Mailing Address:

P.O. Box 1206

(3) City:

Clewiston

(4) State: Florida 33440

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

- (5) Environmental Manager: Mr. A.R. Mayo  
(6) Telephone No.: (813) 983-8121  
(7) Emissions\*:

| Contaminant                            | Rate or Concentration |
|----------------------------------------|-----------------------|
| Particulate (Avg. 3 boilers) 1975-1976 | 0.166 lb/MMBtu        |
| Particulate (Avg. 4 boilers) 1976-1977 | 0.192 lb/MMBtu        |
| Particulate (Avg. 5 boilers) 1977-1978 | 0.188 lb/MMBtu        |
| Particulate (Avg. 4 boilers) 1978-1979 | 0.193 lb/MMBtu        |
| Particulate (Avg. 5 boilers) 1979-1980 | 0.24 lb/MMBtu         |

(8) Process Rate\*:

335,000 to 600,000 steam/hour.

10. Reason for selection and description of systems:

See BACT Attachment

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

D.

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

Sulfur Dioxide: No specific SO<sub>2</sub> removal systems currently are in use on bagasse- or  
1. Control Device/System: bagasse residue-fired boilers.

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.

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

1. Sulfur Dioxide

- a. Control Device: Joy Turbulaire Impingement Scrubber
- b. Operating Principles: See particulate removal systems discussion.
- c. Efficiency\*: +40%
- d. Capital Cost:
- e. Useful Life: 5-10 years
- f. Operating Cost: See Attachment D
- g. Energy\*: 500 KW
- h. Maintenance Cost:
- i. Availability of construction materials and process chemicals:  
Requires no additional materials or chemicals beyond that required for particulate removal system.
- j. Applicability to manufacturing processes:  
Excellent.
- k. Ability to construct with control device, install in available space, and operate within proposed levels:  
Excellent.

2. Sulfur Dioxide

- a. Control Device: Lime/limestone scrubbing
- b. Operating Principles: Wet scrubbing with lime/limestone slurry. Waste disposal to settling pond, water recycle. SO<sub>2</sub> is absorbed by aqueous solution.
- c. Efficiency\*: +90%
- d. Capital Cost:
- e. Useful Life: 5-10 years
- f. Operating Cost: See Attachment D
- g. Energy\*\*: 2,000 KW
- h. Maintenance Costs:
- i. Availability of construction materials and process chemicals:  
Assumed to be good.
- j. Applicability to manufacturing processes:  
Has been applied to similar processes (i.e., coal boilers).
- k. Ability to construct with control device, install in available space, and operate within proposed levels:  
Assumed satisfactory. Requires large land area for waste disposal.

\*Explain method of determining efficiency.

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

3. Sulfur Dioxide

- a. Control Device: Sodium Throwaway Scrubbing
- b. Operating Principles: Wet scrubbing with aqueous solution. SO<sub>2</sub> is absorbed by solution. Requires sludge disposal, water treatment, and solution preparation.
- c. Efficiency\*: +90%
- d. Capital Cost:
- e. Life: 5-10 years
- f. Operating Cost: See Attachment D
- g. Energy: 1,000 KW
- h. Maintenance Cost:

\*Explain method of determining efficiency above.

- i. Availability of construction materials and process chemicals:  
Assumed adequate.
  - j. Applicability to manufacturing processes: Has been applied to other boiler types (i.e., coal).
  - k. Ability to construct with control device, install in available space and operate within proposed levels:  
Assumed adequate.
4. Sulfur Dioxide Control Device Double alkali scrubbing
- b. Operating Principles: Wet scrubbing with aqueous alkaline solution. SO<sub>2</sub> is absorbed by the solution. Requires sludge disposal, water treatment, and solution preparation. Regeneration of solution by calcium alkali.
  - c. Efficiency\*: +90%
  - d. Capital Cost:
  - e. Life: 5-10 years
  - f. Operating Cost: see Attachment D
  - g. Energy: 800 KW
  - h. Maintenance Cost:
  - i. Availability of construction materials and process chemicals:  
Assumed good.
  - j. Applicability to manufacturing processes: Has been applied to other boiler types (i.e., coal).
  - k. Ability to construct with control device, install in available space, and operate within proposed levels:  
Assumed adequate, but possible limitations due to waste disposal requirements.

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

5. k Sulfur Dioxide

- a. Control Device: Spray drying
- b. Operating Principles: Spray of aqueous lime or soda ash absorbent introduced in tower, where it absorbs SO<sub>2</sub> and is dried to solid form. Dry collection then takes place (i.e., fabric filter).
- c. Efficiency\*: +90%
- d. Capital Cost:
- e. Useful Life: 5-10 years
- f. Operating Cost: See Attachment D
- g. Energy\*: 1,000 KW
- h. Maintenance Cost:
- i. Availability of construction materials and process chemicals:  
Assumed good.
- j. Applicability to manufacturing processes: Generally applicable, high reliability claimed but undemonstrated.
- k. Ability to construct with control device, install in available space, and operate within proposed levels:  
Large land requirements for solid waste disposal.

6. x Sulfur Dioxide

- a. Control Device: Wellman-Lord process
- b. Operating Principles: Wet scrubbing using a sodium sulfite solution. Regeneration is included. SO<sub>2</sub> is produced and converted to other products.
- c. Efficiency\*: +90%
- d. Capital Cost:
- e. Useful Life: 5-10 years
- f. Operating Cost: See Attachment D
- g. Energy\*\*: 6,000 KW
- h. Maintenance Costs:
- i. Availability of construction materials and process chemicals:  
Assumed good.
- j. Applicability to manufacturing processes: Costs and complexity will limit to small boilers. Good reliability on coal boilers.
- k. Ability to construct with control device, install in available space, and operate within proposed levels:  
Assumed adequate, but undemonstrated.

\*Explain method of determining efficiency.

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



F. Describe the control technology selected:

1. Control Device: Sulfur Dioxide Joy Turbulaire Impingement Scrubber
2. Efficiency\*: +40%
3. Capital Cost:
4. Life: 5-10 years
5. Operating Cost: No incremental cost above particulate control system.
6. Energy: 500 KW
7. Maintenance Cost:
8. Manufacturer:
9. Other locations where employed on similar processes:

a. See particulate removal systems discussion and Attachment C.

- (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:

See Attachment D

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

■■■■■

1.

1

1

1

1

1

1

1

1

1



1

1

1



1

1

1

[illegible]

(See Section III.C. & PSD report) grams/sec

 $\text{SO}_2$ 

(See Section III.C & PSD report) grams/sec



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.

■

See PSD Report

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

1

Positive social impacts are expected with increased sugar production, due to increased employment and increased tax base for the area. The chosen technology makes these benefits possible. The environmental impacts are discussed in the PSD report.

See attachments

ATTACHMENT A

PROPOSED BOILER NO. 8  
EMISSION ESTIMATES

FUEL USAGE CALCULATIONS

Peak Steam Capacity = 264,000 lb/hr

Btu requirements per lb steam = 1,050 Btu/lb

Boiler efficiencies: Bagasse - 55%  
Residue - 62.5%  
Oil - 80%

System SO<sub>2</sub> loss: Bagasse - 40%  
Residue - 40%  
Oil - 0%

Fuel Analysis:

|                    | <u>Bagasse</u> | <u>Residue</u> | <u>No. 6 Fuel Oil</u> |
|--------------------|----------------|----------------|-----------------------|
| Btu/lb             | 8,000 (dry)    | 8,900 (dry)    | 17,500                |
| lbs/gal            | —              | —              | 8.1                   |
| % S                | ✓ 0.1 (dry)    | ✓ 0.4 (dry)    | 1.0                   |
| % N                | 0.3 (dry)      | 0.4 (dry)      | 0                     |
| % Ash              | 0.5-0.3 (dry)  | 1.9-3.8 (dry)  | 0.1                   |
| % H <sub>2</sub> O | 55             | 40             | 0.2                   |

Bagasse Burning:  $264,000 \text{ lb/hr steam} \times 1,050 \text{ Btu/lb} \div 0.55 = 504.0 \times 10^6 \text{ Btu/hr}$   
 $504.0 \times 10^6 \text{ Btu/hr} \div 8,000 \text{ Btu/lb} = 63,000 \text{ lb/hr dry bagasse}$

Residue Burning:  $264,000 \text{ lb/hr steam} \times 1,050 \text{ Btu/lb} \div 0.625 = 443.5 \times 10^6 \text{ Btu/hr}$   
 $443.5 \times 10^6 \text{ Btu/hr} \div 8,900 \text{ Btu/lb} = 49,834 \text{ lb/hr dry residue}$

Oil Burning: Limited to  $250 \times 10^6 \text{ Btu/hr heat input}$   
 $250 \times 10^6 \text{ Btu/hr} \div 17,500 \text{ Btu/lb} = 14,286 \text{ lb/hr} = 1,764 \text{ gal/hr}$

$264,000 \text{ lb/hr steam} \times 1,050 \text{ Btu/lb} \div 0.800 = 3.465 \times 10^8 \text{ Btu/hr}$   
 $= 347 \times 10^6 \text{ Btu/hr}$

1.8 14 50- / MMBTU

EMISSION CALCULATIONS

BURNING 100-PERCENT RESIDUE

1. Particulate

Allowable and maximum emissions =  $443.5 \times 10^6 \text{ Btu/hr} \times 0.2 \text{ lb particulate}/10^6 \text{ Btu} = 88.7 \text{ lb/hr}$

Potential (uncontrolled) emissions: assume same as bagasse in AP-42 on a "dry" basis. Factor is 16 lb/ton bagasse on a wet basis.

Convert to dry basis:  $16 \text{ lbs/ton wet bagasse} \times 1 \text{ ton wet}/0.45 \text{ ton dry} = 35.6 \text{ lb/ton dry} \times 49,834 \text{ lb/hr residue (dry)} \div 2,000 = 887.0 \text{ lb/hr}$

2. Sulfur Dioxide (based on scrubber removal of 40%)

Maximum emissions =  $49,834 \text{ lb/hr residue (dry)} \times 0.004 \times 2 \times 0.6 = 239.2 \text{ lb/hr}$

Potential (uncontrolled) emissions =  $239.2 \text{ lb/hr} \div 0.6 = 398.7 \text{ lb/hr}$

3. Nitrogen Oxides

Maximum and Potential (uncontrolled) emissions: assume same factor as bagasse. Factor 1.2 lb/ton bagasse on a wet basis.

Convert to dry basis:  $1.2 \text{ lb/ton wet bagasse} \times 1 \text{ ton wet}/0.45 \text{ ton dry} = 2.67 \text{ lb/ton} \times 49,834 \text{ lb/hr residue (dry)} \div 2,000 = 66.5 \text{ lb/hr}$

4. Other Pollutants

Emissions data or factors not known to exist for other pollutants

BURNING FUEL OIL AT  $250 \times 10^6 \text{ Btu/hr}$

1. Particulate

Allowable and maximum emissions =  $250 \times 10^6 \text{ Btu/hr} \times 0.1 \text{ lb particulate}/10^6 \text{ Btu} = 25.0 \text{ lb/hr}$

Potential (uncontrolled) emissions: from AP-42 Table 1.3-1  
 $1 \text{ lb}/10^3 \text{ gal} = 10(\text{S}) + 3 = 10(1) + 3 = 13$   
 $1,764 \text{ gal/hr} \times 13 \text{ lb}/10^3 \text{ gal} = 22.9 \text{ lb/hr}$

2. Sulfur Dioxide

Maximum and Potential Emissions: from AP-42 Table 1.3-1  
 $1 \text{ lb}/10^3 \text{ gal} = 157 (\text{S}) = 157(1) = 157$   
 $1,764 \text{ gal/hr} \times 157 \text{ lb}/10^3 \text{ gal} = 276.9 \text{ lb/hr}$

3. Nitrogen Oxides

Maximum and Potential Emissions: from AP-42 Table 1.3-1  
 $60 \text{ lb}/10^3 \text{ gal} \times 1,764 \text{ gal/hr} = 105.8 \text{ lb/hr}$

4. Hydrocarbons

Maximum and potential (uncontrolled) emissions: from AP-42,  
Table 1.3-1

$$1 \text{ lb}/10^3 \text{ gal} \times 1,764 \text{ gal/hr} = 1.8 \text{ lb/hr}$$

5. Carbon Monoxide

Maximum and potential (uncontrolled) emissions: from AP-42,  
Table 1.3-1

$$5 \text{ lb}/10^3 \times 1,764 \text{ gal/hr} = 8.8 \text{ lb/hr}$$

4/23/81

## BURNING 100-PERCENT BAGASSE

1. Particulate

Allowable and maximum emissions =  $504.0 \times 10^6 \text{ Btu/hr} \times 0.2 \text{ lb particulate}/10^6 \text{ Btu} = 100.8 \text{ lb/hr}$

Potential (uncontrolled) emissions: from AP-42, Table 1.8-1  
 $16 \text{ lb/ton bagasse (wet)} \times 63,000 \text{ lb/hr bagasse (dry)} \div 0.45 \div 2,000 = 1,120 \text{ lb/hr}$

2. Sulfur Dioxide (based on scrubber removal of 40%)

Maximum Emissions =  $63,000 \text{ lb/hr bagasse (dry)} \times 0.001 \times 2 \times 0.6 = 75.6 \text{ lb/hr}$

Potential (uncontrolled) emissions =  $75.6 \text{ lb/hr} \div 0.6 = 126.0 \text{ lb/hr}$

3. Nitrogen Oxides

Maximum and potential (uncontrolled) emissions: from AP-42, Table 1.8-1

$1.2 \text{ lb/ton bagasse (wet)} \times 63,000 \div 0.45 \text{ lb/hr bagasse} \div 2,000 = 84.0 \text{ lb/hr}^*$

4. Other Pollutants

Emissions data or factors not known to exist for other pollutants.

\* This figure could be greatly overestimated since a recent EPA study reported  $\text{NO}_x$  levels of  $0.002 \text{ lb}/10^6 \text{ Btu}$ , equivalent to  $1.0 \text{ lb/hr}$  for this boiler ("Emission Test Report, U.S. Sugar Company, Bryant, Florida," Monsanto Research Corp., May 1980).

## MAXIMUM EMISSIONS CALCULATIONS

1. Particulate

Maximum emissions occur when burning 100-percent bagasse since heat input is greatest =  $100.8 \text{ lb/hr}$

2. Sulfur Dioxide

Maximum emissions occur when burning oil up to  $250 \times 10^6 \text{ MM Btu/hr}$  with remainder of steam capacity supplied by bagasse residue

$\text{SO}_2$  due to oil =  $276.9 \text{ lb/hr}$

Steam due to oil =  $250 \times 10^6 \text{ MM Btu/hr} \div 1,050 \text{ Btu/lb steam} \times 0.8 = 190,476 \text{ lb/steam/hr}$

Steam due to residue =  $264,000 - 190,476 = 73,524 \text{ lb/steam/hr}$

Residue required =  $73,524 \times 1,050 \div 0.625 \div 8,900 = 13,879 \text{ lb/hr (dry)}$

$\text{SO}_2$  due to residue =  $13,879 \times 0.004 \times 2 \times 0.6 = 66.6 \text{ lb/hr}$

Total  $\text{SO}_2 = 276.9 + 66.6 = 343.5 \text{ lb/hr}$

498.5

565

250  
1235  
5735

3. Nitrogen Oxides

Fuel-oil burning produces maximum  $\text{NO}_x$  emissions, with bagasse next. Therefore, maximum  $\text{NO}_x$  occurs when burning maximum fuel with the rest of the steam supplied by bagasse.

$\text{NO}_x$  due to oil = 105.8 lb/hr

Steam due to oil = 190,746 lb steam/hr (see  $\text{SO}_2$  above)

Steam due to bagasse = 73,524 lb steam/hr

Bagasse required =  $73,524 \times 1,050 \div 0.55 \div 8,000$   
= 17,546 lb/hr (dry)

$\text{NO}_x$  due to bagasse =  $17,546 \times 2.67 \div 2,000 = 23.4$  lb/hr

Total  $\text{NO}_x$  =  $105.8 + 23.4 = 129.2$  lb/hr

140.4 lb/hr

4. Hydrocarbons

Maximum emissions when burning fuel oil = 1.8 lb/hr

5. Carbon Monoxide

Maximum emissions when burning fuel oil = 8.8 lb/hr

ACTUAL EMISSIONS CALCULATIONS

Annual emissions for proposed Boiler 8 based on fuel mix presented in Table A-3 of PSD report for 184 day/yr. For off-season operation (120 days/yr), bagasse is not available; therefore, emissions based upon average fuel oil consumption with remainder of steam produced from residue and assuming maximum steam production of 264,000 lb/hr. This figure is much higher than will actually occur on average during off season.

1. Particulate (based upon allowables)

Crop season:

$18.3 \text{ ton/hr residue} \times 2,000 \times 8,900 \times 0.2 \text{ lb/MM Btu} \times 24 \times 184$   
 $\div 2,000 = 143.8 \text{ ton/yr}$

$7.5 \text{ ton/hr bagasse} \times 2,000 \times 8,000 \times 0.2 \text{ lb/MM Btu} \times 24 \times 184$   
 $\div 2,000 = 53.0 \text{ ton/yr}$

$64 \text{ gal/hr} \times 8.1 \times 17,500 \times 0.1 \text{ lb/MM Btu} \times 24 \times 184 \div 2,000 =$   
 $2.0 \text{ ton/yr}$

325.7  
120.0  
9.1  
454.8

Off season:

Average steam due to oil = 6,900 lb/hr

Average steam due to residue =  $264,000 - 6,900 = 257,100$  lb/hr

Residue required =  $257,100 \times 1,050 \div 0.625 \div 8,900 = 48,531$  lb/hr

$48,531 \text{ lb/hr residue} \times 8,900 \times 0.2 \text{ lb/MM Btu} \times 24 \times 120 \div 2,000$   
= 124.4 ton/yr

$64 \text{ gal/hr} \times 8.1 \times 17,500 \times 0.1 \text{ lb/MM Btu} \times 24 \times 120 \div 2,000$   
= 1.3 ton/yr

120  
204  
121.7

Total = 324.5 ton/yr



4/23/81

2. Sulfur Dioxide

Crop season:

$$\begin{aligned}
 & 18.3 \text{ ton/hr residue} \times 0.004 \times 2 \times 0.6 \times 24 \times 184 = 387.9 \text{ ton/yr} \\
 & 7.5 \text{ ton/hr bagasse} \times 0.001 \times 2 \times 0.6 \times 24 \times 184 = 39.7 \text{ ton/yr} \\
 & 64 \text{ gal/hr} \times 157 \text{ lb/10}^3 \text{ gal} \times 24 \times 184 \div 2,000 = 22.2 \text{ ton/yr}
 \end{aligned}$$

Off season:

$$\begin{aligned}
 & 64 \text{ gal/hr} \times 157 \div 1,000 \times 24 \times 120 \div 2,000 = 14.5 \text{ ton/yr} \\
 & 48,531 \text{ lb/hr residue} \times 0.004 \times 2 \times 0.6 \times 24 \times 120 \div 2,000 = \\
 & 335.4 \text{ ton/yr}
 \end{aligned}$$

Total = 799.7 tons/yr

3. Nitrogen Oxides

Crop season:

$$\begin{aligned}
 & 18.3 \text{ ton/hr residue} \times 2.67 \text{ lb/ton} \times 24 \times 184 \div 2,000 \\
 & = 107.9 \text{ ton/yr} \\
 & 7.5 \text{ ton/hr bagasse} \times 2.67 \text{ lb/ton} \times 24 \times 184 \div 2,000 = 44.2 \text{ ton/yr} \\
 & 64 \text{ gal/hr} \times 60 \text{ lb/10}^3 \text{ gal} \times 24 \times 184 \div 2,000 = 8.5 \text{ ton/yr}
 \end{aligned}$$

Off season:

$$\begin{aligned}
 & 64 \text{ gal/hr} \times 60 \div 1,000 \times 24 \times 120 \div 2,000 = 5.5 \text{ tons/yr} \\
 & 48,531 \text{ lb/hr residue} \div 2,000 \times 2.67 \times 24 \times 120 \div 2,000 \\
 & = 93.3 \text{ tons/yr}
 \end{aligned}$$

Total = 259.4 tons/yr

4. Hydrocarbons

Emissions are due to oil burning only.

$$64 \text{ gal/hr} \times 1 \text{ lb/10}^3 \text{ gal} \times 24 \times (184 + 120) \div 2,000 = 0.2 \text{ ton/yr}$$

5. Carbon Monoxide

Emissions are due to oil burning only.

$$64 \text{ gal/hr} \times 5 \text{ lb/10}^3 \text{ gal} \times 24 \times (184 + 120) \div 2,000 = 1.2 \text{ ton/yr}$$

## POTENTIAL EMISSIONS CALCULATIONS

Potential emissions based upon burning worst-case emitting fuel all the time and 304-day operation per year. No controls considered.

1. Particulate

Worst-case fuel is bagasse at maximum steam production.

$$\begin{aligned}
 & 63,000 \text{ lb/hr bagasse (dry)} \div 2,000 \times 35.6 \text{ lb/ton} = 1,121.4 \text{ lb/hr} \\
 & 1,121.4 \text{ lb/hr} \times 24 \times 304 \div 2,000 = 4,091 \text{ ton/yr}
 \end{aligned}$$

2. Sulfur Dioxide

Worst-case fuel is oil, burning up to 250 MM Btu/hr.

Remainder of steam produced from residue.

$$\begin{aligned}
 & \text{Oil: } 1,764 \text{ gal/hr} \times 157 \text{ lb/10}^3 \text{ gal} = 276.9 \text{ lb/hr} = 1,010.3 \text{ ton/yr} \\
 & \text{Residue: } 13,879 \text{ lb/hr} \times 0.004 \times 2 = 111.0 \text{ lb/hr} = 405.0 \text{ ton/yr}
 \end{aligned}$$

Totals = 387.9 lb/hr = 1,415.3 ton/yr

3. Nitrogen Oxides

Worst-case fuel is oil, with bagasse next.

Oil = 105.8 lb/hr (see Maximum Emissions Calculations)

= 386.0 ton/yr

Bagasse = 23.4 lb/hr = 85.4 ton/yr

Totals = 129.2 lb/hr = 471.4 ton/yr

4. Hydrocarbons

Emissions are due to oil burning.

1.8 lb/hr x 24 x 304 ÷ 2,000 = 6.6 ton/yr

5. Carbon Monoxide

Emissions are due to oil burning.

8.8 lb/hr x 24 x 304 ÷ 2,000 = 32.1 ton/yr

ATTACHMENT B

INSTALLATION, OPERATING, AND MAINTENANCE INSTRUCTIONS

FOR

TURBULAIRE® SCRUBBER

TYPE D



JOY MANUFACTURING COMPANY  
Western Precipitation Division  
1000 W. Ninth St.  
Los Angeles, California 90015

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## FIGURES

|                                                            |   |
|------------------------------------------------------------|---|
| Figure 1. Turbulaire® Scrubber, Type D-B, Sizes 20 thru 64 | 1 |
|------------------------------------------------------------|---|

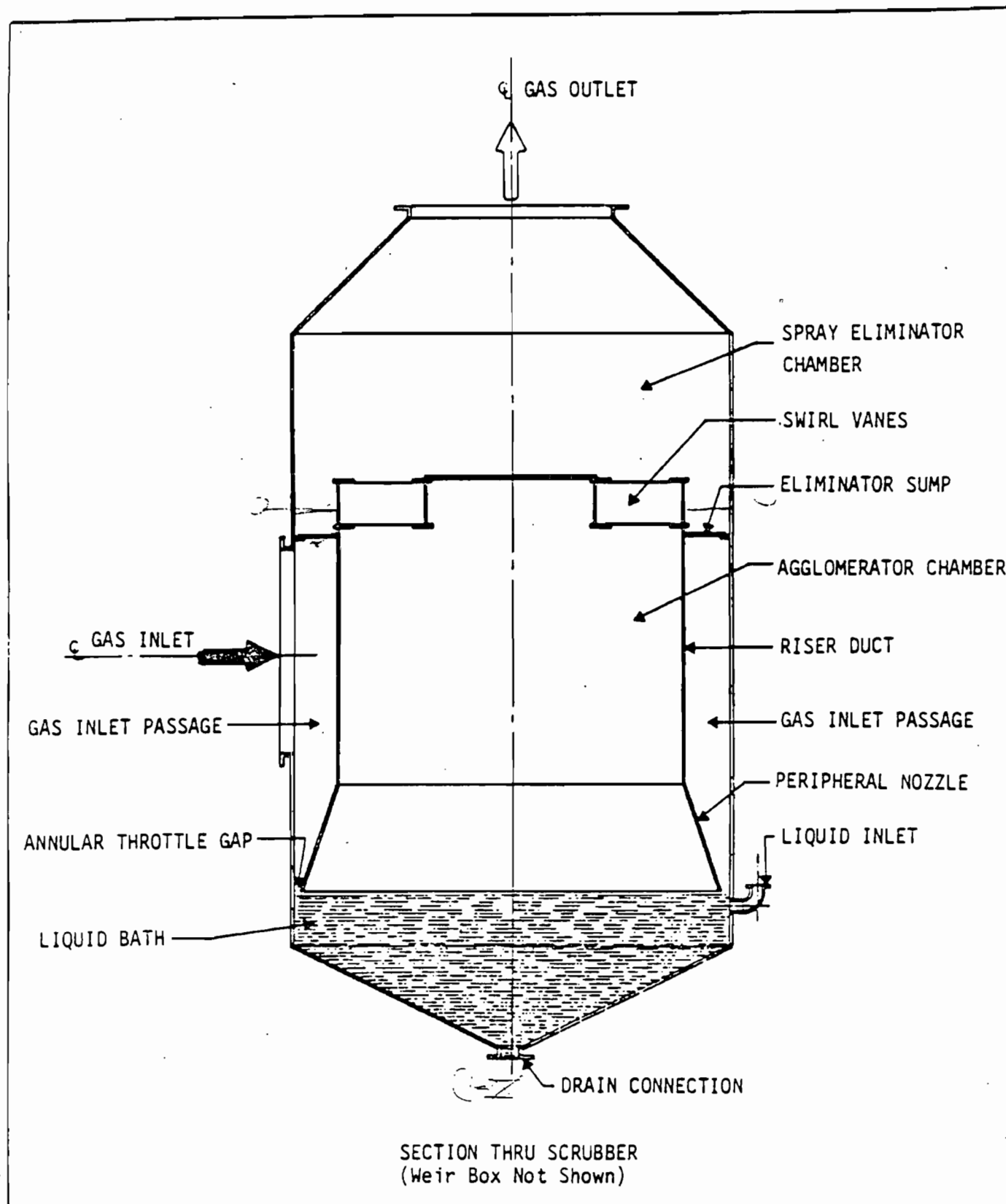


Figure 1. Turbulaire® Scrubber, Type D-B, Sizes 20 thru 64

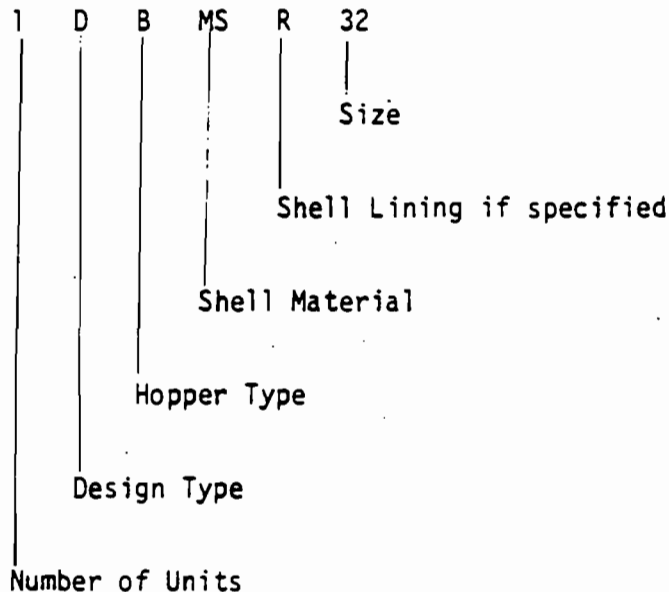
## DESCRIPTION

The Type D Turbulaire® Scrubber (Figure 1) consists of a vertical cylindrical shell with conical top and conical hopper on the lower end. The scrubber is divided into two chambers; the agglomerator chamber and the eliminator chamber.

The agglomerator chamber is in the lower portion of the scrubber and consists of the hopper with liquid bath, the gas inlet passage with conical throttle and the liquid level regulating assembly.

The eliminator chamber is above the agglomerator chamber and consists of a set of swirl vanes and a sump preceding the gas outlet.

## TYPE & SIZE DESIGNATION



The scrubber has the gas inlet located radially on the side of the shell and the gas outlet at the top center. The agglomerator cylinder is surrounded by the gas inlet passage. The shell and the peripheral nozzle of the agglomerator chamber form an annular throttling gap at the bottom of the gas inlet passage. The normal operating level of the scrubbing liquid bath is just below the throttling gap.

Swirl vanes are mounted in the top of the agglomerator cylinder. A horizontal plate joining the agglomerator with the shell forms the eliminator sump. Weep holes drain the liquid from the eliminator sump into the scrubbing liquid bath in the hopper.

A liquid level regulating assembly is mounted on the lower exterior region of the shell. This assembly consists of a gas lock release pipe, weir box with liquid level control, and a seal pipe with overflow. The liquid inlet is located just above the hopper. Access doors are provided in the hopper and in the upper region of the shell.

Construction material for the standard scrubber is mild steel. Optional materials of construction may be: mild steel lined with rubber, lead or coated with epoxy resin; 304 or 306 stainless steel; and fiber reinforced polyester.

## FIELD INSTALLATION

Field installation of the scrubber is as follows:

1. Set the unit on the foundation and attach the anchor bolts.  
Level unit by shimming between unit and foundation.

NOTE: Vertical and horizontal alignment of the scrubber is important to ensure an even circumferential dimension between the peripheral nozzle and quiescent liquid level.

2. Connect the inlet and outlet flues to the unit. It is recommended that inspection doors, adjacent to the scrubber, be included in the customer's flues.

NOTE: Dynamic and dead load forces from customer's fan, equipment and flues must not be transmitted to the scrubber equipment.

3. Attach the sight glass and weir box to the scrubber, then connect the seal pipe overflow to a drain line.
4. Connect the hopper outlet to a drain line. The drain line should contain a valve for flow balancing purposes.



### PREPARATION OF THE SCRUBBER FOR OPERATION

The scrubber is designed to operate under the conditions in the operating data sheet in the front of the manual.

Prior to turning on the flue gas, liquid flow and liquid level should be established as follows:

1. Remove the weir box cover.
2. Turn on the liquid supply. By means of a flow meter or other measuring device, adjust the flow of the inlet liquid until the rate prescribed on the data sheet is attained.
3. Open the valve at the hopper outlet and establish a flow of liquid adequate to remove the slurry from the hopper.
4. Raise or lower the liquid level control as required until the liquid in the scrubber reaches and maintains a steady level, approximately 1/2-inch below the peripheral nozzle. This level is indicated by a red line painted on the weir box. Tighten the clamp which secures the level control in place.

NOTE: The liquid level control and liquid inlet rate may require adjustment to comply with rated pressure drop and outlet gas conditions.

5. Replace the weir box cover. The scrubber is now ready to receive flue gas.

If the tank is lined with lead, rubber, epoxy resins or other material which may deteriorate at high temperatures, the temperature of the inlet gas must be adjusted within limits compatible with these materials as noted after operating instruction.

NOTE: Unless otherwise recommended, 95% to 99% of the slurry should be removed through the valve at the hopper outlet. Only 1% to 5% should be removed through the weir box overflow pipe.

## OPERATION

Operation of the scrubber requires only that the fan be turned on to move flue gas through the scrubber.

As flue gas enters the scrubber through the inlet, its speed is increased to the desired operating velocity as it passes through the throttling gap. The dust-laden gas is then discharged at high velocity and penetrates deeply into the liquid bath wherein the dust combines with the liquid to form a slurry which is discharged through the hopper outlet valve. The turbulence resulting from the entrance of the high velocity gas into the scrubbing bath is sufficient to produce a dense spray. This spray is removed from the gas by the swirl vanes.

The scrubber should continue to operate at constant efficiency if the gas volume, temperature and dust load do not change. If there is an increase in the dust load, it may be necessary to increase the flow rate of the scrubbing liquid, in which case, the hopper outlet valve must be adjusted to maintain the operating liquid level. A decrease in the dust load will permit decreasing the scrubbing liquid flow rate.

[ The efficiency of the unit may be increased by: increasing pressure drop through unit, cooling inlet gases if necessary, and increasing the inlet liquid rate, described as follows:

→ 1. Increase pressure drop through the unit by restricting the nozzle opening or by increasing the gas flow through the unit.

The nozzle opening can be restricted by adding material to the nozzle opening and thus cut down the size of the opening. The opening is designed so that at the gas density and volume specified, the required pressure drop should be obtained. Sometimes the gas density or the volume are not that which is calculated and, if the pressure drop is low, it is necessary to close down on the opening. This is fairly easily accomplished and, by doing this, the velocity of the jet is increased into the liquid pool and, therefore, increases the efficiency of the unit.

The volume of air should never exceed the maximum allowable outlet gas volume as specified on the data sheet. This maximum volume cannot be exceeded without entraining some of the scrubbing liquid, and carrying it into the outlet flue.

Gas flow through the unit can be increased by opening the fan dampers or by introducing infiltration air into the flue through a damper.

[ If the scrubber is operating well below the maximum outlet gas volume, the simplest way to increase the pressure drop through the unit is to increase the fan delivery until the design pressure drop is reached.

2. Introduce liquid sprays ahead of the scrubber inlet to humidify the gases entering the scrubber. This system is employed whenever inlet gas temperatures are high enough to damage the lining of the shell. Changing the specified water flow to the spray nozzles is not recommended since this will change inlet gas density beyond scrubber design limits.

3. Increase the inlet liquid rate. This will also bring the temperatures of the gas down to saturation quickly. However, as the liquid rate is increased, the liquid level control will have to be reset until equilibrium conditions are maintained without gas passing through the unit. Increase of the liquid rate will give lower outlet gas temperatures and also lower outlet liquid temperatures.

## MAINTENANCE

Although the scrubber should operate continuously with minimum maintenance some may be required. This includes: removing any build-up of dust on the peripheral nozzle which would impair operation, and periodically cleaning out the scrubber and liquid seal pipe to prevent clogging of the outlet.

In addition, situations may be encountered which may impair the operation of the scrubber:

1. Plugging of the Overflow Pipe

Occasionally on some dusts (generally those associated with fluorides), there may be some plugging of the overflow pipe which leads from the scrubber to the weir box. This plugging is due to settling out or deposition of particles in the pipe and can generally be relieved by one or two methods.

One method is to periodically clean out the pipe with a reamer or a scraper of some sort. For those scrubbers with rubber, lead, or plastic lining, care should be taken that the lining is not pierced.

Another method is to increase the velocity of liquid through the pipe by closing down on the cross sectional area. This is accomplished by laying pieces of tubing in the overflow pipe and building up enough tubing so that the cross sectional area of the pipe is gradually reduced. The velocity of liquid for materials which tend to settle out should be a minimum of 2 to 3 fps or higher.

2. Cold Weather Operation

During periods of cold weather, care must be taken to prevent freezing of the liquid in the scrubber and in the supply lines. It may be necessary to insulate one or both. During periods of shutdown, the scrubber and liquid lines should be drained unless some method is employed to keep temperatures above the freezing point.

### AUTOMATIC CONTROL RECOMMENDATION

An automatic liquid level control system is available as an optional extra from Western Precipitation Division.

The system consists of the following components:

- a. Displacer type level control unit (Magnetrol)
- b. Solenoid valve
- c. Strainer
- d. Piping and pipe fittings as required for field assembly.

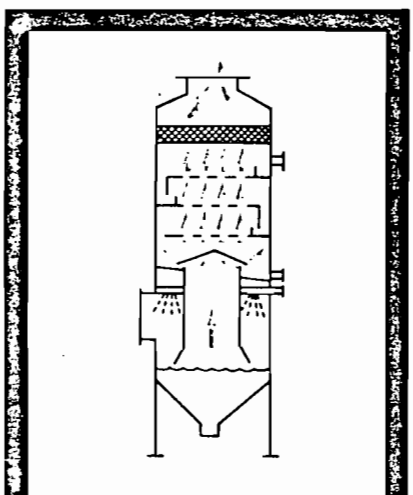
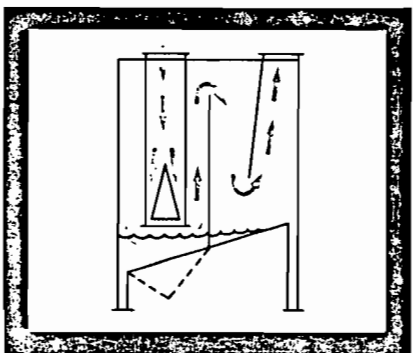
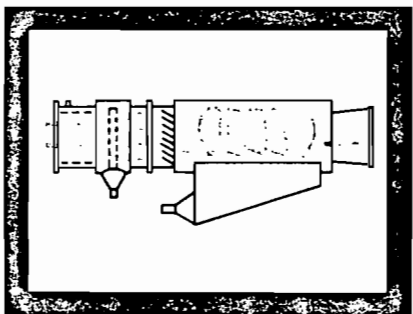
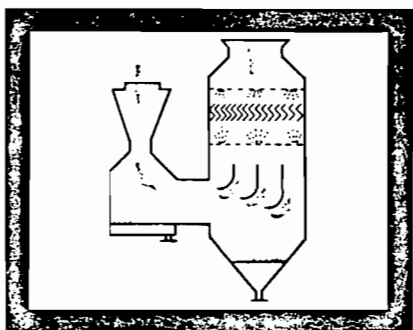
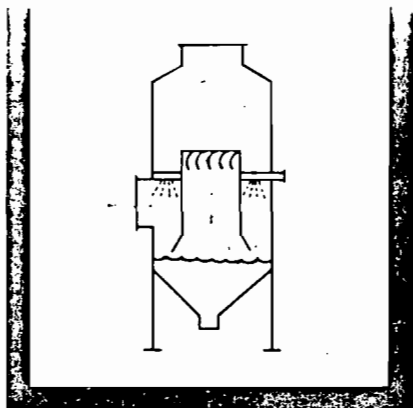
The system is normally shipped loose for field assembly by the customer. Hook-up connections are provided on the hopper and the scrubber body.

### OPERATION

The liquid level control unit uses a solid block displacer - heavier than the liquid - which is suspended from a helical spring. A rising liquid level imparts buoyancy to the displacer, lessening the load on the spring, thus, the displacer moves upward. A magnetic sleeve connected to the displacer also moves upward inside a non-magnetic enclosing tube, attracting a permanent magnet attached to a mercury switch (or pneumatic pilot valve). This actuates and closes the solenoid valve, and make-up water to the scrubber is shut-down. As the liquid level recedes, the magnetic sleeve and displacer drops allowing the magnet and switch element to return to the normal operating level. This actuates and opens the solenoid valve allowing flow of makeup water to the scrubber.

Thus, there is no possibility of excessive high or low liquid levels in the scrubber.

A cross is provided in the line to allow periodic flushing and cleanout of the system.



# Western Precipitation<sup>TM</sup> Gas Scrubbers

*World-Wide Response / Ability*

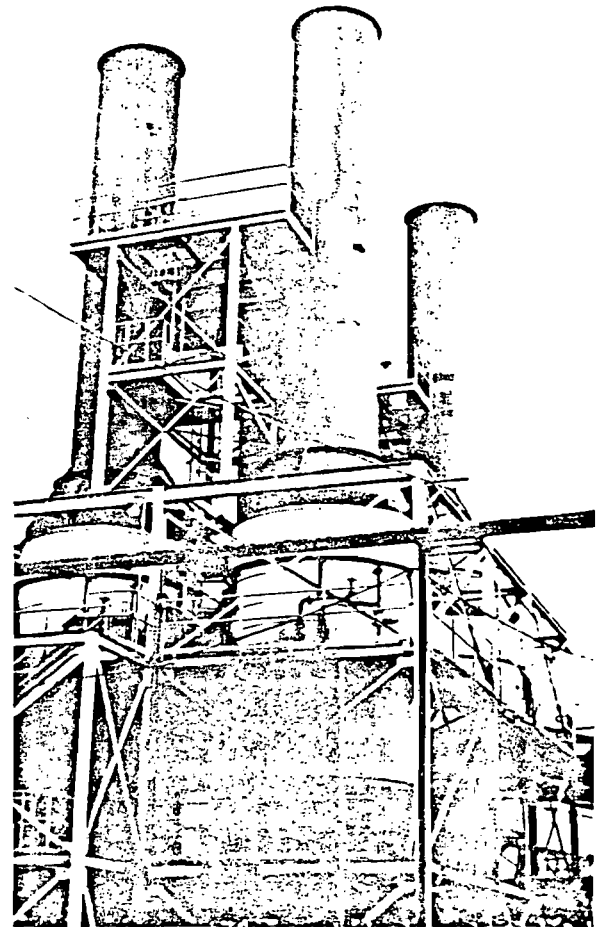
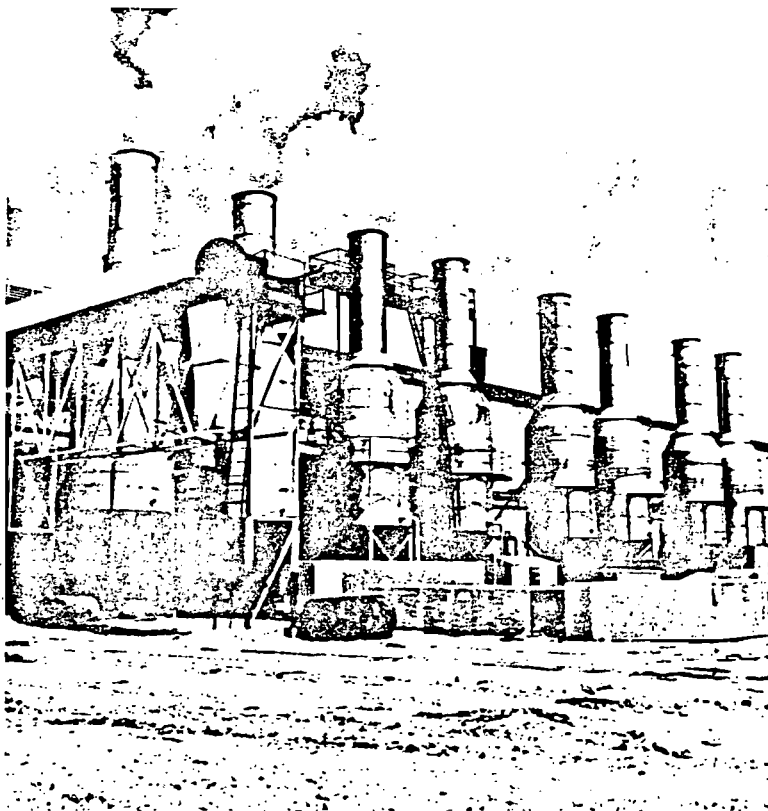
**WESTERN  
PRECIPITATION  
DIVISION**



*Joy Industrial Equipment Company  
P.O. Box 2744, Terminal Annex  
Los Angeles, California 90051  
(213) 240-2300*

# Type "D" Turbulaire® Scrubber

High efficiency / low energy /  
non-plugging / for large volumes.



Type "D" Turbulaire® Scrubbers are used where dust particle sizing and process conditions require low energy inputs (Scrubber pressure drops less than 14 inches of water). These energy requirements are below the range in which the collecting mechanisms of conventional venturi scrubbers begin to take full effect. Hence, our Type "D" units often match the performance of venturi scrubbers while saving 20 to 50 percent in operating horsepower.

The Type "D" model has a vertical flow design which requires a minimum of floor space. The cylindrical configuration improves rigidity with light gage "unitized" construction.

## How It works

A patented peripheral gas nozzle (U.S. patent 3726513) combines a low energy venturi effect with collection by impingement on the liquid bath. This combination provides optimum energy utilization at low pressure drop.

In order to accommodate changes in process conditions or more stringent emission codes, the unit is designed to allow for variations in pressure drop by means of a simple internal adjustment of the peripheral gas nozzle.

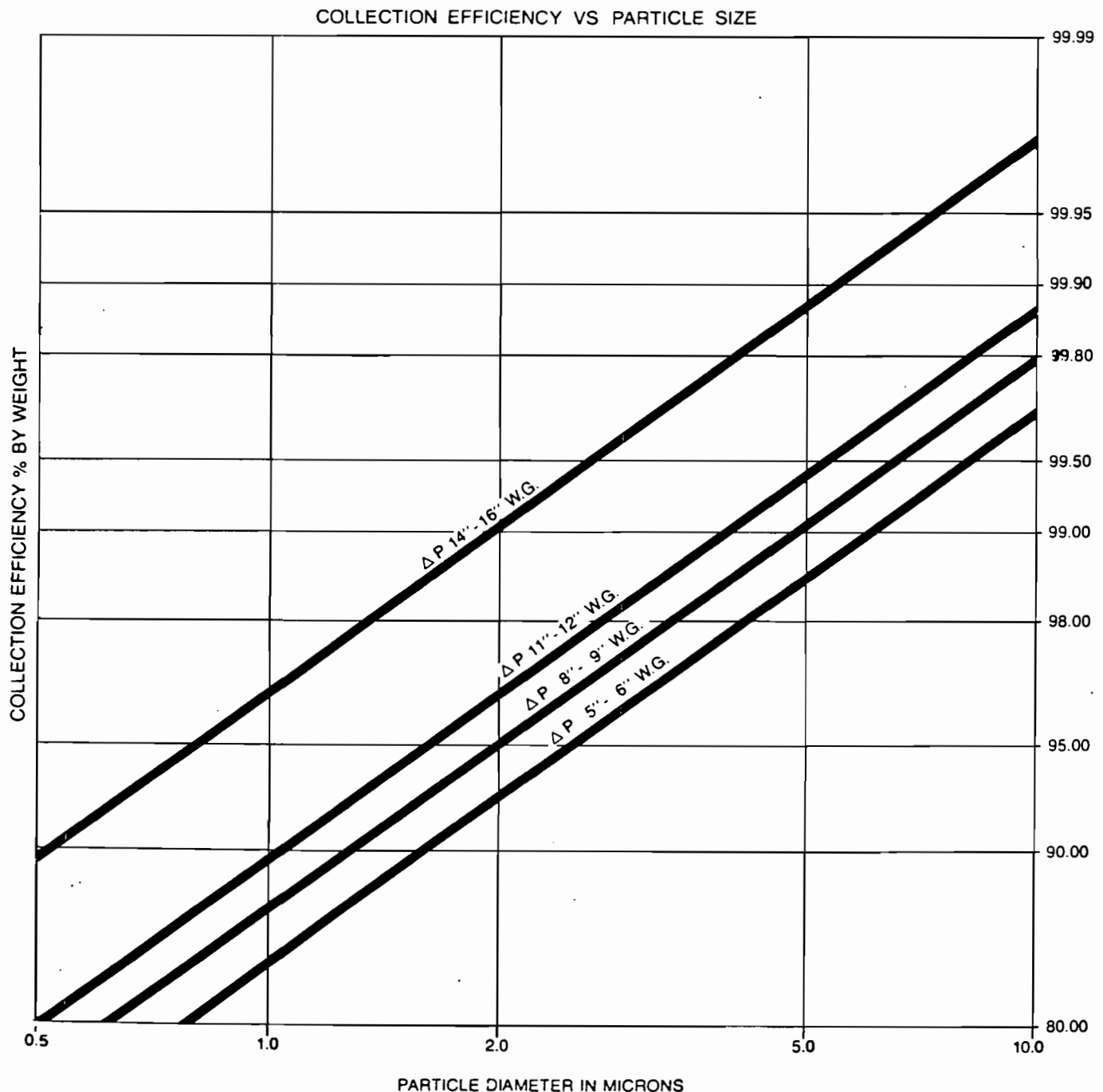
Slurries are kept in suspension in the sump by the action of the gases being scrubbed. Mist elimination is accomplished with the centrifugal action of a set of swirl

vanes, and the droplets once separated from the gas stream are returned by gravity into the sump.

Water needs are kept to a minimum by the unit's ability to recirculate the heavily concentrated slurries often containing as much as 5.0% solids by weight. The top gas outlet configuration makes stack connection simple; the flanged slurry drain can be connected to settling tanks or piped for disposal with ease.

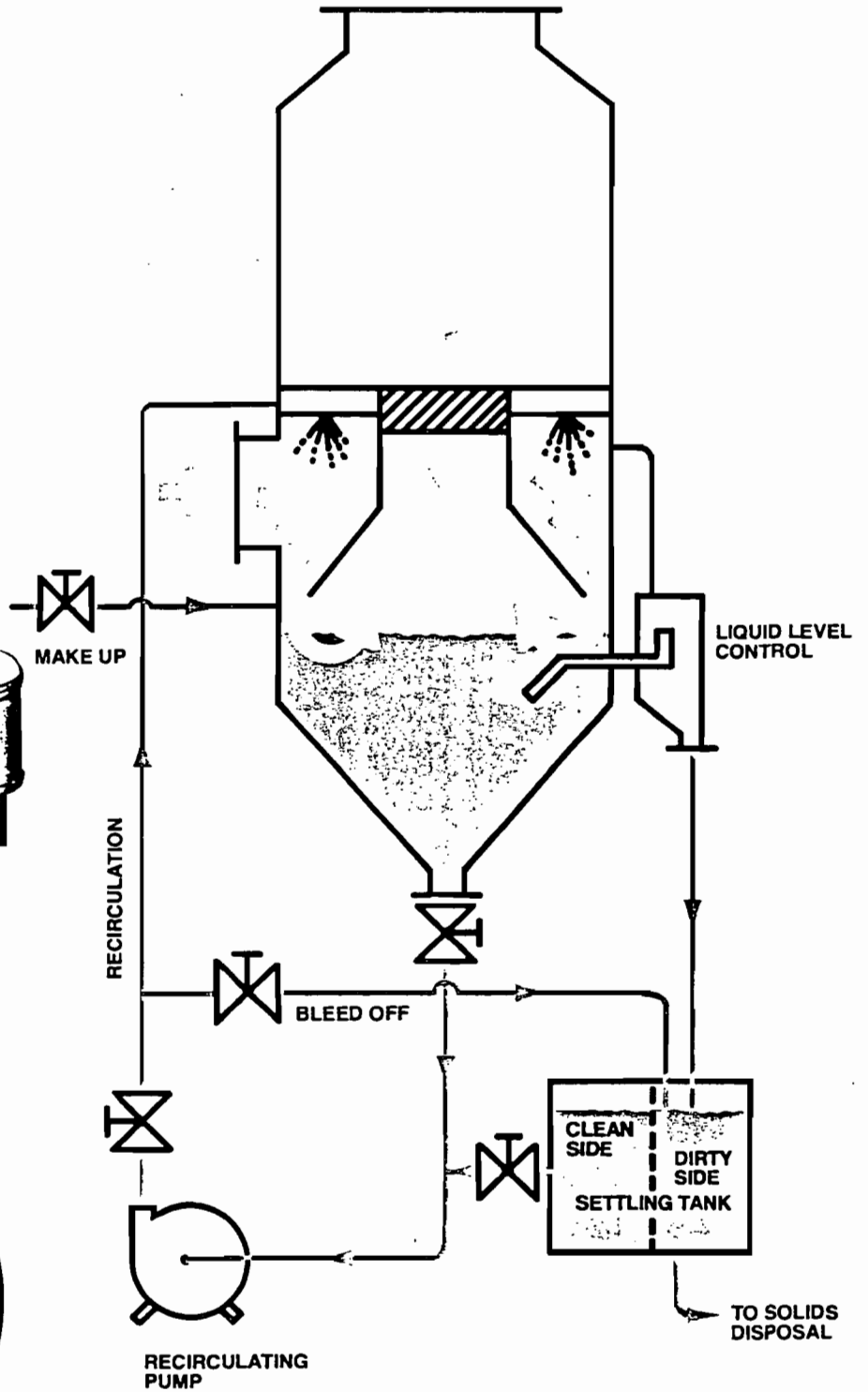
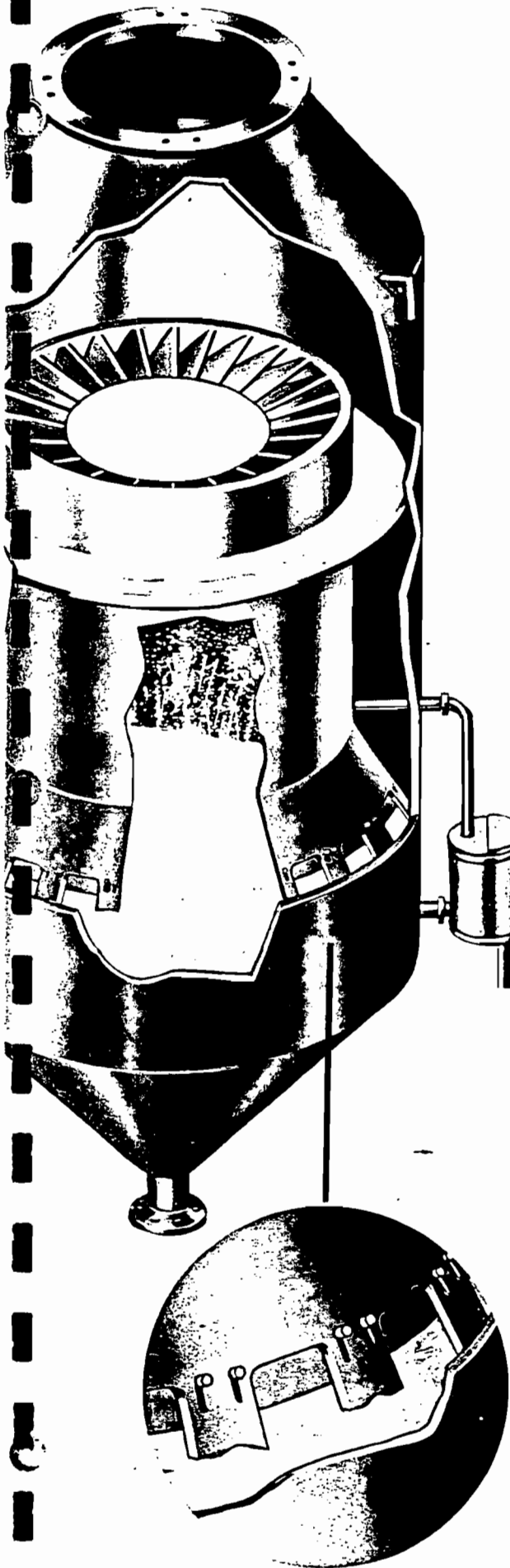
The Type "D" is simple, rugged, with no moving parts and excellent non-plugging characteristics, and it can be made of a variety of corrosion-resistant metals as well as lightweight, low cost fiberglass reinforced polyester (FRP).

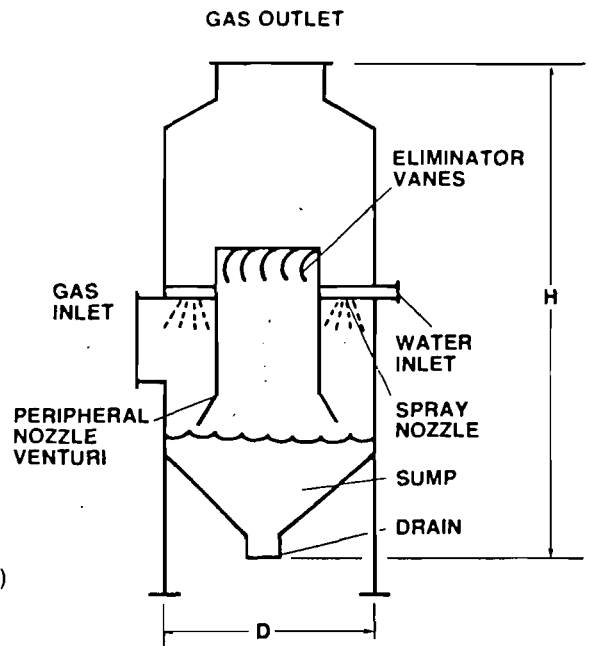
## Turbulaire® Scrubbers Comparative Fractional Efficiency Curves\*





Type "D" Process Flow Diagram





#### AVAILABLE OPTIONS

Support Assembly (Drain flange 2'-6" to grade)  
 Discharge valve, Cast iron or Rubber lined  
 Automatic water supply control  
 Manometer and Fittings  
 Pump and Motor  
 Fan and Motor

#### EQUIPMENT SIZING

| SCRUBBER<br>SIZE | DESIGN<br>ACFM<br>OUTLET | DRAIN<br>SIZE<br>(IN) | SUMP<br>CAPACITY<br>(GAL) | DIAMETER<br>D | HEIGHT<br>H | INLET<br>DIAMETER | OUTLET<br>DIAMETER |
|------------------|--------------------------|-----------------------|---------------------------|---------------|-------------|-------------------|--------------------|
| 4                | 6,900                    | 3                     | 157                       | 4'-0"         | 10'-3"      | 1'-7"             | 2'-9"              |
| 4.5              | 8,700                    | 3                     | 208                       | 4'-6"         | 11'-1"      | 1'-9"             | 3'-1"              |
| 5                | 10,700                   | 3                     | 269                       | 5'-0"         | 12'-1"      | 2'-0"             | 3'-5"              |
| 5.5              | 13,000                   | 3                     | 340                       | 5'-6"         | 13'-0"      | 2'-2"             | 3'-9"              |
| 6                | 15,500                   | 3                     | 423                       | 6'-0"         | 13'-11"     | 2'-4"             | 4'-1"              |
| 6.5              | 18,200                   | 3                     | 517                       | 6'-6"         | 14'-11"     | 2'-7"             | 4'-5"              |
| 7                | 21,100                   | 3                     | 624                       | 7'-0"         | 15'-10"     | 2'-9"             | 4'-9"              |
| 7.5              | 24,300                   | 4                     | 744                       | 7'-6"         | 16'-8"      | 2'-11"            | 5'-1"              |
| 8                | 27,600                   | 4                     | 877                       | 8'-0"         | 17'-8"      | 3'-2"             | 5'-5"              |
| 8.5              | 31,100                   | 4                     | 1,026                     | 8'-6"         | 18'-8"      | 3'-4"             | 5'-9"              |
| 9                | 34,900                   | 4                     | 1,189                     | 9'-0"         | 19'-7"      | 3'-6"             | 6'-1"              |
| 9.5              | 38,900                   | 4                     | 1,370                     | 9'-6"         | 20'-5"      | 3'-9"             | 6'-5"              |
| 10               | 43,100                   | 4                     | 1,566                     | 10'-0"        | 21'-4"      | 3'-11"            | 6'-9"              |
| 10.5             | 47,600                   | 4                     | 1,781                     | 10'-6"        | 22'-4"      | 4'-1"             | 7'-1"              |
| 11               | 52,200                   | 6                     | 2,014                     | 11'-0"        | 23'-2"      | 4'-4"             | 7'-6"              |
| 11.5             | 57,100                   | 6                     | 2,266                     | 11'-6"        | 24'-1"      | 4'-6"             | 7'-10"             |
| 12               | 62,200                   | 6                     | 2,537                     | 12'-0"        | 25'-0"      | 4'-8"             | 8'-2"              |
| 12.5             | 67,400                   | 6                     | 2,830                     | 12'-6"        | 26'-0"      | 4'-11"            | 8'-6"              |
| 13               | 72,900                   | 6                     | 3,144                     | 13'-0"        | 26'-10"     | 5'-1"             | 8'-10"             |

#### EQUIPMENT SPECIFICATIONS

Scrubber of cylindrical shape shall be of the high efficiency inertial-orifice type with radial inlet. The gas to be cleaned passes through a peripheral nozzle and is jetted in a near vertical direction and at high velocity into a static liquid bath, the level of which is maintained slightly below the bottom of the gas nozzle by means of an adjustable weir. Weir box shall be equipped with a gas-lock release mechanism. After leaving liquid bath, gases shall pass through a centrifugal type spray eliminator and exit the scrubber through the top vertical discharge.

World-Wide Response /Ability

**WESTERN  
PRECIPITATION  
DIVISION**



Joy Industrial Equipment Company  
 P.O. Box 2744, Terminal Annex  
 Los Angeles, California 90051  
 (213) 240-2300

## Because we have pioneered the air pollution control field since 1907, we have within arm's reach more answers to your pollution control problems than anyone else. So no matter how peculiar your air pollution problem, our engineers will evaluate many workable solutions—and before they're through, they'll narrow all

of the alternatives to the one solution that's best for your particular case.

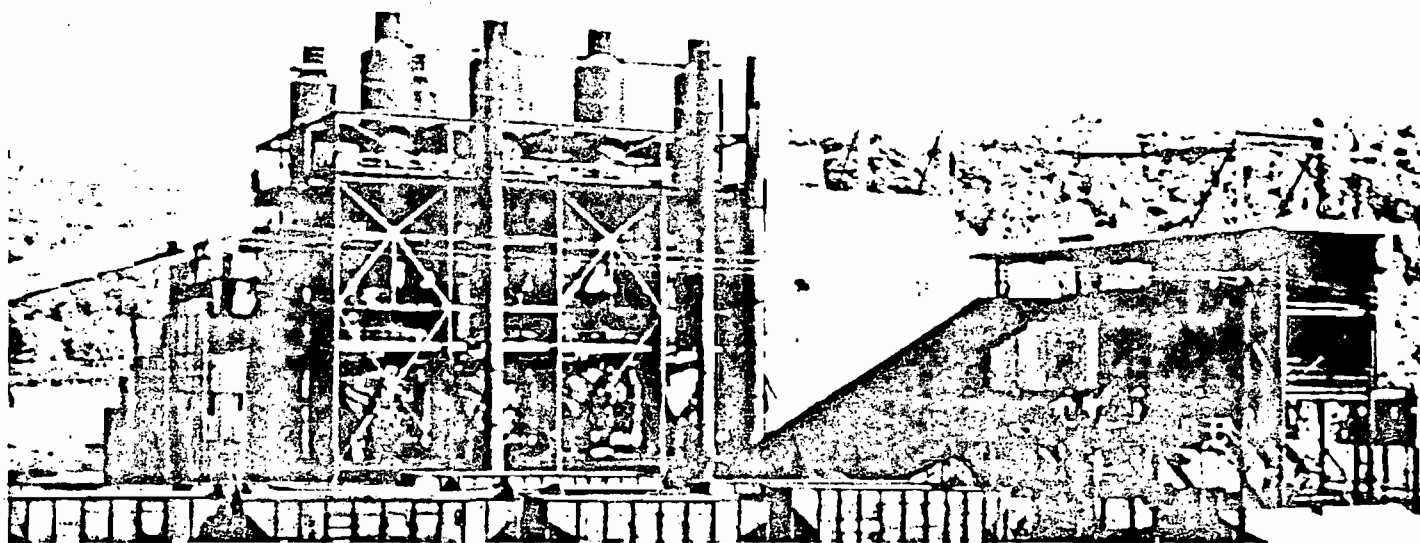
"Turbulaire" scrubbers have been used successfully to control emissions from many industrial process operations, including combustion, chemical, mining, metallurgical, etc.

Scrubbing slurry processing expenses (clarifiers, pumps, etc.) are kept down by making every drop count. Special sump designs maintain high turbulence within the scrubbing liquid. The high turbulence permits higher slurry concentrations reducing the possibilities of solid build-up or system stoppage. (Most of our units operate at liquid to gas ratios of less than 3GPM/1,000 ACFM.) Therefore less processing equipment is required.

Simple, compact designs save valuable in-plant space and make minimum operating and maintenance demands.

"Turbulaire" scrubbers are often used in conjunction with other collection equipment. Flexibility in space needs and efficiency make "Turbulaire" scrubbers excellent add-on units, especially for already tight plant layouts.

Each "Turbulaire" scrubber model can be adapted to meet virtually any corrosion problem. For example, units can be made of mild or stainless steel, FRP, or with corrosion resistant plastics, rubber, lead or acid brick liners.



Some "Turbulaire" features

ATTACHMENT C

BASIS FOR SO<sub>2</sub> REMOVAL EFFICIENCY

Measurement of SO<sub>2</sub> emissions from bagasse-burning boilers was conducted by EPA at the U.S. Sugar Mill in Clewiston during the 1978 to 1979 crop season. SO<sub>2</sub> emissions from residue-burning boilers at SCGC in Belle Glade were measured by ESE during the 1979 to 1980 crop season, and again during April 1981. The results of those tests are shown in Table C-1. results?

Table C-2 compares actual emissions with those predicted by material balance. During the most recent test, samples of residue as burned were analyzed for sulfur content. A copy of the stack test report is included with this submittal as Attachment F. For the earlier tests, the sulfur content of bagasse as published in AP-42 was assumed; for residue, an average value based on previous ultimate fuel analyses conducted by SCGC was assumed.

Tests performed for EPA at U.S. Sugar, Bryant in December 1979 failed to measure SO<sub>2</sub> in scrubbed gases above the detection limit of 3.4 mg/m<sup>3</sup>, corresponding to emissions less than 1 lb/hr from a boiler producing 146,000 lb/hr steam (Peters, 1980). Results of the more recent tests summarized here indicate that from 39 to 82 percent of the theoretical sulfur from residue and about 83 percent from bagasse are eliminated from the gas stream. It is not known what proportion of this removal occurs in the scrubber itself, and what part of the sulfur remains in the bottom ash, or is absorbed by the fly ash.

ATTACHMENT C

BASIS FOR SO<sub>2</sub> REMOVAL EFFICIENCY  
(Continued, Page 2 of 2)

Table C-1 contains the results of a test conducted simultaneously at the inlet and outlet of the scrubbers servicing SCGC Boiler 2. The scrubber itself is seen to remove 27 percent of its inlet SO<sub>2</sub>, which accounts for 11 percent out of the total 70-percent theoretical loss. This shows that the scrubber itself is not responsible for the total SO<sub>2</sub> loss through the system. These figures are the result of only one inlet/outlet test and should not be considered representative of average system behavior.

Regardless of the actual mechanism of removal, these tests demonstrate that only a fraction of the sulfur contained in bagasse and residue is emitted as gas from the scrubbers. An estimate of actual emissions while burning these fuels is necessary to determine air quality impacts. A worst-case emissions estimate was made by assuming a sulfur content of 0.4 percent in residue and 0.1 percent in bagasse on a dry basis, and an overall sulfur loss of 40 percent of the theoretical maximum.

Table C-1. Summary of SO<sub>2</sub> Emissions Tests

| Boiler | Test Location | Test Date | Measured SO <sub>2</sub> Emissions (lb/hr) |             |              |         | Steam Rate (lb/hr) |
|--------|---------------|-----------|--------------------------------------------|-------------|--------------|---------|--------------------|
|        |               |           | North Stack                                | South Stack | Center Stack | Average |                    |

The following tests were conducted at SCGC while burning 100-percent bagasse residue.

|   |        |               |    |    |    |     |               |
|---|--------|---------------|----|----|----|-----|---------------|
| 1 | Outlet | 4/2/81        | 14 | 20 | -- | 34  | 120,000       |
| 2 | Outlet | 4/3/81        | 36 | 24 | -- | 60  | 125,000       |
| 2 | Inlet  | 4/3/81        | -- | -- | -- | 82  | 125,000 b. 69 |
| 4 | Outlet | 4/3 to 4/4/81 | 49 | 37 | 59 | 145 | 240,000       |
| 1 | Outlet | 3/20/80       | -- | -- | -- | 75  | 81,200        |
| 2 | Outlet | 3/20/80       | -- | -- | -- | 76  | 94,500        |

The following tests were conducted at U.S. Sugar, Clewiston while burning 100-percent bagasse. Values are averages of three tests.

|   |        |                 |    |    |    |     |         |
|---|--------|-----------------|----|----|----|-----|---------|
| 1 | Outlet | 12/3 to 12/4/79 | -- | -- | -- | 22  | 212,000 |
| 2 | Outlet | 12/4 to 12/5/79 | -- | -- | -- | 17  | 196,100 |
| 5 | Outlet | 12/5 to 12/6/79 | -- | -- | -- | 1.2 | 62,400  |

Source: ESE, 1981.

Table C-2. Combined Boiler/Scrubber SO<sub>2</sub> Removal Efficiency

| Boilers       | Steam Load<br>(lb/hr) | Heat Input*<br>(10 <sup>6</sup> Btu) | Estimated*<br>Fuel Rate<br>(dry lb/hr) | Sulfur<br>Content (%)<br>dry basis | Potential<br>SO <sub>2</sub> Emissions<br>(lb/hr) | Actual<br>SO <sub>2</sub> After<br>Scrubbers<br>(lb/hr) | SO <sub>2</sub> Loss<br>(%) |
|---------------|-----------------------|--------------------------------------|----------------------------------------|------------------------------------|---------------------------------------------------|---------------------------------------------------------|-----------------------------|
| Residue Tests |                       |                                      |                                        |                                    |                                                   |                                                         |                             |
| 1 SCGC        | 120,000               | 201.6                                | 22,652                                 | 0.414†                             | 188                                               | 34                                                      | 82                          |
| 2 SCGC        | 125,000               | 210.0                                | 23,596                                 | 0.426†                             | 201                                               | 60                                                      | 70                          |
| 4 SCGC        | 240,000               | 403.2                                | 45,304                                 | 0.435†                             | 394                                               | 145                                                     | 63                          |
| Average =     |                       |                                      |                                        |                                    |                                                   |                                                         | 72                          |
| 1 SCGC        | 81,200                | 136                                  | 15,280                                 | 0.4**                              | 122                                               | 75                                                      | 39                          |
| 2 SCGC        | 94,500                | 159                                  | 17,865                                 | 0.4**                              | 143                                               | 76                                                      | 47                          |
| Average =     |                       |                                      |                                        |                                    |                                                   |                                                         | 43                          |
| Bagasse Tests |                       |                                      |                                        |                                    |                                                   |                                                         |                             |
| 1 USSC        | 212,800               | 406                                  | 50,750                                 | 0.1**                              | 102                                               | 22                                                      | 70                          |
| 2 USSC        | 196,100               | 374                                  | 46,750                                 | 0.1**                              | 94                                                | 17                                                      | 82                          |
| 5 USSC        | 62,400                | 119                                  | 14,675                                 | 0.1**                              | 30                                                | 1.2                                                     | 96                          |
| Average =     |                       |                                      |                                        |                                    |                                                   |                                                         | 83                          |

\* Basis: 1,050 Btu/lb steam.

62.5-percent efficiency in burning residue, 55-percent efficiency for burning bagasse  
(8,900 Btu/lb dry residue, 8,000 Btu/lb dry bagasse).

† Measured.

\*\*Assumption based on past fuel analyses.

Note: SCGC--Sugar Cane Growers Cooperative residue burning.

USSC--U.S. Sugar, Clewiston bagasse burning.

Source: ESE, 1981.

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ATTACHMENT D  
BACT JUSTIFICATION

Reference Section IV F.10--Reasons for Selection and Discussion of  
Control Systems

SUMMARY

A Joy Turbulaire Type D Impingement scrubber is selected for Sugar Cane Growers Cooperative (SCGC) as BACT for the proposed boiler on the basis of environmental, energy, and economic impacts; proven industry control techniques and systems; and operating experience. A BACT emission limit of 0.2-lb particulate/MM Btu heat input when burning carbonaceous fuel is selected based upon source-specific operating data and experience. A BACT limit of 0.15 lb SO<sub>2</sub>/MM Btu (bagasse), 0.54 lb SO<sub>2</sub>/MM Btu (bagasse residue), and 2.10 lb SO<sub>2</sub>/MM Btu (fuel oil) is selected for the proposed boiler based upon maximum anticipated fuel sulfur content and SO<sub>2</sub> loss of 40 percent of theoretical when burning bagasse or bagasse residue. This SO<sub>2</sub> loss is based upon source test data obtained from existing boilers at SCGC's mill, which demonstrates 40-percent removal can be reasonably met. A discussion of the control systems considered and the justification for BACT selection follows.

AVAILABLE PARTICULATE CONTROL TECHNOLOGY

WET SCRUBBER

Scrubbers are the only control devices currently in operation on bagasse/oil-fired steam boilers in the Florida sugar industry. These scrubbers, mainly of the impingement type, are also utilized on bagasse residue-fired boilers, which in Florida are only in operation at the SCGC mill. The most important design parameters for scrubbers are the liquid-to-gas ratio (amount of water used per unit volume of gas treated) and the intimacy of contact between the liquid and gas phases.



The venturi and spray impingement scrubbers were the wet scrubber designs considered for SCGC. The required particulate emission rate (0.2-lb/MM Btu heat input due to carbonaceous fuel) can be achieved by either system and has been guaranteed by the manufacturer.

In an impingement scrubber, the gas to be cleaned passes through a peripheral nozzle and is guided downward at high velocity into a liquid bath. The level of the liquid bath is maintained slightly below the nozzle by means of an adjustable weir. Collection of flue gas particles is by both direct impaction with the liquid bath and by collision with droplets atomized by the action of the gas stream upon the liquid bath. Mist elimination, achieved by centrifugal action and swirl vanes, precedes gas discharge. The wastewater stream is discharged through a slurry drain (see Attachment B).

In the venturi scrubber, the gases are passed through a venturi tube in which low-pressure water is added at the throat. In spite of a relatively short contact time, extreme turbulence in the venturi promotes intimate contact. The wetted particles and droplets are collected in a mist elimination device. For a given collection efficiency, these devices normally require a greater pressure drop than the impingement scrubber. In addition, pretreatment mechanical collectors are normally necessary to remove the larger abrasive particles and decrease wear on the venturi surfaces.

#### FABRIC FILTER

Particulate emission controls via fabric filtration techniques (baghouse) have not been installed on any bagasse or residue-fired boiler. The principal drawback foreseen by potential users is a fire danger resulting from collection of combustible carbonaceous fly ash. Fires have occurred with both wood- and municipal solid-waste-fired boilers fitted with baghouses. The fire potential could possibly be reduced by extensive modifications and precautions, but most such measures have not been demonstrated in actual application.

Additional problems with baghouses are plugging, solid waste disposal of a dry product, and potential high maintenance costs for filter replacement. A disadvantage to fabric filtration is its inability to remove other primary gaseous pollutants from the gas stream. Another control device would be required to remove soluble pollutants such as SO<sub>2</sub>. This incapability is significant when such inherent removal is proposed as Best Applicable Control Technology (BACT).

#### ELECTROSTATIC PRECIPITATORS

Electrostatic precipitators (ESP) are in operation on wood- and solid waste-fired boilers. However, they have not been applied to bagasse- or residue-fired boilers. Precipitator vendors contacted recently and a study conducted several years ago indicate that electrostatic precipitation of bagasse and residue ash would probably not be feasible. The vendors also caution against possible fire hazard and explosion potential.

Particulate collection in an ESP is accomplished by first imparting an electrical charge to the particles, allowing the charged particles to migrate to a collecting electrode, and dislodging the collected particles from the collecting electrodes. Particle charging is normally accomplished with a high-voltage DC corona. Particle removal is performed by rapping or vibrating the collecting electrodes.

ESPs, which must be guarded against corrosion, have the inherent disadvantage of removing only particulate matter. Another control device would be needed to remove soluble pollutants such as SO<sub>2</sub>. Disposal of a dry solid waste product would also be required.

#### AVAILABLE SULFUR DIOXIDE CONTROL TECHNOLOGY

##### SO<sub>2</sub> SPRAY-TYPE ABSORPTION TOWER

Gas absorption equipment is designed to provide thorough contact between the gas and liquid solvent in order to permit interphase diffusion of the dissolved materials. The rate of mass transfer (absorption) is largely dependent upon the water surface exposed by liquid dispersion. The liquid is introduced at the top of the tower through spray nozzles, while the gas is introduced at the bottom to pass upward through the

liquid. This provides the highest possible efficiency because the solute concentrations in the gas stream decrease as the gas rises through the tower and, as a result, there is constantly a fresher solvent available for contact with the least concentrated gas phase. This gives maximum average driving force for the diffusion process throughout the entire column. The collection efficiency depends on the height of the tower and the liquid dispersion mechanism, which are directly related to the pressure drop and energy requirements.

In some systems the hot flue gases completely dry the absorbing solvent, allowing collection and disposal of the dry particulate. This would require an additional particulate removal device after the SO<sub>2</sub> scrubber. Spray drying is currently in the development/demonstration stage in the United States.

#### SO<sub>2</sub> SCRUBBING SLURRY

Addition of a sodium, alkali, limestone, or lime reagent to a scrubbing water stream significantly increases the absorption of SO<sub>2</sub>. The slurry can be introduced to a single-stage scrubber in which both particulate and SO<sub>2</sub> removal is achieved. The cost of chemicals, all slurry handling mechanisms, slurry preparation, and additional power costs, would be added to the cost of a water-only scrubbing unit. A second method is to provide an add-on flue gas desulfurization (FGD) system after the particulate removal device. In this manner, particulate removal is achieved in the first stage with water only. This greatly decreases slurry requirements because particulate matter will no longer "foul" the absorption reagent, and the potential for recycle is improved. However, additional capital expenditure is necessary and an increased pressure drop results in increased operating costs.

FGD scrubbing systems currently in operation in the United States include lime/limestone scrubbing, sodium scrubbing (throwaway), and double alkali scrubbing. The Wellman-Lord process and spray-drying processes are in the development and/or demonstration stage.

#### AVAILABLE NITROGEN OXIDES CONTROL TECHNIQUES

Several techniques for controlling nitrogen oxide ( $\text{NO}_x$ ) formation in boilers are currently available. These include:

1. Low excess air firing,
2. Staged combustion,
3. Flue gas recirculation,
4. Low  $\text{NO}_x$  burners, and
5. Ammonia injection.

Most of these techniques are not applicable to bagasse- and bagasse residue-fired boilers. Low  $\text{NO}_x$  burners cannot be used when burning material such as bagasse or residue in a spreader-stoker or moving-grate boiler. Excess air, typically in the range of 30 to 50 percent for these boilers, is required to aid in drying of the moisture-laden carbonaceous material and to ensure complete combustion. The low combustion temperatures encountered in bagasse- and residue-fired boilers inherently limit potential  $\text{NO}_x$  formation. The subsequent low emission rates, which have been measured as almost insignificant for a bagasse boiler (Peters, 1980), are presented in the emission estimates section of this application.

Based upon the above considerations, good firing and operational practices are considered to be best practical technology in reducing  $\text{NO}_x$  emissions. Therefore, no other technologies were considered further.

#### BACT SELECTION

##### PARTICULATE REMOVAL SYSTEM

On the basis of environmental, energy, and economic impacts, the Joy Turbulaire impingement scrubber was selected as BACT for the proposed boiler. This system is well demonstrated on existing bagasse- and residue-fired boilers in the industry, has a proven operational record with high reliability and low maintenance, and displays low-energy requirements ( $\Delta P = 5$  to 9 inches  $\text{H}_2\text{O}$ ). The proposed scrubber will operate with a pressure drop of between 5 and 9 inches  $\text{H}_2\text{O}$ , which is

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the range recommended by the manufacturer. Above this range, increased wear, increased particulate entrainment, and increased fan capacity and horsepower reduce the effectiveness of the system.

A venturi scrubber was not chosen for BACT because it has not proven to be a more efficient control device than the impingement scrubber, which is considerably less expensive to install and operate. It requires a greater pressure drop (2 to 3 times that of the impingement scrubber), with a correspondingly greater energy consumption. It requires more water, and has higher maintenance costs due to the abrasive nature of the fly ash and high gas velocities encountered in the venturi and across the exhaust fan. In addition, venturis must be preceded by mechanical collectors to reduce wear, which further increases capital and operating costs of the system.

Venturi scrubbers have now been installed on a total of six boilers in the Florida industry. Table D-1 summarizes annual compliance tests for the scrubbers. At both Gulf & Western and Talisman, mechanical cyclone collectors precede the venturi scrubbers in order to remove larger particles. At Gulf & Western, the venturi scrubber typically operates at a pressure drop of 16 inches H<sub>2</sub>O. At Talisman, the venturis operate typically at 14 inches H<sub>2</sub>O pressure drop. As shown, test results have varied widely, ranging from 0.09 lb/MM Btu to 0.30 lb/MM Btu. The average of all tests for all boilers is 0.20 lb/MM Btu. Boiler 6 at Talisman has displayed below average test results, ranging from 0.09 to 0.15 lb/MM Btu. However, emissions from Boiler 6 have gradually worsened throughout the years, possibly reflecting wear of the scrubber. The data show that overall the venturi scrubbers have not achieved a greater degree of emission reduction than that achieved with the impingement scrubber.

Fabric filters and ESPs were rejected for BACT since, to date, they have not been applied in the sugar industry, in other states or in Florida. Pilot-plant testing would be needed before the feasibility of full-scale

Table D-1. Florida Sugar Industry Venturi Scrubber Compliance Tests

|                                         |               | lb/hr Particulate |        | lb/10 <sup>6</sup> Btu |
|-----------------------------------------|---------------|-------------------|--------|------------------------|
|                                         |               | Allowable         | Actual |                        |
| <u>Glades County Sugar Cooperative*</u> |               |                   |        |                        |
|                                         | 74-75         | 32.1              | 12.4   | 0.12                   |
|                                         | 75-76         | 73.0              | 45.1   | 0.19                   |
|                                         | 76-77         | 51.2              | 24.8   | 0.15                   |
| <u>Gulf &amp; Western</u>               |               |                   |        |                        |
| #10                                     | 79-80         | 39.2              | 43.1   | 0.22                   |
| #11†                                    | 79-80         | 45.1              | 35.4   | 0.16                   |
| #10                                     | 80-81**       | 46.2              | 31.2   | 0.14                   |
| #11†                                    | 80-81         | 51.1              | 53.0   | 0.21                   |
| #11†                                    | Retest        | 47.7              | 34.7   | 0.15                   |
| <u>Talisman</u>                         |               |                   |        |                        |
| #4                                      | 1-6-76        | 61.5              | 58.0   | 0.28                   |
| #5                                      | 1-6-76        | 63.5              | 56.9   | 0.27                   |
| #6†                                     | 1-26-76       | 73.5              | 31.5   | 0.09                   |
| #4                                      | 2-2-77        | 61.2              | 54.4   | 0.27                   |
| #5                                      | 2-25-77       | 50.7              | 43.7   | 0.26                   |
| #6†                                     | Not operating | --                | --     | --                     |
| #4                                      | 1-25-78       | 66.6              | 64.6   | 0.29                   |
| #5                                      | 1-20-78       | 38.3              | 38.0   | 0.30                   |
| #6†                                     | 1-27-78       | 86.0              | 45.2   | 0.11                   |
| #4                                      | 12-18-78      | 44.7              | 25.7   | 0.17                   |
| #5                                      | 12-20-78      | 44.2              | 38.6   | 0.26                   |
| #6†                                     | 1-3-79        | 72.7              | 43.9   | 0.12                   |
| #4                                      | 2-13-80       | 56.0              | 49.6   | 0.27                   |
| #5                                      | 2-7-80        | 59.0              | 46.8   | 0.24                   |
| #6†                                     | 2-11-80       | 84.6              | 59.3   | 0.14                   |
| #4                                      | 1-28-81       | 59.1              | 42.7   | 0.22                   |
| #5                                      | 2-2-81        | 57.3              | 52.4   | 0.27                   |
| #6†                                     | 2-4-81        | 80.2              | 61.2   | 0.15                   |

\* Plant average.

† Allowables are 0.2 lb/10<sup>6</sup> Btu, all others are 0.3 lb/10<sup>6</sup> Btu.

\*\* Modified to vertical orientation this season, #11 remains horizontal.

Source: ESE, 1981.

application of ESP could be assessed. In addition, both ESP and fabric filters exhibit fire and explosion potential and would require dry fly-ash handling and disposal systems, therefore necessitating additional expenditures. A wet fly-ash handling system is already in operation at SCGC, where it serves the existing boilers. A new scrubber could easily be integrated into this existing system.

An economic analysis was conducted on four alternative particulate removal systems: an ESP, fabric filter, venturi scrubber with 14-inch pressure drop preceded by mechanical collectors, and a Turbulaire impingement scrubber with 6-inch pressure drop. Tables D-2 and D-3 summarize the results. As shown, the fabric filter and impingement scrubber both provide similar cost effectiveness. The efficiencies of the ESP and fabric filter could possibly be greater than 91 percent overall, thereby increasing their cost effectiveness. However, since these two systems have not been demonstrated on bagasse/bagasse residue boilers and the cost effectiveness of the ESP is not significantly superior to the impingement scrubber, they were rejected as BACT.

The venturi scrubber, typical of those now in operation in the sugar industry, reflects a cost per unit removal double that of the impingement scrubber. This is primarily due to the need for pretreatment mechanical collectors, larger fan capacity required due to larger pressure drop, and higher operating and maintenance costs. Increased pressure drop across the venturi could afford greater removal efficiencies, but at the expense of increased maintenance and energy requirements.

Because of the superior cost effectiveness of the impingement scrubber, its lower energy requirements, the uncertainty of achieving lower emission levels with the venturi, the small environmental impact of the proposed boiler at the BACT emission level ( $7\text{-ug/m}^3$  highest, second-highest 24-hour concentration and about  $1\text{-ug/m}^3$  annual average), and the predicted overall improvement in TSP air quality as a result of the proposed project, the impingement scrubber was chosen as BACT.

Table D-2. Economic Analysis of Alternative Particulate Control Systems (\$1,000)

|                                                                                                                      | Electrostatic<br>Precipitator | Fabric<br>Filter | Venturi<br>Scrubber<br>$\Delta P = 14$ in.<br>w/Mech.<br>Collector | Turbulaire<br>Impingement<br>Scrubber<br>$\Delta P = 6$ in. |
|----------------------------------------------------------------------------------------------------------------------|-------------------------------|------------------|--------------------------------------------------------------------|-------------------------------------------------------------|
| <b>Capital Costs</b>                                                                                                 |                               |                  |                                                                    |                                                             |
| 1. Direct Costs                                                                                                      |                               |                  |                                                                    |                                                             |
| A. Purchased Equipment                                                                                               |                               |                  |                                                                    |                                                             |
| 1. Control Device and<br>Auxiliary Equipment*                                                                        | 572.6                         | 771.9            | 997.4                                                              | 496.6                                                       |
| 2. Instrument, Controls,<br>Taxes, Freight (A.1 X 0.18)                                                              | <u>103.1</u>                  | <u>138.9</u>     | <u>179.5</u>                                                       | <u>89.4</u>                                                 |
| TOTAL                                                                                                                | 675.7                         | 910.8            | 1,176.9                                                            | 586.0                                                       |
| B. Installation Direct Costs                                                                                         |                               |                  |                                                                    |                                                             |
| 1. Foundations, supports,<br>erection, handling,<br>electrical, piping,<br>insulation, painting†                     | 452.7                         | 655.8            | 659.1                                                              | 328.2                                                       |
| 2. Indirect Costs                                                                                                    |                               |                  |                                                                    |                                                             |
| A. Installation Indirect Costs                                                                                       |                               |                  |                                                                    |                                                             |
| 1. Engineering, supervision,<br>construction, field expense,<br>construction fee, startup,<br>testing, contingencies | <u>385.1</u>                  | <u>409.9</u>     | <u>411.9</u>                                                       | <u>205.1</u>                                                |
| TOTAL CAPITAL COSTS (1A + 1B + 2A)                                                                                   | 1,513.5                       | 1,976.5          | 2,247.9                                                            | 1,119.3                                                     |



Table D-2. Economic Analysis of Alternative Particulate Control Systems (\$1,000)  
(Continued, Page 2 of 2)

|                                               | Electrostatic<br>Precipitator | Fabric<br>Filter | Venturi<br>Scrubber<br>$\Delta P = 14$ in.<br>w/Mech.<br>Collector | Turbulaire<br>Impingement<br>Scrubber<br>$\Delta P = 6$ in. |
|-----------------------------------------------|-------------------------------|------------------|--------------------------------------------------------------------|-------------------------------------------------------------|
| Annual Operating Costs                        |                               |                  |                                                                    |                                                             |
| 1. Direct Operating Costs                     |                               |                  |                                                                    |                                                             |
| A. Operating Labor**                          |                               |                  |                                                                    |                                                             |
| 1. Operator                                   | 5.3                           | 12.7             | 21.2                                                               | 8.5                                                         |
| 2. Supervisor                                 | 0.8                           | 1.9              | 3.2                                                                | 1.3                                                         |
| B. Maintenance**                              |                               |                  |                                                                    |                                                             |
| 1. Labor                                      | 3.5                           | 7.0              | 7.0                                                                | 4.7                                                         |
| 2. Material                                   | 3.5                           | 7.0              | 7.0                                                                | 4.7                                                         |
| C. Utilities**                                |                               |                  |                                                                    |                                                             |
| 1. Electricity                                | 31.2                          | 65.3             | 214.6                                                              | 93.3                                                        |
| 2. Water                                      | --                            | --               | 74.5                                                               | 44.7                                                        |
| D. Waste Disposal                             | 16.5                          | 16.5             | 16.5                                                               | 16.5                                                        |
| 2. Indirect Operating Costs                   |                               |                  |                                                                    |                                                             |
| A. Overhead                                   | 7.7                           | 17.3             | 25.1                                                               | 11.6                                                        |
| B. Property tax, insurance,<br>administration | 60.5                          | 79.1             | 89.9                                                               | 44.8                                                        |
| C. Capital recovery cost                      | <u>246.3</u>                  | <u>321.7</u>     | <u>365.8</u>                                                       | <u>182.2</u>                                                |
| TOTAL ANNUAL OPERATING COSTS                  | 375.3                         | 528.5            | 824.8                                                              | 412.3                                                       |

\* Does not include stack.

† Does not include site preparation, facilities, and buildings.

\*\* Based upon 24-hr/day, 180-day/yr operation.

Source: ESE, 1981.

Table D-3. Comparison of Cost Effectiveness of Alternative Particulate Control Systems

|                                                     | Electrostatic<br>Precipitator | Fabric<br>Filter | Venturi<br>Scrubber<br>$\Delta P = 14$ in.<br>w/Mech.<br>Collector | Turbulaire<br>Impingement<br>Scrubber<br>$\Delta P = 6$ in. |
|-----------------------------------------------------|-------------------------------|------------------|--------------------------------------------------------------------|-------------------------------------------------------------|
| Total Annual Costs<br>(\$1,000)                     | 375.3                         | 528.5            | 824.8                                                              | 412.3                                                       |
| Particulate Removal Efficiency                      | 91%                           | 91%              | 91%                                                                | 91%                                                         |
| Tons/Yr Controlled*                                 | 3,723                         | 3,723            | 3,723                                                              | 3,723                                                       |
| Cost Effectiveness<br>(\$/ton Pollutant Controlled) | 100.8                         | 142.0            | 221.5                                                              | 110.7                                                       |

\* Based on proposed boiler emitting 4,091 tons/yr of uncontrolled particulate (reference Section III.C).

Source: ESE, 1981.

#### PARTICULATE EMISSION LIMIT

An appropriate emission limit for particulate matter was determined by a source-specific analysis of impingement scrubber performance at SCGC. This analysis is consistent with the case-by-case determination implicit in the definition of BACT. Summarized in Table D-4 are all past particulate emissions test data for the SCGC boilers. Both individual stack tests and compliance test averages are shown. Boilers 1 and 2 are the smallest residue-burning boilers in terms of steam production. Boiler 3 fires bagasse and oil only; the others were all tested while firing residue and oil. Boiler 4 is identical in size to the proposed boiler (240,000 lbs steam/hr).

Individual tests over all boilers have ranged from 0.07 lb/MM Btu to 0.23 lb/MM Btu, averaging 0.16 lb/MM Btu (arithmetic mean). Compliance tests over all boilers have ranged from 0.09 to 0.21 lb/MM Btu, averaging 0.16 lb/MM Btu (arithmetic mean). The wide variation in data experienced at this mill and throughout the industry makes it difficult to define an emission limit which can be met 100 percent of the time. In the only BACT determination for bagasse boilers to date (U.S. Sugar Bryant), an emission level being met 80 percent of the time by the existing boilers at Bryant, based upon plant-specific historical operating data, was chosen as BACT (see attached documentation).

In determining a BACT emission level for SCGC's proposed boiler, the U.S. Sugar, Bryant methodology was applied, even though the resulting limit has been demonstrated to be exceeded 20 percent of the time. Figures 1 through 4 show log-probability plots of the emission test data presented in Table D-4 for SCGC, for all boilers (Figures 1 and 2) and for Boiler 4 only (Figures 3 and 4). Both sets of individual test data reflect 80th-percentile levels of 0.20 to 0.21 lb/MM Btu. A figure based on compliance test results is slightly lower, both sets displaying about 0.19 lb/MM Btu emission levels. Based on these site-specific data, an emission limit equal to the State of Florida standard of 0.2-lb/MM Btu heat input from carbonaceous fuel and 0.1-lb/MM Btu heat

Table D-4. SCGC Particulate Compliance Tests, 1976 to 1981, Impingement Scrubbers in Operation

| Boiler | Rated Capacity<br>(lb/steam/<br>hour) | Particulate Emissions by Crop Year (lb/MM Btu)* |              |                  |              |                  |              |                  |              |                  |              |
|--------|---------------------------------------|-------------------------------------------------|--------------|------------------|--------------|------------------|--------------|------------------|--------------|------------------|--------------|
|        |                                       | 1976 to 1977                                    |              | 1977 to 1978     |              | 1978 to 1979     |              | 1979 to 1980     |              | 1980 to 1981     |              |
|        |                                       | Individual Tests                                | Test Average | Individual Tests | Test Average | Individual Tests | Test Average | Individual Tests | Test Average | Individual Tests | Test Average |
| 1      | 120,000                               | 0.14                                            |              | 0.13             |              | 0.16             |              | 0.08             |              | 0.22             |              |
|        |                                       | 0.13                                            | 0.13         | 0.10             | 0.11         | 0.16             | 0.17         | 0.20             | 0.13         | 0.22             | 0.21         |
|        |                                       | 0.12                                            |              | 0.11             |              | 0.18             |              | 0.11             |              | 0.18             |              |
| 2      | 120,000                               | 0.12                                            |              | 0.08             |              | 0.17             |              | 0.10             |              | 0.21             |              |
|        |                                       | 0.11                                            | 0.12         | 0.11             | 0.10         | 0.15             | 0.15         | 0.12             | 0.10         | 0.18             | 0.17         |
|        |                                       | 0.12                                            |              | 0.10             |              | 0.14             |              | 0.9              |              | 0.13             |              |
| 3†     | 100,000                               | 0.19                                            |              | 0.19             |              | 0.21             |              | 0.20             |              | 0.19             |              |
|        |                                       | 0.15                                            | 0.16         | 0.18             | 0.16         | 0.13             | 0.16         | 0.22             | 0.20         | 0.21             | 0.20         |
|        |                                       | 0.14                                            |              | 0.12             |              | 0.13             |              | 0.17             |              | 0.21             |              |
| 4      | 240,000                               | 0.13                                            |              | 0.22             |              | 0.12             |              | 0.19**           |              | 0.19             |              |
|        |                                       | 0.19                                            | 0.18         | 0.18             | 0.19         | 0.23             | 0.15         | 0.21**           | 0.19**       | 0.18             | 0.19         |
|        |                                       | 0.22                                            |              | 0.17             |              | 0.11             |              | 0.18**           |              | 0.20             |              |
| 5      | 160,000                               | 0.15                                            |              | 0.14             |              | 0.19             |              | 0.10             |              | 0.21             |              |
|        |                                       | 0.10                                            | 0.12         | 0.13             | 0.14         | 0.15             | 0.17         | 0.10             | 0.09         | 0.19             | 0.21         |
|        |                                       | 0.10                                            |              | 0.15             |              | 0.18             |              | 0.07             |              | 0.22             |              |

\* Adjusted for heat input due to fuel-oil firing by following equation:  

$$[(\text{Actual Emissions} - \text{Fuel Oil Allowable}) \cdot \text{Heat Input from bagasse or residue}].$$
 This method assumes fuel-oil combustion generates 0.1 lb/particulate/MM Btu.  
 Fuel Oil Allowable = 0.1 times heat input from oil (lb/hr).

† Bagasse and oil only—all other boilers tested on residue and oil.

\*\*Bagasse and oil only burned during this test.

Source: ESE, 1981.

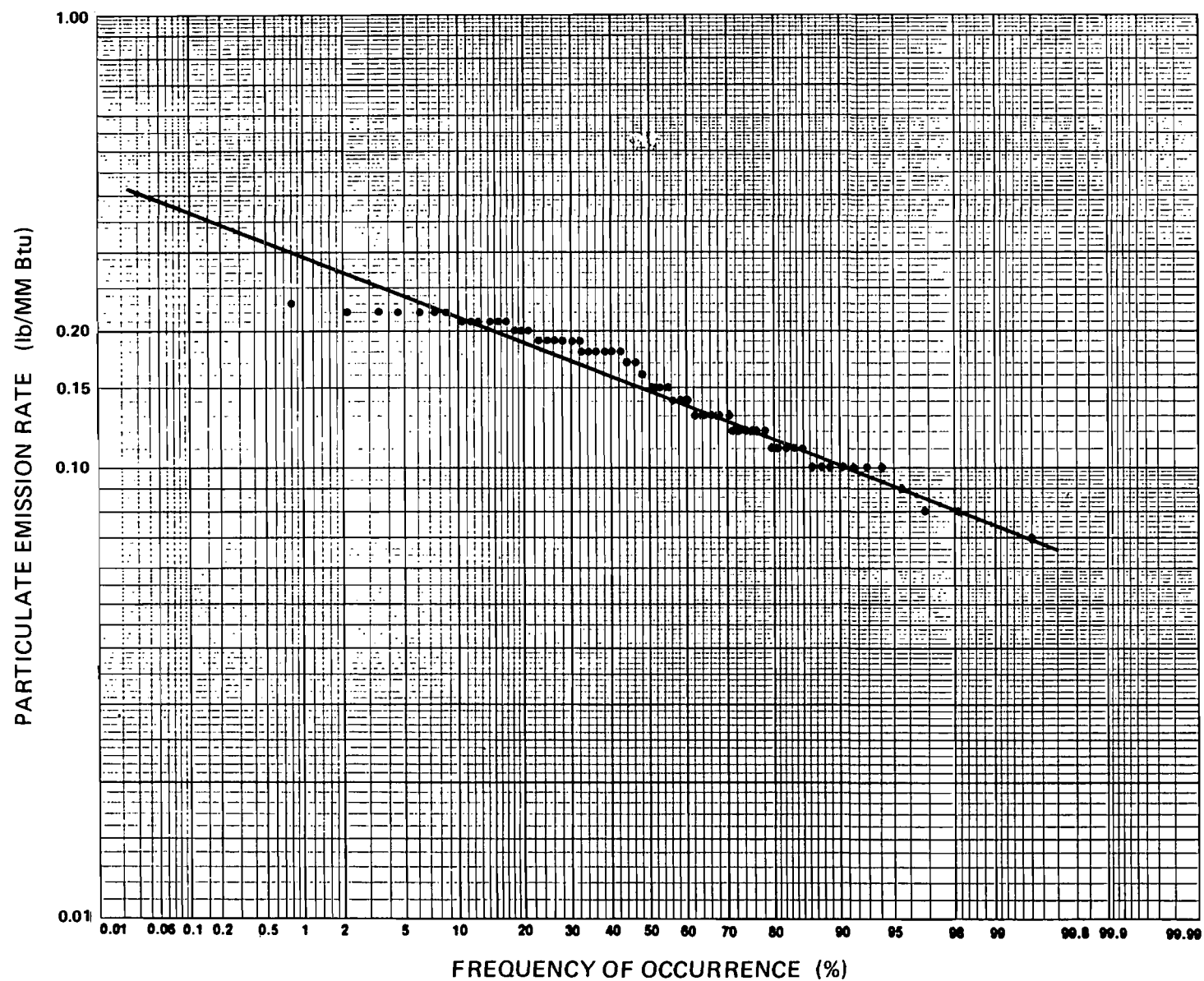
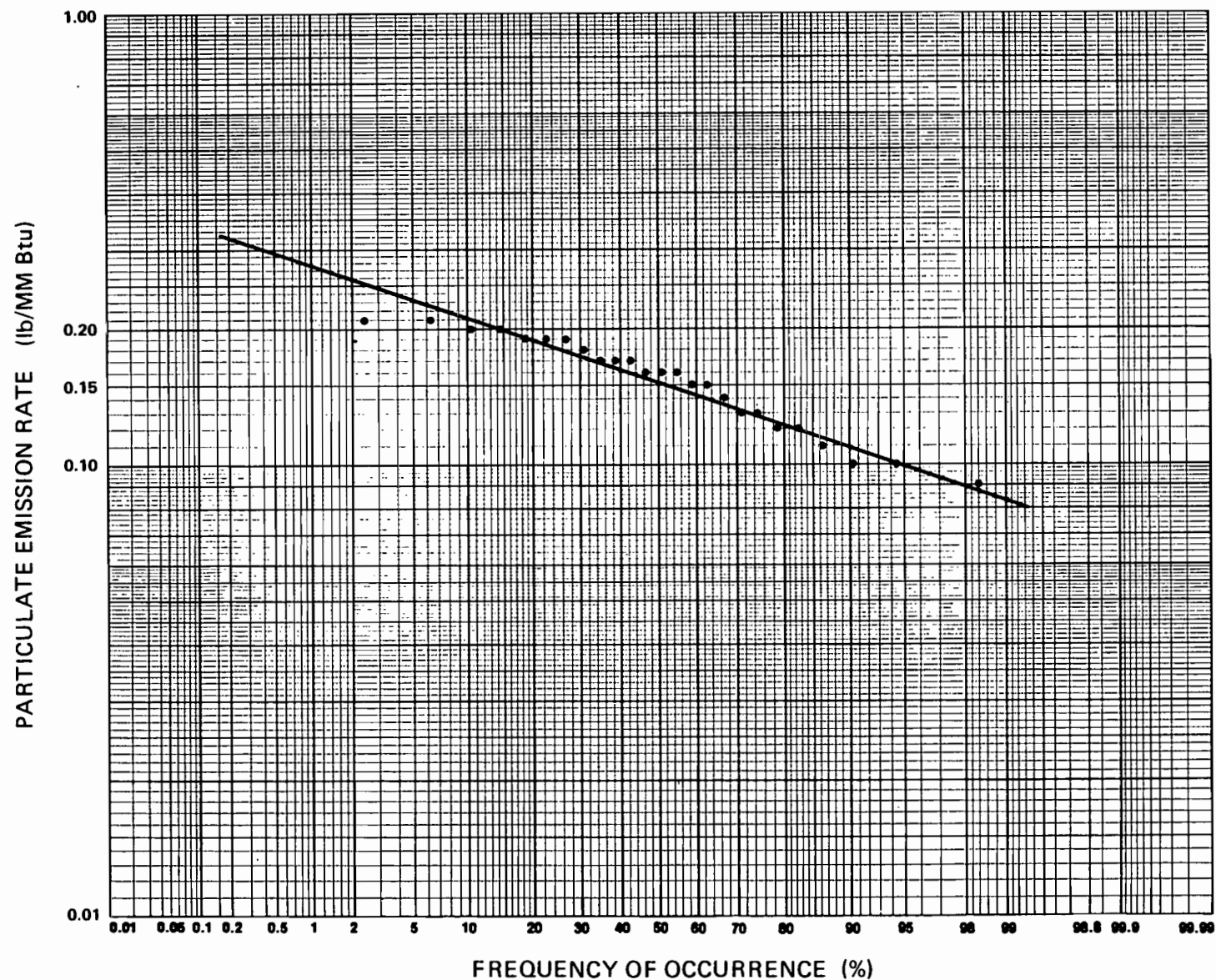


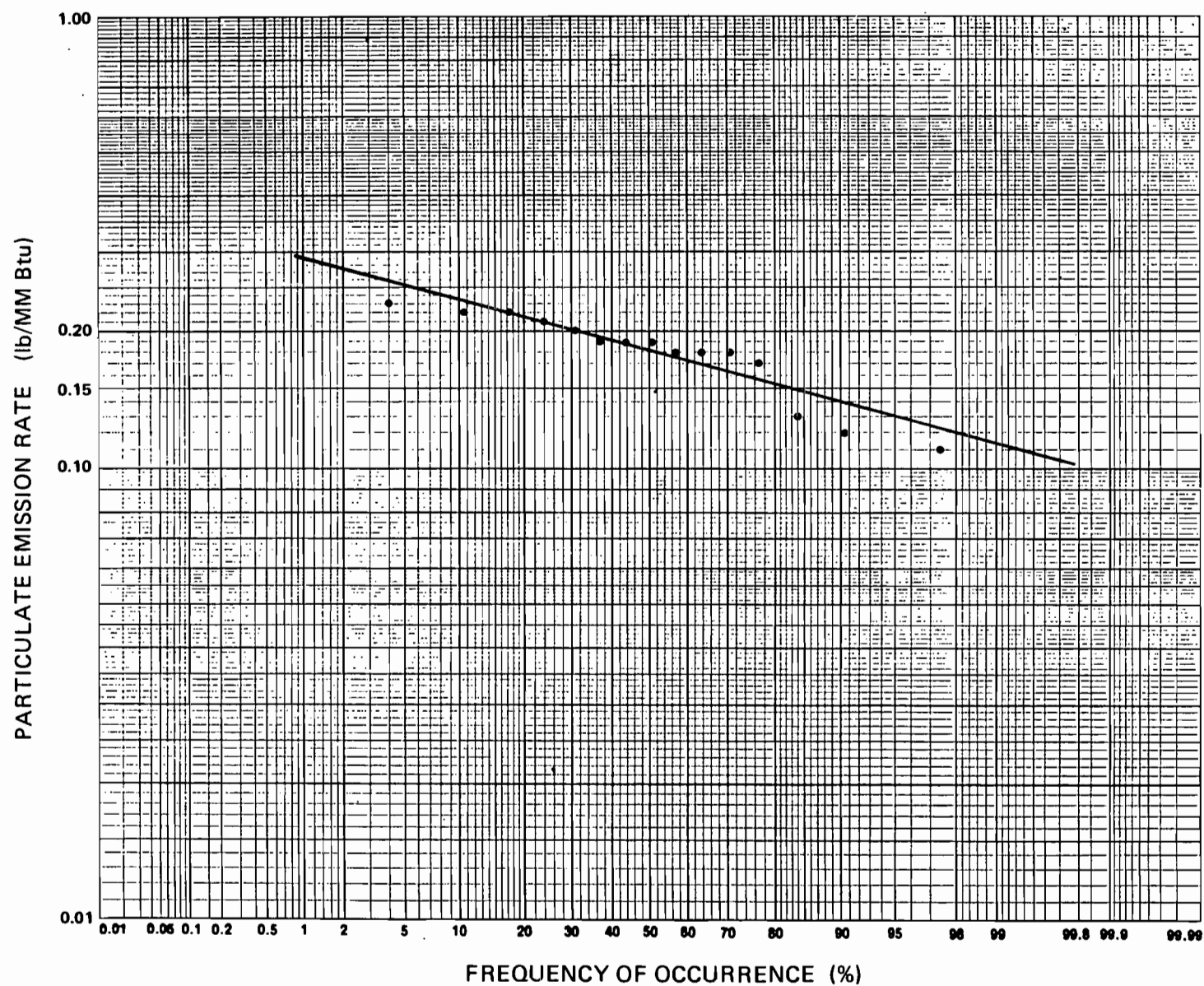
**Figure 1. FREQUENCY DISTRIBUTION OF PARTICULATE STACK TESTS  
FOR SCGC BOILERS 1 THROUGH 5**

SOURCES: ESE, 1981.  
SCGC, 1981.



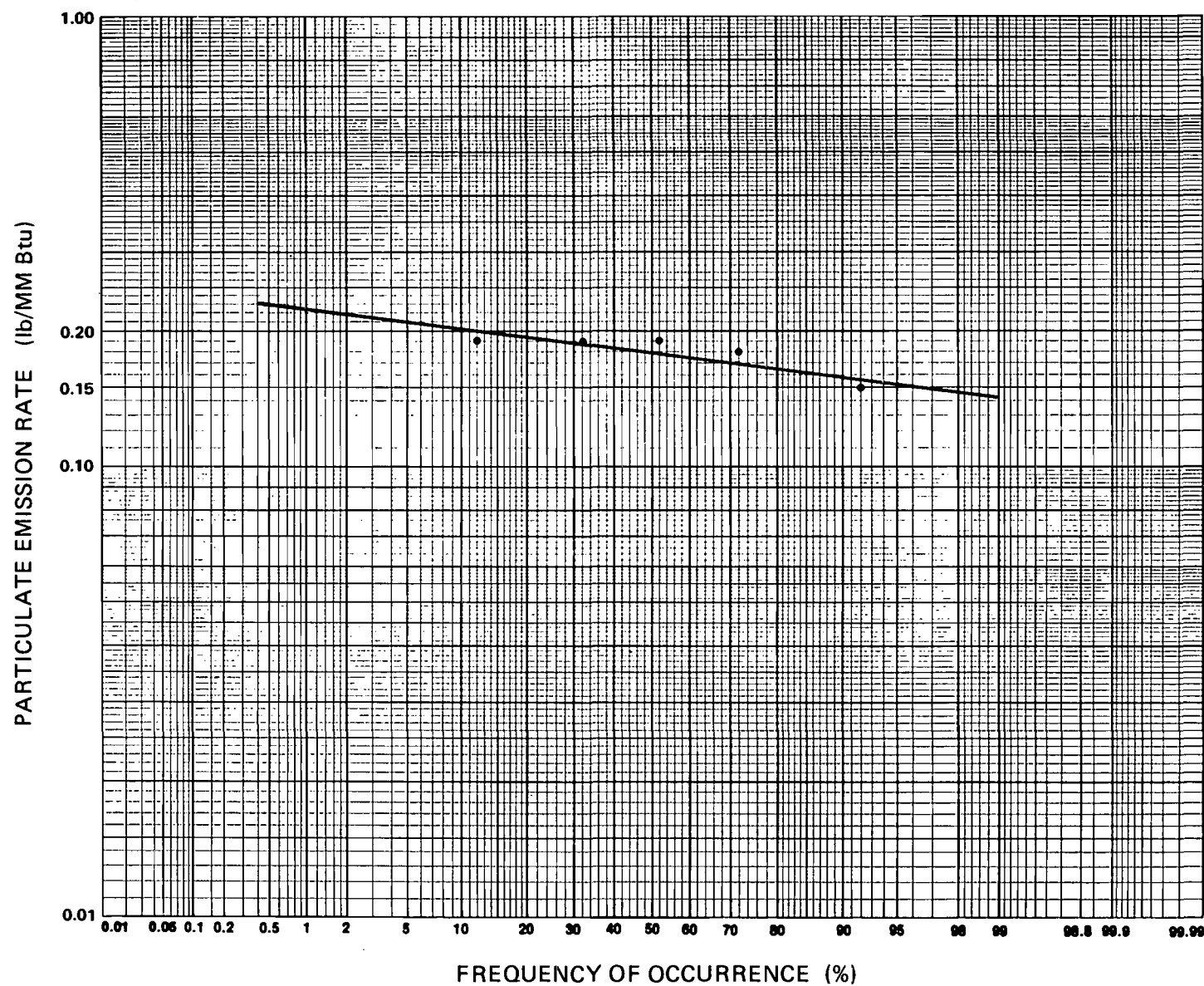
SOURCES: ESE, 1981.  
SCGC, 1981.

**Figure 2. FREQUENCY DISTRIBUTION OF PARTICULATE COMPLIANCE TESTS  
FOR SCGC BOILERS 1 THROUGH 5**



SOURCES: ESE, 1981.  
SCGC, 1981.

Figure 3. FREQUENCY DISTRIBUTION OF PARTICULATE STACK TESTS  
FOR SCGC BOILER 4



SOURCES: ESE, 1981.  
SCGC, 1981.

Figure 4. FREQUENCY DISTRIBUTION OF PARTICULATE COMPLIANCE TESTS  
FOR SCGC BOILER 4



4/22/81

input due to fuel oil is proposed as BACT. This level is exceeded 20 percent of the time by the existing boilers at SCGC. It is also noted that the State of Florida emission regulation of 0.2 lb/MM Btu heat input due to carbonaceous fuel was not based upon demonstrated achievement of this level in practice, but was set as a goal.

The environmental impact of the new boiler at the proposed BACT particulate emission level is small ( $7 \text{ ug/m}^3$ , 24-hour average and about  $1 \text{ ug/m}^3$  annual average), representing 19 percent and 5 percent, respectively, of the allowable Class II PSD increments, and 5 percent and 2 percent, respectively, of the ambient air quality standards. In addition, the overall project will result in a net TSP air quality improvement. Therefore, increased controls are not justified on environmental grounds.

#### SO<sub>2</sub> CONTROL SYSTEM

Six SO<sub>2</sub> removal system alternatives were evaluated: the Turbulaire impingement scrubber and five add-on SO<sub>2</sub> scrubber systems. The Turbulaire impingement system was chosen as BACT based upon its excellent removal efficiency, at least 40 percent overall for the combustion and scrubbing process, at no additional cost. Add-on scrubbers represent a substantial investment in capital, as well as substantial operating costs and waste disposal problems.

In order to determine costs for add-on flue gas desulfurization (FGD) control systems for SO<sub>2</sub> removal, the publication entitled "Technology Assessment Report for Industrial Boiler Applications: Flue Gas Desulfurization" (EPA-600/7-79-178i, Nov. 1979) was utilized. This report presents a summary of capital and annual costs for five FGD systems that were determined to be the best systems for application to industrial boilers (Section 4.0 of the document). A scenario of 0.6-percent S coal and 90-percent SO<sub>2</sub> removal was chosen for comparison for the SCGC proposed addition, since 90-percent removal represents a significantly greater degree of emission control compared

to the 40-percent removal inherent in the impingement scrubber and the 0.6-percent S coal is representative of the relatively low SO<sub>2</sub> emissions produced from the proposed bagasse/bagasse residue-fired boiler. If an add-on FGD system is chosen for SCGC, there would be no reason to design it for a low 75-percent removal.

For certain FGD processes, data presented in the document were for various boiler sizes--in many cases not exceeding 200 MM Btu/hr. The proposed boiler size is 500 MM Btu/hr based upon the worst-case fuel burned. In cases where data were presented for boiler sizes of 250 MM Btu/hr and less, the data were extrapolated to a size of 250 MM Btu/hr and multiplied by 1.5, since costs for a system twice the capacity would not be double. Where cost data were available for boiler sizes greater than 250 MM Btu/hr, a linear interpolation to 500 MM Btu/hr was utilized. Costs presented were mid-1978 dollars; therefore, these were adjusted for mid-1981 dollars assuming a 10-percent annual increase.

The results of the FGD economic analysis are presented in Table D-5. The Turbulaire impingement scrubber, with inherent 40-percent SO<sub>2</sub> removal, affords essentially free SO<sub>2</sub> removal since no additional capital investment or annualized costs are required beyond the particulate control device. All of the add-on FGD systems have a very high cost per unit removal due to the large capital investments and operating costs associated with these systems. The impingement scrubber will control approximately 540 tons/year of SO<sub>2</sub>. The add-on FGD systems will control approximately 740 additional tons of SO<sub>2</sub> per year. However, this additional control is at an extremely high economic penalty.

#### SO<sub>2</sub> Emission Limit

The SO<sub>2</sub> BACT emission limit is proposed in terms of lb/MM Btu for each fuel type utilized, which is consistent with the manner in which the particulate BACT emission limits (and Florida emission standards)

Table D-5. Economic Analysis and Cost Effectiveness of Alternative SO<sub>2</sub> Control Systems

|                                                        | Control System                         |                                 |                                  |                               |                 |                             |
|--------------------------------------------------------|----------------------------------------|---------------------------------|----------------------------------|-------------------------------|-----------------|-----------------------------|
|                                                        | Turbulaire<br>Impingement<br>Scrubber* | Lime/<br>Limestone<br>Scrubbing | Sodium<br>Throwaway<br>Scrubbing | Double<br>Alkali<br>Scrubbing | Spray<br>Drying | Wellman-<br>Lord<br>Process |
| Total Capital Cost<br>(\$1,000)                        | 0                                      | 2,252                           | 1,694                            | 1,984                         | 3,625           | 4,459                       |
| Total Annualized<br>Costs (\$1,000)                    | 0                                      | 1,189                           | 950                              | 1,000                         | 1,575           | 1,446                       |
| SO <sub>2</sub> Removal<br>Efficiency (%)              | 38†                                    | 90                              | 90                               | 90                            | 90              | 90                          |
| Tons/Yr Controlled**                                   | 538                                    | 1,274                           | 1,274                            | 1,274                         | 1,274           | 1,274                       |
| Cost Effectiveness<br>(\$/ton pollutant<br>controlled) | 0                                      | 933                             | 746                              | 746                           | 1,236           | 1,135                       |

\* Costs represent those above that required for the particulate removal system.

† Based upon 40-percent removal for bagasse and bagasse residue and zero removal for oil burning.

\*\* Based upon proposed boiler emitting 1,415 tons/yr of uncontrolled SO<sub>2</sub> (reference Section III.C).

Source: ESE, 1981.

are expressed. This is also consistent with the manner in which the BACT emission limits of the U.S. Sugar, Bryant new boiler are expressed. The lb/MM Btu terminology allows easy calculation of the allowable emission limit for any combination of fuels being burned in the proposed boiler.

The proposed SO<sub>2</sub> emission limits are:

- 0.15-lb/MM Btu heat input due to bagasse
- 0.54-lb/MM Btu heat input due to bagasse residue
- 2.10-lb/MM Btu heat input due to fuel oil.

These limits are based upon the design fuels for the proposed boiler, with residue containing 0.4-percent sulfur, bagasse containing 0.1-percent sulfur, and 40-percent SO<sub>2</sub> loss when burning these fuels.

The oil limit is based upon maximum of 1.8-percent sulfur fuel being burned in the proposed boiler, assuming no SO<sub>2</sub> removal in the scrubber. The oil purchased for the proposed boiler will actually be of 1.0-percent sulfur content (equivalent to 1.2 lb/MM Btu). However, in order for the present practice of mixing low sulfur and high sulfur fuel oil together at SCGC mill to continue, thus avoiding an expensive additional fuel oil storage tank and associated piping, pumps, and metering devices, the additional low sulfur (1.0-percent fuel oil) purchased for the new boiler will be mixed with the low and high sulfur oil now purchased and mixed for the existing boilers. During 1980, the average fuel sulfur content utilized at SCGC was 1.8 percent. With the additional 1.0-percent sulfur purchases for the new boiler beginning in 1982, the average should be lower than 1.8 percent. Therefore, a maximum emission limit of 2.10 lb/MM Btu when burning fuel oil, equivalent to 1.8-percent sulfur fuel, is proposed as BACT.

The fuel oil purchased for the proposed boiler will be of 1.0-percent sulfur content, as described above. A lower sulfur content oil

(i.e., 0.6-percent S) would generate no less SO<sub>2</sub> per lb of steam produced than will be generated burning bagasse residue in the proposed boiler. Since fuel oil is costly compared to bagasse or bagasse residue, the two carbonaceous fuels will be burned in preference to fuel oil whenever they are available. As a result, there is no incentive to require 0.6-percent S or lower fuel oil for BACT. In addition, based upon anticipated fuel usage in the new boiler (see Table A-3, PSD report), the incremental increase in SO<sub>2</sub> emissions from utilizing 1.0-percent sulfur oil compared to 0.6-percent sulfur oil is only 15 tons per year, which is not significant compared to the total annual projected SO<sub>2</sub> emissions from the boiler.

The environmental impact of the proposed boiler at the proposed BACT emission limits further justifies the BACT selection. Highest, second-highest predicted 3-hour and 24-hour concentrations due to the proposed boiler only are 51 ug/m<sup>3</sup> and 16 ug/m<sup>3</sup>, representing 10 percent and 18 percent, respectively, of the allowable Class II PSD increments, and 4 percent and 6 percent, respectively, of the State of Florida AAQS. In addition, the proposed stack modifications will result in an SO<sub>2</sub> air quality improvement over current operating conditions.

STATE OF FLORIDA  
DEPARTMENT OF  
ENVIRONMENTAL REGULATION  
CONSTRUCTION PERMIT

FOR U. S. Sugar Corporation  
P. O. Drawer 1207  
Clewiston, Florida 33440

PERMIT NO. AC50-5177 DATE OF ISSUE 9-20-78

PURSUANT TO THE PROVISIONS OF SECTIONS 403.061 (16) AND 403.707 OF CHAPTER 403 FLORIDA  
STATUTES AND CHAPTERS 17-4 AND 17-7 FLORIDA ADMINISTRATIVE CODE, THIS PERMIT IS ISSUED TO:

Mr. A. R. Mayo, Vice President

FOR THE CONSTRUCTION OF THE FOLLOWING:

Boiler #5; Design steam production rate of 250,000 lbs/hr;

Fired with bagasse and supplemental No. 6 fuel oil;

Controlled by one Joy Turbulaire, Size 175, Type D, impinge-  
ment scrubber.

LOCATED AT Bryant Sugar Mill, U. S. Route 98, Bryant, Palm Beach  
County UTM: East 537.7 North 2969.1

IN ACCORDANCE WITH THE APPLICATION DATED May 3, 1978

ANY CONDITIONS OR PROVISOS WHICH ARE ATTACHED HERETO ARE INCORPORATED INTO AND MADE A  
PART OF THIS PERMIT AS THOUGH FULLY SET FORTH HEREIN. FAILURE TO COMPLY WITH SAID  
CONDITIONS OR PROVISOS SHALL CONSTITUTE A VIOLATION OF THIS PERMIT AND SHALL SUBJECT THE  
APPLICANT TO SUCH CIVIL AND CRIMINAL PENALTIES AS PROVIDED BY LAW.

THIS PERMIT SHALL BE EFFECTIVE FROM THE DATE OF ISSUE UNTIL 9-20-80

OR UNLESS REVOKED OR SURRENDERED AND SHALL BE SUBJECT TO ALL LAWS OF THE STATE AND THE  
RULES AND REGULATIONS OF THE DEPARTMENT.

Philip R. Edwards  
Philip R. Edwards  
District Manager

Joseph W. Landers, Jr.  
JOSEPH W. LANDERS, JR.  
SECRETARY

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

CONSTRUCTION PERMIT PROVISOS

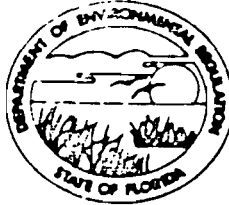
AIR POLLUTION SOURCES

Permit No. AC50-5177

Date: 9-20-78

- (X) 10. The allowable emission rates for this boiler are as follows:
- (a) Particulate Matter: 0.130 pounds per million BTU's heat input for carbonaceous fuel, plus 0.10 pounds per million BTU's heat input for fossil fuel.
  - (b) Sulfur Dioxide: 0.80 pounds per million BTU's heat input for fossil fuel.
  - (c) Visible Emissions: Shall not exceed Ringleman Number 1.5 or an opacity of 30 percent, except that a density of Ringleman Number 2 or an opacity of 40 percent is permissible for not more than two minutes in any one hour.
- (X) 11. This permit is issued conditioned upon U.S. Sugar Corporation accepting permit modifications to the existing bagasse fired boilers at the Bryant Mill. These permit modifications would restrict particulate emissions to 0.247 pounds per million BTU's heat input.
- (X) 12. Ambient monitoring for particulate matter shall be conducted for the first operating season that the new boiler #5 is in operation. The location of the sampler shall be in the approximate area of expected maximum 24-hour ambient concentrations based upon the modeling study for this plant. Sampling shall be conducted using EPA reference methods. A program for monitoring indicating location, frequency, methods of collection and analysis, and quality assurance procedures shall be submitted to the Department within ninety (90) days of receipt of this permit. This program shall be subject to Department approval.

2180 WEST FIRST STREET  
SUITE 401  
FORT MYERS, FLORIDA 33901



BOB GRAHAM  
GOVERNOR

JACOB D. VARN  
SECRETARY

PHILIP R. EDWARDS  
DISTRICT MANAGER

STATE OF FLORIDA  
**DEPARTMENT OF ENVIRONMENTAL REGULATION**  
SOUTH FLORIDA DISTRICT

August 15, 1979

CERTIFIED MAIL #4095925

Mr. A.R. Mayo  
Vice President  
U.S. Sugar Corporation  
P.O. Drawer 1207  
Clewiston, Fl. 33440

Re: Palm Beach Co - AP  
US Sugar Corp.  
Boiler #5  
AC50-5177

Dear Mr. Mayo:

In response to the stipulation entered into between the Department and U.S. Sugar Corporation, Construction Permit AC50-5177 is modified as follows:

1. Condition #10: The allowable emission rates for this boiler are as follows:

- a. Particulate Matter: 0.150 pounds per million BTU's heat input for carbonaceous fuel, plus 0.10 pounds per million BTU's heat input for fossil fuel.
- b. Sulfur Dioxide: Limitation remains as originally issued.
- c. Visible Emissions: Limitations remain as originally issued.

2. Condition #11: The original condition is deleted.

All other conditions remain as originally issued.



Mr. A. R. Mayo  
Page 2  
August 15, 1979

Should you object to these permit modifications, you may file an appropriate petition for an administrative hearing. This petition must be filed within fourteen (14) days of receipt of this letter and must conform to the requirements of Section 28-5.15, Florida Administrative Code (copy enclosed). The petition must be filed with the Office of General Counsel, Department of Environmental Regulation, Twin Towers Office Building, 2600 Blair Stone Road, Tallahassee, Florida 32301. If no petition is filed within the prescribed time, you will be deemed to have accepted this permit modification and waived your right to request an administrative hearing on this matter.

Your continued cooperation in this matter will be appreciated.

Sincerely,

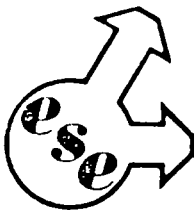


Philip R. Edwards  
District Manager

Encl

PRE/TWD/hi

cc: Mary Clark  
Palm Beach Co Health Dept  
William H. Green

*Ball*  
**environmental science and engineering, inc.**

P. O. BOX 13454

● GAINESVILLE, FLORIDA 32604

● 904 / 372- 3318

September 11, 1978  
*[Handwritten signature]*

Mr. Brian Mitchell  
Air Program  
EPA Region IV  
345 Courtland Street, N.E.  
Atlanta, Georgia 30308

Dear Brian:

Following our discussion on August 31 regarding the BACT determination for U.S. Sugar Corporation's proposed new bagasse boiler, we have reviewed the information which was submitted and offer additional clarifying information which you requested.

Regarding the use of supplemental fuel oil, Mr. A. R. Mayo, Vice President of U.S. Sugar Corporation, has indicated to us that 150,000 gallons of No. 6 oil per year would meet their normal needs. Thus, the use of oil with a sulfur content of 2.4 percent will result in an emission of substantially less than 250 tons per year of SO<sub>2</sub>.

At our meeting, one of your associates raised the question of insuring that the steam production on oil alone would not exceed 150,000 pounds of steam per hour. Mr. Mayo has assured us that the design of the boiler precludes this. The total system is designed for the production of no more than 150,000 pounds of steam per hour when burning oil alone. The whole purpose of a bagasse boiler is to utilize the bagasse. The firing sub-system, including guns, piping, pumps, controls, and oil heater limit the steam production to 150,000 pounds of steam per hour on oil alone. Also the boiler, ducts, fans, and controls are designed to limit steam production to this value.

You had asked us to contact Joy Manufacturing, who make the Turbulaire scrubber, to find out if they would guarantee their scrubber to meet an emission limitation of 0.1 lb per million BTU heat input. Mr. Bob Hyde, of Joy, has indicated to us that this would have to be on a case-by-case basis.

U.S.Sugar Corporation

-2-

September 11, 1978

We have performed a statistical analysis of the emission test results from U.S.Sugar mills at Bryant and Clewiston. Enclosed are Log-probability plots for results from Bryant alone, and Bryant and Clewiston. The Clewiston boilers which are included are those which are the same manufacturer and which have the same physical configuration of boiler, fan, and scrubber. Figures 1 and 3 are expressed in terms of pounds per million BTU of heat input. Figures 2 and 4 are expressed in terms of grains per dry standard cubic feet of flue gases. If the sampling data may be considered as being representative of the new boiler and scrubber, based on the Bryant data alone, emissions would exceed:

|                             |                 |
|-----------------------------|-----------------|
| 0.18 lb/10 <sup>6</sup> BTU | 10% of the time |
| 0.15 "                      | 20% "           |
| 0.10 "                      | 60% "           |

Using both Bryant and Clewiston data (both under the same management), the emissions would exceed:

|                             |                 |
|-----------------------------|-----------------|
| 0.21 lb/10 <sup>6</sup> BTU | 10% of the time |
| 0.18 "                      | 20% "           |
| 0.10 "                      | 76% "           |

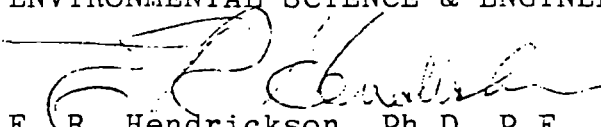
As we indicated to you at the time of our meeting, bagasse is a fuel which is extremely variable in its characteristics. The variability depends upon the variety of cane, the milling method, the soil in which it was grown, the weather conditions during harvest, and other factors beyond the control of the company.

All of the re-evaluation of data which we have performed has led us to the conclusion that BACT for bagasse boilers should be no more stringent than the Florida rule for new sources of 0.2 pound per million BTU of heat input. A lower emission limitation can not be complied with consistently by a company which has one of the best records of emission control in the Florida industry.

We look forward to a thorough discussion of this determination on September 20. If you or your colleagues have any additional questions, please do not hesitate to call me or Dave Buff.

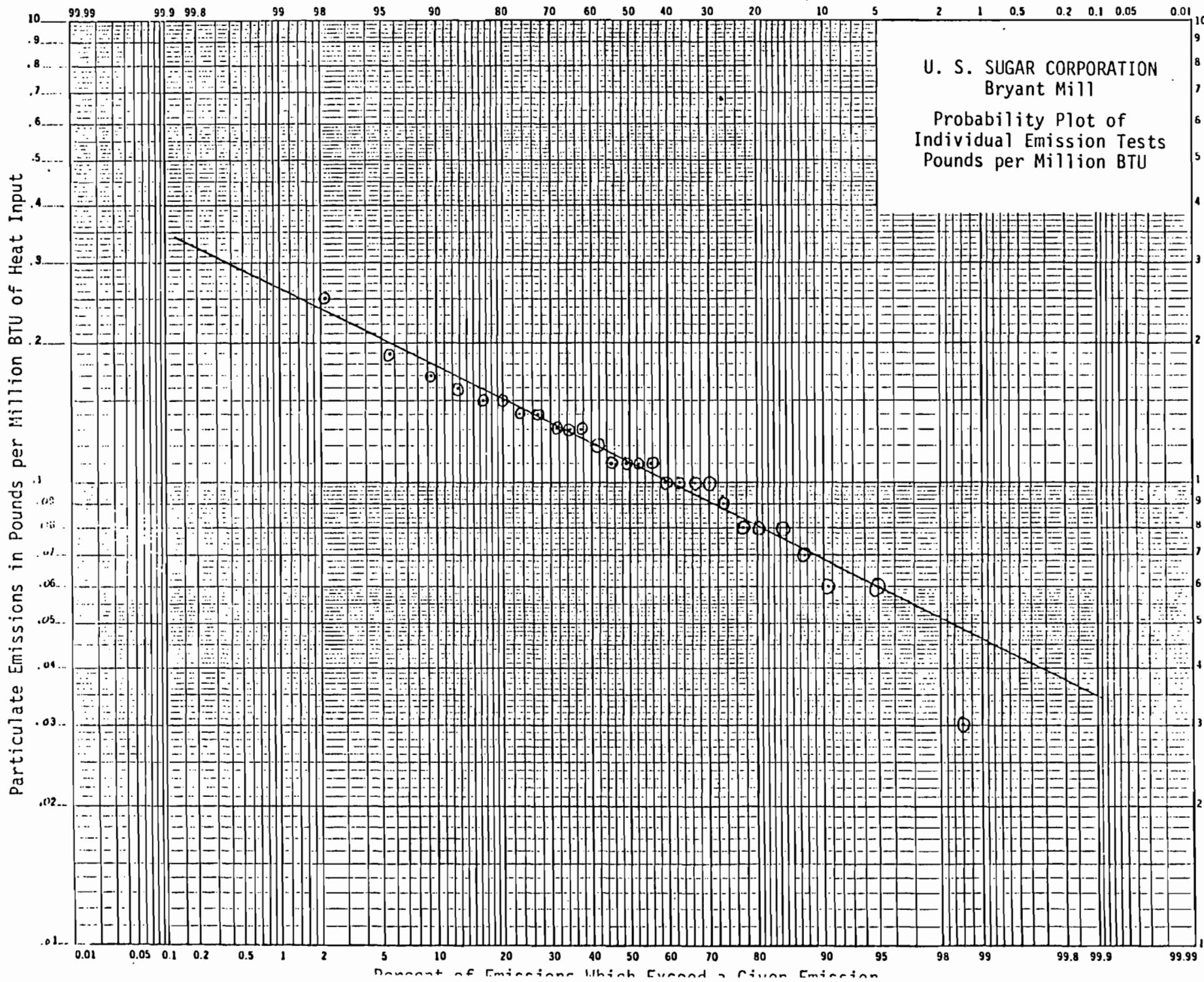
Sincerely yours,

ENVIRONMENTAL SCIENCE & ENGINEERING, INC.

  
E. R. Hendrickson, Ph.D., P.E.  
Chairman of the Board

ERH/cbh

CC: Mr Mayo  
Mr. Green



April 7, 1981

Mr. Thomas W. Davis, Engineer  
Department of Environmental Regulation  
2269 Bay Street  
Fort Myers, Florida 33901

RE: Palm Beach County - USSC  
Bryant Boiler No. 5

Dear Mr. Davis:

As you requested we are enclosing copy of Report No. 352-S, the first compliance tests performed on Bryant Boiler No. 5 for the 1980/81 Crop and which was repeated on March 6, 1981, Report No. 355-S, because it failed to meet the 0.15#/MBTU limit established for this Boiler. We have already submitted the second tests which I understand you witnessed and which did meet the emission limit.

As you know, the emission limits placed on this Boiler by DER were based on a BACT determination which concluded that BACT for this Boiler was in fact an emission control installation similar to the other existing Boilers at Bryant Mill, yet the limit was arbitrarily set at 0.15#/MBTU. This was done despite the fact that as we pointed out to your Department at the time, these existing Boilers, although capable as an average of meeting this limit, the test data for these Boilers showed that they did with certain frequency exceed the figure of 0.15#/MBTU. It is to be expected therefore, that the same thing will occur on Boiler No. 5 since both the Boiler and emission control equipment are of the same design as those of the other Boilers in this Plant and which were the basis for BACT for the new Boiler.

As you know, bagasse is a fuel that lacks uniformity in combustibility as compared with other fuels and this results in variations in emissions beyond the control of the owner/operator. This, DER failed to take into consideration despite the data presented to them at the time which showed that the limit established would on occasion be exceeded.

We did enter into a stipulation with DER on July 17, 1979, where Paragraph No. 3 specifically states that the 0.15#/MBTU limit will not prejudice U. S. Sugar's right to seek a modification of the condition at a later date if actual data supported it.

RECEIVED  
E.R.A.  
APR 13 1981

Page Two  
Mr. Thomas W. Davis  
Dept. of Environmental Regulation

Such request for modification is not being considered yet in view of the fact that only three full tests have been carried out so far on this Boiler, but if future tests indicate that we cannot with considerable consistency meet the limits as now established we expect to exercise, sometime in the future, the right to seek a modification of these limits.

Very truly yours,

UNITED STATES SUGAR CORPORATION

A. R. Mayo  
Vice President, Sugar Houses

ARM/cbb  
Enclosure

cc: Mr. Steve Smallwood, Chief  
Bureau of Air Quality Management (DER)

Ms. Mary L. Clark, Esquire, DER

Mr. William H. Green, Esquire  
(Hopping Boyd Green & Sons)  
Tallahassee, FL 32301

ATTACHMENT F

SOURCE TEST REPORT

SULFUR DIOXIDE EMISSIONS  
BOILERS 1, 2, and 4  
BAGASSE RESIDUE FUEL

Prepared for:

SUGAR CANE GROWERS COOPERATIVE  
Belle Glade, Florida

Prepared by:

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.  
Gainesville, Florida

ESE No. 81-127-100

April 1981

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## 1.0 INTRODUCTION

ESE conducted testing for sulfur dioxide (SO<sub>2</sub>) emissions from Boilers 1, 2, and 4 at the Sugar Cane Growers Cooperative in Belle Glade, Florida. These tests were conducted to demonstrate the removal efficiency for SO<sub>2</sub> between combustion and final wet scrubber emissions.

Three test runs were made at each scrubber outlet stack. Boilers 1 and 2 each have dual scrubber/outlet stacks. Boiler 4 has three wet scrubbers and outlet stacks. All outlets were sampled simultaneously using the EPA Method 6 sampling train. Velocity and moisture were measured throughout the testing periods. Steam rates were recorded so that residue feed rates could be established. Residue samples also were taken every half hour during testing and composited for sulfur analysis.

Scrubber inlet concentrations of SO<sub>2</sub> also were measured simultaneously with outlet emissions for Boiler 2.

## 2.0 SUMMARY OF RESULTS

Tables 1, 2, and 3 summarize SO<sub>2</sub> emissions from the wet scrubber outlets of Boilers 1, 2, and 4, respectively.

Table 4 summarizes the scrubber inlet tests performed on Boiler 2.

On Run 1, Boiler 1, isopropyl alcohol (ISO) was used in the first impinger. The catch in the ISO on the north and south stacks equaled 1.03 and 1.10 pounds per hour, respectively. ISO was not used during any of the subsequent sampling in order to increase accuracy of stack gas moisture determinations. SO<sub>2</sub> removal efficiencies determined in this manner are, therefore, biased in a conservative direction.

Large impingers (EPA Method 8 Type) were used in lieu of midget impingers for all runs; the sample rate was adjusted accordingly.

Complete emission data are presented in Appendix A. Field data sheets are located in Appendix B.

Table 1. Sulfur Reduction Summary, Boiler 1

| Boiler<br>Run<br>Number | Date<br>(1981) | Time<br>(Start-<br>Finish) | Flow<br>Rate<br>(SCFMD) | Stack<br>Temperature<br>(°F) | H2O<br>(%) | Steam<br>Production<br>Rate<br>(lb/hr) | Bagasse Residue |              | SO2 Emission |       | Reduct ion<br>Efficiency<br>(%) |
|-------------------------|----------------|----------------------------|-------------------------|------------------------------|------------|----------------------------------------|-----------------|--------------|--------------|-------|---------------------------------|
|                         |                |                            |                         |                              |            |                                        | S<br>(%)        | TPH<br>(dry) | ppm          | lb/hr |                                 |
| Boiler 1 South          |                |                            |                         |                              |            |                                        |                 |              |              |       |                                 |
| Run 1 S                 | 4/2            | 1124-1224                  | 20,330                  | 144.2                        | 20.8       | —                                      | —               | —            | 82.5         | 16.66 | —                               |
| Run 2 S                 | 4/2            | 1320-1420                  | 20,462                  | 144.6                        | 20.3       | —                                      | —               | —            | 102.9        | 20.91 | —                               |
| Run 3 S                 | 4/2            | 1443-1523                  | 20,200                  | 146.6                        | 21.3       | —                                      | —               | —            | 112.3        | 22.53 | —                               |
| South                   |                |                            |                         |                              |            |                                        |                 |              |              |       |                                 |
| Average                 | —              | —                          | 20,331                  | 145.1                        | 20.8       | —                                      | —               | —            | 99.2         | 20.03 | —                               |
| Boiler 1 North          |                |                            |                         |                              |            |                                        |                 |              |              |       |                                 |
| Run 1 N                 | 4/2            | 1124-1224                  | 15,742                  | 140.0                        | 19.5       | —                                      | —               | —            | 62.5         | 9.77  | —                               |
| Run 2 N                 | 4/2            | 1320-1420                  | 15,889                  | 141.0                        | 20.0       | —                                      | —               | —            | 95.1         | 15.00 | —                               |
| Run 3 N                 | 4/2            | 1443-1523                  | 19,018                  | 145.0                        | 21.8       | —                                      | —               | —            | 92.5         | 17.48 | —                               |
| North                   |                |                            |                         |                              |            |                                        |                 |              |              |       |                                 |
| Average                 | —              | —                          | 16,883                  | 142.0                        | 20.4       | —                                      | —               | —            | 83.4         | 14.08 | —                               |
| Total                   |                |                            |                         |                              |            |                                        |                 |              |              |       |                                 |
| Boiler 1                | —              | —                          | 37,214                  | 143.6                        | 20.6       | 120,000                                | 0.414           | 11.326       | 91.3         | 34.11 | 82                              |

Notes: Residue Feed Rate =  $\left( \frac{120,000 \text{ lb steam}}{\text{hr}} \right) \left( \frac{1,050 \text{ Btu/lb steam}}{0.625} \right) \div \left( \frac{8,900 \text{ Btu}}{\text{lb dry residue}} \right) \left( \frac{2,000 \text{ lb}}{\text{ton}} \right) = \frac{11.326 \text{ tons dry residue}}{\text{hr}}$

$$\text{Theoretical SO}_2 \text{ Emission} = (11.326 \text{ TPH})(2,000 \text{ lb/ton})(0.00414) \left( \frac{64.064}{32.064} \right) = 187.4 \text{ lb/hr}$$

Source: ESE, 1981.

Table 2. Sulfur Reduction Summary, Boiler 2

| Boiler<br>Run<br>Number | Date<br>(1981) | Time<br>(Start-<br>Finish) | Flow<br>Rate<br>(SCFMD) | Stack<br>Temperature<br>(°F) | H2O<br>(%) | Steam<br>Production<br>Rate<br>(lb/hr) | Bagasse Residue |              | SO2 Emission |       | Reduction<br>Efficiency<br>(%) |
|-------------------------|----------------|----------------------------|-------------------------|------------------------------|------------|----------------------------------------|-----------------|--------------|--------------|-------|--------------------------------|
|                         |                |                            |                         |                              |            |                                        | S<br>(%)        | TPH<br>(dry) | ppm          | lb/hr |                                |
| Boiler 2 South          |                |                            |                         |                              |            |                                        |                 |              |              |       |                                |
| Run 1 S                 | 4/3            | 0912-1012                  | 23,988                  | 139.8                        | 19.4       | —                                      | —               | —            | 77.3         | 18.42 | —                              |
| Run 2 S                 | 4/3            | 1040-1140                  | 22,386                  | 150.0                        | 21.2       | —                                      | —               | —            | 59.0         | 13.11 | —                              |
| Run 3 S                 | 4/3            | 1225-1325                  | 23,306                  | 150.0                        | 22.8       | —                                      | —               | —            | 80.3         | 18.59 | —                              |
| South<br>Average        | —              | —                          | 23,227                  | 146.6                        | 21.1       | —                                      | —               | —            | 72.2         | 16.71 | —                              |
| Boiler 2 North          |                |                            |                         |                              |            |                                        |                 |              |              |       |                                |
| Run 1 N                 | 4/3            | 0912-1012                  | 29,642                  | 144.6                        | 22.0       | —                                      | —               | —            | 155.6        | 45.79 | —                              |
| Run 2 N                 | 4/3            | 1040-1140                  | 30,473                  | 150.0                        | 22.3       | —                                      | —               | —            | 132.1        | 39.99 | —                              |
| Run 3 N                 | 4/3            | 1225-1325                  | 35,139                  | 150.0                        | 22.1       | —                                      | —               | —            | 136.2        | 47.54 | —                              |
| North<br>Average        | —              | —                          | 31,751                  | 148.2                        | 22.1       | —                                      | —               | —            | 141.3        | 44.44 | —                              |
| Total<br>Boiler 2       | —              | —                          | 54,978                  | 147.4                        | 21.6       | 125,000                                | 0.426           | 11.798       | 106.8        | 61.15 | 70                             |

Notes: Residue Feed Rate =  $\left( \frac{125,000 \text{ lb steam}}{\text{hr}} \right) \left( \frac{1,050 \text{ Btu/lb steam}}{0.625} \right) \div \left( \frac{8,900 \text{ Btu}}{\text{lb dry residue}} \right) \left( \frac{2,000 \text{ lb}}{\text{ton}} \right) = \frac{11.798 \text{ tons dry residue}}{\text{hr}}$

Theoretical SO<sub>2</sub> Emission = (11.798 TPH)(2,000 lb/ton)(0.00426)  $\left( \frac{64.064}{32.064} \right) = 200.8 \text{ lb/hr}$

Source: ESE, 1981.

Table 3. Sulfur Reduction Summary, Boiler 4

| Boiler<br>Run<br>Number | Date<br>(1981) | Time<br>(Start-<br>Finish) | Flow<br>Rate<br>(SCFMD) | Stack<br>Temperature<br>(°F) | H2O<br>(%) | Steam<br>Production<br>Rate<br>(lb/hr) | Bagasse Residue |              | SO2 Emission |        | Reduction<br>Efficiency<br>(%) |
|-------------------------|----------------|----------------------------|-------------------------|------------------------------|------------|----------------------------------------|-----------------|--------------|--------------|--------|--------------------------------|
|                         |                |                            |                         |                              |            |                                        | S<br>(%)        | TPH<br>(dry) | ppm          | lb/hr  |                                |
| Boiler 4 South          |                |                            |                         |                              |            |                                        |                 |              |              |        |                                |
| Run 1 S                 | 4/3            | 1645-1715                  | 26,289                  | 145.0                        | 21.2       | —                                      | —               | —            | 101.8        | 26.59  | —                              |
| Run 2 S                 | 4/4            | 0834-0934                  | 27,047                  | 146.4                        | 22.2       | —                                      | —               | —            | 148.7        | 39.93  | —                              |
| Run 3 S                 | 4/4            | 0950-1054                  | 28,309                  | 147.5                        | 21.5       | —                                      | —               | —            | 152.1        | 42.76  | —                              |
| South<br>Average        | —              | —                          | 27,215                  | 146.3                        | 21.6       | —                                      | —               | —            | 134.2        | 36.43  | —                              |
| Boiler 2 Center         |                |                            |                         |                              |            |                                        |                 |              |              |        |                                |
| Run 1 C                 | 4/3            | 1645-1715                  | 37,249                  | 150.0                        | 23.4       | —                                      | —               | —            | 100.2        | 37.05  | —                              |
| Run 2 C                 | 4/4            | 0834-0934                  | 34,937                  | 147.9                        | 24.5       | —                                      | —               | —            | 208.6        | 72.40  | —                              |
| Run 3 C                 | 4/4            | 0950-1035                  | 33,945                  | 145.0                        | 22.2       | —                                      | —               | —            | 202.2        | 68.18  | —                              |
| Center<br>Average       | —              | —                          | 35,377                  | 147.6                        | 23.4       | —                                      | —               | —            | 170.3        | 59.21  | —                              |
| Boiler 4 North          |                |                            |                         |                              |            |                                        |                 |              |              |        |                                |
| Run 1 N                 | 4/3            | 1645-1715                  | 27,002                  | 150.0                        | 23.0       | —                                      | —               | —            | 126.4        | 33.91  | —                              |
| Run 2 N                 | 4/4            | 0834-0934                  | 28,573                  | 148.1                        | 24.0       | —                                      | —               | —            | 198.4        | 56.30  | —                              |
| Run 3 N                 | 4/4            | 0950-1050                  | 30,781                  | 146.3                        | 22.9       | —                                      | —               | —            | 189.2        | 57.83  | —                              |
| North<br>Average        | —              | —                          | 28,785                  | 148.1                        | 23.3       | —                                      | —               | —            | 171.3        | 49.35  | —                              |
| Total<br>Boiler 4       | —              | —                          | 91,377                  | 147.3                        | 22.8       | 240,000                                | 0.435           | 22.652       | 158.6        | 145.00 | 63                             |

Notes: Residue Feed Rate =  $\left( \frac{240,000 \text{ lb steam}}{\text{hr}} \right) \left( \frac{1,050 \text{ Btu/lb steam}}{0.625} \right) \div \left( \frac{8,900 \text{ Btu}}{\text{lb dry residue}} \right) \left( \frac{2,000 \text{ lb}}{\text{ton}} \right) = \frac{22.652 \text{ tons dry residue}}{\text{hr}}$

Theoretical SO2 Emission = (22.652 TPH)(2,000 lb/ton)(0.00435)  $\left( \frac{64.064}{32.064} \right) = 393.75 \text{ lb/hr}$

Table 4. Sulfur Dioxide Summary, Boiler 2 Inlet

| Boiler<br>Run<br>Number | Date<br>(1981) | Time<br>(Start-<br>Finish) | Flow Rate<br>(SCFMD) | H <sub>2</sub> O<br>(Percent) | SO <sub>2</sub> |       |
|-------------------------|----------------|----------------------------|----------------------|-------------------------------|-----------------|-------|
|                         |                |                            |                      |                               | ppm             | lb/hr |
| 1                       | 4/3            | 0930-1030                  | 53,630               | 13.9                          | 155.9           | 83.04 |
| 2                       | 4/3            | 1054-1154                  | 52,859               | 13.7                          | 110.7           | 58.12 |
| 3                       | 4/3            | 1242-1322                  | 58,445               | 8.3                           | 133.0           | 77.21 |
| Average                 | --             | --                         | 54,978               | 12.0                          | 133.2           | 72.79 |

Source: ESE, 1981.

### 3.0 FIELD AND ANALYTICAL PROCEDURES

#### 3.1 FIELD SAMPLING ASSEMBLY

The sampling and analytical procedures used follow the procedures as outlined in EPA Method 6 in the Code of Federal Regulations, Chapter I, Title 40, Part 60, Appendix A, revised as of July 1, 1980, modified for Greenburg-Smith impingers. The sampling equipment consists of the following:

1. Borosilicate Glass Probe--Fitted with ground glass ball joint and heated to maintain conditions above stack dew point; a plug of glass wool inserted to act as a particulate filter.
2. Impingers--Four impingers. The first is a bubbler charged with 100 ml of 80 percent isopropanol and glass wool packed in the top. The second and third are charged with 100 ml each of 3 percent  $H_2O_2$ , and the fourth is charged with a preweighed amount of silica gel. Impingers are preweighed if a moisture determination is to be made.
3. Control Box--Module containing a vacuum gage, a thermometer capable of measuring temperature to within  $\pm 5^\circ$ , a dry gas meter with an accuracy of  $\pm 2$  percent, and valves and related equipment to regulate flow.

A schematic of the sampling train is shown in Figure 1.

Upon arrival at the plant, the control box was checked for leaks, the impingers were charged and connected in line, and the probe was attached. The sampling train was leak-checked at 15 inches mercury for leaks. Care was taken during the release of vacuum to prevent backup of the sampling reagents. Crushed ice was packed around the impingers, and the probe was placed in the stack. The stack was sampled for 20 minutes, and readings were taken every 5 minutes. A flow rate of approximately 0.5 cubic foot per minute was held for the entire sample



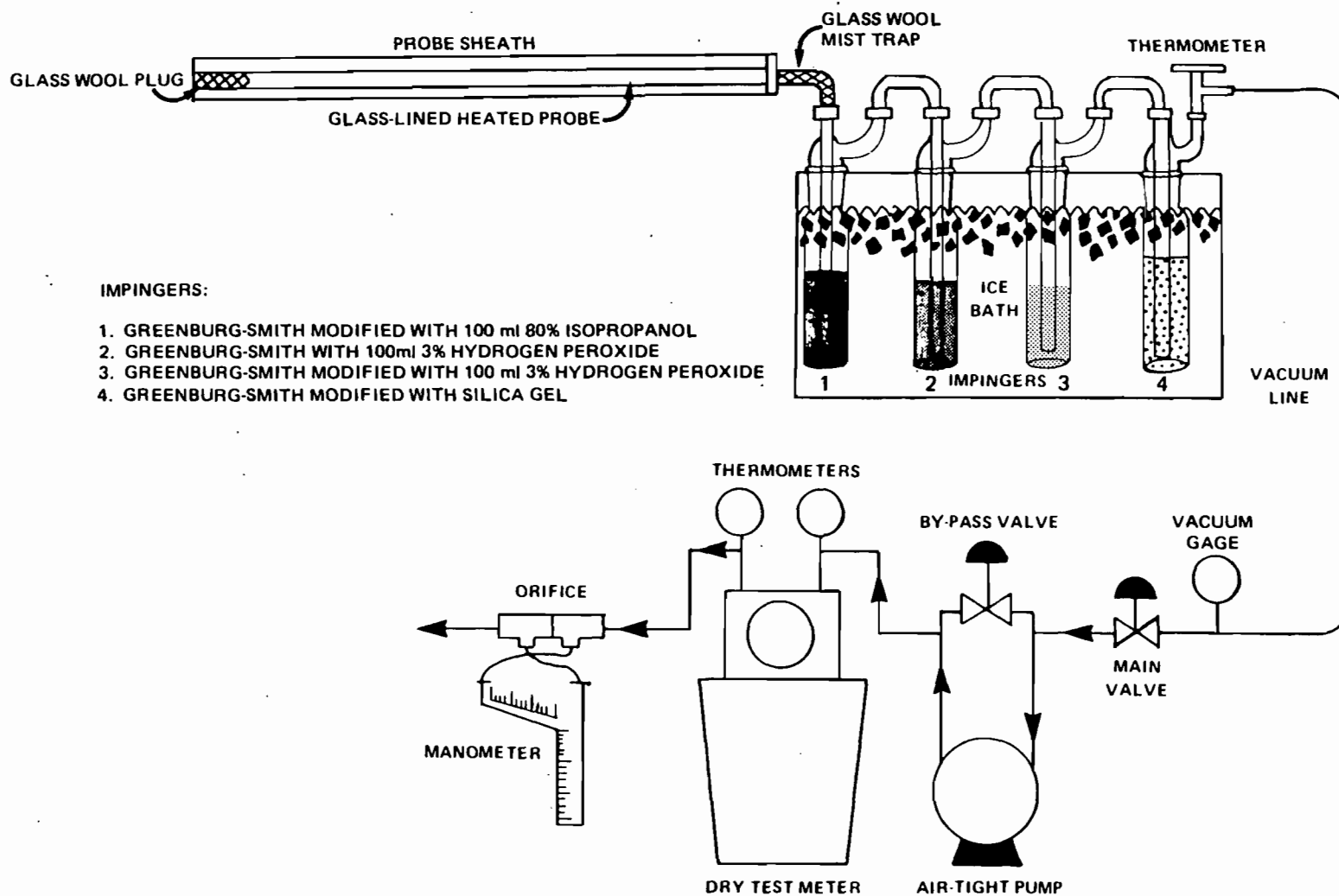


**Figure 1**  
**EPA METHOD 6 SAMPLING TRAIN**

**SUGAR CANE GROWERS  
COOPERATIVE**

SOURCE: ESE, 1981.

4/14/81

period. Upon completion of the run, a final leak check was performed at the highest vacuum encountered during testing.

### 3.2 SAMPLE RECOVERY

The probe was detached from the train, and the ice bath was drained. Clean ambient air was drawn through the impingers for 15 minutes at the same rate the sample was collected. The impinger train was weighed for moisture gain, and the isopropanol was discarded.  $H_2O_2$  and distilled water washings from the second and third impingers were collected, diluted to 300 ml, and stored in a clean sample bottle for later analysis.

### 3.3 ANALYTICAL PROCEDURES

The sample was carefully transferred to the laboratory site, and the volume was checked. A 20-ml aliquot was added to 80 ml of 100 percent isopropanol with two to four drops of thorin indicator. The solution was then titrated with 0.0100 N barium perchlorate to a pink endpoint. This was repeated until samples agreed within 1 percent or 0.2 ml.

PREVENTION OF SIGNIFICANT DETERIORATION REPORT

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## 1.0 SOURCE INFORMATION

The Sugar Cane Growers Cooperative of Florida (SCGC) operates a cane processing mill just outside Belle Glade, Florida (Figure 1). The layout and operation of this mill are described in this section. The plot plan of the sugar processing operation and the process flow are shown in Figures 2 and 3, respectively.

### 1.1 EXISTING PROCESS

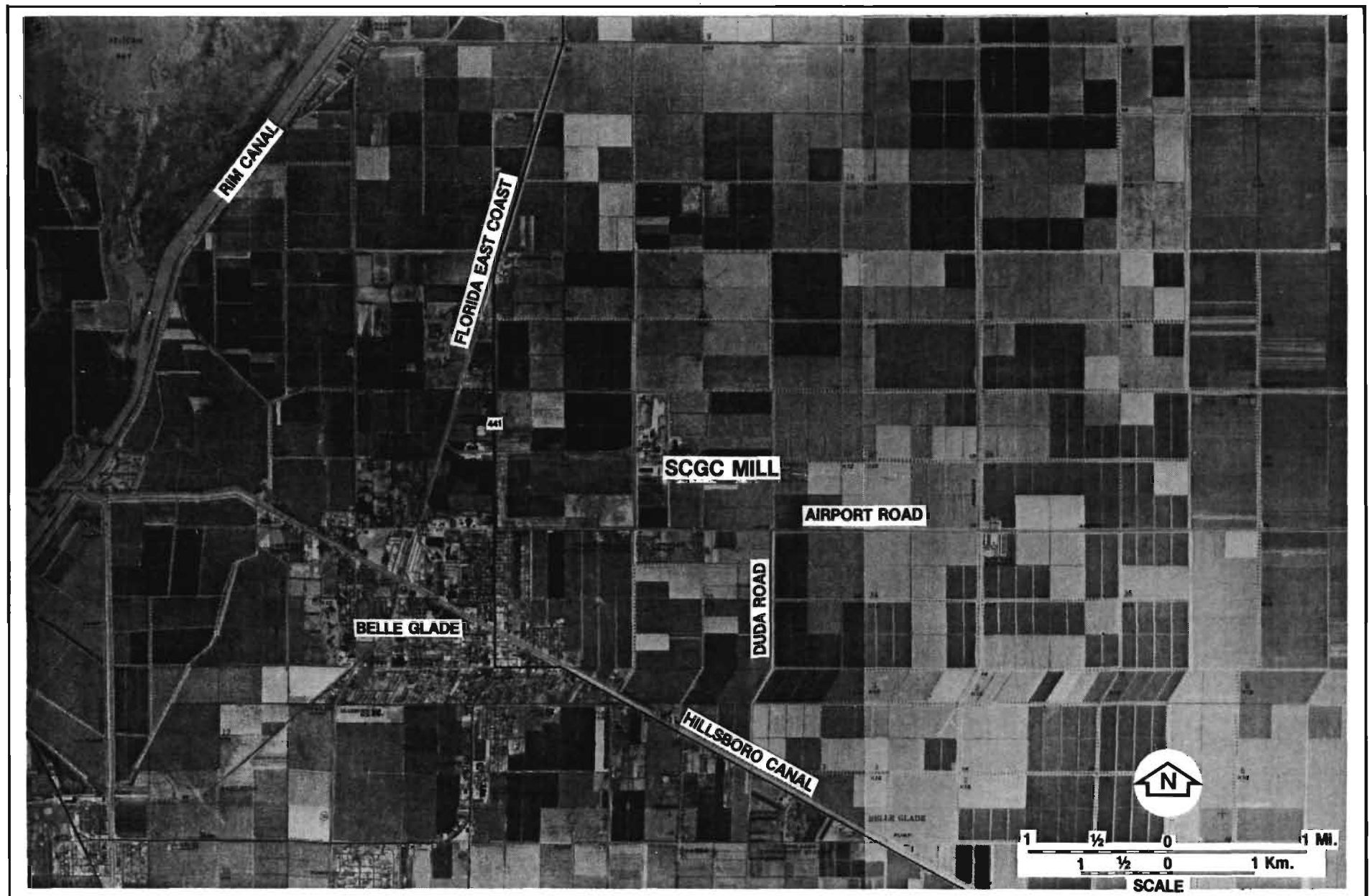
Harvested cane is crushed, and the juice is extracted. The juice is concentrated and separated into sugar crystals and molasses. Most of the bagasse (cane from which the juice has been extracted) is delivered to a neighboring furfural extraction plant. The byproduct of the furfural process is bagasse residue.

*a liquid aldehyde  $C_5H_8O_2$*

Process steam for both the mill and the furfural plant is provided by burning bagasse residue and bagasse; a small amount of oil is burned to supplement steam production and to stabilize boiler operation. The total plant steam generating capacity is 890,000 lb/hr when all boilers are operating at rated capacity.

Seven boilers are used during the crop season. Boilers 1, 2, 4, and 5 are capable of burning bagasse, residue, and oil. Boiler 3 burns bagasse and oil only. Boilers 6 and 7 are exclusively oil burning. Boilers 1 through 5 are fitted with a total of 10 impingement scrubbers, with a stack servicing each scrubber. Stack parameters are given in Section 2.2.

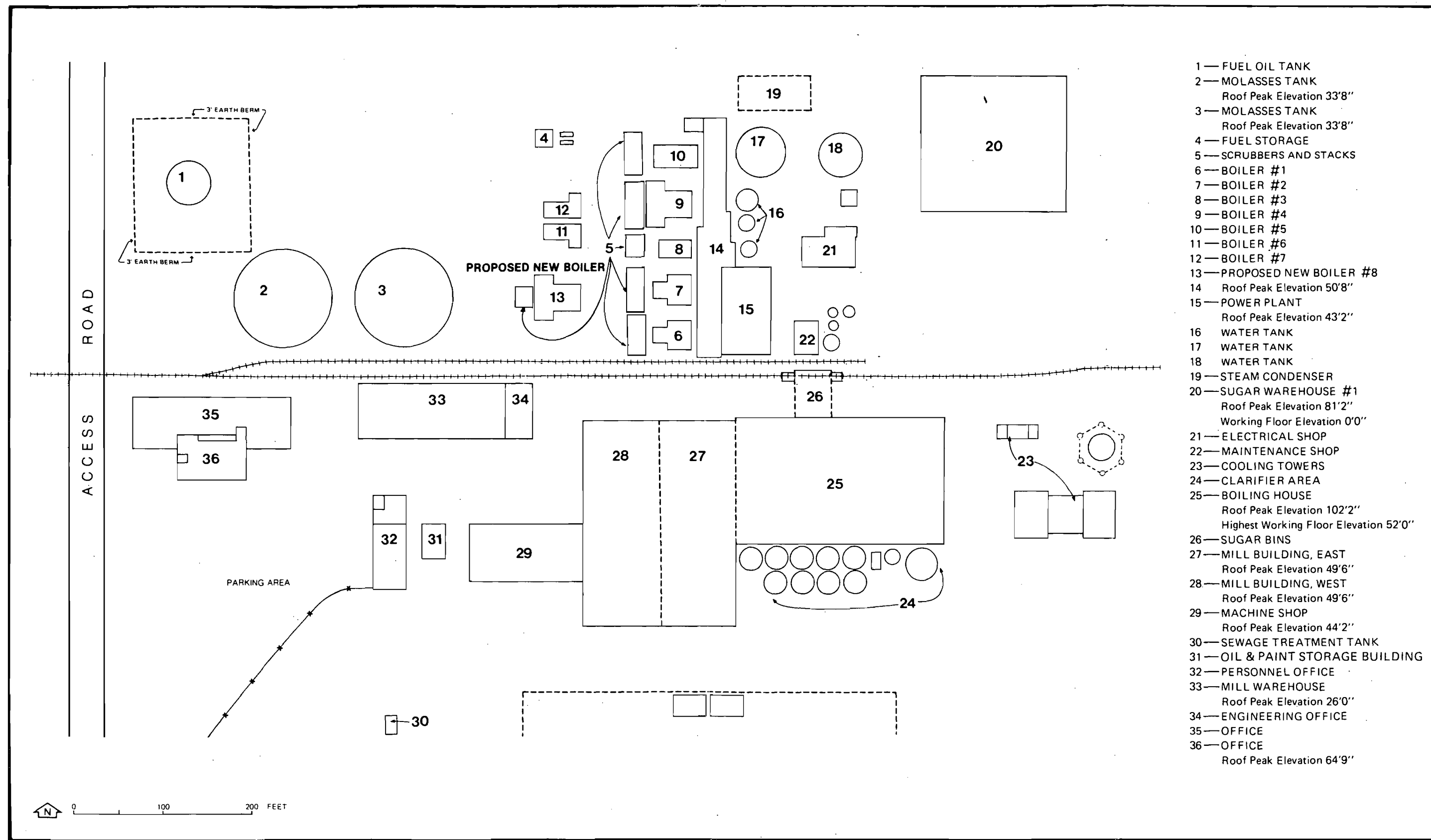
Occasionally, during the month preceding and up to 3 months following the crop season, Boilers 1, 2, 4, or 5 are operated to provide steam to the furfural operation. No bagasse is burned during this off-season operation. Steam is produced by burning bagasse residue and oil is used only for start-up and emergencies. Three or fewer boilers are in operation during this period to provide a maximum steam rate of 400,000 lb/hr.



SOURCES: U. S. GEOLOGICAL SURVEY, 1970.  
ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1981.

Figure 1. LOCATION OF SUGAR CANE GROWERS COOPERATIVE SUGAR MILL





SOURCE: SUGAR CANE GROWERS COOPERATIVE.  
ESE, 1981.

Figure 2. PLOT PLAN OF SUGAR CANE GROWERS COOPERATIVE SUGAR MILL



## 1.2 PROPOSED MODIFICATION

During the next 2 years, an increase in cane planting is expected among members of SCGC. In order to process this cane quickly enough to avoid a degradation of quality in the field, the milling capacity of SCGC Sugar Mill must be increased. To provide steam for this additional capacity, a 240,000 lb/hr, rated capacity, boiler (No. 8) will be built, as shown in Figure 2.

This boiler will have the capability of burning residue, bagasse, and oil. Particulate and sulfur dioxide (SO<sub>2</sub>) emissions will be controlled by impingement scrubbing and ducted to a single 155-foot-tall stack. Although Good Engineering Practice (GEP) stack height based on the buildings nearest the new boiler is less than 155 feet, the new stack falls within the area of influence of two buildings with 81- and 102-foot peak elevations. Thus, modeling credit for the 155-foot design stack height is allowed under draft United States Environmental Protection Agency (EPA) Good Engineering Practice Guidelines (EPA, 1978d). More detailed stack parameters are given in Section 2.2.

During the crop season, the projected maximum residue consumption is 1,500 tons per day, distributed among Boilers 1, 2, 4, 5, and 8. The remainder of the steam in Boilers 1 through 5 and 8 is produced from bagasse and the smallest practical amount of oil. Concurrently with this permit, Boilers 6 and 7, rated at 120,000 lb steam/hr, will be limited to production of 75,000 lb steam/hr. Sufficient 1-percent sulfur oil will be purchased to cover the needs of Boilers 6, 7, and 8 and will be blended with the 2.4-percent sulfur oil that supplies the needs of Boilers 1 through 5. The oil burned in all the boilers, therefore, will have a sulfur content somewhere between 1 percent and 2.4 percent. During calendar year 1980, the overall sulfur content of oil in the plant was 1.8 percent. When the additional 1-percent sulfur oil for Boiler 8 is added, the overall sulfur content of oil burned will be less than this amount; however, 1.8-percent sulfur content oil was assumed in the emissions calculations. These calculations are discussed in Section 2.2.

1-2.4 S. oil  
1.8% or  
2.4% should  
be used

Modeling indicates that improved dispersion of emissions from the existing facilities is necessary to meet ambient air quality standards if the new boiler is added. Thus, in addition to the construction of the new boiler, the following steps will be taken: (1) the three 85-foot stacks serving Boiler 4 will be ducted into a single stack 110 feet tall, (2) the exit gases from Boilers 6 and 7 (currently passing through two 40-foot stacks) will be combined into a single 40-foot stack, (3) permit conditions of the existing boilers will be reduced from 0.3 lb particulate/ $10^6$  Btu to 0.25 lb particulate/ $10^6$  Btu to reflect actual emissions, and (4) Boilers 6 and 7 will each be limited to production of 75,000 lb steam/hr. ↑ or ↓ ?

The increased buoyancy and initial plume height provided by the stack modifications reduce ground-level concentrations enough to provide a net improvement in air quality, even with the addition of Boiler 8.

## 2.0 AIR QUALITY ANALYSIS

Current actual total plant emissions of particulate matter, SO<sub>2</sub>, and nitrogen oxides (NO<sub>x</sub>) are each greater than 250 tons per year; thus, the mill is classified as a major source under both federal and state criteria (40 CFR Part 52.21 and FAC 17-2). The new boiler will increase emissions of these pollutants by an amount greater than the significant rates established by EPA and shown in Table 2-1. Therefore, the addition of Boiler 8 is classified as a major modification and is subject to federal Prevention of Significant Deterioration (PSD) review for these three pollutants. No emission factors for carbon monoxide, hydrocarbons, or non-criteria pollutants are available for bagasse or residue consumption, and emissions of these pollutants have been assumed to be below the federal significant emission rates. X

The components of the federal PSD review are:

1. Control technology review,
2. Source impact analysis,
3. Air quality analysis,
4. Source information, and
5. Additional impact analysis.

The control technology review is contained in the accompanying permit application. The remaining components are discussed in this PSD report.

7 Under current Florida Department of Environmental Regulation (DER) PSD rules, the proposed source is a major emitting facility for particulate matter, SO<sub>2</sub>, and NO<sub>x</sub>, and, therefore, requires PSD review for these pollutants [FAC 17-2.04 (6)(a)]. However, the proposed new boiler and modifications to existing stacks will not cause an increase in ground-level concentrations over the baseline for any pollutant, as is demonstrated in this report; therefore, a Best Available Control Technology (BACT) determination is not required under PSD [FAC 17-2.04 (6)(c)]. Under FAC 17-2.03 Best Available Control Technology, a determination of BACT is required if either required by FAC 17-2.04 (6)(c), or if the proposed source is a major emitting facility and does not have an applicable Emission Limiting Standard in FAC 17-2.05 or 17-2.16. The

Table 2-1. Significant Emission Rates

| Pollutant                             | Significant<br>Emission Rate<br>(Tons per year) |
|---------------------------------------|-------------------------------------------------|
| Carbon Monoxide                       | 100                                             |
| Nitrogen Dioxide                      | 40                                              |
| Total Suspended Particulates          | 25                                              |
| Sulfur Dioxide                        | 40                                              |
| Ozone (volatile<br>organic compounds) | 40                                              |
| Lead                                  | 0.6                                             |
| Mercury                               | 0.1                                             |
| Beryllium                             | 0.0004                                          |
| Asbestos                              | 0.007                                           |
| Fluorides                             | 3                                               |
| Sulfuric Acid Mist                    | 7                                               |
| Vinyl Chloride                        | 1                                               |
| Total Reduced Sulfur                  | 10                                              |
| Hydrogen Sulfide                      | 10                                              |
| Reduced Sulfur Compounds              | 10                                              |
| Inorganic Arsenic                     | 0                                               |
| Radionuclides                         | 0                                               |
| Benzene                               | 0                                               |
| Ethylene Dichloride                   | 0                                               |
| Polyvinyl Chloride                    | 0                                               |

Source: Federal Register, Vol. 45, No. 154, 1980.

applicable Emission Limiting Standard for the proposed boiler is for particulate matter only. Therefore, BACT is required for SO<sub>2</sub> and NO<sub>x</sub> only under Florida DER rules. X

The SCGC Sugar Mill is in Palm Beach County, a non-attainment area for ozone. Since volatile organic compound emissions will not exceed the PSD significant emission rate (Table 2-1) or the non-attainment emission cutoff level of 5 lb/hr and 15 tons/year potential emissions [FAC 17-2.16 (3)(a)], neither non-attainment nor PSD review applies for that pollutant. No sulfur dioxide or particulate matter non-attainment areas are within 100 kilometers (km) of the site. X

The nearest Class I area is the Everglades National Park, approximately 105 km south of the plant. Since no Class I areas are within 100 km of the plant, analysis is limited to a discussion of impacts on visibility in Section 3.0.

## 2.1 MONITORING DATA

The Clean Air Act Amendments of August 1977 require that the owner of any proposed major air pollution source conduct ambient air monitoring for applicable pollutants for a period of 1 year prior to submission of a construction permit application. The use of existing representative data may be permitted in lieu of monitoring, provided the data meet EPA PSD monitoring criteria. Assuming this application is complete before June 8, 1981, the monitoring provisions of the 1978 PSD regulations will apply. Under these regulations, monitoring was required only for criteria pollutants for which the source was major or a major modification. A major modification was defined as an increase from a new facility within the source of either 100 tons per year (28 listed source categories) or 250 tons per year. Under the old PSD definitions, the proposed modification under the old PSD definitions would be subject to ambient monitoring for SO<sub>2</sub>, particulate matter, and NO<sub>x</sub> (except that NO<sub>x</sub> emissions are only slightly above the PSD threshold and are believed to be greatly overestimated).

2.1.1 Total Suspended Particulate (TSP)

The Florida Sugar Cane League (FSCL) and Palm Beach County (PBC) maintain a network of hi-vol monitors in the sugar producing area of the state. The monitoring is conducted on a 6-day monitoring cycle using the EPA reference method (40 CFR Part 50 App. B). Figure 4 shows the location of these monitors within about 10 miles of the SCGC Sugar Mill, and four additional monitors considered appropriate for determination of a background concentration value. Table 2-2 summarizes the most recently available data from the monitors. No violations of the  $150\text{-ug/m}^3$  24-hour or  $60\text{-ug/m}^3$  annual geometric mean standards have been observed during 1980.

For each station, the concentration one (1) standard deviation above the geometric mean was calculated. For lognormally distributed data, 84 percent of the observed values are below this value. Correlation coefficients for a lognormal fit of the FSCL data are all above 0.990, indicating a very close approximation of the lognormal distribution (correlations not available for PBC stations). Stations 1, 2, 9 and PB16 are greater than 10 km from any point source and yet affected by the same meteorology as the proposed source. As such, they are considered regional monitors, and a statistical analysis of their data was performed to establish a background concentration.

Construction on Highway U.S. 27 near Station 1 began in January 1980 and clearly influenced results at that station during that year. The average 84th-percentile value among the remaining three stations was  $40\text{ ug/m}^3$ , which was taken to be an appropriate short-term background concentration. The probability of the 84th-percentile or higher concentration occurring in combination with meteorological conditions causing highest, second-highest 24-hour point source impacts is less than once in 15 years.



**SOURCES: FLORIDA SUGAR CANE LEAGUE.  
ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1981.**

### Figure 4. REGIONAL HI-VOL MONITORS

Table 2-2. Summary of 1980 Ambient TSP Monitoring Data (24-Hour Average,  $\mu\text{g}/\text{m}^3$ )

| Station* | Number of<br>Observations | Maximum | Second<br>Maximum | Arithmetic<br>Mean | Geometric<br>Mean | Geometric<br>Standard<br>Deviation | Correlation<br>Coefficient | 84th<br>Percentile† |
|----------|---------------------------|---------|-------------------|--------------------|-------------------|------------------------------------|----------------------------|---------------------|
| SL-1     | 54                        | 103     | 79                | 46                 | 42                | 1.50                               | 0.979                      | 64                  |
| SL-2     | 57                        | 78      | 68                | 30                 | 27                | 1.55                               | 0.989                      | 42**                |
| SL-4     | 60                        | 110     | 89                | 54                 | 50                | 1.42                               | 0.983                      | 72                  |
| SL-5     | 58                        | 107     | 107               | 64                 | 60                | 1.40                               | 0.978                      | 85                  |
| SL-6     | 60                        | 115     | 100               | 43                 | 39                | 1.56                               | 0.995                      | 61                  |
| SL-7     | 53                        | 102     | 83                | 45                 | 42                | 1.44                               | 0.968                      | 61                  |
| SL-9     | 56                        | 49      | 44                | 24                 | 23                | 1.45                               | 0.992                      | 32**                |
| SL-13    | 57                        | 106     | 92                | 36                 | 32                | 1.66                               | 0.969                      | 53                  |
| SL-14    | 60                        | 102     | 100               | 40                 | 35                | 1.65                               | 0.993                      | 58                  |
| SL-15    | 51                        | 105     | 90                | 47                 | 43                | 1.51                               | 0.990                      | 65                  |
| PB-16    | 60                        | 68      | 67                | 34                 | 32                | 1.44                               | --††                       | 46**                |
| PB-19    | 61                        | 110     | 96                | 59                 | 57                | 1.34                               | --††                       | 76                  |

\* SL = Sugar League Data

PB = Palm Beach County Data

† C.84 = M Sg (1-0.5 in Sg)

C.84 = 84th percentile concentration

M = arithmetic mean

Sg = geometric standard deviation (Larson, 1971).

\*\* Background station.

†† Not available from annual report.

Source: ESE, 1981.

### 2.1.2 Sulfur Dioxide (SO<sub>2</sub>)

Continuous SO<sub>2</sub> monitoring was conducted with a Beckman 906A analyzer in combination with selective scrubbers. During 1976 and the first three quarters of 1977, the monitor was located in downtown Belle Glade. The highest 1-hour reading during this period was 257 ug/m<sup>3</sup>.

In November of 1977, the monitor was moved to the IFAS Agricultural Research and Education center outside Belle Glade. The data recorded at that location are summarized in Table 2-3. The highest values recorded were 210 ug/m<sup>3</sup> (3-hour), 115 ug/m<sup>3</sup> (24-hour), and 18 ug/m<sup>3</sup> (annual). Monitoring for sulfur dioxide was discontinued in June 1979 because of consistently low readings during the previous 4 years.

The Palm Beach County Health Department operated a continuous SO<sub>2</sub> monitor at the Belle Glade Water Treatment Plant until May 1978. The highest 3-hour and 24-hour averages recorded in 1977 were 76 ug/m<sup>3</sup> and 42 ug/m<sup>3</sup>, respectively. The highest 3-hour and 24-hour averages recorded in 1978 before the monitor was discontinued were 113 ug/m<sup>3</sup> and 50 ug/m<sup>3</sup>, respectively.

A background concentration of 20 ug/m<sup>3</sup> was assumed for modeling purposes (EPA, 1978a).

## 2.2 AIR QUALITY IMPACTS

### 2.2.1 Emissions Inventory

The area within 50 km of SCGC Sugar Mill was inventoried for point sources of particulate and sulfur dioxide emissions. The basis for this inventory was the 1980 Air Permit Inventory System (APIS). Construction permits submitted during 1981 were also accounted for and the maximum allowable emission rates were used.

Table 2-3. Summary of Sulfur Dioxide Monitoring Data, 1978 to 1979,  
Florida Sugar Cane League

| Year | Quarter      | Number of<br>Observations | Highest<br>3-Hour<br>(ug/m <sup>3</sup> ) | Highest<br>24-Hour<br>(ug/m <sup>3</sup> ) | Arithmetic<br>Average<br>(ug/m <sup>3</sup> ) |
|------|--------------|---------------------------|-------------------------------------------|--------------------------------------------|-----------------------------------------------|
| 1978 | 1            | --                        | 210                                       | 115                                        | 34                                            |
|      | 2            | --                        | 47                                        | 24                                         | 8                                             |
|      | 3            | 1,788                     | 123                                       | 55                                         | 26                                            |
|      | 4            | 1,762                     | 52                                        | 31                                         | 13                                            |
|      | Annual       | --                        | --                                        | --                                         | 18                                            |
| 1979 | 1            | 1,900                     | 52                                        | 26                                         | 9                                             |
|      | 2            | 1,893                     | 66                                        | 45                                         | 5                                             |
|      | Year to date | --                        | --                                        | --                                         | 8                                             |

Note: Monitor is located at the IFAS Agricultural Research and  
Educational Center outside the city of Belle Glade.

Source: Florida Sugar Cane League.

The inventory includes all the mills and both refineries in Palm Beach and Hendry Counties, two point sources in Belle Glade, and Florida Power & Light Riviera and Lake Worth Utilities generating stations.

#### 2.2.2 Dispersion Models and Meteorology

Both short-term (3- and 24-hour) and long-term (crop-season) impacts were predicted with the Industrial Source Complex model, an EPA approved gaussian dispersion model, using rural dispersion characteristics.

Five years (1970 to 1974) of historical surface meteorological data recorded at West Palm Beach Airport were input to the model. Upper atmosphere observations were recorded at Miami for the same time period. Only data for the period from 15 October through 15 March were modeled to reflect the seasonal operation of the plant. Plant emissions during the off season will be less than half the maximum emissions. Experience with West Palm meteorological data indicates that worst-case meteorology during the off season produces impacts no more than 20 percent above those projected for the crop season, with equal emissions. The impacts of the off-season reduced loads will not exceed those modeled for full load during the crop season.

#### 2.2.3 Air Quality Impact

Initial modeling with 5 years of meteorological data was performed for emissions from SCGC Sugar Mill only. The critical meteorology and approximate location of highest, second-highest concentrations were determined with a radial receptor grid covering 36 directions every 200 meters from the plant center. The impact determination was refined with a 1-km square grid of receptors at 100-meter intervals. All surrounding sources were included in this refined analysis.

The stack parameters used for modeling are shown in Table 2-4. Calculation of flow rates and pollutant emission rates are found in

Table 2-4. Summary of Stack Parameters

| Boiler        | Rated Steam Capacity (lb/hr) | Number of Stacks | Stack Height (ft) | Temperature of Exit Gas (°F) | Stack Diameter (ft) | Particulate Worst Case |        | SO2 Worst Case       |        |
|---------------|------------------------------|------------------|-------------------|------------------------------|---------------------|------------------------|--------|----------------------|--------|
|               |                              |                  |                   |                              |                     | 10 <sup>3</sup> ACFM   | lb/hr* | 10 <sup>3</sup> ACFM | lb/hr* |
| 1             | 120                          | 2                | 80                | 160                          | 4.5                 | 38.6                   | 27     | 37.2                 | 48     |
| 2             | 120                          | 2                | 80                | 160                          | 4.5                 | 38.6                   | 27     | 37.2                 | 48     |
| 3             | 100                          | 1                | 80                | 160                          | 5.3                 | 64.3                   | 45     | 67.4                 | 35     |
| 4 as is       | 240                          | 3                | 85                | 160                          | 5.3                 | 51.4                   | 29     | 49.7                 | 64     |
| 4 w/mod       | 240                          | 1                | 110               | 160                          | 9.2                 | 154.3                  | 86     | 149.0                | 192    |
| 5             | 160                          | 2                | 80                | 160                          | 4.5                 | 51.5                   | 36     | 49.5                 | 64     |
| 6 as is       | 120†                         | 1                | 40                | 630                          | 5.0                 | 42.9                   | 9.8    | 42.9                 | 203    |
| 7 as is       | 120†                         | 1                | 40                | 630                          | 5.0                 | 42.9                   | 9.8    | 42.9                 | 203    |
| 6 and 7 w/mod | 75 each                      | 1                | 40                | 630                          | 7.1                 | 85.8                   | 19.6   | 85.8                 | 406    |
| 8             | 240**                        | 1                | 155               | 160                          | 10.0                | 169.8                  | 95.0   | 164.0                | 211    |

\* See Appendix A, Table A-3: as-is emissions based on 0.25 actual for Boilers 1, 2, 3, and 5; 0.2 allowable for Boilers 4 and 8.

† Emissions calculated at actual maximum of 75,000 lb/hr.

\*\* Emissions calculated with 10-percent peak factor.

Source: ESE, 1981.

Appendices A and B. Worst-case impacts for TSP and SO<sub>2</sub> occur under different operating conditions.

Worst-case particulate impact occurs when burning 100-percent bagasse or residue in Boilers 1 through 5 and 8. Even though the emission rate while burning bagasse could be potentially greater than while burning bagasse residue, the buoyant flux of the exit gases is greater. This potential difference is due to variations in moisture content, heating value, combustion efficiency, and required excess air. Since the differences in emissions and buoyant flux would be offsetting, the average value of the two fuels was used.

Worst-case SO<sub>2</sub> impacts occur when the maximum amounts of residue and oil are burned. Total process operation limits available residue to 1,500 tons per day. This amount of residue is divided among Boilers 1, 2, 4, 5, and 8 in a ratio approximately proportional to their rated steam capacity. The remaining required steam is generated from 900 tons/day of bagasse and some oil. When bagasse residue supplies are limited, the steam demand is met by additional bagasse, if available.

Sulfur dioxide modeling was based on maximum plant-wide residue usage of 1,500 tons per day. Projected average daily oil consumption for Boilers 1 through 5 and 8 (5,800 gal/day) and maximum oil consumption for Boilers 6 and 7 (33,300 gal/day) were also assumed. This fuel mix is detailed in Table A-3 in Appendix A. This projected total oil consumption of 39,100 gal/day is 61 percent greater than the actual average daily consumption of 24,250 gal/day during the crop season in 1980. Although oil consumption during any hour may be several times the average rate when bagasse and residue are not available, this occurs only when the plant milling rate is substantially below capacity. Under these conditions, the corresponding steam demand is also reduced and the boilers are operating at a fraction of their rated capacity. Thus, plant-wide SO<sub>2</sub> emissions will never operationally exceed the 14 tons per day projected for the fuel mix described previously.

Above-average oil consumption in Boiler 8 may increase its individual SO<sub>2</sub> emissions above the 211 lb/hr used as model input. This condition would only occur simultaneously with a reduction in SO<sub>2</sub> emissions from the other boilers. Since a greater proportion of emissions would be passing through a taller stack, the ground-level impacts under this condition would not increase over that modeled for the average conditions.

The results of this analysis are given in Table 2-5. The sum of the projected highest, second-highest impacts and background concentrations are 149 ug/m<sup>3</sup> 24-hour TSP, 249 ug/m<sup>3</sup> 24-hour SO<sub>2</sub>, and 492 ug/m<sup>3</sup> 3-hour SO<sub>2</sub>. These values are below the corresponding Ambient Air Quality Standards (AAQS) of 150 ug/m<sup>3</sup>, 260 ug/m<sup>3</sup>, and 1,300 ug/m<sup>3</sup>, respectively (Table 2-6).

The possibility of interaction with surrounding sources to produce higher concentrations was investigated. The critical meteorology in the directions aligning the nearest sources was determined. Concentrations along this radial with the selected meteorological conditions were determined. Table 2-7 gives the results of this investigation. It is seen that no source interactions occur which produce concentrations more than 2 ug/m<sup>3</sup> higher than those due to SCGC alone. No concentrations above AAQS standards are projected.

The projected average concentrations due to SCGC Sugar Mill emissions after plant modification over the 184-day modeling period were 13 ug/m<sup>3</sup> TSP and 25 ug/m<sup>3</sup> SO<sub>2</sub>; during the rest of the year the plant is operating at less than half capacity or is totally inoperative. Thus, the actual annual average will be some fraction of these 184-day averages. The 184-day averages determined in the same way for the existing plant are 16 ug/m<sup>3</sup> TSP and 40 ug/m<sup>3</sup> SO<sub>2</sub> (Table 2-5). Since no violations of the annual standards were detected in 1980 at any monitoring site and the proposed construction will result in a net air



Table 2-5. Highest, Second-Highest Ground-Level Concentrations  
(ug/m<sup>3</sup>)--Proposed SCGC Sugar Mill Expansion.

|                                         | TSP                        |         | 3-hr                       | SO <sub>2</sub>             |         |
|-----------------------------------------|----------------------------|---------|----------------------------|-----------------------------|---------|
|                                         | 24-hr                      | 184-day |                            | 24-hr                       | 184-day |
| Existing Plant<br>+ background          | 134*<br>+ 40<br><u>174</u> | 16      | 733<br>+ 20<br><u>753</u>  | 357<br>+ 20<br><u>377</u>   | 40      |
| Proposed Modifica-<br>tion + background | 109*<br>+ 40<br><u>149</u> | 13      | 472†<br>+ 20<br><u>492</u> | 229**<br>+ 20<br><u>249</u> | 25      |
| New Source                              | 6.9                        | --      | 51                         | 16                          | --      |

\* Day 65/1973, Direction 290°, Distance 1,000 m

† Day 329/1973 Period 5, Direction 320°, Distance 800 m

\*\* Day 319/1971, Direction 260°, Distance 1,000 m

Source: ESE, 1981.

Table 2-6. National and State of Florida Ambient Air Quality Standards

| Pollutant                    | Averaging Time                      | National              |                         | Florida                 |
|------------------------------|-------------------------------------|-----------------------|-------------------------|-------------------------|
|                              |                                     | Primary Standard      | Secondary Standard      |                         |
| Suspended Particulate Matter | Annual Geometric Mean               | 75 ug/m <sup>3</sup>  | 60 ug/m <sup>3</sup>    | 60 ug/m <sup>3</sup>    |
|                              | 24-Hour Maximum*                    | 260 ug/m <sup>3</sup> | 150 ug/m <sup>3</sup>   | 150 ug/m <sup>3</sup>   |
| Sulfur Dioxide               | Annual Arithmetic Mean              | 80 ug/m <sup>3</sup>  | NA†                     | 60 ug/m <sup>3</sup>    |
|                              | 24-Hour Maximum*                    | 365 ug/m <sup>3</sup> | NA†                     | 260 ug/m <sup>3</sup>   |
|                              | 3-Hour Maximum*                     | NA†                   | 1,300 ug/m <sup>3</sup> | 1,300 ug/m <sup>3</sup> |
| Carbon Monoxide              | 8-Hour Maximum*                     | 10 mg/m <sup>3</sup>  | 10 mg/m <sup>3</sup>    | 10 mg/m <sup>3</sup>    |
|                              | 1-Hour Maximum*                     | 40 mg/m <sup>3</sup>  | 40 mg/m <sup>3</sup>    | 40 mg/m <sup>3</sup>    |
| Hydrocarbons                 | 3-Hour Maximum*<br>(6 to 9 A.M.)    | 160 ug/m <sup>3</sup> | 160 ug/m <sup>3</sup>   | 160 ug/m <sup>3</sup>   |
| Nitrogen Dioxide             | Annual Arithmetic Mean              | 100 ug/m <sup>3</sup> | 100 ug/m <sup>3</sup>   | 100 ug/m <sup>3</sup>   |
| Ozone                        | 1-Hour Maximum*                     | 235 ug/m <sup>3</sup> | 235 ug/m <sup>3</sup>   | 160 ug/m <sup>3</sup>   |
| Lead                         | Calendar Quarter<br>Arithmetic Mean | 1.5 ug/m <sup>3</sup> | 1.5 ug/m <sup>3</sup>   | NA†                     |

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

† No standard exists.

Sources: 40 CFR Part 50, 1980.  
FAC Chapter 17-2.

4/23/81

Table 2-7. Highest, Second-Highest 24-Hour Ground-Level Concentrations ( $\mu\text{g}/\text{m}^3$ ) In Directions of Interaction with Nearby Sources

| Interacting Source    | Direction | Day/Year | Impact of SCGC*<br>Mill Only | Impact with<br>Interacting Sources* |
|-----------------------|-----------|----------|------------------------------|-------------------------------------|
| <u>Sulfur Dioxide</u> |           |          |                              |                                     |
| FPL-Riviera           | 80°       | 89/74    | 101                          | 101                                 |
| <u>TSP</u>            |           |          |                              |                                     |
| U.S. Sugar, Bryant    | 190°      | 76/71    | 75                           | 76                                  |
| Osceola               | 210-220°  | 295/73   | 134                          | 135                                 |
| Atlantic              | 290°      | 65/73    | 147                          | 149                                 |
| Talisman              | 360°      | 330/72   | 98                           | 99                                  |
| Gulf & Western        | 40°       | 34/72    | 82                           | 83                                  |
| U.S. Sugar, Clewiston | 100°      | 361/72   | 91                           | 92                                  |

\* Includes background of  $40 \mu\text{g}/\text{m}^3$  TSP and  $20 \mu\text{g}/\text{m}^3$   $\text{SO}_2$ .

Source: ESE, 1981.

quality improvement, no rigorous, long-term analysis was performed with the area-wide inventory.

This discussion demonstrates that construction of the new boiler, in conjunction with the plant modifications described, will not cause or contribute to violations of any federal or State of Florida Ambient Air Quality Standard.

### 2.3 INCREMENT CONSUMPTION

Both federal and state PSD regulations require a demonstration that a proposed source will not cause or contribute to increases in ambient concentrations of TSP or SO<sub>2</sub> greater than a specified amount over a baseline concentration. Since 1974, the baseline year established by Florida DER, the only modification at the SCGC mill has been the installation of scrubbers on Boilers 1 through 5; the only construction affecting either state or federal increment consumption from this mill has resulted in a net decrease in emissions. Table 2-5 and the appended computer printouts in Appendix C show that the proposed project would result in an improvement in air quality at all points over that predicted for the present plant configuration with actual emission rates. This means that regardless of increment consuming activity by any surrounding source, the net impact of this project on any increment standard would be negative. Thus, no formal baseline was established and no explicit increment consumption analysis was performed.

### 3.0 ADDITIONAL IMPACTS ANALYSIS

#### 3.1 IMPACTS ON SOILS AND VEGETATION

Impacts on soils and vegetation due to operation of the proposed sources are expected to be minor. The projected highest, second-highest 3-hour  $\text{SO}_2$  concentration of  $492 \text{ ug/m}^3$  and crop-season average concentration of  $25 \text{ ug/m}^3$  (see Table 2-5) are below levels generally reported as damaging to most plant species. As an example of such damage levels, European studies have found one-half-hour levels of  $3,406 \text{ ug/m}^3$  and long-term means of  $393 \text{ ug/m}^3$  to approximate threshold levels for several species (Heck and Brandt, 1977). Alfalfa, which is commonly thought to be one of the most  $\text{SO}_2$ -sensitive species, has a 2-hour threshold level of at least  $2,620 \text{ ug/m}^3$  and an 8-hour threshold of  $655 \text{ ug/m}^3$  (Heck and Brandt, 1977). No data are available on the sensitivity of sugar cane to  $\text{SO}_2$  concentrations. No evidence of damage to the cane surrounding the SCGC mill has been observed to date. The proposed modification will result in reduced concentration impacts on surrounding vegetation. No discernible impacts are predicted from this source.

Particulate matter is generally considered to have a relatively unimportant effect on vegetation (Jacobson and Hill, 1970). The particulate matter generated by this source is largely ash from the burning of the same vegetation which would be impacted. Emitted particulate will be mostly suspended and will deposit on vegetation primarily through plume impaction.

Plant species classified as "sensitive" to  $\text{NO}_2$ , such as pinto bean, cucumber, lettuce, and tomato, displayed injury when exposed to  $\text{NO}_2$  levels of  $3,760$  to  $4,960 \text{ ug/m}^3$  for a 2-hour period. Extremely resistant species, such as heath, were unaffected by an exposure of  $1,900,000 \text{ ug/m}^3$  for 1 hour. Blue grass, orange tree plants, and rye are all classified as "intermediate" in resistance to  $\text{NO}_2$  injury. It has been found that  $\text{NO}_x$  concentration is more important to plant injury than the duration of exposure (Jacobson, et al., 1970). Because of the low levels of  $\text{NO}_2$  predicted to result from the proposed

modification (less than  $10 \text{ ug/m}^3$ , estimated annual average), no effect on plants or soils is expected.

Effects of  $\text{SO}_2$ ,  $\text{NO}_2$ , and particulate matter emissions on soils are expected to be negligible. Acid rain effects in the area are generally unknown, due to a lack of data for the region (Florida Sulfur Oxides Study, Inc., 1978). The potential for long-range pollutant transport or significant acid rain effects from the proposed source is considered to be very low.

### 3.2 VISIBILITY IMPACTS

A Level I visibility screening analysis (EPA, 1980) was conducted which confirmed that no visibility impairment should occur in the Class I area. The absolute values of the three Level I contrast parameters (C1--plume contrast against the sky; C2--plume contrast against terrain; and C3--change in the sky/terrain contrast caused by primary and secondary aerosol) are well below 0.10. Thus, it is highly unlikely that the emissions source would cause adverse visibility impairment in Class I areas.

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Appendix A  
Emissions Calculations



Table A-1. Derivation of Process Input Weight and Maximum Sulfur Dioxide Emissions (Uncontrolled)

|                                                                                                                                                                                                                                                                                                            |                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <u>Bagasse</u>                                                                                                                                                                                                                                                                                             | 8,380 lb steam/ton dry bagasse  |
| $1,050 \frac{\text{Btu}}{\text{lb steam}} \times \frac{1}{0.55} \times \frac{1 \text{ lb dry bagasse}}{8,000 \text{ Btu}} \times \frac{0.001 \text{ lb S}}{\text{lb bagasse}} \times \frac{2 \text{ lb SO}_2}{1 \text{ lb S}}$ $= 4.8 \times 10^{-4} \frac{\text{lb SO}_2}{\text{lb steam from bagasse}}$  |                                 |
| <u>Residue</u>                                                                                                                                                                                                                                                                                             | 10,600 lb steam/ton dry residue |
| $1,050 \frac{\text{Btu}}{\text{lb steam}} \times \frac{1}{0.625} \times \frac{1 \text{ lb dry residue}}{8,900 \text{ Btu}} \times \frac{0.004 \text{ lb S}}{\text{lb residue}} \times \frac{2 \text{ lb SO}_2}{1 \text{ lb S}}$ $= 1.5 \times 10^{-3} \frac{\text{lb SO}_2}{\text{lb steam from residue}}$ |                                 |
| <u>2.4% Sulfur Oil</u>                                                                                                                                                                                                                                                                                     | 108 lb steam/gallon oil         |
| $1,050 \frac{\text{Btu}}{\text{lb steam}} \times \frac{1}{0.8} \times \frac{1 \text{ lb}}{17,500 \text{ Btu}} \times \frac{0.024 \text{ lb S}}{\text{lb oil}} \times \frac{2 \text{ lb SO}_2}{1 \text{ lb S}}$ $= 3.6 \times 10^{-3} \frac{\text{lb SO}_2}{\text{lb steam from 2.4-\% S oil}}$             |                                 |
| <u>1% Sulfur Oil</u>                                                                                                                                                                                                                                                                                       | 108 lb steam/gallon oil         |
| $1.5 \times 10^{-3} \frac{\text{lb SO}_2}{\text{lb steam from 1-\% S oil}}$                                                                                                                                                                                                                                |                                 |

Source: ESE, 1981.

Table A-2. Emissions per 1,000 lb Steam

| For Every<br>1,000 lb Steam<br>Generated From: | Particulate @<br>0.2 lb/10 <sup>6</sup> Btu<br>(lb) | Particulate @<br>0.25 lb/10 <sup>6</sup> Btu<br>(lb) | SO <sub>2</sub><br>(lb) | Ft <sup>3</sup> Exit Gas<br>Saturated<br>at 160°F |
|------------------------------------------------|-----------------------------------------------------|------------------------------------------------------|-------------------------|---------------------------------------------------|
| Bagasse                                        | 0.38                                                | 0.48                                                 | 0.29*                   | 40,800                                            |
| Residue                                        | 0.34                                                | 0.42                                                 | 0.9*                    | 36,400                                            |
| Oil (2.4%)                                     | 0.13†                                               | 0.13†                                                | 3.6                     | 25,920**                                          |
| Oil (1.8%)                                     | 0.13†                                               | 0.13†                                                | 2.7                     | 25,920**                                          |
| Oil (1.0%)                                     | 0.13†                                               | 0.13†                                                | 1.5                     | 25,920**                                          |

\* Including 40-percent SO<sub>2</sub> loss.

† Oil at 0.1 lb/10<sup>6</sup> Btu.

\*\* For scrubber exit conditions (for Boilers 6 and 7, unscrubbed, this would be 34,328).

Source: ESE, 1981.

Table A-3. Maximum Pollutant Emissions from Individual Boilers

| Boiler          | Rated Capacity<br>(1000 lb steam) | Worst-Case Particulate (no oil<br>burned in combination boilers) |                                 |                                             | Worst-Case Sulfur Dioxide       |                             |                         |                                  |                                             |
|-----------------|-----------------------------------|------------------------------------------------------------------|---------------------------------|---------------------------------------------|---------------------------------|-----------------------------|-------------------------|----------------------------------|---------------------------------------------|
|                 |                                   | lb Particulate/hr*                                               |                                 |                                             | Fuel Rate (per hour), Dry Basis |                             |                         |                                  |                                             |
|                 |                                   | g/s                                                              | 0.02 lb/<br>10 <sup>6</sup> Btu | 10 <sup>3</sup> ACFM<br>(m <sup>3</sup> /s) |                                 |                             |                         |                                  |                                             |
|                 |                                   | 0.25 lb/<br>10 <sup>6</sup> Btu                                  |                                 |                                             | Residue (ton)<br>(lb steam)     | Bagasse (ton)<br>(lb steam) | Oil (gal)<br>(lb steam) | lb SO <sub>2</sub> /hr†<br>(g/s) | 10 <sup>3</sup> ACFM<br>(m <sup>3</sup> /s) |
| 1               | 120                               | 54<br>(6.8)                                                      | —                               | 77.2<br>(36.4)                              | 8.3<br>(88,000)                 | 3.5<br>(28,900)             | 29<br>(3,100)           | 96<br>(12.1)                     | 74.4<br>(35.1)                              |
| 2               | 120                               | 54<br>(6.8)                                                      | —                               | 77.2<br>(36.4)                              | 8.3<br>(88,000)                 | 3.5<br>(28,900)             | 29<br>(3,100)           | 96<br>(12.1)                     | 74.4<br>(35.1)                              |
| 3               | 100                               | 45<br>(5.7)                                                      | —                               | 64.3<br>(30.4)                              | —                               | 11.6<br>(97,400)            | 24<br>(2,600)           | 35<br>(4.4)                      | 67.4<br>(31.3)                              |
| 4               | 240                               | —                                                                | 86.4<br>(10.9)                  | 154.3<br>(72.8)                             | 16.6<br>(176,000)               | 6.9<br>(57,700)             | 58<br>(6,300)           | 192<br>(24.2)                    | 149<br>(70.2)                               |
| 5               | 160                               | 72<br>(9.1)                                                      | —                               | 103.0<br>(48.6)                             | 11.1<br>(117,700)               | 4.6<br>(38,100)             | 39<br>(4,200)           | 128<br>(16.2)                    | 99<br>(46.8)                                |
| 6 & 7           | 2(75)                             | —                                                                | 2 x (9.8)**<br>2 x (1.2)        | 2x(42.9)<br>2x(20.3)                        | —                               | —                           | 2x(694)<br>2x(75,000)   | 2x(203)<br>2x(25.5)              | 2x(42.9)<br>2x(20.3)                        |
| 8 (New)         | 264††                             | —                                                                | 95.0<br>(12.0)                  | 169.8<br>(80.2)                             | 18.3<br>(194,000)               | 7.5<br>(63,100)             | 64<br>(6,900)           | 211<br>(26.7)                    | 164<br>(77.2)                               |
| Total Fuel Rate |                                   |                                                                  |                                 |                                             | 1,500 tons/day                  | 900 tons/day                | 39,100 gpd              |                                  |                                             |

\* Average of bagasse and residue values (except #3).

† Including 40-percent SO<sub>2</sub> loss for residue and bagasse only.\*\* Oil at 0.1 lb/10<sup>6</sup> Btu.

†† Rated capacity plus 10-percent peak factor.

Note: Oil mix in 1980: 1,465,577 gal 2.4%  
 1,126,463 gal 1.0%  
 2,592,040 gal 1.8%

Source: ESE, 1981.

Note: Using average oil consumption in latest permit renewals for Boilers 1 through 5.  
 Boilers 6 and 7 at maximum rated capacity.  
 All boilers with 1.8% sulfur. Assume 61.5 tons/hour (1,500 tons/day) dry residue apportioned over Boilers 1, 2, 4, 5, and New. Remainder is bagasse.

Appendix B  
Combustion and Flow Calculations

Table B-1. Exit Gas Calculation

|            | Mole Dry Gas<br>Per 100 lb Wet Fuel | + 0.48 mol (160°F)<br>Per Mol Dry Air | = Lb Mol Gas Leaving<br>Scrubber @ 160°F<br>per 100 lb Wet Fuel |
|------------|-------------------------------------|---------------------------------------|-----------------------------------------------------------------|
| Bagasse    | 11.6                                | 5.57                                  | 17.2                                                            |
| Residue    | 17.4                                | 8.35                                  | 25.8                                                            |
| Oil        | 52.2                                | 25.06                                 | 77.3                                                            |
| Nos. 6 & 7 | 58.2                                | 0                                     | 58.2                                                            |

$$R = 1545.3 \text{ ft}^2 \text{ lbf}/^\circ\text{R-lb mole}$$

$$@ 160^\circ\text{F} = 620^\circ\text{R} \quad 14.7 \text{ psi} = 2116.8 \text{ lbf}/\text{ft}^2$$

$$V = \frac{n RT}{P}$$

$$\text{ft}^3 = N \text{ lb mole} \frac{1545.3 \text{ ft}^2 \text{ lbf} \times 620^\circ\text{R}}{2116.8 \text{ lbf}/\text{ft}^2}$$

$$V = 452.6 n \text{ ft}^3$$

$$\text{Bagasse} \quad 7,785 \text{ ft}^3/100 \text{ lb wet fuel}$$

$$\text{Residue} \quad 11,677 \text{ ft}^3/100 \text{ lb wet fuel}$$

$$\text{Oil} \quad 34,986 \text{ ft}^3/100 \text{ lb fuel (when passing through scrubber)}$$

$$\text{Oil} \quad 26,341 \times \frac{1091}{620} = 46,343 \text{ ft}^3/100 \text{ lb fuel}$$

(Nos. 6 & 7,  
no scrubber)

Source: ESE, 1981.

Table B-2. Oil No. 6, 2.4 Percent, Combustion Calculation

| Ultimate Analysis<br>lb/100 lb Fuel |      |       | Moles per<br>100 lb Fuel |                             | Required for Combustion<br>Moles/100 lb<br>Fuel at 100 Percent |              |              |
|-------------------------------------|------|-------|--------------------------|-----------------------------|----------------------------------------------------------------|--------------|--------------|
|                                     |      |       |                          |                             | O <sub>2</sub>                                                 | Dry Air      |              |
| C                                   | 85.6 | .12   | =                        | 7.13 x 1.0/4.76             | =                                                              | 7.13         | 33.94        |
| H <sub>2</sub>                      | 9.7  | .2.02 | =                        | 4.80 x 0.5/2.38             | =                                                              | 2.40         | 11.42        |
| O <sub>2</sub>                      | 2.0  | .30   | =                        | 0.07      --                |                                                                |              |              |
| N <sub>2</sub>                      |      |       |                          | --                          |                                                                |              |              |
| S                                   | 2.4  | .32   | =                        | 0.08 x 1.0/4.76             | =                                                              | 0.08         | 0.38         |
| H <sub>2</sub> O                    | 0.2  | .18   |                          | 0.01      --                |                                                                |              |              |
| Ash                                 | 0.1  |       |                          |                             |                                                                |              |              |
|                                     |      |       |                          | <u>12.09</u>                |                                                                | <u>9.61</u>  | <u>45.74</u> |
|                                     |      |       |                          | Less O <sub>2</sub> in fuel |                                                                | <u>-0.04</u> | <u>-0.17</u> |
|                                     |      |       |                          | 0.035 x 4.76 = 0.17         |                                                                | <u>9.57</u>  | <u>45.57</u> |

$$\frac{248,500 \text{ lb air}^\dagger}{15,688 \text{ lb oil}} = \frac{1,584 \text{ lb air/100 lb fuel}}{54.6 \text{ mole/100 lb fuel}}$$

|                   | O <sub>2</sub> | Air              |
|-------------------|----------------|------------------|
| 54.6 --->         | 11.5           | 54.6             |
| xs Air            | --             | 9.03 (19.8% xs)* |
| xs O <sub>2</sub> | 1.9            | --               |

$$\text{Moles H}_2\text{O in air } (54.6 \times 29 \times 0.013) \cdot 18 = 1.14$$

Products of Combustion

|                  |      |                   |                                                  |
|------------------|------|-------------------|--------------------------------------------------|
| CO <sub>2</sub>  | 7.13 | x 1               | 7.13                                             |
| H <sub>2</sub> O | 4.80 | x 1 + 0.01 + 1.14 | 5.95                                             |
| SO <sub>2</sub>  | 0.08 | x 1               | 0.08                                             |
| N <sub>2</sub>   | 54.6 | x 0.79            | 43.13                                            |
| O <sub>2</sub>   | xs   |                   | <u>1.9</u>                                       |
|                  |      |                   | 58.19 ---> 52.24 dry moles<br>per 100 lb<br>fuel |

Saturated air at 160°: 0.3 lb H<sub>2</sub>O/lb air  
0.48 lb mole H<sub>2</sub>O/lb mole air

\* Approximately.  
† Plant records

Sources: ESE, 1981.  
SCGC, 1981.

Table B-3. Bagasse, Combustion Calculation

| Ultimate Analysis                                  |      |       | Moles per       |                 | Required for Combustion |             |              |
|----------------------------------------------------|------|-------|-----------------|-----------------|-------------------------|-------------|--------------|
| lb/100 lb Fuel                                     |      |       | 100 lb Wet Fuel |                 | Moles/100 lb            |             |              |
|                                                    |      |       |                 |                 | Fuel at 100 Percent     |             |              |
|                                                    |      |       |                 |                 | O <sub>2</sub>          | Dry Air     |              |
| C                                                  | 21.8 | .12   | =               | 1.82 x 1.0/4.76 | =                       | 1.82        | 8.66         |
| H <sub>2</sub>                                     | 2.8  | .2.02 | =               | 1.39 x 0.5/2.38 | =                       | 0.70        | 3.31         |
| O <sub>2</sub>                                     | 20.4 | .32   | =               | 0.64      --    | =                       | 0           |              |
| N <sub>2</sub>                                     | 0.1  | .28   | =               | 0.0      --     | =                       | 0           |              |
| S                                                  | 0.1  | .32   | =               | 0.0 x 1.0/4.76  | =                       | 0           |              |
| H <sub>2</sub> O                                   | 54.5 | .18   | =               | 3.03      --    |                         |             |              |
| Ash                                                | 0.3  |       |                 |                 |                         |             |              |
| <u>100.0</u>                                       |      |       |                 | <u>6.88</u>     |                         | <u>2.52</u> | <u>11.97</u> |
| Less O <sub>2</sub> in fuel                        |      |       |                 |                 |                         | -0.64       | -3.05        |
| 0.64 x 4.76 = 3.05 mol air/0.19 mol O <sub>2</sub> |      |       |                 |                 |                         | <u>1.88</u> | <u>8.95</u>  |

$$\frac{368,500 \text{ lb air}^\dagger}{108,545 \text{ lb bagasse}} = \frac{3.39 \text{ lb air/lb bagasse (29 lb mol/lb air)}}{11.69 \text{ lb mol air/100 lb wet fuel}}$$

|                                 |  | Required for Combustion<br>Moles/100 lb Fuel |                 |
|---------------------------------|--|----------------------------------------------|-----------------|
|                                 |  | O <sub>2</sub>                               | Air             |
| 339 lb air                      |  | 2.45                                         | 11.69 (31% xs)* |
| xs Air = 11.69 - 8.95           |  | --                                           | 2.74            |
| xs O <sub>2</sub> = 2.45 - 1.88 |  | 0.57                                         | --              |

$$\text{Moles H}_2\text{O in air (11.69 x 29 x 0 x 0.013) . 18} = 0.24$$

| Products of Combustion |       |                   | Moles/100 lb<br>Wet Fuel                                      |
|------------------------|-------|-------------------|---------------------------------------------------------------|
| CO <sub>2</sub>        | 1.82  | x 1               | 1.82                                                          |
| H <sub>2</sub> O       | 1.39  | x 1 + 3.03 + 0.24 | 4.66                                                          |
| SO <sub>2</sub>        | 0.0   |                   | 0.0                                                           |
| N <sub>2</sub>         | 11.69 | x 0.79            | 9.24                                                          |
| O <sub>2</sub>         | xs    |                   | 0.57                                                          |
|                        |       |                   | <u>16.29</u> ---> 11.63 mol dry<br>gas per 100 lb<br>wet fuel |

$$\text{Moles H}_2\text{O in saturated air at 160°F} = 0.48 \text{ mol/mol air} \\ (0.3 \text{ lb/lb air})$$

\* Approximately.

† Plant records.

Sources: ESE, 1981.  
SCGC, 1981.

Table B-4. Residue, Combustion Calculation

| Ultimate Analysis<br>lb/100 lb Fuel |       |       | Moles per<br>100 lb Wet Fuel |                                                     | Required for Combustion<br>Moles/100 lb<br>Fuel at 100 Percent<br>O <sub>2</sub> Dry Air |             |
|-------------------------------------|-------|-------|------------------------------|-----------------------------------------------------|------------------------------------------------------------------------------------------|-------------|
| C                                   | 32.1  | .12   | =                            | 2.68 x 1.0/4.76                                     | =                                                                                        | 2.68 12.76  |
| H <sub>2</sub>                      | 3.4   | .2.02 | =                            | 1.68 x 0.5/2.38                                     | =                                                                                        | 0.84 4.00   |
| O <sub>2</sub>                      | 22.9  | .32   | =                            | 0.72 --                                             |                                                                                          |             |
| N <sub>2</sub>                      | 0.2   | .28   | =                            | 0.01 --                                             |                                                                                          |             |
| S                                   | 0.3   | .32   | =                            | 0.01 x 1.0/4.76                                     | =                                                                                        | 0.01 0.05   |
| H <sub>2</sub> O                    | 39.5  | .18   | =                            | 2.19 --                                             |                                                                                          |             |
| Ash                                 | 1.6   |       |                              |                                                     |                                                                                          |             |
|                                     | 100.0 |       |                              | 7.29                                                |                                                                                          | 3.53 16.81  |
|                                     |       |       |                              | Less O <sub>2</sub> in fuel<br>(0.72) x 4.76 = 3.43 |                                                                                          | -0.72 -3.43 |

$$\frac{332,000 \text{ lb air}^\dagger}{65,242 \text{ lb residue}} = \frac{509 \text{ lb air/100 lb wet fuel}}{17.55 \text{ mol air/100 lb wet fuel}}$$

|                   | O <sub>2</sub> | Air             |
|-------------------|----------------|-----------------|
| 17.55 mol ---->   | 3.68           | 17.55 (31% xs)* |
| xs Air            | --             | 4.17            |
| xs O <sub>2</sub> | 0.87           | --              |

$$\text{Moles H}_2\text{O in air (17.55 x 29 x 0 x 0.013) . 18} = 0.37$$

| Products of Combustion |       |                   | Moles/100 lb<br>Wet Fuel                              |
|------------------------|-------|-------------------|-------------------------------------------------------|
| CO <sub>2</sub>        | 2.68  | x 1               | 2.68                                                  |
| H <sub>2</sub> O       | 1.68  | x 1 + 2.19 + 0.37 | 4.24                                                  |
| SO <sub>2</sub>        | 0.01  | x 1               | 0.01                                                  |
| N <sub>2</sub>         | 17.55 | x 0.79            | 13.86                                                 |
| O <sub>2</sub>         | xs    |                   | 0.87                                                  |
|                        |       |                   | 21.66 ----> 17.42 dry moles<br>per 100 lb wet<br>fuel |

Saturated air at 160°F: 0.3 lb H<sub>2</sub>O/lb air  
0.48 lb mole H<sub>2</sub>O/lb mole air

\* Approximately.  
† Plant records.

Sources: ESE, 1981.  
SCGC, 1981.



APPENDIX C  
COMPUTER MODEL PRINTOUTS

Sulfur Dioxide

\*\*\* SCGC 2150 -- 502

\*\*\*

CALCULATE (CONCENTRATION=1,DEPOSITION=2)  
 RECEIPIF GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)  
 DISCRETE RECEIPIF SYSTEM (RECTANGULAR=1,POLAR=2)  
 TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)  
 CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)  
 LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)

ISW(1) = 1  
 ISW(2) = 4  
 ISW(3) = 1  
 ISW(4) = 0  
 ISW(5) = 0  
 ISW(6) = 1

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)  
 WITH THE FOLLOWING TIME PERIODS:

HOURLY (YES=1,NO=0)  
 2-HOUR (YES=1,NO=0)  
 3-HOUR (YES=1,NO=0)  
 4-HOUR (YES=1,NO=0)  
 6-HOUR (YES=1,NO=0)  
 8-HOUR (YES=1,NO=0)  
 12-HOUR (YES=1,NO=0)  
 24-HOUR (YES=1,NO=0)

ISW(7) = 0  
 ISW(8) = 0  
 ISW(9) = 1  
 ISW(10) = 0  
 ISW(11) = 0  
 ISW(12) = 0  
 ISW(13) = 0  
 ISW(14) = 1  
 ISW(15) = 1

PRINT \*H\*-DAY TABLE(S) (YES=1,NO=0)

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE  
 SPECIFIED BY ISW(7) THROUGH ISW(14):

DAILY TABLES (YES=1,NO=0)

HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)

MAXIMUM 50 TABLES (YES=1,NO=0)

METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)

RURAL-URBAN OPTION (RURAL=0,URBAN MODE 1=1,URBAN MODE 2=2)

WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)

VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)

SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)

PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)

PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)

ISW(16) = 0  
 ISW(17) = 1  
 ISW(18) = 1  
 ISW(19) = 1  
 ISW(20) = 0  
 ISW(21) = 1  
 ISW(22) = 1  
 ISW(23) = 0  
 ISW(24) = 1  
 ISW(25) = 1

NUMBER OF INPUT SOURCES

NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)

TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)

NUMBER OF X (ANGLE) GRID VALUES

NUMBER OF Y (THETA) GRID VALUES

NUMBER OF DISCRETE RECEIPIFS

SOURCE EMISSION RATE UNITS CONVERSION FACTOR

ENTRAINMENT COEFFICIENT FOR UNSTABLE ATMOSPHERE

ENTRAINMENT COEFFICIENT FOR STABLE ATMOSPHERE

HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED ZR = 7.00 METERS

LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA

DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION DECAY = 0.000000E+00

SURFACE STATION NO.

YEAR OF SURFACE DATA

UPPER AIR STATION NO.

YEAR OF UPPER AIR DATA

ALLOCATED DATA STORAGE

REQUIRED DATA STORAGE FOR THIS PROBLEM RUN

NSOURC = 8  
 NGROUP = 2  
 IPERD = 0  
 NXPNTS = 5  
 NYPNTS = 36  
 NXWYPT = 0  
 TK = .10000E+07  
 BETA1 = 0.600  
 BETA2 = 0.600  
 IMET = 9  
 ISS = 12844  
 ISY = 70  
 IUS = 12839  
 IUY = 70  
 LIMIT = 43500 WORDS  
 MINIT = 6825 WORDS



\*\*\* SCGC 2150 -- S02

\*\*\*

\*\*\* VERTICAL POTENTIAL TEMPERATURE GRADIENTS \*\*\*  
(DEGREES KELVIN PER METER)

| STABILITY<br>CATEGORY | 1          | 2          | 3          | 4          | 5          | 6          |
|-----------------------|------------|------------|------------|------------|------------|------------|
| A                     | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| B                     | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| C                     | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| D                     | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| E                     | .20000E-01 | .20000E-01 | .20000E-01 | .20000E-01 | .20000E-01 | .20000E-01 |
| F                     | .35000E-01 | .35000E-01 | .35000E-01 | .35000E-01 | .35000E-01 | .35000E-01 |

\*\*\* RANGES OF POLAR GRID SYSTEM \*\*\*  
(METERS)

600., 800., 1000., 1200., 1400.,

\*\*\* RADIAL ANGLES OF POLAR GRID SYSTEM \*\*\*

(DEGREES)

10., 20., 30., 40., 50., 60., 70., 80., 90., 100.,  
110., 120., 130., 140., 150., 160., 170., 180., 190., 200.,  
210., 220., 230., 240., 250., 260., 270., 280., 290., 300.,  
310., 320., 330., 340., 350., 360.,

\*\*\* SCGC 2150 -- S02

\*\*\*

SOURCE # 1---BOILERS #1 & #2 -- 2 STACKS EACH  
 SOURCE # 2---BOILER #3 -- 1 STACK  
 SOURCE # 3---BOILER #4 -- 1 STACK  
 SOURCE # 4---BOILER #5 -- 2 STACKS  
 SOURCE # 5---NEW BOILER, #8  
 SOURCE # 6---BOILERS #6 & #7 -- BOTH INTO ONE STACK  
 SOURCE # 7---BOILER #4 -- AS IS, 3 STACKS  
 SOURCE # 8---BOILERS #6 & #7 -- AS IS, 1 STACK EACH

\*\*\* SOURCE DATA \*\*\*

|        |     | EMISSION        |           | RATE         |          | TEMP.     |        | EXIT VEL. |          | BLDG.                       |        |        |        |
|--------|-----|-----------------|-----------|--------------|----------|-----------|--------|-----------|----------|-----------------------------|--------|--------|--------|
|        |     | TYPE=0,1        |           | TYPE=2       |          | TYPE=0    |        | TYPE=0    |          |                             |        |        |        |
|        |     | (G/S)           |           | (G/S)        |          | (DEG.K)   |        | (M/S)     |          |                             |        |        |        |
|        |     | Y A NUMBER      |           | BASE         |          | VERT.DIM. |        | HORZ.DIM. |          | DIAM. HEIGHT LENGTH WIDTH   |        |        |        |
|        |     | PART.           |           | ELEV. HEIGHT |          | TYPE=1    |        | TYPE=1,2  |          | TYPE=0 TYPE=0 TYPE=0 TYPE=0 |        |        |        |
|        |     | CATS. *PER M**2 |           | (M) (M)      |          | (M) (M)   |        | (M) (M)   |          | (M) (M) (M) (M)             |        |        |        |
| SOURCE | P K | NUMBER          | TYPE=2    | X            | Y        | ELEV.     | HEIGHT | TYPE=1    | TYPE=1,2 | TYPE=0                      | TYPE=0 | TYPE=0 | TYPE=0 |
| NUMBER | E F | CATS.           | *PER M**2 | (M)          | (M)      | (M)       | (M)    | (M)       | (M)      | (M)                         | (M)    | (M)    | (M)    |
| 1      | 0 0 | 0               | 24.200    | 0.           | 31. 0.0  | 24.40     | 344.0  | 11.40     | 1.40     | 0.00                        | 0.00   | 0.00   | 0.00   |
| 2      | 0 0 | 0               | 4.400     | 0.           | 0. 0.0   | 24.40     | 344.0  | 15.60     | 1.60     | 0.00                        | 0.00   | 0.00   | 0.00   |
| 3      | 0 0 | 0               | 24.200    | 0.           | -16. 0.0 | 33.50     | 344.0  | 11.20     | 2.82     | 0.00                        | 0.00   | 0.00   | 0.00   |
| 4      | 0 0 | 0               | 16.200    | 0.           | -30. 0.0 | 24.40     | 344.0  | 15.20     | 1.40     | 0.00                        | 0.00   | 0.00   | 0.00   |
| 5      | 0 0 | 0               | 26.700    | -33.         | -16. 0.0 | 47.20     | 344.0  | 10.60     | 3.05     | 0.00                        | 0.00   | 0.00   | 0.00   |
| 6      | 0 0 | 0               | 51.000    | -33.         | 10. 0.0  | 12.20     | 606.0  | 22.40     | 1.52     | 0.00                        | 0.00   | 0.00   | 0.00   |
| 7      | 0 0 | 0               | 24.200    | 0.           | -16. 0.0 | 25.90     | 344.0  | 11.20     | 1.63     | 0.00                        | 0.00   | 0.00   | 0.00   |
| 8      | 0 0 | 0               | 51.000    | -33.         | 10. 0.0  | 12.20     | 606.0  | 11.20     | 1.52     | 0.00                        | 0.00   | 0.00   | 0.00   |

\*N\*-DAY  
 183 DAYS  
 SGROUP# 1  
 YEAR 1970  
 \*\*\* SCGC 2150 -- SC2

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, -6,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 17.6 AND OCCURRED AT ( 1000.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | 400.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |      |      |      |      |      |
|---------|------|------|------|------|------|
| 360.0 / | 4.1  | 5.2  | 5.7  | 5.7  | 5.6  |
| 350.0 / | 4.8  | 5.9  | 6.1  | 5.9  | 5.7  |
| 340.0 / | 8.3  | 10.1 | 10.7 | 10.3 | 9.9  |
| 330.0 / | 7.6  | 8.8  | 9.0  | 8.5  | 8.1  |
| 320.0 / | 10.2 | 12.0 | 12.4 | 11.8 | 11.1 |
| 310.0 / | 9.8  | 11.6 | 12.0 | 11.6 | 11.0 |
| 300.0 / | 9.5  | 11.0 | 11.3 | 10.8 | 10.2 |
| 290.0 / | 9.3  | 11.0 | 11.3 | 10.9 | 10.2 |
| 280.0 / | 9.1  | 10.1 | 10.2 | 9.7  | 9.0  |
| 270.0 / | 13.6 | 15.9 | 16.4 | 15.7 | 14.7 |
| 260.0 / | 14.7 | 17.2 | 17.6 | 16.7 | 15.6 |
| 250.0 / | 12.7 | 15.5 | 16.3 | 15.8 | 15.0 |
| 240.0 / | 8.3  | 9.5  | 9.7  | 9.2  | 8.5  |
| 230.0 / | 8.0  | 9.1  | 9.2  | 8.6  | 7.9  |
| 220.0 / | 6.2  | 6.9  | 6.8  | 6.4  | 5.9  |
| 210.0 / | 4.4  | 4.8  | 4.7  | 4.4  | 4.0  |
| 200.0 / | 3.7  | 4.1  | 4.1  | 3.9  | 3.6  |
| 190.0 / | 4.0  | 4.7  | 4.8  | 4.6  | 4.3  |
| 180.0 / | 5.2  | 6.2  | 6.3  | 6.0  | 5.7  |
| 170.0 / | 7.1  | 8.2  | 8.3  | 7.8  | 7.3  |
| 160.0 / | 9.5  | 11.0 | 11.3 | 10.8 | 10.3 |
| 150.0 / | 10.0 | 11.8 | 12.3 | 11.9 | 11.4 |
| 140.0 / | 12.9 | 15.5 | 16.3 | 15.9 | 15.3 |
| 130.0 / | 13.6 | 16.1 | 16.7 | 16.1 | 15.3 |
| 120.0 / | 11.9 | 12.8 | 13.2 | 12.6 | 12.0 |
| 110.0 / | 9.5  | 11.3 | 11.7 | 11.3 | 10.7 |
| 100.0 / | 5.3  | 6.8  | 7.0  | 6.7  | 6.4  |
| 90.0 /  | 4.2  | 5.3  | 5.7  | 5.7  | 5.7  |
| 80.0 /  | 3.5  | 4.1  | 4.2  | 4.1  | 4.0  |
| 70.0 /  | 4.2  | 5.1  | 5.4  | 5.4  | 5.2  |
| 60.0 /  | 5.7  | 6.8  | 7.0  | 6.8  | 6.5  |
| 50.0 /  | 5.4  | 6.1  | 6.3  | 6.0  | 5.7  |
| 40.0 /  | 4.1  | 4.7  | 4.7  | 4.5  | 4.3  |
| 30.0 /  | 3.1  | 3.5  | 3.5  | 3.3  | 3.1  |
| 20.0 /  | 2.9  | 3.5  | 3.7  | 3.6  | 3.4  |
| 10.0 /  | 3.1  | 3.7  | 3.8  | 3.6  | 3.4  |

\*N\*-DAY  
 183 DAYS  
 SGROUP# 1  
 YEAR 1971  
 \*\*\* SCGC 2150 -- S02

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, -6,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 25.3 AND OCCURRED AT ( 1000.0, / 260.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
| 360.0 /                    | 3.0   | 3.7   | 4.1    | 4.1    | 4.0    |
| 350.0 /                    | 4.9   | 6.1   | 6.5    | 6.3    | 6.1    |
| 340.0 /                    | 7.1   | 8.6   | 9.2    | 9.0    | 8.6    |
| 330.0 /                    | 9.4   | 11.1  | 11.6   | 11.3   | 10.8   |
| 320.0 /                    | 11.7  | 14.2  | 15.0   | 14.6   | 13.9   |
| 310.0 /                    | 11.4  | 13.8  | 14.6   | 14.2   | 13.6   |
| 300.0 /                    | 9.6   | 11.0  | 11.1   | 10.6   | 9.9    |
| 290.0 /                    | 10.5  | 12.1  | 12.4   | 11.9   | 11.2   |
| 280.0 /                    | 12.8  | 14.6  | 14.8   | 14.1   | 13.3   |
| 270.0 /                    | 16.6  | 19.1  | 19.5   | 18.6   | 17.5   |
| 260.0 /                    | 21.0  | 24.6  | 25.3   | 24.1   | 22.5   |
| 250.0 /                    | 19.5  | 22.6  | 23.2   | 22.0   | 20.4   |
| 240.0 /                    | 14.9  | 17.3  | 17.7   | 16.8   | 15.6   |
| 230.0 /                    | 9.4   | 10.7  | 10.8   | 10.2   | 9.5    |
| 220.0 /                    | 6.6   | 7.4   | 7.4    | 7.0    | 6.4    |
| 210.0 /                    | 4.3   | 4.9   | 5.0    | 4.7    | 4.4    |
| 200.0 /                    | 3.4   | 3.8   | 3.9    | 3.6    | 3.4    |
| 190.0 /                    | 3.8   | 4.3   | 4.3    | 4.1    | 3.8    |
| 180.0 /                    | 4.5   | 5.3   | 5.5    | 5.3    | 5.1    |
| 170.0 /                    | 4.8   | 5.6   | 5.9    | 5.7    | 5.4    |
| 160.0 /                    | 4.5   | 5.2   | 5.4    | 5.3    | 5.1    |
| 150.0 /                    | 5.1   | 6.1   | 6.6    | 6.6    | 6.4    |
| 140.0 /                    | 8.1   | 10.1  | 11.0   | 11.0   | 10.8   |
| 130.0 /                    | 9.2   | 11.3  | 12.1   | 12.0   | 11.8   |
| 120.0 /                    | 7.8   | 9.2   | 9.6    | 9.3    | 9.0    |
| 110.0 /                    | 5.8   | 6.9   | 7.2    | 7.0    | 6.8    |
| 100.0 /                    | 3.9   | 4.4   | 4.4    | 4.3    | 4.1    |
| 90.0 /                     | 3.5   | 4.2   | 4.5    | 4.4    | 4.3    |
| 80.0 /                     | 3.5   | 4.0   | 4.1    | 4.0    | 3.8    |
| 70.0 /                     | 4.1   | 4.6   | 4.5    | 4.2    | 3.9    |
| 60.0 /                     | 3.8   | 4.3   | 4.3    | 4.2    | 4.0    |
| 50.0 /                     | 3.6   | 4.2   | 4.4    | 4.3    | 4.2    |
| 40.0 /                     | 2.6   | 3.1   | 3.2    | 3.1    | 3.0    |
| 30.0 /                     | 2.7   | 3.2   | 3.3    | 3.2    | 3.0    |
| 20.0 /                     | 2.3   | 3.0   | 3.2    | 3.1    | 3.0    |
| 10.0 /                     | 2.1   | 2.6   | 2.8    | 2.7    | 2.6    |



\*N\*-DAY  
 184 DAYS  
 SGROUP# 1  
 YEAR 1972  
 \*\*\* SCGC 2150 -- S02

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\* 184-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, -6,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 20.6 AND OCCURRED AT ( 1000.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |       |        |        |        |
|----------------------------|----------------|-------|--------|--------|--------|
|                            | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0 |
| 360.0 /                    | 6.1            | 7.5   | 8.1    | 7.9    | 7.7    |
| 350.0 /                    | 6.0            | 7.1   | 7.4    | 7.1    | 6.8    |
| 340.0 /                    | 7.8            | 9.2   | 9.5    | 9.2    | 8.7    |
| 330.0 /                    | 9.1            | 10.6  | 11.0   | 10.5   | 10.0   |
| 320.0 /                    | 10.3           | 11.7  | 11.9   | 11.3   | 10.7   |
| 310.0 /                    | 13.7           | 15.2  | 15.3   | 14.5   | 13.7   |
| 300.0 /                    | 15.2           | 16.9  | 16.9   | 15.9   | 14.9   |
| 290.0 /                    | 14.5           | 16.9  | 17.4   | 16.6   | 15.7   |
| 280.0 /                    | 14.0           | 16.0  | 16.3   | 15.5   | 14.6   |
| 270.0 /                    | 16.9           | 19.8  | 20.6   | 19.9   | 18.9   |
| 260.0 /                    | 15.9           | 18.8  | 19.7   | 19.0   | 18.1   |
| 250.0 /                    | 13.2           | 15.5  | 16.1   | 15.4   | 14.5   |
| 240.0 /                    | 11.3           | 13.2  | 13.6   | 12.9   | 12.0   |
| 230.0 /                    | 9.5            | 11.1  | 11.4   | 10.9   | 10.1   |
| 220.0 /                    | 5.1            | 5.8   | 5.8    | 5.4    | 5.0    |
| 210.0 /                    | 3.9            | 4.6   | 4.7    | 4.5    | 4.2    |
| 200.0 /                    | 2.8            | 3.3   | 3.4    | 3.2    | 3.0    |
| 190.0 /                    | 2.8            | 3.2   | 3.3    | 3.1    | 2.9    |
| 180.0 /                    | 4.6            | 5.3   | 5.3    | 5.0    | 4.7    |
| 170.0 /                    | 6.5            | 7.3   | 7.5    | 7.1    | 6.7    |
| 160.0 /                    | 7.1            | 8.4   | 8.8    | 8.5    | 8.1    |
| 150.0 /                    | 6.5            | 7.4   | 7.5    | 7.1    | 6.7    |
| 140.0 /                    | 8.2            | 9.8   | 10.2   | 9.9    | 9.5    |
| 130.0 /                    | 7.0            | 8.2   | 8.6    | 8.3    | 8.0    |
| 120.0 /                    | 6.5            | 7.8   | 8.2    | 7.9    | 7.6    |
| 110.0 /                    | 5.4            | 6.6   | 6.9    | 6.7    | 6.4    |
| 100.0 /                    | 3.8            | 4.5   | 4.6    | 4.4    | 4.3    |
| 90.0 /                     | 2.9            | 3.5   | 3.7    | 3.6    | 3.6    |
| 80.0 /                     | 2.4            | 2.9   | 3.0    | 3.0    | 2.9    |
| 70.0 /                     | 2.8            | 3.6   | 3.9    | 3.8    | 3.8    |
| 60.0 /                     | 4.8            | 5.5   | 5.6    | 5.4    | 5.1    |
| 50.0 /                     | 5.6            | 6.4   | 6.6    | 6.3    | 6.0    |
| 40.0 /                     | 5.6            | 6.7   | 7.1    | 6.9    | 6.6    |
| 30.0 /                     | 4.1            | 4.8   | 5.0    | 4.9    | 4.7    |
| 20.0 /                     | 4.5            | 5.5   | 5.9    | 5.9    | 5.7    |
| 10.0 /                     | 4.0            | 5.0   | 5.4    | 5.3    | 5.1    |

\*N\*-DAY  
 183 DAYS  
 SGROUP# 1  
 YEAR 1973  
 \*\*\* SCGC 2150 -- S02

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, -6,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 19.0 AND OCCURRED AT ( 1000.0, 320.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |      |      |      |      |      |
|---------|------|------|------|------|------|
| 360.0 / | 3.9  | 4.5  | 4.7  | 4.6  | 4.4  |
| 350.0 / | 5.7  | 6.7  | 7.0  | 6.7  | 6.4  |
| 340.0 / | 8.2  | 9.8  | 10.1 | 9.7  | 9.3  |
| 330.0 / | 10.8 | 12.5 | 12.7 | 12.0 | 11.3 |
| 320.0 / | 15.6 | 18.4 | 19.0 | 18.2 | 17.1 |
| 310.0 / | 15.6 | 18.1 | 18.6 | 17.8 | 16.9 |
| 300.0 / | 14.5 | 17.1 | 17.8 | 17.2 | 16.3 |
| 290.0 / | 12.2 | 13.9 | 14.2 | 13.6 | 12.9 |
| 280.0 / | 13.1 | 14.7 | 14.8 | 14.0 | 13.2 |
| 270.0 / | 15.2 | 17.9 | 18.5 | 17.8 | 16.9 |
| 260.0 / | 15.5 | 17.9 | 18.3 | 17.4 | 16.3 |
| 250.0 / | 15.2 | 17.8 | 18.4 | 17.6 | 16.4 |
| 240.0 / | 11.0 | 12.6 | 12.9 | 12.3 | 11.5 |
| 230.0 / | 8.0  | 9.1  | 9.3  | 8.8  | 8.2  |
| 220.0 / | 8.0  | 9.3  | 9.5  | 9.0  | 8.3  |
| 210.0 / | 4.7  | 5.3  | 5.4  | 5.0  | 4.6  |
| 200.0 / | 2.7  | 3.1  | 3.1  | 3.0  | 2.8  |
| 190.0 / | 3.1  | 3.5  | 3.5  | 3.3  | 3.0  |
| 180.0 / | 5.3  | 6.1  | 6.2  | 5.8  | 5.4  |
| 170.0 / | 5.4  | 6.3  | 6.4  | 6.2  | 5.8  |
| 160.0 / | 6.7  | 8.1  | 8.6  | 8.4  | 8.1  |
| 150.0 / | 8.0  | 9.6  | 10.2 | 9.9  | 9.5  |
| 140.0 / | 10.3 | 12.6 | 13.3 | 12.9 | 12.4 |
| 130.0 / | 10.7 | 13.1 | 14.0 | 13.9 | 13.5 |
| 120.0 / | 9.8  | 12.0 | 12.8 | 12.5 | 12.1 |
| 110.0 / | 8.1  | 9.6  | 10.1 | 9.9  | 9.6  |
| 100.0 / | 4.6  | 5.4  | 5.7  | 5.6  | 5.4  |
| 90.0 /  | 3.5  | 4.2  | 4.5  | 4.5  | 4.5  |
| 80.0 /  | 2.9  | 3.2  | 3.3  | 3.1  | 2.9  |
| 70.0 /  | 3.0  | 3.4  | 3.6  | 3.4  | 3.3  |
| 60.0 /  | 2.1  | 3.0  | 3.0  | 2.8  | 2.7  |
| 50.0 /  | 3.2  | 3.8  | 3.9  | 3.7  | 3.5  |
| 40.0 /  | 2.4  | 2.9  | 3.1  | 3.0  | 2.9  |
| 30.0 /  | 2.3  | 2.7  | 2.8  | 2.7  | 2.6  |
| 20.0 /  | 3.0  | 3.7  | 3.9  | 3.8  | 3.7  |
| 10.0 /  | 2.9  | 3.5  | 3.6  | 3.5  | 3.3  |

\*N\*-DAY  
 183 DAYS  
 SCROUP# 1  
 YEAR 1974  
 \*\*\* SCGC 2150 -- SC2

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, -6,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 24.3 AND OCCURRED AT ( 1000.0, 270.0) \*

DIRECTION / RANGE (METERS)  
 (DEGREES) / 600.0 800.0 1000.0 1200.0 1400.0

|         |      |      |      |      |      |
|---------|------|------|------|------|------|
| 360.0 / | 4.3  | 4.9  | 5.0  | 4.9  | 4.7  |
| 350.0 / | 4.5  | 5.1  | 5.2  | 4.9  | 4.7  |
| 340.0 / | 7.1  | 8.2  | 8.3  | 7.9  | 7.5  |
| 330.0 / | 10.7 | 11.9 | 11.8 | 11.2 | 10.5 |
| 320.0 / | 14.5 | 16.0 | 16.0 | 15.1 | 14.1 |
| 310.0 / | 15.1 | 16.9 | 17.0 | 16.2 | 15.2 |
| 300.0 / | 13.5 | 15.1 | 15.1 | 14.3 | 13.4 |
| 290.0 / | 13.7 | 15.5 | 15.8 | 15.1 | 14.4 |
| 280.0 / | 15.6 | 17.4 | 17.6 | 16.7 | 15.8 |
| 270.0 / | 20.0 | 23.4 | 24.3 | 23.5 | 22.3 |
| 260.0 / | 19.2 | 22.2 | 22.8 | 21.9 | 20.7 |
| 250.0 / | 17.4 | 20.4 | 21.0 | 20.0 | 18.8 |
| 240.0 / | 14.0 | 16.5 | 17.1 | 16.4 | 15.4 |
| 230.0 / | 8.5  | 10.1 | 10.4 | 10.0 | 9.4  |
| 220.0 / | 4.4  | 5.1  | 5.2  | 5.0  | 4.7  |
| 210.0 / | 3.3  | 3.7  | 3.7  | 3.5  | 3.3  |
| 200.0 / | 3.1  | 3.4  | 3.4  | 3.2  | 3.0  |
| 190.0 / | 2.9  | 3.3  | 3.4  | 3.2  | 3.0  |
| 180.0 / | 4.3  | 4.9  | 5.0  | 4.7  | 4.4  |
| 170.0 / | 3.7  | 4.3  | 4.4  | 4.3  | 4.0  |
| 160.0 / | 4.7  | 5.7  | 6.0  | 5.9  | 5.7  |
| 150.0 / | 5.4  | 6.4  | 6.8  | 6.6  | 6.4  |
| 140.0 / | 7.4  | 9.0  | 9.7  | 9.5  | 9.2  |
| 130.0 / | 8.2  | 9.6  | 10.4 | 10.2 | 9.9  |
| 120.0 / | 5.1  | 5.9  | 6.1  | 6.0  | 5.8  |
| 110.0 / | 3.8  | 4.4  | 4.6  | 4.5  | 4.3  |
| 100.0 / | 3.4  | 3.8  | 3.9  | 3.7  | 3.5  |
| 90.0 /  | 3.4  | 4.0  | 4.2  | 4.0  | 3.5  |
| 80.0 /  | 3.4  | 3.9  | 4.0  | 3.8  | 3.7  |
| 70.0 /  | 3.2  | 3.5  | 3.6  | 3.5  | 3.4  |
| 60.0 /  | 3.3  | 4.3  | 4.5  | 4.3  | 4.1  |
| 50.0 /  | 3.5  | 4.3  | 4.3  | 4.0  | 3.7  |
| 40.0 /  | 3.6  | 4.0  | 4.0  | 3.7  | 3.5  |
| 30.0 /  | 2.4  | 2.7  | 2.7  | 2.5  | 2.4  |
| 20.0 /  | 2.3  | 2.7  | 2.7  | 2.6  | 2.4  |
| 10.0 /  | 2.3  | 3.0  | 3.8  | 3.6  | 3.4  |

2ND HIGH  
3-HR  
SGROUP# 1  
YEAR 1970  
\*\*\* SCGC 2150 -- S02

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\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, -6,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 451.0 AND OCCURRED AT ( 1000.0, 310.0) \*

| DIPECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 218.6 ( 27, 5) | 298.6 ( 34, 3) | 307.6 ( 34, 3) | 294.3 ( 80, 8) | 299.1 ( 80, 8) |
| 350.0 /                    | 275.5 ( 34, 1) | 324.0 ( 87, 6) | 329.2 ( 6, 4)  | 305.7 ( 34, 1) | 281.4 ( 34, 1) |
| 340.0 /                    | 263.2 ( 32, 8) | 385.9 ( 33, 6) | 411.1 ( 33, 6) | 397.6 ( 33, 6) | 375.0 ( 33, 6) |
| 330.0 /                    | 341.6 ( 95, 4) | 299.0 ( 95, 4) | 282.4 (346, 5) | 266.8 (346, 5) | 250.4 (346, 5) |
| 320.0 /                    | 363.7 ( 72, 5) | 413.3 ( 76, 8) | 439.0 ( 76, 8) | 419.3 ( 90, 5) | 372.0 ( 90, 5) |
| 310.0 /                    | 377.3 ( 78, 5) | 417.3 ( 29, 4) | 451.0 ( 29, 4) | 438.9 ( 29, 4) | 409.1 ( 32, 8) |
| 300.0 /                    | 333.2 (101, 5) | 390.8 ( 46, 5) | 423.8 ( 46, 5) | 416.8 ( 46, 5) | 398.3 ( 46, 5) |
| 290.0 /                    | 298.7 ( 61, 4) | 331.6 (302, 6) | 377.4 (302, 6) | 373.2 ( 61, 4) | 352.6 ( 61, 4) |
| 280.0 /                    | 327.5 (324, 5) | 318.3 ( 60, 8) | 343.4 ( 60, 8) | 327.9 (324, 5) | 316.8 (313, 8) |
| 270.0 /                    | 315.1 ( 60, 7) | 344.8 (292, 1) | 368.1 (292, 1) | 355.8 (292, 1) | 337.2 ( 32, 2) |
| 260.0 /                    | 307.1 (291, 5) | 394.2 (291, 5) | 414.0 (302, 3) | 398.6 (291, 5) | 368.5 (291, 5) |
| 250.0 /                    | 371.8 (326, 5) | 423.2 (302, 1) | 430.9 (312, 5) | 412.9 (301, 6) | 386.8 (301, 6) |
| 240.0 /                    | 299.1 (312, 5) | 343.5 (291, 1) | 359.5 (291, 1) | 339.8 (291, 1) | 312.7 (291, 1) |
| 230.0 /                    | 337.5 (364, 5) | 367.9 (337, 6) | 387.7 (337, 6) | 370.8 (364, 5) | 346.3 (364, 5) |
| 220.0 /                    | 399.3 ( 39, 5) | 308.0 ( 39, 5) | 303.4 ( 38, 5) | 299.8 ( 38, 5) | 275.8 ( 65, 5) |
| 210.0 /                    | 268.9 ( 82, 5) | 271.5 ( 82, 5) | 250.7 ( 82, 5) | 219.9 ( 82, 5) | 210.0 ( 37, 4) |
| 200.0 /                    | 248.9 (322, 5) | 268.8 (322, 5) | 262.2 (322, 5) | 243.1 (322, 5) | 223.0 (322, 5) |
| 190.0 /                    | 246.2 ( 75, 5) | 255.3 ( 75, 5) | 239.1 ( 51, 4) | 215.6 ( 51, 4) | 204.2 (348, 6) |
| 180.0 /                    | 263.1 ( 51, 4) | 301.0 (305, 6) | 334.3 (305, 6) | 315.1 ( 51, 5) | 283.6 (336, 6) |
| 170.0 /                    | 332.7 (321, 5) | 335.0 (339, 4) | 315.0 ( 52, 6) | 302.3 ( 52, 6) | 290.4 ( 24, 4) |
| 160.0 /                    | 340.3 ( 45, 5) | 365.5 (305, 4) | 384.7 ( 57, 3) | 372.8 ( 57, 3) | 354.5 ( 57, 3) |
| 150.0 /                    | 292.6 ( 45, 5) | 317.3 ( 35, 6) | 303.8 ( 58, 7) | 311.3 ( 58, 7) | 309.2 ( 58, 7) |
| 140.0 /                    | 424.8 (338, 4) | 435.2 (338, 4) | 402.8 (338, 4) | 357.9 (338, 4) | 324.1 ( 31, 1) |
| 130.0 /                    | 371.9 (340, 4) | 355.9 (319, 5) | 380.7 (319, 5) | 370.8 ( 8, 1)  | 355.8 ( 7, 3)  |
| 120.0 /                    | 372.6 (296, 4) | 354.9 (304, 4) | 306.5 (304, 4) | 294.1 ( 41, 2) | 278.8 ( 41, 2) |
| 110.0 /                    | 358.7 ( 44, 5) | 394.8 ( 72, 6) | 428.8 ( 72, 6) | 408.5 ( 20, 5) | 374.9 ( 20, 5) |
| 100.0 /                    | 267.5 ( 49, 4) | 321.7 ( 73, 6) | 347.5 ( 73, 6) | 338.7 ( 73, 6) | 322.7 ( 73, 6) |
| 90.0 /                     | 265.4 ( 1, 5)  | 263.1 ( 1, 5)  | 288.5 ( 19, 5) | 290.8 ( 19, 5) | 255.7 ( 19, 5) |
| 80.0 /                     | 327.9 (298, 4) | 309.9 (298, 4) | 306.5 ( 68, 2) | 301.3 ( 68, 2) | 268.2 ( 68, 2) |
| 70.0 /                     | 306.5 (298, 4) | 267.0 (298, 4) | 274.1 ( 67, 6) | 262.6 ( 1, 4)  | 245.7 ( 1, 4)  |
| 60.0 /                     | 336.4 (359, 4) | 342.9 ( 18, 4) | 322.9 ( 18, 4) | 295.6 ( 12, 4) | 280.6 ( 64, 6) |
| 50.0 /                     | 287.0 (347, 4) | 332.5 (316, 5) | 339.4 ( 92, 6) | 322.8 ( 92, 6) | 300.4 ( 92, 6) |
| 40.0 /                     | 305.3 ( 28, 4) | 307.1 ( 26, 4) | 289.7 ( 26, 4) | 241.6 (254, 8) | 233.7 (254, 8) |
| 30.0 /                     | 217.2 (297, 5) | 232.1 ( 6, 5)  | 222.8 ( 92, 4) | 208.6 ( 6, 6)  | 200.6 ( 6, 6)  |
| 20.0 /                     | 215.1 (355, 5) | 236.2 ( 92, 4) | 205.6 ( 56, 4) | 194.2 ( 56, 4) | 180.7 ( 56, 4) |
| 10.0 /                     | 213.7 (317, 4) | 238.7 ( 26, 6) | 253.0 ( 26, 6) | 248.8 ( 17, 8) | 240.9 ( 26, 6) |

2ND HIGH  
3-HR  
SGROUP# 1  
YEAR 1971  
\*\*\* SCGC 2150 -- SC2

\*\*\*

\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)  
\* FROM SOURCES: 1, -6,  
\* FOR THE RECEPTOR GFID \*

\* MAXIMUM VALUE EQUALS 447.8 AND OCCURRED AT ( 1000.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 181.3 (331, 4) | 220.8 ( 62, 3) | 257.9 ( 62, 3) | 260.8 ( 85, 3) | 238.3 ( 85, 3) |
| 350.0 /                    | 246.8 ( 95, 6) | 305.9 ( 95, 6) | 323.8 ( 95, 6) | 315.5 ( 95, 6) | 302.2 ( 95, 6) |
| 340.0 /                    | 266.1 (307, 4) | 300.4 ( 5, 5)  | 314.4 ( 5, 5)  | 302.2 ( 5, 5)  | 284.4 ( 5, 5)  |
| 330.0 /                    | 315.0 (341, 4) | 347.4 ( 57, 5) | 371.2 ( 57, 5) | 357.0 ( 57, 5) | 335.6 ( 57, 5) |
| 320.0 /                    | 304.9 ( 4, 2)  | 368.1 ( 74, 6) | 392.3 ( 74, 6) | 382.9 ( 74, 6) | 365.3 ( 74, 6) |
| 310.0 /                    | 305.0 ( 92, 4) | 334.8 ( 6, 5)  | 371.0 ( 6, 5)  | 369.8 ( 6, 5)  | 357.6 ( 6, 5)  |
| 300.0 /                    | 269.6 ( 65, 4) | 312.0 (364, 6) | 306.1 ( 52, 5) | 299.4 (340, 5) | 285.9 (349, 8) |
| 290.0 /                    | 308.8 ( 81, 4) | 324.2 (362, 5) | 299.9 (104, 6) | 284.7 (104, 6) | 266.9 (348, 3) |
| 280.0 /                    | 384.0 ( 46, 5) | 354.4 ( 46, 5) | 327.5 ( 49, 8) | 323.8 ( 94, 8) | 315.5 ( 94, 8) |
| 270.0 /                    | 345.3 (291, 4) | 355.9 (313, 6) | 385.8 (322, 3) | 383.0 (322, 3) | 368.1 (322, 3) |
| 260.0 /                    | 359.3 (104, 5) | 431.5 (320, 3) | 447.8 (348, 1) | 424.6 (309, 8) | 388.7 (309, 8) |
| 250.0 /                    | 379.4 (105, 4) | 420.9 (353, 2) | 421.2 (359, 8) | 421.9 ( 48, 6) | 390.0 (353, 2) |
| 240.0 /                    | 395.6 (357, 1) | 423.2 (102, 4) | 429.0 (309, 1) | 431.1 (309, 1) | 404.7 (359, 1) |
| 230.0 /                    | 326.1 ( 55, 5) | 314.0 (359, 5) | 334.7 (101, 8) | 328.4 (102, 1) | 316.0 (101, 8) |
| 220.0 /                    | 293.5 ( 29, 5) | 364.7 (101, 6) | 391.1 (101, 6) | 381.2 (101, 6) | 362.3 (101, 6) |
| 210.0 /                    | 294.9 ( 87, 4) | 240.4 (295, 6) | 258.0 (356, 4) | 255.9 (295, 6) | 245.0 (295, 6) |
| 200.0 /                    | 264.8 ( 93, 5) | 322.4 ( 93, 5) | 326.1 ( 86, 5) | 295.9 ( 86, 5) | 265.2 ( 86, 5) |
| 190.0 /                    | 245.4 ( 13, 4) | 272.1 ( 76, 6) | 292.6 ( 76, 6) | 288.1 ( 76, 6) | 277.7 ( 76, 6) |
| 180.0 /                    | 275.6 ( 55, 4) | 313.4 (352, 5) | 320.8 (352, 5) | 303.1 (352, 5) | 281.4 (352, 5) |
| 170.0 /                    | 356.2 (308, 3) | 373.8 ( 55, 4) | 334.0 ( 55, 4) | 303.6 ( 16, 5) | 289.3 ( 16, 5) |
| 160.0 /                    | 232.4 ( 67, 5) | 251.9 ( 12, 4) | 255.5 (329, 5) | 246.7 (329, 5) | 233.7 (329, 5) |
| 150.0 /                    | 291.7 ( 67, 5) | 284.3 ( 67, 5) | 308.9 (317, 7) | 281.2 ( 98, 4) | 245.7 ( 1, 4)  |
| 140.0 /                    | 316.3 ( 28, 4) | 326.2 ( 16, 7) | 332.4 ( 89, 6) | 309.0 ( 89, 6) | 297.6 ( 86, 2) |
| 130.0 /                    | 287.4 ( 79, 4) | 336.3 ( 40, 2) | 378.8 ( 40, 2) | 376.5 ( 40, 2) | 362.4 ( 40, 2) |
| 120.0 /                    | 366.5 ( 82, 4) | 342.8 ( 82, 4) | 337.7 ( 63, 4) | 326.4 ( 63, 4) | 307.4 ( 63, 4) |
| 110.0 /                    | 331.5 ( 96, 5) | 340.2 ( 63, 1) | 366.3 ( 96, 3) | 349.2 ( 96, 3) | 324.9 ( 96, 3) |
| 100.0 /                    | 267.2 ( 11, 5) | 271.6 ( 96, 5) | 258.4 ( 54, 5) | 245.4 (351, 4) | 244.5 (351, 4) |
| 90.0 /                     | 282.7 (104, 4) | 297.3 ( 11, 5) | 265.5 ( 11, 5) | 261.5 ( 96, 2) | 260.6 ( 96, 2) |
| 80.0 /                     | 235.7 ( 15, 4) | 243.3 ( 17, 5) | 244.7 ( 82, 5) | 220.3 ( 17, 5) | 199.5 ( 17, 5) |
| 70.0 /                     | 346.5 ( 15, 5) | 379.3 ( 15, 5) | 370.0 ( 15, 5) | 339.0 ( 15, 5) | 306.1 ( 15, 5) |
| 60.0 /                     | 316.6 ( 75, 5) | 325.9 (106, 4) | 286.5 (331, 4) | 264.5 (331, 4) | 240.8 (331, 4) |
| 50.0 /                     | 318.2 (324, 5) | 328.7 ( 44, 2) | 355.5 ( 44, 2) | 307.9 (106, 4) | 259.7 (106, 4) |
| 40.0 /                     | 267.7 ( 62, 6) | 267.8 ( 46, 4) | 261.0 ( 95, 8) | 253.1 ( 95, 8) | 240.2 ( 95, 8) |
| 30.0 /                     | 195.2 ( 62, 5) | 244.6 ( 95, 7) | 261.2 ( 95, 7) | 253.2 ( 95, 7) | 226.0 ( 85, 4) |
| 20.0 /                     | 194.4 ( 85, 4) | 263.0 ( 18, 3) | 315.5 ( 18, 3) | 321.3 ( 18, 3) | 316.8 ( 18, 3) |
| 10.0 /                     | 191.4 ( 39, 3) | 236.7 ( 39, 3) | 246.5 ( 39, 3) | 233.4 ( 39, 3) | 217.0 ( 39, 3) |

2ND HIGH  
3-HR  
SGROUP# 1  
YEAR 1972  
\*\*\* SCGC 2150 -- S02

\*\*\*

\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, -6,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 448.2 AND OCCURRED AT ( 800.0, 250.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 291.8 (357, 1) | 346.3 (357, 1) | 354.9 (357, 1) | 333.2 (357, 1) | 307.2 (357, 1) |
| 350.0 /                    | 244.4 ( 79, 5) | 282.6 ( 10, 6) | 287.5 ( 11, 4) | 277.6 ( 11, 4) | 264.7 ( 11, 4) |
| 340.0 /                    | 345.2 ( 34, 3) | 423.2 ( 34, 3) | 438.3 ( 34, 3) | 418.2 ( 34, 3) | 392.5 ( 34, 3) |
| 330.0 /                    | 341.4 ( 62, 6) | 428.2 ( 62, 6) | 429.6 ( 13, 3) | 402.3 ( 13, 3) | 369.8 ( 13, 3) |
| 320.0 /                    | 354.6 ( 30, 5) | 436.2 (301, 4) | 406.4 (301, 4) | 370.5 ( 21, 4) | 344.3 ( 21, 4) |
| 310.0 /                    | 383.2 ( 95, 5) | 375.0 (349, 8) | 414.6 ( 81, 8) | 407.1 (333, 5) | 392.4 (349, 8) |
| 300.0 /                    | 447.1 ( 87, 5) | 432.8 ( 87, 5) | 383.9 ( 87, 5) | 329.3 ( 56, 5) | 304.5 (349, 7) |
| 290.0 /                    | 350.2 ( 57, 5) | 378.5 ( 57, 5) | 382.2 ( 9, 4)  | 373.0 ( 9, 4)  | 352.8 ( 9, 4)  |
| 280.0 /                    | 446.2 (297, 5) | 418.9 (297, 5) | 369.8 (343, 4) | 342.8 (297, 4) | 316.7 (297, 4) |
| 270.0 /                    | 348.9 (345, 5) | 367.5 (347, 3) | 369.0 ( 52, 6) | 372.1 ( 52, 6) | 359.8 (347, 3) |
| 260.0 /                    | 297.0 (293, 5) | 336.7 (295, 8) | 345.0 (295, 8) | 346.9 ( 18, 7) | 340.0 ( 18, 7) |
| 250.0 /                    | 405.9 ( 94, 5) | 448.2 ( 94, 5) | 438.8 ( 94, 5) | 401.5 ( 94, 5) | 372.5 (101, 6) |
| 240.0 /                    | 315.8 (294, 6) | 401.3 (353, 2) | 430.3 (295, 3) | 415.8 (295, 3) | 390.5 (295, 3) |
| 230.0 /                    | 310.9 ( 71, 1) | 396.5 ( 71, 1) | 435.9 ( 71, 1) | 430.6 ( 71, 1) | 411.9 ( 71, 1) |
| 220.0 /                    | 327.9 (342, 4) | 331.3 (314, 4) | 304.7 (342, 4) | 286.2 ( 71, 6) | 263.9 ( 71, 6) |
| 210.0 /                    | 276.5 ( 70, 6) | 327.1 ( 66, 5) | 322.1 ( 71, 5) | 301.5 ( 71, 5) | 276.5 ( 71, 5) |
| 200.0 /                    | 245.2 ( 69, 7) | 300.6 ( 69, 7) | 317.6 ( 69, 7) | 302.9 ( 69, 7) | 281.9 ( 69, 7) |
| 190.0 /                    | 213.1 ( 97, 6) | 257.9 ( 97, 6) | 274.1 ( 97, 6) | 246.4 ( 66, 3) | 235.5 ( 66, 3) |
| 180.0 /                    | 290.2 ( 92, 4) | 360.0 ( 92, 4) | 381.3 ( 92, 4) | 372.6 ( 92, 4) | 358.6 ( 92, 4) |
| 170.0 /                    | 363.5 (326, 4) | 367.3 (326, 4) | 353.3 ( 66, 2) | 350.6 ( 66, 2) | 325.1 ( 83, 4) |
| 160.0 /                    | 293.2 (299, 4) | 287.9 (289, 4) | 303.9 ( 40, 6) | 294.6 ( 40, 6) | 280.5 ( 40, 6) |
| 150.0 /                    | 303.4 ( 16, 2) | 291.7 (363, 5) | 282.3 (363, 5) | 266.0 (363, 5) | 246.5 (363, 5) |
| 140.0 /                    | 328.5 ( 84, 4) | 317.3 ( 84, 4) | 343.3 ( 36, 2) | 343.5 ( 36, 2) | 333.9 ( 36, 2) |
| 130.0 /                    | 246.5 (321, 4) | 275.1 (362, 3) | 298.2 (362, 3) | 292.8 (362, 3) | 278.3 (327, 2) |
| 120.0 /                    | 226.2 (327, 5) | 284.7 (303, 4) | 305.1 (303, 4) | 294.9 (303, 4) | 272.4 (313, 4) |
| 110.0 /                    | 250.5 (328, 4) | 294.6 (328, 4) | 283.5 ( 77, 4) | 259.5 (327, 1) | 257.4 (327, 1) |
| 100.0 /                    | 274.1 ( 50, 5) | 308.7 ( 50, 7) | 315.5 ( 50, 7) | 295.0 ( 50, 7) | 271.9 ( 50, 7) |
| 90.0 /                     | 287.5 ( 88, 4) | 234.3 ( 88, 4) | 241.9 ( 49, 7) | 234.1 ( 49, 7) | 221.4 ( 49, 7) |
| 80.0 /                     | 176.8 (361, 5) | 195.8 ( 88, 4) | 194.9 ( 64, 5) | 187.7 ( 64, 5) | 177.2 ( 64, 5) |
| 70.0 /                     | 246.4 ( 47, 5) | 315.2 ( 48, 5) | 284.8 ( 38, 6) | 279.1 ( 38, 6) | 268.3 ( 38, 6) |
| 60.0 /                     | 355.0 ( 88, 5) | 343.0 ( 78, 4) | 334.1 ( 78, 4) | 300.1 ( 99, 4) | 265.6 (313, 2) |
| 50.0 /                     | 349.7 ( 38, 5) | 325.7 ( 82, 4) | 321.7 ( 82, 4) | 313.2 (320, 3) | 308.3 (320, 3) |
| 40.0 /                     | 482.4 ( 5, 5)  | 441.9 ( 34, 5) | 402.0 ( 6, 4)  | 348.2 ( 6, 4)  | 300.9 ( 6, 4)  |
| 30.0 /                     | 314.2 ( 63, 5) | 319.8 ( 5, 4)  | 315.5 ( 89, 4) | 290.5 ( 5, 4)  | 265.1 ( 5, 4)  |
| 20.0 /                     | 391.5 ( 34, 4) | 364.5 ( 85, 4) | 325.0 ( 85, 4) | 281.9 ( 85, 4) | 273.0 ( 76, 8) |
| 10.0 /                     | 238.7 ( 65, 4) | 243.0 (302, 4) | 234.4 (302, 4) | 213.0 (302, 4) | 199.7 (330, 8) |

2ND HIGH  
3-HR  
SGROUP# 1  
YEAR 1972  
\*\*\* SCGC 2150 -- 502

\*\*\*

\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, -6,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 448.2 AND OCCURRED AT ( 800.0, 250.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 291.0 (357, 1) | 346.3 (357, 1) | 354.9 (357, 1) | 333.2 (357, 1) | 307.2 (357, 1) |
| 350.0 /                    | 244.4 ( 79, 5) | 282.6 ( 10, 6) | 287.5 ( 11, 4) | 277.6 ( 11, 4) | 264.7 ( 11, 4) |
| 340.0 /                    | 345.2 ( 34, 3) | 423.2 ( 34, 3) | 438.3 ( 34, 3) | 418.2 ( 34, 3) | 392.5 ( 34, 3) |
| 330.0 /                    | 341.4 ( 62, 6) | 428.2 ( 62, 6) | 429.6 ( 13, 3) | 402.3 ( 13, 3) | 369.8 ( 13, 3) |
| 320.0 /                    | 394.6 ( 30, 5) | 436.2 (301, 4) | 406.4 (301, 4) | 370.5 ( 21, 4) | 344.3 ( 21, 4) |
| 310.0 /                    | 383.2 ( 95, 5) | 375.0 (349, 8) | 414.6 ( 81, 8) | 407.1 (333, 5) | 392.4 (349, 8) |
| 300.0 /                    | 447.1 ( 87, 5) | 432.8 ( 87, 5) | 383.9 ( 87, 5) | 329.3 ( 56, 5) | 304.5 (349, 7) |
| 290.0 /                    | 350.2 ( 57, 5) | 378.5 ( 57, 5) | 382.2 ( 9, 4)  | 373.0 ( 9, 4)  | 352.8 ( 9, 4)  |
| 280.0 /                    | 446.2 (297, 5) | 418.9 (297, 5) | 369.8 (343, 4) | 342.8 (297, 4) | 316.7 (297, 4) |
| 270.0 /                    | 348.9 (345, 5) | 367.5 (347, 3) | 369.0 ( 52, 6) | 372.1 ( 52, 6) | 359.8 (347, 3) |
| 260.0 /                    | 297.0 (293, 5) | 336.7 (295, 8) | 345.0 (295, 8) | 346.9 ( 18, 7) | 340.0 ( 18, 7) |
| 250.0 /                    | 405.9 ( 94, 5) | 448.2 ( 94, 5) | 438.8 ( 94, 5) | 401.5 ( 94, 5) | 372.5 (101, 6) |
| 240.0 /                    | 315.8 (294, 6) | 401.3 (353, 2) | 430.3 (295, 3) | 415.8 (295, 3) | 390.5 (295, 3) |
| 230.0 /                    | 310.9 ( 71, 1) | 396.5 ( 71, 1) | 435.9 ( 71, 1) | 430.6 ( 71, 1) | 411.9 ( 71, 1) |
| 220.0 /                    | 227.9 (342, 4) | 331.3 (314, 4) | 304.7 (342, 4) | 286.2 ( 71, 6) | 263.9 ( 71, 6) |
| 210.0 /                    | 276.5 ( 70, 6) | 327.1 ( 66, 5) | 322.1 ( 71, 5) | 301.5 ( 71, 5) | 276.5 ( 71, 5) |
| 200.0 /                    | 245.2 ( 69, 7) | 300.6 ( 69, 7) | 317.6 ( 69, 7) | 302.9 ( 69, 7) | 281.9 ( 69, 7) |
| 190.0 /                    | 213.1 ( 97, 6) | 257.9 ( 97, 6) | 274.1 ( 97, 6) | 246.4 ( 66, 3) | 235.5 ( 66, 3) |
| 180.0 /                    | 290.2 ( 92, 4) | 360.0 ( 52, 4) | 381.3 ( 92, 4) | 372.6 ( 92, 4) | 358.6 ( 92, 4) |
| 170.0 /                    | 363.5 (326, 4) | 367.3 (326, 4) | 353.3 ( 66, 2) | 350.6 ( 66, 2) | 325.1 ( 83, 4) |
| 160.0 /                    | 293.2 (293, 4) | 287.9 (289, 4) | 303.9 ( 40, 6) | 294.6 ( 40, 6) | 280.5 ( 40, 6) |
| 150.0 /                    | 303.4 ( 16, 2) | 291.7 (363, 5) | 282.3 (363, 5) | 266.0 (363, 5) | 246.5 (363, 5) |
| 140.0 /                    | 328.5 ( 84, 4) | 317.3 ( 84, 4) | 343.3 ( 36, 2) | 343.5 ( 36, 2) | 333.9 ( 36, 2) |
| 130.0 /                    | 246.5 (321, 4) | 275.1 (362, 3) | 298.2 (362, 3) | 292.8 (362, 3) | 278.3 (327, 2) |
| 120.0 /                    | 226.2 (327, 5) | 284.7 (363, 4) | 305.1 (303, 4) | 294.9 (303, 4) | 272.4 (313, 4) |
| 110.0 /                    | 250.5 (328, 4) | 294.6 (328, 4) | 283.5 ( 77, 4) | 259.5 (327, 1) | 257.4 (327, 1) |
| 100.0 /                    | 274.1 ( 50, 5) | 308.7 ( 50, 7) | 315.5 ( 50, 7) | 295.0 ( 50, 7) | 271.0 ( 50, 7) |
| 90.0 /                     | 287.5 ( 88, 4) | 234.3 ( 88, 4) | 241.9 ( 49, 7) | 234.1 ( 49, 7) | 221.4 ( 49, 7) |
| 80.0 /                     | 176.8 (361, 5) | 195.8 ( 88, 4) | 194.9 ( 64, 5) | 187.7 ( 64, 5) | 177.2 ( 64, 5) |
| 70.0 /                     | 248.4 ( 48, 5) | 319.2 ( 48, 5) | 284.8 ( 38, 6) | 279.1 ( 38, 6) | 268.3 ( 38, 6) |
| 60.0 /                     | 255.0 ( 48, 5) | 343.0 ( 78, 4) | 334.1 ( 78, 4) | 300.1 ( 99, 4) | 265.6 (313, 2) |
| 50.0 /                     | 349.7 ( 38, 5) | 325.7 ( 62, 4) | 321.7 ( 82, 4) | 313.2 (320, 3) | 308.3 (320, 3) |
| 40.0 /                     | 402.4 ( 5, 5)  | 441.9 ( 34, 5) | 402.0 ( 6, 4)  | 348.2 ( 6, 4)  | 300.9 ( 6, 4)  |
| 30.0 /                     | 314.1 ( 62, 5) | 319.8 ( 5, 4)  | 315.5 ( 89, 4) | 290.5 ( 5, 4)  | 265.1 ( 5, 4)  |
| 20.0 /                     | 391.1 ( 34, 4) | 364.5 ( 85, 4) | 325.0 ( 85, 4) | 281.9 ( 85, 4) | 273.0 ( 76, 8) |
| 10.0 /                     | 230.7 ( 65, 4) | 243.0 (302, 4) | 234.4 (302, 4) | 213.0 (302, 4) | 199.7 (330, 6) |

2ND HIGH  
3-HR  
SGROUP# 1  
YEAR 1973  
\*\*\* SCGC 2150 -- S02

\*\*\*

\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, -6,  
\* FOR THE RECEPTION GRID \*

\* MAXIMUM VALUE EQUALS 472.0 AND OCCURRED AT ( 800.0, 320.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 233.2 ( 79, 4) | 305.8 (304, 4) | 280.5 (304, 4) | 252.7 ( 94, 3) | 243.4 ( 94, 3) |
| 350.0 /                    | 319.7 ( 93, 4) | 321.7 ( 85, 1) | 329.9 ( 85, 1) | 314.0 (332, 6) | 300.2 (332, 6) |
| 340.0 /                    | 308.8 ( 93, 4) | 343.6 ( 93, 5) | 379.6 ( 46, 1) | 371.8 ( 84, 8) | 344.8 ( 84, 8) |
| 330.0 /                    | 336.0 (361, 4) | 404.8 ( 22, 3) | 420.6 ( 22, 3) | 399.6 ( 22, 3) | 371.4 ( 22, 3) |
| 320.0 /                    | 446.0 (329, 5) | 472.0 (329, 5) | 452.3 (329, 5) | 410.8 (329, 5) | 367.2 (329, 5) |
| 310.0 /                    | 333.5 ( 73, 5) | 363.7 (360, 3) | 387.5 (360, 3) | 375.1 (360, 3) | 353.6 (360, 3) |
| 300.0 /                    | 352.8 ( 69, 6) | 372.5 ( 87, 8) | 399.7 ( 87, 8) | 386.6 ( 87, 8) | 371.3 ( 70, 3) |
| 290.0 /                    | 355.4 (301, 4) | 374.6 (353, 8) | 399.9 ( 65, 3) | 386.4 ( 65, 3) | 365.2 ( 65, 3) |
| 280.0 /                    | 369.7 ( 64, 5) | 367.5 ( 72, 5) | 344.0 (328, 4) | 310.8 (328, 4) | 283.5 (353, 6) |
| 270.0 /                    | 360.2 (289, 5) | 414.6 (104, 7) | 446.2 ( 64, 5) | 424.7 (104, 7) | 396.8 (321, 8) |
| 260.0 /                    | 351.2 (327, 4) | 352.2 (321, 4) | 380.2 ( 25, 6) | 380.4 ( 25, 6) | 368.2 (353, 1) |
| 250.0 /                    | 337.2 (300, 4) | 376.4 (319, 5) | 386.7 (291, 3) | 369.1 (291, 3) | 344.1 (291, 3) |
| 240.0 /                    | 316.1 (289, 4) | 392.1 (316, 6) | 430.3 (316, 6) | 423.7 (316, 6) | 403.9 (316, 6) |
| 230.0 /                    | 310.7 (335, 6) | 399.7 (335, 6) | 440.0 (335, 6) | 420.3 (294, 8) | 389.7 (294, 8) |
| 220.0 /                    | 332.4 (315, 1) | 362.8 (295, 4) | 374.7 (295, 4) | 352.3 (295, 4) | 331.7 (294, 3) |
| 210.0 /                    | 287.8 (290, 5) | 304.5 (290, 5) | 292.9 (290, 5) | 268.4 (290, 5) | 243.4 (290, 5) |
| 200.0 /                    | 238.8 (293, 2) | 283.2 (293, 2) | 271.1 ( 30, 5) | 243.2 (295, 6) | 226.7 (295, 6) |
| 190.0 /                    | 251.9 ( 81, 5) | 258.5 (352, 5) | 249.1 (352, 5) | 227.1 (352, 5) | 200.9 (352, 5) |
| 180.0 /                    | 371.2 (352, 5) | 380.3 (103, 4) | 389.9 (352, 5) | 365.3 (352, 5) | 336.8 (352, 5) |
| 170.0 /                    | 341.8 ( 37, 4) | 341.8 ( 37, 4) | 338.9 ( 81, 4) | 320.1 (298, 6) | 303.6 (298, 6) |
| 160.0 /                    | 317.2 ( 72, 4) | 331.6 ( 9, 6)  | 347.5 ( 9, 6)  | 335.4 ( 9, 6)  | 318.4 ( 9, 6)  |
| 150.0 /                    | 300.5 (352, 4) | 337.6 (297, 4) | 341.0 ( 52, 5) | 310.2 ( 52, 5) | 289.6 ( 92, 4) |
| 140.0 /                    | 359.0 (302, 5) | 357.2 (302, 5) | 362.8 (303, 3) | 360.5 (303, 3) | 331.7 (302, 4) |
| 130.0 /                    | 401.0 (344, 5) | 413.6 (344, 5) | 377.7 ( 47, 5) | 338.8 ( 42, 4) | 324.4 ( 42, 4) |
| 120.0 /                    | 379.8 (101, 4) | 363.6 ( 99, 6) | 351.0 ( 99, 6) | 375.6 ( 99, 6) | 357.4 (342, 4) |
| 110.0 /                    | 364.2 (351, 4) | 397.9 (351, 4) | 388.4 (351, 4) | 356.2 (351, 4) | 329.4 ( 95, 1) |
| 100.0 /                    | 251.2 ( 85, 5) | 273.5 ( 85, 5) | 273.5 ( 41, 5) | 265.9 (350, 8) | 252.5 (350, 8) |
| 90.0 /                     | 289.6 ( 85, 5) | 249.8 (355, 6) | 286.8 (355, 6) | 291.7 (355, 6) | 287.8 (355, 6) |
| 80.0 /                     | 303.1 ( 19, 4) | 318.5 ( 15, 4) | 304.7 (347, 5) | 280.5 ( 41, 3) | 274.3 ( 41, 3) |
| 70.0 /                     | 301.4 (347, 5) | 313.9 ( 19, 4) | 311.9 ( 98, 4) | 292.8 ( 98, 4) | 270.0 ( 98, 4) |
| 60.0 /                     | 333.7 ( 8, 4)  | 333.5 ( 6, 4)  | 320.4 ( 85, 6) | 302.2 ( 85, 6) | 277.2 (320, 5) |
| 50.0 /                     | 277.8 ( 57, 5) | 312.3 ( 94, 5) | 317.3 ( 92, 1) | 286.6 ( 99, 5) | 257.4 ( 99, 5) |
| 40.0 /                     | 381.6 (340, 4) | 221.2 (348, 4) | 230.6 (348, 4) | 218.5 (348, 4) | 202.8 (348, 4) |
| 30.0 /                     | 259.9 ( 94, 4) | 301.7 ( 94, 4) | 302.7 ( 94, 4) | 281.1 ( 94, 4) | 257.2 ( 94, 4) |
| 20.0 /                     | 251.3 ( 76, 3) | 294.0 ( 76, 3) | 291.4 ( 80, 2) | 288.0 ( 80, 2) | 278.0 ( 80, 2) |
| 10.0 /                     | 305.4 ( 27, 4) | 332.3 ( 27, 4) | 323.3 ( 27, 4) | 302.2 ( 85, 2) | 284.2 (354, 7) |



2ND HIGH  
3-HR  
SGROUP# 1  
YEAR 1974  
\*\*\* SCGC 2150 -- S02

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\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, -6,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 470.3 AND OCCURRED AT ( 800.0, 360.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 461.4 ( 21, 4) | 470.3 ( 83, 4) | 421.8 ( 50, 5) | 406.1 ( 21, 4) | 363.4 ( 21, 4) |
| 350.0 /                    | 284.9 ( 50, 4) | 283.4 (289, 4) | 291.1 (289, 4) | 278.6 (289, 4) | 263.9 (289, 4) |
| 340.0 /                    | 285.4 ( 25, 5) | 310.7 ( 38, 4) | 332.8 ( 38, 4) | 319.6 ( 38, 4) | 298.5 ( 38, 4) |
| 330.0 /                    | 374.1 (353, 5) | 347.5 (353, 5) | 317.8 ( 87, 5) | 293.5 ( 87, 5) | 271.7 (354, 5) |
| 320.0 /                    | 448.4 ( 92, 5) | 437.2 ( 44, 5) | 422.4 ( 78, 6) | 396.8 ( 92, 5) | 354.9 ( 92, 5) |
| 310.0 /                    | 399.6 ( 85, 4) | 385.4 (103, 5) | 395.6 (103, 6) | 393.9 ( 94, 1) | 384.0 ( 94, 1) |
| 300.0 /                    | 423.1 ( 85, 4) | 407.0 ( 85, 4) | 416.3 (103, 3) | 399.3 (329, 5) | 341.1 (329, 5) |
| 290.0 /                    | 334.9 ( 86, 4) | 359.2 ( 15, 4) | 397.3 ( 15, 4) | 395.8 ( 15, 4) | 385.2 ( 15, 4) |
| 280.0 /                    | 375.5 ( 86, 5) | 386.3 (309, 4) | 401.0 ( 3, 3)  | 390.9 ( 3, 3)  | 370.5 ( 3, 3)  |
| 270.0 /                    | 365.5 (309, 4) | 400.8 ( 67, 3) | 446.2 ( 73, 8) | 435.0 ( 73, 8) | 409.2 ( 73, 8) |
| 260.0 /                    | 371.5 ( 23, 5) | 381.6 ( 23, 5) | 358.8 ( 23, 5) | 321.6 ( 23, 5) | 302.8 (320, 7) |
| 250.0 /                    | 360.5 (365, 4) | 361.7 (333, 4) | 372.4 (318, 6) | 375.3 (318, 6) | 366.9 (318, 6) |
| 240.0 /                    | 307.1 (306, 6) | 369.4 (295, 1) | 400.5 (303, 7) | 398.6 (303, 7) | 387.2 (303, 7) |
| 230.0 /                    | 287.8 (244, 2) | 350.7 (296, 5) | 374.1 (312, 4) | 363.7 (312, 4) | 344.0 (312, 4) |
| 220.0 /                    | 217.6 (305, 5) | 265.6 (305, 5) | 284.9 (305, 5) | 280.0 (305, 5) | 268.5 (305, 5) |
| 210.0 /                    | 198.9 ( 77, 6) | 236.0 (356, 5) | 251.5 (356, 5) | 244.9 (356, 5) | 233.0 (356, 5) |
| 200.0 /                    | 251.3 ( 54, 4) | 247.6 ( 54, 4) | 250.3 (363, 6) | 245.3 (363, 6) | 237.0 (363, 6) |
| 190.0 /                    | 187.6 ( 96, 6) | 218.8 ( 54, 4) | 206.8 (363, 6) | 200.3 (363, 6) | 191.3 (363, 6) |
| 180.0 /                    | 317.0 (332, 5) | 340.1 (332, 5) | 328.7 (332, 5) | 307.7 ( 8, 4)  | 298.7 ( 8, 4)  |
| 170.0 /                    | 210.1 (313, 4) | 210.8 ( 54, 4) | 207.7 (311, 6) | 197.2 (311, 6) | 184.6 (311, 6) |
| 160.0 /                    | 244.6 ( 41, 4) | 247.7 (339, 4) | 247.2 ( 57, 5) | 242.9 (313, 6) | 235.2 (313, 6) |
| 150.0 /                    | 335.0 (338, 4) | 315.0 (339, 4) | 293.8 (343, 3) | 288.3 (291, 4) | 268.6 (326, 5) |
| 140.0 /                    | 268.0 ( 42, 5) | 292.3 (317, 1) | 315.1 ( 56, 5) | 309.2 ( 56, 5) | 297.1 ( 56, 5) |
| 130.0 /                    | 275.9 ( 42, 4) | 329.3 ( 40, 6) | 368.3 ( 40, 6) | 367.7 ( 40, 6) | 357.2 ( 40, 6) |
| 120.0 /                    | 262.6 ( 76, 5) | 292.8 ( 76, 5) | 294.6 ( 76, 5) | 278.4 ( 96, 1) | 267.8 ( 96, 1) |
| 110.0 /                    | 329.5 (312, 4) | 325.5 (316, 4) | 323.2 ( 53, 8) | 323.9 ( 53, 8) | 300.5 (326, 4) |
| 100.0 /                    | 254.0 ( 17, 4) | 294.9 ( 40, 1) | 308.2 ( 40, 1) | 294.1 ( 40, 1) | 262.4 (363, 4) |
| 90.0 /                     | 225.0 ( 88, 6) | 290.4 ( 88, 6) | 297.9 ( 71, 5) | 297.3 ( 88, 6) | 278.8 ( 88, 6) |
| 80.0 /                     | 245.0 ( 71, 4) | 272.3 ( 71, 4) | 268.2 ( 71, 4) | 247.6 ( 71, 4) | 225.7 ( 71, 4) |
| 70.0 /                     | 299.7 (291, 5) | 324.5 ( 89, 5) | 302.7 ( 71, 4) | 271.9 (291, 5) | 245.1 (291, 5) |
| 60.0 /                     | 223.0 ( 81, 4) | 248.7 ( 88, 7) | 276.7 ( 88, 7) | 268.0 ( 89, 4) | 235.0 ( 89, 4) |
| 50.0 /                     | 348.5 ( 39, 5) | 353.4 ( 44, 4) | 310.0 ( 44, 4) | 265.7 ( 39, 4) | 246.4 ( 39, 4) |
| 40.0 /                     | 316.0 ( 95, 4) | 329.5 ( 99, 4) | 313.3 ( 99, 4) | 292.8 ( 85, 2) | 282.3 ( 89, 2) |
| 30.0 /                     | 267.6 (342, 5) | 283.8 (342, 5) | 272.9 (342, 5) | 248.8 (342, 5) | 224.5 (342, 5) |
| 20.0 /                     | 207.1 (353, 4) | 218.9 (342, 5) | 209.5 ( 39, 3) | 206.2 ( 39, 3) | 199.4 ( 39, 3) |
| 10.0 /                     | 408.1 ( 47, 4) | 346.2 ( 47, 4) | 328.5 ( 83, 4) | 272.8 ( 83, 4) | 221.2 ( 83, 4) |

2ND HIGH  
24-HR  
SGROUP# 1  
YEAR 1970  
\*\*\* SCGC 2150 -- S02

\*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, -6,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 194.9 AND OCCURRED AT ( 1000.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 55.6 ( 87, 1)  | 63.7 ( 71, 1)  | 75.2 ( 71, 1)  | 71.8 ( 34, 1)  | 65.2 ( 34, 1)  |
| 350.0 /                    | 86.1 ( 34, 1)  | 101.2 ( 87, 1) | 99.3 ( 87, 1)  | 92.6 ( 87, 1)  | 86.0 ( 87, 1)  |
| 340.0 /                    | 93.8 ( 64, 1)  | 116.9 ( 64, 1) | 124.1 ( 47, 1) | 124.7 ( 47, 1) | 123.1 ( 47, 1) |
| 330.0 /                    | 66.2 ( 95, 1)  | 78.0 ( 33, 1)  | 80.0 ( 33, 1)  | 80.3 (294, 1)  | 79.0 (294, 1)  |
| 320.0 /                    | 103.4 ( 90, 1) | 120.2 ( 90, 1) | 122.3 ( 90, 1) | 115.5 ( 90, 1) | 107.3 ( 90, 1) |
| 310.0 /                    | 102.2 (293, 1) | 124.7 (293, 1) | 130.9 (293, 1) | 126.4 (293, 1) | 124.8 ( 29, 1) |
| 300.0 /                    | 105.7 (164, 1) | 102.8 ( 62, 1) | 108.0 ( 62, 1) | 104.4 ( 62, 1) | 99.5 ( 62, 1)  |
| 290.0 /                    | 89.1 (303, 1)  | 110.2 (303, 1) | 116.4 (303, 1) | 113.1 (303, 1) | 107.7 (303, 1) |
| 280.0 /                    | 112.4 ( 60, 1) | 125.8 ( 60, 1) | 126.3 ( 60, 1) | 118.0 ( 60, 1) | 108.4 ( 60, 1) |
| 270.0 /                    | 140.8 ( 60, 1) | 180.3 ( 60, 1) | 194.9 ( 60, 1) | 189.2 ( 60, 1) | 177.6 (292, 1) |
| 260.0 /                    | 111.6 ( 5, 1)  | 136.3 (344, 1) | 146.2 (344, 1) | 142.6 (344, 1) | 136.4 (344, 1) |
| 250.0 /                    | 111.4 (301, 1) | 138.0 (331, 1) | 156.6 (331, 1) | 158.0 (331, 1) | 154.8 (331, 1) |
| 240.0 /                    | 78.4 ( 37, 1)  | 99.0 ( 37, 1)  | 105.9 ( 37, 1) | 102.6 ( 37, 1) | 97.1 ( 37, 1)  |
| 230.0 /                    | 104.1 (250, 1) | 126.4 (290, 1) | 113.8 (106, 1) | 97.8 (106, 1)  | 90.4 ( 31, 1)  |
| 220.0 /                    | 61.4 ( 38, 1)  | 76.2 ( 38, 1)  | 75.0 (106, 1)  | 68.2 ( 93, 1)  | 63.7 ( 53, 1)  |
| 210.0 /                    | 48.4 (322, 1)  | 49.5 (106, 1)  | 51.2 (106, 1)  | 47.2 ( 58, 1)  | 40.9 ( 58, 1)  |
| 200.0 /                    | 48.8 (322, 1)  | 53.6 (322, 1)  | 53.4 (322, 1)  | 50.4 (322, 1)  | 46.9 (322, 1)  |
| 190.0 /                    | 44.5 ( 75, 1)  | 51.5 ( 2, 1)   | 57.6 ( 97, 1)  | 55.8 ( 97, 1)  | 53.2 ( 97, 1)  |
| 180.0 /                    | 53.9 (300, 1)  | 66.1 (300, 1)  | 69.7 (300, 1)  | 67.5 (300, 1)  | 64.4 (300, 1)  |
| 170.0 /                    | 56.9 ( 52, 1)  | 71.0 ( 52, 1)  | 75.8 ( 52, 1)  | 73.2 ( 52, 1)  | 71.0 ( 24, 1)  |
| 160.0 /                    | 79.1 ( 52, 1)  | 88.7 ( 57, 1)  | 95.0 ( 57, 1)  | 93.5 ( 57, 1)  | 90.4 ( 57, 1)  |
| 150.0 /                    | 63.7 ( 52, 1)  | 78.3 ( 52, 1)  | 83.2 ( 52, 1)  | 80.6 ( 52, 1)  | 76.6 ( 52, 1)  |
| 140.0 /                    | 84.8 (361, 1)  | 107.6 (309, 1) | 117.7 (309, 1) | 115.6 (309, 1) | 110.7 (309, 1) |
| 130.0 /                    | 109.9 ( 7, 1)  | 140.2 ( 7, 1)  | 147.9 (328, 1) | 139.9 (328, 1) | 130.3 ( 8, 1)  |
| 120.0 /                    | 72.2 (315, 1)  | 85.0 ( 20, 1)  | 89.2 ( 20, 1)  | 85.4 ( 20, 1)  | 80.2 ( 20, 1)  |
| 110.0 /                    | 56.1 ( 25, 1)  | 116.2 ( 20, 1) | 122.1 ( 41, 1) | 117.5 ( 41, 1) | 110.3 ( 41, 1) |
| 100.0 /                    | 74.4 ( 72, 1)  | 90.8 ( 72, 1)  | 95.1 ( 72, 1)  | 90.6 ( 72, 1)  | 84.7 ( 72, 1)  |
| 90.0 /                     | 40.8 ( 12, 1)  | 55.0 (306, 1)  | 51.3 (103, 1)  | 51.4 (103, 1)  | 49.2 (103, 1)  |
| 80.0 /                     | 57.7 ( 1, 1)   | 61.4 ( 48, 1)  | 65.1 ( 48, 1)  | 63.4 ( 68, 1)  | 60.5 ( 68, 1)  |
| 70.0 /                     | 53.6 ( 1, 1)   | 59.2 ( 30, 1)  | 60.8 ( 30, 1)  | 57.3 ( 30, 1)  | 53.1 ( 30, 1)  |
| 60.0 /                     | 73.0 (359, 1)  | 83.0 (359, 1)  | 84.4 (359, 1)  | 80.8 (359, 1)  | 73.9 (327, 1)  |
| 50.0 /                     | 67.8 ( 56, 1)  | 84.6 ( 56, 1)  | 79.7 (297, 1)  | 71.3 (297, 1)  | 64.9 (297, 1)  |
| 40.0 /                     | 46.1 ( 1, 1)   | 47.0 ( 92, 1)  | 46.9 ( 92, 1)  | 44.8 (359, 1)  | 40.7 ( 92, 1)  |
| 30.0 /                     | 52.6 ( 9, 1)   | 48.3 ( 92, 1)  | 42.3 (102, 1)  | 41.2 (102, 1)  | 39.2 (102, 1)  |
| 20.0 /                     | 44.2 ( 81, 1)  | 52.5 ( 92, 1)  | 42.8 (365, 1)  | 43.5 (102, 1)  | 43.7 (102, 1)  |
| 10.0 /                     | 34.4 ( 12, 1)  | 38.1 ( 17, 1)  | 41.4 ( 81, 1)  | 37.4 ( 81, 1)  | 33.4 ( 34, 1)  |

2ND HIGH  
24-HR  
SGROUP# 1  
YEAR 1971  
\*\*\* SCGC 2150 -- 502

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, -G,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 214.2 AND OCCURRED AT ( 1000.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 43.3 ( 95, 1)  | 52.9 ( 95, 1)  | 54.7 ( 95, 1)  | 51.9 ( 95, 1)  | 48.5 (297, 1)  |
| 350.0 /                    | 62.1 ( 38, 1)  | 75.4 ( 38, 1)  | 80.1 ( 38, 1)  | 78.7 ( 38, 1)  | 76.5 ( 38, 1)  |
| 340.0 /                    | 82.5 ( 38, 1)  | 103.6 ( 38, 1) | 111.4 ( 38, 1) | 108.5 ( 38, 1) | 103.2 ( 38, 1) |
| 330.0 /                    | 86.1 ( 36, 1)  | 107.4 ( 36, 1) | 114.7 ( 36, 1) | 111.7 ( 36, 1) | 106.6 ( 36, 1) |
| 320.0 /                    | 100.1 ( 36, 1) | 124.2 ( 36, 1) | 130.6 ( 36, 1) | 125.7 ( 36, 1) | 118.8 ( 36, 1) |
| 310.0 /                    | 112.1 ( 4, 1)  | 140.3 ( 92, 1) | 149.5 ( 92, 1) | 146.7 ( 92, 1) | 141.6 ( 92, 1) |
| 300.0 /                    | 69.8 (340, 1)  | 82.1 (348, 1)  | 89.0 (348, 1)  | 89.0 (349, 1)  | 89.0 (349, 1)  |
| 290.0 /                    | 71.4 (348, 1)  | 88.7 (348, 1)  | 94.0 (348, 1)  | 91.0 (348, 1)  | 86.5 (348, 1)  |
| 280.0 /                    | 84.3 (289, 1)  | 104.7 (323, 1) | 111.1 (323, 1) | 107.6 (323, 1) | 102.1 (323, 1) |
| 270.0 /                    | 126.4 ( 3, 1)  | 158.5 ( 34, 1) | 168.9 ( 34, 1) | 162.3 ( 34, 1) | 151.5 ( 34, 1) |
| 260.0 /                    | 174.2 (319, 1) | 206.6 (319, 1) | 214.2 (319, 1) | 203.0 (319, 1) | 187.8 (319, 1) |
| 250.0 /                    | 141.1 (310, 1) | 178.3 (310, 1) | 191.2 (310, 1) | 185.5 (310, 1) | 175.2 (310, 1) |
| 240.0 /                    | 156.9 (309, 1) | 199.0 (309, 1) | 205.8 (357, 1) | 185.5 (357, 1) | 165.0 (357, 1) |
| 230.0 /                    | 95.2 (357, 1)  | 109.1 (357, 1) | 107.0 (357, 1) | 97.8 (100, 1)  | 93.4 (100, 1)  |
| 220.0 /                    | 95.5 (100, 1)  | 100.4 (100, 1) | 94.8 (100, 1)  | 84.9 (100, 1)  | 75.3 (100, 1)  |
| 210.0 /                    | 57.4 ( 80, 1)  | 58.9 (356, 1)  | 64.0 (356, 1)  | 60.9 (100, 1)  | 55.0 (100, 1)  |
| 200.0 /                    | 53.5 (352, 1)  | 59.7 ( 86, 1)  | 59.4 ( 86, 1)  | 55.3 ( 86, 1)  | 52.3 ( 93, 1)  |
| 190.0 /                    | 57.8 (352, 1)  | 67.7 ( 76, 1)  | 67.4 ( 76, 1)  | 63.1 ( 76, 1)  | 58.3 ( 76, 1)  |
| 180.0 /                    | 60.1 (352, 1)  | 70.2 (352, 1)  | 72.0 (352, 1)  | 66.2 (352, 1)  | 63.5 (352, 1)  |
| 170.0 /                    | 67.6 (329, 1)  | 79.8 (329, 1)  | 82.7 (329, 1)  | 78.5 (329, 1)  | 73.1 (329, 1)  |
| 160.0 /                    | 64.8 (300, 1)  | 67.2 (314, 1)  | 70.7 (314, 1)  | 68.2 (314, 1)  | 64.6 (314, 1)  |
| 150.0 /                    | 50.5 ( 98, 1)  | 59.6 (317, 1)  | 64.1 (317, 1)  | 65.0 (317, 1)  | 60.7 (317, 1)  |
| 140.0 /                    | 78.9 ( 89, 1)  | 90.5 ( 85, 1)  | 107.3 ( 16, 1) | 105.6 ( 16, 1) | 101.6 ( 16, 1) |
| 130.0 /                    | 82.4 ( 40, 1)  | 106.0 ( 40, 1) | 116.4 ( 40, 1) | 115.6 ( 40, 1) | 112.5 ( 40, 1) |
| 120.0 /                    | 85.1 ( 66, 1)  | 106.9 ( 66, 1) | 116.5 ( 66, 1) | 114.2 ( 66, 1) | 109.2 ( 66, 1) |
| 110.0 /                    | 60.0 ( 75, 1)  | 66.0 ( 75, 1)  | 66.4 ( 75, 1)  | 66.4 ( 54, 1)  | 66.8 ( 54, 1)  |
| 100.0 /                    | 51.4 (298, 1)  | 56.7 ( 54, 1)  | 55.0 ( 44, 1)  | 53.4 ( 44, 1)  | 50.6 ( 44, 1)  |
| 90.0 /                     | 56.0 ( 96, 1)  | 70.6 ( 15, 1)  | 75.1 ( 15, 1)  | 72.7 ( 15, 1)  | 69.3 ( 15, 1)  |
| 80.0 /                     | 60.3 ( 44, 1)  | 69.0 ( 44, 1)  | 68.7 ( 44, 1)  | 63.3 ( 44, 1)  | 57.8 ( 44, 1)  |
| 70.0 /                     | 74.5 ( 15, 1)  | 88.0 ( 82, 1)  | 79.7 ( 82, 1)  | 70.1 ( 82, 1)  | 61.1 ( 82, 1)  |
| 60.0 /                     | 71.6 (321, 1)  | 71.4 (331, 1)  | 71.3 ( 39, 1)  | 68.5 ( 39, 1)  | 60.4 ( 75, 1)  |
| 50.0 /                     | 55.7 ( 75, 1)  | 58.2 ( 75, 1)  | 56.8 (324, 1)  | 50.8 (324, 1)  | 45.5 (324, 1)  |
| 40.0 /                     | 34.9 ( 46, 1)  | 38.5 ( 95, 1)  | 40.6 ( 95, 1)  | 39.0 ( 95, 1)  | 36.7 ( 95, 1)  |
| 30.0 /                     | 61.3 ( 12, 1)  | 60.5 ( 85, 1)  | 53.3 ( 85, 1)  | 46.6 ( 18, 1)  | 47.1 ( 18, 1)  |
| 20.0 /                     | 45.0 ( 66, 1)  | 58.2 ( 66, 1)  | 62.6 ( 66, 1)  | 61.3 ( 66, 1)  | 59.5 ( 66, 1)  |
| 10.0 /                     | 36.3 ( 37, 1)  | 52.1 ( 37, 1)  | 59.1 ( 37, 1)  | 59.1 ( 37, 1)  | 57.5 ( 37, 1)  |

2ND HIGH  
24-HR  
SGROUP# 1  
YEAR 1972  
\*\*\* SCGC 2150 -- SC2

\*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, -6,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 202.9 AND OCCURRED AT ( 1000.0, 250.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 87.7 (356, 1)  | 106.1 (330, 1) | 111.0 (330, 1) | 105.7 (330, 1) | 98.8 (330, 1)  |
| 350.0 /                    | 67.9 (330, 1)  | 84.1 (330, 1)  | 87.4 (330, 1)  | 83.1 (330, 1)  | 77.8 (330, 1)  |
| 340.0 /                    | 62.6 (341, 1)  | 77.5 (356, 1)  | 81.6 (356, 1)  | 76.6 (356, 1)  | 70.0 (356, 1)  |
| 330.0 /                    | 85.6 ( 62, 1)  | 101.9 (301, 1) | 103.2 ( 13, 1) | 104.1 (341, 1) | 102.0 ( 62, 1) |
| 320.0 /                    | 105.7 (366, 1) | 123.0 (366, 1) | 126.2 (366, 1) | 120.5 (366, 1) | 113.2 (366, 1) |
| 310.0 /                    | 117.1 (366, 1) | 131.7 ( 95, 1) | 128.6 (349, 1) | 125.2 (349, 1) | 119.5 (349, 1) |
| 300.0 /                    | 132.7 (349, 1) | 154.0 (349, 1) | 157.4 (349, 1) | 150.2 ( 95, 1) | 136.6 ( 95, 1) |
| 290.0 /                    | 83.2 (349, 1)  | 104.0 (348, 1) | 110.9 (307, 1) | 114.2 (307, 1) | 114.3 (307, 1) |
| 280.0 /                    | 110.0 ( 81, 1) | 120.0 (343, 1) | 122.7 (343, 1) | 122.5 ( 81, 1) | 113.1 ( 81, 1) |
| 270.0 /                    | 117.7 (347, 1) | 148.2 (347, 1) | 160.3 (347, 1) | 157.3 (347, 1) | 150.0 (347, 1) |
| 260.0 /                    | 102.2 (345, 1) | 131.5 ( 18, 1) | 145.8 ( 18, 1) | 145.4 ( 18, 1) | 141.3 ( 18, 1) |
| 250.0 /                    | 159.6 (306, 1) | 194.6 (101, 1) | 202.9 (101, 1) | 193.1 (101, 1) | 179.7 (101, 1) |
| 240.0 /                    | 114.9 (100, 1) | 139.0 (100, 1) | 143.7 (100, 1) | 134.8 (100, 1) | 123.7 (306, 1) |
| 230.0 /                    | 90.4 (100, 1)  | 109.5 (100, 1) | 114.9 ( 72, 1) | 112.4 ( 72, 1) | 107.1 ( 72, 1) |
| 220.0 /                    | 64.0 ( 70, 1)  | 76.9 ( 70, 1)  | 80.8 ( 70, 1)  | 77.7 ( 70, 1)  | 73.2 ( 70, 1)  |
| 210.0 /                    | 54.5 ( 72, 1)  | 69.5 ( 72, 1)  | 75.3 ( 72, 1)  | 73.8 ( 72, 1)  | 70.5 ( 72, 1)  |
| 200.0 /                    | 75.5 ( 69, 1)  | 90.6 ( 69, 1)  | 93.9 ( 69, 1)  | 88.4 ( 69, 1)  | 81.3 ( 69, 1)  |
| 190.0 /                    | 57.4 ( 69, 1)  | 62.4 ( 59, 1)  | 60.1 ( 59, 1)  | 57.3 ( 66, 1)  | 54.4 ( 66, 1)  |
| 180.0 /                    | 54.4 ( 16, 1)  | 63.5 ( 7, 1)   | 65.7 ( 7, 1)   | 61.9 ( 7, 1)   | 57.1 ( 7, 1)   |
| 170.0 /                    | 79.0 (351, 1)  | 95.6 (351, 1)  | 98.1 (351, 1)  | 91.6 (351, 1)  | 83.9 (351, 1)  |
| 160.0 /                    | 71.1 (336, 1)  | 88.8 ( 16, 1)  | 95.3 ( 16, 1)  | 91.9 ( 16, 1)  | 86.4 ( 16, 1)  |
| 150.0 /                    | 65.2 ( 16, 1)  | 77.3 ( 16, 1)  | 78.7 ( 16, 1)  | 73.4 ( 16, 1)  | 67.3 ( 16, 1)  |
| 140.0 /                    | 98.1 (322, 1)  | 104.7 ( 36, 1) | 116.4 ( 36, 1) | 116.1 ( 36, 1) | 113.1 ( 36, 1) |
| 130.0 /                    | 95.1 (328, 1)  | 120.5 (327, 1) | 131.6 (327, 1) | 129.2 (327, 1) | 124.0 (327, 1) |
| 120.0 /                    | 84.0 (361, 1)  | 95.4 (321, 1)  | 99.2 (321, 1)  | 95.3 (321, 1)  | 90.5 (321, 1)  |
| 110.0 /                    | 57.9 ( 50, 1)  | 67.7 (361, 1)  | 72.1 (361, 1)  | 70.8 (361, 1)  | 68.9 (361, 1)  |
| 100.0 /                    | 82.4 ( 44, 1)  | 105.5 ( 44, 1) | 112.9 ( 44, 1) | 106.7 ( 50, 1) | 97.8 ( 50, 1)  |
| 90.0 /                     | 52.4 ( 44, 1)  | 59.7 (361, 1)  | 62.2 (361, 1)  | 58.9 ( 44, 1)  | 55.0 ( 44, 1)  |
| 80.0 /                     | 31.0 ( 49, 1)  | 37.4 ( 88, 1)  | 35.6 ( 50, 1)  | 34.1 ( 50, 1)  | 32.6 (325, 1)  |
| 70.0 /                     | 36.2 ( 48, 1)  | 46.0 ( 48, 1)  | 48.5 ( 48, 1)  | 46.7 ( 48, 1)  | 44.3 ( 48, 1)  |
| 60.0 /                     | 77.5 ( 85, 1)  | 93.9 ( 85, 1)  | 97.5 ( 85, 1)  | 92.9 ( 85, 1)  | 87.4 ( 85, 1)  |
| 50.0 /                     | 55.5 ( 39, 1)  | 79.8 ( 6, 1)   | 75.3 ( 47, 1)  | 73.0 ( 47, 1)  | 69.6 ( 47, 1)  |
| 40.0 /                     | 65.0 ( 39, 1)  | 83.9 ( 34, 1)  | 76.1 ( 6, 1)   | 66.8 ( 6, 1)   | 62.2 ( 82, 1)  |
| 30.0 /                     | 58.5 ( 45, 1)  | 58.6 ( 85, 1)  | 56.0 ( 33, 1)  | 55.7 ( 33, 1)  | 54.7 ( 5, 1)   |
| 20.0 /                     | 49.5 ( 85, 1)  | 52.8 ( 63, 1)  | 56.1 (331, 1)  | 54.7 (331, 1)  | 52.3 (331, 1)  |
| 10.0 /                     | 44.7 (357, 1)  | 57.5 ( 96, 1)  | 59.8 ( 96, 1)  | 58.3 ( 96, 1)  | 55.6 ( 96, 1)  |

2ND HIGH  
24-HR  
SGROUP# 1  
YEAR 1973  
\*\*\* SCCC 2150 -- 500

\*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, -6,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 191.6 AND OCCURRED AT ( 1000.0, 220.0) \*

| DIPECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 42.1 (304, 1)  | 47.2 ( 76, 1)  | 52.2 ( 76, 1)  | 51.9 ( 76, 1)  | 50.6 ( 76, 1)  |
| 350.0 /                    | 62.9 ( 91, 1)  | 77.4 ( 91, 1)  | 81.9 ( 91, 1)  | 79.6 ( 91, 1)  | 76.0 ( 91, 1)  |
| 340.0 /                    | 112.6 ( 97, 1) | 129.1 ( 97, 1) | 131.9 ( 97, 1) | 124.6 ( 97, 1) | 115.6 ( 97, 1) |
| 330.0 /                    | 97.8 (361, 1)  | 116.1 ( 84, 1) | 117.4 ( 93, 1) | 113.0 ( 93, 1) | 106.4 ( 93, 1) |
| 320.0 /                    | 126.1 ( 21, 1) | 146.4 ( 21, 1) | 150.7 ( 21, 1) | 143.8 ( 21, 1) | 134.7 ( 21, 1) |
| 310.0 /                    | 132.3 (360, 1) | 163.8 (360, 1) | 172.9 (360, 1) | 166.4 (360, 1) | 156.6 (360, 1) |
| 300.0 /                    | 109.8 ( 32, 1) | 129.5 ( 70, 1) | 147.3 ( 70, 1) | 153.3 ( 70, 1) | 156.8 ( 70, 1) |
| 290.0 /                    | 127.9 ( 65, 1) | 173.4 ( 65, 1) | 189.5 ( 65, 1) | 187.0 ( 65, 1) | 181.1 ( 65, 1) |
| 280.0 /                    | 163.8 ( 64, 1) | 100.7 ( 72, 1) | 97.6 ( 72, 1)  | 90.8 ( 72, 1)  | 84.0 ( 72, 1)  |
| 270.0 /                    | 121.5 ( 17, 1) | 138.7 ( 17, 1) | 152.1 ( 64, 1) | 139.7 ( 64, 1) | 126.9 ( 64, 1) |
| 260.0 /                    | 131.2 (317, 1) | 157.1 (317, 1) | 166.2 (317, 1) | 161.1 (317, 1) | 152.5 (317, 1) |
| 250.0 /                    | 117.8 (335, 1) | 149.4 (335, 1) | 160.7 (335, 1) | 157.5 (335, 1) | 150.7 (335, 1) |
| 240.0 /                    | 115.2 (316, 1) | 138.8 (315, 1) | 145.6 (315, 1) | 139.0 (315, 1) | 129.3 (315, 1) |
| 230.0 /                    | 83.8 (315, 1)  | 98.4 (315, 1)  | 102.0 (334, 1) | 100.5 (334, 1) | 96.2 (334, 1)  |
| 220.0 /                    | 156.3 (295, 1) | 185.5 (295, 1) | 191.6 (295, 1) | 180.7 (295, 1) | 166.7 (295, 1) |
| 210.0 /                    | 80.7 (295, 1)  | 102.9 (295, 1) | 104.5 (295, 1) | 97.7 (295, 1)  | 89.7 (295, 1)  |
| 200.0 /                    | 56.7 (295, 1)  | 66.9 (295, 1)  | 69.5 (295, 1)  | 66.5 (295, 1)  | 62.4 (295, 1)  |
| 190.0 /                    | 44.0 (259, 1)  | 48.2 (352, 1)  | 48.4 (352, 1)  | 45.5 (352, 1)  | 41.8 (352, 1)  |
| 180.0 /                    | 54.4 (352, 1)  | 57.9 (352, 1)  | 56.7 (352, 1)  | 56.7 ( 50, 1)  | 55.6 ( 50, 1)  |
| 170.0 /                    | 50.2 ( 15, 1)  | 62.4 ( 50, 1)  | 70.5 ( 50, 1)  | 70.0 ( 50, 1)  | 67.8 ( 50, 1)  |
| 160.0 /                    | 58.3 ( 15, 1)  | 71.4 ( 50, 1)  | 84.8 ( 50, 1)  | 86.4 ( 50, 1)  | 85.0 ( 50, 1)  |
| 150.0 /                    | 61.0 ( 52, 1)  | 79.8 ( 50, 1)  | 95.9 ( 50, 1)  | 98.9 ( 50, 1)  | 98.1 ( 50, 1)  |
| 140.0 /                    | 107.1 ( 14, 1) | 110.5 ( 47, 1) | 119.2 ( 48, 1) | 115.7 ( 14, 1) | 108.0 ( 14, 1) |
| 130.0 /                    | 103.4 ( 42, 1) | 136.4 (343, 1) | 141.8 (343, 1) | 136.3 (343, 1) | 128.6 (343, 1) |
| 120.0 /                    | 78.5 ( 42, 1)  | 105.1 ( 12, 1) | 115.1 ( 12, 1) | 112.4 ( 12, 1) | 106.9 ( 12, 1) |
| 110.0 /                    | 76.6 ( 80, 1)  | 97.2 ( 29, 1)  | 101.1 ( 29, 1) | 96.3 ( 29, 1)  | 90.1 ( 29, 1)  |
| 100.0 /                    | 56.1 (350, 1)  | 75.9 (350, 1)  | 83.9 (350, 1)  | 82.5 (350, 1)  | 78.9 (350, 1)  |
| 90.0 /                     | 47.8 ( 85, 1)  | 59.2 (302, 1)  | 65.4 (302, 1)  | 65.5 (302, 1)  | 64.3 (302, 1)  |
| 80.0 /                     | 45.1 ( 19, 1)  | 52.3 ( 85, 1)  | 54.3 ( 85, 1)  | 51.7 ( 85, 1)  | 48.4 ( 85, 1)  |
| 70.0 /                     | 68.6 ( 19, 1)  | 64.7 ( 19, 1)  | 63.8 ( 19, 1)  | 56.5 (320, 1)  | 53.6 ( 19, 1)  |
| 60.0 /                     | 43.3 ( 85, 1)  | 52.8 ( 85, 1)  | 55.5 ( 85, 1)  | 53.9 ( 85, 1)  | 51.8 ( 85, 1)  |
| 50.0 /                     | 48.1 (320, 1)  | 52.4 ( 94, 1)  | 52.3 ( 94, 1)  | 48.4 ( 94, 1)  | 42.4 ( 99, 1)  |
| 40.0 /                     | 51.2 (348, 1)  | 63.3 (348, 1)  | 66.3 (348, 1)  | 63.4 (348, 1)  | 59.6 (348, 1)  |
| 30.0 /                     | 47.2 (350, 1)  | 56.2 (350, 1)  | 57.8 ( 80, 1)  | 56.3 ( 80, 1)  | 53.4 ( 80, 1)  |
| 20.0 /                     | 45.0 (305, 1)  | 60.4 (304, 1)  | 64.1 (305, 1)  | 62.2 (305, 1)  | 59.4 (305, 1)  |
| 10.0 /                     | 38.6 ( 23, 1)  | 46.5 ( 27, 1)  | 45.7 ( 27, 1)  | 43.2 ( 27, 1)  | 41.0 ( 27, 1)  |

2ND HIGH  
24-HR  
SGROUP# 1  
YEAR 1974  
\*\*\* SCGC 2150 -- S02

\*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, -6,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 268.0 AND OCCURRED AT ( 1200.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 58.2 ( 21, 1)  | 71.7 ( 53, 1)  | 77.3 ( 50, 1)  | 77.1 ( 50, 1)  | 75.7 ( 50, 1)  |
| 350.0 /                    | 60.2 ( 38, 1)  | 68.6 ( 30, 1)  | 71.2 ( 50, 1)  | 68.4 ( 50, 1)  | 64.6 ( 50, 1)  |
| 340.0 /                    | 79.5 ( 30, 1)  | 98.2 (349, 1)  | 104.5 (349, 1) | 101.3 (349, 1) | 96.5 (349, 1)  |
| 330.0 /                    | 86.9 ( 92, 1)  | 95.0 ( 92, 1)  | 94.4 ( 52, 1)  | 89.6 (354, 1)  | 87.2 (354, 1)  |
| 320.0 /                    | 115.2 ( 94, 1) | 121.3 ( 93, 1) | 115.6 ( 93, 1) | 105.0 ( 93, 1) | 94.9 ( 93, 1)  |
| 310.0 /                    | 190.1 ( 85, 1) | 110.1 ( 94, 1) | 121.6 ( 94, 1) | 121.2 ( 94, 1) | 117.8 ( 94, 1) |
| 300.0 /                    | 103.9 (104, 1) | 116.9 (104, 1) | 118.3 (104, 1) | 112.0 (104, 1) | 104.5 (104, 1) |
| 290.0 /                    | 50.1 ( 65, 1)  | 114.1 (358, 1) | 120.0 (102, 1) | 113.7 (102, 1) | 105.5 (102, 1) |
| 280.0 /                    | 93.4 ( 74, 1)  | 103.7 ( 74, 1) | 104.5 (321, 1) | 101.9 (321, 1) | 97.1 (321, 1)  |
| 270.0 /                    | 145.2 (357, 1) | 186.5 (357, 1) | 206.5 (357, 1) | 208.0 (357, 1) | 193.0 ( 74, 1) |
| 260.0 /                    | 116.9 (321, 1) | 144.7 (321, 1) | 154.1 (321, 1) | 149.8 (321, 1) | 142.2 (321, 1) |
| 250.0 /                    | 114.6 (101, 1) | 135.7 ( 65, 1) | 148.9 ( 65, 1) | 147.4 ( 65, 1) | 141.6 ( 65, 1) |
| 240.0 /                    | 161.4 (294, 1) | 187.4 (294, 1) | 189.1 (294, 1) | 175.4 (294, 1) | 160.2 (306, 1) |
| 230.0 /                    | 130.5 (314, 1) | 159.0 (314, 1) | 168.9 (314, 1) | 163.5 (314, 1) | 154.3 (314, 1) |
| 220.0 /                    | 50.8 (296, 1)  | 60.2 (296, 1)  | 64.0 (305, 1)  | 63.9 (305, 1)  | 62.6 (305, 1)  |
| 210.0 /                    | 45.6 ( 77, 1)  | 51.6 ( 77, 1)  | 52.3 ( 77, 1)  | 49.7 ( 77, 1)  | 46.6 ( 77, 1)  |
| 200.0 /                    | 47.6 ( 12, 1)  | 52.5 ( 54, 1)  | 47.1 ( 54, 1)  | 43.4 (364, 1)  | 42.0 (364, 1)  |
| 190.0 /                    | 30.2 (363, 1)  | 38.5 (363, 1)  | 35.3 ( 54, 1)  | 33.8 ( 96, 1)  | 32.9 ( 96, 1)  |
| 180.0 /                    | 70.4 (332, 1)  | 79.7 (332, 1)  | 80.3 (332, 1)  | 75.3 (332, 1)  | 69.5 (332, 1)  |
| 170.0 /                    | 48.2 (311, 1)  | 57.9 (311, 1)  | 61.4 (311, 1)  | 59.9 (311, 1)  | 57.2 (311, 1)  |
| 160.0 /                    | 56.2 (325, 1)  | 69.5 (325, 1)  | 73.8 (325, 1)  | 70.8 (325, 1)  | 66.1 (325, 1)  |
| 150.0 /                    | 67.9 (339, 1)  | 69.7 ( 41, 1)  | 73.0 (343, 1)  | 74.7 (343, 1)  | 74.4 ( 96, 1)  |
| 140.0 /                    | 86.6 ( 57, 1)  | 112.1 ( 57, 1) | 121.5 ( 57, 1) | 118.2 ( 57, 1) | 112.2 ( 57, 1) |
| 130.0 /                    | 94.6 (338, 1)  | 98.4 (338, 1)  | 103.6 ( 41, 1) | 101.5 ( 41, 1) | 97.4 ( 40, 1)  |
| 120.0 /                    | 57.6 ( 76, 1)  | 64.4 ( 96, 1)  | 67.7 ( 96, 1)  | 65.1 ( 96, 1)  | 61.4 ( 96, 1)  |
| 110.0 /                    | 51.5 ( 17, 1)  | 57.9 (336, 1)  | 57.9 (335, 1)  | 54.3 (335, 1)  | 50.2 (335, 1)  |
| 100.0 /                    | 45.4 (361, 1)  | 49.5 (363, 1)  | 48.6 ( 55, 1)  | 49.4 ( 55, 1)  | 47.8 ( 55, 1)  |
| 90.0 /                     | 55.4 ( 55, 1)  | 69.2 (316, 1)  | 70.6 (316, 1)  | 68.2 (316, 1)  | 65.1 (316, 1)  |
| 80.0 /                     | 75.0 ( 89, 1)  | 80.9 ( 89, 1)  | 78.0 ( 89, 1)  | 70.6 ( 89, 1)  | 63.5 ( 89, 1)  |
| 70.0 /                     | 63.8 ( 75, 1)  | 83.2 ( 75, 1)  | 89.6 ( 75, 1)  | 87.1 ( 75, 1)  | 83.2 ( 75, 1)  |
| 60.0 /                     | 89.2 ( 88, 1)  | 96.4 ( 89, 1)  | 92.6 ( 89, 1)  | 83.5 ( 89, 1)  | 74.7 ( 89, 1)  |
| 50.0 /                     | 54.2 ( 88, 1)  | 53.3 ( 59, 1)  | 53.0 ( 89, 1)  | 49.1 ( 89, 1)  | 45.4 ( 89, 1)  |
| 40.0 /                     | 68.4 ( 92, 1)  | 70.0 ( 47, 1)  | 73.1 ( 47, 1)  | 69.4 ( 47, 1)  | 64.6 ( 47, 1)  |
| 30.0 /                     | 36.9 (342, 1)  | 38.6 (342, 1)  | 38.2 ( 89, 1)  | 36.1 ( 88, 1)  | 33.9 ( 88, 1)  |
| 20.0 /                     | 27.1 ( 73, 1)  | 30.8 ( 34, 1)  | 33.5 ( 34, 1)  | 34.2 ( 34, 1)  | 34.6 ( 34, 1)  |
| 10.0 /                     | 49.4 ( 47, 1)  | 57.9 ( 47, 1)  | 59.4 ( 47, 1)  | 53.6 ( 75, 1)  | 51.6 ( 75, 1)  |

183-DAY  
 183 DAYS  
 SGROUP# 2  
 YEAR 1970  
 \*\*\* SCCC 2150 -- 502

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 28.0 AND OCCURRED AT ( 800.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |      |      |      |      |      |
|---------|------|------|------|------|------|
| 360.0 / | 6.4  | 8.1  | 8.6  | 8.4  | 8.1  |
| 350.0 / | 7.6  | 9.1  | 9.3  | 8.7  | 8.1  |
| 340.0 / | 13.5 | 16.2 | 16.3 | 15.2 | 14.0 |
| 330.0 / | 12.0 | 13.8 | 13.6 | 12.5 | 11.4 |
| 320.0 / | 16.2 | 19.0 | 18.8 | 17.3 | 15.7 |
| 310.0 / | 16.0 | 19.5 | 18.4 | 16.9 | 15.5 |
| 300.0 / | 15.1 | 17.2 | 16.9 | 15.6 | 14.2 |
| 290.0 / | 15.0 | 17.5 | 17.3 | 15.9 | 14.5 |
| 280.0 / | 14.7 | 16.2 | 15.5 | 13.9 | 12.5 |
| 270.0 / | 22.6 | 25.9 | 25.2 | 22.8 | 20.4 |
| 260.0 / | 24.4 | 28.0 | 27.2 | 24.5 | 21.8 |
| 250.0 / | 21.7 | 25.7 | 25.5 | 23.3 | 21.0 |
| 240.0 / | 13.7 | 15.3 | 14.7 | 13.2 | 11.8 |
| 230.0 / | 13.0 | 14.2 | 13.5 | 12.0 | 10.7 |
| 220.0 / | 10.0 | 10.7 | 10.1 | 9.0  | 8.0  |
| 210.0 / | 7.0  | 7.4  | 6.9  | 6.1  | 5.3  |
| 200.0 / | 6.0  | 6.5  | 6.2  | 5.5  | 4.9  |
| 190.0 / | 6.0  | 7.5  | 7.4  | 6.7  | 6.1  |
| 180.0 / | 8.9  | 10.1 | 9.7  | 8.8  | 7.9  |
| 170.0 / | 12.0 | 13.2 | 12.5 | 11.2 | 10.0 |
| 160.0 / | 15.6 | 17.5 | 17.1 | 15.7 | 14.4 |
| 150.0 / | 16.7 | 19.2 | 19.1 | 17.7 | 16.3 |
| 140.0 / | 21.5 | 25.2 | 25.3 | 23.7 | 22.0 |
| 130.0 / | 22.3 | 25.5 | 25.3 | 23.4 | 21.5 |
| 120.0 / | 18.0 | 20.1 | 19.7 | 18.1 | 16.7 |
| 110.0 / | 15.6 | 17.8 | 17.6 | 16.3 | 15.0 |
| 100.0 / | 9.3  | 10.5 | 10.4 | 9.7  | 9.0  |
| 90.0 /  | 6.6  | 8.0  | 8.6  | 8.4  | 8.2  |
| 80.0 /  | 5.5  | 6.2  | 6.2  | 6.0  | 5.7  |
| 70.0 /  | 6.8  | 7.8  | 8.0  | 7.7  | 7.4  |
| 60.0 /  | 9.2  | 10.4 | 10.4 | 9.7  | 9.1  |
| 50.0 /  | 8.6  | 9.5  | 9.2  | 8.4  | 7.7  |
| 40.0 /  | 6.4  | 7.0  | 6.9  | 6.4  | 5.9  |
| 30.0 /  | 4.0  | 5.3  | 5.1  | 4.7  | 4.2  |
| 20.0 /  | 4.5  | 5.2  | 5.3  | 5.1  | 4.8  |
| 10.0 /  | 4.8  | 5.5  | 5.5  | 5.2  | 4.8  |

20

•N1-DAY  
 183 DAYS  
 SGRUP# 2  
 YEAR 1971  
 \*\*\* SCCC 2150 -- SGC

\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 46.4 AND OCCURRED AT ( 800.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |       |        |        |        |
|----------------------------|----------------|-------|--------|--------|--------|
|                            | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0 |
| 360.0 /                    | 4.7            | 5.8   | 6.2    | 6.0    | 5.9    |
| 350.0 /                    | 7.8            | 9.7   | 10.0   | 9.5    | 8.9    |
| 340.0 /                    | 11.4           | 14.1  | 14.3   | 13.4   | 12.5   |
| 330.0 /                    | 15.2           | 17.9  | 17.8   | 16.6   | 15.3   |
| 320.0 /                    | 19.4           | 23.4  | 23.5   | 21.8   | 20.0   |
| 310.0 /                    | 18.6           | 22.5  | 22.8   | 21.2   | 19.5   |
| 300.0 /                    | 15.3           | 17.1  | 16.6   | 15.1   | 13.7   |
| 290.0 /                    | 16.5           | 18.9  | 18.7   | 17.2   | 15.8   |
| 280.0 /                    | 20.4           | 23.1  | 22.5   | 20.5   | 18.6   |
| 270.0 /                    | 27.4           | 30.9  | 30.0   | 27.1   | 24.4   |
| 260.0 /                    | 35.8           | 40.4  | 38.6   | 34.6   | 30.7   |
| 250.0 /                    | 33.5           | 37.3  | 35.4   | 31.4   | 27.8   |
| 240.0 /                    | 25.0           | 27.9  | 26.7   | 24.0   | 21.3   |
| 230.0 /                    | 15.7           | 17.1  | 16.1   | 14.4   | 12.8   |
| 220.0 /                    | 10.8           | 11.8  | 11.1   | 9.9    | 8.7    |
| 210.0 /                    | 7.0            | 7.7   | 7.4    | 6.7    | 6.0    |
| 200.0 /                    | 5.6            | 6.2   | 5.8    | 5.2    | 4.6    |
| 190.0 /                    | 6.2            | 6.8   | 6.5    | 5.9    | 5.2    |
| 180.0 /                    | 7.3            | 8.3   | 8.2    | 7.7    | 7.1    |
| 170.0 /                    | 7.9            | 8.9   | 8.8    | 8.2    | 7.5    |
| 160.0 /                    | 7.1            | 8.6   | 8.0    | 7.6    | 7.3    |
| 150.0 /                    | 8.5            | 10.0  | 10.2   | 9.8    | 9.3    |
| 140.0 /                    | 13.7           | 16.7  | 17.3   | 16.7   | 16.0   |
| 130.0 /                    | 15.3           | 18.5  | 19.0   | 18.2   | 17.3   |
| 120.0 /                    | 12.5           | 14.4  | 14.4   | 13.6   | 12.8   |
| 110.0 /                    | 9.4            | 10.7  | 10.8   | 10.1   | 9.5    |
| 100.0 /                    | 6.1            | 6.6   | 6.5    | 6.0    | 5.7    |
| 90.0 /                     | 5.7            | 6.6   | 6.6    | 6.3    | 6.0    |
| 80.0 /                     | 5.6            | 6.1   | 5.9    | 5.5    | 5.1    |
| 70.0 /                     | 6.6            | 6.8   | 6.4    | 5.7    | 5.1    |
| 60.0 /                     | 6.1            | 6.4   | 6.1    | 5.7    | 5.4    |
| 50.0 /                     | 5.8            | 6.5   | 6.5    | 6.2    | 5.9    |
| 40.0 /                     | 4.0            | 4.7   | 4.7    | 4.5    | 4.2    |
| 30.0 /                     | 4.4            | 5.0   | 4.9    | 4.6    | 4.2    |
| 20.0 /                     | 3.6            | 4.7   | 5.0    | 4.8    | 4.5    |
| 10.0 /                     | 3.2            | 3.9   | 4.1    | 3.9    | 3.7    |



\*N\*-DAY  
 184 DAYS  
 SGROUP# 2  
 YEAR 1972  
 \*\*\* SCGC 2150 -- S02

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\* 184-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 32.1 AND OCCURRED AT ( 800.0, 270.0) \*

| DIPECTION /<br>(DEGREES) / | RANGE (METERS) |       |        |        |        |
|----------------------------|----------------|-------|--------|--------|--------|
|                            | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0 |
| 360.0 /                    | 9.3            | 11.6  | 12.2   | 11.7   | 11.1   |
| 350.0 /                    | 9.3            | 10.9  | 11.0   | 10.3   | 9.7    |
| 340.0 /                    | 12.3           | 14.3  | 14.3   | 13.3   | 12.3   |
| 330.0 /                    | 14.6           | 16.8  | 16.7   | 15.3   | 14.0   |
| 320.0 /                    | 16.1           | 18.2  | 17.8   | 16.4   | 15.0   |
| 310.0 /                    | 21.2           | 23.2  | 22.5   | 20.6   | 18.8   |
| 300.0 /                    | 23.5           | 25.6  | 24.7   | 22.4   | 20.3   |
| 290.0 /                    | 22.9           | 26.5  | 26.4   | 24.3   | 22.2   |
| 280.0 /                    | 21.8           | 25.0  | 24.7   | 22.7   | 20.7   |
| 270.0 /                    | 27.2           | 32.1  | 32.1   | 29.6   | 27.0   |
| 260.0 /                    | 26.3           | 30.9  | 30.7   | 28.2   | 25.6   |
| 250.0 /                    | 22.1           | 25.4  | 24.8   | 22.5   | 20.3   |
| 240.0 /                    | 19.4           | 21.7  | 20.6   | 18.4   | 16.3   |
| 230.0 /                    | 16.4           | 18.5  | 17.5   | 15.6   | 13.8   |
| 220.0 /                    | 8.5            | 9.3   | 8.6    | 7.6    | 6.6    |
| 210.0 /                    | 6.7            | 7.6   | 7.3    | 6.5    | 5.7    |
| 200.0 /                    | 4.8            | 5.4   | 5.1    | 4.6    | 4.1    |
| 190.0 /                    | 4.8            | 5.3   | 5.0    | 4.5    | 4.0    |
| 180.0 /                    | 7.7            | 8.4   | 8.1    | 7.2    | 6.5    |
| 170.0 /                    | 10.4           | 11.7  | 11.4   | 10.3   | 9.3    |
| 160.0 /                    | 11.5           | 13.5  | 13.4   | 12.4   | 11.4   |
| 150.0 /                    | 10.8           | 11.7  | 11.2   | 10.2   | 9.3    |
| 140.0 /                    | 13.5           | 15.8  | 15.8   | 14.6   | 13.5   |
| 130.0 /                    | 11.3           | 13.1  | 13.1   | 12.3   | 11.5   |
| 120.0 /                    | 10.3           | 12.2  | 12.4   | 11.6   | 10.8   |
| 110.0 /                    | 8.4            | 10.2  | 10.5   | 9.9    | 9.3    |
| 100.0 /                    | 6.0            | 6.8   | 6.8    | 6.3    | 6.0    |
| 90.0 /                     | 4.7            | 5.4   | 5.4    | 5.2    | 5.0    |
| 80.0 /                     | 3.8            | 4.4   | 4.5    | 4.3    | 4.1    |
| 70.0 /                     | 4.5            | 5.5   | 5.8    | 5.7    | 5.6    |
| 60.0 /                     | 7.2            | 8.0   | 8.0    | 7.5    | 7.1    |
| 50.0 /                     | 8.0            | 9.5   | 9.6    | 9.0    | 8.4    |
| 40.0 /                     | 8.8            | 10.3  | 10.5   | 9.8    | 9.2    |
| 30.0 /                     | 6.4            | 7.3   | 7.3    | 6.9    | 6.6    |
| 20.0 /                     | 6.8            | 8.4   | 8.9    | 8.6    | 8.2    |
| 10.0 /                     | 6.0            | 7.5   | 7.9    | 7.7    | 7.3    |

22

\*N\*-DAY  
 183 DAYS  
 SGRQUR# 2  
 YEAR 1973  
 \*\*\* SCGC 2150 -- S02

\*\*\*

\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 29.5 AND OCCURRED AT ( 800.0, 320.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
| 360.0 /                    | 6.0   | 7.0   | 7.0    | 6.6    | 6.2    |
| 350.0 /                    | 8.7   | 10.3  | 10.3   | 9.6    | 8.9    |
| 340.0 /                    | 13.0  | 15.3  | 15.3   | 14.2   | 13.1   |
| 330.0 /                    | 17.3  | 19.7  | 19.1   | 17.3   | 15.6   |
| 320.0 /                    | 25.5  | 29.5  | 29.0   | 26.5   | 23.9   |
| 310.0 /                    | 25.1  | 28.8  | 28.3   | 25.9   | 23.5   |
| 300.0 /                    | 23.6  | 27.5  | 27.3   | 25.2   | 23.1   |
| 290.0 /                    | 19.2  | 21.8  | 21.5   | 19.8   | 18.2   |
| 280.0 /                    | 20.4  | 22.6  | 22.0   | 20.1   | 18.3   |
| 270.0 /                    | 24.5  | 28.8  | 28.7   | 26.4   | 24.0   |
| 260.0 /                    | 25.4  | 29.1  | 28.3   | 25.6   | 22.8   |
| 250.0 /                    | 25.4  | 29.2  | 28.4   | 25.5   | 22.8   |
| 240.0 /                    | 18.0  | 20.4  | 19.7   | 17.8   | 15.9   |
| 230.0 /                    | 13.3  | 14.8  | 14.2   | 12.7   | 11.3   |
| 220.0 /                    | 13.6  | 15.1  | 14.3   | 12.7   | 11.1   |
| 210.0 /                    | 7.9   | 8.5   | 8.0    | 7.0    | 6.2    |
| 200.0 /                    | 4.5   | 5.0   | 4.7    | 4.3    | 3.8    |
| 190.0 /                    | 5.2   | 5.6   | 5.4    | 4.8    | 4.2    |
| 180.0 /                    | 8.6   | 9.7   | 9.4    | 8.4    | 7.5    |
| 170.0 /                    | 8.8   | 9.9   | 9.7    | 8.9    | 8.1    |
| 160.0 /                    | 10.7  | 12.8  | 13.1   | 12.4   | 11.6   |
| 150.0 /                    | 12.8  | 15.2  | 15.6   | 14.7   | 13.8   |
| 140.0 /                    | 16.9  | 19.9  | 20.3   | 19.2   | 17.9   |
| 130.0 /                    | 17.5  | 20.5  | 21.6   | 20.7   | 19.7   |
| 120.0 /                    | 16.1  | 19.4  | 19.8   | 18.7   | 17.5   |
| 110.0 /                    | 12.7  | 15.1  | 15.4   | 14.6   | 13.8   |
| 100.0 /                    | 7.4   | 8.5   | 8.6    | 8.1    | 7.7    |
| 90.0 /                     | 5.7   | 6.8   | 7.0    | 6.7    | 6.4    |
| 80.0 /                     | 4.6   | 5.0   | 4.8    | 4.4    | 4.1    |
| 70.0 /                     | 4.6   | 5.1   | 5.1    | 4.8    | 4.5    |
| 60.0 /                     | 4.4   | 4.6   | 4.3    | 3.9    | 3.6    |
| 50.0 /                     | 4.5   | 5.2   | 5.2    | 5.3    | 4.9    |
| 40.0 /                     | 3.2   | 4.5   | 4.6    | 4.3    | 4.1    |
| 30.0 /                     | 3.1   | 4.2   | 4.1    | 3.8    | 3.5    |
| 20.0 /                     | 4.2   | 5.7   | 5.8    | 5.5    | 5.2    |
| 10.0 /                     | 4.5   | 5.3   | 5.3    | 5.0    | 4.6    |

|         |      |      |      |      |      |
|---------|------|------|------|------|------|
| 360.0 / | 6.0  | 7.0  | 7.0  | 6.6  | 6.2  |
| 350.0 / | 8.7  | 10.3 | 10.3 | 9.6  | 8.9  |
| 340.0 / | 13.0 | 15.3 | 15.3 | 14.2 | 13.1 |
| 330.0 / | 17.3 | 19.7 | 19.1 | 17.3 | 15.6 |
| 320.0 / | 25.5 | 29.5 | 29.0 | 26.5 | 23.9 |
| 310.0 / | 25.1 | 28.8 | 28.3 | 25.9 | 23.5 |
| 300.0 / | 23.6 | 27.5 | 27.3 | 25.2 | 23.1 |
| 290.0 / | 19.2 | 21.8 | 21.5 | 19.8 | 18.2 |
| 280.0 / | 20.4 | 22.6 | 22.0 | 20.1 | 18.3 |
| 270.0 / | 24.5 | 28.8 | 28.7 | 26.4 | 24.0 |
| 260.0 / | 25.4 | 29.1 | 28.3 | 25.6 | 22.8 |
| 250.0 / | 25.4 | 29.2 | 28.4 | 25.5 | 22.8 |
| 240.0 / | 18.0 | 20.4 | 19.7 | 17.8 | 15.9 |
| 230.0 / | 13.3 | 14.8 | 14.2 | 12.7 | 11.3 |
| 220.0 / | 13.6 | 15.1 | 14.3 | 12.7 | 11.1 |
| 210.0 / | 7.9  | 8.5  | 8.0  | 7.0  | 6.2  |
| 200.0 / | 4.5  | 5.0  | 4.7  | 4.3  | 3.8  |
| 190.0 / | 5.2  | 5.6  | 5.4  | 4.8  | 4.2  |
| 180.0 / | 8.6  | 9.7  | 9.4  | 8.4  | 7.5  |
| 170.0 / | 8.8  | 9.9  | 9.7  | 8.9  | 8.1  |
| 160.0 / | 10.7 | 12.8 | 13.1 | 12.4 | 11.6 |
| 150.0 / | 12.8 | 15.2 | 15.6 | 14.7 | 13.8 |
| 140.0 / | 16.9 | 19.9 | 20.3 | 19.2 | 17.9 |
| 130.0 / | 17.5 | 20.5 | 21.6 | 20.7 | 19.7 |
| 120.0 / | 16.1 | 19.4 | 19.8 | 18.7 | 17.5 |
| 110.0 / | 12.7 | 15.1 | 15.4 | 14.6 | 13.8 |
| 100.0 / | 7.4  | 8.5  | 8.6  | 8.1  | 7.7  |
| 90.0 /  | 5.7  | 6.8  | 7.0  | 6.7  | 6.4  |
| 80.0 /  | 4.6  | 5.0  | 4.8  | 4.4  | 4.1  |
| 70.0 /  | 4.6  | 5.1  | 5.1  | 4.8  | 4.5  |
| 60.0 /  | 4.4  | 4.6  | 4.3  | 3.9  | 3.6  |
| 50.0 /  | 4.5  | 5.2  | 5.2  | 5.3  | 4.9  |
| 40.0 /  | 3.2  | 4.5  | 4.6  | 4.3  | 4.1  |
| 30.0 /  | 3.1  | 4.2  | 4.1  | 3.8  | 3.5  |
| 20.0 /  | 4.2  | 5.7  | 5.8  | 5.5  | 5.2  |
| 10.0 /  | 4.5  | 5.3  | 5.3  | 5.0  | 4.6  |

23

\*N\*-DAY  
 183 DAYS  
 SGR0UP# 2  
 YEAR 1974  
 \*\*\* SCGC 2150 -- 302

\*\*\*

\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 38.3 AND OCCURRED AT ( 800.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |      |      |      |      |      |
|---------|------|------|------|------|------|
| 360.0 / | 6.6  | 7.3  | 7.3  | 6.9  | 6.6  |
| 350.0 / | 6.9  | 7.7  | 7.6  | 7.1  | 6.6  |
| 340.0 / | 11.1 | 12.4 | 12.2 | 11.2 | 10.4 |
| 330.0 / | 16.6 | 18.0 | 17.3 | 15.8 | 14.3 |
| 320.0 / | 22.7 | 24.6 | 23.5 | 21.3 | 19.2 |
| 310.0 / | 23.8 | 25.9 | 25.1 | 22.9 | 20.9 |
| 300.0 / | 21.2 | 23.2 | 22.4 | 20.4 | 18.5 |
| 290.0 / | 21.6 | 24.2 | 23.7 | 21.9 | 20.1 |
| 280.0 / | 24.5 | 27.4 | 26.6 | 24.3 | 22.0 |
| 270.0 / | 32.8 | 38.3 | 37.8 | 34.6 | 31.5 |
| 260.0 / | 31.5 | 36.1 | 35.4 | 32.2 | 29.1 |
| 250.0 / | 29.2 | 33.4 | 32.4 | 29.2 | 26.2 |
| 240.0 / | 23.7 | 27.2 | 26.3 | 23.8 | 21.3 |
| 230.0 / | 14.3 | 16.5 | 16.1 | 14.5 | 13.0 |
| 220.0 / | 7.4  | 8.3  | 7.9  | 7.1  | 6.4  |
| 210.0 / | 5.3  | 5.8  | 5.6  | 5.0  | 4.5  |
| 200.0 / | 4.9  | 5.4  | 5.2  | 4.6  | 4.1  |
| 190.0 / | 4.7  | 5.2  | 5.1  | 4.6  | 4.2  |
| 180.0 / | 6.9  | 7.6  | 7.4  | 6.7  | 6.1  |
| 170.0 / | 6.0  | 6.8  | 6.7  | 6.2  | 5.7  |
| 160.0 / | 7.7  | 9.1  | 9.2  | 8.7  | 8.1  |
| 150.0 / | 5.2  | 10.5 | 10.5 | 9.7  | 9.1  |
| 140.0 / | 12.5 | 15.1 | 15.4 | 14.5 | 13.5 |
| 130.0 / | 13.3 | 15.8 | 16.1 | 15.2 | 14.2 |
| 120.0 / | 8.1  | 9.2  | 9.2  | 8.7  | 8.2  |
| 110.0 / | 6.2  | 6.9  | 6.8  | 6.4  | 6.1  |
| 100.0 / | 5.4  | 5.8  | 5.7  | 5.2  | 4.8  |
| 90.0 /  | 5.6  | 6.2  | 6.1  | 5.7  | 5.4  |
| 80.0 /  | 5.5  | 5.9  | 5.7  | 5.3  | 5.0  |
| 70.0 /  | 5.0  | 5.3  | 5.2  | 4.9  | 4.6  |
| 60.0 /  | 6.0  | 6.5  | 6.4  | 6.0  | 5.6  |
| 50.0 /  | 6.1  | 6.4  | 6.1  | 5.5  | 5.1  |
| 40.0 /  | 5.7  | 6.0  | 5.6  | 5.1  | 4.6  |
| 30.0 /  | 3.8  | 4.0  | 3.9  | 3.5  | 3.2  |
| 20.0 /  | 3.7  | 4.0  | 3.9  | 3.6  | 3.3  |
| 10.0 /  | 5.1  | 5.5  | 5.3  | 4.9  | 4.6  |

2ND HIGH  
3-HR  
SGROUP# 2  
YEAR 1970  
\*\*\* SCGC 2150 -- 802

\*\*\*

\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 733.1 AND OCCURRED AT ( 800.0, 310.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 560.1 ( 67, 4) | 492.1 ( 71, 5) | 449.9 ( 34, 3) | 475.2 ( 80, 8) | 484.4 ( 80, 8) |
| 350.0 /                    | 463.4 ( 34, 1) | 507.6 ( 34, 1) | 472.1 ( 6, 4)  | 409.8 ( 34, 1) | 356.3 ( 34, 1) |
| 340.0 /                    | 563.4 ( 33, 6) | 671.9 ( 33, 6) | 648.7 ( 33, 6) | 578.2 ( 33, 6) | 509.1 ( 33, 6) |
| 330.0 /                    | 484.9 ( 95, 4) | 449.4 ( 95, 5) | 442.9 (100, 5) | 401.7 (346, 5) | 370.8 ( 95, 5) |
| 320.0 /                    | 504.1 ( 76, 8) | 699.6 ( 76, 8) | 631.6 ( 90, 5) | 525.7 ( 90, 5) | 486.3 ( 63, 8) |
| 310.0 /                    | 669.7 (314, 5) | 733.1 ( 29, 4) | 696.5 ( 32, 8) | 605.6 ( 32, 8) | 533.3 ( 91, 6) |
| 300.0 /                    | 540.4 ( 46, 5) | 689.5 ( 46, 5) | 691.6 ( 46, 5) | 624.0 ( 69, 5) | 549.5 ( 69, 5) |
| 290.0 /                    | 481.1 ( 28, 5) | 553.4 (302, 6) | 616.0 ( 61, 4) | 555.5 ( 61, 4) | 495.6 ( 55, 6) |
| 280.0 /                    | 513.3 ( 27, 5) | 560.3 (324, 5) | 550.9 ( 60, 8) | 494.8 ( 60, 8) | 437.7 ( 60, 8) |
| 270.0 /                    | 520.0 (242, 7) | 609.0 (252, 1) | 601.8 ( 32, 2) | 545.3 ( 32, 2) | 484.7 ( 32, 2) |
| 260.0 /                    | 606.1 (323, 4) | 655.2 (302, 3) | 617.0 ( 5, 7)  | 550.6 ( 5, 7)  | 484.2 ( 5, 7)  |
| 250.0 /                    | 608.6 (326, 5) | 703.0 (301, 6) | 668.7 (301, 6) | 613.6 (342, 2) | 562.6 (342, 2) |
| 240.0 /                    | 519.4 (291, 1) | 566.0 (291, 1) | 517.9 (334, 3) | 501.8 (334, 3) | 435.6 (291, 6) |
| 230.0 /                    | 512.9 (364, 5) | 567.6 (337, 6) | 583.9 (337, 6) | 544.4 (364, 5) | 485.3 (364, 5) |
| 220.0 /                    | 509.0 ( 35, 5) | 483.3 ( 38, 5) | 459.0 ( 65, 5) | 370.4 ( 65, 5) | 349.2 (339, 6) |
| 210.0 /                    | 460.8 ( 82, 5) | 402.9 ( 82, 5) | 372.1 ( 37, 4) | 358.6 ( 37, 4) | 335.1 ( 37, 4) |
| 200.0 /                    | 391.7 ( 82, 5) | 404.4 (322, 5) | 381.4 (322, 5) | 306.6 (304, 5) | 248.3 (304, 5) |
| 190.0 /                    | 424.7 ( 51, 4) | 395.1 ( 51, 4) | 356.9 ( 97, 7) | 330.6 ( 2, 4)  | 309.2 ( 2, 4)  |
| 180.0 /                    | 409.4 ( 51, 4) | 502.5 (305, 6) | 490.7 (300, 6) | 450.8 (300, 6) | 412.4 ( 21, 6) |
| 170.0 /                    | 552.5 (339, 4) | 524.9 ( 24, 4) | 537.7 ( 4, 5)  | 473.2 ( 4, 5)  | 413.3 ( 4, 5)  |
| 160.0 /                    | 547.9 ( 21, 5) | 579.6 (332, 6) | 608.1 (332, 6) | 570.4 (332, 6) | 522.8 (332, 6) |
| 150.0 /                    | 492.0 (361, 5) | 457.9 (308, 5) | 515.1 ( 58, 7) | 519.5 ( 35, 6) | 464.3 ( 35, 6) |
| 140.0 /                    | 714.7 (338, 4) | 639.7 (338, 4) | 567.3 ( 31, 1) | 514.3 ( 31, 1) | 459.0 ( 31, 1) |
| 130.0 /                    | 564.8 (289, 4) | 625.5 (319, 5) | 620.2 ( 7, 3)  | 565.8 ( 7, 3)  | 507.7 ( 7, 3)  |
| 120.0 /                    | 560.7 (304, 4) | 502.1 ( 41, 2) | 493.1 ( 41, 2) | 443.8 ( 41, 2) | 394.0 ( 41, 2) |
| 110.0 /                    | 608.2 ( 72, 6) | 690.4 ( 20, 5) | 621.9 ( 20, 5) | 537.3 ( 20, 5) | 464.1 ( 20, 5) |
| 100.0 /                    | 452.1 ( 73, 6) | 563.5 ( 73, 6) | 548.7 ( 68, 3) | 475.6 ( 68, 3) | 411.4 ( 68, 3) |
| 90.0 /                     | 427.6 ( 1, 5)  | 449.8 ( 19, 5) | 494.0 ( 19, 5) | 455.0 (306, 4) | 404.2 (103, 3) |
| 80.0 /                     | 472.7 (298, 4) | 505.8 ( 68, 2) | 501.5 ( 68, 2) | 454.6 ( 68, 2) | 405.8 ( 68, 2) |
| 70.0 /                     | 444.9 (298, 4) | 444.2 ( 67, 6) | 409.9 ( 67, 6) | 357.4 ( 67, 6) | 348.5 (102, 8) |
| 60.0 /                     | 535.2 ( 18, 4) | 506.6 ( 67, 7) | 478.5 ( 64, 6) | 464.0 ( 64, 6) | 435.4 ( 64, 6) |
| 50.0 /                     | 466.0 ( 92, 6) | 519.7 ( 52, 6) | 485.5 ( 92, 6) | 454.8 ( 6, 7)  | 428.9 ( 6, 7)  |
| 40.0 /                     | 467.7 ( 26, 4) | 427.8 (297, 5) | 393.0 (294, 8) | 353.1 ( 26, 4) | 314.5 ( 6, 6)  |
| 30.0 /                     | 327.1 (347, 5) | 329.5 ( 6, 6)  | 363.6 ( 6, 6)  | 347.9 ( 6, 6)  | 322.5 ( 6, 6)  |
| 20.0 /                     | 325.2 (359, 5) | 310.2 ( 56, 4) | 302.6 ( 56, 4) | 273.1 ( 56, 4) | 253.7 ( 81, 2) |
| 10.0 /                     | 326.3 (317, 4) | 397.4 ( 56, 4) | 381.5 ( 17, 8) | 366.2 ( 56, 4) | 331.3 ( 56, 4) |

25

2ND HIGH  
3-HR  
SGROUP# 2  
YEAR 1971  
\*\*\* SCGC 2150 -- 502

\*\*\*

\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 727.7 AND OCCURRED AT ( 800.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
| 360.0 /                    | 253.2 ( 39, 3) | 388.4 ( 39, 3) | 416.9 ( 62, 3) | 374.4 ( 39, 3) | 352.0 (333, 3) |
| 350.0 /                    | 393.1 ( 95, 6) | 504.0 ( 95, 6) | 516.5 ( 95, 6) | 479.1 ( 95, 6) | 435.2 ( 95, 6) |
| 340.0 /                    | 441.1 ( 53, 6) | 507.6 ( 53, 6) | 478.3 ( 53, 6) | 440.2 ( 5, 6)  | 402.1 ( 38, 6) |
| 330.0 /                    | 501.8 (341, 4) | 586.4 ( 57, 5) | 577.9 ( 57, 5) | 523.7 ( 57, 5) | 468.0 ( 57, 5) |
| 320.0 /                    | 506.2 ( 60, 6) | 631.2 ( 74, 6) | 634.0 ( 74, 6) | 579.1 ( 74, 6) | 526.7 (341, 1) |
| 310.0 /                    | 483.6 ( 92, 4) | 619.3 ( 6, 5)  | 611.8 (365, 4) | 562.9 (365, 4) | 510.3 (365, 4) |
| 300.0 /                    | 444.5 (364, 6) | 496.1 (340, 5) | 491.3 (340, 5) | 454.2 (349, 8) | 436.0 ( 50, 4) |
| 290.0 /                    | 511.9 ( 81, 4) | 456.4 (104, 6) | 446.0 (104, 6) | 432.7 (348, 3) | 410.9 (348, 3) |
| 280.0 /                    | 580.1 ( 46, 5) | 539.1 ( 49, 8) | 560.9 ( 94, 8) | 485.4 (289, 5) | 465.5 (347, 6) |
| 270.0 /                    | 564.4 (291, 4) | 622.2 (322, 3) | 640.7 (340, 1) | 592.0 (340, 1) | 533.9 (340, 1) |
| 260.0 /                    | 677.5 (320, 3) | 727.7 (309, 8) | 670.5 (319, 6) | 601.0 (319, 6) | 530.2 (319, 6) |
| 250.0 /                    | 644.7 (353, 2) | 698.0 (359, 8) | 662.4 (359, 8) | 583.4 (359, 8) | 520.5 (319, 2) |
| 240.0 /                    | 664.6 (102, 4) | 655.1 (359, 1) | 707.7 (359, 1) | 672.1 (359, 1) | 618.7 (359, 1) |
| 230.0 /                    | 520.7 ( 55, 5) | 536.7 (102, 1) | 557.7 (102, 1) | 513.5 (101, 8) | 462.0 (101, 8) |
| 220.0 /                    | 502.6 (310, 6) | 607.5 (101, 6) | 601.0 (101, 6) | 543.2 ( 98, 5) | 470.8 ( 98, 5) |
| 210.0 /                    | 356.5 ( 87, 4) | 372.9 ( 80, 4) | 382.7 ( 55, 6) | 361.5 ( 55, 6) | 332.9 ( 55, 6) |
| 200.0 /                    | 468.6 ( 93, 5) | 509.7 ( 86, 5) | 445.7 ( 86, 5) | 376.4 ( 86, 5) | 319.2 ( 86, 5) |
| 190.0 /                    | 397.4 (308, 4) | 473.7 ( 76, 6) | 485.2 ( 76, 6) | 447.9 ( 76, 6) | 405.1 ( 76, 6) |
| 180.0 /                    | 456.3 ( 95, 4) | 499.3 (352, 5) | 468.4 (352, 5) | 413.7 (352, 5) | 366.1 (304, 3) |
| 170.0 /                    | 611.2 ( 85, 4) | 615.9 (308, 3) | 557.6 (308, 3) | 489.3 (308, 3) | 427.4 (308, 3) |
| 160.0 /                    | 412.8 ( 12, 4) | 411.5 (329, 5) | 404.1 (329, 5) | 365.3 (329, 5) | 334.9 ( 22, 1) |
| 150.0 /                    | 460.2 ( 67, 5) | 426.7 ( 1, 4)  | 424.5 ( 1, 4)  | 387.9 ( 1, 4)  | 356.4 (318, 2) |
| 140.0 /                    | 524.7 ( 89, 6) | 545.6 ( 79, 3) | 519.0 ( 89, 4) | 479.8 ( 89, 4) | 441.7 ( 86, 2) |
| 130.0 /                    | 512.0 ( 40, 2) | 647.5 ( 40, 2) | 641.9 ( 40, 2) | 550.9 (338, 4) | 469.1 (338, 4) |
| 120.0 /                    | 548.1 ( 81, 4) | 564.4 ( 63, 4) | 536.8 ( 63, 4) | 475.2 ( 63, 4) | 435.2 ( 96, 6) |
| 110.0 /                    | 515.7 ( 63, 1) | 563.9 ( 63, 1) | 553.3 ( 96, 3) | 483.6 ( 96, 3) | 420.7 ( 56, 3) |
| 100.0 /                    | 425.7 ( 11, 5) | 396.8 ( 54, 5) | 356.8 ( 54, 5) | 348.7 (351, 4) | 322.6 ( 44, 5) |
| 90.0 /                     | 463.2 ( 11, 5) | 418.5 ( 11, 5) | 438.0 ( 96, 2) | 421.7 ( 96, 2) | 395.6 ( 56, 2) |
| 80.0 /                     | 397.2 ( 17, 5) | 384.1 ( 17, 5) | 340.0 ( 17, 5) | 289.8 ( 17, 5) | 247.6 ( 17, 5) |
| 70.0 /                     | 575.9 ( 15, 5) | 588.6 ( 15, 5) | 526.7 ( 15, 5) | 450.0 ( 15, 5) | 383.9 ( 15, 5) |
| 60.0 /                     | 513.9 (106, 4) | 427.7 (331, 4) | 356.1 (331, 4) | 352.0 (331, 4) | 308.2 (331, 4) |
| 50.0 /                     | 471.6 (324, 5) | 552.1 (106, 4) | 440.3 (106, 4) | 405.6 (337, 6) | 377.5 (337, 6) |
| 40.0 /                     | 408.5 ( 40, 4) | 432.4 ( 95, 8) | 425.8 ( 95, 8) | 372.6 ( 62, 6) | 321.7 ( 62, 6) |
| 30.0 /                     | 387.1 ( 67, 5) | 446.6 ( 95, 7) | 373.7 ( 85, 4) | 320.3 ( 66, 4) | 280.3 ( 66, 4) |
| 20.0 /                     | 322.7 ( 65, 4) | 392.7 ( 18, 3) | 502.6 ( 15, 3) | 522.1 ( 15, 3) | 516.4 ( 18, 3) |
| 10.0 /                     | 330.6 ( 39, 3) | 383.5 ( 39, 3) | 366.7 ( 39, 3) | 337.3 ( 54, 3) | 313.3 ( 54, 3) |

2ND HIGH  
3-HR  
SCGROUP# 2  
YEAR 1972  
\*\*\* SCGC 2150 -- S02

\*\*\*

\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 714.1 AND OCCURRED AT ( 800.0, 230.0 ) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 466.7 ( 91, 2) | 558.7 (357, 1) | 510.4 (357, 1) | 443.8 (357, 1) | 397.3 (357, 6) |
| 350.0 /                    | 404.8 (330, 5) | 447.3 ( 10, 6) | 450.6 ( 11, 4) | 432.0 ( 10, 6) | 401.6 ( 10, 6) |
| 340.0 /                    | 547.7 ( 34, 3) | 654.5 ( 34, 3) | 663.8 ( 34, 3) | 617.1 ( 34, 3) | 552.0 ( 13, 5) |
| 330.0 /                    | 633.9 ( 13, 3) | 686.4 ( 13, 3) | 638.3 ( 13, 3) | 557.9 ( 13, 3) | 483.7 ( 13, 5) |
| 320.0 /                    | 658.3 ( 30, 5) | 632.6 ( 55, 5) | 564.2 (366, 1) | 517.2 ( 21, 4) | 469.1 ( 21, 4) |
| 310.0 /                    | 597.8 (316, 5) | 668.3 ( 81, 8) | 678.9 (349, 8) | 636.6 (349, 8) | 581.9 (349, 8) |
| 300.0 /                    | 707.9 ( 87, 5) | 590.2 ( 87, 5) | 524.3 (349, 7) | 477.1 ( 95, 4) | 401.6 (323, 8) |
| 290.0 /                    | 584.5 ( 57, 5) | 633.8 ( 9, 4)  | 614.0 ( 9, 4)  | 559.3 (308, 5) | 485.6 (307, 5) |
| 280.0 /                    | 678.0 (297, 5) | 585.1 (343, 4) | 540.3 (297, 4) | 492.4 (348, 7) | 463.5 (348, 7) |
| 270.0 /                    | 562.0 (345, 5) | 580.9 (293, 5) | 621.7 ( 52, 6) | 570.2 (347, 3) | 505.7 (347, 3) |
| 260.0 /                    | 536.8 (295, 8) | 565.2 (295, 8) | 591.4 ( 18, 7) | 569.1 ( 18, 7) | 528.8 ( 18, 7) |
| 250.0 /                    | 685.4 ( 94, 5) | 681.8 ( 94, 5) | 627.9 (101, 6) | 573.2 (101, 6) | 504.2 (317, 4) |
| 240.0 /                    | 597.2 (353, 2) | 698.0 (295, 3) | 667.8 (295, 3) | 592.8 (295, 3) | 520.4 (295, 3) |
| 230.0 /                    | 566.3 ( 71, 1) | 714.1 ( 71, 1) | 709.7 ( 71, 1) | 642.6 ( 71, 1) | 571.7 ( 71, 1) |
| 220.0 /                    | 541.7 ( 71, 4) | 523.7 (314, 4) | 447.3 (314, 4) | 378.4 (314, 4) | 325.0 (314, 4) |
| 210.0 /                    | 492.1 ( 86, 5) | 487.7 ( 71, 5) | 483.7 ( 72, 6) | 438.0 ( 72, 6) | 387.6 ( 7, 7)  |
| 200.0 /                    | 460.9 ( 69, 7) | 526.4 ( 69, 7) | 493.7 ( 69, 7) | 431.8 ( 69, 7) | 374.9 ( 69, 7) |
| 190.0 /                    | 357.2 ( 97, 6) | 426.0 ( 59, 4) | 419.4 ( 66, 3) | 383.1 ( 66, 3) | 344.1 ( 66, 5) |
| 180.0 /                    | 418.5 ( 83, 4) | 584.9 ( 92, 4) | 615.1 ( 92, 4) | 566.0 ( 7, 5)  | 494.8 ( 7, 5)  |
| 170.0 /                    | 587.8 (328, 4) | 584.6 ( 66, 2) | 546.4 ( 83, 4) | 445.1 ( 83, 4) | 371.6 (336, 5) |
| 160.0 /                    | 432.6 (289, 4) | 488.8 ( 40, 6) | 481.4 (352, 5) | 438.0 ( 36, 3) | 401.9 ( 36, 3) |
| 150.0 /                    | 464.8 (218, 4) | 454.7 (363, 5) | 446.2 ( 51, 6) | 408.8 ( 51, 6) | 380.0 (328, 6) |
| 140.0 /                    | 506.9 ( 84, 4) | 560.5 ( 36, 1) | 600.7 ( 36, 2) | 561.0 ( 36, 1) | 513.6 ( 36, 1) |
| 130.0 /                    | 482.4 ( 51, 4) | 494.3 (362, 3) | 484.4 (352, 3) | 461.7 (362, 3) | 418.1 (327, 3) |
| 120.0 /                    | 450.9 ( 50, 8) | 478.9 ( 50, 8) | 450.5 (361, 4) | 434.6 (313, 4) | 419.8 (313, 4) |
| 110.0 /                    | 325.2 ( 77, 6) | 439.0 ( 77, 6) | 419.4 (327, 1) | 423.3 (328, 4) | 384.1 (328, 4) |
| 100.0 /                    | 479.2 ( 50, 7) | 504.0 ( 50, 7) | 455.4 ( 50, 7) | 393.8 ( 50, 7) | 377.6 ( 64, 4) |
| 90.0 /                     | 335.5 ( 49, 7) | 404.5 ( 49, 7) | 391.8 ( 49, 7) | 350.0 ( 49, 7) | 310.7 (358, 5) |
| 80.0 /                     | 285.5 (361, 5) | 307.6 ( 49, 7) | 297.5 ( 49, 7) | 273.3 ( 64, 5) | 260.7 (313, 3) |
| 70.0 /                     | 389.5 ( 48, 5) | 446.9 ( 38, 6) | 468.3 ( 38, 6) | 437.7 ( 38, 6) | 399.5 ( 38, 6) |
| 60.0 /                     | 492.1 ( 78, 4) | 507.1 ( 78, 4) | 423.1 ( 99, 4) | 405.2 (313, 2) | 365.5 ( 78, 4) |
| 50.0 /                     | 506.1 ( 6, 4)  | 499.2 ( 82, 4) | 499.4 ( 47, 6) | 484.3 (320, 3) | 479.6 (320, 3) |
| 40.0 /                     | 645.8 ( 34, 5) | 599.7 ( 6, 4)  | 504.3 ( 6, 4)  | 439.1 ( 38, 4) | 400.3 ( 32, 8) |
| 30.0 /                     | 481.5 ( 85, 4) | 466.2 ( 5, 4)  | 442.7 ( 63, 5) | 393.5 ( 5, 4)  | 351.6 ( 23, 4) |
| 20.0 /                     | 522.0 ( 34, 4) | 496.1 ( 85, 4) | 450.2 ( 76, 8) | 450.1 ( 76, 8) | 433.2 ( 76, 8) |
| 10.0 /                     | 366.5 ( 65, 4) | 354.5 (302, 4) | 328.0 (330, 8) | 304.7 (330, 8) | 278.1 (330, 8) |

2ND HIGH

3-HR

SGROUP# 2

YEAR 1973

\*\*\* SCGC 2150 -- 502

\*\*\*

\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 725.0 AND OCCURRED AT ( 600.0, 320.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 360.2 ( 79, 4) | 440.3 (304, 4) | 423.6 ( 94, 3) | 404.5 ( 94, 3) | 375.9 ( 94, 3) |
| 350.0 /                    | 427.3 ( 93, 4) | 502.2 ( 85, 1) | 508.2 (332, 6) | 473.2 (332, 6) | 431.5 (332, 6) |
| 340.0 /                    | 527.3 ( 79, 4) | 568.4 ( 46, 1) | 598.3 ( 84, 8) | 521.7 ( 84, 8) | 452.1 ( 84, 8) |
| 330.0 /                    | 584.1 (361, 4) | 667.1 ( 22, 3) | 626.4 ( 22, 3) | 551.7 ( 22, 3) | 482.2 ( 22, 3) |
| 320.0 /                    | 725.0 (329, 5) | 707.7 (329, 5) | 624.7 ( 1, 5)  | 547.8 ( 4, 4)  | 492.4 ( 4, 4)  |
| 310.0 /                    | 548.3 ( 73, 5) | 633.1 (360, 3) | 613.0 (360, 3) | 578.9 ( 97, 2) | 521.3 ( 90, 3) |
| 300.0 /                    | 563.3 ( 69, 6) | 644.8 ( 69, 6) | 630.7 ( 88, 2) | 604.2 ( 88, 2) | 561.6 ( 67, 6) |
| 290.0 /                    | 561.6 (361, 4) | 641.8 ( 32, 6) | 608.2 ( 32, 6) | 564.9 ( 65, 3) | 523.5 ( 65, 3) |
| 280.0 /                    | 508.8 ( 72, 5) | 544.1 (328, 4) | 489.6 (353, 6) | 469.7 ( 67, 8) | 439.4 ( 67, 8) |
| 270.0 /                    | 631.9 (104, 7) | 721.2 (104, 7) | 682.2 (321, 8) | 649.5 (105, 1) | 575.1 (105, 1) |
| 260.0 /                    | 548.1 (327, 4) | 613.1 (336, 7) | 644.1 ( 25, 6) | 616.9 (353, 1) | 569.2 (353, 1) |
| 250.0 /                    | 570.0 (327, 4) | 604.0 (291, 3) | 592.9 (105, 3) | 533.5 (291, 3) | 513.8 (311, 2) |
| 240.0 /                    | 557.3 (316, 6) | 690.4 ( 60, 1) | 683.3 (316, 6) | 617.5 (316, 6) | 548.9 (316, 6) |
| 230.0 /                    | 562.1 (292, 2) | 693.6 (294, 8) | 642.2 (294, 8) | 561.1 (294, 8) | 487.3 (294, 8) |
| 220.0 /                    | 506.6 (295, 4) | 598.8 (295, 4) | 551.6 (294, 3) | 496.7 (294, 3) | 441.3 (294, 3) |
| 210.0 /                    | 435.9 (290, 5) | 448.6 (290, 5) | 416.1 (290, 5) | 370.8 (293, 8) | 336.3 (293, 8) |
| 200.0 /                    | 390.0 ( 31, 5) | 418.8 ( 30, 5) | 369.7 (295, 6) | 328.3 (295, 6) | 289.2 (295, 6) |
| 190.0 /                    | 438.1 (293, 3) | 424.7 (352, 5) | 357.9 (352, 5) | 294.7 ( 81, 5) | 256.3 ( 52, 6) |
| 180.0 /                    | 582.0 (352, 5) | 590.8 (333, 5) | 576.7 (352, 5) | 507.7 (352, 5) | 443.1 (352, 5) |
| 170.0 /                    | 544.6 ( 37, 4) | 544.1 ( 15, 5) | 527.7 ( 50, 5) | 488.8 (298, 6) | 438.2 (298, 6) |
| 160.0 /                    | 525.8 ( 15, 5) | 544.7 (296, 6) | 542.3 ( 9, 6)  | 515.3 ( 12, 1) | 506.3 ( 12, 1) |
| 150.0 /                    | 500.1 (297, 4) | 535.9 ( 52, 5) | 464.4 ( 52, 5) | 422.2 ( 92, 4) | 402.6 ( 51, 1) |
| 140.0 /                    | 588.9 ( 14, 4) | 575.2 (303, 3) | 554.4 (302, 4) | 467.3 (101, 3) | 436.2 ( 48, 8) |
| 130.0 /                    | 582.0 (344, 5) | 589.7 ( 47, 5) | 554.8 (344, 5) | 465.2 (344, 5) | 418.5 ( 42, 7) |
| 120.0 /                    | 568.0 ( 99, 6) | 654.5 ( 99, 6) | 616.0 ( 6, 5)  | 535.2 ( 99, 6) | 466.0 ( 99, 6) |
| 110.0 /                    | 645.3 (351, 4) | 632.3 (351, 4) | 566.2 ( 95, 1) | 547.5 ( 95, 1) | 507.9 ( 86, 5) |
| 100.0 /                    | 426.3 ( 85, 5) | 448.2 ( 41, 5) | 451.8 (350, 8) | 416.4 (350, 8) | 376.0 (350, 8) |
| 90.0 /                     | 342.3 (355, 6) | 461.5 (355, 6) | 483.1 (355, 6) | 455.9 (355, 6) | 421.7 (355, 6) |
| 80.0 /                     | 457.7 ( 19, 4) | 475.2 (347, 5) | 476.3 ( 41, 3) | 441.6 ( 41, 4) | 391.2 ( 41, 4) |
| 70.0 /                     | 474.8 (347, 5) | 456.5 ( 19, 4) | 440.5 ( 19, 4) | 401.6 ( 19, 4) | 364.5 ( 46, 5) |
| 60.0 /                     | 528.8 (320, 5) | 515.1 ( 85, 6) | 467.0 (320, 5) | 402.0 (320, 5) | 343.0 (320, 5) |
| 50.0 /                     | 464.8 ( 94, 5) | 465.2 ( 57, 5) | 429.8 ( 57, 5) | 376.3 ( 57, 5) | 327.8 ( 57, 5) |
| 40.0 /                     | 334.5 (348, 4) | 364.1 ( 80, 7) | 353.4 ( 80, 7) | 315.7 ( 80, 7) | 278.9 ( 80, 7) |
| 30.0 /                     | 475.1 (350, 5) | 484.8 ( 94, 6) | 413.0 ( 94, 4) | 359.5 ( 94, 4) | 312.2 ( 54, 4) |
| 20.0 /                     | 394.8 ( 94, 4) | 447.6 ( 28, 5) | 450.2 ( 80, 2) | 444.5 ( 80, 2) | 407.1 ( 76, 3) |
| 10.0 /                     | 460.1 ( 95, 2) | 512.9 ( 85, 2) | 408.2 (354, 7) | 466.5 (354, 7) | 433.4 (354, 7) |

2ND HIGH  
3-HR  
SGROUP# 2  
YEAR 1974  
\*\*\* SCGC 2150 -- 502

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\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)  
\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 698.4 AND OCCURRED AT ( 800.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 673.7 ( 21, 4) | 661.9 ( 21, 4) | 600.9 ( 21, 4) | 525.5 ( 21, 4) | 459.9 ( 21, 4) |
| 350.0 /                    | 415.1 ( 40, 4) | 439.5 (289, 4) | 444.8 (289, 4) | 411.3 (289, 4) | 373.3 (289, 4) |
| 340.0 /                    | 452.3 ( 38, 4) | 564.1 ( 38, 4) | 528.2 ( 38, 4) | 460.8 ( 38, 4) | 418.0 ( 28, 6) |
| 330.0 /                    | 547.2 (353, 5) | 496.2 ( 9, 5)  | 452.5 (354, 5) | 415.4 (341, 6) | 383.4 (341, 6) |
| 320.0 /                    | 691.2 ( 92, 5) | 670.7 ( 92, 5) | 587.8 ( 92, 5) | 517.2 ( 93, 6) | 477.0 ( 4, 6)  |
| 310.0 /                    | 593.1 ( 85, 4) | 653.3 ( 94, 1) | 686.9 ( 94, 1) | 640.6 ( 94, 1) | 581.2 ( 94, 1) |
| 300.0 /                    | 666.8 ( 85, 4) | 661.8 (103, 3) | 569.3 (329, 5) | 510.1 (104, 6) | 466.1 ( 15, 5) |
| 290.0 /                    | 502.5 ( 86, 4) | 600.3 ( 15, 4) | 661.8 ( 15, 4) | 638.3 ( 3, 5)  | 581.4 ( 3, 5)  |
| 280.0 /                    | 612.7 ( 86, 5) | 624.0 (102, 3) | 620.9 ( 6, 3)  | 580.7 ( 6, 3)  | 515.4 ( 3, 3)  |
| 270.0 /                    | 614.6 ( 73, 8) | 698.4 (102, 2) | 698.3 ( 73, 8) | 643.5 (334, 2) | 583.1 (334, 2) |
| 260.0 /                    | 607.9 ( 23, 5) | 559.1 ( 23, 5) | 537.0 (320, 7) | 494.4 (345, 5) | 473.1 (345, 5) |
| 250.0 /                    | 560.4 (365, 4) | 590.8 (333, 4) | 616.9 ( 69, 6) | 592.3 (318, 6) | 552.9 (318, 6) |
| 240.0 /                    | 540.1 (295, 1) | 630.8 (303, 7) | 669.4 (306, 6) | 601.0 (306, 6) | 548.4 ( 13, 3) |
| 230.0 /                    | 508.9 (312, 4) | 618.8 (312, 4) | 603.5 (312, 4) | 539.7 (312, 4) | 475.7 (312, 4) |
| 220.0 /                    | 385.5 (314, 5) | 460.5 (305, 5) | 468.0 (305, 5) | 429.5 (305, 5) | 379.9 (293, 7) |
| 210.0 /                    | 323.7 (356, 5) | 398.1 (356, 5) | 394.8 (356, 5) | 358.9 (356, 5) | 321.0 (356, 5) |
| 200.0 /                    | 411.5 ( 54, 4) | 399.8 (363, 6) | 436.0 (363, 6) | 393.3 ( 12, 5) | 323.1 ( 12, 5) |
| 190.0 /                    | 275.9 ( 96, 6) | 300.6 (363, 6) | 326.0 (363, 6) | 312.6 (363, 6) | 291.6 (363, 6) |
| 180.0 /                    | 528.2 (332, 5) | 513.0 (332, 5) | 516.7 ( 8, 4)  | 495.2 ( 8, 4)  | 453.4 (344, 5) |
| 170.0 /                    | 341.8 (313, 4) | 320.2 (311, 6) | 311.4 (311, 6) | 280.9 (311, 6) | 250.3 (311, 6) |
| 160.0 /                    | 410.1 ( 41, 4) | 411.0 ( 57, 5) | 428.0 (313, 6) | 398.8 (313, 6) | 362.9 (313, 6) |
| 150.0 /                    | 507.9 (339, 4) | 458.9 ( 48, 4) | 458.3 (326, 5) | 422.0 (326, 5) | 381.7 (326, 5) |
| 140.0 /                    | 403.6 (352, 4) | 520.9 ( 56, 5) | 527.2 ( 48, 5) | 472.5 ( 48, 5) | 418.3 ( 48, 5) |
| 130.0 /                    | 465.5 ( 42, 4) | 612.6 ( 40, 6) | 637.7 ( 40, 6) | 575.4 ( 54, 1) | 509.2 ( 54, 1) |
| 120.0 /                    | 444.5 ( 76, 5) | 482.1 ( 76, 5) | 465.2 ( 96, 1) | 427.5 ( 96, 1) | 408.9 (291, 3) |
| 110.0 /                    | 531.4 (316, 4) | 542.8 ( 53, 8) | 510.3 (336, 4) | 421.6 (336, 4) | 410.7 ( 12, 4) |
| 100.0 /                    | 439.8 ( 40, 1) | 510.6 ( 40, 1) | 432.3 (363, 4) | 348.8 (363, 4) | 283.9 (363, 4) |
| 90.0 /                     | 437.6 ( 88, 6) | 473.4 (336, 6) | 470.7 ( 88, 6) | 421.1 (336, 6) | 375.3 (336, 6) |
| 80.0 /                     | 411.6 ( 71, 4) | 418.5 ( 71, 4) | 379.4 ( 71, 4) | 329.0 ( 71, 4) | 285.6 ( 71, 4) |
| 70.0 /                     | 505.5 ( 89, 5) | 460.2 (291, 5) | 419.8 (291, 5) | 363.3 ( 89, 5) | 312.8 (291, 5) |
| 60.0 /                     | 335.0 ( 98, 7) | 428.4 ( 88, 7) | 390.0 ( 47, 7) | 351.0 ( 47, 7) | 311.5 ( 47, 7) |
| 50.0 /                     | 561.8 ( 44, 4) | 472.5 ( 44, 4) | 428.0 ( 39, 4) | 375.7 ( 39, 4) | 346.8 ( 51, 1) |
| 40.0 /                     | 520.7 ( 89, 4) | 456.2 ( 99, 4) | 476.4 ( 39, 6) | 466.8 ( 89, 2) | 443.3 ( 89, 2) |
| 30.0 /                     | 415.4 (342, 5) | 434.2 (342, 5) | 394.4 (342, 5) | 339.0 (342, 5) | 290.4 (342, 5) |
| 20.0 /                     | 566.3 (342, 5) | 348.8 (342, 5) | 341.4 ( 39, 3) | 309.4 ( 47, 5) | 261.1 ( 47, 5) |
| 10.0 /                     | 515.0 ( 47, 4) | 493.2 ( 83, 4) | 366.6 ( 83, 4) | 299.8 (105, 7) | 287.7 (105, 7) |

29



2ND HIGH  
24-HR  
SGROUP# 2  
YEAR 1970  
\*\*\* SC6C 2150 -- SC2

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\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 322.9 AND OCCURRED AT ( 800.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 80.4 ( 87, 1)  | 100.1 ( 64, 1) | 112.1 ( 34, 1) | 95.6 ( 34, 1)  | 85.7 ( 64, 1)  |
| 350.0 /                    | 140.6 ( 87, 1) | 149.4 ( 87, 1) | 141.8 ( 87, 1) | 127.8 ( 87, 1) | 115.0 ( 87, 1) |
| 340.0 /                    | 165.3 ( 64, 1) | 201.5 ( 64, 1) | 206.7 ( 47, 1) | 196.2 ( 47, 1) | 184.0 ( 47, 1) |
| 330.0 /                    | 115.1 ( 77, 1) | 142.1 ( 33, 1) | 131.4 (294, 1) | 127.6 (294, 1) | 121.1 (294, 1) |
| 320.0 /                    | 171.4 ( 90, 1) | 192.2 ( 90, 1) | 184.4 ( 90, 1) | 164.9 ( 90, 1) | 145.9 ( 90, 1) |
| 310.0 /                    | 166.4 (293, 1) | 211.5 (293, 1) | 214.8 (293, 1) | 197.0 (293, 1) | 189.4 ( 29, 1) |
| 300.0 /                    | 155.4 (104, 1) | 159.7 ( 62, 1) | 166.9 ( 62, 1) | 158.0 ( 62, 1) | 146.7 ( 62, 1) |
| 290.0 /                    | 140.7 (303, 1) | 178.0 (303, 1) | 182.8 (303, 1) | 170.3 (303, 1) | 155.3 (303, 1) |
| 280.0 /                    | 188.2 ( 60, 1) | 210.6 ( 60, 1) | 195.9 ( 60, 1) | 170.4 ( 60, 1) | 147.2 ( 60, 1) |
| 270.0 /                    | 271.7 ( 60, 1) | 322.9 ( 60, 1) | 304.7 (292, 1) | 265.1 (292, 1) | 229.6 (292, 1) |
| 260.0 /                    | 199.4 ( 5, 1)  | 243.2 ( 5, 1)  | 238.0 (344, 1) | 219.2 (291, 1) | 196.2 (331, 1) |
| 250.0 /                    | 201.0 (301, 1) | 236.9 (331, 1) | 263.9 (331, 1) | 255.7 (331, 1) | 239.5 (331, 1) |
| 240.0 /                    | 138.2 ( 37, 1) | 171.3 ( 37, 1) | 171.3 ( 37, 1) | 156.2 ( 37, 1) | 140.3 (291, 1) |
| 230.0 /                    | 194.6 (290, 1) | 174.8 (106, 1) | 153.7 ( 31, 1) | 134.7 ( 31, 1) | 117.1 ( 31, 1) |
| 220.0 /                    | 109.3 ( 38, 1) | 115.6 ( 93, 1) | 110.9 ( 93, 1) | 98.6 ( 93, 1)  | 86.7 ( 93, 1)  |
| 210.0 /                    | 78.6 (322, 1)  | 77.9 (106, 1)  | 70.0 ( 58, 1)  | 57.2 ( 58, 1)  | 50.1 ( 37, 1)  |
| 200.0 /                    | 75.5 (322, 1)  | 85.6 (322, 1)  | 82.0 ( 97, 1)  | 72.5 ( 97, 1)  | 63.5 ( 97, 1)  |
| 190.0 /                    | 75.2 ( 75, 1)  | 84.7 ( 52, 1)  | 91.8 ( 2, 1)   | 86.2 ( 97, 1)  | 77.6 ( 97, 1)  |
| 180.0 /                    | 85.8 (300, 1)  | 111.8 (300, 1) | 115.5 (300, 1) | 106.9 (300, 1) | 96.9 (300, 1)  |
| 170.0 /                    | 108.5 ( 52, 1) | 130.1 ( 52, 1) | 125.7 ( 52, 1) | 119.3 ( 24, 1) | 109.2 ( 51, 1) |
| 160.0 /                    | 131.0 ( 97, 1) | 148.3 ( 57, 1) | 150.6 ( 57, 1) | 140.5 ( 57, 1) | 132.4 ( 54, 1) |
| 150.0 /                    | 113.6 ( 35, 1) | 138.1 ( 35, 1) | 136.7 ( 52, 1) | 124.2 ( 52, 1) | 111.0 ( 52, 1) |
| 140.0 /                    | 150.3 (309, 1) | 197.5 (309, 1) | 195.9 (309, 1) | 177.5 (309, 1) | 158.5 (309, 1) |
| 130.0 /                    | 201.7 ( 7, 1)  | 239.0 (328, 1) | 233.4 ( 8, 1)  | 220.1 ( 8, 1)  | 198.5 ( 7, 1)  |
| 120.0 /                    | 128.7 ( 41, 1) | 145.4 ( 20, 1) | 143.9 (319, 1) | 130.0 (319, 1) | 115.6 (319, 1) |
| 110.0 /                    | 177.0 ( 41, 1) | 204.3 ( 41, 1) | 193.5 ( 41, 1) | 170.9 ( 41, 1) | 149.8 ( 41, 1) |
| 100.0 /                    | 158.0 ( 72, 1) | 158.1 ( 72, 1) | 149.0 ( 72, 1) | 131.2 ( 72, 1) | 114.9 ( 72, 1) |
| 90.0 /                     | 69.2 ( 19, 1)  | 76.7 (365, 1)  | 82.9 (365, 1)  | 79.0 (365, 1)  | 73.2 (365, 1)  |
| 80.0 /                     | 92.5 ( 1, 1)   | 106.0 ( 48, 1) | 105.0 ( 68, 1) | 96.0 ( 68, 1)  | 86.3 ( 68, 1)  |
| 70.0 /                     | 83.1 ( 1, 1)   | 87.8 ( 30, 1)  | 86.2 ( 30, 1)  | 77.6 (298, 1)  | 71.1 ( 30, 1)  |
| 60.0 /                     | 117.0 (355, 1) | 130.1 (359, 1) | 117.0 (327, 1) | 105.6 ( 67, 1) | 96.2 ( 67, 1)  |
| 50.0 /                     | 126.3 ( 56, 1) | 116.4 (297, 1) | 106.3 ( 40, 1) | 95.2 ( 40, 1)  | 84.5 ( 40, 1)  |
| 40.0 /                     | 73.0 ( 92, 1)  | 73.7 ( 92, 1)  | 70.4 ( 48, 1)  | 64.7 ( 48, 1)  | 58.5 ( 48, 1)  |
| 30.0 /                     | 77.2 ( 92, 1)  | 68.1 (102, 1)  | 67.9 (102, 1)  | 61.8 (102, 1)  | 55.5 (102, 1)  |
| 20.0 /                     | 72.2 ( 81, 1)  | 65.8 (365, 1)  | 65.6 (102, 1)  | 68.4 (102, 1)  | 68.6 (102, 1)  |
| 10.0 /                     | 55.1 ( 82, 1)  | 59.7 ( 17, 1)  | 56.1 ( 21, 1)  | 49.0 ( 34, 1)  | 44.1 (318, 1)  |

2ND HIGH  
24-HR  
SGROUP# 2  
YEAR 1971  
\*\*\* SCGC 2150 -- S02

\*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)  
\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 357.2 AND OCCURRED AT ( 800.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 75.0 ( 95, 1)  | 89.2 ( 95, 1)  | 87.3 ( 95, 1)  | 78.4 ( 95, 1)  | 73.9 (297, 1)  |
| 350.0 /                    | 100.3 ( 38, 1) | 125.2 ( 38, 1) | 128.1 ( 38, 1) | 120.3 ( 38, 1) | 111.5 ( 38, 1) |
| 340.0 /                    | 145.1 ( 38, 1) | 185.1 ( 38, 1) | 183.9 ( 38, 1) | 166.3 ( 38, 1) | 147.8 ( 38, 1) |
| 330.0 /                    | 146.3 ( 36, 1) | 175.8 ( 36, 1) | 180.4 ( 36, 1) | 166.4 ( 36, 1) | 151.6 ( 36, 1) |
| 320.0 /                    | 177.5 ( 58, 1) | 210.6 ( 36, 1) | 210.9 ( 36, 1) | 192.2 ( 36, 1) | 172.0 ( 36, 1) |
| 310.0 /                    | 183.6 ( 4, 1)  | 232.8 ( 92, 1) | 233.6 ( 92, 1) | 217.3 ( 92, 1) | 200.6 ( 92, 1) |
| 300.0 /                    | 112.9 ( 92, 1) | 134.8 (348, 1) | 143.8 (348, 1) | 139.4 (348, 1) | 132.4 (349, 1) |
| 290.0 /                    | 118.6 ( 34, 1) | 148.0 (348, 1) | 151.6 (348, 1) | 139.7 ( 35, 1) | 121.5 ( 35, 1) |
| 280.0 /                    | 136.6 ( 71, 1) | 172.9 (323, 1) | 179.9 (323, 1) | 167.2 (323, 1) | 150.2 ( 34, 1) |
| 270.0 /                    | 217.6 ( 3, 1)  | 280.0 ( 34, 1) | 264.4 ( 34, 1) | 238.9 ( 91, 1) | 218.3 ( 91, 1) |
| 260.0 /                    | 320.8 (327, 1) | 357.2 (319, 1) | 332.3 (319, 1) | 289.3 (319, 1) | 250.2 (319, 1) |
| 250.0 /                    | 261.6 (310, 1) | 307.4 (310, 1) | 296.7 (310, 1) | 266.0 (310, 1) | 236.1 (310, 1) |
| 240.0 /                    | 285.3 (305, 1) | 315.5 (357, 1) | 269.0 (357, 1) | 240.2 (102, 1) | 214.5 (102, 1) |
| 230.0 /                    | 173.3 (357, 1) | 168.7 (357, 1) | 159.3 (100, 1) | 147.0 (100, 1) | 134.5 (100, 1) |
| 220.0 /                    | 145.5 (100, 1) | 144.4 (100, 1) | 128.0 (100, 1) | 109.5 (100, 1) | 95.6 ( 98, 1)  |
| 210.0 /                    | 87.6 ( 80, 1)  | 87.9 (356, 1)  | 92.4 (100, 1)  | 80.6 (100, 1)  | 70.2 (100, 1)  |
| 200.0 /                    | 85.2 ( 86, 1)  | 97.8 ( 93, 1)  | 97.1 ( 93, 1)  | 87.1 ( 93, 1)  | 76.9 (352, 1)  |
| 190.0 /                    | 95.3 ( 76, 1)  | 108.3 ( 76, 1) | 102.3 ( 76, 1) | 90.3 ( 76, 1)  | 82.0 ( 93, 1)  |
| 180.0 /                    | 100.2 (352, 1) | 112.8 (352, 1) | 106.4 (352, 1) | 94.3 (352, 1)  | 83.0 (352, 1)  |
| 170.0 /                    | 121.9 (329, 1) | 137.5 (329, 1) | 129.6 (329, 1) | 113.9 (329, 1) | 99.4 (329, 1)  |
| 160.0 /                    | 97.6 (306, 1)  | 115.8 (314, 1) | 114.6 (314, 1) | 103.7 (314, 1) | 92.5 (314, 1)  |
| 150.0 /                    | 83.8 ( 98, 1)  | 93.9 (315, 1)  | 97.7 (315, 1)  | 92.3 (315, 1)  | 88.0 (317, 1)  |
| 140.0 /                    | 148.8 ( 89, 1) | 180.4 ( 16, 1) | 182.2 ( 86, 1) | 166.7 ( 86, 1) | 152.4 ( 86, 1) |
| 130.0 /                    | 159.9 ( 19, 1) | 194.3 ( 40, 1) | 195.9 ( 40, 1) | 181.2 ( 40, 1) | 166.0 ( 40, 1) |
| 120.0 /                    | 158.6 ( 65, 1) | 191.4 ( 66, 1) | 190.3 ( 66, 1) | 173.0 ( 66, 1) | 154.8 ( 66, 1) |
| 110.0 /                    | 95.7 ( 75, 1)  | 104.4 ( 79, 1) | 102.4 ( 54, 1) | 104.7 ( 54, 1) | 103.3 ( 54, 1) |
| 100.0 /                    | 82.7 (298, 1)  | 91.0 ( 44, 1)  | 87.4 ( 44, 1)  | 78.1 ( 44, 1)  | 69.1 ( 44, 1)  |
| 90.0 /                     | 95.4 ( 90, 1)  | 117.7 ( 15, 1) | 121.2 ( 15, 1) | 112.5 ( 15, 1) | 102.7 ( 15, 1) |
| 80.0 /                     | 105.4 ( 15, 1) | 110.5 ( 15, 1) | 102.3 ( 15, 1) | 88.9 ( 44, 1)  | 79.5 ( 15, 1)  |
| 70.0 /                     | 136.2 ( 85, 1) | 123.5 ( 82, 1) | 103.0 ( 82, 1) | 84.7 ( 82, 1)  | 69.9 ( 82, 1)  |
| 60.0 /                     | 187.0 (331, 1) | 114.4 ( 39, 1) | 99.7 ( 75, 1)  | 84.8 ( 75, 1)  | 73.1 ( 75, 1)  |
| 50.0 /                     | 87.8 ( 75, 1)  | 86.1 (324, 1)  | 71.5 (324, 1)  | 71.4 ( 18, 1)  | 70.7 ( 18, 1)  |
| 40.0 /                     | 55.6 ( 95, 1)  | 67.1 ( 95, 1)  | 65.4 (337, 1)  | 62.3 (337, 1)  | 57.7 (337, 1)  |
| 30.0 /                     | 94.0 ( 95, 1)  | 79.8 ( 85, 1)  | 72.6 ( 18, 1)  | 73.7 ( 18, 1)  | 73.1 ( 18, 1)  |
| 20.0 /                     | 73.3 ( 60, 1)  | 95.3 ( 66, 1)  | 98.9 ( 66, 1)  | 93.1 ( 66, 1)  | 86.9 ( 66, 1)  |
| 10.0 /                     | 55.4 ( 37, 1)  | 80.3 ( 37, 1)  | 89.6 ( 37, 1)  | 87.8 ( 37, 1)  | 80.7 ( 39, 1)  |

31

2ND HIGH  
24-HR  
SGROUP# 2  
YEAR 1972  
\*\*\* SCGC 2150 -- SC1

\*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 331.2 AND OCCURRED AT ( 800.0, 250.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 145.1 (356, 1) | 171.3 (356, 1) | 167.7 (330, 1) | 153.7 (330, 1) | 138.8 (330, 1) |
| 350.0 /                    | 110.9 (330, 1) | 135.7 (330, 1) | 137.5 (330, 1) | 126.6 (330, 1) | 114.5 (330, 1) |
| 340.0 /                    | 134.1 ( 13, 1) | 145.9 (356, 1) | 132.0 (356, 1) | 112.1 (356, 1) | 95.3 ( 50, 1)  |
| 330.0 /                    | 151.8 ( 13, 1) | 165.9 ( 13, 1) | 163.1 (341, 1) | 156.7 ( 62, 1) | 137.4 ( 62, 1) |
| 320.0 /                    | 169.8 (366, 1) | 200.0 (366, 1) | 197.2 (366, 1) | 179.1 (366, 1) | 160.0 (366, 1) |
| 310.0 /                    | 184.7 (360, 1) | 199.5 (349, 1) | 204.2 (349, 1) | 189.4 (349, 1) | 172.2 (349, 1) |
| 300.0 /                    | 197.1 (349, 1) | 240.6 (349, 1) | 223.5 ( 95, 1) | 194.5 ( 95, 1) | 170.0 ( 95, 1) |
| 290.0 /                    | 145.7 ( 81, 1) | 168.9 ( 81, 1) | 179.9 (307, 1) | 175.9 (308, 1) | 165.5 (308, 1) |
| 280.0 /                    | 167.5 (297, 1) | 188.0 (343, 1) | 197.0 (311, 1) | 177.4 ( 81, 1) | 154.2 ( 81, 1) |
| 270.0 /                    | 207.5 (347, 1) | 261.8 (347, 1) | 261.5 (347, 1) | 237.4 (347, 1) | 211.6 (347, 1) |
| 260.0 /                    | 183.8 ( 8, 1)  | 229.4 ( 18, 1) | 242.1 ( 18, 1) | 228.4 ( 18, 1) | 210.5 ( 18, 1) |
| 250.0 /                    | 270.9 (306, 1) | 331.2 (101, 1) | 313.0 (101, 1) | 275.8 (101, 1) | 240.8 (101, 1) |
| 240.0 /                    | 223.9 (109, 1) | 237.8 (100, 1) | 217.4 (306, 1) | 192.7 (306, 1) | 169.1 (306, 1) |
| 230.0 /                    | 166.9 (100, 1) | 188.3 ( 72, 1) | 189.1 ( 72, 1) | 172.2 ( 72, 1) | 154.1 ( 72, 1) |
| 220.0 /                    | 114.8 ( 70, 1) | 131.0 ( 70, 1) | 123.8 ( 70, 1) | 109.3 ( 70, 1) | 95.7 ( 70, 1)  |
| 210.0 /                    | 92.8 ( 72, 1)  | 120.3 ( 72, 1) | 123.6 ( 72, 1) | 114.4 ( 72, 1) | 103.8 ( 72, 1) |
| 200.0 /                    | 134.7 ( 70, 1) | 152.8 ( 70, 1) | 144.4 ( 70, 1) | 125.1 ( 69, 1) | 107.4 ( 69, 1) |
| 190.0 /                    | 95.1 ( 59, 1)  | 96.6 ( 66, 1)  | 95.7 ( 66, 1)  | 86.6 ( 66, 1)  | 77.3 ( 66, 1)  |
| 180.0 /                    | 101.6 ( 16, 1) | 111.9 ( 7, 1)  | 102.2 ( 7, 1)  | 87.9 ( 7, 1)   | 75.4 ( 7, 1)   |
| 170.0 /                    | 154.8 (351, 1) | 162.9 (351, 1) | 147.8 (336, 1) | 135.9 ( 66, 1) | 120.3 ( 40, 1) |
| 160.0 /                    | 141.3 ( 16, 1) | 163.1 ( 16, 1) | 154.4 ( 16, 1) | 136.0 ( 16, 1) | 118.8 ( 16, 1) |
| 150.0 /                    | 115.8 ( 16, 1) | 128.1 ( 45, 1) | 115.9 ( 16, 1) | 100.0 ( 16, 1) | 86.2 ( 16, 1)  |
| 140.0 /                    | 155.9 (322, 1) | 190.4 ( 36, 1) | 201.5 ( 36, 1) | 189.3 ( 36, 1) | 173.3 ( 36, 1) |
| 130.0 /                    | 145.9 (327, 1) | 202.3 (327, 1) | 208.1 ( 51, 1) | 186.7 ( 51, 1) | 167.6 ( 51, 1) |
| 120.0 /                    | 137.5 (361, 1) | 158.0 ( 51, 1) | 153.3 ( 51, 1) | 137.6 ( 51, 1) | 126.6 (321, 1) |
| 110.0 /                    | 166.4 ( 50, 1) | 112.4 ( 50, 1) | 113.4 (361, 1) | 111.2 (361, 1) | 107.2 (361, 1) |
| 100.0 /                    | 159.5 ( 44, 1) | 177.9 ( 50, 1) | 160.1 ( 50, 1) | 140.8 (361, 1) | 135.1 (361, 1) |
| 90.0 /                     | 85.3 ( 56, 1)  | 89.9 (361, 1)  | 89.8 (361, 1)  | 83.0 (361, 1)  | 76.0 (361, 1)  |
| 80.0 /                     | 58.2 ( 62, 1)  | 55.1 ( 50, 1)  | 52.6 ( 44, 1)  | 52.9 ( 44, 1)  | 49.7 (325, 1)  |
| 70.0 /                     | 58.3 ( 48, 1)  | 76.5 ( 48, 1)  | 69.6 ( 44, 1)  | 67.6 ( 44, 1)  | 63.5 ( 44, 1)  |
| 60.0 /                     | 131.1 ( 89, 1) | 152.3 ( 65, 1) | 148.2 ( 99, 1) | 127.4 ( 99, 1) | 110.7 ( 59, 1) |
| 50.0 /                     | 120.8 ( 38, 1) | 114.1 ( 47, 1) | 118.6 ( 47, 1) | 110.9 ( 47, 1) | 101.5 ( 47, 1) |
| 40.0 /                     | 121.3 ( 34, 1) | 116.8 ( 6, 1)  | 104.3 ( 82, 1) | 95.8 ( 82, 1)  | 88.0 ( 82, 1)  |
| 30.0 /                     | 86.5 ( 25, 1)  | 86.6 ( 33, 1)  | 91.0 ( 33, 1)  | 77.8 ( 5, 1)   | 78.1 (319, 1)  |
| 20.0 /                     | 75.2 ( 25, 1)  | 91.0 (331, 1)  | 93.0 (331, 1)  | 85.4 (331, 1)  | 78.5 (319, 1)  |
| 10.0 /                     | 68.2 ( 96, 1)  | 82.7 ( 56, 1)  | 85.6 ( 96, 1)  | 82.2 ( 96, 1)  | 78.6 (312, 1)  |

32

2ND HIGH  
24-HR  
SCGROUP# 2  
YEAR 1973  
\*\*\* SCGC 2150 -- SC2

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\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 314.3 AND OCCURRED AT ( 600.0, 220.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 64.0 (304, 1)  | 75.7 ( 76, 1)  | 83.8 ( 76, 1)  | 81.9 ( 76, 1)  | 77.9 ( 76, 1)  |
| 350.0 /                    | 102.4 ( 91, 1) | 130.8 ( 91, 1) | 133.3 ( 91, 1) | 122.7 ( 91, 1) | 110.6 ( 91, 1) |
| 340.0 /                    | 192.0 ( 97, 1) | 214.8 ( 97, 1) | 202.3 ( 97, 1) | 177.8 ( 97, 1) | 154.9 ( 97, 1) |
| 330.0 /                    | 169.7 (361, 1) | 189.8 ( 84, 1) | 186.1 ( 93, 1) | 168.9 ( 93, 1) | 151.3 ( 93, 1) |
| 320.0 /                    | 208.4 ( 21, 1) | 238.4 ( 21, 1) | 229.1 ( 21, 1) | 205.4 ( 21, 1) | 183.4 (329, 1) |
| 310.0 /                    | 231.2 (360, 1) | 278.8 (360, 1) | 272.6 (360, 1) | 245.1 (360, 1) | 217.2 (360, 1) |
| 300.0 /                    | 178.6 ( 32, 1) | 216.3 ( 70, 1) | 237.7 ( 70, 1) | 239.3 ( 70, 1) | 237.6 ( 70, 1) |
| 290.0 /                    | 190.9 ( 65, 1) | 267.6 ( 65, 1) | 297.0 ( 65, 1) | 291.3 ( 65, 1) | 277.1 ( 65, 1) |
| 280.0 /                    | 159.2 ( 64, 1) | 145.4 ( 72, 1) | 137.9 ( 65, 1) | 128.6 (324, 1) | 122.0 (324, 1) |
| 270.0 /                    | 192.4 ( 17, 1) | 232.8 ( 17, 1) | 228.9 ( 17, 1) | 205.6 ( 17, 1) | 181.8 ( 17, 1) |
| 260.0 /                    | 237.7 ( 17, 1) | 276.1 (317, 1) | 272.1 (317, 1) | 244.8 (317, 1) | 216.7 (317, 1) |
| 250.0 /                    | 217.1 (105, 1) | 256.0 (335, 1) | 261.7 (335, 1) | 241.6 (335, 1) | 218.3 (335, 1) |
| 240.0 /                    | 207.0 (316, 1) | 246.5 (315, 1) | 231.4 (315, 1) | 202.2 (315, 1) | 175.2 (315, 1) |
| 230.0 /                    | 194.6 (315, 1) | 167.1 (315, 1) | 167.8 (334, 1) | 154.2 (334, 1) | 138.9 (334, 1) |
| 220.0 /                    | 286.9 (295, 1) | 314.3 (295, 1) | 289.6 (295, 1) | 251.4 (295, 1) | 217.3 (295, 1) |
| 210.0 /                    | 157.5 (295, 1) | 169.4 (295, 1) | 154.9 (295, 1) | 134.1 (295, 1) | 115.8 (295, 1) |
| 200.0 /                    | 93.7 (295, 1)  | 108.9 (295, 1) | 105.0 (295, 1) | 94.1 (295, 1)  | 83.3 (295, 1)  |
| 190.0 /                    | 73.2 (352, 1)  | 78.8 (352, 1)  | 73.2 (352, 1)  | 64.1 (352, 1)  | 55.6 (352, 1)  |
| 180.0 /                    | 80.0 (352, 1)  | 93.7 (297, 1)  | 92.1 ( 50, 1)  | 93.2 ( 50, 1)  | 90.3 ( 50, 1)  |
| 170.0 /                    | 82.7 ( 15, 1)  | 94.6 (297, 1)  | 111.0 ( 50, 1) | 112.1 ( 50, 1) | 108.6 ( 50, 1) |
| 160.0 /                    | 90.1 ( 15, 1)  | 116.1 ( 48, 1) | 135.0 ( 50, 1) | 140.4 ( 50, 1) | 138.6 ( 50, 1) |
| 150.0 /                    | 101.6 (297, 1) | 125.7 (297, 1) | 147.1 ( 50, 1) | 153.1 ( 50, 1) | 151.6 ( 50, 1) |
| 140.0 /                    | 175.2 (302, 1) | 179.2 ( 48, 1) | 172.0 ( 14, 1) | 157.1 ( 14, 1) | 143.7 ( 14, 1) |
| 130.0 /                    | 194.1 ( 42, 1) | 219.7 (343, 1) | 214.5 (343, 1) | 196.1 (343, 1) | 178.1 (343, 1) |
| 120.0 /                    | 136.9 ( 42, 1) | 193.6 ( 12, 1) | 188.7 ( 12, 1) | 173.8 ( 34, 1) | 159.7 ( 34, 1) |
| 110.0 /                    | 130.4 ( 86, 1) | 159.7 (342, 1) | 158.3 ( 29, 1) | 141.4 ( 29, 1) | 125.1 ( 29, 1) |
| 100.0 /                    | 111.9 (350, 1) | 138.8 (350, 1) | 136.8 (350, 1) | 123.7 (350, 1) | 110.2 (350, 1) |
| 90.0 /                     | 79.2 ( 85, 1)  | 93.5 (302, 1)  | 101.5 (302, 1) | 99.2 (302, 1)  | 95.4 (302, 1)  |
| 80.0 /                     | 78.1 ( 85, 1)  | 85.8 ( 85, 1)  | 85.7 ( 85, 1)  | 76.2 ( 85, 1)  | 67.1 ( 85, 1)  |
| 70.0 /                     | 94.6 ( 19, 1)  | 92.5 ( 19, 1)  | 84.2 ( 19, 1)  | 73.9 ( 19, 1)  | 65.1 ( 19, 1)  |
| 60.0 /                     | 82.4 ( 85, 1)  | 87.1 ( 85, 1)  | 81.7 ( 85, 1)  | 74.6 ( 85, 1)  | 69.0 ( 85, 1)  |
| 50.0 /                     | 73.8 ( 94, 1)  | 78.4 ( 94, 1)  | 70.7 ( 80, 1)  | 64.0 ( 94, 1)  | 58.5 ( 92, 1)  |
| 40.0 /                     | 90.5 (348, 1)  | 108.7 (348, 1) | 106.0 (348, 1) | 95.0 (348, 1)  | 84.5 (348, 1)  |
| 30.0 /                     | 85.2 (350, 1)  | 91.4 (350, 1)  | 90.2 ( 80, 1)  | 84.2 ( 80, 1)  | 77.4 ( 80, 1)  |
| 20.0 /                     | 78.2 ( 94, 1)  | 96.8 (305, 1)  | 99.4 (305, 1)  | 92.9 (305, 1)  | 85.2 (305, 1)  |
| 10.0 /                     | 61.8 ( 85, 1)  | 71.2 ( 85, 1)  | 67.7 ( 85, 1)  | 60.0 ( 85, 1)  | 55.2 ( 27, 1)  |

33

2ND HIGH  
24-HR  
SGROUP# C  
YEAR 1974  
\*\*\* SCGC 2150 -- 502

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\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 336.8 AND OCCURRED AT ( 1000.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0         |
| 360.0 /                    | 93.6 ( 50, 1)  | 119.8 ( 50, 1) | 124.6 ( 83, 1) | 116.5 ( 83, 1) | 110.9 ( 50, 1) |
| 350.0 /                    | 98.4 ( 38, 1)  | 111.6 ( 50, 1) | 111.2 ( 50, 1) | 101.5 ( 50, 1) | 91.4 ( 50, 1)  |
| 340.0 /                    | 138.5 ( 38, 1) | 163.2 ( 38, 1) | 162.5 (349, 1) | 152.6 (349, 1) | 140.3 (349, 1) |
| 330.0 /                    | 144.8 ( 92, 1) | 152.7 ( 92, 1) | 140.6 ( 92, 1) | 132.4 (354, 1) | 124.2 (354, 1) |
| 320.0 /                    | 185.0 ( 94, 1) | 179.9 ( 93, 1) | 158.8 ( 93, 1) | 150.2 (334, 1) | 139.2 (334, 1) |
| 310.0 /                    | 163.5 ( 94, 1) | 203.8 ( 94, 1) | 205.5 ( 94, 1) | 189.3 ( 94, 1) | 172.3 ( 94, 1) |
| 300.0 /                    | 171.9 ( 52, 1) | 189.2 (104, 1) | 179.3 (104, 1) | 160.0 (104, 1) | 141.9 (104, 1) |
| 290.0 /                    | 147.9 ( 68, 1) | 196.0 (358, 1) | 186.9 (102, 1) | 163.8 (102, 1) | 146.5 ( 63, 1) |
| 280.0 /                    | 161.2 ( 74, 1) | 172.4 ( 74, 1) | 171.4 (321, 1) | 157.2 (321, 1) | 146.8 ( 65, 1) |
| 270.0 /                    | 252.9 (357, 1) | 329.9 (357, 1) | 336.8 ( 74, 1) | 293.1 ( 74, 1) | 253.5 ( 74, 1) |
| 260.0 /                    | 202.5 (321, 1) | 253.1 (321, 1) | 252.7 (321, 1) | 229.2 (321, 1) | 204.1 (321, 1) |
| 250.0 /                    | 197.7 (101, 1) | 239.6 ( 65, 1) | 243.6 ( 65, 1) | 223.9 ( 65, 1) | 201.6 ( 65, 1) |
| 240.0 /                    | 296.4 (294, 1) | 311.9 (294, 1) | 280.1 (294, 1) | 253.6 (306, 1) | 218.2 (295, 1) |
| 230.0 /                    | 230.8 (314, 1) | 278.8 (314, 1) | 272.1 (314, 1) | 243.7 (314, 1) | 215.2 (314, 1) |
| 220.0 /                    | 88.9 (296, 1)  | 101.0 (296, 1) | 103.0 (305, 1) | 97.2 (305, 1)  | 90.6 (305, 1)  |
| 210.0 /                    | 71.2 ( 77, 1)  | 82.0 ( 77, 1)  | 80.6 ( 77, 1)  | 73.0 ( 77, 1)  | 63.8 (356, 1)  |
| 200.0 /                    | 76.9 ( 12, 1)  | 73.5 ( 54, 1)  | 67.5 (364, 1)  | 63.6 (364, 1)  | 59.7 (364, 1)  |
| 190.0 /                    | 54.2 ( 35, 1)  | 59.7 (363, 1)  | 56.9 ( 35, 1)  | 53.1 ( 96, 1)  | 50.3 ( 96, 1)  |
| 180.0 /                    | 117.5 (332, 1) | 125.6 (332, 1) | 116.4 (332, 1) | 102.3 (332, 1) | 89.4 (332, 1)  |
| 170.0 /                    | 81.2 (311, 1)  | 98.2 (311, 1)  | 97.1 (311, 1)  | 88.6 (311, 1)  | 79.8 (311, 1)  |
| 160.0 /                    | 95.3 (313, 1)  | 126.2 (325, 1) | 117.7 (325, 1) | 102.6 (325, 1) | 89.0 (325, 1)  |
| 150.0 /                    | 111.8 ( 41, 1) | 114.5 (325, 1) | 122.9 ( 56, 1) | 115.2 (343, 1) | 107.1 ( 56, 1) |
| 140.0 /                    | 158.0 ( 56, 1) | 209.9 ( 57, 1) | 206.1 ( 57, 1) | 184.8 ( 57, 1) | 163.5 ( 57, 1) |
| 130.0 /                    | 158.0 (338, 1) | 171.2 ( 41, 1) | 173.2 ( 41, 1) | 159.0 ( 41, 1) | 145.2 ( 40, 1) |
| 120.0 /                    | 94.8 ( 76, 1)  | 109.3 ( 96, 1) | 105.4 ( 96, 1) | 96.6 ( 40, 1)  | 82.1 ( 40, 1)  |
| 110.0 /                    | 90.1 ( 40, 1)  | 93.5 (335, 1)  | 90.2 (335, 1)  | 80.9 (335, 1)  | 71.8 (335, 1)  |
| 100.0 /                    | 79.5 (363, 1)  | 76.1 ( 55, 1)  | 78.7 ( 55, 1)  | 73.9 ( 55, 1)  | 68.5 ( 55, 1)  |
| 90.0 /                     | 92.6 ( 55, 1)  | 102.6 (316, 1) | 96.9 (316, 1)  | 92.5 (351, 1)  | 91.1 (351, 1)  |
| 80.0 /                     | 125.0 ( 89, 1) | 122.1 ( 89, 1) | 107.1 ( 89, 1) | 90.9 ( 89, 1)  | 79.7 (335, 1)  |
| 70.0 /                     | 112.0 ( 75, 1) | 135.2 ( 75, 1) | 135.9 ( 75, 1) | 126.4 ( 75, 1) | 116.4 ( 75, 1) |
| 60.0 /                     | 145.0 ( 89, 1) | 143.0 ( 89, 1) | 123.8 ( 89, 1) | 104.4 ( 89, 1) | 88.7 ( 89, 1)  |
| 50.0 /                     | 89.0 ( 88, 1)  | 86.2 ( 89, 1)  | 80.1 ( 69, 1)  | 70.8 ( 89, 1)  | 63.0 ( 89, 1)  |
| 40.0 /                     | 110.5 ( 99, 1) | 114.1 ( 47, 1) | 106.7 ( 47, 1) | 96.3 ( 89, 1)  | 84.6 ( 89, 1)  |
| 30.0 /                     | 59.3 ( 99, 1)  | 60.2 (342, 1)  | 54.2 (342, 1)  | 48.4 ( 88, 1)  | 44.4 ( 88, 1)  |
| 20.0 /                     | 45.8 (342, 1)  | 50.2 ( 50, 1)  | 52.1 ( 39, 1)  | 52.1 ( 39, 1)  | 51.3 ( 34, 1)  |
| 10.0 /                     | 81.2 ( 47, 1)  | 86.2 ( 83, 1)  | 84.1 ( 75, 1)  | 81.8 ( 75, 1)  | 73.2 ( 47, 1)  |

34

\*N\*-DAY  
 183 DAYS  
 SGROUP# 3  
 YEAR 1970  
 \*\*\* SCGC 2050 -- SC2

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: *56,*  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 1.3 AND OCCURRED AT ( 1400.0, 260.0) \*

DIRECTION / RANGE (METERS)  
 (DEGREES) / 600.0 800.0 1000.0 1200.0 1400.0

|         |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|
| 360.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 350.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 340.0 / | 0.1 | 0.3 | 0.5 | 0.6 | 0.7 |
| 330.0 / | 0.1 | 0.3 | 0.5 | 0.6 | 0.7 |
| 320.0 / | 0.2 | 0.4 | 0.7 | 0.8 | 0.9 |
| 310.0 / | 0.2 | 0.4 | 0.7 | 0.8 | 0.9 |
| 300.0 / | 0.2 | 0.5 | 0.7 | 0.8 | 0.8 |
| 290.0 / | 0.2 | 0.4 | 0.6 | 0.8 | 0.8 |
| 280.0 / | 0.2 | 0.4 | 0.6 | 0.7 | 0.7 |
| 270.0 / | 0.2 | 0.6 | 0.9 | 1.1 | 1.2 |
| 260.0 / | 0.3 | 0.6 | 1.0 | 1.2 | 1.3 |
| 250.0 / | 0.2 | 0.5 | 0.9 | 1.1 | 1.2 |
| 240.0 / | 0.1 | 0.4 | 0.6 | 0.7 | 0.7 |
| 230.0 / | 0.2 | 0.4 | 0.6 | 0.7 | 0.7 |
| 220.0 / | 0.2 | 0.4 | 0.5 | 0.5 | 0.6 |
| 210.0 / | 0.1 | 0.3 | 0.4 | 0.4 | 0.4 |
| 200.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 190.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 180.0 / | 0.1 | 0.3 | 0.4 | 0.5 | 0.5 |
| 170.0 / | 0.2 | 0.4 | 0.6 | 0.6 | 0.7 |
| 160.0 / | 0.2 | 0.5 | 0.7 | 0.8 | 0.8 |
| 150.0 / | 0.3 | 0.5 | 0.7 | 0.8 | 0.9 |
| 140.0 / | 0.3 | 0.7 | 0.9 | 1.1 | 1.2 |
| 130.0 / | 0.3 | 0.7 | 0.9 | 1.1 | 1.1 |
| 120.0 / | 0.3 | 0.6 | 0.8 | 0.9 | 0.9 |
| 110.0 / | 0.2 | 0.4 | 0.6 | 0.7 | 0.8 |
| 100.0 / | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 |
| 90.0 /  | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 80.0 /  | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 70.0 /  | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 60.0 /  | 0.2 | 0.3 | 0.5 | 0.5 | 0.5 |
| 50.0 /  | 0.2 | 0.3 | 0.4 | 0.5 | 0.5 |
| 40.0 /  | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 30.0 /  | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |
| 20.0 /  | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 |
| 10.0 /  | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |

35

\*N\*-DAY  
 183 DAYS  
 SGROUP# 3  
 YEAR 1971  
 \*\*\* SCGC 2050 -- S02

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: *5h.*  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 1.9 AND OCCURRED AT ( 1400.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|
| 360.0 / | 0.0 | 0.1 | 0.2 | 0.2 | 0.3 |
| 350.0 / | 0.0 | 0.2 | 0.3 | 0.4 | 0.4 |
| 340.0 / | 0.1 | 0.2 | 0.4 | 0.5 | 0.6 |
| 330.0 / | 0.1 | 0.3 | 0.6 | 0.7 | 0.8 |
| 320.0 / | 0.1 | 0.4 | 0.8 | 1.0 | 1.1 |
| 310.0 / | 0.1 | 0.4 | 0.7 | 0.9 | 1.0 |
| 300.0 / | 0.2 | 0.5 | 0.7 | 0.8 | 0.8 |
| 290.0 / | 0.2 | 0.5 | 0.7 | 0.8 | 0.9 |
| 280.0 / | 0.2 | 0.6 | 0.9 | 1.0 | 1.1 |
| 270.0 / | 0.3 | 0.7 | 1.1 | 1.3 | 1.4 |
| 260.0 / | 0.3 | 0.9 | 1.4 | 1.7 | 1.9 |
| 250.0 / | 0.3 | 0.8 | 1.3 | 1.6 | 1.8 |
| 240.0 / | 0.3 | 0.7 | 1.1 | 1.3 | 1.4 |
| 230.0 / | 0.2 | 0.5 | 0.7 | 0.8 | 0.8 |
| 220.0 / | 0.1 | 0.3 | 0.5 | 0.6 | 0.6 |
| 210.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 200.0 / | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |
| 190.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 180.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 170.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 160.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 150.0 / | 0.1 | 0.3 | 0.4 | 0.4 | 0.5 |
| 140.0 / | 0.2 | 0.4 | 0.6 | 0.7 | 0.7 |
| 130.0 / | 0.2 | 0.4 | 0.6 | 0.7 | 0.8 |
| 120.0 / | 0.2 | 0.3 | 0.5 | 0.6 | 0.6 |
| 110.0 / | 0.1 | 0.3 | 0.4 | 0.4 | 0.5 |
| 100.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 90.0 /  | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 80.0 /  | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 70.0 /  | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 |
| 60.0 /  | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 |
| 50.0 /  | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 40.0 /  | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 30.0 /  | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 20.0 /  | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 |
| 10.0 /  | 0.0 | 0.1 | 0.1 | 0.1 | 0.2 |

36

\*N\*-DAY  
 184 DAYS  
 SGROUP# 3  
 YEAR 1972  
 \*\*\* SCGC 2050 -- S02

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\* 184-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 56,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 1.5 AND OCCURRED AT ( 1400.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|
| 360.0 / | 0.1 | 0.3 | 0.4 | 0.5 | 0.6 |
| 350.0 / | 0.1 | 0.3 | 0.4 | 0.5 | 0.5 |
| 340.0 / | 0.2 | 0.3 | 0.5 | 0.6 | 0.7 |
| 330.0 / | 0.2 | 0.4 | 0.6 | 0.8 | 0.8 |
| 320.0 / | 0.3 | 0.5 | 0.7 | 0.8 | 0.9 |
| 310.0 / | 0.3 | 0.7 | 1.0 | 1.1 | 1.2 |
| 300.0 / | 0.4 | 0.9 | 1.2 | 1.3 | 1.4 |
| 290.0 / | 0.3 | 0.7 | 1.1 | 1.3 | 1.4 |
| 280.0 / | 0.3 | 0.6 | 0.9 | 1.1 | 1.2 |
| 270.0 / | 0.3 | 0.7 | 1.1 | 1.4 | 1.5 |
| 260.0 / | 0.2 | 0.6 | 1.1 | 1.3 | 1.5 |
| 250.0 / | 0.2 | 0.5 | 0.9 | 1.1 | 1.2 |
| 240.0 / | 0.2 | 0.5 | 0.8 | 0.9 | 1.0 |
| 230.0 / | 0.1 | 0.4 | 0.6 | 0.8 | 0.9 |
| 220.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 210.0 / | 0.0 | 0.1 | 0.3 | 0.3 | 0.4 |
| 200.0 / | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 |
| 190.0 / | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 |
| 180.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 170.0 / | 0.1 | 0.3 | 0.5 | 0.5 | 0.6 |
| 160.0 / | 0.2 | 0.3 | 0.5 | 0.6 | 0.6 |
| 150.0 / | 0.2 | 0.4 | 0.5 | 0.6 | 0.6 |
| 140.0 / | 0.2 | 0.4 | 0.6 | 0.7 | 0.7 |
| 130.0 / | 0.1 | 0.3 | 0.5 | 0.5 | 0.6 |
| 120.0 / | 0.1 | 0.3 | 0.4 | 0.5 | 0.5 |
| 110.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 100.0 / | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |
| 90.0 /  | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 80.0 /  | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 70.0 /  | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 |
| 60.0 /  | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 |
| 50.0 /  | 0.2 | 0.3 | 0.4 | 0.5 | 0.5 |
| 40.0 /  | 0.2 | 0.3 | 0.4 | 0.5 | 0.5 |
| 30.0 /  | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 20.0 /  | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 10.0 /  | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |

34



\*N\*-DAY  
 183 DAYS  
 SGROUP# 3  
 YEAR 1973  
 \*\*\* SCGC 2050 -- S02

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: *54*  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 1.4 AND OCCURRED AT ( 1400.0, 250.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|
| 360.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 350.0 / | 0.1 | 0.3 | 0.4 | 0.4 | 0.5 |
| 340.0 / | 0.2 | 0.3 | 0.5 | 0.6 | 0.7 |
| 330.0 / | 0.2 | 0.5 | 0.7 | 0.8 | 0.9 |
| 320.0 / | 0.3 | 0.7 | 1.1 | 1.3 | 1.4 |
| 310.0 / | 0.3 | 0.7 | 1.1 | 1.3 | 1.4 |
| 300.0 / | 0.3 | 0.7 | 1.1 | 1.3 | 1.4 |
| 290.0 / | 0.3 | 0.6 | 0.9 | 1.0 | 1.1 |
| 280.0 / | 0.3 | 0.7 | 0.9 | 1.1 | 1.1 |
| 270.0 / | 0.3 | 0.7 | 1.0 | 1.3 | 1.4 |
| 260.0 / | 0.2 | 0.6 | 1.0 | 1.2 | 1.3 |
| 250.0 / | 0.3 | 0.7 | 1.1 | 1.3 | 1.4 |
| 240.0 / | 0.2 | 0.5 | 0.8 | 0.9 | 1.0 |
| 230.0 / | 0.1 | 0.3 | 0.5 | 0.7 | 0.7 |
| 220.0 / | 0.1 | 0.4 | 0.6 | 0.7 | 0.7 |
| 210.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 200.0 / | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 |
| 190.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 180.0 / | 0.1 | 0.3 | 0.4 | 0.5 | 0.5 |
| 170.0 / | 0.1 | 0.3 | 0.4 | 0.5 | 0.5 |
| 160.0 / | 0.2 | 0.3 | 0.5 | 0.6 | 0.6 |
| 150.0 / | 0.2 | 0.4 | 0.6 | 0.7 | 0.7 |
| 140.0 / | 0.3 | 0.5 | 0.7 | 0.8 | 0.9 |
| 130.0 / | 0.2 | 0.5 | 0.7 | 0.8 | 0.9 |
| 120.0 / | 0.2 | 0.4 | 0.7 | 0.8 | 0.9 |
| 110.0 / | 0.1 | 0.3 | 0.5 | 0.6 | 0.6 |
| 100.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 90.0 /  | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |
| 80.0 /  | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 |
| 70.0 /  | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |
| 60.0 /  | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 |
| 50.0 /  | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |
| 40.0 /  | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 |
| 30.0 /  | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 20.0 /  | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |
| 10.0 /  | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |

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\*N\*-DAY  
 183 DAYS  
 SCGROUP# 3  
 YEAR 1974  
 \*\*\* SCGC 2050 -- S02

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 58,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 1.8 AND OCCURRED AT ( 1400.0, 270.0) \*

DIRECTION / RANGE (METERS)  
 (DEGREES) / 600.0 800.0 1000.0 1200.0 1400.0

|         |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|
| 360.0 / | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 |
| 350.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 340.0 / | 0.2 | 0.3 | 0.5 | 0.5 | 0.6 |
| 330.0 / | 0.3 | 0.5 | 0.8 | 0.8 | 0.9 |
| 320.0 / | 0.4 | 0.8 | 1.1 | 1.2 | 1.2 |
| 310.0 / | 0.5 | 0.9 | 1.2 | 1.3 | 1.3 |
| 300.0 / | 0.4 | 0.8 | 1.0 | 1.1 | 1.2 |
| 290.0 / | 0.4 | 0.7 | 1.0 | 1.1 | 1.2 |
| 280.0 / | 0.3 | 0.7 | 1.1 | 1.2 | 1.3 |
| 270.0 / | 0.3 | 0.8 | 1.3 | 1.6 | 1.8 |
| 260.0 / | 0.3 | 0.8 | 1.3 | 1.6 | 1.7 |
| 250.0 / | 0.3 | 0.7 | 1.2 | 1.4 | 1.6 |
| 240.0 / | 0.2 | 0.6 | 1.0 | 1.2 | 1.3 |
| 230.0 / | 0.1 | 0.3 | 0.5 | 0.7 | 0.8 |
| 220.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 210.0 / | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |
| 200.0 / | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |
| 190.0 / | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 |
| 180.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 170.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 160.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 150.0 / | 0.1 | 0.3 | 0.4 | 0.5 | 0.5 |
| 140.0 / | 0.1 | 0.3 | 0.5 | 0.6 | 0.7 |
| 130.0 / | 0.1 | 0.3 | 0.5 | 0.6 | 0.7 |
| 120.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 110.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 100.0 / | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |
| 90.0 /  | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 80.0 /  | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 70.0 /  | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |
| 60.0 /  | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 |
| 50.0 /  | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 |
| 40.0 /  | 0.1 | 0.3 | 0.3 | 0.3 | 0.3 |
| 30.0 /  | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 20.0 /  | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 10.0 /  | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |

39

2ND HIGH  
3-HR  
SGROUP# 3  
YEAR 1970  
\*\*\* SCGC 2050 -- S02

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\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 51,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 47.1 AND OCCURRED AT ( 1200.0, 140.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |               |               |               |               |
|----------------------------|----------------|---------------|---------------|---------------|---------------|
|                            | 600.0          | 800.0         | 1000.0        | 1200.0        | 1400.0        |
| 360.0 /                    | 14.2 (363, 5)  | 15.4 (363, 5) | 19.9 (357, 4) | 22.0 ( 34, 3) | 22.2 (357, 4) |
| 350.0 /                    | 10.8 (357, 5)  | 19.6 (306, 5) | 20.3 (357, 5) | 20.5 ( 6, 4)  | 21.6 ( 77, 5) |
| 340.0 /                    | 17.0 ( 90, 4)  | 23.5 (314, 4) | 30.2 (314, 4) | 32.3 ( 33, 8) | 32.2 ( 95, 4) |
| 330.0 /                    | 18.3 (363, 4)  | 33.3 (100, 5) | 33.8 ( 95, 4) | 30.2 (356, 5) | 28.7 (356, 5) |
| 320.0 /                    | 23.7 ( 95, 4)  | 30.3 ( 95, 4) | 29.1 ( 95, 4) | 31.4 ( 79, 5) | 32.8 ( 79, 5) |
| 310.0 /                    | 19.5 ( 78, 5)  | 32.9 ( 78, 5) | 35.7 ( 78, 5) | 34.1 ( 32, 8) | 36.8 ( 32, 8) |
| 300.0 /                    | 27.1 (104, 5)  | 34.1 ( 78, 5) | 33.6 ( 78, 5) | 33.5 ( 69, 5) | 32.4 ( 25, 4) |
| 290.0 /                    | 20.7 (104, 5)  | 30.5 (101, 5) | 31.3 (101, 5) | 28.9 (104, 4) | 26.6 (302, 6) |
| 280.0 /                    | 20.5 (104, 4)  | 20.4 (324, 5) | 31.3 (324, 5) | 35.3 ( 27, 5) | 30.2 ( 27, 5) |
| 270.0 /                    | 22.6 ( 83, 5)  | 25.3 (104, 5) | 28.3 (335, 5) | 28.9 (296, 6) | 29.0 (296, 6) |
| 260.0 /                    | 21.1 ( 49, 5)  | 29.3 (323, 4) | 32.2 ( 83, 5) | 31.4 (291, 5) | 33.3 (291, 5) |
| 250.0 /                    | 17.5 (312, 5)  | 37.7 (312, 5) | 45.2 (326, 5) | 44.1 (326, 5) | 40.2 (326, 5) |
| 240.0 /                    | 17.8 ( 83, 4)  | 27.0 ( 83, 4) | 28.5 ( 83, 4) | 28.0 (291, 6) | 29.4 (291, 6) |
| 230.0 /                    | 31.0 (106, 6)  | 37.9 (106, 5) | 33.7 ( 65, 5) | 32.3 (106, 6) | 29.1 (337, 6) |
| 220.0 /                    | 20.6 (106, 5)  | 30.8 (106, 6) | 34.0 ( 39, 5) | 33.0 ( 39, 5) | 29.9 ( 39, 5) |
| 210.0 /                    | 14.3 (304, 5)  | 26.5 ( 82, 5) | 31.1 ( 82, 5) | 30.3 ( 82, 5) | 27.4 ( 82, 5) |
| 200.0 /                    | 11.0 (106, 5)  | 18.3 (106, 5) | 22.7 ( 82, 5) | 23.5 ( 82, 5) | 22.2 ( 82, 5) |
| 190.0 /                    | 11.2 (338, 5)  | 21.5 ( 75, 5) | 24.6 ( 75, 5) | 23.8 ( 75, 5) | 21.9 ( 75, 5) |
| 180.0 /                    | 15.9 ( 51, 5)  | 29.0 (325, 4) | 34.0 (325, 4) | 32.0 (325, 4) | 27.8 (325, 4) |
| 170.0 /                    | 21.8 (305, 4)  | 31.0 (325, 4) | 38.0 (325, 4) | 36.9 (325, 4) | 33.8 (321, 5) |
| 160.0 /                    | 30.3 (305, 4)  | 43.2 (305, 4) | 41.4 ( 49, 5) | 37.5 ( 21, 5) | 34.0 ( 21, 5) |
| 150.0 /                    | 23.9 (296, 4)  | 34.2 ( 49, 5) | 30.7 (361, 5) | 30.5 (361, 5) | 28.2 (361, 5) |
| 140.0 /                    | 24.4 (103, 4)  | 39.1 (338, 4) | 47.1 (338, 4) | 47.1 (338, 4) | 43.7 (338, 4) |
| 130.0 /                    | 38.9 (105, 5)  | 38.0 (105, 5) | 39.9 (340, 4) | 38.4 (289, 4) | 34.7 (362, 5) |
| 120.0 /                    | 33.0 (304, 4)  | 41.6 (304, 4) | 40.7 (296, 4) | 33.6 (296, 4) | 28.8 (299, 4) |
| 110.0 /                    | 34.5 ( 44, 5)  | 44.7 ( 44, 5) | 42.2 ( 44, 5) | 36.2 ( 44, 5) | 31.3 (304, 4) |
| 100.0 /                    | 19.5 ( 44, 5)  | 26.2 ( 49, 4) | 26.0 ( 20, 4) | 24.9 ( 68, 3) | 25.2 ( 12, 5) |
| 90.0 /                     | 21.2 (307, 5)  | 25.8 ( 1, 5)  | 29.5 ( 1, 5)  | 28.8 ( 1, 5)  | 26.4 ( 1, 5)  |
| 80.0 /                     | 31.2 (298, 4)  | 39.3 (307, 5) | 37.6 (307, 5) | 33.2 (307, 5) | 28.4 (307, 5) |
| 70.0 /                     | 17.1 ( 30, 4)  | 25.7 ( 30, 4) | 30.2 ( 30, 4) | 25.8 (298, 4) | 21.3 (298, 4) |
| 60.0 /                     | 20.7 (298, 4)  | 30.3 ( 18, 4) | 37.1 ( 18, 4) | 37.2 (359, 4) | 35.8 (359, 4) |
| 50.0 /                     | 22.2 (298, 4)  | 26.7 (347, 4) | 29.7 (347, 4) | 26.5 (347, 4) | 28.2 ( 92, 6) |
| 40.0 /                     | 21.3 (105, 4)  | 25.0 (105, 4) | 31.8 ( 26, 4) | 34.5 ( 26, 4) | 28.7 (297, 5) |
| 30.0 /                     | 25.7 (297, 5)  | 25.5 (297, 5) | 23.5 (347, 5) | 23.1 (347, 5) | 19.5 ( 92, 4) |
| 20.0 /                     | 19.0 (101, 4)  | 21.4 (359, 5) | 22.7 (359, 5) | 20.2 ( 92, 4) | 16.7 ( 92, 4) |
| 10.0 /                     | 16.7 ( 81, 4)  | 23.1 (101, 4) | 22.7 (317, 4) | 23.4 (297, 6) | 22.5 ( 26, 6) |

2ND HIGH  
3-HR  
SGROUP# 3  
YEAR 1971  
\*\*\* SCGC 2050 -- 502

\*\*\*

\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: *58*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 41.9 AND OCCURRED AT ( 1000.0, 280.0 ) \*

| DIRECTION /<br>(DEGREES) / | 600.0         | 800.0         | 1000.0        | 1200.0        | 1400.0        |
|----------------------------|---------------|---------------|---------------|---------------|---------------|
| 360.0 /                    | 10.6 ( 70, 4) | 17.9 ( 85, 3) | 20.3 ( 73, 3) | 20.1 ( 73, 3) | 19.3 ( 39, 3) |
| 350.0 /                    | 9.6 ( 73, 4)  | 19.1 ( 73, 4) | 22.1 ( 39, 1) | 22.9 ( 73, 4) | 22.6 ( 95, 6) |
| 340.0 /                    | 7.0 (341, 4)  | 15.3 (341, 4) | 21.1 (349, 5) | 23.1 (341, 4) | 23.5 ( 38, 6) |
| 330.0 /                    | 15.2 ( 94, 4) | 22.0 ( 30, 5) | 27.4 ( 9, 6)  | 31.7 ( 58, 4) | 31.2 (354, 6) |
| 320.0 /                    | 10.3 (341, 4) | 21.1 (349, 5) | 25.2 ( 60, 6) | 27.6 ( 4, 2)  | 31.1 (341, 5) |
| 310.0 /                    | 12.5 (364, 4) | 20.6 ( 81, 5) | 23.9 ( 81, 5) | 29.7 ( 6, 5)  | 34.2 ( 6, 5)  |
| 300.0 /                    | 16.4 ( 14, 4) | 21.4 ( 84, 4) | 28.0 (364, 6) | 30.8 (364, 6) | 28.2 ( 92, 4) |
| 290.0 /                    | 21.6 ( 81, 4) | 35.6 ( 81, 4) | 36.4 (106, 5) | 32.5 (106, 5) | 27.9 (106, 5) |
| 280.0 /                    | 23.9 (289, 5) | 37.1 (289, 5) | 41.9 (289, 5) | 38.0 ( 46, 5) | 32.5 ( 46, 5) |
| 270.0 /                    | 20.9 (289, 4) | 34.5 ( 46, 5) | 39.6 (104, 5) | 37.2 ( 46, 5) | 33.7 (322, 3) |
| 260.0 /                    | 30.0 (103, 5) | 40.7 (103, 5) | 39.0 (103, 5) | 35.8 (104, 5) | 33.8 (348, 1) |
| 250.0 /                    | 29.6 (105, 4) | 41.6 (103, 5) | 41.0 (293, 5) | 40.1 (105, 4) | 34.1 (105, 4) |
| 240.0 /                    | 18.8 ( 55, 5) | 34.3 ( 55, 5) | 40.0 (311, 4) | 39.2 (311, 4) | 35.8 (311, 4) |
| 230.0 /                    | 17.8 ( 55, 5) | 33.6 ( 29, 4) | 38.0 ( 29, 4) | 35.1 ( 29, 4) | 33.3 (317, 5) |
| 220.0 /                    | 16.0 (317, 4) | 25.5 ( 29, 4) | 31.1 ( 98, 5) | 31.2 ( 29, 5) | 29.0 (310, 6) |
| 210.0 /                    | 15.2 (101, 4) | 20.0 ( 80, 4) | 20.2 ( 87, 4) | 21.6 ( 80, 4) | 21.0 ( 99, 4) |
| 200.0 /                    | 10.8 ( 86, 5) | 18.8 (100, 4) | 19.6 ( 90, 4) | 23.4 ( 93, 5) | 26.9 ( 93, 5) |
| 190.0 /                    | 17.7 ( 2, 4)  | 23.6 ( 76, 5) | 26.2 (308, 4) | 25.9 (308, 4) | 24.2 ( 76, 5) |
| 180.0 /                    | 15.3 ( 2, 4)  | 23.8 ( 2, 4)  | 24.4 ( 2, 4)  | 25.6 (308, 5) | 28.3 (308, 5) |
| 170.0 /                    | 15.4 (317, 4) | 26.1 ( 12, 4) | 27.7 (329, 4) | 31.0 (329, 4) | 32.2 (329, 4) |
| 160.0 /                    | 16.5 (317, 4) | 23.5 ( 55, 4) | 26.1 ( 12, 4) | 25.6 ( 12, 4) | 23.4 ( 12, 4) |
| 150.0 /                    | 18.5 ( 28, 4) | 23.6 ( 28, 4) | 23.0 ( 67, 5) | 24.3 ( 67, 5) | 23.6 ( 1, 4)  |
| 140.0 /                    | 17.2 ( 98, 4) | 26.4 ( 28, 4) | 29.4 ( 64, 3) | 33.1 ( 1, 5)  | 30.7 ( 1, 5)  |
| 130.0 /                    | 18.4 ( 82, 5) | 24.2 ( 79, 4) | 26.4 ( 79, 4) | 25.5 ( 79, 4) | 27.3 ( 40, 2) |
| 120.0 /                    | 30.5 ( 82, 4) | 34.4 ( 96, 4) | 30.8 ( 96, 4) | 29.7 ( 19, 5) | 29.4 ( 82, 4) |
| 110.0 /                    | 20.0 (104, 4) | 24.2 ( 96, 4) | 24.3 ( 96, 4) | 26.2 ( 96, 3) | 24.1 ( 96, 5) |
| 100.0 /                    | 23.3 ( 96, 5) | 27.7 ( 96, 5) | 25.9 ( 96, 5) | 27.5 ( 54, 5) | 27.8 ( 54, 5) |
| 90.0 /                     | 16.2 ( 11, 5) | 21.9 (104, 4) | 24.5 (298, 5) | 25.1 ( 44, 4) | 26.7 ( 44, 4) |
| 80.0 /                     | 18.5 (300, 4) | 24.6 (300, 4) | 25.5 ( 15, 4) | 25.7 ( 15, 4) | 24.1 ( 15, 4) |
| 70.0 /                     | 21.5 ( 82, 5) | 30.0 ( 75, 5) | 33.6 ( 15, 5) | 33.1 ( 85, 6) | 33.8 ( 85, 6) |
| 60.0 /                     | 25.9 ( 75, 5) | 34.4 ( 75, 5) | 32.1 ( 75, 4) | 30.1 ( 75, 4) | 30.6 (331, 4) |
| 50.0 /                     | 27.8 (324, 5) | 35.5 (324, 5) | 34.0 (324, 5) | 29.7 (324, 5) | 25.2 (324, 5) |
| 40.0 /                     | 18.5 (106, 4) | 25.3 ( 46, 4) | 26.8 (106, 4) | 25.1 (106, 4) | 23.3 ( 62, 6) |
| 30.0 /                     | 15.2 ( 88, 4) | 20.1 ( 88, 4) | 19.8 ( 88, 4) | 19.5 ( 25, 4) | 21.3 ( 95, 7) |
| 20.0 /                     | 11.7 ( 70, 4) | 17.9 ( 31, 4) | 18.6 ( 85, 4) | 17.0 (333, 4) | 17.4 ( 9, 4)  |
| 10.0 /                     | 9.4 (104, 4)  | 19.4 (104, 4) | 22.3 (104, 4) | 21.1 (104, 4) | 18.6 (104, 4) |

41

2ND HIGH  
3-HR  
SGROUP# 3  
YEAR 1972  
\*\*\* SCGC 2050 -- S02

\*\*\*

\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: *58,*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 50.9 AND OCCURRED AT ( 1000.0, 280.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |               |               |               |               |
|----------------------------|----------------|---------------|---------------|---------------|---------------|
|                            | 600.0          | 800.0         | 1000.0        | 1200.0        | 1400.0        |
| 360.0 /                    | 13.0 ( 88, 5)  | 20.5 ( 11, 5) | 23.0 ( 78, 6) | 24.3 (357, 1) | 25.9 (357, 1) |
| 350.0 /                    | 12.6 (330, 5)  | 20.9 (330, 5) | 25.1 (330, 5) | 25.8 ( 79, 5) | 24.4 ( 79, 5) |
| 340.0 /                    | 18.3 (104, 4)  | 23.9 (104, 4) | 25.3 (104, 4) | 29.9 ( 13, 5) | 33.5 ( 13, 5) |
| 330.0 /                    | 20.4 (316, 5)  | 23.9 ( 57, 4) | 28.4 ( 62, 6) | 34.0 ( 62, 6) | 36.5 ( 62, 6) |
| 320.0 /                    | 26.8 (316, 5)  | 34.4 (301, 4) | 38.9 (301, 4) | 38.7 ( 30, 5) | 39.8 ( 30, 5) |
| 310.0 /                    | 26.1 (104, 5)  | 42.6 (316, 5) | 48.4 (316, 5) | 46.9 (316, 5) | 42.6 (316, 5) |
| 300.0 /                    | 27.6 (106, 4)  | 48.4 ( 75, 4) | 48.1 ( 95, 5) | 44.8 ( 87, 5) | 41.0 ( 56, 5) |
| 290.0 /                    | 18.0 (103, 5)  | 28.8 ( 75, 4) | 35.5 ( 57, 5) | 38.3 ( 57, 5) | 37.8 ( 57, 5) |
| 280.0 /                    | 25.8 ( 60, 4)  | 49.7 (297, 5) | 50.9 (297, 5) | 46.0 (297, 5) | 39.8 (297, 5) |
| 270.0 /                    | 21.5 (103, 4)  | 32.9 ( 56, 4) | 38.1 (364, 5) | 37.8 (293, 5) | 35.3 (293, 5) |
| 260.0 /                    | 15.5 (364, 5)  | 29.2 (103, 4) | 35.2 (293, 5) | 36.3 (293, 5) | 34.5 (293, 5) |
| 250.0 /                    | 18.9 (317, 4)  | 39.2 (103, 4) | 35.0 ( 94, 5) | 37.0 ( 94, 5) | 36.6 ( 94, 5) |
| 240.0 /                    | 18.8 (291, 4)  | 25.8 (291, 4) | 26.4 (292, 5) | 30.9 (295, 3) | 33.2 (353, 2) |
| 230.0 /                    | 12.1 (304, 4)  | 20.7 (299, 4) | 26.8 (304, 4) | 29.7 (299, 4) | 33.5 ( 71, 1) |
| 220.0 /                    | 16.4 (289, 4)  | 22.2 (342, 4) | 28.4 (299, 4) | 29.3 (299, 4) | 27.5 (299, 4) |
| 210.0 /                    | 5.6 (289, 4)   | 12.1 ( 39, 4) | 21.2 ( 70, 6) | 25.3 ( 70, 6) | 26.0 ( 86, 5) |
| 200.0 /                    | 7.2 ( 84, 5)   | 15.7 ( 59, 4) | 18.6 ( 53, 4) | 23.1 ( 59, 4) | 23.6 ( 69, 7) |
| 190.0 /                    | 18.0 (326, 5)  | 23.6 ( 84, 5) | 20.1 ( 84, 5) | 18.3 (323, 4) | 19.3 ( 97, 6) |
| 180.0 /                    | 18.4 (326, 5)  | 22.9 (326, 5) | 22.8 ( 7, 5)  | 29.0 ( 7, 5)  | 30.4 ( 83, 4) |
| 170.0 /                    | 20.1 (290, 4)  | 27.8 (326, 4) | 38.2 (326, 4) | 41.1 (326, 4) | 39.9 (326, 4) |
| 160.0 /                    | 22.4 ( 97, 5)  | 26.4 ( 45, 5) | 28.3 (289, 4) | 29.4 (290, 4) | 24.5 (290, 4) |
| 150.0 /                    | 21.7 ( 97, 4)  | 28.9 (359, 5) | 30.3 ( 97, 4) | 28.7 (363, 5) | 27.9 ( 84, 4) |
| 140.0 /                    | 15.0 ( 59, 4)  | 29.2 (322, 5) | 29.3 (359, 5) | 28.6 ( 84, 4) | 27.2 ( 84, 4) |
| 130.0 /                    | 15.2 (321, 5)  | 25.4 (321, 4) | 26.9 (321, 4) | 24.8 (321, 4) | 21.8 (321, 4) |
| 120.0 /                    | 17.6 (362, 5)  | 23.9 (361, 4) | 22.2 (328, 4) | 22.4 (359, 4) | 21.2 ( 50, 8) |
| 110.0 /                    | 17.5 ( 77, 4)  | 22.2 ( 88, 4) | 20.6 (363, 5) | 22.9 (328, 4) | 21.8 ( 77, 4) |
| 100.0 /                    | 16.8 ( 88, 4)  | 20.9 ( 88, 4) | 20.6 (361, 4) | 20.9 (363, 4) | 20.0 (363, 4) |
| 90.0 /                     | 16.2 ( 3, 5)   | 20.3 ( 84, 5) | 20.3 ( 31, 4) | 19.3 (358, 5) | 18.4 ( 88, 4) |
| 80.0 /                     | 5.4 (320, 5)   | 15.9 ( 78, 5) | 19.7 (320, 5) | 20.6 (320, 5) | 20.2 (320, 5) |
| 70.0 /                     | 25.8 ( 88, 5)  | 24.3 ( 88, 5) | 19.7 ( 88, 5) | 19.9 ( 48, 5) | 23.6 ( 48, 5) |
| 60.0 /                     | 30.0 ( 99, 4)  | 37.6 ( 88, 5) | 31.6 ( 86, 5) | 29.6 ( 78, 4) | 29.3 ( 78, 4) |
| 50.0 /                     | 22.2 (104, 4)  | 27.9 ( 6, 5)  | 30.9 ( 98, 5) | 33.2 ( 6, 4)  | 30.8 ( 98, 5) |
| 40.0 /                     | 24.6 ( 5, 5)   | 39.9 ( 5, 5)  | 43.9 ( 5, 5)  | 42.0 ( 5, 5)  | 38.0 ( 5, 5)  |
| 30.0 /                     | 18.5 ( 5, 5)   | 27.7 ( 5, 5)  | 31.1 ( 63, 5) | 28.4 ( 85, 4) | 26.3 ( 5, 4)  |
| 20.0 /                     | 26.8 ( 88, 5)  | 25.4 ( 96, 4) | 23.3 ( 34, 4) | 28.6 ( 34, 4) | 26.8 ( 85, 4) |
| 10.0 /                     | 24.4 (316, 4)  | 21.8 ( 65, 4) | 24.5 ( 65, 4) | 23.7 ( 65, 4) | 21.9 (302, 4) |

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2ND HIGH  
3-HR  
SGROUP# 3  
YEAP 1973  
\*\*\* SCGC 2050 -- S02

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\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 51,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 50.1 AND OCCURRED AT ( 1200.0, 320.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0         | 800.0         | 1000.0        | 1200.0        | 1400.0        |
|----------------------------|---------------|---------------|---------------|---------------|---------------|
| 360.0 /                    | 14.6 (332, 4) | 21.4 (332, 4) | 24.9 ( 79, 4) | 22.5 ( 79, 4) | 21.5 (309, 4) |
| 350.0 /                    | 20.6 ( 79, 4) | 24.6 ( 27, 4) | 24.3 ( 93, 4) | 30.0 (304, 4) | 27.9 (304, 4) |
| 340.0 /                    | 31.7 ( 79, 4) | 35.2 ( 93, 4) | 30.4 ( 93, 4) | 28.3 ( 84, 8) | 27.3 ( 79, 4) |
| 330.0 /                    | 19.4 ( 99, 3) | 25.1 ( 99, 3) | 26.3 ( 93, 6) | 29.4 ( 97, 5) | 32.5 ( 93, 6) |
| 320.0 /                    | 21.8 (329, 5) | 40.6 (329, 5) | 49.2 (329, 5) | 50.1 (329, 5) | 47.9 (329, 5) |
| 310.0 /                    | 20.9 ( 1, 5)  | 36.1 ( 1, 4)  | 39.2 (358, 4) | 36.8 (358, 4) | 33.8 ( 1, 4)  |
| 300.0 /                    | 19.1 (313, 4) | 29.6 (326, 4) | 35.4 (326, 4) | 34.7 (326, 4) | 33.6 ( 68, 4) |
| 290.0 /                    | 21.9 (313, 5) | 28.3 (301, 4) | 34.6 (301, 4) | 34.8 (301, 4) | 32.6 (353, 8) |
| 280.0 /                    | 22.1 ( 64, 5) | 39.4 ( 64, 4) | 44.3 ( 72, 5) | 43.4 ( 72, 5) | 39.5 ( 72, 5) |
| 270.0 /                    | 21.8 ( 5, 5)  | 28.8 (289, 5) | 36.4 (289, 5) | 38.4 (289, 5) | 37.8 (289, 5) |
| 260.0 /                    | 19.4 (327, 5) | 36.3 (102, 6) | 36.6 (102, 6) | 37.9 (321, 4) | 39.3 (321, 4) |
| 250.0 /                    | 20.8 (102, 6) | 34.2 (327, 4) | 38.9 (300, 4) | 36.4 (300, 4) | 36.1 (327, 4) |
| 240.0 /                    | 17.8 (104, 4) | 24.0 (104, 4) | 24.6 (289, 4) | 30.6 (316, 6) | 34.3 ( 78, 5) |
| 230.0 /                    | 14.9 ( 37, 5) | 23.1 ( 37, 5) | 27.0 (294, 8) | 29.7 (335, 6) | 34.7 (335, 6) |
| 220.0 /                    | 15.1 (103, 4) | 27.9 ( 95, 5) | 31.6 ( 95, 5) | 30.3 ( 95, 5) | 30.1 (103, 5) |
| 210.0 /                    | 12.7 ( 7, 5)  | 22.4 ( 7, 5)  | 25.7 (290, 5) | 25.2 (295, 3) | 27.8 (290, 5) |
| 200.0 /                    | 10.5 ( 81, 5) | 17.2 ( 81, 5) | 20.2 ( 81, 5) | 20.8 ( 52, 6) | 20.8 ( 52, 6) |
| 190.0 /                    | 13.1 (299, 4) | 21.2 (299, 4) | 26.8 ( 43, 4) | 27.8 ( 43, 4) | 26.1 ( 43, 4) |
| 180.0 /                    | 13.6 ( 81, 4) | 22.1 ( 20, 4) | 27.3 (346, 5) | 31.1 (346, 5) | 32.4 (352, 5) |
| 170.0 /                    | 16.0 ( 77, 5) | 31.0 ( 37, 4) | 41.0 ( 37, 4) | 41.0 ( 15, 5) | 36.6 ( 15, 5) |
| 160.0 /                    | 21.5 ( 15, 5) | 31.6 ( 15, 5) | 32.4 ( 15, 5) | 29.6 ( 15, 5) | 27.5 ( 78, 4) |
| 150.0 /                    | 17.7 ( 53, 4) | 24.6 (302, 4) | 27.5 (352, 4) | 28.6 (299, 3) | 29.2 (299, 3) |
| 140.0 /                    | 23.3 ( 47, 5) | 35.2 ( 47, 5) | 39.9 (302, 5) | 39.5 (302, 5) | 36.5 (302, 5) |
| 130.0 /                    | 21.1 ( 95, 4) | 28.8 ( 14, 5) | 40.1 (344, 5) | 40.4 ( 47, 5) | 36.9 ( 47, 5) |
| 120.0 /                    | 26.2 ( 6, 5)  | 34.9 (101, 4) | 33.7 ( 53, 5) | 35.2 ( 99, 6) | 37.1 ( 99, 6) |
| 110.0 /                    | 18.4 ( 85, 4) | 25.8 ( 19, 5) | 32.8 ( 86, 5) | 35.7 ( 86, 5) | 36.5 ( 86, 5) |
| 100.0 /                    | 14.2 ( 58, 4) | 20.5 ( 58, 4) | 21.4 ( 58, 4) | 24.8 (355, 4) | 24.4 ( 85, 5) |
| 90.0 /                     | 13.2 (303, 5) | 20.1 (303, 5) | 20.1 ( 6, 4)  | 21.0 (302, 3) | 20.2 (355, 6) |
| 80.0 /                     | 19.1 ( 6, 4)  | 32.0 ( 19, 4) | 37.0 ( 19, 4) | 36.5 ( 19, 4) | 33.6 ( 19, 4) |
| 70.0 /                     | 21.5 (320, 4) | 29.9 (320, 5) | 30.4 (320, 5) | 30.1 ( 98, 4) | 30.5 ( 98, 4) |
| 60.0 /                     | 18.2 ( 5, 4)  | 25.6 (320, 5) | 35.9 (320, 5) | 36.9 ( 6, 4)  | 34.6 ( 6, 4)  |
| 50.0 /                     | 19.2 ( 99, 4) | 21.2 ( 57, 5) | 26.6 ( 57, 5) | 28.0 ( 57, 5) | 27.8 ( 57, 5) |
| 40.0 /                     | 11.4 ( 57, 5) | 12.0 ( 99, 5) | 14.1 ( 94, 6) | 15.9 ( 94, 6) | 17.3 (348, 4) |
| 30.0 /                     | 12.5 ( 99, 4) | 17.8 ( 8, 4)  | 20.8 ( 94, 6) | 22.0 (350, 5) | 22.8 (350, 5) |
| 20.0 /                     | 19.6 (320, 4) | 24.1 (313, 4) | 23.7 (313, 4) | 21.2 ( 28, 5) | 22.5 ( 28, 5) |
| 10.0 /                     | 13.7 ( 27, 4) | 22.3 (304, 5) | 22.1 (304, 5) | 21.0 ( 23, 5) | 28.1 ( 23, 5) |

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2ND HIGH  
3-HR  
SGROUP# 3  
YEAR 1974  
\*\*\* SCGC 2050 -- S02

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\* SECOND HIGHEST 3-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: *54*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 49.1 AND OCCURRED AT ( 1000.0, 300.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0         | 800.0         | RANGE (METERS)<br>1000.0 | 1200.0        | 1400.0        |
|----------------------------|---------------|---------------|--------------------------|---------------|---------------|
| 360.0 /                    | 25.8 ( 21, 4) | 38.2 ( 21, 4) | 42.1 ( 21, 4)            | 41.7 ( 21, 4) | 38.8 ( 83, 4) |
| 350.0 /                    | 27.4 ( 83, 4) | 29.6 ( 21, 4) | 27.3 ( 30, 4)            | 25.2 ( 80, 4) | 25.4 ( 30, 4) |
| 340.0 /                    | 19.3 ( 16, 4) | 27.0 ( 30, 4) | 27.9 ( 30, 4)            | 27.4 ( 38, 4) | 29.2 ( 38, 4) |
| 330.0 /                    | 20.8 (104, 5) | 32.3 ( 84, 4) | 35.5 (353, 5)            | 33.0 (353, 5) | 30.5 ( 87, 5) |
| 320.0 /                    | 25.5 (359, 5) | 34.0 (359, 5) | 32.4 (359, 5)            | 32.5 ( 92, 5) | 36.1 ( 78, 6) |
| 310.0 /                    | 30.3 ( 44, 5) | 42.8 ( 85, 5) | 42.8 ( 85, 5)            | 38.8 (103, 6) | 37.7 ( 10, 4) |
| 300.0 /                    | 33.0 ( 65, 4) | 48.3 ( 85, 4) | 49.1 ( 85, 4)            | 44.3 ( 85, 4) | 38.4 ( 85, 4) |
| 290.0 /                    | 22.5 ( 90, 5) | 31.6 ( 27, 5) | 34.2 ( 27, 5)            | 32.4 ( 68, 6) | 31.6 ( 43, 5) |
| 280.0 /                    | 25.0 ( 86, 5) | 35.7 (309, 4) | 40.3 (309, 4)            | 38.6 (309, 4) | 34.6 (309, 4) |
| 270.0 /                    | 25.1 ( 68, 4) | 41.5 (309, 4) | 45.4 (309, 4)            | 42.5 (309, 4) | 37.4 ( 68, 4) |
| 260.0 /                    | 22.2 ( 97, 4) | 34.5 (101, 4) | 38.4 (328, 5)            | 37.7 (328, 5) | 34.4 (328, 5) |
| 250.0 /                    | 23.6 ( 90, 5) | 37.7 (323, 5) | 38.1 ( 97, 4)            | 35.3 (365, 4) | 34.0 (323, 5) |
| 240.0 /                    | 19.6 (310, 4) | 28.6 ( 97, 4) | 29.9 ( 97, 4)            | 32.6 (306, 6) | 33.4 (310, 4) |
| 230.0 /                    | 11.2 (310, 4) | 17.3 (339, 5) | 21.2 (339, 5)            | 26.4 (312, 4) | 29.6 (312, 4) |
| 220.0 /                    | 11.8 ( 69, 4) | 19.9 (364, 5) | 22.4 (364, 5)            | 21.4 (364, 5) | 22.8 (293, 7) |
| 210.0 /                    | 11.9 (356, 4) | 19.8 (356, 4) | 22.1 ( 32, 5)            | 21.4 (356, 4) | 19.8 ( 77, 6) |
| 200.0 /                    | 14.7 ( 54, 4) | 26.4 ( 54, 4) | 29.4 ( 54, 4)            | 27.9 ( 54, 4) | 24.9 ( 54, 4) |
| 190.0 /                    | 17.6 ( 54, 4) | 24.6 ( 69, 4) | 21.1 ( 69, 4)            | 20.0 ( 90, 4) | 19.3 ( 54, 4) |
| 180.0 /                    | 14.5 ( 69, 4) | 24.1 (332, 5) | 29.2 (344, 5)            | 30.4 (332, 5) | 29.5 (332, 5) |
| 170.0 /                    | 13.8 (292, 5) | 18.0 ( 96, 4) | 19.8 ( 54, 4)            | 20.9 ( 54, 4) | 20.0 ( 54, 4) |
| 160.0 /                    | 13.6 (322, 5) | 22.2 ( 41, 4) | 25.2 ( 41, 4)            | 24.3 ( 41, 4) | 24.4 (325, 4) |
| 150.0 /                    | 16.8 ( 42, 5) | 31.3 (291, 4) | 37.3 (339, 4)            | 34.9 (339, 4) | 30.7 (339, 4) |
| 140.0 /                    | 16.1 ( 42, 5) | 20.1 ( 42, 5) | 23.4 (338, 4)            | 24.0 (338, 4) | 23.7 (316, 8) |
| 130.0 /                    | 18.7 ( 76, 5) | 22.4 ( 76, 4) | 23.0 ( 12, 4)            | 25.5 ( 42, 4) | 26.9 ( 40, 6) |
| 120.0 /                    | 15.1 (336, 4) | 20.7 ( 17, 4) | 21.4 (292, 4)            | 26.8 (316, 6) | 26.1 (336, 4) |
| 110.0 /                    | 20.6 (316, 4) | 24.1 (106, 4) | 30.1 (336, 4)            | 32.2 (336, 4) | 30.6 (316, 4) |
| 100.0 /                    | 22.6 (363, 4) | 29.5 ( 17, 4) | 28.6 ( 17, 4)            | 25.5 ( 17, 4) | 22.1 ( 17, 4) |
| 90.0 /                     | 21.6 ( 17, 4) | 23.7 (291, 4) | 22.9 (316, 5)            | 24.2 ( 88, 6) | 25.9 ( 88, 6) |
| 80.0 /                     | 15.9 (350, 4) | 23.6 (350, 4) | 25.7 ( 71, 4)            | 26.1 ( 71, 4) | 25.4 ( 71, 4) |
| 70.0 /                     | 19.5 ( 79, 5) | 23.3 (290, 4) | 28.1 (291, 5)            | 29.2 (291, 5) | 28.4 (291, 5) |
| 60.0 /                     | 22.0 ( 89, 4) | 24.9 ( 21, 5) | 23.9 ( 82, 4)            | 22.0 ( 82, 4) | 22.7 ( 88, 7) |
| 50.0 /                     | 15.1 ( 99, 4) | 30.2 ( 99, 4) | 32.8 ( 99, 4)            | 33.8 ( 39, 5) | 32.7 ( 44, 4) |
| 40.0 /                     | 21.5 ( 16, 4) | 25.0 ( 16, 4) | 30.8 ( 99, 4)            | 30.9 ( 99, 4) | 29.3 ( 99, 4) |
| 30.0 /                     | 14.8 ( 88, 3) | 19.7 ( 75, 4) | 21.2 (342, 5)            | 23.0 (342, 5) | 23.1 (342, 5) |
| 20.0 /                     | 12.5 (342, 5) | 21.1 (342, 5) | 23.9 (353, 4)            | 21.9 (353, 4) | 20.1 ( 47, 5) |
| 10.0 /                     | 15.0 ( 82, 4) | 21.9 ( 68, 4) | 25.9 ( 47, 4)            | 29.4 ( 47, 4) | 30.5 ( 47, 4) |

44

2ND HIGH  
24-HR  
SGROUP# 3  
YEAR 1970  
\*\*\* SCGC 2050 -- S02

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\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 51  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 14.6 AND OCCURRED AT ( 1400.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0        | 800.0        | 1000.0        | 1200.0        | 1400.0        |
|----------------------------|--------------|--------------|---------------|---------------|---------------|
| 360.0 /                    | 1.8 (363, 1) | 2.7 ( 34, 1) | 4.4 ( 87, 1)  | 4.3 ( 87, 1)  | 4.2 ( 64, 1)  |
| 350.0 /                    | 1.6 (357, 1) | 3.7 ( 34, 1) | 5.9 ( 87, 1)  | 6.5 ( 87, 1)  | 6.8 ( 87, 1)  |
| 340.0 /                    | 2.2 ( 90, 1) | 4.8 ( 95, 1) | 6.3 ( 47, 1)  | 8.3 ( 47, 1)  | 9.7 ( 47, 1)  |
| 330.0 /                    | 4.1 ( 95, 1) | 5.6 (356, 1) | 6.3 (356, 1)  | 6.6 ( 33, 1)  | 6.7 ( 33, 1)  |
| 320.0 /                    | 3.4 ( 80, 1) | 5.2 ( 79, 1) | 7.5 ( 79, 1)  | 10.4 ( 90, 1) | 10.8 ( 90, 1) |
| 310.0 /                    | 3.7 ( 91, 1) | 5.9 ( 89, 1) | 6.6 ( 78, 1)  | 8.3 (293, 1)  | 9.8 (293, 1)  |
| 300.0 /                    | 4.4 ( 78, 1) | 6.9 ( 78, 1) | 7.6 ( 78, 1)  | 9.9 (293, 1)  | 8.6 (104, 1)  |
| 290.0 /                    | 2.6 (335, 1) | 4.9 (335, 1) | 6.2 ( 61, 1)  | 7.5 (303, 1)  | 8.5 (303, 1)  |
| 280.0 /                    | 3.5 ( 27, 1) | 4.7 (306, 1) | 5.6 (306, 1)  | 6.3 ( 60, 1)  | 7.2 ( 60, 1)  |
| 270.0 /                    | 3.4 ( 27, 1) | 5.7 (292, 1) | 10.8 ( 60, 1) | 13.4 (292, 1) | 14.6 (292, 1) |
| 260.0 /                    | 3.8 ( 27, 1) | 5.6 (291, 1) | 7.4 (301, 1)  | 8.6 (302, 1)  | 9.7 ( 5, 1)   |
| 250.0 /                    | 2.4 (326, 1) | 6.1 (301, 1) | 9.7 (301, 1)  | 11.2 (301, 1) | 11.7 (301, 1) |
| 240.0 /                    | 2.3 ( 83, 1) | 4.2 (291, 1) | 7.5 (106, 1)  | 6.6 (106, 1)  | 6.9 ( 37, 1)  |
| 230.0 /                    | 2.9 ( 83, 1) | 5.1 (364, 1) | 7.7 (290, 1)  | 9.3 (290, 1)  | 9.9 (290, 1)  |
| 220.0 /                    | 2.9 (289, 1) | 4.5 ( 65, 1) | 5.4 ( 65, 1)  | 5.5 ( 93, 1)  | 6.2 ( 38, 1)  |
| 210.0 /                    | 2.1 (289, 1) | 4.1 (322, 1) | 5.4 (322, 1)  | 5.4 ( 58, 1)  | 5.0 ( 58, 1)  |
| 200.0 /                    | 1.7 ( 58, 1) | 3.0 ( 58, 1) | 3.3 ( 58, 1)  | 4.0 (322, 1)  | 4.4 (322, 1)  |
| 190.0 /                    | 1.6 ( 75, 1) | 2.9 ( 75, 1) | 3.6 ( 75, 1)  | 3.8 ( 39, 1)  | 3.9 ( 39, 1)  |
| 180.0 /                    | 2.3 (105, 1) | 3.6 (325, 1) | 4.3 (325, 1)  | 4.1 (300, 1)  | 4.9 (300, 1)  |
| 170.0 /                    | 3.2 ( 97, 1) | 4.4 (339, 1) | 5.3 (321, 1)  | 5.7 (321, 1)  | 5.6 (321, 1)  |
| 160.0 /                    | 4.1 (305, 1) | 6.2 ( 49, 1) | 6.3 (305, 1)  | 5.8 (305, 1)  | 6.6 ( 52, 1)  |
| 150.0 /                    | 3.6 ( 65, 1) | 5.2 (103, 1) | 6.0 (361, 1)  | 6.5 (361, 1)  | 6.3 (361, 1)  |
| 140.0 /                    | 4.0 (103, 1) | 5.3 (338, 1) | 6.4 (338, 1)  | 7.2 (328, 1)  | 8.1 (309, 1)  |
| 130.0 /                    | 5.2 (296, 1) | 6.5 (289, 1) | 7.0 (362, 1)  | 7.9 ( 7, 1)   | 8.6 (328, 1)  |
| 120.0 /                    | 4.4 (304, 1) | 5.9 (304, 1) | 7.2 (299, 1)  | 8.1 (315, 1)  | 8.1 (315, 1)  |
| 110.0 /                    | 4.3 ( 44, 1) | 5.8 (316, 1) | 6.8 ( 72, 1)  | 7.8 ( 41, 1)  | 8.7 ( 41, 1)  |
| 100.0 /                    | 2.5 ( 49, 1) | 3.4 (306, 1) | 5.1 ( 72, 1)  | 6.2 ( 68, 1)  | 6.8 ( 68, 1)  |
| 90.0 /                     | 2.7 (307, 1) | 3.4 ( 1, 1)  | 4.1 (327, 1)  | 4.2 (327, 1)  | 4.8 ( 19, 1)  |
| 80.0 /                     | 4.0 (307, 1) | 5.7 ( 1, 1)  | 6.5 ( 1, 1)   | 6.4 ( 1, 1)   | 5.8 ( 1, 1)   |
| 70.0 /                     | 3.0 (359, 1) | 4.7 (359, 1) | 5.2 (359, 1)  | 5.0 (359, 1)  | 4.7 ( 1, 1)   |
| 60.0 /                     | 4.1 (298, 1) | 5.5 (298, 1) | 6.7 (359, 1)  | 7.5 (359, 1)  | 7.7 (359, 1)  |
| 50.0 /                     | 3.6 (298, 1) | 4.7 (298, 1) | 5.4 ( 56, 1)  | 6.4 ( 56, 1)  | 6.9 (297, 1)  |
| 40.0 /                     | 3.3 ( 1, 1)  | 5.0 ( 1, 1)  | 5.3 ( 1, 1)   | 4.9 ( 1, 1)   | 4.8 ( 26, 1)  |
| 30.0 /                     | 3.6 (297, 1) | 3.8 ( 1, 1)  | 4.2 ( 50, 1)  | 4.1 ( 50, 1)  | 3.8 ( 50, 1)  |
| 20.0 /                     | 2.8 (359, 1) | 4.5 (359, 1) | 4.9 (359, 1)  | 4.5 ( 92, 1)  | 3.8 ( 81, 1)  |
| 10.0 /                     | 2.2 ( 92, 1) | 2.9 (101, 1) | 3.4 (317, 1)  | 3.5 (317, 1)  | 3.4 (317, 1)  |



2ND HIGH  
24-HR  
SGROUP# 3  
YEAR 1971  
\*\*\* SCGC 2050 -- S02

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: *5A.*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 15.5 AND OCCURRED AT ( 1400.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0        | 800.0        | 1000.0        | 1200.0        | 1400.0               |
|----------------------------|--------------|--------------|---------------|---------------|----------------------|
| 360.0 /                    | 1.3 ( 70, 1) | 2.4 (331, 1) | 3.2 ( 73, 1)  | 3.7 ( 95, 1)  | 4.1 ( 95, 1)         |
| 350.0 /                    | 1.4 ( 73, 1) | 2.5 (331, 1) | 3.7 ( 39, 1)  | 4.7 ( 53, 1)  | 5.6 ( 39, 1)         |
| 340.0 /                    | 1.4 (347, 1) | 4.1 (341, 1) | 6.4 ( 38, 1)  | 8.2 ( 38, 1)  | 9.3 ( 38, 1)         |
| 330.0 /                    | 2.4 (341, 1) | 4.3 ( 94, 1) | 5.3 (341, 1)  | 6.6 ( 36, 1)  | 7.6 ( 36, 1)         |
| 320.0 /                    | 1.8 (342, 1) | 4.2 (294, 1) | 6.7 ( 4, 1)   | 8.7 ( 4, 1)   | 10.0 ( 4, 1)         |
| 310.0 /                    | 1.8 (364, 1) | 3.8 ( 92, 1) | 6.1 ( 4, 1)   | 8.7 ( 4, 1)   | 10.2 ( 92, 1)        |
| 300.0 /                    | 3.9 ( 84, 1) | 5.3 ( 84, 1) | 5.5 ( 84, 1)  | 5.9 (340, 1)  | 6.0 ( 50, 1)         |
| 290.0 /                    | 3.3 (106, 1) | 4.9 ( 81, 1) | 5.2 ( 46, 1)  | 5.5 (348, 1)  | 6.5 (348, 1)         |
| 280.0 /                    | 3.4 ( 71, 1) | 6.7 ( 71, 1) | 8.0 (289, 1)  | 7.7 (289, 1)  | 8.0 ( 34, 1)         |
| 270.0 /                    | 3.8 (104, 1) | 5.6 (303, 1) | 7.7 ( 91, 1)  | 10.1 ( 91, 1) | 12.0 ( 3, 1)         |
| 260.0 /                    | 4.2 (103, 1) | 6.7 (327, 1) | 11.4 (320, 1) | 14.2 (320, 1) | <u>15.5 (320, 1)</u> |
| 250.0 /                    | 4.8 (103, 1) | 7.4 (103, 1) | 10.5 (310, 1) | 13.4 (310, 1) | 14.9 (310, 1)        |
| 240.0 /                    | 3.3 (103, 1) | 7.8 (357, 1) | 11.6 (102, 1) | 13.3 (102, 1) | 14.3 (357, 1)        |
| 230.0 /                    | 3.7 (101, 1) | 7.1 (101, 1) | 8.7 (317, 1)  | 8.0 (317, 1)  | 7.4 (357, 1)         |
| 220.0 /                    | 3.7 (101, 1) | 6.5 ( 29, 1) | 8.3 (101, 1)  | 8.6 (100, 1)  | 8.3 (100, 1)         |
| 210.0 /                    | 3.2 (101, 1) | 4.3 ( 80, 1) | 5.1 (100, 1)  | 5.2 (100, 1)  | 5.1 ( 80, 1)         |
| 200.0 /                    | 1.7 ( 90, 1) | 2.8 ( 90, 1) | 3.7 (352, 1)  | 4.6 ( 86, 1)  | 4.8 ( 86, 1)         |
| 190.0 /                    | 2.2 ( 2, 1)  | 3.5 ( 76, 1) | 3.9 (352, 1)  | 4.9 (352, 1)  | 5.3 (352, 1)         |
| 180.0 /                    | 1.9 ( 2, 1)  | 3.8 ( 55, 1) | 4.6 ( 55, 1)  | 4.4 ( 55, 1)  | 4.5 (352, 1)         |
| 170.0 /                    | 2.5 (317, 1) | 4.5 ( 55, 1) | 5.3 (329, 1)  | 5.9 (308, 1)  | 6.2 (308, 1)         |
| 160.0 /                    | 3.0 (317, 1) | 4.3 (317, 1) | 4.5 (317, 1)  | 5.3 (329, 1)  | 5.2 (300, 1)         |
| 150.0 /                    | 2.3 ( 28, 1) | 3.9 (292, 1) | 4.6 ( 98, 1)  | 4.4 ( 98, 1)  | 4.0 ( 98, 1)         |
| 140.0 /                    | 2.6 ( 86, 1) | 4.7 ( 83, 1) | 5.4 ( 89, 1)  | 6.6 ( 89, 1)  | 7.2 ( 89, 1)         |
| 130.0 /                    | 2.7 ( 97, 1) | 4.4 (298, 1) | 5.8 (338, 1)  | 7.1 ( 20, 1)  | 9.0 ( 20, 1)         |
| 120.0 /                    | 4.3 ( 82, 1) | 5.8 ( 82, 1) | 7.1 ( 96, 1)  | 6.9 ( 96, 1)  | 7.9 ( 66, 1)         |
| 110.0 /                    | 2.5 ( 79, 1) | 3.7 ( 79, 1) | 4.7 ( 79, 1)  | 5.1 ( 79, 1)  | 5.2 ( 79, 1)         |
| 100.0 /                    | 3.7 (104, 1) | 4.6 (298, 1) | 5.3 (298, 1)  | 5.3 (298, 1)  | 5.1 (298, 1)         |
| 90.0 /                     | 2.9 ( 17, 1) | 3.4 ( 11, 1) | 4.7 ( 96, 1)  | 5.3 ( 96, 1)  | 5.8 ( 15, 1)         |
| 80.0 /                     | 2.3 (300, 1) | 4.1 ( 15, 1) | 5.4 ( 15, 1)  | 5.4 ( 82, 1)  | 5.1 ( 82, 1)         |
| 70.0 /                     | 3.9 ( 15, 1) | 6.3 ( 15, 1) | 7.3 ( 15, 1)  | 7.3 ( 15, 1)  | 6.9 ( 15, 1)         |
| 60.0 /                     | 4.3 (331, 1) | 6.3 (331, 1) | 7.0 (331, 1)  | 7.0 (331, 1)  | 6.6 (331, 1)         |
| 50.0 /                     | 4.5 (106, 1) | 5.9 (106, 1) | 6.2 (106, 1)  | 5.8 (106, 1)  | 5.1 (106, 1)         |
| 40.0 /                     | 2.3 (106, 1) | 3.2 (106, 1) | 3.5 ( 46, 1)  | 3.5 ( 46, 1)  | 3.3 ( 81, 1)         |
| 30.0 /                     | 1.9 ( 88, 1) | 3.2 ( 62, 1) | 4.7 ( 62, 1)  | 4.9 ( 85, 1)  | 4.5 ( 85, 1)         |
| 20.0 /                     | 1.5 ( 70, 1) | 2.2 ( 31, 1) | 2.6 ( 85, 1)  | 3.6 ( 66, 1)  | 4.3 ( 66, 1)         |
| 10.0 /                     | 1.2 (104, 1) | 3.0 ( 70, 1) | 2.8 (104, 1)  | 2.6 (104, 1)  | 2.9 ( 37, 1)         |

*see next*

DAILY: 320  
24-HR/PD 1  
SGROUP# 1  
YEAR 1971  
\*\*\* SCGC 2051 --S02

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\* DAILY 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: *51,* \* ENDING WITH HOUR 24 FOR DAY 320 \*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 15.6 AND OCCURRED AT ( 1700.0, 260.0) \*

DIRECTION / RANGE (METERS)  
(DEGREES) / 1400.0 1700.0 2000.0 2300.0 2600.0

-----  
260.0 / 15.5 15.8 15.2 14.2 13.0

47

2ND HIGH  
24-HR  
SGROUP# 3  
YEAR 1972  
\*\*\* SCGC 2050 -- SC2

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\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: *58,*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 15.3 AND OCCURRED AT ( 1400.0, 250.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0        | 800.0        | 1000.0        | 1200.0        | 1400.0        |
|----------------------------|--------------|--------------|---------------|---------------|---------------|
| 360.0 /                    | 1.7 (104, 1) | 3.7 ( 22, 1) | 5.5 (356, 1)  | 7.0 (356, 1)  | 7.7 (330, 1)  |
| 350.0 /                    | 2.9 ( 98, 1) | 4.0 (104, 1) | 5.3 (330, 1)  | 6.4 (330, 1)  | 7.1 (330, 1)  |
| 340.0 /                    | 2.3 ( 29, 1) | 4.4 (356, 1) | 5.5 ( 29, 1)  | 6.1 ( 13, 1)  | 6.8 ( 13, 1)  |
| 330.0 /                    | 2.9 ( 76, 1) | 4.5 ( 55, 1) | 7.0 ( 13, 1)  | 7.9 ( 13, 1)  | 8.7 ( 62, 1)  |
| 320.0 /                    | 4.1 ( 55, 1) | 6.3 (301, 1) | 8.0 ( 55, 1)  | 8.8 (366, 1)  | 9.8 (366, 1)  |
| 310.0 /                    | 3.6 (333, 1) | 7.9 ( 95, 1) | 9.0 (366, 1)  | 10.4 (366, 1) | 10.6 ( 95, 1) |
| 300.0 /                    | 5.7 ( 75, 1) | 9.5 ( 75, 1) | 10.9 ( 58, 1) | 10.9 ( 58, 1) | 10.2 (349, 1) |
| 290.0 /                    | 3.3 ( 58, 1) | 6.3 ( 58, 1) | 7.2 ( 58, 1)  | 8.0 (349, 1)  | 9.0 (349, 1)  |
| 280.0 /                    | 3.6 (291, 1) | 6.8 (291, 1) | 8.1 ( 60, 1)  | 8.5 (343, 1)  | 9.2 (343, 1)  |
| 270.0 /                    | 3.8 (103, 1) | 6.5 (293, 1) | 9.5 (297, 1)  | 11.2 (297, 1) | 12.2 (297, 1) |
| 260.0 /                    | 3.4 (293, 1) | 6.3 (296, 1) | 9.6 (293, 1)  | 10.9 (345, 1) | 12.1 (345, 1) |
| 250.0 /                    | 2.9 (332, 1) | 6.1 (317, 1) | 9.9 (306, 1)  | 13.5 (306, 1) | 15.3 (101, 1) |
| 240.0 /                    | 2.9 (337, 1) | 6.0 (337, 1) | 9.4 (304, 1)  | 10.2 (304, 1) | 10.4 (306, 1) |
| 230.0 /                    | 2.1 ( 25, 1) | 5.5 (304, 1) | 7.0 (304, 1)  | 7.7 (100, 1)  | 8.3 (100, 1)  |
| 220.0 /                    | 2.1 (289, 1) | 3.0 ( 71, 1) | 4.6 ( 83, 1)  | 5.3 ( 70, 1)  | 6.1 ( 70, 1)  |
| 210.0 /                    | 0.7 ( 70, 1) | 3.0 ( 86, 1) | 3.8 ( 86, 1)  | 4.4 ( 72, 1)  | 5.2 ( 72, 1)  |
| 200.0 /                    | 0.9 ( 84, 1) | 2.4 ( 94, 1) | 4.1 ( 70, 1)  | 5.5 ( 70, 1)  | 6.2 ( 70, 1)  |
| 190.0 /                    | 2.3 (326, 1) | 3.4 ( 84, 1) | 3.2 ( 69, 1)  | 4.2 ( 69, 1)  | 4.6 ( 69, 1)  |
| 180.0 /                    | 2.9 ( 84, 1) | 4.5 ( 84, 1) | 4.7 ( 83, 1)  | 4.3 ( 83, 1)  | 4.9 ( 92, 1)  |
| 170.0 /                    | 3.1 (326, 1) | 4.5 ( 97, 1) | 5.7 ( 83, 1)  | 6.7 (351, 1)  | 7.2 (351, 1)  |
| 160.0 /                    | 3.7 (290, 1) | 5.0 ( 45, 1) | 5.0 ( 16, 1)  | 6.4 ( 16, 1)  | 7.1 ( 16, 1)  |
| 150.0 /                    | 3.6 (322, 1) | 5.7 ( 97, 1) | 6.2 (322, 1)  | 6.3 ( 93, 1)  | 6.6 ( 93, 1)  |
| 140.0 /                    | 3.7 (321, 1) | 5.5 (328, 1) | 8.4 (322, 1)  | 8.6 (322, 1)  | 8.2 (322, 1)  |
| 130.0 /                    | 2.9 (322, 1) | 5.1 (322, 1) | 6.0 ( 51, 1)  | 7.1 (327, 1)  | 8.4 ( 51, 1)  |
| 120.0 /                    | 2.9 (362, 1) | 4.6 (361, 1) | 6.1 (359, 1)  | 7.1 (359, 1)  | 7.3 (359, 1)  |
| 110.0 /                    | 2.5 ( 88, 1) | 3.8 (363, 1) | 4.5 (363, 1)  | 4.7 (321, 1)  | 4.7 (321, 1)  |
| 100.0 /                    | 2.6 (361, 1) | 4.1 ( 50, 1) | 6.3 ( 50, 1)  | 7.1 ( 50, 1)  | 7.5 ( 50, 1)  |
| 90.0 /                     | 2.0 ( 3, 1)  | 2.5 ( 84, 1) | 3.2 ( 88, 1)  | 3.7 ( 44, 1)  | 3.8 ( 88, 1)  |
| 80.0 /                     | 1.3 ( 78, 1) | 2.1 (320, 1) | 2.6 (320, 1)  | 2.8 (320, 1)  | 2.9 (320, 1)  |
| 70.0 /                     | 3.4 ( 88, 1) | 3.4 ( 88, 1) | 2.9 ( 88, 1)  | 2.9 ( 48, 1)  | 3.4 ( 48, 1)  |
| 60.0 /                     | 4.8 ( 88, 1) | 5.0 ( 6, 1)  | 5.6 ( 85, 1)  | 6.5 ( 85, 1)  | 7.0 ( 85, 1)  |
| 50.0 /                     | 5.5 (104, 1) | 5.4 (104, 1) | 5.2 ( 99, 1)  | 6.4 ( 38, 1)  | 6.7 ( 6, 1)   |
| 40.0 /                     | 3.6 (104, 1) | 5.4 ( 5, 1)  | 6.2 ( 5, 1)   | 6.3 ( 5, 1)   | 6.6 ( 34, 1)  |
| 30.0 /                     | 3.3 ( 85, 1) | 4.7 ( 85, 1) | 5.1 ( 85, 1)  | 5.0 ( 85, 1)  | 4.7 ( 85, 1)  |
| 20.0 /                     | 3.3 ( 88, 1) | 3.2 ( 5, 1)  | 3.5 ( 63, 1)  | 4.0 ( 63, 1)  | 4.4 (331, 1)  |
| 10.0 /                     | 3.0 (316, 1) | 2.7 ( 65, 1) | 3.2 ( 96, 1)  | 3.5 (302, 1)  | 3.6 (302, 1)  |

2ND HIGH  
24-HR  
SGROUP# 3  
YEAR 1973  
\*\*\* SCGC 2050 -- S02

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\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: *51.*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 14.6 AND OCCURRED AT ( 1400.0, 220.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0        | 800.0        | 1000.0        | 1200.0        | 1400.0        |
|----------------------------|--------------|--------------|---------------|---------------|---------------|
| 360.0 /                    | 1.9 (332, 1) | 2.9 (304, 1) | 3.3 (332, 1)  | 3.6 ( 40, 1)  | 3.7 (304, 1)  |
| 350.0 /                    | 3.2 (349, 1) | 4.6 ( 27, 1) | 4.4 (332, 1)  | 5.2 ( 91, 1)  | 6.1 ( 91, 1)  |
| 340.0 /                    | 4.0 ( 79, 1) | 5.2 ( 79, 1) | 8.3 ( 93, 1)  | 9.3 ( 93, 1)  | 9.9 ( 93, 1)  |
| 330.0 /                    | 2.5 ( 79, 1) | 4.1 ( 93, 1) | 6.8 (361, 1)  | 8.4 ( 93, 1)  | 9.2 ( 93, 1)  |
| 320.0 /                    | 3.0 ( 69, 1) | 6.5 ( 84, 1) | 11.0 ( 1, 1)  | 11.3 (329, 1) | 12.1 (329, 1) |
| 310.0 /                    | 5.1 ( 1, 1)  | 7.6 (358, 1) | 9.6 ( 68, 1)  | 11.0 ( 90, 1) | 12.3 ( 90, 1) |
| 300.0 /                    | 3.2 ( 68, 1) | 5.6 (326, 1) | 7.6 ( 74, 1)  | 9.7 ( 74, 1)  | 11.3 ( 70, 1) |
| 290.0 /                    | 3.4 (313, 1) | 5.2 ( 32, 1) | 8.6 ( 63, 1)  | 9.1 ( 65, 1)  | 11.3 ( 65, 1) |
| 280.0 /                    | 5.4 ( 64, 1) | 9.0 ( 64, 1) | 10.0 ( 87, 1) | 10.3 ( 72, 1) | 9.6 ( 72, 1)  |
| 270.0 /                    | 4.2 (102, 1) | 5.4 (104, 1) | 8.1 (104, 1)  | 9.8 (322, 1)  | 11.6 (322, 1) |
| 260.0 /                    | 4.2 (327, 1) | 7.3 (102, 1) | 8.9 ( 17, 1)  | 12.2 ( 17, 1) | 12.8 (327, 1) |
| 250.0 /                    | 4.1 ( 78, 1) | 7.0 (102, 1) | 9.1 (105, 1)  | 10.9 (105, 1) | 12.0 (335, 1) |
| 240.0 /                    | 4.1 ( 78, 1) | 5.7 (102, 1) | 7.5 ( 78, 1)  | 9.5 (315, 1)  | 10.5 (315, 1) |
| 230.0 /                    | 2.2 ( 95, 1) | 3.9 (294, 1) | 5.5 ( 95, 1)  | 6.5 (292, 1)  | 7.1 (334, 1)  |
| 220.0 /                    | 1.9 ( 95, 1) | 5.8 (295, 1) | 11.0 (295, 1) | 13.5 (295, 1) | 14.6 (295, 1) |
| 210.0 /                    | 1.6 ( 7, 1)  | 3.2 ( 82, 1) | 5.5 (295, 1)  | 6.8 (295, 1)  | 7.4 (295, 1)  |
| 200.0 /                    | 1.3 ( 81, 1) | 2.2 (293, 1) | 4.1 (293, 1)  | 4.6 ( 30, 1)  | 5.1 (295, 1)  |
| 190.0 /                    | 1.7 (103, 1) | 3.0 (352, 1) | 4.1 (293, 1)  | 4.6 (293, 1)  | 4.7 (352, 1)  |
| 180.0 /                    | 1.9 ( 81, 1) | 3.5 ( 81, 1) | 4.6 ( 81, 1)  | 4.8 (103, 1)  | 4.8 ( 24, 1)  |
| 170.0 /                    | 2.1 ( 77, 1) | 3.9 ( 37, 1) | 5.1 ( 37, 1)  | 5.2 ( 15, 1)  | 5.0 ( 37, 1)  |
| 160.0 /                    | 2.8 ( 78, 1) | 4.1 ( 53, 1) | 4.5 ( 52, 1)  | 4.7 ( 52, 1)  | 4.6 (296, 1)  |
| 150.0 /                    | 3.3 (302, 1) | 5.1 (302, 1) | 5.3 (302, 1)  | 5.4 (297, 1)  | 6.2 (297, 1)  |
| 140.0 /                    | 4.5 ( 14, 1) | 8.5 ( 14, 1) | 10.4 ( 14, 1) | 10.7 ( 14, 1) | 10.4 ( 14, 1) |
| 130.0 /                    | 3.2 ( 47, 1) | 6.3 ( 47, 1) | 7.8 ( 47, 1)  | 8.2 ( 47, 1)  | 9.4 ( 42, 1)  |
| 120.0 /                    | 3.4 ( 77, 1) | 6.2 (101, 1) | 6.0 ( 12, 1)  | 7.6 ( 6, 1)   | 7.5 ( 34, 1)  |
| 110.0 /                    | 3.1 ( 86, 1) | 5.0 ( 86, 1) | 5.4 (351, 1)  | 6.1 (351, 1)  | 6.3 (351, 1)  |
| 100.0 /                    | 2.4 ( 86, 1) | 4.0 ( 86, 1) | 4.4 (355, 1)  | 5.1 (350, 1)  | 5.8 (350, 1)  |
| 90.0 /                     | 2.0 ( 85, 1) | 3.2 ( 85, 1) | 3.9 ( 85, 1)  | 4.5 (302, 1)  | 5.1 (302, 1)  |
| 80.0 /                     | 2.8 ( 19, 1) | 4.7 (320, 1) | 5.4 ( 19, 1)  | 5.3 ( 19, 1)  | 4.9 ( 19, 1)  |
| 70.0 /                     | 3.1 ( 19, 1) | 5.3 ( 19, 1) | 6.0 ( 19, 1)  | 5.8 ( 19, 1)  | 5.5 ( 19, 1)  |
| 60.0 /                     | 2.8 (349, 1) | 3.8 ( 6, 1)  | 4.6 ( 6, 1)   | 4.6 ( 6, 1)   | 4.5 ( 8, 1)   |
| 50.0 /                     | 2.1 (349, 1) | 2.7 ( 57, 1) | 4.1 (320, 1)  | 4.8 (320, 1)  | 4.9 (320, 1)  |
| 40.0 /                     | 1.5 ( 57, 1) | 2.2 ( 80, 1) | 3.5 (348, 1)  | 4.4 (348, 1)  | 4.8 (348, 1)  |
| 30.0 /                     | 1.7 ( 94, 1) | 2.6 (320, 1) | 3.5 (350, 1)  | 4.1 (350, 1)  | 4.3 (350, 1)  |
| 20.0 /                     | 2.4 (320, 1) | 3.0 (313, 1) | 3.4 ( 27, 1)  | 4.2 (305, 1)  | 4.8 (305, 1)  |
| 10.0 /                     | 1.9 ( 27, 1) | 3.0 (304, 1) | 3.1 (304, 1)  | 2.8 (304, 1)  | 3.5 ( 23, 1)  |

2ND HIGH  
24-HR  
SGROUP# 3  
YEAR 1974  
\*\*\* SCGC 2050 -- S02

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\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: *51*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 14.4 AND OCCURRED AT ( 1400.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0        | 800.0        | 1000.0        | 1200.0        | 1400.0        |
|----------------------------|--------------|--------------|---------------|---------------|---------------|
| 360.0 /                    | 3.4 (324, 1) | 4.8 ( 21, 1) | 5.3 ( 21, 1)  | 5.2 ( 21, 1)  | 5.8 ( 50, 1)  |
| 350.0 /                    | 3.4 ( 80, 1) | 4.1 (324, 1) | 4.0 (324, 1)  | 4.9 ( 38, 1)  | 5.7 ( 38, 1)  |
| 340.0 /                    | 3.0 ( 80, 1) | 4.1 ( 80, 1) | 6.1 ( 82, 1)  | 8.1 ( 82, 1)  | 7.7 ( 30, 1)  |
| 330.0 /                    | 2.9 (353, 1) | 5.1 ( 92, 1) | 7.2 ( 92, 1)  | 7.9 ( 92, 1)  | 8.2 ( 92, 1)  |
| 320.0 /                    | 3.7 ( 80, 1) | 6.5 ( 44, 1) | 7.8 ( 44, 1)  | 8.1 ( 78, 1)  | 8.6 ( 78, 1)  |
| 310.0 /                    | 6.1 ( 85, 1) | 9.1 ( 85, 1) | 9.5 ( 85, 1)  | 10.2 ( 94, 1) | 11.3 ( 94, 1) |
| 300.0 /                    | 5.2 ( 80, 1) | 8.0 ( 98, 1) | 9.3 (104, 1)  | 10.4 (104, 1) | 10.2 (329, 1) |
| 290.0 /                    | 3.4 (104, 1) | 6.0 ( 27, 1) | 7.4 ( 27, 1)  | 7.5 ( 27, 1)  | 8.6 (358, 1)  |
| 280.0 /                    | 4.3 (106, 1) | 5.6 ( 43, 1) | 8.1 ( 23, 1)  | 9.4 (102, 1)  | 9.5 ( 23, 1)  |
| 270.0 /                    | 3.3 ( 64, 1) | 5.8 ( 64, 1) | 9.9 ( 73, 1)  | 12.3 ( 73, 1) | 14.4 (357, 1) |
| 260.0 /                    | 5.3 ( 97, 1) | 7.4 ( 97, 1) | 8.9 (328, 1)  | 10.9 (328, 1) | 11.9 (328, 1) |
| 250.0 /                    | 4.1 ( 90, 1) | 6.3 (295, 1) | 8.5 (101, 1)  | 10.2 ( 65, 1) | 11.8 ( 65, 1) |
| 240.0 /                    | 4.3 ( 97, 1) | 6.3 ( 97, 1) | 10.4 (294, 1) | 12.5 (294, 1) | 13.4 (294, 1) |
| 230.0 /                    | 1.4 (310, 1) | 4.5 (312, 1) | 8.3 (314, 1)  | 11.1 (314, 1) | 12.7 (314, 1) |
| 220.0 /                    | 2.1 (364, 1) | 3.4 (339, 1) | 5.2 (364, 1)  | 5.1 (364, 1)  | 4.7 (305, 1)  |
| 210.0 /                    | 1.6 (356, 1) | 3.1 (356, 1) | 3.5 (315, 1)  | 4.1 ( 77, 1)  | 4.4 ( 77, 1)  |
| 200.0 /                    | 2.0 (319, 1) | 4.5 ( 12, 1) | 5.6 ( 12, 1)  | 5.7 ( 12, 1)  | 5.1 ( 54, 1)  |
| 190.0 /                    | 2.7 ( 69, 1) | 3.1 ( 69, 1) | 2.7 (352, 1)  | 2.5 ( 90, 1)  | 2.5 ( 90, 1)  |
| 180.0 /                    | 2.7 (292, 1) | 4.0 ( 54, 1) | 5.4 (332, 1)  | 6.1 (332, 1)  | 6.4 (332, 1)  |
| 170.0 /                    | 1.9 ( 96, 1) | 3.1 ( 54, 1) | 4.3 ( 54, 1)  | 4.2 (292, 1)  | 4.5 ( 54, 1)  |
| 160.0 /                    | 1.9 (292, 1) | 3.6 (292, 1) | 5.3 (325, 1)  | 5.8 (339, 1)  | 5.3 (339, 1)  |
| 150.0 /                    | 2.9 ( 96, 1) | 5.3 ( 96, 1) | 7.0 (291, 1)  | 7.0 (291, 1)  | 6.5 (291, 1)  |
| 140.0 /                    | 3.0 ( 42, 1) | 5.1 (352, 1) | 5.8 (352, 1)  | 7.4 ( 57, 1)  | 8.0 ( 56, 1)  |
| 130.0 /                    | 3.6 (338, 1) | 6.0 ( 76, 1) | 6.4 ( 76, 1)  | 7.1 ( 57, 1)  | 8.5 ( 57, 1)  |
| 120.0 /                    | 2.2 ( 17, 1) | 3.7 (316, 1) | 4.2 ( 76, 1)  | 4.6 ( 76, 1)  | 4.7 ( 76, 1)  |
| 110.0 /                    | 3.0 ( 17, 1) | 4.5 (106, 1) | 4.6 (316, 1)  | 4.7 (336, 1)  | 4.6 (336, 1)  |
| 100.0 /                    | 3.0 (363, 1) | 4.4 ( 17, 1) | 4.4 ( 17, 1)  | 4.0 ( 17, 1)  | 4.2 ( 40, 1)  |
| 90.0 /                     | 2.6 (106, 1) | 3.8 ( 17, 1) | 4.1 ( 17, 1)  | 4.1 ( 55, 1)  | 4.8 ( 55, 1)  |
| 80.0 /                     | 2.9 ( 89, 1) | 4.8 ( 89, 1) | 6.1 ( 89, 1)  | 6.4 ( 89, 1)  | 6.4 ( 89, 1)  |
| 70.0 /                     | 2.7 ( 89, 1) | 4.7 ( 71, 1) | 4.9 ( 71, 1)  | 5.9 ( 75, 1)  | 6.5 ( 75, 1)  |
| 60.0 /                     | 3.4 ( 88, 1) | 5.8 ( 89, 1) | 7.1 ( 89, 1)  | 7.4 ( 89, 1)  | 7.3 ( 89, 1)  |
| 50.0 /                     | 3.1 ( 99, 1) | 5.0 ( 44, 1) | 5.8 ( 99, 1)  | 5.7 ( 31, 1)  | 5.2 ( 31, 1)  |
| 40.0 /                     | 3.2 ( 31, 1) | 5.1 ( 31, 1) | 6.2 ( 39, 1)  | 6.7 ( 99, 1)  | 6.3 ( 99, 1)  |
| 30.0 /                     | 2.1 ( 99, 1) | 2.8 ( 31, 1) | 2.9 (342, 1)  | 3.4 ( 99, 1)  | 3.1 (342, 1)  |
| 20.0 /                     | 1.6 (342, 1) | 2.6 (342, 1) | 3.0 (353, 1)  | 2.9 (342, 1)  | 2.7 (342, 1)  |
| 10.0 /                     | 2.5 ( 79, 1) | 4.0 ( 79, 1) | 4.4 ( 79, 1)  | 4.3 ( 47, 1)  | 4.6 ( 83, 1)  |

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\*\*\* SCCC 2150 -- 502

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COMPOSITE SECOND-HIGHEST 3-HOUR CONCENTRATION TABLE, UG/CU.M, FOR SOURCE GROUP 1

\* FOR THE RECEPTOR GRID \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |       |        |        |        |
|----------------------------|----------------|-------|--------|--------|--------|
|                            | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0 |
| 360.0 /                    | 461.4          | 470.3 | 421.8  | 406.1  | 363.4  |
| 350.0 /                    | 319.7          | 324.0 | 329.9  | 315.5  | 302.2  |
| 340.0 /                    | 363.2          | 423.2 | 438.3  | 418.2  | 392.5  |
| 330.0 /                    | 374.1          | 426.2 | 429.6  | 462.3  | 371.4  |
| 320.0 /                    | 448.4          | 472.0 | 452.3  | 419.3  | 372.0  |
| 310.0 /                    | 399.6          | 417.3 | 451.0  | 438.9  | 409.1  |
| 300.0 /                    | 447.1          | 432.8 | 423.8  | 416.8  | 398.3  |
| 290.0 /                    | 355.4          | 378.5 | 399.9  | 395.8  | 385.2  |
| 280.0 /                    | 446.2          | 418.9 | 401.0  | 390.5  | 370.5  |
| 270.0 /                    | 365.5          | 414.6 | 446.2  | 435.0  | 409.9  |
| 260.0 /                    | 371.5          | 431.5 | 447.8  | 424.6  | 388.7  |
| 250.0 /                    | 405.9          | 448.2 | 438.8  | 421.9  | 390.0  |
| 240.0 /                    | 395.6          | 423.2 | 430.3  | 431.1  | 404.7  |
| 230.0 /                    | 337.5          | 399.7 | 440.0  | 430.6  | 411.9  |
| 220.0 /                    | 332.4          | 364.7 | 391.1  | 381.2  | 362.3  |
| 210.0 /                    | 287.8          | 327.1 | 322.1  | 301.5  | 276.5  |
| 200.0 /                    | 264.8          | 322.4 | 326.1  | 302.9  | 281.9  |
| 190.0 /                    | 251.9          | 272.1 | 292.6  | 288.1  | 277.7  |
| 180.0 /                    | 371.2          | 380.3 | 389.9  | 372.6  | 358.6  |
| 170.0 /                    | 363.5          | 373.8 | 353.3  | 350.6  | 325.1  |
| 160.0 /                    | 340.3          | 365.5 | 384.7  | 372.8  | 354.5  |
| 150.0 /                    | 335.0          | 337.6 | 341.0  | 311.3  | 309.2  |
| 140.0 /                    | 434.9          | 435.2 | 402.8  | 360.5  | 333.9  |
| 130.0 /                    | 401.6          | 413.6 | 380.7  | 376.5  | 362.4  |
| 120.0 /                    | 372.6          | 363.6 | 391.0  | 375.6  | 357.4  |
| 110.0 /                    | 364.8          | 397.9 | 428.6  | 408.5  | 374.5  |
| 100.0 /                    | 274.1          | 321.7 | 347.5  | 338.7  | 322.7  |
| 90.0 /                     | 282.7          | 297.3 | 297.9  | 297.3  | 287.8  |
| 80.0 /                     | 327.9          | 315.5 | 306.5  | 301.3  | 288.2  |
| 70.0 /                     | 346.5          | 379.3 | 370.0  | 339.0  | 306.1  |
| 60.0 /                     | 355.0          | 343.0 | 334.1  | 302.2  | 280.6  |
| 50.0 /                     | 349.7          | 353.4 | 355.9  | 322.8  | 308.3  |
| 40.0 /                     | 402.4          | 441.9 | 402.0  | 348.2  | 300.9  |
| 30.0 /                     | 314.2          | 319.8 | 315.5  | 290.5  | 265.1  |
| 20.0 /                     | 301.5          | 364.5 | 325.0  | 321.2  | 318.8  |
| 10.0 /                     | 308.1          | 340.2 | 336.5  | 302.2  | 284.2  |

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\*\*\* SCGC 2150 -- SC2

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COMPOSITE SECOND-HIGHEST 24-HOUR CONCENTRATION TABLE, UG/CU.M, FOR SOURCE GROUP 1

\* FOR THE RECEPTOR GRID \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |       |        |        |        |
|----------------------------|----------------|-------|--------|--------|--------|
|                            | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0 |
| 360.0 /                    | 87.7           | 106.1 | 111.0  | 105.7  | 98.8   |
| 350.0 /                    | 86.1           | 101.2 | 99.3   | 92.6   | 86.0   |
| 340.0 /                    | 112.6          | 129.1 | 131.9  | 124.7  | 123.1  |
| 330.0 /                    | 97.8           | 116.1 | 117.4  | 113.0  | 106.6  |
| 320.0 /                    | 126.1          | 146.4 | 150.7  | 143.8  | 134.7  |
| 310.0 /                    | 132.3          | 163.8 | 172.9  | 166.4  | 156.6  |
| 300.0 /                    | 132.7          | 154.0 | 157.4  | 153.3  | 156.8  |
| 290.0 /                    | 127.9          | 173.4 | 189.5  | 187.0  | 181.1  |
| 280.0 /                    | 112.4          | 125.8 | 126.3  | 122.5  | 113.1  |
| 270.0 /                    | 145.2          | 186.5 | 206.5  | 208.0  | 193.0  |
| 260.0 /                    | 174.2          | 206.6 | 214.2  | 203.0  | 187.8  |
| 250.0 /                    | 159.6          | 194.6 | 202.9  | 193.1  | 179.7  |
| 240.0 /                    | 161.4          | 199.0 | 205.8  | 185.5  | 165.0  |
| 230.0 /                    | 130.5          | 159.0 | 168.9  | 163.5  | 154.3  |
| 220.0 /                    | 156.3          | 185.5 | 191.6  | 180.7  | 166.7  |
| 210.0 /                    | 88.7           | 102.9 | 104.5  | 97.7   | 89.7   |
| 200.0 /                    | 75.5           | 90.6  | 93.9   | 88.4   | 81.3   |
| 190.0 /                    | 57.8           | 67.7  | 67.4   | 63.1   | 58.3   |
| 180.0 /                    | 70.4           | 79.7  | 80.3   | 75.3   | 69.5   |
| 170.0 /                    | 79.6           | 95.6  | 98.1   | 91.6   | 83.9   |
| 160.0 /                    | 79.1           | 88.8  | 95.3   | 93.5   | 90.4   |
| 150.0 /                    | 67.9           | 79.8  | 95.9   | 98.9   | 98.1   |
| 140.0 /                    | 107.1          | 112.1 | 121.5  | 118.2  | 113.1  |
| 130.0 /                    | 109.9          | 140.2 | 147.9  | 139.9  | 130.3  |
| 120.0 /                    | 89.1           | 106.9 | 116.5  | 114.2  | 109.2  |
| 110.0 /                    | 96.1           | 116.2 | 122.1  | 117.5  | 110.3  |
| 100.0 /                    | 82.4           | 105.5 | 112.9  | 106.7  | 97.8   |
| 90.0 /                     | 56.0           | 70.6  | 75.1   | 72.7   | 69.3   |
| 80.0 /                     | 75.0           | 80.9  | 78.0   | 70.6   | 63.5   |
| 70.0 /                     | 74.5           | 88.0  | 89.6   | 87.1   | 83.2   |
| 60.0 /                     | 89.2           | 96.4  | 97.5   | 92.9   | 87.4   |
| 50.0 /                     | 69.5           | 84.6  | 75.7   | 73.0   | 69.6   |
| 40.0 /                     | 69.0           | 83.9  | 76.1   | 69.4   | 64.6   |
| 30.0 /                     | 61.3           | 60.5  | 57.8   | 56.3   | 54.7   |
| 20.0 /                     | 49.5           | 60.4  | 64.1   | 62.2   | 59.5   |
| 10.0 /                     | 49.4           | 57.9  | 59.8   | 59.1   | 57.5   |

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COMPOSITE SECOND-HIGHEST 3-HOUR CONCENTRATION TABLE, UG/CU.M, FOR SOURCE GROUP 2

\* FOR THE RECEPTOR GRID \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |              |        |        |        |
|----------------------------|----------------|--------------|--------|--------|--------|
|                            | 600.0          | 800.0        | 1000.0 | 1200.0 | 1400.0 |
| 360.0 /                    | 673.7          | 661.9        | 600.9  | 525.5  | 484.4  |
| 350.0 /                    | 463.4          | 507.6        | 516.5  | 479.1  | 435.2  |
| 340.0 /                    | 563.4          | 671.9        | 663.8  | 617.1  | 552.0  |
| 330.0 /                    | 633.9          | 686.4        | 638.3  | 557.9  | 483.7  |
| 320.0 /                    | 725.0          | 707.7        | 634.0  | 579.1  | 526.7  |
| 310.0 /                    | 669.7          | <u>733.1</u> | 696.5  | 640.6  | 581.9  |
| 300.0 /                    | 707.0          | 689.5        | 691.6  | 624.0  | 561.6  |
| 290.0 /                    | 584.5          | 641.8        | 661.8  | 638.3  | 581.4  |
| 280.0 /                    | 678.0          | 624.0        | 620.9  | 580.7  | 515.4  |
| 270.0 /                    | 631.5          | 721.2        | 698.3  | 649.5  | 583.1  |
| 260.0 /                    | 677.5          | 727.7        | 670.5  | 616.9  | 569.2  |
| 250.0 /                    | 685.4          | 703.0        | 668.7  | 613.6  | 562.6  |
| 240.0 /                    | 664.6          | 698.0        | 707.7  | 672.1  | 618.7  |
| 230.0 /                    | 566.3          | 714.1        | 709.7  | 642.6  | 571.7  |
| 220.0 /                    | 568.6          | 607.5        | 601.0  | 543.2  | 470.8  |
| 210.0 /                    | 492.1          | 487.7        | 483.7  | 438.0  | 387.6  |
| 200.0 /                    | 468.6          | 526.4        | 493.7  | 431.8  | 374.9  |
| 190.0 /                    | 438.1          | 473.7        | 485.2  | 447.9  | 405.1  |
| 180.0 /                    | 582.0          | 590.8        | 615.1  | 566.0  | 494.8  |
| 170.0 /                    | 611.2          | 615.9        | 557.6  | 489.3  | 438.2  |
| 160.0 /                    | 547.9          | 579.6        | 608.1  | 570.4  | 522.8  |
| 150.0 /                    | 507.5          | 535.5        | 515.1  | 515.5  | 464.3  |
| 140.0 /                    | 714.7          | 639.7        | 600.7  | 561.0  | 513.6  |
| 130.0 /                    | 658.0          | 647.5        | 641.9  | 575.4  | 509.2  |
| 120.0 /                    | 589.0          | 654.5        | 616.0  | 535.2  | 466.0  |
| 110.0 /                    | 645.3          | 690.4        | 621.9  | 547.5  | 507.9  |
| 100.0 /                    | 479.9          | 563.5        | 548.7  | 475.6  | 411.4  |
| 90.0 /                     | 463.2          | 473.4        | 494.0  | 455.5  | 421.7  |
| 80.0 /                     | 497.7          | 505.8        | 501.5  | 454.6  | 405.8  |
| 70.0 /                     | 575.5          | 588.6        | 526.7  | 450.0  | 399.5  |
| 60.0 /                     | 535.2          | 515.1        | 478.5  | 464.0  | 435.4  |
| 50.0 /                     | 561.8          | 552.1        | 499.4  | 484.3  | 479.6  |
| 40.0 /                     | 645.8          | 599.7        | 504.3  | 466.8  | 443.3  |
| 30.0 /                     | 481.5          | 484.8        | 442.7  | 393.5  | 351.6  |
| 20.0 /                     | 523.0          | 496.1        | 502.6  | 522.1  | 516.4  |
| 10.0 /                     | 515.0          | 512.5        | 488.2  | 466.5  | 433.4  |

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\*\*\* SCGC 2150 -- SC2

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COMPOSITE SECOND-HIGHEST 24-HOUR CONCENTRATION TABLE, UG/CO.M, FOR SOURCE GROUP 2

\* FOR THE RECEPTOR GRID \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |       |        |        |        |
|----------------------------|----------------|-------|--------|--------|--------|
|                            | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0 |
| 360.0 /                    | 145.1          | 171.3 | 167.7  | 153.7  | 138.8  |
| 350.0 /                    | 140.6          | 149.4 | 141.8  | 127.8  | 115.0  |
| 340.0 /                    | 192.0          | 214.8 | 206.7  | 196.2  | 184.0  |
| 330.0 /                    | 160.7          | 189.8 | 186.1  | 168.9  | 151.6  |
| 320.0 /                    | 208.4          | 238.4 | 229.1  | 205.4  | 183.4  |
| 310.0 /                    | 231.2          | 278.8 | 272.6  | 245.1  | 217.2  |
| 300.0 /                    | 197.1          | 240.6 | 237.7  | 239.3  | 237.6  |
| 290.0 /                    | 190.9          | 267.6 | 297.0  | 291.3  | 277.1  |
| 280.0 /                    | 188.2          | 210.6 | 197.0  | 177.4  | 154.2  |
| 270.0 /                    | 271.7          | 329.9 | 336.8  | 243.1  | 253.5  |
| 260.0 /                    | 320.8          | 357.2 | 332.3  | 289.3  | 250.2  |
| 250.0 /                    | 270.9          | 331.2 | 313.0  | 275.8  | 240.8  |
| 240.0 /                    | 296.4          | 315.5 | 280.1  | 253.6  | 218.2  |
| 230.0 /                    | 230.8          | 278.8 | 272.1  | 243.7  | 215.2  |
| 220.0 /                    | 286.9          | 314.3 | 289.6  | 251.4  | 217.3  |
| 210.0 /                    | 157.5          | 169.4 | 154.9  | 134.1  | 115.8  |
| 200.0 /                    | 134.7          | 152.8 | 144.4  | 125.1  | 107.4  |
| 190.0 /                    | 99.3           | 108.3 | 102.3  | 90.3   | 82.0   |
| 180.0 /                    | 117.5          | 125.6 | 116.4  | 106.9  | 96.9   |
| 170.0 /                    | 154.5          | 162.9 | 147.8  | 135.9  | 120.3  |
| 160.0 /                    | 141.3          | 163.1 | 154.4  | 140.5  | 138.6  |
| 150.0 /                    | 119.8          | 138.1 | 147.1  | 153.1  | 151.6  |
| 140.0 /                    | 175.2          | 209.9 | 206.1  | 185.3  | 173.3  |
| 130.0 /                    | 201.7          | 239.0 | 233.4  | 220.1  | 198.5  |
| 120.0 /                    | 158.6          | 193.6 | 190.3  | 173.8  | 159.7  |
| 110.0 /                    | 177.0          | 204.3 | 193.5  | 170.9  | 149.8  |
| 100.0 /                    | 159.5          | 177.9 | 160.1  | 140.8  | 135.1  |
| 90.0 /                     | 95.4           | 117.7 | 121.2  | 112.5  | 102.7  |
| 80.0 /                     | 125.0          | 122.1 | 107.1  | 96.0   | 86.3   |
| 70.0 /                     | 136.2          | 135.2 | 135.9  | 126.4  | 116.4  |
| 60.0 /                     | 149.0          | 152.3 | 148.2  | 127.4  | 110.7  |
| 50.0 /                     | 126.3          | 116.4 | 118.6  | 110.9  | 101.5  |
| 40.0 /                     | 121.3          | 116.8 | 106.7  | 96.2   | 94.8   |
| 30.0 /                     | 94.0           | 91.4  | 91.0   | 84.2   | 78.1   |
| 20.0 /                     | 74.2           | 96.8  | 99.4   | 93.1   | 86.9   |
| 10.0 /                     | 81.2           | 86.2  | 89.6   | 87.8   | 80.7   |

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\*\*\* SCGC 2050 -- S02

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COMPOSITE SECOND-HIGHEST 3-HOUR CONCENTRATION TABLE, UG/CU.M, FOR SOURCE GROUP 3

\* FOR THE RECEPTOR GRID \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |       |        |        |        |
|----------------------------|----------------|-------|--------|--------|--------|
|                            | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0 |
| 360.0 /                    | 25.8           | 38.2  | 42.1   | 41.7   | 38.8   |
| 350.0 /                    | 27.4           | 29.6  | 27.3   | 30.0   | 27.9   |
| 340.0 /                    | 31.7           | 35.2  | 30.4   | 32.3   | 33.5   |
| 330.0 /                    | 20.8           | 33.3  | 35.5   | 34.0   | 36.5   |
| 320.0 /                    | 26.8           | 40.6  | 49.2   | 50.1   | 47.9   |
| 310.0 /                    | 30.3           | 42.8  | 48.4   | 46.9   | 42.6   |
| 300.0 /                    | 33.0           | 48.4  | 49.1   | 44.8   | 41.0   |
| 290.0 /                    | 22.5           | 35.6  | 36.4   | 38.3   | 37.8   |
| 280.0 /                    | 25.8           | 49.7  | 50.9   | 46.0   | 39.8   |
| 270.0 /                    | 25.1           | 41.5  | 45.4   | 42.5   | 37.8   |
| 260.0 /                    | 30.0           | 40.7  | 39.0   | 37.9   | 39.3   |
| 250.0 /                    | 29.6           | 41.6  | 45.2   | 44.1   | 40.2   |
| 240.0 /                    | 19.6           | 34.3  | 40.0   | 39.2   | 35.8   |
| 230.0 /                    | 31.0           | 37.9  | 38.0   | 35.1   | 34.7   |
| 220.0 /                    | 20.6           | 30.8  | 34.0   | 33.0   | 30.1   |
| 210.0 /                    | 15.2           | 26.5  | 31.1   | 30.3   | 27.8   |
| 200.0 /                    | 14.7           | 26.4  | 29.4   | 27.9   | 26.9   |
| 190.0 /                    | 18.0           | 24.6  | 26.8   | 27.8   | 26.1   |
| 180.0 /                    | 18.4           | 29.0  | 34.0   | 32.0   | 32.4   |
| 170.0 /                    | 21.8           | 31.0  | 41.0   | 41.1   | 39.9   |
| 160.0 /                    | 30.3           | 43.2  | 41.4   | 37.5   | 34.0   |
| 150.0 /                    | 25.9           | 34.2  | 37.3   | 34.9   | 30.7   |
| 140.0 /                    | 24.4           | 39.1  | 47.1   | 47.1   | 43.7   |
| 130.0 /                    | 36.9           | 38.0  | 40.1   | 40.4   | 36.9   |
| 120.0 /                    | 33.0           | 41.6  | 40.7   | 35.2   | 37.1   |
| 110.0 /                    | 34.5           | 44.7  | 42.2   | 36.2   | 36.5   |
| 100.0 /                    | 23.3           | 29.5  | 28.6   | 27.5   | 27.8   |
| 90.0 /                     | 21.6           | 25.8  | 29.5   | 28.8   | 26.7   |
| 80.0 /                     | 31.2           | 39.3  | 37.6   | 36.5   | 33.6   |
| 70.0 /                     | 25.8           | 30.0  | 33.6   | 33.1   | 33.8   |
| 60.0 /                     | 30.0           | 37.6  | 37.1   | 37.2   | 35.8   |
| 50.0 /                     | 27.8           | 35.5  | 34.0   | 33.8   | 32.7   |
| 40.0 /                     | 24.6           | 39.9  | 43.9   | 42.0   | 38.0   |
| 30.0 /                     | 25.7           | 27.7  | 31.1   | 28.4   | 26.3   |
| 20.0 /                     | 26.8           | 25.4  | 23.9   | 28.6   | 26.8   |
| 10.0 /                     | 24.4           | 23.1  | 25.9   | 29.4   | 30.5   |

\*\*\* SCGC 2050 -- S02

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COMPOSITE SECOND-HIGHEST 24-HOUR CONCENTRATION TABLE, UG/CU.M, FOR SOURCE GROUP 3

\* FOR THE RECEPTOR GRID \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |       |        |        |        |
|----------------------------|----------------|-------|--------|--------|--------|
|                            | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0 |
| 360.0 /                    | 3.4            | 4.8   | 5.5    | 7.0    | 7.7    |
| 350.0 /                    | 3.4            | 4.6   | 5.9    | 6.5    | 7.1    |
| 340.0 /                    | 4.0            | 5.2   | 8.3    | 9.3    | 9.9    |
| 330.0 /                    | 4.1            | 5.6   | 7.2    | 8.4    | 9.2    |
| 320.0 /                    | 4.1            | 6.5   | 11.0   | 11.3   | 12.1   |
| 310.0 /                    | 6.1            | 9.1   | 9.6    | 11.0   | 12.3   |
| 300.0 /                    | 5.7            | 9.5   | 10.9   | 10.9   | 11.3   |
| 290.0 /                    | 3.4            | 6.3   | 8.6    | 9.1    | 11.3   |
| 280.0 /                    | 5.4            | 9.0   | 10.0   | 10.3   | 9.6    |
| 270.0 /                    | 4.2            | 6.5   | 10.8   | 13.4   | 14.6   |
| 260.0 /                    | 5.3            | 7.4   | 11.4   | 14.2   | 15.5   |
| 250.0 /                    | 4.8            | 7.4   | 10.5   | 13.5   | 15.3   |
| 240.0 /                    | 4.3            | 7.8   | 11.6   | 13.3   | 14.3   |
| 230.0 /                    | 3.7            | 7.1   | 8.7    | 11.1   | 12.7   |
| 220.0 /                    | 3.7            | 6.5   | 11.0   | 13.5   | 14.6   |
| 210.0 /                    | 3.2            | 4.3   | 5.5    | 6.8    | 7.4    |
| 200.0 /                    | 2.0            | 4.5   | 5.6    | 5.7    | 6.2    |
| 190.0 /                    | 2.7            | 3.5   | 4.1    | 4.9    | 5.3    |
| 180.0 /                    | 2.9            | 4.5   | 5.4    | 6.1    | 6.4    |
| 170.0 /                    | 3.2            | 4.5   | 5.7    | 6.7    | 7.2    |
| 160.0 /                    | 4.1            | 6.2   | 6.3    | 6.4    | 7.1    |
| 150.0 /                    | 3.6            | 5.7   | 7.0    | 7.0    | 6.6    |
| 140.0 /                    | 4.5            | 8.5   | 10.4   | 10.7   | 10.4   |
| 130.0 /                    | 5.2            | 6.5   | 7.8    | 8.2    | 9.4    |
| 120.0 /                    | 4.4            | 6.2   | 7.2    | 8.1    | 8.1    |
| 110.0 /                    | 4.3            | 5.8   | 6.8    | 7.8    | 8.7    |
| 100.0 /                    | 3.7            | 4.6   | 6.3    | 7.1    | 7.5    |
| 90.0 /                     | 2.5            | 3.8   | 4.7    | 5.3    | 5.8    |
| 80.0 /                     | 4.0            | 5.7   | 6.5    | 6.4    | 6.4    |
| 70.0 /                     | 3.9            | 6.3   | 7.3    | 7.3    | 6.9    |
| 60.0 /                     | 4.8            | 6.3   | 7.1    | 7.5    | 7.7    |
| 50.0 /                     | 5.5            | 5.9   | 6.2    | 6.4    | 6.9    |
| 40.0 /                     | 3.6            | 5.4   | 6.2    | 6.7    | 6.6    |
| 30.0 /                     | 3.6            | 4.7   | 5.1    | 5.0    | 4.7    |
| 20.0 /                     | 3.3            | 4.5   | 4.9    | 4.5    | 4.8    |
| 10.0 /                     | 3.0            | 4.0   | 4.4    | 4.3    | 4.6    |

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CALCULATE (CONCENTRATION=1,DEPOSITION=2)  
RECEPTOR GRID SYSTEM (PECTANGULAR=1 OR 3, POLAR=2 OR 4)  
DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)  
TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)  
CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)  
LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)

ISW(1) = 1  
ISW(2) = 3  
ISW(3) = 1  
ISW(4) = 0  
ISW(5) = 0  
ISW(6) = 1

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)  
WITH THE FOLLOWING TIME PERIODS:

HOURLY (YES=1,NO=0)  
2-HOUR (YES=1,NO=0)  
3-HOUR (YES=1,NO=0)  
4-HOUR (YES=1,NO=0)  
6-HOUR (YES=1,NO=0)  
8-HOUR (YES=1,NO=0)  
12-HOUR (YES=1,NO=0)  
24-HOUR (YES=1,NO=0)

ISW(7) = 0  
ISW(8) = 0  
ISW(9) = 0  
ISW(10) = 0  
ISW(11) = 0  
ISW(12) = 0  
ISW(13) = 0  
ISW(14) = 1  
ISW(15) = 0

PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE  
SPECIFIED BY ISW(7) THROUGH ISW(14):

DAILY TABLES (YES=1,NO=0)

HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)

MAXIMUM 50 TABLES (YES=1,NO=0)

METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)

RURAL-URBAN OPTION (RURAL=0,URBAN MODE 1=1,URBAN MODE 2=2)

WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)

VERTICAL PCT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)

SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)

PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)

PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)

ISW(16) = 1  
ISW(17) = 0  
ISW(18) = 0  
ISW(19) = 1  
ISW(20) = 0  
ISW(21) = 1  
ISW(22) = 1  
ISW(23) = 0  
ISW(24) = 1  
ISW(25) = 1

NUMBER OF INPUT SOURCES

NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)

TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)

NUMBER OF X (RANGE) GRID VALUES

NUMBER OF Y (THETA) GRID VALUES

NUMBER OF DISCRETE RECEPTORS

SOURCE EMISSION RATE UNITS CONVERSION FACTOR

ENTRAINMENT COEFFICIENT FOR UNSTABLE ATMOSPHERE

ENTRAINMENT COEFFICIENT FOR STABLE ATMOSPHERE

HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED ZR = 7.00 METERS

LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA

DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION DECAY =0.000000E+00

SURFACE STATION NO.

YEAR OF SURFACE DATA

UPPER AIR STATION NO.

YEAR OF UPPER AIR DATA

ALLOCATED DATA STORAGE

REQUIRED DATA STORAGE FOR THIS PROBLEM RUN

NSOURC = 44  
NGROUP = 1  
IPERD = 0  
NXPNTS = 10  
NYPNTS = 10  
NXWYPT = 0  
TK =.10000E+07  
BETA1 =0.600  
BETA2 =0.600  
IMET = 9  
ISS = 12844  
ISY = 70  
IUS = 12839  
IUY = 70  
LIMIT = 43500 WORDS  
MINIT = 9780 WORDS



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\*\*\* VERTICAL POTENTIAL TEMPERATURE GRADIENTS \*\*\*  
(DEGREES KELVIN PER METER)

| STABILITY<br>CATEGORY | WIND SPEED CATEGORY |            |            |            |            |            |
|-----------------------|---------------------|------------|------------|------------|------------|------------|
|                       | 1                   | 2          | 3          | 4          | 5          | 6          |
| A                     | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| B                     | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| C                     | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| D                     | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| E                     | .20000E-01          | .20000E-01 | .20000E-01 | .20000E-01 | .20000E-01 | .20000E-01 |
| F                     | .35000E-01          | .35000E-01 | .35000E-01 | .35000E-01 | .35000E-01 | .35000E-01 |

\*\*\* X-COORDINATES OF RECTANGULAR GRID SYSTEM \*\*\*  
(METERS)

-1485., -1385., -1285., -1185., -1085., -985., -885., -785., -685., -585.,

\*\*\* Y-COORDINATES OF RECTANGULAR GRID SYSTEM \*\*\*  
(METERS)

-674., -574., -474., -374., -274., -174., -74., 26., 126., 226.,

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[illegible]

\*\*\* SOURCE DATA \*\*\*

| EMISSION RATE |  |  |  |  |  |  |  |  |  |  |  |  |  |  | TEMP.     |  | EXIT VEL. |  |        |  |  |  |
|---------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------|--|-----------|--|--------|--|--|--|
| TYPE=0,1      |  |  |  |  |  |  |  |  |  |  |  |  |  |  | TYPE=0    |  | TYPE=0    |  |        |  |  |  |
| (G/S)         |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (DEG.K)   |  | (M/S)     |  |        |  |  |  |
| TYPE=2        |  |  |  |  |  |  |  |  |  |  |  |  |  |  | VERT.DIM. |  | HORZ.DIM. |  | BLDG.  |  |  |  |
| (G/S)         |  |  |  |  |  |  |  |  |  |  |  |  |  |  | TYPE=1    |  | TYPE=1,2  |  | HEIGHT |  |  |  |
| X             |  |  |  |  |  |  |  |  |  |  |  |  |  |  | TYPE=0    |  | TYPE=0    |  | LENGTH |  |  |  |
| Y             |  |  |  |  |  |  |  |  |  |  |  |  |  |  | TYPE=0    |  | TYPE=0    |  | WIDTH  |  |  |  |
| ELEV.         |  |  |  |  |  |  |  |  |  |  |  |  |  |  | TYPE=0    |  | TYPE=0    |  | TYPE=0 |  |  |  |
| HEIGHT        |  |  |  |  |  |  |  |  |  |  |  |  |  |  | TYPE=0    |  | TYPE=0    |  | TYPE=0 |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
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| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  | (M)       |  | (M)    |  |  |  |
| (M)           |  |  |  |  |  |  |  |  |  |  |  |  |  |  | (M)       |  |           |  |        |  |  |  |



\*\*\* SCGC 2151 --S02

\*\*\*

\*\*\* SOURCE DATA \*\*\*

|        |     | EMISSION  |        |         |       |     |       | TEMP.     |        | EXIT VEL. |          |        |        |        |        |
|--------|-----|-----------|--------|---------|-------|-----|-------|-----------|--------|-----------|----------|--------|--------|--------|--------|
|        |     | RATE      |        |         |       |     |       | TYPE=0    |        | TYPE=0    |          |        |        |        |        |
|        |     | TYPE=0.1  |        |         |       |     |       | (DEG.K)   |        | (M/S)     |          |        |        |        |        |
|        |     | (G/S)     |        |         |       |     |       |           |        |           |          |        |        |        |        |
|        |     | TYPE=2    |        |         |       |     |       | VERT.DIM. |        | HORZ.DIM. |          | DIAM.  |        | HEIGHT |        |
|        |     | (G/S)     |        |         |       |     |       | TYPE=1    |        | TYPE=1,2  |          | TYPE=0 |        | TYPE=0 |        |
|        |     | *PER M**2 |        |         |       |     |       | (M)       |        | (M)       |          | (M)    |        | (M)    |        |
|        |     |           |        |         |       |     |       |           |        |           |          |        |        |        |        |
| SOURCE | T W | Y A       | NUMBER | PART.   | X     | Y   | BASE  | ELEV.     | HEIGHT | TYPE=1    | TYPE=1,2 | TYPE=0 | TYPE=0 | TYPE=0 | TYPE=0 |
| NUMBER | E E | CATS.     |        |         | (M)   | (M) | (M)   | (M)       | (M)    | (M)       | (M)      | (M)    | (M)    | (M)    | (M)    |
| 149    | 0 0 | 0         | 0.140  | -29000. | 3600. | 0.0 | 22.90 | 341.0     | 10.36  | 2.23      | 0.00     | 0.00   | 0.00   | 0.00   | 0.00   |
| 152    | 0 0 | 0         | 0.030  | -29000. | 3600. | 0.0 | 19.60 | 494.0     | 2.22   | 1.83      | 0.00     | 0.00   | 0.00   | 0.00   | 0.00   |
| 153    | 0 0 | 0         | 0.030  | -29000. | 3600. | 0.0 | 10.70 | 316.0     | 10.61  | 1.52      | 0.00     | 0.00   | 0.00   | 0.00   | 0.00   |
| 154    | 0 0 | 0         | 0.050  | -29000. | 3600. | 0.0 | 15.20 | 338.0     | 5.66   | 1.52      | 0.00     | 0.00   | 0.00   | 0.00   | 0.00   |

DAILY: 319  
 24-HR/PO 1  
 SGROUP# 1  
 YEAR 1971  
 \*\*\* SCGC 2151 --SC2

\*\*\*

\* DAILY 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
 \* FROM SOURCES: 1, -6, 101, -154, \* ENDING WITH HOUR 24 FOR DAY 319 \*  
 \* FOR THE RECEPTOR GRID \*  
 \* MAXIMUM VALUE EQUALS 229.0 AND OCCURRED AT ( -1085.0, -274.0) \*

| Y-AXIS /<br>(METERS) / | -1485.0 | -1385.0 | -1285.0 | -1185.0 | -1085.0 | -985.0 | -885.0 | -785.0 | -685.0 |
|------------------------|---------|---------|---------|---------|---------|--------|--------|--------|--------|
| 226.0 /                | 7.9     | 6.7     | 5.6     | 4.6     | 3.8     | 3.2    | 2.7    | 2.5    | 2.4    |
| 126.0 /                | 28.7    | 27.0    | 25.0    | 22.6    | 20.0    | 17.0   | 13.7   | 10.5   | 7.5    |
| 26.0 /                 | 68.5    | 70.3    | 71.8    | 73.0    | 73.8    | 73.4   | 71.2   | 67.7   | 62.7   |
| -74.0 /                | 108.3   | 114.6   | 121.4   | 128.6   | 136.3   | 143.4  | 148.3  | 152.0  | 153.8  |
| -174.0 /               | 141.5   | 153.4   | 167.0   | 182.5   | 199.9   | 216.7  | 226.6  | 224.9  | 203.0  |
| -274.0 /               | 187.1   | 202.9   | 217.3   | 227.3   | 229.0   | 217.7  | 188.0  | 147.1  | 104.7  |
| -374.0 /               | 260.0   | 198.9   | 190.2   | 173.4   | 150.1   | 124.0  | 97.8   | 74.1   | 53.2   |
| -474.0 /               | 150.9   | 136.0   | 118.9   | 101.7   | 85.7    | 71.0   | 57.1   | 42.8   | 25.4   |
| -574.0 /               | 96.8    | 85.3    | 74.4    | 64.1    | 54.4    | 45.0   | 33.7   | 18.8   | 6.5    |
| -674.0 /               | 64.9    | 57.4    | 50.2    | 43.4    | 36.0    | 25.7   | 13.5   | 5.1    | 2.5    |

DAILY: 319  
24-HR/PD 1  
SGROUP# 1  
YEAR 1971  
\*\*\* SCGC 2151 --S02

\*\*\*

\* DAILY 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, -6, 101, -154, \* ENDING WITH HOUR 24 FOR DAY 319 \*  
\* FOR THE RECEPTOR GRID \*  
\* MAXIMUM VALUE EQUALS 229.0 AND OCCURRED AT ( -1085.0, -274.0) \*

Y-AXIS /  
(METERS) / -585.0

X-AXIS (METERS)

-----  
226.0 / 2.4  
126.0 / 4.9  
26.0 / 55.4  
-74.0 / 151.0  
-174.0 / 156.2  
-274.0 / 68.0  
-374.0 / 32.6  
-474.0 / 8.8  
-574.0 / 2.6  
-674.0 / 2.2

64

DAILY: 89

24-HR/PD 1

SGROUP# 1

YEAR 1974

\*\*\* SCGC 2152 --S02

INTERACTION W/ FPL RIVIERA

\* DAILY 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CULIC METER) \*

\* ENDING WITH HOUR 24 FOR DAY 89 \*

\* FROM SOURCES: 1, -6, 101, -154,

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 81.2 AND OCCURRED AT ( 800.0, 80.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|        |      |      |      |      |      |
|--------|------|------|------|------|------|
| 80.0 / | 75.3 | 81.2 | 78.3 | 70.9 | 63.7 |
|--------|------|------|------|------|------|

65

Total Suspended Particulate

\*\*\* SCGC 3150 -- TSP 0.25/0.2

TSP

\*\*\*

CALCULATE (CONCENTRATION=1,DEPOSITION=2)  
RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)  
DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)  
TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)  
CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)  
LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)

ISW(1) = 1  
ISW(2) = 4  
ISW(3) = 1  
ISW(4) = 0  
ISW(5) = 0  
ISW(6) = 1

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)  
WITH THE FOLLOWING TIME PERIODS:

HOURLY (YES=1,NO=0)  
2-HOUR (YES=1,NO=0)  
3-HOUR (YES=1,NO=0)  
4-HOUR (YES=1,NO=0)  
6-HOUR (YES=1,NO=0)  
8-HOUR (YES=1,NO=0)  
12-HOUR (YES=1,NO=0)  
24-HOUR (YES=1,NO=0)

ISW(7) = 0  
ISW(8) = 0  
ISW(9) = 0  
ISW(10) = 0  
ISW(11) = 0  
ISW(12) = 0  
ISW(13) = 0  
ISW(14) = 1  
ISW(15) = 1

PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE  
SPECIFIED BY ISW(7) THROUGH ISW(14):

DAILY TABLES (YES=1,NO=0)  
HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)  
MAXIMUM 50 TABLES (YES=1,NO=0)

ISW(16) = 0  
ISW(17) = 1  
ISW(18) = 1  
ISW(19) = 1  
ISW(20) = 0  
ISW(21) = 1  
ISW(22) = 1  
ISW(23) = 0  
ISW(24) = 1  
ISW(25) = 1

METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)  
RURAL-URBAN OPTION (RURAL=0,URBAN MODE 1=1,URBAN MODE 2=2)  
WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)  
VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)  
SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)  
PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)  
PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)

NUMBER OF INPUT SOURCES  
NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)  
TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)  
NUMBER OF X (RANGE) GRID VALUES  
NUMBER OF Y (THETA) GRID VALUES  
NUMBER OF DISCRETE RECEPTORS  
SOURCE EMISSION RATE UNITS CONVERSION FACTOR  
ENTRAINMENT COEFFICIENT FOR UNSTABLE ATMOSPHERE  
ENTRAINMENT COEFFICIENT FOR STABLE ATMOSPHERE  
HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED  
LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA  
DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION DECAY =0.000000E+00  
SURFACE STATION NO.  
YEAR OF SURFACE DATA  
UPPER AIR STATION NO.  
YEAR OF UPPER AIR DATA  
ALLOCATED DATA STORAGE  
REQUIRED DATA STORAGE FOR THIS PROBLEM RUN

NSOURC = 8  
NGROUP = 2  
IPERD = 0  
NXPNTS = 5  
NYPNTS = 36  
NXUYPT = 0  
TK = .10000E+07  
BETA1 = 0.600  
BETA2 = 0.600  
ZR = 7.00 METERS  
IHET = 9  
ISS = 12844  
ISY = 70  
IUS = 12839  
IUY = 70  
LIMIT = 43500 WORDS  
MIMIT = 4683 WORDS



\*\*\* SCGC 3150 -- TSP 0.25/0.2

\*\*\*

\*\*\* VERTICAL POTENTIAL TEMPERATURE GRADIENTS \*\*\*  
(DEGREES KELVIN PER METER)

| STABILITY<br>CATEGORY | WIND SPEED CATEGORY |            |            |            |            |            |
|-----------------------|---------------------|------------|------------|------------|------------|------------|
|                       | 1                   | 2          | 3          | 4          | 5          | 6          |
| A                     | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| B                     | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| C                     | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| D                     | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| E                     | .20000E-01          | .20000E-01 | .20000E-01 | .20000E-01 | .20000E-01 | .20000E-01 |
| F                     | .35000E-01          | .35000E-01 | .35000E-01 | .35000E-01 | .35000E-01 | .35000E-01 |

\*\*\* RANGES OF POLAR GRID SYSTEM \*\*\*  
(METERS)

600., 800., 1000., 1200., 1400.,

\*\*\* RADIAL ANGLES OF POLAR GRID SYSTEM \*\*\*

(DEGREES)

|       |       |       |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 10.,  | 20.,  | 30.,  | 40.,  | 50.,  | 60.,  | 70.,  | 80.,  | 90.,  | 100., |
| 110., | 120., | 130., | 140., | 150., | 160., | 170., | 180., | 190., | 200., |
| 210., | 220., | 230., | 240., | 250., | 260., | 270., | 280., | 290., | 300., |
| 310., | 320., | 330., | 340., | 350., | 360., |       |       |       |       |



\*\*\* SCGC 3150 -- TSP 0.25/0.2

\*\*\*

SOURCE # 1---BOILER #1 & #2 -- 2 STACKS EACH  
 SOURCE # 2---BOILER #3 -- 1 STACK  
 SOURCE # 3---BOILER #4 -- 1 STACK  
 SOURCE # 4---BOILER #5 -- 2 STACKS  
 SOURCE # 5---NEW BOILER, #8  
 SOURCE # 6---BOILERS #6 & #7 -- BOTH INTO ONE STACK  
 SOURCE # 7---BOILER #4 -- AS IS, 3 STACKS  
 SOURCE # 8---BOILERS #6 & #7 -- AS IS, 1 STACK EACH

\*\*\* SOURCE DATA \*\*\*

| SOURCE<br>NUMBER | T<br>P | W<br>K | Y<br>A | NUMBER<br>PART. | EMISSION<br>RATE<br>TYPE=0,1<br>(G/S) | X<br>(M) | Y<br>(M) | BASE<br>ELEV. (M) | HEIGHT<br>(M) | TEMP.<br>TYPE=0<br>(DEG.K) | EXIT VEL.<br>TYPE=0<br>(M/S) | BLDG.<br>DIAM. (M) | BLDG.<br>HEIGHT (M) | BLDG.<br>LENGTH (M) | BLDG.<br>WIDTH (M) |
|------------------|--------|--------|--------|-----------------|---------------------------------------|----------|----------|-------------------|---------------|----------------------------|------------------------------|--------------------|---------------------|---------------------|--------------------|
|                  |        |        |        |                 | TYPE=2<br>(G/S)                       |          |          |                   |               | VERT.DIM.<br>TYPE=1<br>(M) | HORZ.DIM.<br>TYPE=1,2<br>(M) |                    |                     |                     |                    |
| 1                | 0      | 0      | 0      | 0               | 13.600                                | 0.       | 31.      | 0.0               | 24.40         | 344.0                      | 11.80                        | 1.40               | 0.00                | 0.00                | 0.00               |
| 2                | 0      | 0      | 0      | 0               | 5.700                                 | 0.       | 0.       | 0.0               | 24.40         | 344.0                      | 15.10                        | 1.60               | 0.00                | 0.00                | 0.00               |
| 3                | 0      | 0      | 0      | 0               | 10.900                                | 0.       | -16.     | 0.0               | 33.53         | 344.0                      | 11.60                        | 2.82               | 0.00                | 0.00                | 0.00               |
| 4                | 0      | 0      | 0      | 0               | 9.100                                 | 0.       | -30.     | 0.0               | 24.40         | 344.0                      | 15.80                        | 1.40               | 0.00                | 0.00                | 0.00               |
| 5                | 0      | 0      | 0      | 0               | 12.000                                | -33.     | -16.     | 0.0               | 47.24         | 344.0                      | 11.00                        | 3.05               | 0.00                | 0.00                | 0.00               |
| 6                | 0      | 0      | 0      | 0               | 2.500                                 | -33.     | 10.      | 0.0               | 12.20         | 606.0                      | 22.40                        | 1.52               | 0.00                | 0.00                | 0.00               |
| 7                | 0      | 0      | 0      | 0               | 10.900                                | 0.       | -16.     | 0.0               | 25.90         | 344.0                      | 11.60                        | 1.63               | 0.00                | 0.00                | 0.00               |
| 8                | 0      | 0      | 0      | 0               | 2.500                                 | -33.     | 10.      | 0.0               | 12.20         | 606.0                      | 11.20                        | 1.52               | 0.00                | 0.00                | 0.00               |

\*N\*-DAY  
 183 DAYS  
 SGROUP# 1  
 YEAR 1970  
 \*\*\* SCGC 3150 -- TSP 0.25/0.2

\*\*\*

\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, -6.  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 9.1 AND OCCURRED AT ( 800.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
| 360.0 /                    | 2.2   | 2.8   | 3.0    | 3.0    | 2.9    |
| 350.0 /                    | 2.7   | 3.2   | 3.2    | 3.0    | 2.8    |
| 340.0 /                    | 4.6   | 5.5   | 5.5    | 5.2    | 4.8    |
| 330.0 /                    | 4.3   | 4.8   | 4.7    | 4.3    | 3.9    |
| 320.0 /                    | 5.7   | 6.5   | 6.4    | 5.9    | 5.4    |
| 310.0 /                    | 5.4   | 6.2   | 6.1    | 5.7    | 5.2    |
| 300.0 /                    | 5.3   | 5.9   | 5.8    | 5.3    | 4.9    |
| 290.0 /                    | 5.2   | 5.9   | 5.8    | 5.4    | 4.9    |
| 280.0 /                    | 5.1   | 5.4   | 5.1    | 4.6    | 4.2    |
| 270.0 /                    | 7.6   | 8.4   | 8.2    | 7.4    | 6.8    |
| 260.0 /                    | 8.3   | 9.1   | 8.8    | 8.0    | 7.2    |
| 250.0 /                    | 7.2   | 8.3   | 8.3    | 7.7    | 7.0    |
| 240.0 /                    | 4.6   | 5.1   | 4.9    | 4.4    | 4.0    |
| 230.0 /                    | 4.5   | 4.8   | 4.6    | 4.1    | 3.7    |
| 220.0 /                    | 3.5   | 3.7   | 3.5    | 3.1    | 2.8    |
| 210.0 /                    | 2.5   | 2.5   | 2.4    | 2.1    | 1.9    |
| 200.0 /                    | 2.1   | 2.2   | 2.1    | 1.9    | 1.7    |
| 190.0 /                    | 2.2   | 2.5   | 2.5    | 2.3    | 2.1    |
| 180.0 /                    | 3.0   | 3.3   | 3.2    | 2.9    | 2.7    |
| 170.0 /                    | 4.0   | 4.3   | 4.1    | 3.7    | 3.4    |
| 160.0 /                    | 5.3   | 5.8   | 5.7    | 5.3    | 4.9    |
| 150.0 /                    | 5.6   | 6.3   | 6.2    | 5.8    | 5.4    |
| 140.0 /                    | 7.1   | 8.2   | 8.3    | 7.8    | 7.3    |
| 130.0 /                    | 7.5   | 8.5   | 8.4    | 7.9    | 7.3    |
| 120.0 /                    | 6.0   | 6.7   | 6.6    | 6.1    | 5.7    |
| 110.0 /                    | 5.3   | 5.9   | 5.9    | 5.5    | 5.1    |
| 100.0 /                    | 3.2   | 3.5   | 3.5    | 3.3    | 3.1    |
| 90.0 /                     | 2.3   | 2.8   | 3.0    | 2.9    | 2.5    |
| 80.0 /                     | 1.9   | 2.2   | 2.2    | 2.1    | 2.0    |
| 70.0 /                     | 2.4   | 2.7   | 2.8    | 2.7    | 2.6    |
| 60.0 /                     | 3.2   | 3.6   | 3.6    | 3.4    | 3.2    |
| 50.0 /                     | 3.0   | 3.2   | 3.2    | 2.9    | 2.7    |
| 40.0 /                     | 2.2   | 2.5   | 2.4    | 2.2    | 2.1    |
| 30.0 /                     | 1.7   | 1.8   | 1.7    | 1.6    | 1.5    |
| 20.0 /                     | 1.6   | 1.5   | 1.9    | 1.8    | 1.7    |
| 10.0 /                     | 1.7   | 2.0   | 2.0    | 1.8    | 1.7    |

\*N\*-DAY  
 183 DAYS  
 SGROUP# 1  
 YEAR 1971  
 \*\*\* SCGC 3150 -- TSP 0.25/0.2

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, -6,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 12.9 AND OCCURRED AT ( 800.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |       |        |        |        |
|----------------------------|----------------|-------|--------|--------|--------|
|                            | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0 |
| 360.0 /                    | 1.7            | 2.0   | 2.2    | 2.1    | 2.1    |
| 350.0 /                    | 2.8            | 3.4   | 3.5    | 3.3    | 3.1    |
| 340.0 /                    | 4.0            | 4.8   | 4.8    | 4.5    | 4.2    |
| 330.0 /                    | 5.3            | 6.1   | 6.0    | 5.6    | 5.2    |
| 320.0 /                    | 6.7            | 7.8   | 7.8    | 7.2    | 6.7    |
| 310.0 /                    | 6.5            | 7.6   | 7.6    | 7.1    | 6.6    |
| 300.0 /                    | 5.4            | 5.9   | 5.7    | 5.2    | 4.7    |
| 290.0 /                    | 5.9            | 6.5   | 6.4    | 5.9    | 5.5    |
| 280.0 /                    | 7.2            | 7.9   | 7.6    | 7.0    | 6.3    |
| 270.0 /                    | 9.4            | 10.2  | 9.8    | 9.0    | 8.1    |
| 260.0 /                    | 11.8           | 12.9  | 12.4   | 11.3   | 10.1   |
| 250.0 /                    | 10.9           | 11.8  | 11.3   | 10.2   | 9.2    |
| 240.0 /                    | 8.3            | 9.1   | 8.8    | 8.0    | 7.2    |
| 230.0 /                    | 5.2            | 5.6   | 5.3    | 4.8    | 4.3    |
| 220.0 /                    | 3.7            | 3.9   | 3.7    | 3.3    | 3.0    |
| 210.0 /                    | 2.4            | 2.6   | 2.5    | 2.3    | 2.1    |
| 200.0 /                    | 1.9            | 2.0   | 1.9    | 1.7    | 1.6    |
| 190.0 /                    | 2.1            | 2.3   | 2.2    | 2.0    | 1.8    |
| 180.0 /                    | 2.5            | 2.8   | 2.8    | 2.7    | 2.5    |
| 170.0 /                    | 2.6            | 2.9   | 2.9    | 2.8    | 2.6    |
| 160.0 /                    | 2.4            | 2.7   | 2.8    | 2.6    | 2.5    |
| 150.0 /                    | 2.8            | 3.2   | 3.4    | 3.2    | 3.1    |
| 140.0 /                    | 4.4            | 5.4   | 5.6    | 5.4    | 5.2    |
| 130.0 /                    | 5.1            | 6.0   | 6.2    | 5.9    | 5.7    |
| 120.0 /                    | 4.2            | 4.8   | 4.8    | 4.6    | 4.3    |
| 110.0 /                    | 3.1            | 3.6   | 3.6    | 3.4    | 3.2    |
| 100.0 /                    | 2.1            | 2.3   | 2.2    | 2.1    | 2.0    |
| 90.0 /                     | 2.0            | 2.2   | 2.3    | 2.2    | 2.1    |
| 80.0 /                     | 1.9            | 2.1   | 2.0    | 1.9    | 1.8    |
| 70.0 /                     | 2.2            | 2.3   | 2.2    | 2.0    | 1.8    |
| 60.0 /                     | 2.1            | 2.2   | 2.1    | 2.0    | 1.9    |
| 50.0 /                     | 2.0            | 2.2   | 2.3    | 2.2    | 2.0    |
| 40.0 /                     | 1.4            | 1.7   | 1.7    | 1.6    | 1.5    |
| 30.0 /                     | 1.5            | 1.7   | 1.7    | 1.6    | 1.5    |
| 20.0 /                     | 1.3            | 1.6   | 1.7    | 1.6    | 1.5    |
| 10.0 /                     | 1.1            | 1.4   | 1.5    | 1.4    | 1.3    |

\*N\*-DAY  
 184 DAYS  
 SGROUP# 1  
 YEAR 1972  
 \*\*\* SCGC 3150 -- TSP 0.25/0.2

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\* 184-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, -6,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 10.8 AND OCCURRED AT ( 800.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
| 360.0 /                    | 3.4   | 4.2   | 4.3    | 4.2    | 4.0    |
| 350.0 /                    | 3.4   | 3.9   | 3.9    | 3.7    | 3.4    |
| 340.0 /                    | 4.4   | 5.0   | 5.0    | 4.6    | 4.3    |
| 330.0 /                    | 5.1   | 5.8   | 5.7    | 5.2    | 4.8    |
| 320.0 /                    | 5.8   | 6.4   | 6.2    | 5.7    | 5.2    |
| 310.0 /                    | 7.7   | 8.2   | 7.9    | 7.2    | 6.6    |
| 300.0 /                    | 8.5   | 9.1   | 8.7    | 7.9    | 7.2    |
| 290.0 /                    | 8.2   | 9.2   | 9.1    | 8.4    | 7.7    |
| 280.0 /                    | 7.9   | 8.7   | 8.5    | 7.7    | 7.1    |
| 270.0 /                    | 9.6   | 10.8  | 10.7   | 9.9    | 9.0    |
| 260.0 /                    | 9.0   | 10.2  | 10.1   | 9.3    | 8.6    |
| 250.0 /                    | 7.4   | 8.3   | 8.1    | 7.5    | 6.8    |
| 240.0 /                    | 6.3   | 6.9   | 6.6    | 6.0    | 5.4    |
| 230.0 /                    | 5.3   | 5.8   | 5.6    | 5.1    | 4.5    |
| 220.0 /                    | 2.9   | 3.1   | 2.9    | 2.6    | 2.3    |
| 210.0 /                    | 2.2   | 2.4   | 2.3    | 2.1    | 1.9    |
| 200.0 /                    | 1.6   | 1.7   | 1.7    | 1.5    | 1.4    |
| 190.0 /                    | 1.6   | 1.7   | 1.6    | 1.5    | 1.3    |
| 180.0 /                    | 2.5   | 2.8   | 2.7    | 2.4    | 2.2    |
| 170.0 /                    | 3.5   | 3.8   | 3.8    | 3.5    | 3.1    |
| 160.0 /                    | 3.9   | 4.5   | 4.5    | 4.2    | 3.9    |
| 150.0 /                    | 3.6   | 3.9   | 3.7    | 3.4    | 3.2    |
| 140.0 /                    | 4.6   | 5.2   | 5.2    | 4.9    | 4.6    |
| 130.0 /                    | 3.9   | 4.4   | 4.4    | 4.2    | 3.9    |
| 120.0 /                    | 3.6   | 4.2   | 4.3    | 4.0    | 3.8    |
| 110.0 /                    | 3.0   | 3.6   | 3.7    | 3.5    | 3.2    |
| 100.0 /                    | 2.1   | 2.3   | 2.3    | 2.2    | 2.1    |
| 90.0 /                     | 1.6   | 1.8   | 1.8    | 1.8    | 1.7    |
| 80.0 /                     | 1.3   | 1.5   | 1.6    | 1.5    | 1.5    |
| 70.0 /                     | 1.6   | 1.9   | 2.0    | 2.0    | 1.9    |
| 60.0 /                     | 2.6   | 2.9   | 2.9    | 2.7    | 2.5    |
| 50.0 /                     | 3.0   | 3.4   | 3.4    | 3.2    | 3.0    |
| 40.0 /                     | 3.1   | 3.6   | 3.7    | 3.5    | 3.3    |
| 30.0 /                     | 2.3   | 2.8   | 2.6    | 2.5    | 2.4    |
| 20.0 /                     | 2.4   | 3.0   | 3.2    | 3.1    | 2.9    |
| 10.0 /                     | 2.2   | 2.5   | 2.9    | 2.8    | 2.7    |

\*N\*-DAY  
 183 DAYS  
 SGROUP# 1  
 YEAR 1973  
 \*\*\* SCGC 3150 -- TSP 0.25/0.2

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, -6.  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 10.0 AND OCCURRED AT ( 600.0, 320.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |     |      |     |     |     |
|---------|-----|------|-----|-----|-----|
| 360.0 / | 2.2 | 2.5  | 2.5 | 2.4 | 2.2 |
| 350.0 / | 3.2 | 3.7  | 3.7 | 3.4 | 3.2 |
| 340.0 / | 4.6 | 5.3  | 5.3 | 4.9 | 4.5 |
| 330.0 / | 6.1 | 6.7  | 6.5 | 5.9 | 5.5 |
| 320.0 / | 8.9 | 10.0 | 9.7 | 8.9 | 8.1 |
| 310.0 / | 8.8 | 9.8  | 9.6 | 8.8 | 8.0 |
| 300.0 / | 8.2 | 9.3  | 9.2 | 8.5 | 7.8 |
| 290.0 / | 6.8 | 7.6  | 7.4 | 6.8 | 6.2 |
| 280.0 / | 7.3 | 7.9  | 7.6 | 6.9 | 6.3 |
| 270.0 / | 8.6 | 9.7  | 9.6 | 8.8 | 8.1 |
| 260.0 / | 8.7 | 9.6  | 9.3 | 8.5 | 7.6 |
| 250.0 / | 8.6 | 9.6  | 9.3 | 8.5 | 7.6 |
| 240.0 / | 6.2 | 6.8  | 6.6 | 6.0 | 5.4 |
| 230.0 / | 4.5 | 4.9  | 4.7 | 4.3 | 3.8 |
| 220.0 / | 4.5 | 4.9  | 4.6 | 4.2 | 3.7 |
| 210.0 / | 2.7 | 2.8  | 2.7 | 2.4 | 2.1 |
| 200.0 / | 1.6 | 1.7  | 1.6 | 1.5 | 1.3 |
| 190.0 / | 1.8 | 1.9  | 1.8 | 1.6 | 1.4 |
| 180.0 / | 2.9 | 3.3  | 3.2 | 2.9 | 2.6 |
| 170.0 / | 3.0 | 3.4  | 3.3 | 3.1 | 2.8 |
| 160.0 / | 3.7 | 4.4  | 4.5 | 4.3 | 4.0 |
| 150.0 / | 4.4 | 5.2  | 5.3 | 5.0 | 4.7 |
| 140.0 / | 5.7 | 6.7  | 6.8 | 6.4 | 6.0 |
| 130.0 / | 6.0 | 7.0  | 7.2 | 6.9 | 6.6 |
| 120.0 / | 5.5 | 6.4  | 6.6 | 6.3 | 5.9 |
| 110.0 / | 4.4 | 5.1  | 5.2 | 4.9 | 4.7 |
| 100.0 / | 2.5 | 2.8  | 2.9 | 2.7 | 2.6 |
| 90.0 /  | 1.9 | 2.3  | 2.3 | 2.2 | 2.2 |
| 80.0 /  | 1.6 | 1.7  | 1.6 | 1.5 | 1.4 |
| 70.0 /  | 1.6 | 1.8  | 1.8 | 1.7 | 1.6 |
| 60.0 /  | 1.5 | 1.6  | 1.5 | 1.4 | 1.3 |
| 50.0 /  | 1.7 | 2.0  | 2.0 | 1.9 | 1.7 |
| 40.0 /  | 1.3 | 1.6  | 1.6 | 1.5 | 1.4 |
| 30.0 /  | 1.3 | 1.4  | 1.4 | 1.3 | 1.2 |
| 20.0 /  | 1.7 | 2.0  | 2.0 | 1.9 | 1.8 |
| 10.0 /  | 1.6 | 1.9  | 1.9 | 1.8 | 1.7 |

\*N\*-DAY  
 183 DAYS  
 SGROUP# 1  
 YEAR 1974  
 \*\*\* SCGC 3150 -- TSP 0.25/0.2

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, -6,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 12.6 AND OCCURRED AT ( 800.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |      |      |      |      |      |
|---------|------|------|------|------|------|
| 360.0 / | 2.4  | 2.6  | 2.6  | 2.5  | 2.3  |
| 350.0 / | 2.5  | 2.7  | 2.7  | 2.5  | 2.3  |
| 340.0 / | 4.0  | 4.4  | 4.3  | 4.0  | 3.7  |
| 330.0 / | 5.9  | 6.3  | 6.0  | 5.5  | 5.0  |
| 320.0 / | 8.0  | 8.5  | 8.0  | 7.3  | 6.6  |
| 310.0 / | 8.3  | 8.9  | 8.6  | 7.9  | 7.2  |
| 300.0 / | 7.5  | 8.0  | 7.7  | 7.0  | 6.4  |
| 290.0 / | 7.7  | 8.3  | 8.1  | 7.5  | 6.9  |
| 280.0 / | 8.8  | 9.4  | 9.0  | 8.2  | 7.5  |
| 270.0 / | 11.3 | 12.6 | 12.4 | 11.4 | 10.4 |
| 260.0 / | 10.8 | 11.9 | 11.6 | 10.6 | 9.7  |
| 250.0 / | 9.8  | 10.9 | 10.5 | 9.6  | 8.7  |
| 240.0 / | 7.9  | 8.8  | 8.5  | 7.8  | 7.1  |
| 230.0 / | 4.8  | 5.4  | 5.3  | 4.8  | 4.4  |
| 220.0 / | 2.5  | 2.7  | 2.6  | 2.4  | 2.2  |
| 210.0 / | 1.9  | 2.0  | 1.9  | 1.7  | 1.6  |
| 200.0 / | 1.7  | 1.9  | 1.8  | 1.6  | 1.4  |
| 190.0 / | 1.6  | 1.6  | 1.7  | 1.6  | 1.4  |
| 180.0 / | 2.4  | 2.6  | 2.5  | 2.3  | 2.1  |
| 170.0 / | 2.0  | 2.3  | 2.3  | 2.1  | 2.0  |
| 160.0 / | 2.6  | 3.0  | 3.1  | 2.9  | 2.8  |
| 150.0 / | 3.0  | 3.4  | 3.4  | 3.2  | 3.0  |
| 140.0 / | 4.1  | 4.9  | 5.0  | 4.7  | 4.4  |
| 130.0 / | 4.5  | 5.3  | 5.3  | 5.1  | 4.8  |
| 120.0 / | 2.8  | 3.1  | 3.1  | 3.0  | 2.8  |
| 110.0 / | 2.1  | 2.3  | 2.3  | 2.2  | 2.1  |
| 100.0 / | 1.9  | 2.0  | 2.0  | 1.8  | 1.7  |
| 90.0 /  | 1.9  | 2.1  | 2.1  | 2.0  | 1.9  |
| 80.0 /  | 1.9  | 2.0  | 2.0  | 1.8  | 1.7  |
| 70.0 /  | 1.7  | 1.8  | 1.8  | 1.7  | 1.6  |
| 60.0 /  | 2.0  | 2.3  | 2.2  | 2.1  | 2.0  |
| 50.0 /  | 2.1  | 2.3  | 2.2  | 2.0  | 1.8  |
| 40.0 /  | 2.0  | 2.1  | 2.0  | 1.8  | 1.7  |
| 30.0 /  | 1.7  | 1.4  | 1.3  | 1.2  | 1.1  |
| 20.0 /  | 1.3  | 1.4  | 1.4  | 1.3  | 1.2  |
| 10.0 /  | 1.9  | 2.1  | 1.9  | 1.6  | 1.7  |

2ND HIGH

24-HR

SGROUP# 1

YEAR 1970

\*\*\* SCGC 3150 -- TSP 0.25/0.2

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\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, -6,

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 94.1 AND OCCURRED AT ( 800.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0         | 800.0         | 1000.0        | 1200.0        | 1400.0        |
|----------------------------|---------------|---------------|---------------|---------------|---------------|
| 360.0 /                    | 27.9 ( 87, 1) | 36.4 ( 71, 1) | 34.6 ( 34, 1) | 31.3 ( 64, 1) | 28.7 ( 64, 1) |
| 350.0 /                    | 46.7 ( 34, 1) | 50.8 ( 34, 1) | 47.2 ( 34, 1) | 42.4 ( 47, 1) | 39.0 ( 47, 1) |
| 340.0 /                    | 53.3 ( 64, 1) | 63.3 ( 47, 1) | 65.5 ( 47, 1) | 62.7 ( 47, 1) | 59.5 ( 47, 1) |
| 330.0 /                    | 35.8 ( 95, 1) | 40.0 (294, 1) | 43.7 (294, 1) | 42.7 (294, 1) | 40.7 (294, 1) |
| 320.0 /                    | 58.4 ( 90, 1) | 64.3 ( 90, 1) | 61.7 ( 90, 1) | 55.6 ( 90, 1) | 49.8 ( 90, 1) |
| 310.0 /                    | 59.4 (293, 1) | 70.9 (293, 1) | 70.4 (293, 1) | 64.5 (293, 1) | 61.6 ( 29, 1) |
| 300.0 /                    | 55.1 (104, 1) | 57.5 ( 62, 1) | 58.5 ( 62, 1) | 54.8 ( 62, 1) | 50.6 ( 62, 1) |
| 290.0 /                    | 51.7 (303, 1) | 62.3 (303, 1) | 62.5 (303, 1) | 58.0 (303, 1) | 53.1 (303, 1) |
| 280.0 /                    | 63.3 ( 60, 1) | 65.7 ( 60, 1) | 60.4 ( 60, 1) | 53.0 ( 60, 1) | 46.5 ( 60, 1) |
| 270.0 /                    | 80.2 ( 60, 1) | 94.1 ( 60, 1) | 90.1 (292, 1) | 81.0 (292, 1) | 72.3 (292, 1) |
| 260.0 /                    | 64.3 ( 5, 1)  | 76.0 (344, 1) | 76.4 (331, 1) | 72.5 (331, 1) | 66.9 (344, 1) |
| 250.0 /                    | 63.2 (301, 1) | 80.0 (331, 1) | 87.9 (331, 1) | 85.4 (331, 1) | 80.7 (331, 1) |
| 240.0 /                    | 44.2 ( 37, 1) | 52.7 ( 37, 1) | 52.7 ( 37, 1) | 50.4 (291, 1) | 44.5 (291, 1) |
| 230.0 /                    | 56.2 (294, 1) | 60.3 (290, 1) | 50.2 (106, 1) | 41.4 (106, 1) | 36.1 ( 31, 1) |
| 220.0 /                    | 35.1 ( 38, 1) | 40.3 ( 38, 1) | 36.8 ( 93, 1) | 33.1 ( 93, 1) | 29.6 ( 93, 1) |
| 210.0 /                    | 27.8 (322, 1) | 27.4 (106, 1) | 25.0 ( 58, 1) | 20.9 ( 58, 1) | 17.9 ( 86, 1) |
| 200.0 /                    | 28.3 (322, 1) | 30.4 (322, 1) | 28.6 (304, 1) | 24.9 (304, 1) | 21.6 (304, 1) |
| 190.0 /                    | 24.5 ( 39, 1) | 29.7 ( 2, 1)  | 31.0 ( 97, 1) | 28.6 ( 97, 1) | 26.0 ( 27, 1) |
| 180.0 /                    | 31.2 (300, 1) | 37.8 (300, 1) | 38.0 (300, 1) | 35.2 (300, 1) | 32.1 (300, 1) |
| 170.0 /                    | 32.0 ( 52, 1) | 37.0 ( 52, 1) | 37.3 ( 24, 1) | 36.3 ( 2, 1)  | 34.3 ( 24, 1) |
| 160.0 /                    | 41.4 ( 97, 1) | 48.4 ( 57, 1) | 48.9 ( 57, 1) | 48.6 ( 54, 1) | 46.9 ( 52, 1) |
| 150.0 /                    | 36.5 ( 52, 1) | 42.8 ( 52, 1) | 42.5 ( 52, 1) | 39.0 ( 52, 1) | 35.4 ( 52, 1) |
| 140.0 /                    | 47.0 ( 65, 1) | 56.9 (309, 1) | 57.6 (309, 1) | 53.5 (309, 1) | 49.0 (309, 1) |
| 130.0 /                    | 61.7 ( 7, 1)  | 68.8 (328, 1) | 68.6 ( 8, 1)  | 65.7 ( 8, 1)  | 61.7 ( 8, 1)  |
| 120.0 /                    | 41.2 (315, 1) | 45.4 ( 20, 1) | 45.2 ( 20, 1) | 41.4 ( 20, 1) | 37.5 ( 20, 1) |
| 110.0 /                    | 51.7 ( 28, 1) | 58.2 ( 20, 1) | 57.0 ( 20, 1) | 52.4 ( 20, 1) | 47.7 ( 20, 1) |
| 100.0 /                    | 41.9 ( 72, 1) | 47.2 ( 72, 1) | 45.6 ( 72, 1) | 41.1 ( 72, 1) | 36.8 ( 72, 1) |
| 90.0 /                     | 23.5 ( 15, 1) | 29.4 (306, 1) | 26.3 (365, 1) | 26.4 (103, 1) | 25.7 (103, 1) |
| 80.0 /                     | 32.6 ( 1, 1)  | 32.1 ( 68, 1) | 33.0 ( 68, 1) | 30.7 ( 68, 1) | 28.0 ( 68, 1) |
| 70.0 /                     | 30.1 ( 1, 1)  | 30.7 ( 30, 1) | 30.6 ( 30, 1) | 28.2 ( 30, 1) | 25.6 ( 30, 1) |
| 60.0 /                     | 41.4 (359, 1) | 45.0 (359, 1) | 42.9 (327, 1) | 37.6 (327, 1) | 33.2 (327, 1) |
| 50.0 /                     | 37.4 ( 56, 1) | 42.8 ( 56, 1) | 37.8 (297, 1) | 32.9 (297, 1) | 29.6 (297, 1) |
| 40.0 /                     | 26.3 ( 26, 1) | 25.9 ( 26, 1) | 23.6 ( 48, 1) | 21.7 ( 48, 1) | 19.8 ( 48, 1) |
| 30.0 /                     | 25.4 ( 52, 1) | 20.6 (102, 1) | 21.0 (102, 1) | 19.7 (102, 1) | 18.8 ( 23, 1) |
| 20.0 /                     | 24.7 ( 31, 1) | 22.7 ( 56, 1) | 24.1 (102, 1) | 24.6 (102, 1) | 24.3 (102, 1) |
| 10.0 /                     | 19.1 (317, 1) | 20.6 ( 81, 1) | 19.5 (318, 1) | 17.7 (318, 1) | 16.0 (318, 1) |

2ND HIGH  
24-HR  
SGROUP# 1  
YEAR 1971  
\*\*\* SCGC 3150 -- TSP 0.25/0.2

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\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, -6,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 105.7 AND OCCURRED AT ( 800.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |               |               |               |
|----------------------------|----------------|----------------|---------------|---------------|---------------|
|                            | 600.0          | 800.0          | 1000.0        | 1200.0        | 1400.0        |
| 360.0 /                    | 24.3 ( 95, 1)  | 28.3 ( 95, 1)  | 27.6 ( 95, 1) | 27.5 (297, 1) | 27.2 (297, 1) |
| 350.0 /                    | 36.1 ( 38, 1)  | 42.6 ( 38, 1)  | 42.6 ( 38, 1) | 39.8 ( 38, 1) | 37.1 ( 38, 1) |
| 340.0 /                    | 47.3 ( 38, 1)  | 56.1 ( 38, 1)  | 55.8 ( 38, 1) | 51.2 ( 38, 1) | 46.5 ( 38, 1) |
| 330.0 /                    | 49.2 ( 36, 1)  | 58.4 ( 36, 1)  | 58.4 ( 36, 1) | 54.3 ( 36, 1) | 49.9 ( 36, 1) |
| 320.0 /                    | 57.4 ( 36, 1)  | 68.7 ( 36, 1)  | 68.1 ( 36, 1) | 62.3 ( 36, 1) | 56.4 ( 36, 1) |
| 310.0 /                    | 64.0 ( 92, 1)  | 74.1 ( 92, 1)  | 74.4 ( 92, 1) | 69.9 ( 92, 1) | 65.3 ( 92, 1) |
| 300.0 /                    | 37.8 (348, 1)  | 46.7 (348, 1)  | 48.6 (348, 1) | 47.8 (340, 1) | 44.3 (348, 1) |
| 290.0 /                    | 41.1 (348, 1)  | 49.9 (348, 1)  | 48.5 ( 35, 1) | 43.5 ( 35, 1) | 38.7 ( 35, 1) |
| 280.0 /                    | 48.4 (323, 1)  | 60.7 (323, 1)  | 61.9 (323, 1) | 54.6 ( 34, 1) | 47.8 ( 34, 1) |
| 270.0 /                    | 71.6 ( 34, 1)  | 81.9 ( 34, 1)  | 82.1 ( 91, 1) | 77.5 ( 91, 1) | 71.8 ( 91, 1) |
| 260.0 /                    | 97.9 (319, 1)  | 105.7 (319, 1) | 99.7 (319, 1) | 89.0 (319, 1) | 78.9 (319, 1) |
| 250.0 /                    | 79.9 (310, 1)  | 92.5 (310, 1)  | 91.3 (310, 1) | 84.0 (310, 1) | 76.3 (310, 1) |
| 240.0 /                    | 82.3 (357, 1)  | 90.9 (102, 1)  | 88.9 (102, 1) | 81.1 (102, 1) | 73.2 (102, 1) |
| 230.0 /                    | 46.8 (357, 1)  | 50.3 (100, 1)  | 50.3 (100, 1) | 47.0 (100, 1) | 43.6 (100, 1) |
| 220.0 /                    | 51.5 (100, 1)  | 50.3 (100, 1)  | 45.2 (100, 1) | 39.1 (100, 1) | 33.8 (100, 1) |
| 210.0 /                    | 28.2 ( 86, 1)  | 33.0 (356, 1)  | 32.2 (100, 1) | 28.4 (100, 1) | 25.0 (100, 1) |
| 200.0 /                    | 28.8 (352, 1)  | 30.0 ( 86, 1)  | 29.3 ( 93, 1) | 26.6 (352, 1) | 23.6 (352, 1) |
| 190.0 /                    | 32.3 (352, 1)  | 34.7 ( 76, 1)  | 32.8 ( 93, 1) | 30.0 (352, 1) | 26.6 (352, 1) |
| 180.0 /                    | 34.5 (352, 1)  | 37.6 (352, 1)  | 35.7 (352, 1) | 32.0 (352, 1) | 28.6 (352, 1) |
| 170.0 /                    | 38.0 (329, 1)  | 41.8 (329, 1)  | 40.1 (329, 1) | 36.1 (329, 1) | 32.2 (329, 1) |
| 160.0 /                    | 34.8 (300, 1)  | 37.6 (314, 1)  | 37.0 (314, 1) | 33.8 (314, 1) | 30.6 (314, 1) |
| 150.0 /                    | 26.4 (317, 1)  | 32.0 (317, 1)  | 34.3 (317, 1) | 32.2 ( 41, 1) | 29.6 ( 41, 1) |
| 140.0 /                    | 44.1 ( 16, 1)  | 54.1 ( 86, 1)  | 53.7 ( 86, 1) | 50.2 ( 86, 1) | 46.8 (315, 1) |
| 130.0 /                    | 46.7 ( 40, 1)  | 56.9 ( 40, 1)  | 58.1 ( 40, 1) | 54.8 ( 40, 1) | 51.2 ( 40, 1) |
| 120.0 /                    | 49.6 ( 63, 1)  | 57.4 ( 66, 1)  | 58.0 ( 66, 1) | 53.9 ( 66, 1) | 49.3 ( 66, 1) |
| 110.0 /                    | 29.7 ( 79, 1)  | 31.9 ( 19, 1)  | 36.6 ( 54, 1) | 37.7 ( 54, 1) | 38.1 (295, 1) |
| 100.0 /                    | 28.6 (298, 1)  | 31.6 ( 54, 1)  | 30.1 ( 54, 1) | 26.6 ( 54, 1) | 23.2 ( 54, 1) |
| 90.0 /                     | 31.7 ( 15, 1)  | 40.2 ( 15, 1)  | 41.2 ( 15, 1) | 38.3 ( 15, 1) | 35.1 ( 15, 1) |
| 80.0 /                     | 31.9 ( 44, 1)  | 33.5 ( 44, 1)  | 31.2 ( 7, 1)  | 31.3 ( 15, 1) | 27.6 ( 15, 1) |
| 70.0 /                     | 41.1 ( 15, 1)  | 39.2 ( 15, 1)  | 36.3 ( 85, 1) | 31.6 ( 82, 1) | 26.4 ( 82, 1) |
| 60.0 /                     | 39.1 (331, 1)  | 36.6 (331, 1)  | 33.0 ( 39, 1) | 30.2 ( 39, 1) | 27.3 ( 75, 1) |
| 50.0 /                     | 31.3 ( 75, 1)  | 29.4 ( 44, 1)  | 26.0 (324, 1) | 24.1 ( 18, 1) | 23.7 ( 18, 1) |
| 40.0 /                     | 18.5 ( 46, 1)  | 21.6 (337, 1)  | 22.3 (337, 1) | 20.8 (337, 1) | 19.0 (337, 1) |
| 30.0 /                     | 36.5 ( 85, 1)  | 26.6 ( 85, 1)  | 26.1 ( 18, 1) | 26.3 ( 62, 1) | 23.0 ( 62, 1) |
| 20.0 /                     | 25.4 ( 66, 1)  | 32.7 ( 66, 1)  | 33.6 ( 66, 1) | 31.6 ( 66, 1) | 29.6 ( 66, 1) |
| 10.0 /                     | 26.7 ( 37, 1)  | 29.7 ( 37, 1)  | 33.1 ( 37, 1) | 30.3 ( 39, 1) | 26.6 ( 39, 1) |



2ND HIGH

24-HR

SGROUP# 1

YEAR 1972

\*\*\* SCGC 3150 -- TSP 0.25/0.2

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\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, -6,

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 59.3 AND OCCURRED AT ( 800.0, 250.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |               |               |               |               |
|----------------------------|----------------|---------------|---------------|---------------|---------------|
|                            | 600.0          | 800.0         | 1000.0        | 1200.0        | 1400.0        |
| 360.0 /                    | 51.0 (356, 1)  | 58.0 (330, 1) | 58.3 (330, 1) | 53.7 (330, 1) | 48.9 (330, 1) |
| 350.0 /                    | 38.1 (330, 1)  | 46.0 (330, 1) | 46.1 (330, 1) | 42.3 (330, 1) | 38.4 (330, 1) |
| 340.0 /                    | 35.7 (341, 1)  | 43.7 (341, 1) | 44.1 (341, 1) | 40.6 (341, 1) | 37.0 (341, 1) |
| 330.0 /                    | 50.8 ( 62, 1)  | 56.1 (301, 1) | 54.4 (341, 1) | 49.2 ( 62, 1) | 44.0 ( 62, 1) |
| 320.0 /                    | 60.9 (366, 1)  | 68.4 (366, 1) | 66.4 (366, 1) | 60.3 (366, 1) | 54.3 (366, 1) |
| 310.0 /                    | 66.3 (366, 1)  | 70.2 ( 95, 1) | 68.6 (349, 1) | 63.6 (349, 1) | 58.3 (349, 1) |
| 300.0 /                    | 76.7 (349, 1)  | 86.4 ( 95, 1) | 79.0 ( 95, 1) | 69.6 ( 95, 1) | 61.3 ( 95, 1) |
| 290.0 /                    | 47.6 (348, 1)  | 58.5 (348, 1) | 64.0 (307, 1) | 61.0 (308, 1) | 57.4 (308, 1) |
| 280.0 /                    | 62.2 ( 81, 1)  | 65.7 (343, 1) | 63.8 (343, 1) | 58.2 (343, 1) | 52.7 (343, 1) |
| 270.0 /                    | 68.9 (347, 1)  | 81.6 (347, 1) | 81.0 (347, 1) | 74.6 (347, 1) | 67.8 (347, 1) |
| 260.0 /                    | 59.5 (345, 1)  | 74.3 ( 18, 1) | 77.8 ( 18, 1) | 73.9 ( 18, 1) | 68.9 ( 18, 1) |
| 250.0 /                    | 88.7 (101, 1)  | 99.3 (101, 1) | 95.8 (101, 1) | 86.6 (101, 1) | 77.5 (101, 1) |
| 240.0 /                    | 62.7 (306, 1)  | 71.2 (306, 1) | 69.1 (306, 1) | 62.6 (306, 1) | 56.0 (306, 1) |
| 230.0 /                    | 49.8 (100, 1)  | 57.8 ( 72, 1) | 57.9 ( 72, 1) | 53.6 ( 72, 1) | 48.9 ( 72, 1) |
| 220.0 /                    | 36.8 ( 70, 1)  | 41.3 ( 70, 1) | 39.8 ( 70, 1) | 36.0 ( 70, 1) | 32.3 ( 70, 1) |
| 210.0 /                    | 31.1 ( 72, 1)  | 38.0 ( 72, 1) | 38.6 ( 72, 1) | 36.1 ( 72, 1) | 33.2 ( 72, 1) |
| 200.0 /                    | 39.8 ( 69, 1)  | 43.0 ( 69, 1) | 40.8 ( 69, 1) | 36.6 ( 69, 1) | 32.5 ( 69, 1) |
| 190.0 /                    | 32.0 ( 69, 1)  | 32.5 ( 59, 1) | 30.0 ( 66, 1) | 27.6 ( 66, 1) | 25.0 ( 66, 1) |
| 180.0 /                    | 29.9 ( 7, 1)   | 31.7 ( 7, 1)  | 29.8 ( 7, 1)  | 26.6 ( 7, 1)  | 23.5 ( 7, 1)  |
| 170.0 /                    | 41.2 (351, 1)  | 46.4 ( 40, 1) | 47.8 ( 40, 1) | 44.7 ( 40, 1) | 41.1 ( 40, 1) |
| 160.0 /                    | 41.1 (336, 1)  | 47.8 (336, 1) | 47.1 (336, 1) | 43.2 (336, 1) | 39.1 (336, 1) |
| 150.0 /                    | 35.0 ( 16, 1)  | 39.1 ( 93, 1) | 36.9 ( 45, 1) | 31.3 ( 16, 1) | 27.8 (328, 1) |
| 140.0 /                    | 54.4 (322, 1)  | 58.9 ( 36, 1) | 61.8 ( 36, 1) | 58.7 ( 36, 1) | 54.5 ( 36, 1) |
| 130.0 /                    | 54.9 ( 51, 1)  | 63.4 (328, 1) | 63.1 (328, 1) | 58.4 (328, 1) | 53.6 (328, 1) |
| 120.0 /                    | 47.7 (361, 1)  | 50.9 (361, 1) | 50.7 (321, 1) | 47.6 (321, 1) | 44.4 (321, 1) |
| 110.0 /                    | 30.5 (321, 1)  | 36.7 (331, 1) | 40.5 (331, 1) | 39.3 (331, 1) | 37.3 (331, 1) |
| 100.0 /                    | 45.2 ( 50, 1)  | 49.3 ( 50, 1) | 50.8 (361, 1) | 48.6 (361, 1) | 44.8 ( 44, 1) |
| 90.0 /                     | 28.1 (361, 1)  | 31.8 (361, 1) | 30.4 ( 44, 1) | 27.3 ( 44, 1) | 24.4 ( 44, 1) |
| 80.0 /                     | 17.7 ( 42, 1)  | 19.7 ( 68, 1) | 19.0 ( 49, 1) | 17.2 ( 44, 1) | 16.2 ( 44, 1) |
| 70.0 /                     | 20.9 ( 48, 1)  | 26.2 ( 48, 1) | 25.2 ( 99, 1) | 22.7 ( 44, 1) | 21.3 ( 44, 1) |
| 60.0 /                     | 42.0 ( 85, 1)  | 48.5 ( 85, 1) | 48.0 ( 85, 1) | 44.1 ( 85, 1) | 40.3 ( 85, 1) |
| 50.0 /                     | 39.4 ( 38, 1)  | 40.3 ( 47, 1) | 41.3 ( 47, 1) | 38.4 ( 47, 1) | 35.2 ( 47, 1) |
| 40.0 /                     | 48.1 ( 34, 1)  | 42.3 ( 34, 1) | 37.1 ( 6, 1)  | 31.6 ( 82, 1) | 29.1 ( 82, 1) |
| 30.0 /                     | 30.9 ( 35, 1)  | 29.6 ( 33, 1) | 30.6 ( 33, 1) | 28.7 ( 5, 1)  | 27.5 (319, 1) |
| 20.0 /                     | 25.4 ( 63, 1)  | 29.8 (331, 1) | 29.7 (331, 1) | 28.5 (319, 1) | 28.6 (319, 1) |
| 10.0 /                     | 25.0 (357, 1)  | 32.5 (357, 1) | 33.6 (357, 1) | 31.4 (357, 1) | 29.5 (335, 1) |

2ND HIGH  
24-HR  
SGROUP# 1  
YEAR 1973  
\*\*\* SCGC 3150 -- TSP 0.25/0.2

\*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)  
\* FROM SOURCES: 1, -6,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 106.8 AND OCCURRED AT ( 1000.0, 290.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |               |                |                |               |
|----------------------------|----------------|---------------|----------------|----------------|---------------|
|                            | 600.0          | 800.0         | 1000.0         | 1200.0         | 1400.0        |
| 360.0 /                    | 24.0 (304, 1)  | 27.0 ( 76, 1) | 29.3 ( 76, 1)  | 28.3 ( 76, 1)  | 27.8 ( 22, 1) |
| 350.0 /                    | 36.6 ( 91, 1)  | 43.9 ( 91, 1) | 43.6 ( 91, 1)  | 40.1 ( 91, 1)  | 36.5 ( 22, 1) |
| 340.0 /                    | 61.7 ( 97, 1)  | 66.3 ( 97, 1) | 62.7 ( 97, 1)  | 56.0 ( 97, 1)  | 49.8 ( 97, 1) |
| 330.0 /                    | 55.4 ( 84, 1)  | 58.4 ( 22, 1) | 58.7 ( 93, 1)  | 54.4 ( 93, 1)  | 49.7 ( 93, 1) |
| 320.0 /                    | 72.5 ( 21, 1)  | 79.3 ( 21, 1) | 75.8 ( 21, 1)  | 68.5 ( 21, 1)  | 61.7 (329, 1) |
| 310.0 /                    | 75.7 (360, 1)  | 88.1 (360, 1) | 86.1 (360, 1)  | 78.4 (360, 1)  | 70.6 (360, 1) |
| 300.0 /                    | 63.3 ( 32, 1)  | 72.3 ( 70, 1) | 79.1 ( 70, 1)  | 79.5 ( 70, 1)  | 78.9 ( 70, 1) |
| 290.0 /                    | 72.8 ( 65, 1)  | 99.2 ( 65, 1) | 106.8 ( 65, 1) | 102.9 ( 65, 1) | 97.0 ( 65, 1) |
| 280.0 /                    | 56.6 ( 64, 1)  | 50.9 ( 72, 1) | 47.8 ( 65, 1)  | 44.0 ( 65, 1)  | 40.9 (324, 1) |
| 270.0 /                    | 69.8 ( 17, 1)  | 78.7 (322, 1) | 76.9 ( 64, 1)  | 68.2 ( 64, 1)  | 60.2 ( 64, 1) |
| 260.0 /                    | 76.4 (317, 1)  | 86.9 (317, 1) | 84.7 (317, 1)  | 77.0 (317, 1)  | 69.4 (317, 1) |
| 250.0 /                    | 68.5 (335, 1)  | 83.8 (335, 1) | 84.7 (335, 1)  | 78.6 (335, 1)  | 71.9 (335, 1) |
| 240.0 /                    | 65.4 (315, 1)  | 70.9 (315, 1) | 67.3 (315, 1)  | 60.4 (315, 1)  | 53.8 (315, 1) |
| 230.0 /                    | 46.9 (315, 1)  | 51.5 (334, 1) | 52.3 (334, 1)  | 48.9 (334, 1)  | 44.9 (334, 1) |
| 220.0 /                    | 86.8 (295, 1)  | 93.5 (295, 1) | 88.4 (295, 1)  | 79.0 (295, 1)  | 70.0 (295, 1) |
| 210.0 /                    | 50.6 (295, 1)  | 53.4 (295, 1) | 50.9 (296, 1)  | 45.6 (296, 1)  | 40.6 (296, 1) |
| 200.0 /                    | 32.7 (295, 1)  | 36.3 (295, 1) | 34.8 (295, 1)  | 31.5 (295, 1)  | 28.2 (295, 1) |
| 190.0 /                    | 24.5 (352, 1)  | 25.8 (352, 1) | 24.2 (352, 1)  | 21.6 (352, 1)  | 19.0 (352, 1) |
| 180.0 /                    | 31.2 ( 24, 1)  | 31.7 (352, 1) | 32.1 ( 50, 1)  | 31.9 ( 50, 1)  | 30.7 ( 50, 1) |
| 170.0 /                    | 26.3 ( 81, 1)  | 35.8 ( 50, 1) | 41.0 ( 50, 1)  | 40.4 ( 50, 1)  | 38.6 ( 50, 1) |
| 160.0 /                    | 31.6 ( 15, 1)  | 40.5 ( 50, 1) | 49.0 ( 50, 1)  | 49.9 ( 50, 1)  | 48.6 ( 50, 1) |
| 150.0 /                    | 33.9 ( 52, 1)  | 45.0 ( 50, 1) | 54.6 ( 50, 1)  | 56.1 ( 50, 1)  | 55.2 ( 50, 1) |
| 140.0 /                    | 58.4 ( 14, 1)  | 60.1 ( 48, 1) | 59.8 ( 14, 1)  | 54.9 ( 14, 1)  | 50.2 ( 14, 1) |
| 130.0 /                    | 58.4 ( 42, 1)  | 71.8 (343, 1) | 70.9 (343, 1)  | 65.5 (343, 1)  | 60.0 (343, 1) |
| 120.0 /                    | 44.6 ( 42, 1)  | 56.7 ( 34, 1) | 58.4 ( 34, 1)  | 55.0 ( 34, 1)  | 51.1 ( 34, 1) |
| 110.0 /                    | 42.1 (242, 1)  | 50.6 ( 29, 1) | 49.1 ( 29, 1)  | 44.6 ( 29, 1)  | 40.1 ( 29, 1) |
| 100.0 /                    | 31.6 (350, 1)  | 39.5 (350, 1) | 40.2 (350, 1)  | 37.5 (350, 1)  | 34.3 (350, 1) |
| 90.0 /                     | 25.0 (302, 1)  | 33.6 (302, 1) | 36.3 (302, 1)  | 35.3 (302, 1)  | 33.8 (302, 1) |
| 80.0 /                     | 25.4 ( 19, 1)  | 27.5 ( 85, 1) | 26.6 ( 85, 1)  | 24.1 ( 85, 1)  | 21.6 ( 85, 1) |
| 70.0 /                     | 33.6 ( 19, 1)  | 33.1 ( 19, 1) | 30.8 (320, 1)  | 27.7 ( 19, 1)  | 24.7 ( 19, 1) |
| 60.0 /                     | 24.2 ( 8, 1)   | 25.2 ( 8, 1)  | 24.0 ( 85, 1)  | 22.6 ( 85, 1)  | 21.3 ( 85, 1) |
| 50.0 /                     | 27.3 (320, 1)  | 27.1 (320, 1) | 23.9 (320, 1)  | 22.1 ( 92, 1)  | 20.7 ( 92, 1) |
| 40.0 /                     | 29.1 (348, 1)  | 34.0 (348, 1) | 33.2 (348, 1)  | 30.2 (348, 1)  | 27.3 (348, 1) |
| 30.0 /                     | 25.8 (350, 1)  | 28.3 ( 80, 1) | 30.2 ( 80, 1)  | 28.9 ( 80, 1)  | 27.0 ( 80, 1) |
| 20.0 /                     | 27.7 (305, 1)  | 33.9 (305, 1) | 34.2 (305, 1)  | 31.9 (305, 1)  | 29.3 (305, 1) |
| 10.0 /                     | 21.9 ( 23, 1)  | 24.7 ( 27, 1) | 23.1 ( 27, 1)  | 21.1 ( 27, 1)  | 19.5 ( 27, 1) |

2ND HIGH

24-HR

SGROUP# 1

YEAR 1974

\*\*\* SCGC 3150 -- TSP 0.25/0.2

\*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, -6,

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 103.4 AND OCCURRED AT ( 800.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |               |               |
|----------------------------|----------------|----------------|----------------|---------------|---------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0        | 1400.0        |
| 360.0 /                    | 33.5 ( 53, 1)  | 40.7 ( 53, 1)  | 41.0 ( 50, 1)  | 38.9 ( 50, 1) | 36.6 ( 50, 1) |
| 350.0 /                    | 35.1 ( 32, 1)  | 37.1 ( 50, 1)  | 36.9 ( 50, 1)  | 33.9 ( 50, 1) | 30.8 ( 50, 1) |
| 340.0 /                    | 44.4 (349, 1)  | 55.6 (349, 1)  | 56.7 (349, 1)  | 52.8 (349, 1) | 48.5 (349, 1) |
| 330.0 /                    | 44.5 ( 92, 1)  | 48.0 (354, 1)  | 47.8 (354, 1)  | 44.8 (354, 1) | 42.0 (354, 1) |
| 320.0 /                    | 61.6 ( 93, 1)  | 59.0 ( 93, 1)  | 52.7 ( 93, 1)  | 48.5 (334, 1) | 45.6 (334, 1) |
| 310.0 /                    | 51.5 ( 85, 1)  | 59.3 ( 94, 1)  | 61.1 ( 94, 1)  | 57.7 ( 94, 1) | 53.9 ( 94, 1) |
| 300.0 /                    | 54.8 (104, 1)  | 58.7 (104, 1)  | 59.1 (358, 1)  | 54.5 (358, 1) | 49.6 (358, 1) |
| 290.0 /                    | 51.5 ( 61, 1)  | 61.7 (102, 1)  | 58.1 (102, 1)  | 51.9 ( 63, 1) | 49.7 ( 63, 1) |
| 280.0 /                    | 52.0 ( 74, 1)  | 54.3 (321, 1)  | 54.8 (321, 1)  | 50.7 (321, 1) | 47.5 ( 65, 1) |
| 270.0 /                    | 84.5 (357, 1)  | 103.4 (357, 1) | 100.5 ( 74, 1) | 90.1 ( 74, 1) | 80.1 ( 74, 1) |
| 260.0 /                    | 68.1 (321, 1)  | 80.8 (321, 1)  | 80.3 (321, 1)  | 73.6 (321, 1) | 66.7 (321, 1) |
| 250.0 /                    | 62.3 (304, 1)  | 75.6 ( 65, 1)  | 76.9 ( 65, 1)  | 71.7 ( 65, 1) | 65.7 ( 65, 1) |
| 240.0 /                    | 84.8 (294, 1)  | 88.3 (294, 1)  | 88.7 (306, 1)  | 81.7 (295, 1) | 72.1 (295, 1) |
| 230.0 /                    | 75.4 (314, 1)  | 86.4 (314, 1)  | 84.4 (314, 1)  | 76.9 (314, 1) | 69.3 (314, 1) |
| 220.0 /                    | 29.0 (296, 1)  | 33.5 (305, 1)  | 34.0 (305, 1)  | 32.2 (305, 1) | 30.2 (305, 1) |
| 210.0 /                    | 26.0 ( 77, 1)  | 28.2 ( 77, 1)  | 27.0 ( 77, 1)  | 24.4 ( 77, 1) | 21.9 ( 77, 1) |
| 200.0 /                    | 27.2 ( 12, 1)  | 24.9 ( 12, 1)  | 23.6 (364, 1)  | 22.2 (364, 1) | 20.8 (364, 1) |
| 190.0 /                    | 17.2 (363, 1)  | 20.1 ( 54, 1)  | 19.0 ( 96, 1)  | 18.3 ( 96, 1) | 17.2 ( 96, 1) |
| 180.0 /                    | 38.7 (332, 1)  | 40.5 (332, 1)  | 38.0 (332, 1)  | 33.9 (332, 1) | 30.1 (332, 1) |
| 170.0 /                    | 28.0 (311, 1)  | 32.0 (311, 1)  | 31.6 (311, 1)  | 29.2 (311, 1) | 26.7 (311, 1) |
| 160.0 /                    | 31.3 (325, 1)  | 35.0 (325, 1)  | 33.8 (325, 1)  | 30.6 (325, 1) | 27.4 (325, 1) |
| 150.0 /                    | 38.5 (349, 1)  | 36.1 (325, 1)  | 37.1 ( 96, 1)  | 35.4 ( 56, 1) | 33.1 ( 56, 1) |
| 140.0 /                    | 48.8 ( 57, 1)  | 55.4 ( 57, 1)  | 59.8 ( 57, 1)  | 55.2 ( 57, 1) | 50.2 ( 57, 1) |
| 130.0 /                    | 52.3 (338, 1)  | 51.7 ( 40, 1)  | 52.9 ( 40, 1)  | 49.8 ( 40, 1) | 46.2 ( 40, 1) |
| 120.0 /                    | 30.5 ( 76, 1)  | 33.4 ( 96, 1)  | 32.6 ( 96, 1)  | 30.5 ( 40, 1) | 29.0 ( 40, 1) |
| 110.0 /                    | 28.2 ( 17, 1)  | 31.9 (335, 1)  | 31.2 (335, 1)  | 28.3 (335, 1) | 25.5 (335, 1) |
| 100.0 /                    | 26.7 (363, 1)  | 23.9 (363, 1)  | 25.3 ( 55, 1)  | 24.5 ( 55, 1) | 23.2 ( 55, 1) |
| 90.0 /                     | 32.0 ( 55, 1)  | 36.6 (316, 1)  | 35.5 (316, 1)  | 33.1 (316, 1) | 31.5 (351, 1) |
| 80.0 /                     | 36.5 ( 89, 1)  | 37.6 ( 89, 1)  | 34.6 ( 89, 1)  | 30.3 ( 89, 1) | 26.5 ( 89, 1) |
| 70.0 /                     | 35.8 ( 75, 1)  | 44.3 ( 75, 1)  | 45.7 ( 75, 1)  | 42.0 ( 89, 1) | 37.4 ( 89, 1) |
| 60.0 /                     | 43.9 ( 81, 1)  | 43.8 ( 89, 1)  | 39.4 ( 89, 1)  | 34.2 ( 89, 1) | 29.8 ( 89, 1) |
| 50.0 /                     | 30.3 ( 94, 1)  | 27.3 ( 99, 1)  | 24.9 ( 89, 1)  | 22.9 (342, 1) | 21.1 (355, 1) |
| 40.0 /                     | 38.2 ( 99, 1)  | 35.6 ( 47, 1)  | 34.1 ( 47, 1)  | 33.8 ( 89, 1) | 32.3 ( 89, 1) |
| 30.0 /                     | 20.9 (342, 1)  | 20.8 (342, 1)  | 18.7 ( 88, 1)  | 17.3 ( 88, 1) | 16.1 ( 88, 1) |
| 20.0 /                     | 15.0 ( 79, 1)  | 17.1 ( 34, 1)  | 18.0 ( 34, 1)  | 17.4 ( 39, 1) | 17.2 ( 39, 1) |
| 10.0 /                     | 20.3 ( 47, 1)  | 31.7 ( 47, 1)  | 29.6 ( 75, 1)  | 27.6 ( 47, 1) | 24.8 ( 47, 1) |

\*N\*-DAY  
 183 DAYS  
 SGROUP# 2  
 YEAR 1970  
 \*\*\* SCGC 3150 -- TSP 0.25/0.2

\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 11.4 AND OCCURRED AT ( 800.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |       |        |        |        |
|----------------------------|----------------|-------|--------|--------|--------|
|                            | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0 |
| 360.0 /                    | 2.9            | 3.5   | 3.7    | 3.5    | 3.4    |
| 350.0 /                    | 3.5            | 4.0   | 3.9    | 3.6    | 3.3    |
| 340.0 /                    | 6.0            | 6.9   | 6.7    | 6.1    | 5.5    |
| 330.0 /                    | 5.4            | 5.9   | 5.6    | 5.0    | 4.4    |
| 320.0 /                    | 7.3            | 8.1   | 7.6    | 6.8    | 6.1    |
| 310.0 /                    | 7.0            | 7.7   | 7.4    | 6.7    | 6.0    |
| 300.0 /                    | 6.7            | 7.3   | 6.9    | 6.2    | 5.5    |
| 290.0 /                    | 6.7            | 7.4   | 7.0    | 6.3    | 5.6    |
| 280.0 /                    | 6.4            | 6.7   | 6.1    | 5.3    | 4.7    |
| 270.0 /                    | 9.7            | 10.4  | 9.7    | 8.6    | 7.5    |
| 260.0 /                    | 10.6           | 11.4  | 10.6   | 9.3    | 8.1    |
| 250.0 /                    | 9.5            | 10.6  | 10.1   | 9.0    | 8.0    |
| 240.0 /                    | 6.0            | 6.3   | 5.8    | 5.1    | 4.5    |
| 230.0 /                    | 5.7            | 5.9   | 5.4    | 4.7    | 4.1    |
| 220.0 /                    | 4.5            | 4.5   | 4.1    | 3.5    | 3.1    |
| 210.0 /                    | 3.2            | 3.1   | 2.8    | 2.4    | 2.1    |
| 200.0 /                    | 2.6            | 2.7   | 2.5    | 2.2    | 1.9    |
| 190.0 /                    | 2.9            | 3.1   | 3.0    | 2.7    | 2.4    |
| 180.0 /                    | 3.8            | 4.1   | 3.8    | 3.4    | 3.0    |
| 170.0 /                    | 5.1            | 5.3   | 4.9    | 4.3    | 3.8    |
| 160.0 /                    | 6.8            | 7.3   | 6.9    | 6.2    | 5.5    |
| 150.0 /                    | 7.2            | 7.9   | 7.6    | 6.9    | 6.3    |
| 140.0 /                    | 9.2            | 10.3  | 10.1   | 9.3    | 8.5    |
| 130.0 /                    | 9.5            | 10.5  | 10.2   | 9.2    | 8.4    |
| 120.0 /                    | 7.6            | 8.3   | 7.9    | 7.2    | 6.5    |
| 110.0 /                    | 6.6            | 7.3   | 7.0    | 6.4    | 5.9    |
| 100.0 /                    | 4.0            | 4.3   | 4.2    | 3.9    | 3.6    |
| 90.0 /                     | 2.9            | 3.5   | 3.7    | 3.6    | 3.4    |
| 80.0 /                     | 2.4            | 2.6   | 2.6    | 2.4    | 2.3    |
| 70.0 /                     | 3.0            | 3.4   | 3.4    | 3.2    | 3.0    |
| 60.0 /                     | 4.1            | 4.5   | 4.3    | 4.0    | 3.7    |
| 50.0 /                     | 3.8            | 3.9   | 3.7    | 3.3    | 3.0    |
| 40.0 /                     | 2.8            | 3.0   | 2.9    | 2.6    | 2.4    |
| 30.0 /                     | 2.1            | 2.2   | 2.0    | 1.8    | 1.6    |
| 20.0 /                     | 2.0            | 2.3   | 2.3    | 2.2    | 2.0    |
| 10.0 /                     | 1.2            | 1.4   | 2.4    | 2.2    | 2.0    |

\*N\*-DAY  
 183 DAYS  
 SGROUP# 2  
 YEAR 1971  
 \*\*\* SCGC 3150 -- TSP 0.25/0.2

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 16.0 AND OCCURRED AT ( 800.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |      |      |      |      |      |
|---------|------|------|------|------|------|
| 360.0 / | 2.2  | 2.6  | 2.7  | 2.6  | 2.5  |
| 350.0 / | 3.7  | 4.3  | 4.3  | 3.9  | 3.6  |
| 340.0 / | 5.3  | 6.1  | 5.9  | 5.4  | 4.9  |
| 330.0 / | 6.9  | 7.6  | 7.3  | 6.6  | 5.9  |
| 320.0 / | 8.7  | 9.8  | 9.4  | 8.5  | 7.6  |
| 310.0 / | 8.4  | 9.6  | 9.2  | 8.4  | 7.5  |
| 300.0 / | 6.8  | 7.2  | 6.8  | 6.0  | 5.3  |
| 290.0 / | 7.4  | 8.1  | 7.7  | 6.9  | 6.3  |
| 280.0 / | 5.1  | 9.7  | 9.1  | 8.0  | 7.2  |
| 270.0 / | 11.9 | 12.7 | 11.8 | 10.4 | 9.1  |
| 260.0 / | 15.1 | 16.0 | 14.7 | 12.9 | 11.2 |
| 250.0 / | 14.2 | 14.8 | 13.5 | 11.7 | 10.2 |
| 240.0 / | 10.8 | 11.4 | 10.5 | 9.2  | 8.0  |
| 230.0 / | 6.8  | 6.9  | 6.3  | 5.5  | 4.8  |
| 220.0 / | 4.8  | 4.9  | 4.4  | 3.8  | 3.3  |
| 210.0 / | 3.1  | 3.2  | 3.0  | 2.6  | 2.3  |
| 200.0 / | 2.4  | 2.5  | 2.3  | 2.0  | 1.7  |
| 190.0 / | 2.7  | 2.8  | 2.6  | 2.3  | 2.0  |
| 180.0 / | 3.2  | 3.5  | 3.4  | 3.1  | 2.9  |
| 170.0 / | 3.4  | 3.6  | 3.5  | 3.2  | 3.0  |
| 160.0 / | 3.1  | 3.4  | 3.3  | 3.1  | 2.9  |
| 150.0 / | 3.6  | 4.1  | 4.1  | 3.9  | 3.6  |
| 140.0 / | 5.8  | 6.8  | 6.9  | 6.5  | 6.1  |
| 130.0 / | 6.5  | 7.6  | 7.6  | 7.1  | 6.6  |
| 120.0 / | 5.3  | 5.3  | 5.8  | 5.4  | 5.0  |
| 110.0 / | 3.9  | 4.4  | 4.4  | 4.1  | 3.8  |
| 100.0 / | 2.6  | 2.8  | 2.7  | 2.5  | 2.3  |
| 90.0 /  | 2.5  | 2.8  | 2.7  | 2.6  | 2.4  |
| 80.0 /  | 2.4  | 2.6  | 2.4  | 2.2  | 2.0  |
| 70.0 /  | 2.8  | 2.8  | 2.5  | 2.2  | 2.0  |
| 60.0 /  | 2.6  | 2.6  | 2.5  | 2.3  | 2.1  |
| 50.0 /  | 2.5  | 2.7  | 2.7  | 2.5  | 2.4  |
| 40.0 /  | 1.8  | 2.1  | 2.0  | 1.9  | 1.7  |
| 30.0 /  | 1.9  | 2.1  | 2.0  | 1.8  | 1.7  |
| 20.0 /  | 1.6  | 2.0  | 2.1  | 2.0  | 1.8  |
| 10.0 /  | 1.5  | 1.7  | 1.8  | 1.7  | 1.6  |

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\*N\*-DAY  
 184 DAYS  
 SGROUP# 2  
 YEAR 1972  
 \*\*\* SCGC 3150 -- TSP 0.25/0.2

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\* 184-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 13.6 AND OCCURRED AT ( 800.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |      |      |      |      |      |
|---------|------|------|------|------|------|
| 360.0 / | 4.4  | 5.3  | 5.3  | 5.0  | 4.6  |
| 350.0 / | 4.3  | 4.9  | 4.7  | 4.3  | 3.9  |
| 340.0 / | 5.6  | 6.2  | 6.0  | 5.4  | 4.9  |
| 330.0 / | 6.6  | 7.2  | 6.8  | 6.1  | 5.5  |
| 320.0 / | 7.4  | 7.8  | 7.3  | 6.6  | 5.9  |
| 310.0 / | 9.7  | 10.0 | 9.2  | 8.2  | 7.4  |
| 300.0 / | 10.7 | 11.0 | 10.2 | 9.0  | 8.0  |
| 290.0 / | 10.6 | 11.5 | 10.9 | 9.8  | 8.8  |
| 280.0 / | 10.0 | 10.8 | 10.1 | 9.0  | 8.0  |
| 270.0 / | 12.3 | 13.6 | 12.9 | 11.5 | 10.3 |
| 260.0 / | 11.7 | 12.9 | 12.2 | 10.9 | 9.7  |
| 250.0 / | 9.7  | 10.5 | 9.8  | 8.7  | 7.7  |
| 240.0 / | 8.2  | 8.6  | 7.9  | 6.9  | 6.1  |
| 230.0 / | 7.0  | 7.3  | 6.7  | 5.8  | 5.0  |
| 220.0 / | 3.8  | 3.9  | 3.5  | 3.0  | 2.5  |
| 210.0 / | 2.8  | 3.0  | 2.8  | 2.4  | 2.1  |
| 200.0 / | 2.0  | 2.2  | 2.0  | 1.8  | 1.5  |
| 190.0 / | 2.0  | 2.1  | 1.9  | 1.7  | 1.5  |
| 180.0 / | 3.2  | 3.4  | 3.2  | 2.8  | 2.5  |
| 170.0 / | 4.4  | 4.8  | 4.5  | 4.0  | 3.6  |
| 160.0 / | 5.6  | 5.7  | 5.5  | 5.0  | 4.5  |
| 150.0 / | 4.6  | 4.8  | 4.5  | 4.0  | 3.6  |
| 140.0 / | 5.9  | 6.6  | 6.4  | 5.8  | 5.3  |
| 130.0 / | 4.9  | 5.5  | 5.4  | 4.9  | 4.5  |
| 120.0 / | 4.6  | 5.3  | 5.2  | 4.8  | 4.4  |
| 110.0 / | 3.8  | 4.5  | 4.5  | 4.2  | 3.8  |
| 100.0 / | 2.6  | 2.8  | 2.8  | 2.6  | 2.4  |
| 90.0 /  | 2.0  | 2.2  | 2.2  | 2.1  | 2.0  |
| 80.0 /  | 1.7  | 1.9  | 1.9  | 1.8  | 1.7  |
| 70.0 /  | 2.6  | 2.4  | 2.5  | 2.4  | 2.3  |
| 60.0 /  | 3.2  | 3.5  | 3.4  | 3.2  | 2.9  |
| 50.0 /  | 3.8  | 4.2  | 4.0  | 3.7  | 3.4  |
| 40.0 /  | 3.9  | 4.4  | 4.4  | 4.1  | 3.8  |
| 30.0 /  | 2.9  | 3.2  | 3.1  | 2.9  | 2.7  |
| 20.0 /  | 3.1  | 3.7  | 3.9  | 3.7  | 3.5  |
| 10.0 /  | 2.9  | 3.5  | 3.6  | 3.4  | 3.2  |

\*N\*-DAY  
 183 DAYS  
 SGROUP# 2  
 YEAR 1973  
 \*\*\* SCGC 3150 -- TSP 0.25/0.2

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 12.4 AND OCCURRED AT ( 800.0, 320.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |      |      |      |      |     |
|---------|------|------|------|------|-----|
| 360.0 / | 2.8  | 3.1  | 3.0  | 2.8  | 2.5 |
| 350.0 / | 4.1  | 4.6  | 4.4  | 4.0  | 3.6 |
| 340.0 / | 5.9  | 6.6  | 6.3  | 5.7  | 5.2 |
| 330.0 / | 7.7  | 8.3  | 7.7  | 6.8  | 6.0 |
| 320.0 / | 11.4 | 12.4 | 11.6 | 10.3 | 9.1 |
| 310.0 / | 11.3 | 12.1 | 11.4 | 10.2 | 9.1 |
| 300.0 / | 10.6 | 11.6 | 11.0 | 9.9  | 8.9 |
| 290.0 / | 8.7  | 9.4  | 8.8  | 7.9  | 7.1 |
| 280.0 / | 9.2  | 9.6  | 9.0  | 8.0  | 7.1 |
| 270.0 / | 11.1 | 12.2 | 11.6 | 10.3 | 9.2 |
| 260.0 / | 11.2 | 12.0 | 11.2 | 9.8  | 8.6 |
| 250.0 / | 11.2 | 12.0 | 11.2 | 9.8  | 8.5 |
| 240.0 / | 8.0  | 8.5  | 7.9  | 6.9  | 6.1 |
| 230.0 / | 5.8  | 6.1  | 5.6  | 4.9  | 4.3 |
| 220.0 / | 5.8  | 6.0  | 5.5  | 4.8  | 4.1 |
| 210.0 / | 3.5  | 3.5  | 3.2  | 2.7  | 2.3 |
| 200.0 / | 2.0  | 2.1  | 1.9  | 1.7  | 1.5 |
| 190.0 / | 2.2  | 2.3  | 2.1  | 1.8  | 1.6 |
| 180.0 / | 3.8  | 4.1  | 3.8  | 3.3  | 2.9 |
| 170.0 / | 3.9  | 4.2  | 4.0  | 3.6  | 3.2 |
| 160.0 / | 4.8  | 5.5  | 5.5  | 5.1  | 4.7 |
| 150.0 / | 5.6  | 6.5  | 6.5  | 6.0  | 5.5 |
| 140.0 / | 7.3  | 8.3  | 8.3  | 7.7  | 7.1 |
| 130.0 / | 7.6  | 8.8  | 8.8  | 8.3  | 7.8 |
| 120.0 / | 7.9  | 8.1  | 8.1  | 7.5  | 6.9 |
| 110.0 / | 5.5  | 6.4  | 6.3  | 5.9  | 5.4 |
| 100.0 / | 3.2  | 3.5  | 3.5  | 3.2  | 3.0 |
| 90.0 /  | 2.5  | 2.8  | 2.8  | 2.7  | 2.5 |
| 80.0 /  | 2.0  | 2.0  | 1.9  | 1.7  | 1.6 |
| 70.0 /  | 2.0  | 2.2  | 2.2  | 2.0  | 1.9 |
| 60.0 /  | 1.9  | 1.9  | 1.8  | 1.6  | 1.4 |
| 50.0 /  | 2.2  | 2.5  | 2.4  | 2.2  | 2.0 |
| 40.0 /  | 1.7  | 1.9  | 1.9  | 1.8  | 1.6 |
| 30.0 /  | 1.6  | 1.7  | 1.6  | 1.5  | 1.4 |
| 20.0 /  | 2.1  | 2.4  | 2.4  | 2.3  | 2.1 |
| 10.0 /  | 2.1  | 2.4  | 2.3  | 2.1  | 1.9 |

\*N\*-DAY  
 183 DAYS  
 SGROUP# 2  
 YEAR 1974  
 \*\*\* SCGC 3150 -- TSP 0.25/0.2

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 15.8 AND OCCURRED AT ( 800.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |       |        |        |        |
|----------------------------|----------------|-------|--------|--------|--------|
|                            | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0 |
| 360.0 /                    | 3.0            | 3.2   | 3.1    | 2.8    | 2.7    |
| 350.0 /                    | 3.2            | 3.4   | 3.2    | 2.9    | 2.6    |
| 340.0 /                    | 5.0            | 5.4   | 5.1    | 4.6    | 4.2    |
| 330.0 /                    | 7.4            | 7.6   | 7.0    | 6.2    | 5.6    |
| 320.0 /                    | 10.1           | 10.3  | 9.4    | 8.3    | 7.3    |
| 310.0 /                    | 10.5           | 10.8  | 10.1   | 9.0    | 8.1    |
| 300.0 /                    | 9.4            | 9.8   | 9.1    | 8.0    | 7.2    |
| 290.0 /                    | 9.7            | 10.2  | 9.6    | 8.6    | 7.8    |
| 280.0 /                    | 11.1           | 11.5  | 10.7   | 9.4    | 8.4    |
| 270.0 /                    | 14.5           | 15.8  | 14.8   | 13.2   | 11.7   |
| 260.0 /                    | 13.9           | 15.0  | 14.0   | 12.3   | 10.9   |
| 250.0 /                    | 12.7           | 13.7  | 12.7   | 11.1   | 9.8    |
| 240.0 /                    | 10.3           | 11.1  | 10.3   | 9.0    | 7.9    |
| 230.0 /                    | 6.3            | 6.9   | 6.4    | 5.6    | 4.9    |
| 220.0 /                    | 3.3            | 3.4   | 3.2    | 2.8    | 2.4    |
| 210.0 /                    | 2.4            | 2.5   | 2.3    | 2.0    | 1.7    |
| 200.0 /                    | 2.2            | 2.3   | 2.1    | 1.8    | 1.6    |
| 190.0 /                    | 2.1            | 2.2   | 2.1    | 1.8    | 1.6    |
| 180.0 /                    | 3.0            | 3.2   | 3.0    | 2.7    | 2.4    |
| 170.0 /                    | 2.6            | 2.8   | 2.7    | 2.5    | 2.3    |
| 160.0 /                    | 3.3            | 3.8   | 3.8    | 3.5    | 3.2    |
| 150.0 /                    | 3.9            | 4.3   | 4.1    | 3.8    | 3.5    |
| 140.0 /                    | 5.4            | 6.2   | 6.1    | 5.6    | 5.2    |
| 130.0 /                    | 5.8            | 6.6   | 6.5    | 6.0    | 5.5    |
| 120.0 /                    | 3.5            | 3.8   | 3.7    | 3.5    | 3.2    |
| 110.0 /                    | 2.7            | 2.9   | 2.8    | 2.6    | 2.4    |
| 100.0 /                    | 2.3            | 2.4   | 2.3    | 2.1    | 1.9    |
| 90.0 /                     | 2.4            | 2.5   | 2.5    | 2.3    | 2.2    |
| 80.0 /                     | 2.3            | 2.4   | 2.3    | 2.1    | 2.0    |
| 70.0 /                     | 2.1            | 2.2   | 2.1    | 2.0    | 1.8    |
| 60.0 /                     | 2.6            | 2.7   | 2.7    | 2.5    | 2.3    |
| 50.0 /                     | 2.7            | 2.7   | 2.5    | 2.2    | 2.0    |
| 40.0 /                     | 2.5            | 2.5   | 2.3    | 2.0    | 1.8    |
| 30.0 /                     | 1.6            | 1.7   | 1.6    | 1.4    | 1.3    |
| 20.0 /                     | 1.6            | 1.7   | 1.6    | 1.5    | 1.3    |
| 10.0 /                     | 2.3            | 2.4   | 2.3    | 2.1    | 1.9    |



2ND HIGH  
24-HR  
SGROUP# 2  
YEAR 1970

\*\*\* SCGC 3150 -- TSP 0.25/0.2 \*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, 2, 4, 7, 8, \*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 116.9 AND OCCURRED AT ( 800.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |               |
|----------------------------|----------------|----------------|----------------|----------------|---------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0        |
| 360.0 /                    | 34.3 ( 64, 1)  | 46.0 ( 34, 1)  | 41.1 ( 64, 1)  | 37.2 ( 64, 1)  | 35.6 ( 17, 1) |
| 350.0 /                    | 60.8 ( 87, 1)  | 62.7 ( 87, 1)  | 56.7 ( 47, 1)  | 50.3 ( 87, 1)  | 44.3 ( 87, 1) |
| 340.0 /                    | 71.0 ( 64, 1)  | 82.2 ( 47, 1)  | 81.1 ( 47, 1)  | 74.7 ( 47, 1)  | 68.8 ( 47, 1) |
| 330.0 /                    | 48.1 ( 33, 1)  | 52.9 (294, 1)  | 55.5 (294, 1)  | 52.5 (294, 1)  | 48.6 (294, 1) |
| 320.0 /                    | 75.5 ( 90, 1)  | 79.1 ( 90, 1)  | 72.2 ( 90, 1)  | 62.6 ( 90, 1)  | 54.2 ( 90, 1) |
| 310.0 /                    | 78.5 (293, 1)  | 91.4 (293, 1)  | 86.7 (293, 1)  | 77.6 ( 29, 1)  | 70.7 ( 91, 1) |
| 300.0 /                    | 63.3 (104, 1)  | 72.1 ( 62, 1)  | 71.7 ( 62, 1)  | 65.4 ( 62, 1)  | 59.0 ( 62, 1) |
| 290.0 /                    | 66.6 (303, 1)  | 78.0 (303, 1)  | 75.5 (303, 1)  | 67.6 (303, 1)  | 60.0 (303, 1) |
| 280.0 /                    | 77.4 ( 60, 1)  | 79.7 ( 60, 1)  | 70.7 ( 60, 1)  | 60.0 ( 60, 1)  | 51.0 ( 60, 1) |
| 270.0 /                    | 111.1 ( 60, 1) | 116.9 (292, 1) | 104.7 (292, 1) | 90.4 (345, 1)  | 82.3 (345, 1) |
| 260.0 /                    | 82.3 ( 5, 1)   | 98.9 (291, 1)  | 96.3 (331, 1)  | 87.8 (344, 1)  | 78.3 (344, 1) |
| 250.0 /                    | 83.8 (301, 1)  | 106.9 (331, 1) | 115.0 (331, 1) | 107.5 (331, 1) | 98.0 (331, 1) |
| 240.0 /                    | 57.7 ( 37, 1)  | 67.5 ( 37, 1)  | 65.3 (291, 1)  | 57.6 ( 37, 1)  | 50.7 ( 37, 1) |
| 230.0 /                    | 72.2 (290, 1)  | 65.6 (106, 1)  | 52.2 ( 31, 1)  | 45.1 ( 31, 1)  | 38.8 ( 31, 1) |
| 220.0 /                    | 46.2 ( 38, 1)  | 48.6 ( 93, 1)  | 44.1 ( 93, 1)  | 37.9 ( 93, 1)  | 32.6 ( 93, 1) |
| 210.0 /                    | 35.0 (322, 1)  | 34.1 ( 58, 1)  | 27.4 ( 58, 1)  | 24.6 ( 86, 1)  | 23.3 ( 86, 1) |
| 200.0 /                    | 36.9 (322, 1)  | 37.7 (304, 1)  | 32.2 (304, 1)  | 26.9 (304, 1)  | 23.0 ( 2, 1)  |
| 190.0 /                    | 31.6 ( 39, 1)  | 38.9 ( 2, 1)   | 38.8 ( 97, 1)  | 34.3 ( 97, 1)  | 30.0 ( 97, 1) |
| 180.0 /                    | 40.7 (300, 1)  | 49.1 (300, 1)  | 47.6 (300, 1)  | 42.4 (300, 1)  | 35.4 ( 51, 1) |
| 170.0 /                    | 42.7 ( 52, 1)  | 48.1 ( 52, 1)  | 48.0 ( 2, 1)   | 44.6 ( 24, 1)  | 40.9 ( 24, 1) |
| 160.0 /                    | 52.8 ( 57, 1)  | 62.0 ( 57, 1)  | 61.9 ( 54, 1)  | 60.9 ( 54, 1)  | 54.8 ( 52, 1) |
| 150.0 /                    | 47.3 ( 52, 1)  | 55.4 ( 52, 1)  | 52.8 ( 52, 1)  | 46.7 ( 52, 1)  | 40.9 ( 52, 1) |
| 140.0 /                    | 62.8 (309, 1)  | 74.7 (309, 1)  | 71.8 (309, 1)  | 63.8 (309, 1)  | 56.1 (309, 1) |
| 130.0 /                    | 80.7 (328, 1)  | 86.6 ( 8, 1)   | 88.8 ( 8, 1)   | 81.2 ( 7, 1)   | 71.5 ( 7, 1)  |
| 120.0 /                    | 54.0 (315, 1)  | 59.0 (319, 1)  | 56.9 (319, 1)  | 49.1 (319, 1)  | 42.7 ( 20, 1) |
| 110.0 /                    | 66.8 ( 41, 1)  | 74.6 ( 41, 1)  | 69.1 ( 41, 1)  | 60.3 ( 20, 1)  | 53.6 ( 20, 1) |
| 100.0 /                    | 55.1 ( 72, 1)  | 59.7 ( 72, 1)  | 54.5 ( 72, 1)  | 47.1 ( 72, 1)  | 40.6 ( 72, 1) |
| 90.0 /                     | 32.8 ( 15, 1)  | 35.8 (306, 1)  | 33.9 (365, 1)  | 31.8 (103, 1)  | 30.9 (103, 1) |
| 80.0 /                     | 41.5 ( 1, 1)   | 41.7 ( 68, 1)  | 40.6 ( 68, 1)  | 36.3 ( 68, 1)  | 32.0 ( 68, 1) |
| 70.0 /                     | 36.3 ( 1, 1)   | 36.9 ( 30, 1)  | 34.9 (298, 1)  | 31.0 (102, 1)  | 28.7 ( 30, 1) |
| 60.0 /                     | 53.6 (357, 1)  | 54.2 (327, 1)  | 46.5 (327, 1)  | 39.9 ( 81, 1)  | 35.5 ( 81, 1) |
| 50.0 /                     | 45.8 ( 56, 1)  | 47.7 (297, 1)  | 42.6 ( 40, 1)  | 37.4 ( 40, 1)  | 32.6 ( 40, 1) |
| 40.0 /                     | 32.7 ( 20, 1)  | 30.7 ( 26, 1)  | 29.8 (359, 1)  | 27.6 (359, 1)  | 25.3 (359, 1) |
| 30.0 /                     | 29.1 ( 92, 1)  | 26.0 (102, 1)  | 25.5 (102, 1)  | 24.3 ( 23, 1)  | 23.4 ( 23, 1) |
| 20.0 /                     | 25.2 ( 53, 1)  | 25.5 ( 56, 1)  | 30.7 (102, 1)  | 30.8 (102, 1)  | 29.9 (102, 1) |
| 10.0 /                     | 24.2 ( 34, 1)  | 25.4 (318, 1)  | 23.3 (318, 1)  | 20.7 (318, 1)  | 17.8 (318, 1) |

2ND HIGH  
24-HR  
SGROUP# 2  
YEAR 1971

\*\*\* SCGC 3150 -- TSP 0.25/0.2

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\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 130.5 AND OCCURRED AT ( 800.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |               |               |
|----------------------------|----------------|----------------|----------------|---------------|---------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0        | 1400.0        |
| 360.0 /                    | 32.0 ( 95, 1)  | 35.9 ( 95, 1)  | 35.1 (297, 1)  | 34.8 ( 39, 1) | 31.2 ( 39, 1) |
| 350.0 /                    | 47.2 ( 38, 1)  | 54.2 ( 38, 1)  | 52.0 ( 38, 1)  | 47.0 ( 38, 1) | 42.6 ( 38, 1) |
| 340.0 /                    | 63.9 ( 38, 1)  | 72.5 ( 38, 1)  | 67.9 ( 38, 1)  | 59.5 ( 38, 1) | 54.9 ( 59, 1) |
| 330.0 /                    | 64.5 ( 36, 1)  | 74.1 ( 36, 1)  | 71.0 ( 36, 1)  | 63.7 ( 36, 1) | 56.9 ( 36, 1) |
| 320.0 /                    | 75.6 ( 36, 1)  | 87.9 ( 36, 1)  | 83.4 ( 36, 1)  | 73.4 ( 36, 1) | 65.3 ( 51, 1) |
| 310.0 /                    | 83.2 ( 92, 1)  | 93.5 ( 92, 1)  | 90.0 ( 92, 1)  | 81.7 ( 92, 1) | 74.2 ( 92, 1) |
| 300.0 /                    | 49.4 (348, 1)  | 60.1 (348, 1)  | 60.4 (348, 1)  | 56.6 (340, 1) | 52.2 (348, 1) |
| 290.0 /                    | 54.1 (348, 1)  | 64.3 (348, 1)  | 58.6 ( 35, 1)  | 50.1 ( 35, 1) | 45.0 (362, 1) |
| 280.0 /                    | 63.7 (323, 1)  | 78.6 (323, 1)  | 73.0 ( 34, 1)  | 61.6 (353, 1) | 54.5 (353, 1) |
| 270.0 /                    | 95.8 ( 3, 1)   | 106.0 ( 34, 1) | 103.1 ( 91, 1) | 93.7 ( 91, 1) | 83.8 ( 91, 1) |
| 260.0 /                    | 126.1 (319, 1) | 130.5 (320, 1) | 116.2 (320, 1) | 99.9 (319, 1) | 85.3 (319, 1) |
| 250.0 /                    | 107.4 (310, 1) | 118.1 (310, 1) | 110.5 ( 48, 1) | 98.0 ( 48, 1) | 85.9 ( 48, 1) |
| 240.0 /                    | 106.1 (357, 1) | 114.1 (102, 1) | 107.1 (102, 1) | 94.2 (102, 1) | 82.3 (102, 1) |
| 230.0 /                    | 61.0 (357, 1)  | 62.8 (100, 1)  | 61.0 (100, 1)  | 55.3 (100, 1) | 49.9 (100, 1) |
| 220.0 /                    | 64.0 (100, 1)  | 59.0 (100, 1)  | 50.7 (100, 1)  | 42.5 (326, 1) | 38.1 (326, 1) |
| 210.0 /                    | 34.6 ( 80, 1)  | 40.2 (356, 1)  | 37.0 (100, 1)  | 31.7 (100, 1) | 27.2 (100, 1) |
| 200.0 /                    | 37.4 ( 86, 1)  | 38.5 ( 93, 1)  | 34.9 (352, 1)  | 29.9 (352, 1) | 25.5 (352, 1) |
| 190.0 /                    | 41.4 ( 76, 1)  | 42.3 ( 76, 1)  | 40.2 (352, 1)  | 34.2 (352, 1) | 29.2 (352, 1) |
| 180.0 /                    | 44.9 (352, 1)  | 47.4 (352, 1)  | 42.7 (352, 1)  | 36.7 (352, 1) | 31.5 (352, 1) |
| 170.0 /                    | 49.8 (329, 1)  | 52.8 (329, 1)  | 47.8 (329, 1)  | 41.1 (329, 1) | 35.3 (329, 1) |
| 160.0 /                    | 42.1 (314, 1)  | 48.3 (314, 1)  | 45.5 (314, 1)  | 40.0 (314, 1) | 35.8 (329, 1) |
| 150.0 /                    | 33.7 (315, 1)  | 40.3 (315, 1)  | 41.3 ( 41, 1)  | 36.7 ( 41, 1) | 33.0 ( 41, 1) |
| 140.0 /                    | 58.7 ( 16, 1)  | 68.8 ( 86, 1)  | 65.5 (315, 1)  | 62.6 (315, 1) | 55.6 ( 16, 1) |
| 130.0 /                    | 62.4 ( 40, 1)  | 74.8 ( 40, 1)  | 72.9 ( 40, 1)  | 66.1 ( 40, 1) | 59.7 ( 40, 1) |
| 120.0 /                    | 63.8 ( 66, 1)  | 74.1 ( 66, 1)  | 71.2 ( 66, 1)  | 63.4 ( 66, 1) | 55.8 ( 66, 1) |
| 110.0 /                    | 38.1 ( 79, 1)  | 42.6 ( 54, 1)  | 49.3 ( 54, 1)  | 50.8 (295, 1) | 46.9 ( 54, 1) |
| 100.0 /                    | 36.1 (298, 1)  | 37.1 ( 54, 1)  | 34.4 ( 54, 1)  | 29.7 ( 54, 1) | 25.5 ( 54, 1) |
| 90.0 /                     | 42.9 ( 15, 1)  | 52.4 ( 15, 1)  | 51.2 ( 15, 1)  | 45.8 ( 15, 1) | 40.6 ( 15, 1) |
| 80.0 /                     | 39.4 ( 44, 1)  | 40.3 ( 44, 1)  | 40.1 ( 7, 1)   | 34.7 ( 15, 1) | 29.9 ( 15, 1) |
| 70.0 /                     | 50.7 ( 15, 1)  | 46.8 ( 85, 1)  | 40.3 ( 82, 1)  | 32.0 ( 82, 1) | 27.4 ( 75, 1) |
| 60.0 /                     | 47.5 (331, 1)  | 42.1 ( 39, 1)  | 39.2 ( 39, 1)  | 33.4 ( 75, 1) | 28.3 ( 75, 1) |
| 50.0 /                     | 36.8 (106, 1)  | 33.5 (324, 1)  | 31.3 ( 18, 1)  | 30.9 ( 18, 1) | 29.5 ( 18, 1) |
| 40.0 /                     | 24.3 ( 95, 1)  | 27.3 ( 95, 1)  | 27.4 (337, 1)  | 24.9 (337, 1) | 22.3 (337, 1) |
| 30.0 /                     | 35.6 ( 85, 1)  | 31.1 ( 18, 1)  | 34.1 ( 62, 1)  | 28.6 ( 62, 1) | 24.1 ( 62, 1) |
| 20.0 /                     | 34.2 ( 66, 1)  | 41.9 ( 66, 1)  | 41.3 ( 66, 1)  | 37.6 ( 66, 1) | 34.2 ( 66, 1) |
| 10.0 /                     | 27.5 ( 37, 1)  | 38.7 ( 37, 1)  | 39.3 ( 39, 1)  | 33.1 ( 39, 1) | 28.1 ( 39, 1) |

2ND HIGH  
24-HR  
SGROUP# 2  
YEAR 1972

\*\*\* SCGC 3150 -- TSF 0.25/0.2 \*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 126.2 AND OCCURRED AT ( 800.0, 250.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |               |               |
|----------------------------|----------------|----------------|----------------|---------------|---------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0        | 1400.0        |
| 360.0 /                    | 66.8 (356, 1)  | 72.5 (330, 1)  | 70.5 (330, 1)  | 63.3 (330, 1) | 56.1 (330, 1) |
| 350.0 /                    | 49.7 (330, 1)  | 58.3 (330, 1)  | 56.2 (330, 1)  | 49.9 (330, 1) | 43.9 (330, 1) |
| 340.0 /                    | 45.0 (356, 1)  | 54.1 (341, 1)  | 53.8 (341, 1)  | 48.7 (341, 1) | 43.5 (341, 1) |
| 330.0 /                    | 65.3 ( 13, 1)  | 66.2 (301, 1)  | 64.6 ( 62, 1)  | 55.7 ( 62, 1) | 48.0 ( 62, 1) |
| 320.0 /                    | 79.1 (366, 1)  | 86.1 (366, 1)  | 79.9 (366, 1)  | 69.7 (366, 1) | 60.6 (366, 1) |
| 310.0 /                    | 85.0 (366, 1)  | 86.6 (349, 1)  | 83.6 (349, 1)  | 74.7 (349, 1) | 66.2 (349, 1) |
| 300.0 /                    | 96.3 (349, 1)  | 101.0 ( 95, 1) | 87.2 ( 95, 1)  | 74.1 (365, 1) | 68.7 (340, 1) |
| 290.0 /                    | 62.1 (348, 1)  | 75.4 (348, 1)  | 76.7 (308, 1)  | 70.6 (308, 1) | 65.1 (308, 1) |
| 280.0 /                    | 75.3 (297, 1)  | 80.3 (311, 1)  | 75.3 (343, 1)  | 66.8 (348, 1) | 60.6 (348, 1) |
| 270.0 /                    | 90.0 (347, 1)  | 103.3 (347, 1) | 97.4 (347, 1)  | 85.8 (347, 1) | 75.1 (347, 1) |
| 260.0 /                    | 82.6 (345, 1)  | 98.1 ( 18, 1)  | 98.0 ( 18, 1)  | 89.4 ( 18, 1) | 80.4 ( 18, 1) |
| 250.0 /                    | 117.6 (101, 1) | 126.2 (101, 1) | 114.6 (101, 1) | 99.0 (101, 1) | 85.1 (101, 1) |
| 240.0 /                    | 85.2 (306, 1)  | 92.5 (306, 1)  | 84.4 (306, 1)  | 72.9 (306, 1) | 62.8 (306, 1) |
| 230.0 /                    | 67.1 (100, 1)  | 74.2 ( 72, 1)  | 71.1 ( 72, 1)  | 63.2 ( 72, 1) | 55.6 ( 72, 1) |
| 220.0 /                    | 50.2 ( 70, 1)  | 53.6 ( 70, 1)  | 48.4 ( 70, 1)  | 41.9 ( 72, 1) | 37.0 ( 72, 1) |
| 210.0 /                    | 40.1 ( 72, 1)  | 48.8 ( 72, 1)  | 47.9 ( 72, 1)  | 43.2 ( 72, 1) | 38.4 ( 72, 1) |
| 200.0 /                    | 52.1 ( 69, 1)  | 54.0 ( 69, 1)  | 48.2 ( 69, 1)  | 41.1 ( 69, 1) | 35.0 ( 69, 1) |
| 190.0 /                    | 41.7 ( 59, 1)  | 39.3 ( 66, 1)  | 37.0 ( 66, 1)  | 32.5 ( 66, 1) | 28.4 ( 69, 1) |
| 180.0 /                    | 39.1 ( 7, 1)   | 39.5 ( 7, 1)   | 34.8 ( 7, 1)   | 30.5 ( 42, 1) | 29.2 ( 42, 1) |
| 170.0 /                    | 54.7 (351, 1)  | 61.7 ( 40, 1)  | 62.3 ( 40, 1)  | 53.1 (326, 1) | 45.2 (326, 1) |
| 160.0 /                    | 53.0 (336, 1)  | 61.3 (336, 1)  | 58.2 (336, 1)  | 51.3 (336, 1) | 44.9 (336, 1) |
| 150.0 /                    | 45.5 ( 16, 1)  | 49.5 ( 93, 1)  | 41.6 ( 16, 1)  | 36.6 (328, 1) | 32.8 (328, 1) |
| 140.0 /                    | 67.9 (322, 1)  | 78.1 ( 36, 1)  | 79.1 ( 36, 1)  | 72.2 ( 36, 1) | 64.7 ( 36, 1) |
| 130.0 /                    | 67.3 (327, 1)  | 79.2 ( 51, 1)  | 76.7 (328, 1)  | 70.1 (328, 1) | 63.3 (328, 1) |
| 120.0 /                    | 61.1 (361, 1)  | 62.6 (361, 1)  | 60.7 (321, 1)  | 56.0 (321, 1) | 51.2 (321, 1) |
| 110.0 /                    | 39.4 ( 50, 1)  | 47.0 (331, 1)  | 51.7 (331, 1)  | 49.5 (331, 1) | 46.1 ( 77, 1) |
| 100.0 /                    | 58.7 ( 50, 1)  | 60.4 ( 50, 1)  | 61.2 (361, 1)  | 56.8 ( 44, 1) | 49.3 ( 44, 1) |
| 90.0 /                     | 34.7 (361, 1)  | 38.2 (361, 1)  | 36.2 ( 44, 1)  | 31.3 ( 44, 1) | 27.7 ( 88, 1) |
| 80.0 /                     | 22.7 ( 49, 1)  | 22.5 ( 88, 1)  | 22.9 ( 44, 1)  | 22.3 ( 44, 1) | 21.2 ( 44, 1) |
| 70.0 /                     | 27.4 ( 48, 1)  | 32.1 ( 99, 1)  | 29.8 ( 44, 1)  | 28.0 ( 44, 1) | 25.2 ( 48, 1) |
| 60.0 /                     | 53.4 ( 85, 1)  | 60.1 ( 85, 1)  | 57.4 ( 85, 1)  | 50.0 ( 99, 1) | 42.9 ( 99, 1) |
| 50.0 /                     | 50.8 ( 30, 1)  | 51.7 ( 47, 1)  | 50.5 ( 47, 1)  | 45.3 ( 47, 1) | 40.1 ( 47, 1) |
| 40.0 /                     | 50.9 ( 34, 1)  | 49.6 ( 6, 1)   | 40.4 ( 6, 1)   | 35.8 ( 82, 1) | 32.1 ( 82, 1) |
| 30.0 /                     | 37.1 ( 85, 1)  | 38.5 ( 33, 1)  | 36.9 ( 5, 1)   | 35.0 ( 33, 1) | 32.1 ( 33, 1) |
| 20.0 /                     | 32.8 ( 63, 1)  | 37.9 (331, 1)  | 36.2 (331, 1)  | 36.2 (319, 1) | 35.7 (319, 1) |
| 10.0 /                     | 32.9 (357, 1)  | 41.8 (357, 1)  | 41.8 ( 96, 1)  | 38.4 ( 96, 1) | 35.6 (312, 1) |

2ND HIGH  
24-HR  
SGROUP# 2  
YEAR 1973

\*\*\* SCGC 3150 -- TSP 0.25/0.2 \*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, 2, 4, 7, 8,\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 134.3 AND OCCURRED AT ( 1000.0, 290.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0          | 800.0          | 1000.0         | 1200.0        | 1400.0        |
|----------------------------|----------------|----------------|----------------|---------------|---------------|
| 360.0 /                    | 30.2 (304, 1)  | 35.2 (76, 1)   | 37.0 (76, 1)   | 35.1 (22, 1)  | 33.1 (40, 1)  |
| 350.0 /                    | 48.4 (91, 1)   | 56.3 (91, 1)   | 53.4 (91, 1)   | 47.4 (332, 1) | 42.0 (332, 1) |
| 340.0 /                    | 79.9 (97, 1)   | 82.1 (97, 1)   | 73.3 (97, 1)   | 62.7 (97, 1)  | 53.7 (97, 1)  |
| 330.0 /                    | 71.2 (84, 1)   | 74.3 (93, 1)   | 71.4 (93, 1)   | 63.6 (93, 1)  | 56.1 (93, 1)  |
| 320.0 /                    | 93.1 (21, 1)   | 98.1 (21, 1)   | 89.5 (21, 1)   | 77.9 (21, 1)  | 69.1 (329, 1) |
| 310.0 /                    | 99.4 (360, 1)  | 111.4 (360, 1) | 103.6 (360, 1) | 90.5 (360, 1) | 78.6 (360, 1) |
| 300.0 /                    | 80.3 (32, 1)   | 94.0 (70, 1)   | 98.6 (70, 1)   | 96.2 (70, 1)  | 93.5 (70, 1)  |
| 290.0 /                    | 94.0 (65, 1)   | 127.3 (65, 1)  | 134.3 (65, 1)  | 126.2 (65, 1) | 111.0 (32, 1) |
| 280.0 /                    | 66.3 (64, 1)   | 61.2 (65, 1)   | 59.2 (65, 1)   | 52.8 (65, 1)  | 47.7 (324, 1) |
| 270.0 /                    | 84.6 (17, 1)   | 96.1 (64, 1)   | 87.5 (64, 1)   | 75.8 (64, 1)  | 65.6 (64, 1)  |
| 260.0 /                    | 99.0 (317, 1)  | 110.3 (317, 1) | 102.4 (317, 1) | 89.2 (317, 1) | 77.4 (317, 1) |
| 250.0 /                    | 92.7 (335, 1)  | 109.5 (335, 1) | 104.9 (291, 1) | 93.3 (291, 1) | 82.2 (335, 1) |
| 240.0 /                    | 83.5 (315, 1)  | 88.2 (315, 1)  | 79.4 (315, 1)  | 68.1 (315, 1) | 58.4 (315, 1) |
| 230.0 /                    | 64.4 (315, 1)  | 66.9 (334, 1)  | 64.9 (334, 1)  | 58.3 (334, 1) | 49.9 (294, 1) |
| 220.0 /                    | 113.0 (295, 1) | 116.9 (295, 1) | 103.7 (295, 1) | 88.3 (295, 1) | 75.3 (295, 1) |
| 210.0 /                    | 66.7 (295, 1)  | 69.0 (296, 1)  | 62.3 (296, 1)  | 53.3 (296, 1) | 45.5 (296, 1) |
| 200.0 /                    | 43.0 (295, 1)  | 45.6 (295, 1)  | 41.6 (295, 1)  | 35.9 (295, 1) | 31.0 (295, 1) |
| 190.0 /                    | 31.7 (352, 1)  | 31.8 (352, 1)  | 28.3 (352, 1)  | 24.1 (352, 1) | 20.5 (352, 1) |
| 180.0 /                    | 40.1 (24, 1)   | 39.2 (352, 1)  | 41.9 (50, 1)   | 41.1 (50, 1)  | 38.7 (50, 1)  |
| 170.0 /                    | 36.0 (81, 1)   | 46.5 (50, 1)   | 53.6 (50, 1)   | 52.2 (50, 1)  | 48.8 (50, 1)  |
| 160.0 /                    | 39.7 (48, 1)   | 53.4 (50, 1)   | 65.3 (50, 1)   | 65.7 (50, 1)  | 62.7 (50, 1)  |
| 150.0 /                    | 42.9 (297, 1)  | 57.6 (50, 1)   | 70.8 (50, 1)   | 72.3 (50, 1)  | 70.1 (50, 1)  |
| 140.0 /                    | 74.5 (302, 1)  | 74.4 (14, 1)   | 69.1 (14, 1)   | 62.0 (47, 1)  | 55.7 (14, 1)  |
| 130.0 /                    | 78.2 (42, 1)   | 89.4 (343, 1)  | 84.7 (343, 1)  | 75.7 (343, 1) | 67.5 (343, 1) |
| 120.0 /                    | 59.8 (34, 1)   | 73.8 (34, 1)   | 72.8 (34, 1)   | 66.1 (34, 1)  | 59.4 (34, 1)  |
| 110.0 /                    | 52.4 (342, 1)  | 63.2 (29, 1)   | 59.3 (29, 1)   | 52.0 (29, 1)  | 46.9 (100, 1) |
| 100.0 /                    | 42.7 (350, 1)  | 51.1 (350, 1)  | 49.2 (350, 1)  | 43.8 (350, 1) | 38.6 (350, 1) |
| 90.0 /                     | 33.5 (302, 1)  | 43.4 (302, 1)  | 45.2 (302, 1)  | 42.8 (302, 1) | 40.0 (302, 1) |
| 80.0 /                     | 32.7 (19, 1)   | 34.2 (85, 1)   | 31.7 (85, 1)   | 27.6 (85, 1)  | 24.0 (85, 1)  |
| 70.0 /                     | 40.5 (19, 1)   | 37.7 (19, 1)   | 34.1 (19, 1)   | 29.9 (19, 1)  | 26.5 (19, 1)  |
| 60.0 /                     | 30.8 (8, 1)    | 30.1 (8, 1)    | 27.4 (85, 1)   | 25.1 (85, 1)  | 23.3 (85, 1)  |
| 50.0 /                     | 32.7 (320, 1)  | 30.7 (99, 1)   | 28.9 (92, 1)   | 27.2 (92, 1)  | 24.9 (80, 1)  |
| 40.0 /                     | 37.3 (348, 1)  | 42.7 (348, 1)  | 39.9 (348, 1)  | 34.9 (348, 1) | 30.5 (348, 1) |
| 30.0 /                     | 33.6 (350, 1)  | 36.6 (80, 1)   | 38.1 (80, 1)   | 35.5 (80, 1)  | 32.4 (80, 1)  |
| 20.0 /                     | 36.1 (305, 1)  | 42.7 (305, 1)  | 41.5 (305, 1)  | 37.3 (305, 1) | 33.3 (305, 1) |
| 10.0 /                     | 29.0 (23, 1)   | 29.2 (27, 1)   | 26.8 (85, 1)   | 23.9 (354, 1) | 21.5 (354, 1) |

2ND HIGH  
24-HR  
SGROUP# 2  
YEAR 1974

\*\*\* SCGC 5150 -- TSP 0.25/0.2 \*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 1. 2. 4. 7. 8.\*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 132.5 AND OCCURRED AT ( 800.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |                |                |                |               |
|----------------------------|----------------|----------------|----------------|----------------|---------------|
|                            | 600.0          | 800.0          | 1000.0         | 1200.0         | 1400.0        |
| 360.0 /                    | 44.2 ( 53, 1)  | 52.2 ( 53, 1)  | 49.8 ( 53, 1)  | 45.8 ( 50, 1)  | 41.8 ( 50, 1) |
| 350.0 /                    | 46.1 ( 38, 1)  | 47.1 ( 50, 1)  | 44.9 ( 50, 1)  | 39.8 ( 50, 1)  | 35.1 ( 50, 1) |
| 340.0 /                    | 57.8 (349, 1)  | 71.0 (349, 1)  | 70.0 (349, 1)  | 63.2 (349, 1)  | 56.3 (349, 1) |
| 330.0 /                    | 56.8 ( 92, 1)  | 60.2 (354, 1)  | 57.9 (354, 1)  | 52.6 (354, 1)  | 48.1 (354, 1) |
| 320.0 /                    | 75.4 ( 93, 1)  | 68.4 ( 93, 1)  | 64.4 (334, 1)  | 60.0 (334, 1)  | 54.5 (334, 1) |
| 310.0 /                    | 68.5 ( 94, 1)  | 79.3 ( 94, 1)  | 76.0 ( 94, 1)  | 68.2 ( 94, 1)  | 61.1 ( 94, 1) |
| 300.0 /                    | 71.5 (104, 1)  | 72.9 (104, 1)  | 72.1 (358, 1)  | 65.0 (358, 1)  | 57.7 (358, 1) |
| 290.0 /                    | 66.6 ( 68, 1)  | 76.7 (102, 1)  | 68.5 (102, 1)  | 62.8 ( 63, 1)  | 59.0 ( 63, 1) |
| 280.0 /                    | 64.3 ( 74, 1)  | 70.9 (321, 1)  | 68.1 (321, 1)  | 61.2 ( 65, 1)  | 54.0 ( 64, 1) |
| 270.0 /                    | 111.2 (357, 1) | 132.5 ( 74, 1) | 118.6 ( 74, 1) | 101.3 ( 74, 1) | 86.6 ( 74, 1) |
| 260.0 /                    | 92.0 (321, 1)  | 105.4 (321, 1) | 98.9 (321, 1)  | 83.6 (328, 1)  | 75.3 (321, 1) |
| 250.0 /                    | 83.4 ( 65, 1)  | 98.8 ( 65, 1)  | 94.8 ( 65, 1)  | 83.8 (295, 1)  | 70.7 (295, 1) |
| 240.0 /                    | 108.0 (254, 1) | 111.6 (306, 1) | 106.2 (295, 1) | 89.5 (295, 1)  | 75.9 (295, 1) |
| 230.0 /                    | 100.0 (314, 1) | 111.0 (314, 1) | 102.6 (314, 1) | 89.2 (314, 1)  | 77.2 (314, 1) |
| 220.0 /                    | 38.5 (296, 1)  | 43.4 (305, 1)  | 41.8 (305, 1)  | 38.1 (305, 1)  | 34.6 (305, 1) |
| 210.0 /                    | 33.0 ( 77, 1)  | 34.9 ( 77, 1)  | 32.1 ( 77, 1)  | 27.9 ( 77, 1)  | 24.0 (356, 1) |
| 200.0 /                    | 34.3 ( 12, 1)  | 29.9 (364, 1)  | 28.6 (364, 1)  | 26.0 (364, 1)  | 23.7 (364, 1) |
| 190.0 /                    | 22.4 (363, 1)  | 23.2 ( 96, 1)  | 24.2 ( 96, 1)  | 22.6 ( 96, 1)  | 20.7 ( 96, 1) |
| 180.0 /                    | 49.3 (332, 1)  | 49.5 (332, 1)  | 44.0 (332, 1)  | 37.6 (332, 1)  | 32.2 (344, 1) |
| 170.0 /                    | 36.2 (344, 1)  | 40.8 (311, 1)  | 38.4 (311, 1)  | 34.0 (311, 1)  | 30.0 (311, 1) |
| 160.0 /                    | 42.3 (325, 1)  | 44.8 (325, 1)  | 40.4 (325, 1)  | 34.6 (325, 1)  | 29.7 (355, 1) |
| 150.0 /                    | 48.3 (339, 1)  | 46.7 (343, 1)  | 47.9 (343, 1)  | 44.7 (343, 1)  | 40.6 ( 56, 1) |
| 140.0 /                    | 66.4 ( 57, 1)  | 78.7 ( 57, 1)  | 75.1 ( 57, 1)  | 66.2 ( 57, 1)  | 57.8 ( 57, 1) |
| 130.0 /                    | 66.9 (338, 1)  | 67.4 ( 41, 1)  | 66.2 ( 40, 1)  | 60.0 ( 40, 1)  | 53.9 ( 40, 1) |
| 120.0 /                    | 38.3 ( 78, 1)  | 41.8 ( 96, 1)  | 40.4 ( 40, 1)  | 37.9 ( 40, 1)  | 33.9 (316, 1) |
| 110.0 /                    | 36.7 (336, 1)  | 41.8 (335, 1)  | 39.8 (335, 1)  | 35.4 (335, 1)  | 31.3 (335, 1) |
| 100.0 /                    | 32.6 (365, 1)  | 31.1 ( 55, 1)  | 32.1 ( 55, 1)  | 30.1 ( 55, 1)  | 27.7 ( 55, 1) |
| 90.0 /                     | 40.7 ( 55, 1)  | 43.9 (316, 1)  | 40.9 (351, 1)  | 39.8 (351, 1)  | 37.0 ( 55, 1) |
| 80.0 /                     | 48.0 ( 89, 1)  | 46.2 ( 89, 1)  | 39.7 ( 89, 1)  | 33.2 ( 89, 1)  | 28.4 (335, 1) |
| 70.0 /                     | 48.8 ( 75, 1)  | 57.2 ( 75, 1)  | 53.3 ( 85, 1)  | 45.7 ( 85, 1)  | 39.7 ( 89, 1) |
| 60.0 /                     | 54.7 ( 81, 1)  | 51.2 ( 89, 1)  | 43.5 ( 89, 1)  | 36.3 ( 89, 1)  | 30.6 ( 89, 1) |
| 50.0 /                     | 38.9 ( 94, 1)  | 32.3 ( 89, 1)  | 30.5 ( 89, 1)  | 27.7 (355, 1)  | 26.4 (355, 1) |
| 40.0 /                     | 47.4 ( 99, 1)  | 44.0 ( 47, 1)  | 43.4 ( 89, 1)  | 40.6 ( 39, 1)  | 35.2 ( 39, 1) |
| 30.0 /                     | 26.6 (342, 1)  | 25.1 (342, 1)  | 21.8 ( 88, 1)  | 19.9 ( 88, 1)  | 18.3 ( 68, 1) |
| 20.0 /                     | 18.5 ( 34, 1)  | 21.2 (105, 1)  | 22.1 ( 39, 1)  | 21.2 ( 34, 1)  | 20.8 ( 39, 1) |
| 10.0 /                     | 36.6 ( 47, 1)  | 37.3 ( 83, 1)  | 36.5 ( 47, 1)  | 31.7 ( 47, 1)  | 27.5 ( 47, 1) |

24

\*N\*-DAY  
 183 DAYS  
 SGROUP# 3  
 YEAR 1970  
 \*\*\* SCGC 1050 -- TSP 0.25/0.2

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 58,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 0.5 AND OCCURRED AT ( 1400.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|
| 360.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.2 |
| 350.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.2 |
| 340.0 / | 0.0 | 0.1 | 0.2 | 0.3 | 0.3 |
| 330.0 / | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 |
| 320.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 310.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 300.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 290.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 280.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 270.0 / | 0.1 | 0.2 | 0.4 | 0.5 | 0.5 |
| 260.0 / | 0.1 | 0.3 | 0.4 | 0.5 | 0.5 |
| 250.0 / | 0.1 | 0.2 | 0.4 | 0.5 | 0.5 |
| 240.0 / | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 |
| 230.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 220.0 / | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 |
| 210.0 / | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 |
| 200.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 190.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.2 |
| 180.0 / | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 170.0 / | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |
| 160.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 150.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 140.0 / | 0.1 | 0.3 | 0.4 | 0.5 | 0.5 |
| 130.0 / | 0.1 | 0.3 | 0.4 | 0.5 | 0.5 |
| 120.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 110.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 |
| 100.0 / | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 90.0 /  | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 80.0 /  | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 70.0 /  | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 |
| 60.0 /  | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 50.0 /  | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 40.0 /  | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 30.0 /  | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 20.0 /  | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 10.0 /  | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |

\*N\*-DAY  
 183 DAYS  
 SGROUP# 3  
 YEAR 1971  
 \*\*\* SCGC 1050 -- TSP 0.25/0.2

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: *5p.*  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 0.8 AND OCCURRED AT ( 1400.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|
| 360.0 / | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
| 350.0 / | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 |
| 340.0 / | 0.0 | 0.1 | 0.2 | 0.2 | 0.3 |
| 330.0 / | 0.0 | 0.1 | 0.2 | 0.3 | 0.3 |
| 320.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 |
| 310.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 300.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 290.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 280.0 / | 0.1 | 0.2 | 0.4 | 0.4 | 0.5 |
| 270.0 / | 0.1 | 0.3 | 0.5 | 0.6 | 0.6 |
| 260.0 / | 0.1 | 0.4 | 0.6 | 0.7 | 0.8 |
| 250.0 / | 0.1 | 0.3 | 0.6 | 0.7 | 0.8 |
| 240.0 / | 0.1 | 0.3 | 0.5 | 0.5 | 0.6 |
| 230.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 220.0 / | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 |
| 210.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.2 |
| 200.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 190.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 180.0 / | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 |
| 170.0 / | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 |
| 160.0 / | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 |
| 150.0 / | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 140.0 / | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 |
| 130.0 / | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |
| 120.0 / | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 |
| 110.0 / | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 100.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 90.0 /  | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 80.0 /  | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 70.0 /  | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 |
| 60.0 /  | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 50.0 /  | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 40.0 /  | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 30.0 /  | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 20.0 /  | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
| 10.0 /  | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |

\*N\*-DAY  
 184 DAYS  
 SGROUP# 3  
 YEAR 1972  
 \*\*\* SCGC 1050 -- TSP 0.25/0.2

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\* 184-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: *54.*  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 0.7 AND OCCURRED AT ( 1400.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|
| 360.0 / | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 |
| 350.0 / | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 340.0 / | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 |
| 330.0 / | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 |
| 320.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 310.0 / | 0.1 | 0.3 | 0.4 | 0.5 | 0.5 |
| 300.0 / | 0.2 | 0.4 | 0.5 | 0.6 | 0.6 |
| 290.0 / | 0.1 | 0.3 | 0.5 | 0.5 | 0.6 |
| 280.0 / | 0.1 | 0.3 | 0.4 | 0.5 | 0.5 |
| 270.0 / | 0.1 | 0.3 | 0.5 | 0.6 | 0.7 |
| 260.0 / | 0.1 | 0.3 | 0.4 | 0.6 | 0.6 |
| 250.0 / | 0.1 | 0.2 | 0.4 | 0.5 | 0.5 |
| 240.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 230.0 / | 0.0 | 0.2 | 0.3 | 0.3 | 0.4 |
| 220.0 / | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 |
| 210.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.2 |
| 200.0 / | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
| 190.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 180.0 / | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 |
| 170.0 / | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 160.0 / | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 |
| 150.0 / | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 |
| 140.0 / | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 |
| 130.0 / | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 |
| 120.0 / | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 110.0 / | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 |
| 100.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 90.0 /  | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 80.0 /  | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 70.0 /  | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 60.0 /  | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 50.0 /  | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 40.0 /  | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 30.0 /  | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 |
| 20.0 /  | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 |
| 10.0 /  | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |

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\*N\*-DAY  
 183 DAYS  
 SGROUP# 3  
 YEAR 1973  
 \*\*\* SCGC 1050 -- TSP 0.25/0.2

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: *51.*  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 0.6 AND OCCURRED AT ( 1400.0, 250.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
| 360.0 /                    | 0.0   | 0.1   | 0.1    | 0.1    | 0.2    |
| 350.0 /                    | 0.1   | 0.1   | 0.2    | 0.2    | 0.2    |
| 340.0 /                    | 0.1   | 0.1   | 0.2    | 0.3    | 0.3    |
| 330.0 /                    | 0.1   | 0.2   | 0.3    | 0.4    | 0.4    |
| 320.0 /                    | 0.1   | 0.3   | 0.5    | 0.5    | 0.6    |
| 310.0 /                    | 0.1   | 0.3   | 0.5    | 0.6    | 0.6    |
| 300.0 /                    | 0.1   | 0.3   | 0.4    | 0.5    | 0.6    |
| 290.0 /                    | 0.1   | 0.2   | 0.4    | 0.4    | 0.5    |
| 280.0 /                    | 0.1   | 0.3   | 0.4    | 0.5    | 0.5    |
| 270.0 /                    | 0.1   | 0.3   | 0.4    | 0.5    | 0.6    |
| 260.0 /                    | 0.1   | 0.3   | 0.4    | 0.5    | 0.6    |
| 250.0 /                    | 0.1   | 0.3   | 0.5    | 0.6    | 0.6    |
| 240.0 /                    | 0.1   | 0.2   | 0.3    | 0.4    | 0.4    |
| 230.0 /                    | 0.1   | 0.1   | 0.2    | 0.3    | 0.3    |
| 220.0 /                    | 0.1   | 0.1   | 0.2    | 0.3    | 0.3    |
| 210.0 /                    | 0.0   | 0.1   | 0.1    | 0.2    | 0.2    |
| 200.0 /                    | 0.0   | 0.0   | 0.1    | 0.1    | 0.1    |
| 190.0 /                    | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 180.0 /                    | 0.0   | 0.1   | 0.2    | 0.2    | 0.2    |
| 170.0 /                    | 0.1   | 0.1   | 0.2    | 0.2    | 0.2    |
| 160.0 /                    | 0.1   | 0.1   | 0.2    | 0.2    | 0.3    |
| 150.0 /                    | 0.1   | 0.2   | 0.2    | 0.3    | 0.3    |
| 140.0 /                    | 0.1   | 0.2   | 0.3    | 0.4    | 0.4    |
| 130.0 /                    | 0.1   | 0.2   | 0.3    | 0.4    | 0.4    |
| 120.0 /                    | 0.1   | 0.2   | 0.3    | 0.3    | 0.4    |
| 110.0 /                    | 0.1   | 0.1   | 0.2    | 0.2    | 0.3    |
| 100.0 /                    | 0.0   | 0.1   | 0.1    | 0.1    | 0.2    |
| 90.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 80.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 70.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 60.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 50.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 40.0 /                     | 0.0   | 0.0   | 0.1    | 0.1    | 0.1    |
| 30.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 20.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 10.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
| 360.0 /                    | 0.0   | 0.1   | 0.1    | 0.1    | 0.2    |
| 350.0 /                    | 0.1   | 0.1   | 0.2    | 0.2    | 0.2    |
| 340.0 /                    | 0.1   | 0.1   | 0.2    | 0.3    | 0.3    |
| 330.0 /                    | 0.1   | 0.2   | 0.3    | 0.4    | 0.4    |
| 320.0 /                    | 0.1   | 0.3   | 0.5    | 0.5    | 0.6    |
| 310.0 /                    | 0.1   | 0.3   | 0.5    | 0.6    | 0.6    |
| 300.0 /                    | 0.1   | 0.3   | 0.4    | 0.5    | 0.6    |
| 290.0 /                    | 0.1   | 0.2   | 0.4    | 0.4    | 0.5    |
| 280.0 /                    | 0.1   | 0.3   | 0.4    | 0.5    | 0.5    |
| 270.0 /                    | 0.1   | 0.3   | 0.4    | 0.5    | 0.6    |
| 260.0 /                    | 0.1   | 0.3   | 0.4    | 0.5    | 0.6    |
| 250.0 /                    | 0.1   | 0.3   | 0.5    | 0.6    | 0.6    |
| 240.0 /                    | 0.1   | 0.2   | 0.3    | 0.4    | 0.4    |
| 230.0 /                    | 0.1   | 0.1   | 0.2    | 0.3    | 0.3    |
| 220.0 /                    | 0.1   | 0.1   | 0.2    | 0.3    | 0.3    |
| 210.0 /                    | 0.0   | 0.1   | 0.1    | 0.2    | 0.2    |
| 200.0 /                    | 0.0   | 0.0   | 0.1    | 0.1    | 0.1    |
| 190.0 /                    | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 180.0 /                    | 0.0   | 0.1   | 0.2    | 0.2    | 0.2    |
| 170.0 /                    | 0.1   | 0.1   | 0.2    | 0.2    | 0.2    |
| 160.0 /                    | 0.1   | 0.1   | 0.2    | 0.2    | 0.3    |
| 150.0 /                    | 0.1   | 0.2   | 0.2    | 0.3    | 0.3    |
| 140.0 /                    | 0.1   | 0.2   | 0.3    | 0.4    | 0.4    |
| 130.0 /                    | 0.1   | 0.2   | 0.3    | 0.4    | 0.4    |
| 120.0 /                    | 0.1   | 0.2   | 0.3    | 0.3    | 0.4    |
| 110.0 /                    | 0.1   | 0.1   | 0.2    | 0.2    | 0.3    |
| 100.0 /                    | 0.0   | 0.1   | 0.1    | 0.1    | 0.2    |
| 90.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 80.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 70.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 60.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 50.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 40.0 /                     | 0.0   | 0.0   | 0.1    | 0.1    | 0.1    |
| 30.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 20.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |
| 10.0 /                     | 0.0   | 0.1   | 0.1    | 0.1    | 0.1    |

\*N\*-DAY  
 183 DAYS  
 SGROUP# 3  
 YEAR 1974  
 \*\*\* SCGC 1050 -- TSP 0.25/0.2

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\* 183-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*

\* FROM SOURCES: 56,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 0.8 AND OCCURRED AT ( 1400.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
|----------------------------|-------|-------|--------|--------|--------|

|         |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|
| 360.0 / | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 |
| 350.0 / | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 |
| 340.0 / | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 330.0 / | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 |
| 320.0 / | 0.2 | 0.3 | 0.5 | 0.5 | 0.5 |
| 310.0 / | 0.2 | 0.4 | 0.5 | 0.6 | 0.6 |
| 300.0 / | 0.2 | 0.3 | 0.4 | 0.5 | 0.5 |
| 290.0 / | 0.1 | 0.3 | 0.4 | 0.5 | 0.5 |
| 280.0 / | 0.1 | 0.3 | 0.5 | 0.5 | 0.6 |
| 270.0 / | 0.1 | 0.3 | 0.6 | 0.7 | 0.8 |
| 260.0 / | 0.1 | 0.3 | 0.5 | 0.7 | 0.7 |
| 250.0 / | 0.1 | 0.3 | 0.5 | 0.6 | 0.7 |
| 240.0 / | 0.1 | 0.2 | 0.4 | 0.5 | 0.6 |
| 230.0 / | 0.0 | 0.1 | 0.2 | 0.3 | 0.3 |
| 220.0 / | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 |
| 210.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 200.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 190.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 180.0 / | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 |
| 170.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 160.0 / | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 |
| 150.0 / | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| 140.0 / | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 |
| 130.0 / | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 |
| 120.0 / | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 |
| 110.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 100.0 / | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 90.0 /  | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 80.0 /  | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 70.0 /  | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 60.0 /  | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 50.0 /  | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 40.0 /  | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 30.0 /  | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 20.0 /  | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| 10.0 /  | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

29

2ND HIGH  
24-HR  
SGROUP# 3  
YEAR 1970  
\*\*\* SCGC 1050 -- TSP 0.25/0.2

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\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: SA,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 6.4 AND OCCURRED AT ( 1400.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |              |              |              |              |
|----------------------------|----------------|--------------|--------------|--------------|--------------|
|                            | 600.0          | 800.0        | 1000.0       | 1200.0       | 1400.0       |
| 360.0 /                    | 0.8 (363, 1)   | 1.1 ( 34, 1) | 1.9 ( 87, 1) | 1.9 ( 87, 1) | 1.8 ( 64, 1) |
| 350.0 /                    | 0.6 (357, 1)   | 1.6 ( 34, 1) | 2.5 ( 87, 1) | 2.8 ( 87, 1) | 3.0 ( 87, 1) |
| 340.0 /                    | 0.9 ( 90, 1)   | 2.0 ( 95, 1) | 2.6 ( 47, 1) | 3.5 ( 47, 1) | 4.1 ( 47, 1) |
| 330.0 /                    | 1.7 ( 95, 1)   | 2.4 (356, 1) | 2.7 (356, 1) | 2.8 ( 33, 1) | 2.9 ( 33, 1) |
| 320.0 /                    | 1.5 ( 80, 1)   | 2.2 ( 79, 1) | 3.2 ( 79, 1) | 4.5 ( 90, 1) | 4.7 ( 90, 1) |
| 310.0 /                    | 1.6 ( 91, 1)   | 2.6 ( 89, 1) | 2.8 ( 78, 1) | 3.5 (293, 1) | 4.2 (293, 1) |
| 300.0 /                    | 1.9 ( 78, 1)   | 3.0 ( 78, 1) | 3.3 ( 78, 1) | 4.2 (293, 1) | 3.8 (104, 1) |
| 290.0 /                    | 1.1 (335, 1)   | 2.1 (335, 1) | 2.6 ( 61, 1) | 3.2 (303, 1) | 3.6 (303, 1) |
| 280.0 /                    | 1.5 ( 27, 1)   | 2.0 (306, 1) | 2.4 (306, 1) | 2.7 ( 60, 1) | 3.1 ( 60, 1) |
| 270.0 /                    | 1.4 ( 27, 1)   | 2.4 (292, 1) | 4.6 ( 60, 1) | 5.8 (292, 1) | 6.4 (292, 1) |
| 260.0 /                    | 1.6 ( 27, 1)   | 2.4 (291, 1) | 3.2 (301, 1) | 3.7 (302, 1) | 4.2 ( 5, 1)  |
| 250.0 /                    | 1.0 (326, 1)   | 2.6 (301, 1) | 4.1 (301, 1) | 4.9 (301, 1) | 5.1 (301, 1) |
| 240.0 /                    | 0.9 ( 83, 1)   | 1.8 (291, 1) | 3.3 (291, 1) | 2.9 (106, 1) | 2.9 ( 37, 1) |
| 230.0 /                    | 1.2 ( 83, 1)   | 2.1 (364, 1) | 3.3 (290, 1) | 4.0 (290, 1) | 4.3 (290, 1) |
| 220.0 /                    | 1.2 (289, 1)   | 1.9 ( 65, 1) | 2.4 ( 65, 1) | 2.4 ( 93, 1) | 2.7 ( 38, 1) |
| 210.0 /                    | 0.9 (289, 1)   | 1.7 (322, 1) | 2.3 (322, 1) | 2.4 ( 58, 1) | 2.2 ( 58, 1) |
| 200.0 /                    | 0.7 ( 58, 1)   | 1.3 ( 58, 1) | 1.4 ( 58, 1) | 1.7 (322, 1) | 1.9 (322, 1) |
| 190.0 /                    | 0.7 ( 75, 1)   | 1.2 ( 75, 1) | 1.6 ( 75, 1) | 1.6 ( 75, 1) | 1.7 ( 39, 1) |
| 180.0 /                    | 1.0 (105, 1)   | 1.5 (325, 1) | 1.8 (325, 1) | 1.7 (325, 1) | 2.1 (300, 1) |
| 170.0 /                    | 1.3 ( 97, 1)   | 1.9 (339, 1) | 2.3 (321, 1) | 2.5 (321, 1) | 2.5 (321, 1) |
| 160.0 /                    | 1.7 (305, 1)   | 2.7 ( 49, 1) | 2.7 (305, 1) | 2.5 (305, 1) | 2.8 ( 52, 1) |
| 150.0 /                    | 1.5 ( 65, 1)   | 2.3 (103, 1) | 2.6 (361, 1) | 2.8 (361, 1) | 2.8 (361, 1) |
| 140.0 /                    | 1.7 (103, 1)   | 2.3 (338, 1) | 2.7 (338, 1) | 3.1 (328, 1) | 3.5 (309, 1) |
| 130.0 /                    | 2.2 (296, 1)   | 2.8 (289, 1) | 3.0 (362, 1) | 3.3 ( 7, 1)  | 3.7 (328, 1) |
| 120.0 /                    | 1.8 (304, 1)   | 2.6 (296, 1) | 3.1 (299, 1) | 3.5 (315, 1) | 3.5 (315, 1) |
| 110.0 /                    | 1.8 ( 44, 1)   | 2.5 (316, 1) | 2.9 ( 72, 1) | 3.3 ( 41, 1) | 3.7 ( 41, 1) |
| 100.0 /                    | 1.1 ( 49, 1)   | 1.5 (306, 1) | 2.2 ( 72, 1) | 2.7 ( 68, 1) | 2.9 ( 68, 1) |
| 90.0 /                     | 1.1 (307, 1)   | 1.4 ( 1, 1)  | 1.8 (327, 1) | 1.8 (327, 1) | 2.0 ( 19, 1) |
| 80.0 /                     | 1.7 (307, 1)   | 2.4 ( 1, 1)  | 2.8 ( 1, 1)  | 2.8 ( 1, 1)  | 2.6 ( 1, 1)  |
| 70.0 /                     | 1.2 (359, 1)   | 2.0 (359, 1) | 2.3 (359, 1) | 2.2 (359, 1) | 2.1 ( 1, 1)  |
| 60.0 /                     | 1.7 (298, 1)   | 2.4 (298, 1) | 2.9 (359, 1) | 3.2 (359, 1) | 3.3 (359, 1) |
| 50.0 /                     | 1.5 (298, 1)   | 2.0 (298, 1) | 2.3 ( 56, 1) | 2.8 ( 56, 1) | 3.0 ( 56, 1) |
| 40.0 /                     | 1.4 ( 1, 1)    | 2.2 ( 1, 1)  | 2.3 ( 1, 1)  | 2.1 ( 1, 1)  | 2.1 ( 26, 1) |
| 30.0 /                     | 1.5 (297, 1)   | 1.6 ( 1, 1)  | 1.8 ( 50, 1) | 1.8 ( 6, 1)  | 1.7 ( 50, 1) |
| 20.0 /                     | 1.2 (359, 1)   | 1.9 (359, 1) | 2.1 (359, 1) | 2.0 ( 92, 1) | 1.7 ( 92, 1) |
| 10.0 /                     | 0.9 ( 92, 1)   | 1.3 (101, 1) | 1.5 (317, 1) | 1.5 (317, 1) | 1.5 (317, 1) |

2ND HIGH  
24-HR  
SGROUP# 3  
YEAR 1971

\*\*\* SCGC 1050 -- TSP 0.25/0.2

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\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: *51*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 6.7 AND OCCURRED AT ( 1400.0, 260.0) \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |              |              |              |                         |
|----------------------------|----------------|--------------|--------------|--------------|-------------------------|
|                            | 600.0          | 800.0        | 1000.0       | 1200.0       | 1400.0                  |
| 360.0 /                    | 0.6 ( 70, 1)   | 1.0 (331, 1) | 1.4 ( 73, 1) | 1.6 ( 95, 1) | 1.8 ( 95, 1)            |
| 350.0 /                    | 0.6 ( 73, 1)   | 1.1 (331, 1) | 1.5 ( 39, 1) | 2.0 ( 95, 1) | 2.4 ( 39, 1)            |
| 340.0 /                    | 0.6 (349, 1)   | 1.7 (341, 1) | 2.7 ( 38, 1) | 3.5 ( 38, 1) | 4.0 ( 38, 1)            |
| 330.0 /                    | 1.0 (341, 1)   | 1.9 (341, 1) | 2.3 (341, 1) | 2.8 ( 36, 1) | 3.3 ( 36, 1)            |
| 320.0 /                    | 0.7 (349, 1)   | 1.8 (294, 1) | 2.8 ( 4, 1)  | 3.7 ( 4, 1)  | 4.3 ( 4, 1)             |
| 310.0 /                    | 0.8 (364, 1)   | 1.6 ( 92, 1) | 2.5 ( 4, 1)  | 3.7 ( 4, 1)  | 4.4 ( 92, 1)            |
| 300.0 /                    | 1.6 ( 84, 1)   | 2.3 ( 84, 1) | 2.4 ( 84, 1) | 2.5 (340, 1) | 2.6 ( 50, 1)            |
| 290.0 /                    | 1.4 (106, 1)   | 2.1 ( 81, 1) | 2.3 (350, 1) | 2.3 (350, 1) | 2.8 (348, 1)            |
| 280.0 /                    | 1.4 ( 71, 1)   | 2.8 ( 71, 1) | 3.5 (289, 1) | 3.4 (289, 1) | 3.5 ( 34, 1)            |
| 270.0 /                    | 1.6 (104, 1)   | 2.4 (104, 1) | 3.3 (339, 1) | 4.3 ( 91, 1) | 5.1 ( 3, 1)             |
| 260.0 /                    | 1.8 (103, 1)   | 2.8 (327, 1) | 4.9 (320, 1) | 6.1 (320, 1) | 6.7 (320, 1)            |
| 250.0 /                    | 2.0 (103, 1)   | 3.2 (103, 1) | 4.5 (310, 1) | 5.8 (310, 1) | <del>6.4 (310, 1)</del> |
| 240.0 /                    | 1.3 (103, 1)   | 3.3 (357, 1) | 5.0 (102, 1) | 5.7 (102, 1) | 6.3 (357, 1)            |
| 230.0 /                    | 1.6 (101, 1)   | 3.0 (101, 1) | 3.8 (317, 1) | 3.5 (317, 1) | 3.2 (357, 1)            |
| 220.0 /                    | 1.6 (101, 1)   | 2.7 ( 29, 1) | 3.6 (101, 1) | 3.8 (100, 1) | 3.6 (100, 1)            |
| 210.0 /                    | 1.4 (100, 1)   | 1.8 ( 80, 1) | 2.2 (100, 1) | 2.3 (100, 1) | 2.2 ( 80, 1)            |
| 200.0 /                    | 0.7 ( 90, 1)   | 1.2 ( 90, 1) | 1.6 (352, 1) | 2.0 (352, 1) | 2.1 ( 86, 1)            |
| 190.0 /                    | 0.9 ( 2, 1)    | 1.5 ( 76, 1) | 1.7 ( 80, 1) | 2.1 (352, 1) | 2.3 (352, 1)            |
| 180.0 /                    | 0.8 ( 2, 1)    | 1.6 ( 55, 1) | 2.0 ( 55, 1) | 1.9 ( 55, 1) | 2.0 (352, 1)            |
| 170.0 /                    | 1.1 (317, 1)   | 1.9 ( 55, 1) | 2.3 ( 55, 1) | 2.5 (308, 1) | 2.7 (308, 1)            |
| 160.0 /                    | 1.3 (317, 1)   | 1.8 (317, 1) | 1.9 (317, 1) | 2.3 (329, 1) | 2.3 (300, 1)            |
| 150.0 /                    | 1.9 ( 28, 1)   | 1.6 (292, 1) | 2.0 ( 98, 1) | 1.9 ( 98, 1) | 1.8 ( 98, 1)            |
| 140.0 /                    | 1.1 ( 86, 1)   | 2.0 ( 83, 1) | 2.3 ( 89, 1) | 2.8 ( 89, 1) | 3.1 ( 89, 1)            |
| 130.0 /                    | 1.2 ( 97, 1)   | 1.9 (298, 1) | 2.5 (338, 1) | 3.0 ( 20, 1) | 3.8 ( 20, 1)            |
| 120.0 /                    | 1.8 ( 82, 1)   | 2.5 ( 82, 1) | 3.1 ( 96, 1) | 3.0 ( 96, 1) | 3.4 ( 66, 1)            |
| 110.0 /                    | 1.1 (104, 1)   | 1.6 ( 79, 1) | 2.0 ( 79, 1) | 2.2 ( 79, 1) | 2.3 ( 79, 1)            |
| 100.0 /                    | 1.6 (104, 1)   | 2.0 (298, 1) | 2.3 (298, 1) | 2.3 (298, 1) | 2.2 (298, 1)            |
| 90.0 /                     | 1.2 ( 17, 1)   | 1.5 (298, 1) | 2.0 ( 96, 1) | 2.3 ( 96, 1) | 2.5 ( 15, 1)            |
| 80.0 /                     | 1.0 (300, 1)   | 1.7 ( 15, 1) | 2.3 ( 15, 1) | 2.4 ( 82, 1) | 2.2 ( 82, 1)            |
| 70.0 /                     | 1.6 ( 15, 1)   | 2.7 ( 15, 1) | 3.2 ( 15, 1) | 3.2 ( 15, 1) | 3.0 ( 15, 1)            |
| 60.0 /                     | 1.8 (331, 1)   | 2.7 (331, 1) | 3.0 (331, 1) | 3.0 (331, 1) | 2.9 (331, 1)            |
| 50.0 /                     | 1.9 (106, 1)   | 2.5 (106, 1) | 2.7 (106, 1) | 2.5 (106, 1) | 2.3 (106, 1)            |
| 40.0 /                     | 1.0 (106, 1)   | 1.4 (106, 1) | 1.5 ( 46, 1) | 1.5 ( 46, 1) | 1.4 ( 46, 1)            |
| 30.0 /                     | 0.8 ( 88, 1)   | 1.4 ( 62, 1) | 2.0 ( 62, 1) | 2.2 ( 85, 1) | 2.0 ( 85, 1)            |
| 20.0 /                     | 0.6 ( 70, 1)   | 1.0 ( 31, 1) | 1.1 ( 66, 1) | 1.5 ( 66, 1) | 1.8 ( 66, 1)            |
| 10.0 /                     | 0.5 ( 39, 1)   | 1.3 ( 70, 1) | 1.2 ( 70, 1) | 1.2 (104, 1) | 1.2 ( 37, 1)            |

see next p

DAILY: 320  
24-HR/PD 1  
SGROUP# 1  
YEAR 1971  
\*\*\* SCGC 1051 -- TSP

\*\*\*

\* DAILY 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 56, \*  
\* FOR THE RECEPTOR GRID \*  
\* ENDING WITH HOUR 24 FOR DAY 320 \*

\* MAXIMUM VALUE EQUALS 6.9 AND OCCURRED AT ( 1700.0, 260.0) \*

| DIRECTION / | RANGE (METERS) |        |        |        |        |
|-------------|----------------|--------|--------|--------|--------|
| (DEGREES) / | 1400.0         | 1700.0 | 2000.0 | 2300.0 | 2600.0 |

|         |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|
| 260.0 / | 6.7 | 6.9 | 6.7 | 6.3 | 5.8 |
|---------|-----|-----|-----|-----|-----|

32

2ND HIGH  
24-HR  
SGROUP# 3

YEAR 1972

\*\*\* SCGC 1050 -- TSP 0.25/0.2

\*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 51,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 6.6 AND OCCURRED AT ( 1400.0, 250.0 ) \*

| DIRECTION /<br>(DEGREES) / | 600.0        | 800.0        | 1000.0       | 1200.0       | 1400.0       |
|----------------------------|--------------|--------------|--------------|--------------|--------------|
| 360.0 /                    | 0.7 ( 11, 1) | 1.5 ( 22, 1) | 2.3 (356, 1) | 3.0 (356, 1) | 3.3 (330, 1) |
| 350.0 /                    | 1.2 ( 98, 1) | 1.7 (104, 1) | 2.2 (330, 1) | 2.7 (330, 1) | 3.0 (330, 1) |
| 340.0 /                    | 1.0 (104, 1) | 1.8 (356, 1) | 2.4 ( 29, 1) | 2.6 ( 13, 1) | 2.9 ( 13, 1) |
| 330.0 /                    | 1.3 ( 76, 1) | 1.9 ( 55, 1) | 3.0 (341, 1) | 3.4 ( 13, 1) | 3.8 ( 62, 1) |
| 320.0 /                    | 1.7 ( 55, 1) | 2.6 (301, 1) | 3.5 ( 55, 1) | 3.8 (366, 1) | 4.2 (366, 1) |
| 310.0 /                    | 1.5 (333, 1) | 3.3 ( 95, 1) | 3.9 (333, 1) | 4.5 (366, 1) | 4.6 ( 95, 1) |
| 300.0 /                    | 2.3 ( 75, 1) | 4.1 ( 75, 1) | 4.7 ( 58, 1) | 4.7 ( 58, 1) | 4.5 ( 58, 1) |
| 290.0 /                    | 1.3 (106, 1) | 2.7 ( 58, 1) | 3.1 ( 58, 1) | 3.4 (349, 1) | 3.9 (349, 1) |
| 280.0 /                    | 1.5 (291, 1) | 2.9 (291, 1) | 3.5 ( 60, 1) | 3.6 (343, 1) | 4.0 (343, 1) |
| 270.0 /                    | 1.7 (103, 1) | 2.8 (293, 1) | 4.0 (297, 1) | 4.8 (297, 1) | 5.2 (297, 1) |
| 260.0 /                    | 1.4 (293, 1) | 2.6 (296, 1) | 4.1 (293, 1) | 4.6 (345, 1) | 5.2 (345, 1) |
| 250.0 /                    | 1.2 (332, 1) | 2.5 (317, 1) | 4.2 (306, 1) | 5.7 (306, 1) | 6.6 (101, 1) |
| 240.0 /                    | 1.2 (337, 1) | 2.6 (337, 1) | 4.0 (304, 1) | 4.4 (304, 1) | 4.5 (306, 1) |
| 230.0 /                    | 0.9 ( 25, 1) | 2.3 (304, 1) | 3.0 (304, 1) | 3.3 (100, 1) | 3.6 (100, 1) |
| 220.0 /                    | 0.9 (289, 1) | 1.3 ( 25, 1) | 2.0 ( 83, 1) | 2.3 ( 70, 1) | 2.6 ( 70, 1) |
| 210.0 /                    | 0.3 (289, 1) | 1.3 ( 86, 1) | 1.6 ( 86, 1) | 1.9 ( 72, 1) | 2.2 ( 72, 1) |
| 200.0 /                    | 0.4 ( 84, 1) | 1.1 ( 94, 1) | 1.7 ( 70, 1) | 2.3 ( 70, 1) | 2.7 ( 70, 1) |
| 190.0 /                    | 1.0 (326, 1) | 1.5 ( 84, 1) | 1.4 ( 69, 1) | 1.8 ( 69, 1) | 2.0 ( 69, 1) |
| 180.0 /                    | 1.2 ( 84, 1) | 1.9 ( 84, 1) | 2.0 ( 83, 1) | 1.9 ( 83, 1) | 2.1 ( 92, 1) |
| 170.0 /                    | 1.3 (326, 1) | 2.0 ( 97, 1) | 2.4 ( 83, 1) | 2.9 (351, 1) | 3.1 (351, 1) |
| 160.0 /                    | 1.5 (290, 1) | 2.1 ( 45, 1) | 2.1 ( 97, 1) | 2.7 ( 16, 1) | 3.1 ( 16, 1) |
| 150.0 /                    | 1.5 (322, 1) | 2.5 ( 97, 1) | 2.7 (322, 1) | 2.7 ( 93, 1) | 2.8 ( 93, 1) |
| 140.0 /                    | 1.5 (321, 1) | 2.3 (321, 1) | 3.6 (322, 1) | 3.7 (322, 1) | 3.6 (322, 1) |
| 130.0 /                    | 1.2 (322, 1) | 2.2 (322, 1) | 2.6 (322, 1) | 3.0 (327, 1) | 3.6 (327, 1) |
| 120.0 /                    | 1.2 ( 78, 1) | 1.9 (361, 1) | 2.6 (359, 1) | 3.0 (359, 1) | 3.2 (359, 1) |
| 110.0 /                    | 1.0 ( 88, 1) | 1.6 (363, 1) | 1.9 (363, 1) | 2.0 (321, 1) | 2.0 (321, 1) |
| 100.0 /                    | 1.1 (361, 1) | 1.8 ( 50, 1) | 2.7 ( 50, 1) | 3.1 ( 50, 1) | 3.3 ( 50, 1) |
| 90.0 /                     | 0.8 ( 3, 1)  | 1.1 ( 84, 1) | 1.4 ( 88, 1) | 1.6 ( 44, 1) | 1.7 ( 88, 1) |
| 80.0 /                     | 0.6 ( 76, 1) | 0.9 (320, 1) | 1.1 (320, 1) | 1.3 (320, 1) | 1.3 (320, 1) |
| 70.0 /                     | 1.5 ( 88, 1) | 1.5 ( 88, 1) | 1.3 ( 88, 1) | 1.2 ( 48, 1) | 1.5 ( 48, 1) |
| 60.0 /                     | 2.1 ( 88, 1) | 2.2 ( 6, 1)  | 2.4 ( 85, 1) | 2.8 ( 85, 1) | 3.0 ( 85, 1) |
| 50.0 /                     | 2.4 (104, 1) | 2.4 (104, 1) | 2.3 ( 99, 1) | 2.7 ( 38, 1) | 2.9 ( 6, 1)  |
| 40.0 /                     | 1.6 (104, 1) | 2.3 ( 5, 1)  | 2.7 ( 5, 1)  | 2.7 ( 5, 1)  | 2.9 ( 34, 1) |
| 30.0 /                     | 1.4 ( 85, 1) | 2.0 ( 85, 1) | 2.2 ( 85, 1) | 2.2 ( 85, 1) | 2.1 ( 85, 1) |
| 20.0 /                     | 1.5 ( 85, 1) | 1.4 ( 98, 1) | 1.5 ( 63, 1) | 1.7 ( 63, 1) | 1.9 (331, 1) |
| 10.0 /                     | 1.3 (316, 1) | 1.2 ( 65, 1) | 1.3 ( 65, 1) | 1.5 (302, 1) | 1.6 (302, 1) |

2ND HIGH  
24-HR  
SGROUP# 3  
YEAR 1973  
\*\*\* SCGC 1050 -- TSP 0.25/0.2 \*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: *51.*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 6.3 AND OCCURRED AT ( 1400.0, 220.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0        | 800.0        | 1000.0       | 1200.0       | 1400.0              |
|----------------------------|--------------|--------------|--------------|--------------|---------------------|
| 360.0 /                    | 0.8 (332, 1) | 1.2 (332, 1) | 1.4 (332, 1) | 1.5 ( 40, 1) | 1.6 (304, 1)        |
| 350.0 /                    | 1.3 (349, 1) | 2.0 ( 27, 1) | 1.9 ( 27, 1) | 2.2 ( 91, 1) | 2.6 ( 91, 1)        |
| 340.0 /                    | 1.7 ( 79, 1) | 2.3 ( 79, 1) | 3.6 ( 93, 1) | 4.0 ( 93, 1) | 4.3 ( 93, 1)        |
| 330.0 /                    | 1.0 ( 79, 1) | 1.7 ( 84, 1) | 2.9 ( 84, 1) | 3.6 ( 93, 1) | 4.0 ( 93, 1)        |
| 320.0 /                    | 1.2 ( 69, 1) | 2.7 (329, 1) | 4.8 ( 1, 1)  | 4.9 (329, 1) | 5.2 (329, 1)        |
| 310.0 /                    | 2.1 ( 1, 1)  | 3.3 (358, 1) | 4.1 ( 68, 1) | 4.7 ( 90, 1) | 5.3 ( 90, 1)        |
| 300.0 /                    | 1.3 ( 68, 1) | 2.4 (326, 1) | 3.2 ( 74, 1) | 4.2 ( 74, 1) | 4.8 ( 70, 1)        |
| 290.0 /                    | 1.4 (313, 1) | 2.1 ( 32, 1) | 3.7 ( 63, 1) | 3.8 ( 65, 1) | 4.8 ( 65, 1)        |
| 280.0 /                    | 2.3 ( 64, 1) | 3.9 ( 62, 1) | 4.3 ( 62, 1) | 4.5 ( 72, 1) | 4.2 ( 72, 1)        |
| 270.0 /                    | 1.8 (102, 1) | 2.3 (104, 1) | 3.5 (104, 1) | 4.1 (322, 1) | 4.9 (322, 1)        |
| 260.0 /                    | 1.7 (327, 1) | 3.2 (102, 1) | 3.7 ( 17, 1) | 5.2 ( 17, 1) | 5.5 (327, 1)        |
| 250.0 /                    | 1.7 ( 78, 1) | 3.0 (291, 1) | 3.9 (105, 1) | 4.7 (105, 1) | 5.2 (335, 1)        |
| 240.0 /                    | 1.7 ( 78, 1) | 2.5 (102, 1) | 3.3 ( 78, 1) | 4.1 (315, 1) | 4.5 (315, 1)        |
| 230.0 /                    | 0.9 ( 95, 1) | 1.6 (294, 1) | 2.4 ( 95, 1) | 2.8 (292, 1) | 3.0 (334, 1)        |
| 220.0 /                    | 0.8 ( 95, 1) | 2.4 (295, 1) | 4.7 (295, 1) | 5.8 (295, 1) | <u>6.3 (295, 1)</u> |
| 210.0 /                    | 0.6 ( 7, 1)  | 1.4 ( 82, 1) | 2.3 (295, 1) | 2.9 (295, 1) | <u>3.2 (295, 1)</u> |
| 200.0 /                    | 0.6 ( 81, 1) | 0.9 (293, 1) | 1.7 (293, 1) | 2.0 ( 30, 1) | 2.2 (295, 1)        |
| 190.0 /                    | 0.7 (103, 1) | 1.2 (352, 1) | 1.7 (293, 1) | 2.0 (293, 1) | 2.0 (352, 1)        |
| 180.0 /                    | 0.8 ( 81, 1) | 1.5 ( 81, 1) | 2.0 ( 81, 1) | 2.1 (352, 1) | 2.1 ( 81, 1)        |
| 170.0 /                    | 0.9 ( 77, 1) | 1.6 ( 37, 1) | 2.2 ( 37, 1) | 2.3 ( 15, 1) | 2.2 ( 37, 1)        |
| 160.0 /                    | 1.2 ( 78, 1) | 1.8 ( 53, 1) | 1.9 ( 52, 1) | 2.0 ( 52, 1) | 2.0 ( 52, 1)        |
| 150.0 /                    | 1.4 (302, 1) | 2.2 (302, 1) | 2.3 (302, 1) | 2.3 (297, 1) | 2.6 (297, 1)        |
| 140.0 /                    | 1.9 ( 14, 1) | 3.6 ( 14, 1) | 4.5 ( 14, 1) | 4.6 ( 14, 1) | 4.5 ( 14, 1)        |
| 130.0 /                    | 1.4 (101, 1) | 2.7 ( 47, 1) | 3.4 ( 47, 1) | 3.6 ( 47, 1) | 4.0 ( 42, 1)        |
| 120.0 /                    | 1.4 ( 77, 1) | 2.6 ( 6, 1)  | 2.5 ( 12, 1) | 3.2 ( 12, 1) | 3.2 ( 34, 1)        |
| 110.0 /                    | 1.3 ( 86, 1) | 2.1 ( 86, 1) | 2.3 (351, 1) | 2.6 (351, 1) | 2.7 (351, 1)        |
| 100.0 /                    | 1.0 ( 86, 1) | 1.7 ( 86, 1) | 1.9 ( 85, 1) | 2.2 (350, 1) | 2.5 (350, 1)        |
| 90.0 /                     | 0.8 ( 85, 1) | 1.4 ( 85, 1) | 1.7 ( 85, 1) | 1.9 (302, 1) | 2.2 (302, 1)        |
| 80.0 /                     | 1.1 ( 19, 1) | 2.0 (320, 1) | 2.3 ( 41, 1) | 2.3 ( 19, 1) | 2.1 ( 19, 1)        |
| 70.0 /                     | 1.3 ( 19, 1) | 2.2 ( 19, 1) | 2.6 ( 19, 1) | 2.6 ( 19, 1) | 2.4 ( 19, 1)        |
| 60.0 /                     | 1.2 (349, 1) | 1.6 ( 6, 1)  | 2.0 ( 6, 1)  | 2.0 ( 6, 1)  | 2.0 ( 6, 1)         |
| 50.0 /                     | 0.9 (349, 1) | 1.1 ( 57, 1) | 1.7 (320, 1) | 2.0 (320, 1) | 2.1 (320, 1)        |
| 40.0 /                     | 0.6 ( 57, 1) | 0.9 ( 99, 1) | 1.5 (348, 1) | 1.9 (348, 1) | 2.1 (348, 1)        |
| 30.0 /                     | 0.7 ( 94, 1) | 1.1 (320, 1) | 1.5 (350, 1) | 1.8 (350, 1) | 1.9 (350, 1)        |
| 20.0 /                     | 1.9 (329, 1) | 1.3 (313, 1) | 1.4 ( 27, 1) | 1.8 (305, 1) | 2.1 (305, 1)        |
| 10.0 /                     | 0.8 ( 27, 1) | 1.3 (304, 1) | 1.3 (304, 1) | 1.2 (304, 1) | 1.5 ( 23, 1)        |

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2ND HIGH  
24-HR  
SGROUP# 3  
YEAR 1974

\*\*\* SCGC 1050 -- TSP 0.25/0.2 \*\*\*

\* SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 51,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 6.2 AND OCCURRED AT ( 1400.0, 270.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0        | 800.0        | 1000.0       | 1200.0       | 1400.0       |
|----------------------------|--------------|--------------|--------------|--------------|--------------|
| 360.0 /                    | 1.5 (324, 1) | 2.1 ( 21, 1) | 2.3 ( 21, 1) | 2.3 ( 21, 1) | 2.5 ( 50, 1) |
| 350.0 /                    | 1.5 ( 80, 1) | 1.7 (324, 1) | 1.7 (324, 1) | 2.1 ( 38, 1) | 2.5 ( 38, 1) |
| 340.0 /                    | 1.3 ( 80, 1) | 1.8 ( 80, 1) | 2.6 ( 82, 1) | 3.4 ( 82, 1) | 3.4 ( 30, 1) |
| 330.0 /                    | 1.2 (353, 1) | 2.2 ( 92, 1) | 3.1 ( 92, 1) | 3.4 ( 92, 1) | 3.6 ( 92, 1) |
| 320.0 /                    | 1.6 ( 80, 1) | 2.8 ( 44, 1) | 3.4 ( 44, 1) | 3.5 ( 78, 1) | 3.7 ( 78, 1) |
| 310.0 /                    | 2.6 ( 85, 1) | 3.9 ( 85, 1) | 4.2 ( 85, 1) | 4.3 ( 94, 1) | 4.5 ( 94, 1) |
| 300.0 /                    | 2.3 ( 80, 1) | 3.4 ( 98, 1) | 4.0 (104, 1) | 4.5 (104, 1) | 4.5 (329, 1) |
| 290.0 /                    | 1.4 (104, 1) | 2.5 ( 27, 1) | 3.2 ( 27, 1) | 3.3 ( 27, 1) | 3.6 (358, 1) |
| 280.0 /                    | 1.8 (106, 1) | 2.4 ( 43, 1) | 3.5 ( 23, 1) | 4.1 (102, 1) | 4.1 ( 23, 1) |
| 270.0 /                    | 1.4 ( 64, 1) | 2.5 ( 64, 1) | 4.2 ( 73, 1) | 5.3 ( 73, 1) | 6.2 (357, 1) |
| 260.0 /                    | 2.2 ( 97, 1) | 3.2 ( 97, 1) | 3.8 (328, 1) | 4.7 (328, 1) | 5.1 (328, 1) |
| 250.0 /                    | 1.8 ( 90, 1) | 2.7 (295, 1) | 3.7 (101, 1) | 4.4 ( 65, 1) | 5.1 ( 65, 1) |
| 240.0 /                    | 1.8 ( 97, 1) | 2.7 ( 97, 1) | 4.4 (294, 1) | 5.4 (294, 1) | 5.8 (294, 1) |
| 230.0 /                    | 0.6 (310, 1) | 1.8 (312, 1) | 3.5 (314, 1) | 4.8 (314, 1) | 5.5 (314, 1) |
| 220.0 /                    | 0.9 (364, 1) | 1.4 (339, 1) | 2.3 (364, 1) | 2.2 (364, 1) | 2.1 (364, 1) |
| 210.0 /                    | 0.7 (356, 1) | 1.3 (356, 1) | 1.5 (315, 1) | 1.7 ( 77, 1) | 1.9 ( 77, 1) |
| 200.0 /                    | 0.8 (315, 1) | 1.9 ( 12, 1) | 2.4 ( 12, 1) | 2.5 ( 12, 1) | 2.3 ( 54, 1) |
| 190.0 /                    | 1.1 ( 69, 1) | 1.3 ( 69, 1) | 1.2 (352, 1) | 1.1 ( 90, 1) | 1.1 ( 90, 1) |
| 180.0 /                    | 1.1 (292, 1) | 1.7 ( 54, 1) | 2.3 (332, 1) | 2.7 (332, 1) | 2.8 (332, 1) |
| 170.0 /                    | 0.8 ( 96, 1) | 1.3 ( 54, 1) | 1.9 ( 54, 1) | 1.8 (292, 1) | 2.0 ( 54, 1) |
| 160.0 /                    | 0.8 (292, 1) | 1.6 (292, 1) | 2.2 (325, 1) | 2.5 (339, 1) | 2.3 (339, 1) |
| 150.0 /                    | 1.2 ( 42, 1) | 2.3 ( 96, 1) | 3.0 (291, 1) | 3.0 (291, 1) | 2.8 (291, 1) |
| 140.0 /                    | 1.3 ( 42, 1) | 2.2 (352, 1) | 2.5 (352, 1) | 3.1 ( 57, 1) | 3.4 ( 56, 1) |
| 130.0 /                    | 1.5 (338, 1) | 2.6 ( 76, 1) | 2.8 ( 76, 1) | 3.0 ( 57, 1) | 3.7 ( 57, 1) |
| 120.0 /                    | 0.9 ( 17, 1) | 1.6 (316, 1) | 1.8 ( 76, 1) | 2.0 ( 76, 1) | 2.0 ( 76, 1) |
| 110.0 /                    | 1.3 ( 17, 1) | 1.9 (106, 1) | 2.0 (316, 1) | 2.0 (336, 1) | 2.0 (336, 1) |
| 100.0 /                    | 1.3 (363, 1) | 1.9 ( 17, 1) | 1.9 ( 17, 1) | 1.8 ( 17, 1) | 1.8 ( 40, 1) |
| 90.0 /                     | 1.2 (106, 1) | 1.6 ( 17, 1) | 1.8 ( 17, 1) | 1.8 ( 17, 1) | 2.1 ( 55, 1) |
| 80.0 /                     | 1.2 ( 89, 1) | 2.1 ( 89, 1) | 2.7 ( 89, 1) | 2.8 ( 89, 1) | 2.8 ( 89, 1) |
| 70.0 /                     | 1.1 ( 89, 1) | 2.0 ( 71, 1) | 2.1 ( 71, 1) | 2.5 ( 75, 1) | 2.8 ( 75, 1) |
| 60.0 /                     | 1.4 ( 88, 1) | 2.5 ( 89, 1) | 3.1 ( 89, 1) | 3.2 ( 89, 1) | 3.2 ( 89, 1) |
| 50.0 /                     | 1.3 ( 99, 1) | 2.2 ( 44, 1) | 2.5 ( 99, 1) | 2.5 ( 31, 1) | 2.3 ( 31, 1) |
| 40.0 /                     | 1.3 ( 31, 1) | 2.2 ( 31, 1) | 2.7 ( 39, 1) | 2.9 ( 99, 1) | 2.8 ( 99, 1) |
| 30.0 /                     | 0.9 ( 94, 1) | 1.2 ( 31, 1) | 1.2 (342, 1) | 1.5 ( 99, 1) | 1.4 ( 99, 1) |
| 20.0 /                     | 0.6 (342, 1) | 1.1 (342, 1) | 1.3 (353, 1) | 1.3 (342, 1) | 1.2 (342, 1) |
| 10.0 /                     | 1.1 ( 79, 1) | 1.7 ( 79, 1) | 1.9 ( 79, 1) | 1.8 ( 47, 1) | 2.0 ( 47, 1) |



\*\*\* SCGC 3150 -- TSP 0.25/0.2

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COMPOSITE SECOND-HIGHEST 24-HOUR CONCENTRATION TABLE, UG/CU.M., FOR SOURCE GROUP 1

\* FOR THE RECEPTOR GRID \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |       |        |        |        |
|----------------------------|----------------|-------|--------|--------|--------|
|                            | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0 |
| 360.0 /                    | 51.0           | 58.0  | 58.3   | 53.7   | 48.9   |
| 350.0 /                    | 46.7           | 50.8  | 47.8   | 42.4   | 39.0   |
| 340.0 /                    | 61.7           | 66.3  | 65.5   | 62.7   | 59.5   |
| 330.0 /                    | 55.4           | 58.4  | 58.7   | 54.4   | 49.9   |
| 320.0 /                    | 72.5           | 79.3  | 75.8   | 68.5   | 61.7   |
| 310.0 /                    | 75.7           | 88.1  | 86.1   | 78.4   | 70.6   |
| 300.0 /                    | 76.7           | 86.4  | 79.1   | 79.5   | 78.9   |
| 290.0 /                    | 72.8           | 99.2  | 106.8  | 102.5  | 97.0   |
| 280.0 /                    | 63.3           | 65.7  | 63.8   | 58.2   | 52.7   |
| 270.0 /                    | 84.5           | 103.4 | 100.5  | 90.1   | 80.1   |
| 260.0 /                    | 97.9           | 105.7 | 99.7   | 89.0   | 78.9   |
| 250.0 /                    | 88.7           | 99.3  | 95.8   | 86.6   | 80.7   |
| 240.0 /                    | 84.8           | 90.9  | 88.9   | 81.7   | 73.2   |
| 230.0 /                    | 75.4           | 86.4  | 84.4   | 76.9   | 69.3   |
| 220.0 /                    | 86.8           | 93.5  | 88.4   | 79.0   | 70.0   |
| 210.0 /                    | 50.0           | 53.4  | 50.9   | 45.6   | 40.6   |
| 200.0 /                    | 39.8           | 43.0  | 40.8   | 36.6   | 32.5   |
| 190.0 /                    | 32.3           | 34.7  | 32.8   | 30.0   | 26.6   |
| 180.0 /                    | 38.7           | 40.5  | 38.0   | 35.2   | 32.1   |
| 170.0 /                    | 41.2           | 46.4  | 47.8   | 44.7   | 41.1   |
| 160.0 /                    | 41.4           | 48.4  | 49.0   | 49.9   | 48.6   |
| 150.0 /                    | 38.5           | 45.0  | 54.6   | 56.1   | 55.2   |
| 140.0 /                    | 55.4           | 60.1  | 61.8   | 58.7   | 54.5   |
| 130.0 /                    | 61.7           | 71.8  | 70.9   | 65.7   | 61.7   |
| 120.0 /                    | 49.6           | 57.4  | 58.4   | 55.0   | 51.1   |
| 110.0 /                    | 51.7           | 58.2  | 57.0   | 52.4   | 47.7   |
| 100.0 /                    | 45.2           | 49.3  | 50.8   | 48.6   | 44.8   |
| 90.0 /                     | 32.0           | 40.2  | 41.2   | 38.3   | 35.1   |
| 80.0 /                     | 36.5           | 37.6  | 34.6   | 31.3   | 28.0   |
| 70.0 /                     | 41.1           | 44.3  | 45.7   | 42.0   | 37.4   |
| 60.0 /                     | 43.9           | 48.5  | 48.0   | 44.1   | 40.3   |
| 50.0 /                     | 39.4           | 42.6  | 41.3   | 38.4   | 35.2   |
| 40.0 /                     | 36.2           | 42.3  | 37.1   | 33.8   | 32.8   |
| 30.0 /                     | 30.5           | 29.6  | 30.6   | 26.9   | 27.5   |
| 20.0 /                     | 27.7           | 33.6  | 34.2   | 31.9   | 29.6   |
| 10.0 /                     | 28.3           | 32.5  | 33.6   | 31.4   | 29.5   |

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\*\*\* SCGC 3150 -- 1SP 0.25/0.2

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COMPOSITE SECOND-HIGHEST 24-HOUR CONCENTRATION TABLE, UG/CU.M, FOR SOURCE GROUP 2

\* FOR THE RECEPTOR GFID \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |       |        |        |        |
|----------------------------|----------------|-------|--------|--------|--------|
|                            | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0 |
| 360.0 /                    | 66.8           | 72.5  | 70.5   | 63.3   | 56.1   |
| 350.0 /                    | 60.8           | 62.7  | 56.7   | 50.3   | 44.3   |
| 340.0 /                    | 79.9           | 82.2  | 81.1   | 74.7   | 68.8   |
| 330.0 /                    | 71.2           | 74.3  | 71.4   | 63.7   | 56.9   |
| 320.0 /                    | 93.1           | 98.1  | 89.5   | 77.9   | 69.1   |
| 310.0 /                    | 99.4           | 111.4 | 103.6  | 90.5   | 78.6   |
| 300.0 /                    | 96.3           | 101.0 | 98.6   | 96.2   | 93.5   |
| 290.0 /                    | 94.0           | 127.3 | 134.3  | 126.2  | 111.0  |
| 280.0 /                    | 77.4           | 80.3  | 75.3   | 66.8   | 60.6   |
| 270.0 /                    | 111.2          | 132.5 | 118.6  | 101.3  | 86.6   |
| 260.0 /                    | 126.1          | 130.5 | 116.2  | 99.9   | 85.3   |
| 250.0 /                    | 117.6          | 126.2 | 115.0  | 107.5  | 98.0   |
| 240.0 /                    | 108.0          | 114.1 | 107.1  | 94.2   | 82.3   |
| 230.0 /                    | 100.0          | 111.0 | 102.6  | 89.2   | 77.2   |
| 220.0 /                    | 113.8          | 116.9 | 103.7  | 88.3   | 75.3   |
| 210.0 /                    | 66.7           | 69.0  | 62.3   | 53.3   | 45.5   |
| 200.0 /                    | 52.1           | 54.0  | 48.2   | 41.1   | 35.0   |
| 190.0 /                    | 41.7           | 42.3  | 40.2   | 34.3   | 30.0   |
| 180.0 /                    | 49.3           | 49.5  | 47.6   | 42.4   | 38.7   |
| 170.0 /                    | 54.7           | 61.7  | 62.3   | 53.1   | 48.8   |
| 160.0 /                    | 53.0           | 62.0  | 65.3   | 65.7   | 62.7   |
| 150.0 /                    | 48.3           | 57.6  | 70.8   | 72.3   | 70.1   |
| 140.0 /                    | 74.5           | 78.7  | 79.1   | 72.2   | 64.7   |
| 130.0 /                    | 80.7           | 89.4  | 88.8   | 81.2   | 71.5   |
| 120.0 /                    | 63.8           | 74.1  | 72.8   | 66.1   | 59.4   |
| 110.0 /                    | 60.8           | 74.6  | 69.1   | 60.3   | 53.6   |
| 100.0 /                    | 58.7           | 60.4  | 61.2   | 56.8   | 49.3   |
| 90.0 /                     | 42.9           | 52.4  | 51.2   | 45.8   | 40.6   |
| 80.0 /                     | 47.0           | 46.2  | 40.6   | 36.3   | 32.0   |
| 70.0 /                     | 50.7           | 57.2  | 53.3   | 45.7   | 39.7   |
| 60.0 /                     | 54.7           | 60.1  | 57.4   | 50.0   | 42.9   |
| 50.0 /                     | 50.8           | 51.7  | 50.5   | 45.2   | 40.1   |
| 40.0 /                     | 50.5           | 49.6  | 43.4   | 40.6   | 35.2   |
| 30.0 /                     | 37.1           | 38.5  | 38.1   | 35.5   | 32.4   |
| 20.0 /                     | 36.1           | 42.7  | 41.5   | 37.6   | 35.7   |
| 10.0 /                     | 36.6           | 41.8  | 41.6   | 36.4   | 35.6   |

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\*\*\* SCGC 1050 -- TSP 0.25/0.2

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COMPOSITE SECOND-HIGHEST 24-HOUR CONCENTRATION TABLE, UG/CU.M, FOR SOURCE GROUP 3

\* FOR THE RECEPTOR GRID \*

| DIRECTION /<br>(DEGREES) / | RANGE (METERS) |       |        |        |                |
|----------------------------|----------------|-------|--------|--------|----------------|
|                            | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0         |
| 360.0 /                    | 1.5            | 2.1   | 2.3    | 3.0    | 3.3            |
| 350.0 /                    | 1.5            | 2.0   | 2.5    | 2.8    | 3.0            |
| 340.0 /                    | 1.7            | 2.3   | 3.6    | 4.0    | 4.3            |
| 330.0 /                    | 1.7            | 2.4   | 3.1    | 3.6    | 4.0            |
| 320.0 /                    | 1.7            | 2.8   | 4.8    | 4.9    | 5.2            |
| 310.0 /                    | 2.6            | 3.9   | 4.2    | 4.7    | 5.3            |
| 300.0 /                    | 2.3            | 4.1   | 4.7    | 4.7    | 4.8            |
| 290.0 /                    | 1.4            | 2.7   | 3.7    | 3.8    | 4.8            |
| 280.0 /                    | 2.3            | 3.9   | 4.3    | 4.5    | 4.2            |
| 270.0 /                    | 1.8            | 2.8   | 4.6    | 5.8    | 6.4            |
| 260.0 /                    | 2.2            | 3.2   | 4.9    | 6.1    | <del>6.7</del> |
| 250.0 /                    | 2.0            | 3.2   | 4.5    | 5.8    | 6.6            |
| 240.0 /                    | 1.8            | 3.3   | 5.0    | 5.7    | 6.3            |
| 230.0 /                    | 1.6            | 3.0   | 3.8    | 4.8    | 5.5            |
| 220.0 /                    | 1.6            | 2.7   | 4.7    | 5.8    | 6.3            |
| 210.0 /                    | 1.4            | 1.8   | 2.3    | 2.9    | 3.2            |
| 200.0 /                    | 0.8            | 1.9   | 2.4    | 2.5    | 2.7            |
| 190.0 /                    | 1.1            | 1.5   | 1.7    | 2.1    | 2.3            |
| 180.0 /                    | 1.2            | 1.9   | 2.3    | 2.7    | 2.8            |
| 170.0 /                    | 1.3            | 2.0   | 2.4    | 2.9    | 3.1            |
| 160.0 /                    | 1.7            | 2.7   | 2.7    | 2.7    | 3.1            |
| 150.0 /                    | 1.5            | 2.5   | 3.0    | 3.0    | 2.8            |
| 140.0 /                    | 1.9            | 3.6   | 4.5    | 4.6    | 4.5            |
| 130.0 /                    | 2.2            | 2.8   | 3.4    | 3.6    | 4.0            |
| 120.0 /                    | 1.8            | 2.6   | 3.1    | 3.5    | 3.5            |
| 110.0 /                    | 1.8            | 2.5   | 2.9    | 3.3    | 3.7            |
| 100.0 /                    | 1.6            | 2.0   | 2.7    | 3.1    | 3.3            |
| 90.0 /                     | 1.2            | 1.6   | 2.0    | 2.3    | 2.5            |
| 80.0 /                     | 1.7            | 2.4   | 2.8    | 2.8    | 2.8            |
| 70.0 /                     | 1.6            | 2.7   | 3.2    | 3.2    | 3.0            |
| 60.0 /                     | 2.1            | 2.7   | 3.1    | 3.2    | 3.3            |
| 50.0 /                     | 2.4            | 2.5   | 2.7    | 2.8    | 3.0            |
| 40.0 /                     | 1.6            | 2.3   | 2.7    | 2.9    | 2.9            |
| 30.0 /                     | 1.5            | 2.0   | 2.2    | 2.2    | 2.1            |
| 20.0 /                     | 1.5            | 1.9   | 2.1    | 2.0    | 2.1            |
| 10.0 /                     | 1.3            | 1.7   | 1.9    | 1.8    | 2.0            |

see 1971

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\*\*\* SCGC 3059 -- TSP

# REFINED RECEPTOR GRID WITH SURROUNDING SOURCES

\*\*\*

CALCULATE (CONCENTRATION=1,DEPOSITION=2)  
RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)  
DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)  
TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)  
CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)  
LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)

ISW(1) = 1  
ISW(2) = 3  
ISW(3) = 1  
ISW(4) = 0  
ISW(5) = 0  
ISW(6) = 1

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)  
WITH THE FOLLOWING TIME PERIODS:

HOURLY (YES=1,NO=0)  
2-HOUR (YES=1,NO=0)  
3-HOUR (YES=1,NO=0)  
4-HOUR (YES=1,NO=0)  
6-HOUR (YES=1,NO=0)  
8-HOUR (YES=1,NO=0)  
12-HOUR (YES=1,NO=0)  
24-HOUR (YES=1,NO=0)

ISW(7) = 0  
ISW(8) = 0  
ISW(9) = 0  
ISW(10) = 0  
ISW(11) = 0  
ISW(12) = 0  
ISW(13) = 0  
ISW(14) = 1  
ISW(15) = 0

PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE  
SPECIFIED BY ISW(7) THROUGH ISW(14):

DAILY TABLES (YES=1,NO=0)  
HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)  
MAXIMUM 50 TABLES (YES=1,NO=0)  
METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)  
RURAL-URBAN OPTION (RURAL=0,URBAN MODE 1=1,URBAN MODE 2=2)  
WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)  
VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)  
SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)  
PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)  
PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)

ISW(16) = 1  
ISW(17) = 0  
ISW(18) = 0  
ISW(19) = 1  
ISW(20) = 0  
ISW(21) = 1  
ISW(22) = 1  
ISW(23) = 0  
ISW(24) = 1  
ISW(25) = 1

NUMBER OF INPUT SOURCES  
NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)  
TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)  
NUMBER OF X (RANGE) GRID VALUES  
NUMBER OF Y (THETA) GRID VALUES  
NUMBER OF DISCRETE RECEPTORS  
SOURCE EMISSION RATE UNITS CONVERSION FACTOR  
ENTRAINMENT COEFFICIENT FOR UNSTABLE ATMOSPHERE  
ENTRAINMENT COEFFICIENT FOR STABLE ATMOSPHERE  
HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED  
LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA  
DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION DECAY =0.000000E+00

NSOURC = 53  
NGROUP = 1  
IPERD = 0  
NXFNTS = 10  
NYPNTS = 10  
NXWYPT = 0  
TK = .10000E+07  
BETA1 = 0.600  
BETA2 = 0.600  
ZR = 7.00 METERS  
IMET = 5

SURFACE STATION NO.  
YEAR OF SURFACE DATA  
UPPER AIR STATION NO.  
YEAR OF UPPER AIR DATA  
ALLOCATED DATA STORAGE  
REQUIRED DATA STORAGE FOR THIS PROBLEM RUN

ISS = 12144  
ISY = 70  
IUS = 12839  
IUY = 70  
LIMIT = 43500 WORDS  
MINIT = 11715 WORDS

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\*\*\* METEOROLOGICAL DAYS TO BE PROCESSED \*\*\*  
(IF=1)

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 0000000000 | 0000000000 | 0000000000 | 0000000000 | 0000000000 |
| 0000000000 | 0000100000 | 0000000000 | 0000000000 | 0000000000 |
| 0000000000 | 0000000000 | 0000000000 | 0000000000 | 0000000000 |
| 0000000000 | 0000000000 | 0000000000 | 0000000000 | 0000000000 |
| 0000000000 | 0000000000 | 0000000000 | 0000000000 | 0000000000 |
| 0000000000 | 0000000000 | 0000000000 | 0000000000 | 0000000000 |
| 0000000000 | 0000000000 | 0000000000 | 0000000000 | 0000000000 |
| 0000000000 | 0000000000 | 0000000000 | 0000000000 | 0000000000 |
| 0000000000 | 000000     |            |            |            |

\*\*\* NUMBER OF SOURCE NUMBERS REQUIRED TO DEFINE SOURCE GROUPS \*\*\*  
(NSOGRP)

4,

\*\*\* SOURCE NUMBERS DEFINING SOURCE GROUPS \*\*\*  
(IUSOR)

1, -6, 101, -159,

\*\*\* UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES \*\*\*  
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

\*\*\* WIND PROFILE EXPONENTS \*\*\*

| STABILITY<br>CATEGORY | WIND SPEED CATEGORY |            |            |            |            |            |
|-----------------------|---------------------|------------|------------|------------|------------|------------|
|                       | 1                   | 2          | 3          | 4          | 5          | 6          |
| A                     | .10000E+00          | .10000E+00 | .10000E+00 | .10000E+00 | .10000E+00 | .10000E+00 |
| B                     | .15000E+00          | .15000E+00 | .15000E+00 | .15000E+00 | .15000E+00 | .15000E+00 |
| C                     | .20000E+00          | .20000E+00 | .20000E+00 | .20000E+00 | .20000E+00 | .20000E+00 |
| D                     | .25000E+00          | .25000E+00 | .25000E+00 | .25000E+00 | .25000E+00 | .25000E+00 |
| E                     | .30000E+00          | .30000E+00 | .30000E+00 | .30000E+00 | .30000E+00 | .30000E+00 |
| F                     | .30000E+00          | .30000E+00 | .30000E+00 | .30000E+00 | .30000E+00 | .30000E+00 |

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\*\*\* VERTICAL POTENTIAL TEMPERATURE GRADIENTS \*\*\*  
(DEGREES KELVIN PER METER)

| STABILITY<br>CATEGORY | WIND SPEED CATEGORY |            |            |            |            |            |
|-----------------------|---------------------|------------|------------|------------|------------|------------|
|                       | 1                   | 2          | 3          | 4          | 5          | 6          |
| A                     | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| B                     | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| C                     | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| D                     | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| E                     | .20000E-01          | .20000E-01 | .20000E-01 | .20000E-01 | .20000E-01 | .20000E-01 |
| F                     | .35000E-01          | .35000E-01 | .35000E-01 | .35000E-01 | .35000E-01 | .35000E-01 |

\*\*\* X-COORDINATES OF RECTANGULAR GRID SYSTEM \*\*\*  
(METERS)

-1440., -1340., -1240., -1140., -1040., -940., -840., -740., -640., -540.,

\*\*\* Y-COORDINATES OF RECTANGULAR GRID SYSTEM \*\*\*  
(METERS)

-158., -58., 42., 142., 242., 342., 442., 542., 642., 742.,

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SOURCE # 1---BOILER #1 & #2 -- 2 STACKS EACH  
SOURCE # 2---BOILER #3 -- 1 STACK  
SOURCE # 3---BOILER #4 -- 1 STACK  
SOURCE # 4---BOILER #5 -- 2 STACKS  
SOURCE # 5---NEW BOILER, #6  
SOURCE # 6---BOILERS #6 & #7 -- BOTH INTO ONE STACK  
SOURCE # 7---BOILER #4 -- AS IS, 3 STACKS  
SOURCE # 8---BOILERS #6 & #7 -- AS IS, 1 STACK EACH  
SOURCE # 101---FPL - RIVIERA 42-03  
SOURCE # 102---FPL - RIVIERA 42-04  
SOURCE # 103---LAKEWORTH UTIL 45-01  
SOURCE # 104---LAKEWORTH UTIL 45-04  
SOURCE # 109---GOOD SAMARITAN HOSP 90-02  
SOURCE # 110---GOOD SAMARITAN HOSP 90-03  
SOURCE # 111---GOOD SAMARITAN HOSP 90-04  
SOURCE # 113---GULF WESTERN 05-03  
SOURCE # 114---GULF WESTERN 05-04  
SOURCE # 115---GULF WESTERN 05-05  
SOURCE # 116---GULF WESTERN 05-09  
SOURCE # 119---GULF WESTERN 05-10  
SOURCE # 120---GULF WESTERN 05-11  
SOURCE # 121---GULF WESTERN 05-12  
SOURCE # 122---GULF WESTERN 05-13  
SOURCE # 126---OSCEOLA FARMS 19-01  
SOURCE # 127---OSCEOLA FARMS 19-02  
SOURCE # 128---OSCEOLA FARMS 19-03  
SOURCE # 129---OSCEOLA FARMS 19-04  
SOURCE # 130---OSCEOLA FARMS 19-05  
SOURCE # 131---OSCEOLA FARMS 19-06  
SOURCE # 132---FLA SUGAR REFIN 50-03  
SOURCE # 133---US SUGAR 61-01  
SOURCE # 134---US SUGAR 61-02  
SOURCE # 135---US SUGAR 61-03  
SOURCE # 137---US SUGAR 61-05  
SOURCE # 138---TALISMAN SUGAR 73-04  
SOURCE # 139---TALISMAN SUGAR 73-05  
SOURCE # 140---TALISMAN SUGAR 73-06  
SOURCE # 141---EVERGLADES SUGAR REFIN 01-01  
SOURCE # 144---EVERGLADES SUGAR REFIN 01-04  
SOURCE # 145---EVERGLADES SUGAR REFIN 01-05  
SOURCE # 146---EVERGLADES SUGAR REFIN 01-06  
SOURCE # 147---US SUGAR CLEW 03-01  
SOURCE # 148---US SUGAR CLEW 03-02  
SOURCE # 149---US SUGAR CLEW 03-03  
SOURCE # 150---US SUGAR CLEW 03-04  
SOURCE # 151---US SUGAR CLEW 03-05  
SOURCE # 153---US SUGAR CLEW 03-07  
SOURCE # 154---US SUGAR CLEW 03-08  
SOURCE # 155---ATLANTIC BOILER #1  
SOURCE # 156---ATLANTIC BOILER #2  
SOURCE # 157---ATLANTIC BOILER #3  
SOURCE # 158---ATLANTIC BOILER #4  
SOURCE # 159---ATLANTIC BOILER #5

|        |     |       |           | RATE     |     |           |        |        | TEMP.     | EXIT VEL. |        |        |        |        |        |
|--------|-----|-------|-----------|----------|-----|-----------|--------|--------|-----------|-----------|--------|--------|--------|--------|--------|
|        |     |       |           | TYPE=0,1 |     |           |        |        | TYPE=0    | TYPE=0    |        |        |        |        |        |
|        |     |       |           | (G/S)    |     |           |        |        | (DEG.K)   | (M/S)     |        |        |        |        |        |
|        |     |       |           | (G/S)    |     |           |        |        | VERT.DIM. | HORZ.DIM. | DIAM.  | HEIGHT | BLDG.  | BLDG.  | BLDG.  |
| SOURCE | P K | PAFT. | TYPE=2    | X        | Y   | BASE      | HEIGHT | TYPE=1 | TYPE=1,2  | TYPE=0    | TYPE=0 | TYPE=0 | TYPE=0 | TYPE=0 | TYPE=0 |
| NUMBER | E E | CATS. | *PER H**2 | (M)      | (M) | ELEV. (M) | (M)    | (M)    | (M)       | (M)       | (M)    | (M)    | (M)    | (M)    | (M)    |
| 1      | 0 0 | 0     | 13.600    | 0.       |     | 31.000    | 24.40  | 344.0. | 11.80     | 1.40      | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   |

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\*\*\* SOURCE DATA \*\*\*

| SOURCE<br>NUMBER | T<br>W | Y<br>A | NUMBER<br>PART. | EMISSION<br>RATE<br>TYPE=0,1<br>(G/S) |           | X<br>(M) | Y<br>(M) | BASE<br>ELEV. (M) | HEIGHT<br>(M) | TEMP.<br>TYPE=0<br>(DEG.K) |                              | EXIT VEL.<br>TYPE=0<br>(M/S) |      | BLDG.<br>DIAM.<br>TYPE=0<br>(M) | BLDG.<br>HEIGHT<br>TYPE=0<br>(M) | BLDG.<br>LENGTH<br>TYPE=0<br>(M) | BLDG.<br>WIDTH<br>TYPE=0<br>(M) |
|------------------|--------|--------|-----------------|---------------------------------------|-----------|----------|----------|-------------------|---------------|----------------------------|------------------------------|------------------------------|------|---------------------------------|----------------------------------|----------------------------------|---------------------------------|
|                  |        |        |                 | TYPE=2<br>(G/S)                       | *PER M**2 |          |          |                   |               | VERT.DIM.<br>TYPE=1<br>(M) | HORZ.DIM.<br>TYPE=1,2<br>(M) |                              |      |                                 |                                  |                                  |                                 |
|                  |        |        |                 |                                       |           |          |          |                   |               |                            |                              |                              |      |                                 |                                  |                                  |                                 |
|                  |        |        |                 |                                       |           |          |          |                   |               |                            |                              |                              |      |                                 |                                  |                                  |                                 |
| 2                | 0      | 0      | 0               | 5.700                                 | 0.        | 0.       | 0.0      | 24.40             | 344.0         | 15.10                      | 1.60                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 3                | 0      | 0      | 0               | 10.500                                | 0.        | -16.     | 0.0      | 33.50             | 344.0         | 11.60                      | 2.82                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 4                | 0      | 0      | 0               | 9.100                                 | 0.        | -30.     | 0.0      | 24.40             | 344.0         | 15.80                      | 1.40                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 5                | 0      | 0      | 0               | 12.000                                | -33.      | -16.     | 0.0      | 47.20             | 344.0         | 11.00                      | 3.05                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 6                | 0      | 0      | 0               | 2.500                                 | -33.      | 10.      | 0.0      | 12.20             | 606.0         | 22.40                      | 1.52                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 7                | 0      | 0      | 0               | 10.900                                | 0.        | -16.     | 0.0      | 25.90             | 344.0         | 11.60                      | 1.63                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 8                | 0      | 0      | 0               | 2.500                                 | -33.      | 10.      | 0.0      | 12.20             | 606.0         | 11.20                      | 1.52                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 101              | 0      | 0      | 0               | 32.260                                | 59300.    | 6900.    | 0.0      | 90.80             | 408.0         | 13.23                      | 4.88                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 102              | 0      | 0      | 0               | 32.260                                | 59300.    | 6900.    | 0.0      | 90.80             | 408.0         | 13.23                      | 4.88                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 103              | 0      | 0      | 0               | 4.000                                 | 57900.    | -9600.   | 0.0      | 30.50             | 408.0         | 6.67                       | 2.13                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 104              | 0      | 0      | 0               | 3.970                                 | 57900.    | -9600.   | 0.0      | 30.50             | 408.0         | 10.74                      | 2.38                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 109              | 0      | 0      | 0               | 1.070                                 | 59500.    | 3300.    | 0.0      | 30.50             | 366.0         | 4.58                       | 2.44                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 110              | 0      | 0      | 0               | 1.070                                 | 59500.    | 3300.    | 0.0      | 30.50             | 366.0         | 4.58                       | 2.44                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 111              | 0      | 0      | 0               | 1.070                                 | 59500.    | 3300.    | 0.0      | 30.50             | 366.0         | 4.58                       | 2.44                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 113              | 0      | 0      | 0               | 1.810                                 | -10000.   | -13200.  | 0.0      | 16.50             | 338.0         | 4.01                       | 3.44                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 114              | 0      | 0      | 0               | 2.560                                 | -10000.   | -13200.  | 0.0      | 16.50             | 341.0         | 4.19                       | 3.44                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 115              | 0      | 0      | 0               | 2.480                                 | -10000.   | -13200.  | 0.0      | 16.50             | 348.0         | 4.09                       | 3.44                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 118              | 0      | 0      | 0               | 2.100                                 | -10000.   | -13200.  | 0.0      | 19.20             | 340.0         | 18.17                      | 2.29                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 119              | 0      | 0      | 0               | 2.160                                 | -10000.   | -13200.  | 0.0      | 16.50             | 339.0         | 4.94                       | 3.44                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 120              | 0      | 0      | 0               | 0.580                                 | -10000.   | -13200.  | 0.0      | 16.20             | 345.0         | 15.05                      | 1.83                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 121              | 0      | 0      | 0               | 6.400                                 | -10000.   | -13200.  | 0.0      | 16.20             | 338.0         | 18.32                      | 1.83                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 122              | 0      | 0      | 0               | 6.050                                 | -10000.   | -13200.  | 0.0      | 16.20             | 340.0         | 12.46                      | 2.29                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 126              | 0      | 0      | 0               | 2.900                                 | 9300.     | 14700.   | 0.0      | 21.90             | 341.0         | 7.60                       | 1.52                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 127              | 0      | 0      | 0               | 4.500                                 | 9300.     | 14700.   | 0.0      | 21.90             | 339.0         | 14.20                      | 1.50                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 128              | 0      | 0      | 0               | 5.500                                 | 9300.     | 14700.   | 0.0      | 21.90             | 329.0         | 11.12                      | 2.00                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 129              | 0      | 0      | 0               | 4.400                                 | 9300.     | 14700.   | 0.0      | 21.90             | 328.0         | 10.20                      | 1.83                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 130              | 0      | 0      | 0               | 4.500                                 | 9300.     | 14700.   | 0.0      | 22.00             | 340.0         | 24.40                      | 1.50                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 131              | 0      | 0      | 0               | 4.500                                 | 9300.     | 14700.   | 0.0      | 22.00             | 340.0         | 24.40                      | 1.50                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 132              | 0      | 0      | 0               | 0.170                                 | 18200.    | -2000.   | 0.0      | 19.80             | 478.0         | 4.07                       | 1.16                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 133              | 0      | 0      | 0               | 8.500                                 | 3900.     | 14800.   | 0.0      | 19.80             | 343.0         | 21.32                      | 1.65                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 134              | 0      | 0      | 0               | 8.600                                 | 3900.     | 14800.   | 0.0      | 19.80             | 341.0         | 21.40                      | 1.65                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 135              | 0      | 0      | 0               | 9.100                                 | 3900.     | 14800.   | 0.0      | 19.80             | 331.0         | 25.50                      | 1.65                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 137              | 0      | 0      | 0               | 13.200                                | 3900.     | 14800.   | 0.0      | 30.50             | 344.0         | 22.37                      | 2.13                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 138              | 0      | 0      | 0               | 3.140                                 | -1900.    | -26900.  | 0.0      | 21.30             | 361.0         | 5.87                       | 3.20                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 139              | 0      | 0      | 0               | 1.240                                 | -1900.    | -26900.  | 0.0      | 21.30             | 361.0         | 5.87                       | 3.20                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 140              | 0      | 0      | 0               | 1.870                                 | -1900.    | -26900.  | 0.0      | 22.90             | 361.0         | 9.40                       | 3.05                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 141              | 0      | 0      | 0               | 0.000                                 | -42700.   | 11100.   | 0.0      | 19.50             | 266.0         | 3.59                       | 1.22                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 144              | 0      | 0      | 0               | 4.000                                 | -42700.   | 11100.   | 0.0      | 21.30             | 205.0         | 10.06                      | 0.88                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |
| 145              | 0      | 0      | 0               | 4.380                                 | -42700.   | 11100.   | 0.0      | 16.50             | 205.0         | 14.37                      | 0.91                         | 0.00                         | 0.00 | 0.00                            | 0.00                             |                                  |                                 |

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\*\*\* SCEC 3059 -- TSP

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\*\*\* SOURCE DATA \*\*\*

| SOURCE<br>NUMBER | T<br>F | W<br>C | A<br>CATS. | EMISSION<br>RATE<br>TYPE=0,1<br>(G/S) |               | X<br>(M) | Y<br>(M) | BASE<br>ELEV.<br>(M) | HEIGHT<br>(M) | TEMP.<br>TYPE=0<br>(DEG.K) | EXIT VEL.<br>TYPE=0<br>(M/S) | BLDG.<br>DIAM.<br>(M) | BLDG.<br>HEIGHT<br>(M) | BLDG.<br>LENGTH<br>(M) | BLDG.<br>WIDTH<br>(M) |
|------------------|--------|--------|------------|---------------------------------------|---------------|----------|----------|----------------------|---------------|----------------------------|------------------------------|-----------------------|------------------------|------------------------|-----------------------|
|                  |        |        |            | TYPE=2<br>(G/S)                       | TYPE=1<br>(M) |          |          |                      |               | TYPE=1,2<br>(M)            |                              |                       |                        |                        |                       |
| 146              | 0      | 0      | 0          | 2.390                                 | -42700.       | 11100.   | 0.0      | 14.00                | 294.0         | 20.49                      | 0.15                         | 0.00                  | 0.00                   | 0.00                   |                       |
| 147              | 0      | 0      | 0          | 5.330                                 | -29000.       | 3600.    | 0.0      | 22.90                | 341.0         | 15.81                      | 2.23                         | 0.00                  | 0.00                   | 0.00                   |                       |
| 148              | 0      | 0      | 0          | 5.390                                 | -29000.       | 3600.    | 0.0      | 22.90                | 334.0         | 16.24                      | 2.23                         | 0.00                  | 0.00                   | 0.00                   |                       |
| 149              | 0      | 0      | 0          | 2.280                                 | -29000.       | 3600.    | 0.0      | 22.90                | 341.0         | 10.36                      | 2.23                         | 0.00                  | 0.00                   | 0.00                   |                       |
| 150              | 0      | 0      | 0          | 1.670                                 | -29000.       | 3600.    | 0.0      | 19.80                | 340.0         | 13.43                      | 1.83                         | 0.00                  | 0.00                   | 0.00                   |                       |
| 151              | 0      | 0      | 0          | 1.530                                 | -29000.       | 3600.    | 0.0      | 19.80                | 334.0         | 8.44                       | 1.83                         | 0.00                  | 0.00                   | 0.00                   |                       |
| 153              | 0      | 0      | 0          | 0.810                                 | -29000.       | 3600.    | 0.0      | 10.70                | 316.0         | 10.61                      | 1.52                         | 0.00                  | 0.00                   | 0.00                   |                       |
| 154              | 0      | 0      | 0          | 0.520                                 | -29000.       | 3600.    | 0.0      | 15.20                | 338.0         | 5.66                       | 1.52                         | 0.00                  | 0.00                   | 0.00                   |                       |
| 155              | 0      | 0      | 0          | 7.000                                 | 18030.        | -8080.   | 0.0      | 18.90                | 346.0         | 12.71                      | 1.92                         | 0.00                  | 0.00                   | 0.00                   |                       |
| 156              | 0      | 0      | 0          | 6.570                                 | 18030.        | -8080.   | 0.0      | 18.90                | 342.0         | 10.89                      | 1.92                         | 0.00                  | 0.00                   | 0.00                   |                       |
| 157              | 0      | 0      | 0          | 9.250                                 | 18030.        | -8080.   | 0.0      | 18.90                | 341.0         | 17.52                      | 1.83                         | 0.00                  | 0.00                   | 0.00                   |                       |
| 158              | 0      | 0      | 0          | 9.250                                 | 18030.        | -8080.   | 0.0      | 18.29                | 344.0         | 15.03                      | 1.83                         | 0.00                  | 0.00                   | 0.00                   |                       |
| 159              | 0      | 0      | 0          | 4.490                                 | 18030.        | -8080.   | 0.0      | 27.40                | 344.0         | 6.64                       | 1.98                         | 0.00                  | 0.00                   | 0.00                   |                       |

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DAILY: 65  
 24-HR/PO 1  
 SGROUP# 1  
 YEAR 1973  
 \*\*\* SCGC 3059 -- TSP

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\* DAILY 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
 \* ENDING WITH HOUR 24 FOR DAY 65 \*  
 \* FROM SOURCES: 1, -6, 101, -159,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 108.7 AND OCCURRED AT ( -940.0, 342.0) \*

| Y-AXIS /   | X-AXIS (METERS) |         |         |         |         |        |        |        |        |
|------------|-----------------|---------|---------|---------|---------|--------|--------|--------|--------|
| (METERS) / | -1440.0         | -1340.0 | -1240.0 | -1140.0 | -1040.0 | -940.0 | -840.0 | -740.0 | -640.0 |
| 742.0 /    | 53.7            | 54.3    | 52.8    | 44.2    | 27.9    | 11.9   | 3.7    | 1.8    | 1.6    |
| 642.0 /    | 67.5            | 61.7    | 59.5    | 59.3    | 54.6    | 39.2   | 18.2   | 5.0    | 1.8    |
| 542.0 /    | 92.3            | 86.8    | 77.8    | 69.5    | 65.5    | 63.3   | 52.3   | 27.8   | 7.3    |
| 442.0 /    | 88.0            | 97.4    | 102.1   | 99.5    | 89.8    | 78.1   | 69.9   | 61.6   | 39.4   |
| 342.0 /    | 58.0            | 67.9    | 80.2    | 93.7    | 105.0   | 108.7  | 99.0   | 81.0   | 64.5   |
| 242.0 /    | 39.7            | 43.9    | 49.2    | 56.1    | 65.6    | 77.5   | 89.0   | 95.4   | 88.7   |
| 142.0 /    | 29.4            | 31.8    | 34.5    | 37.7    | 41.3    | 45.1   | 48.7   | 52.2   | 54.6   |
| 42.0 /     | 23.2            | 23.9    | 24.6    | 25.5    | 26.6    | 27.4   | 27.9   | 28.1   | 27.2   |
| -58.0 /    | 16.2            | 15.9    | 15.4    | 14.8    | 14.1    | 13.0   | 11.5   | 9.7    | 7.6    |
| -158.0 /   | 7.2             | 6.5     | 5.9     | 5.1     | 4.5     | 3.8    | 3.2    | 2.8    | 2.5    |

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DAILY: 65  
24-HR/TD 1  
SGROUP# 1  
YEAR 1973  
\*\*\* SCGC 3059 -- TSP \*\*\*

\* DAILY 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* ENDING WITH HOUR 24 FOR DAY 65 \*  
\* FROM SOURCES: 1, -6, 101, -159,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 108.7 AND OCCURRED AT ( -940.0, 342.0) \*

Y-AXIS / X-AXIS (METERS)  
(METERS) / -540.0

742.0 / 1.6  
642.0 / 1.6  
542.0 / 2.0  
442.0 / 11.2  
342.0 / 46.3  
242.0 / 66.7  
142.0 / 52.4  
42.0 / 24.8  
-56.0 / 5.4  
-158.0 / 2.4

DAILY: 76 INTERACTION W/USS BRYANT  
24-HR/PO 1  
SGROUP# 1  
YEAR 1971  
\*\*\* SCGC 3152 -- TSP

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\* DAILY 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* ENDING WITH HOUR 24 FOR DAY 76 \*  
\* FROM SOURCES: 1, -6, 101, -159,  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 35.5 AND OCCURRED AT ( 800.0, 190.0) \*

| DIRECTION / | RANGE (METERS) |       |        |        |        |
|-------------|----------------|-------|--------|--------|--------|
| (DEGREES) / | 600.0          | 800.0 | 1000.0 | 1200.0 | 1400.0 |

|         |      |      |      |      |      |
|---------|------|------|------|------|------|
| 190.0 / | 33.8 | 35.5 | 33.5 | 30.2 | 27.0 |
|---------|------|------|------|------|------|

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DAILY: 295 INTERACTION W/OSCEOLA  
24-HR/PD 1  
SGROUP# 1  
YEAR 1973  
\*\*\* SCCC 3153 -- TSP

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\* DAILY 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM SOURCES: 1, -6, 101, -159, \* ENDING WITH HOUR 24 FOR DAY 295 \*  
\* FOR THE RECEPTION GRID \*

\* MAXIMUM VALUE EQUALS 95.0 AND OCCURRED AT ( 800.0, 220.0) \*

DIRECTION / RANGE (METERS)  
(DEGREES) / 600.0 800.0 1000.0 1200.0 1400.0

220.0 / 66.2 95.0 89.9 80.5 71.6  
215.0 / 78.4 85.1 80.8 72.5 64.6

DAILY: 65 INTERACTION W/ATLANTIC  
 24-HR/PD 1  
 SCROUP# 1  
 YEAR 1973  
 \*\*\* SCGC 3154 -- TSP

\*\*\*

\* DAILY 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
 \* ENDING WITH HOUR 24 FOR DAY 65 \*  
 \* FROM SOURCES: 1, -6, 101, -159,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 108.7 AND OCCURRED AT ( 1000.0, 290.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
| 290.0 /                    | 74.7  | 101.1 | 108.7  | 104.8  | 98.9   |

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DAILY: 330 INTERACTION W/TALISMAN  
 24-HR/PD 1  
 SGROUP# 1  
 YEAR 1972  
 \*\*\* SCGC 3155 -- TSP

\*\*\*

\* DAILY 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
 \* FROM SOURCES: 1, -6, 101, -159, \* ENDING WITH HOUR 24 FOR DAY 330 \*  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 55.0 AND OCCURRED AT ( 1000.0, 360.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
| 5.0 /                      | 41.1  | 51.1  | 53.0   | 50.0   | 46.3   |
| 360.0 /                    | 49.5  | 58.8  | 59.0   | 54.4   | 49.5   |

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DAILY: 34 INTERACTION W/GULF & WESTERN -- OKEELANTA  
 24-HR/PD 1  
 SGROUP# 1  
 YEAR 1972  
 \*\*\* SCGC 3156 -- TSP \*\*\*

\* DAILY 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
 \* ENDING WITH HOUR 24 FOR DAY 34 \*

\* FROM SOURCES: 1, -6, 101, -159,  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 43.3 AND OCCURRED AT ( 800.0, 40.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
| 40.0 /                     | 39.1  | 43.3  | 41.2   | 37.0   | 33.0   |

DAILY: 361 INTERACTION W/USS CLEWISTON  
 24-HR/PD 1  
 SGROUP# 1  
 YEAR 1972  
 \*\*\* SCGC 3157 -- TSP

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\* DAILY 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
 \* FROM SOURCES: 1, -6, 101, -159, \* ENDING WITH HOUR 24 FOR DAY 361 \*  
 \* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 51.5 AND OCCURRED AT ( 1000.0, 100.0) \*

| DIRECTION /<br>(DEGREES) / | 600.0 | 800.0 | 1000.0 | 1200.0 | 1400.0 |
|----------------------------|-------|-------|--------|--------|--------|
| 100.0 /                    | 42.4  | 49.9  | 51.5   | 49.4   | 46.9   |

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