AP42 Section:	11.20
Reference:	7
Title:	Summary Of Emission Measurements On No. 5 Kiln, Carolina Solite Corporation, Aquadale, North Carolina, Sholtes & Koogler Environmental Consultants, Inc., Gainesville, FL, April 1983.

AP-42 Section 11.20
Reference 1
Report Sect. 4
Reference 5

SUMMARY OF EMISSION MEASUREMENTS

NO. 5 KILN

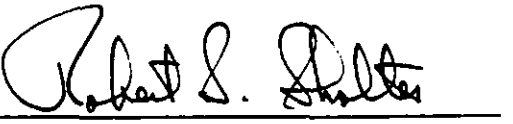
CAROLINA SOLITE CORPORATION
AQUADALE, NORTH CAROLINA

APRIL 5 AND 6, 1983

SHOLTES & KOOGLER
ENVIRONMENTAL CONSULTANTS, INC.
1213 N.W. 6TH STREET
GAINESVILLE, FLORIDA 32601
(904) 377-5822

TABLE OF CONTENTS

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.



ROBERT S. SHOLTES, PH.D., P.E.

4-25-83

DATE

SEAL

1.0 INTRODUCTION

The Carolina Solite Corporation owns and operates a lightweight aggregate production facility near the town of Aquadale, North Carolina. This facility consists of eight rotary kilns which are used to produce lightweight aggregate from materials mined on site.

On April 5 and 6, 1983, Sholtes & Koogler, Environmental Consultants, Inc. (SKEC) of Gainesville, Florida conducted measurements on the No. 5 kiln inlet and outlet for particulate matter, chlorides, chromium and lead. The purpose of this testing was to satisfy provisos 10 and 11 of permit number 3225R4 issued on February 10, 1983, by the North Carolina Department of Natural Resources and Community Developments. These provisos are related to the combustion of liquid waste in kilns 5-8 to provide the heat necessary to produce the lightweight aggregate.

Prior to the test date, the North Carolina Department of Natural Resources and Community Development were notified of the test schedule. Mr. Yin-Pong Chang of this Department was at the plant site to witness the plant operations and the testing procedures.

2.0 PROCESS DESCRIPTION

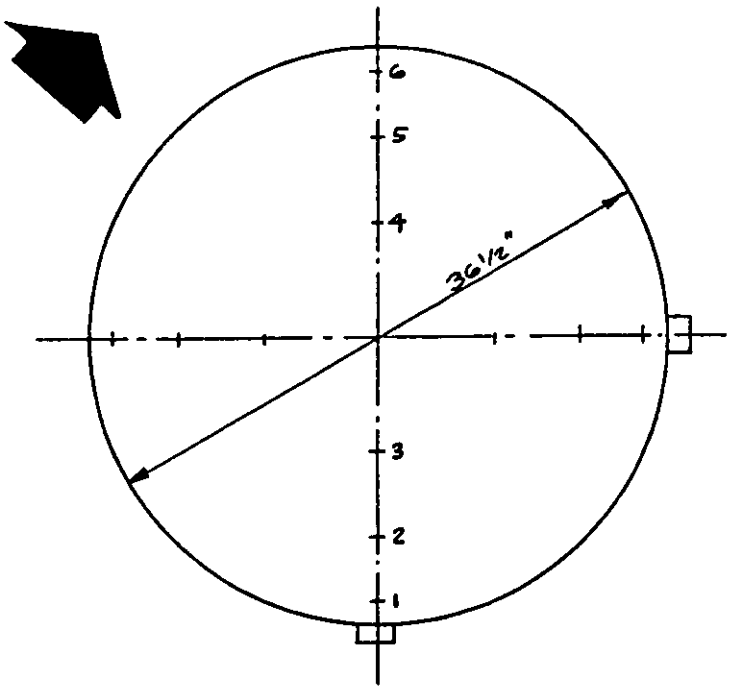
The production of the lightweight aggregate consists of mining the raw material, which is a form of shale, crushing and sizing the material and heating the material in a rotary kiln.

At the point of fusion the carbon dioxide creates millions of tiny cells within the plastic mass expanding it and giving it the lightweight property. The material is removed from the kiln, cooled, crushed, sized and graded for shipment. The combustion gases passing through the kiln suspend small particles which result in particulate matter emissions from the process.

3.0 SAMPLING LOCATIONS

The sampling ports used for emission measurements on the discharge stack were located 60 feet above the base of the stack and 30 feet below the top of the stack. This is equivalent to 20 stack diameters from the point where the gases enter the stack and 9 stack diameters from the exit of the stack. It was determined that a total of 12 sampling points would be used for the sampling and velocity traverses; six sampling points on each of the two perpendicular traverses. The location of the sampling ports and a table of the sampling point locations are in Figure 1 of this report.

The sampling at the inlet of the air pollution control system was conducted in two separate ducts with four sampling ports located in the 21-inch face of each of these ducts. The ports were less than one diameter upstream and downstream from a flow disturbance. For testing, 48 sampling points were used; 24 sampling points in each of the two ducts. The location of these sampling ports and sampling points are shown in Figure 2 of this report.



SECTION A-A

Point	Distance From Stack Wall
1	1.6 inches
2	5.4 inches
3	10.7 inches
4	25.7 inches
5	31.1 inches
6	34.9 inches

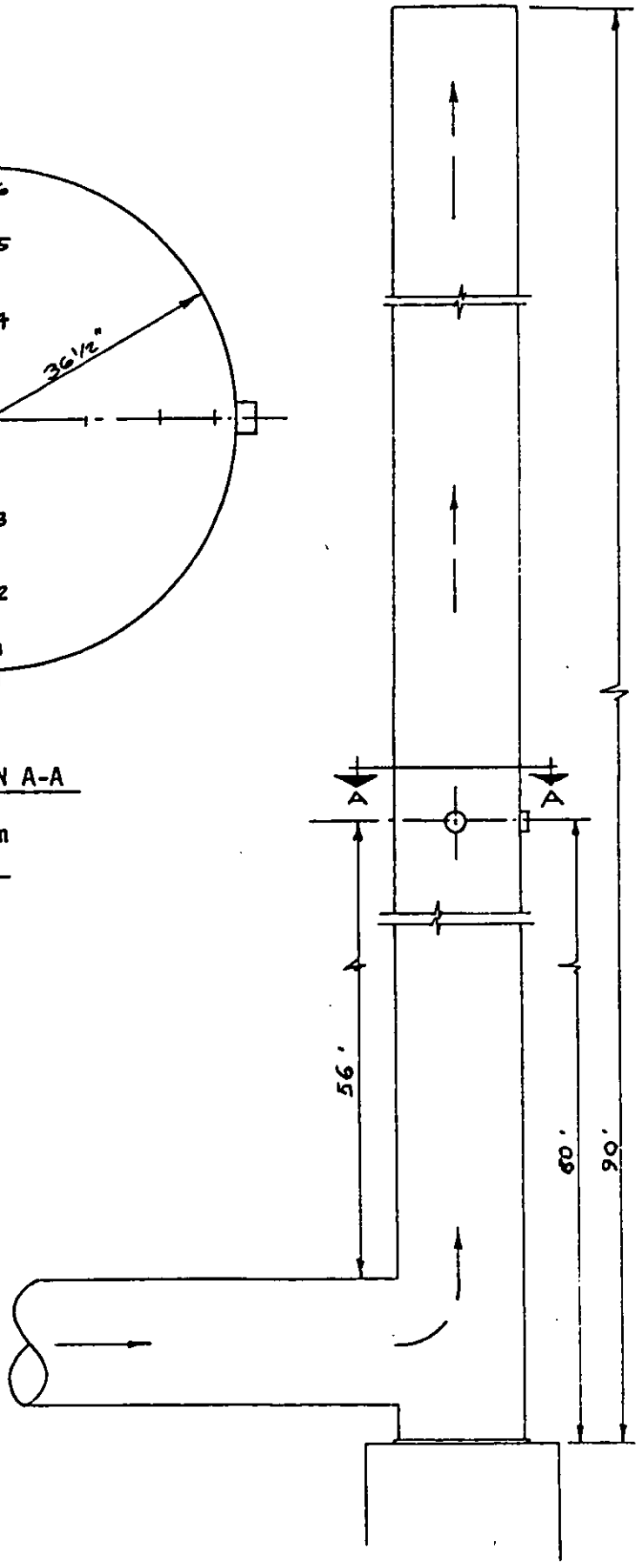
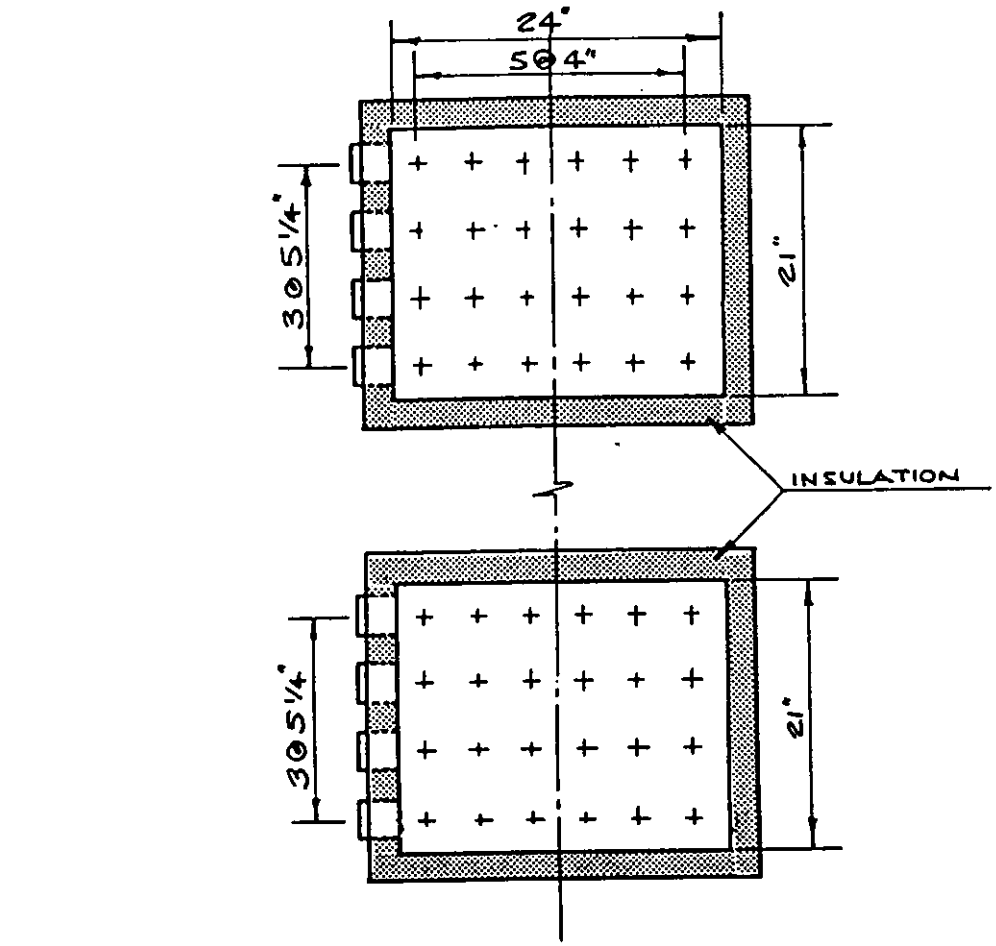


FIGURE 1

NO. 5 KILN OUTLET

CAROLINA SOLITE CORPORATION
AQUADALE, NORTH CAROLINA



SECTION A-A

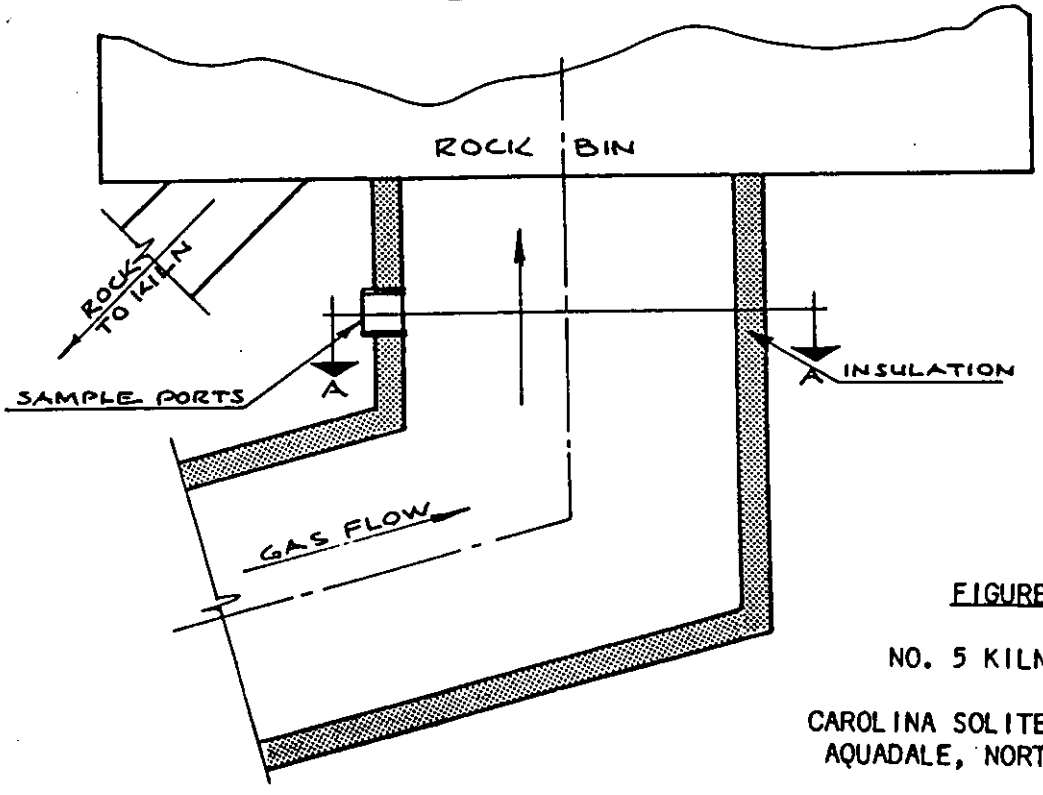


FIGURE 2

NO. 5 KILN INLET

CAROLINA SOLITE CORPORATION
AQUADALE, NORTH CAROLINA

4.0 SAMPLING AND ANALYTICAL PROCEDURES

The methods for sampling at both the inlet and the outlet were as published in 40 CFR 60, Appendix A, Code of Federal Regulations. The sampling and velocity traverses were determined in accordance with Method 1B and the determination of the stack gas flow rate was in accordance with Method 2. The stack gas temperature was measured with a iron-constantan thermocouple and the barometric pressure was obtained from the Aquadale airport. The stack gas density for determining the gas flow rate, was determined by Method 3. The emission measurements were conducted in accordance with Method 5 with one slight variation. There was a flexible connection between the filter and the first impinger. This modification has been agreed to prior by the DNR personnel prior to the test. Testing for all pollutants consisted of three sets of simultaneous tests at the inlet and the outlet of the control system. Particulate matter concentrations were determined from the weight of material collected on the filter and that removed from the probe by the acetone probe wash. Cadmium and lead concentrations were determined in the particulate matter sample using atomic absorption for the heavy metals analyses. The chlorides were collected in the impingers of the sampling train in a solution of 0.1 normal sodium hydroxide. The impinger solution was analyzed by the Argentometric Method.

It should be noted that run 3 on the Inlet was compromised due to darkness and overheating conditions. The suction line from the probe was melted down at least two times. Due to darkness and in the interest of safety, the run was terminated after completing approximately two thirds of the run.

5.0 SUMMARY OF RESULTS

Summarized results of the emission measurements conducted on April 5 and 6, 1983 are presented in Tables 1-4 of this report. These tables summarize the results of test runs 3-5. Test runs 1 and 2 were used to balance the operating parameters of the No. 5 kiln.

The particulate matter concentration at the inlet of the pollution control system averaged 3.6859 grains per standard cubic foot and at the outlet averaged 0.0631 grains per standard cubic foot; resulting in an overall control efficiency of 98.2 percent. The control efficiency for chromium was 91.9 percent, for lead-87.6 percent and for chloride-78.4 percent. These data are summarized in Tables 3 and 4 of this report. All control efficiencies were calculated from concentration data rather than from source data because of the uncertainity involved in measuring air flow rates at the inlet to the control system.

The mass emission rate of materials from the No. 5 kiln stack were 3.19 pounds per hour of particulate matter, 0.01 pounds per hour of chromium, 0.003 poounds per hour of lead and 3.56 pounds per hourof chloride.

Included in the Appendix of this report are all field and analytical data sheets, nomenclature sheets, a list of sample calculations, all necessary calibrations and a list of project participants.

TABLE 1

SUMMARY OF PARTICULATE MATTER EMISSIONS

NO. 5 KILN INLET

CAROLINA SOLITE CORPORATION
AQUADALE, NORTH CAROLINA

APRIL 5 AND 6, 1983

Run No.	Process Weight Rate (tons/hr)	Stack Gas Flow Rate (SCFMD)	Stack Gas Temperature (°F)	Stack Gas Moisture (%)	Particulate Matter Emissions	
					Concentration (gr/SCF)	Mass Emission Rate (lbs/hr)
3		4174	709	8.7	2.8696	102.89
4		3641	791	10.7	4.0089	125.40
5		3702	792	11.2	4.1719	132.67
Average	10	3839	764	10.2	3.6859	120.32
		3,672			4.0904	129.035

TABLE 2

SUMMARY OF PARTICULATE MATTER EMISSIONS

NO. 5 KILN OUTLET

CAROLINA SOLITE CORPORATION
AQUADALE, NORTH CAROLINA

APRIL 5 AND 6, 1983

Run No.	Process Weight Rate (tons/hr)	Stack Gas Flow Rate (SCFMD)	Stack Gas Temperature (°F)	Stack Gas Moisture (%)	Particulate Matter Emissions	
					Concentration (gr/SCF)	Mass Emission Rate (lbs/hr)
3		6207	110	7.2	0.0926	4.94
4		5509	117	7.7	0.0536	2.53
5		5685	98	*6.0	0.0431	2.11
Average	10	5800	108	7.0	0.0631	3.19

*Stack gas saturated.

TABLE 3

EMISSION MEASUREMENTS

NO. 5 KILN

CAROLINA SOLITE CORPORATION
AQUADALE, NORTH CAROLINA

			CHROMIUM			LEAD				CHLORIDE			
	SCFD	SCFMD	(UG)	GR/SCF	LBS/HR	(UG)	GR/SCF	LBS/HR	MG/L	SAMPLE VOL (ML)	TOTAL (MG) -BLANK	GR/SCF	LBS/HR
OUTLET													
Run 3	61.378	6207	1915	.000481	.026	268	.000067	.004	469	395	184.1	.046281	2.46
Run 4	54.608	5509	586	.000166	.008	196	.000055	.003	928	340	314.3	.088808	4.19
Run 5	53.702	5685	400	.000115	.006	95	.000027	.001	890	325	288.1	.082779	4.03
INLET													
Run 3	19.383	4174	6612	.005264	.188	428	.000341	.012		SAMPLE VOID			
Run 4	49.415	3641	6612	.002065	.064	1707	.000533	.017	1960	630	1233.6	.385196	12.02
Run 5	51.923	3702	5344	.001588	.050	1255	.000373	.012	2401	574	1377.0	.409204	12.98
BLANK									2.7	428	1.2		

TABLE 4

PERCENT POLLUTANT REMOVAL

CAROLINA SOLITE CORPORATION
AQUADALE, NORTH CAROLINA

NO. 5 KILN

	CHROMIUM	LEAD	CHLORIDE	PARTICULATE MATTER
Run 3	90.9	80.4	VOID	96.8
Run 4	92.0	89.7	76.9	98.7
Run 5	92.8	92.8	79.8	99.0
Average	91.9	87.6	78.4	98.2

APPENDIX

SOURCE SAMPLING NOMENCLATURE SHEET

PB - Barometric pressure, inches Hg
PS - Stack pressure, inches Hg
As - Stack area, sq. ft.
AS - Effective area of positive stack gas flow, sq. ft.
NPTS - Number of traverse points where the pitot velocity head was greater than zero
TSTD - Standard temperature, °R
TS - Stack temperature, °R
TM - Meter temperature, °R
H - Average square root of velocity head, $\sqrt{\text{inches } H_2O}$
$\bar{H}$ - Average meter orifice pressure differential, inches H_2O
AN - Sampling nozzle area, square feet
CP - S-type pitot tube correction factor
VM - Recorded meter volume sample, cubic feet (meter conditions)
VC - Condensate and silica gel increase in impingers, milliliters
Po - Pressure at the dry test meter orifice, $\left[PB + \frac{\Delta \bar{H}}{13.6}\right]$ inches Hg
STP - Standard conditions

VWV - Converstion of condensate in milliliters to water vapor in cubic feet (STP)
VSTPD - Volume sampled, cubic feet (STP)
VT - Total water vapor volume and dry gas volume sampled, cubic feet (STP)
W - Moisture fraction of stack gas
FDA - Dry gas fraction
MD - Molecular weight of stack gas, lbs/lb-mole (dry conditions)
MS - Molecular weight of stack gas, lbs/lb-mole (stack conditions)
GS - Specific gravity of stack gas, referred to air
EA - Excess air, %
$\sqrt{H \times TS}$ - Average square root of velocity head times stack temperature
$\bar{U}$ - Stack gas velocity, feet per minute
QS - Stack gas flow rate, cubic feet per minute (stack conditions)
QD - Stack gas flow rate, cubic feet per minute (dry conditions)
QSTDP - Stack gas flow rate, cubic feet per minute (STP)
PISO - Percent isokinetic volume sampled (method described in Federal Register)
ESTP - Particulate concentration at standard and dry conditions, grains/scf
E_{12} - ESTP corrected to 12% CO_2, grains/scf
E_{50} - ESTP corrected to 50% excess Air, grains/scf
EM - Mass Emission Rate, lbs/hr

• - Stack Gas Saturated

EQUATIONS FOR CALCULATING PARTICULATE EMISSIONS

$$VWV = 0.0000893(TSTD)(VC)$$

$$VSTPD = (VM)(PB + \frac{\Delta H}{13.6})(\frac{TSTD}{TM})(\frac{1}{29.92})$$

$$VT = (VWV) + (VSTPD)$$

$$W = (VWV) \div (VT)$$

$$FDA = (1.0) - (W)$$

$$FMOIST = \text{Assumed moisture fraction}$$

$$MD = (0.44 \times \%\ CO_2) + (0.32 \times \%\ O_2) + (0.28 \times \%\ N_2) + (0.28 \times \%\ CO)$$

$$MS = (MD \times FDA) + (18 \times W)$$

$$GS = (MS) \div (28.99)$$

$$EA = \frac{\left[(100) \times (\%\ O_2 - \frac{\%\ CO}{2})\right]}{\left[(0.266 \times \%\ N_2) - (\%\ O_2 - \frac{\%\ CO}{2})\right]}$$

$$\underline{U} = 4{,}006(CP)\sqrt{H} \Big/ (\frac{TS}{TSTD})(\frac{29.92}{PS})(\frac{1}{GS})$$

$$QS = (\underline{U}) \times (AS)$$

$$QD = (QS) \times (FDA)$$

$$QSTPD = TSTD(QD)(PS) \div [TS(29.92)]$$

$$PISO = \frac{\left[(0.00267 \times VC \times TS) + (P_o \times TS \times VM \div TM)\right]}{\left[(Time \times \underline{U} \times PS \times AN)\right]}$$

$$ESTP = \frac{(\frac{15.43\ grains}{gram})\ (y)}{VSTPD}$$

$$E_{12} = \frac{(ESTP)\ (12)}{(CO_2\ \%)}$$

$$ESO = \frac{(ESTP)\ (100 + EA)}{150}$$

$$EM = (ESTP)\ (QSTPD)\ (60\ \frac{min}{hr})\ (\frac{lb}{7000\ grains})$$

COMPUTER PRINT-OUTS

SHOLTES AND KOOGLER ENVIRONMENTAL CONSULTANTS

Source Sampling Calculations

Plant: N. CAROLINA SOLITE AQUADALE, N.C. Date: 4-5-83
Stack: NO. 5 KILN INLET Run 3 from 1757 -1940
Weather conditions: OVERCAST [redacted] Ps= 30.24 In.Hg
As= 7 Sq.Ft. [redacted] F [redacted]
[redacted] An= 0.000508 Sq.Ft. Cp= 0.84
Vm= 19.403 cf Vc= 39 ml Total time: 62.2 Minutes

1.	Volume Water Vapor	1.837	SCF
2.	Gas Volume Sampled - STPD	19.383	SCFD
3.	Total Volume	21.22	SCF
4.	Moisture in Stack Gas - Volume Fraction	0.087	
5.	Dry Stack Gas - Volume Fraction	0.913	
6.	Molecular Weight of Stack Gas - Dry Basis	29	
7.	Molecular Weight of Stack Gas - Stack Conditions	28.05	
8.	Specific Gravity of Stack Gas Relative to Air	0.97	
9.	Excess Air - Percent		
10.	Average Stack Velocity	1429.4	FPM
11.	Average Stack Gas Flow Rate	10006	ACFM
12.	Actual Stack Gas Flow Rate Dry	9139	CFMD
13.	Stack Gas Flow Rate STPD	4174	SCFMD
14.	Percent Isokinetic	102.8	%

Probe Wash	1507.70 Mg	1.1979 Gr/SCF	42.95 Lbs/Hr
Filter	2104.10 Mg	1.6717 Gr/SCF	59.94 Lbs/Hr
Totals	3611.80 Mg	2.8696 Gr/SCF	102.89 Lbs/Hr

SHOLTES AND KOOGLER ENVIRONMENTAL CONSULTANTS

Source Sampling Calculations

Plant: N. CAROLINA SOLITE AQUADALE, N.C. Date: 4-5-83
Stack: NO. 5 KILN OUTLET Run 3 from 1806-1940
Weather conditions: CLOUDY Pb= 30.24 In.Hg Ps= 30.25 In.Hg
As= 7.27 Sq.Ft. Ts= ~~110.2 Deg. F~~ Tm= ~~Deg.~~ F
H= 0.279 In.H2O Del ~~H= 2.12~~ An= 0.001042 Sq.Ft. Cp= 0.84
Vm= 60.36 cf Vc= 101.5 ml Total time: ~~72 Minutes~~

1.	Volume Water Vapor	4.781	SCF
2.	Gas Volume Sampled - STPD	61.378	SCFD
3.	Total Volume	66.159	SCF
4.	Moisture in Stack Gas - Volume Fraction	0.072	
5.	Dry Stack Gas - Volume Fraction	0.928	
6.	Molecular Weight of Stack Gas - Dry Basis	29	
7.	Molecular Weight of Stack Gas - Stack Conditions	28.21	
8.	Specific Gravity of Stack Gas Relative to Air	0.97	
9.	Excess Air - Percent		
10.	Average Stack Velocity	983	FPM
11.	Average Stack Gas Flow Rate	7146	ACFM
12.	Actual Stack Gas Flow Rate Dry	6630	CFMD
13.	Stack Gas Flow Rate STPD	6207	SCFMD
14.	Percent Isokinetic	95.8	%

Probe Wash	256.20 Mg	0.0643 Gr/SCF	3.43 Lbs/Hr
Filter	112.70 Mg	0.0283 Gr/SCF	1.51 Lbs/Hr
Totals	368.90 Mg	0.0926 Gr/SCF	4.94 Lbs/Hr

SHOLTES AND KOOGLER ENVIRONMENTAL CONSULTANTS

Source Sampling Calculations

Plant: N. CAROLINA SOLITE AQUADALE, N.C. Date: 4-6-83
Stack: NO. 5 KILN INLET Run 4 from 0912-1127
Weather conditions: OVERCAST Pb= 30.08 In.Hg Ps= 30.08 In.Hg
As= 7 Sq.Ft. [redacted] Deg. F [redacted] F
H= 0.261 In.H2O Del [redacted] An= 0.001056 Sq.Ft. Cp= 0.84
Vm= 49.576 cf Vc= 125.5 ml Total time [redacted]es

1.	Volume Water Vapor	5.911 SCF
2.	Gas Volume Sampled - STPD	49.415 SCFD
3.	Total Volume	55.326 SCF
4.	Moisture in Stack Gas - Volume Fraction	0.107
5.	Dry Stack Gas - Volume Fraction	0.893
6.	Molecular Weight of Stack Gas - Dry Basis	29
7.	Molecular Weight of Stack Gas - Stack Conditions	27.82
8.	Specific Gravity of Stack Gas Relative to Air	0.96
9.	Excess Air - Percent	
10.	Average Stack Velocity	1372.6 FPM
11.	Average Stack Gas Flow Rate	9608 ACFM
12.	Actual Stack Gas Flow Rate Dry	8582 CFMD
13.	Stack Gas Flow Rate STPD	3641 SCFMD
14.	Percent Isokinetic	93.7 %

Probe Wash	9977.10 Mg	3.1093 Gr/SCF	97.26 Lbs/Hr
Filter	2886.70 Mg	0.8996 Gr/SCF	28.14 Lbs/Hr
Totals	PPPPPPP Mg	4.0089 Gr/SCF	125.40 Lbs/Hr

SHOLTES AND KOOGLER ENVIRONMENTAL CONSULTANTS

Source Sampling Calculations

Plant: N. CAROLINA SOLITE AQUADALE, N.C. Date: 4-6-83
Stack: NO. 5 KILN OUTLET Run 4 from 0905-1022
Weather conditions: CLOUDY RAIN Pb= 30.08 In.Hg Ps= 30.09 In.Hg
As= 7.27 Sq.Ft. Ts= [redacted] Tm= [redacted] F
H= 0.251 In.H2O Del [redacted] An= 0.001042 Sq.Ft. Cp= 0.84
Vm= 54.108 cf Vs [redacted] Total time: [redacted]

1.	Volume Water Vapor	4.545	SCF
2.	Gas Volume Sampled - STPD	54.608	SCFD
3.	Total Volume	59.153	SCF
4.	Moisture in Stack Gas - Volume Fraction	0.077	
5.	Dry Stack Gas - Volume Fraction	0.923	
6.	Molecular Weight of Stack Gas - Dry Basis	29	
7.	Molecular Weight of Stack Gas - Stack Conditions	28.15	
8.	Specific Gravity of Stack Gas Relative to Air	0.97	
9.	Excess Air - Percent		
10.	Average Stack Velocity	891.7	FPM
11.	Average Stack Gas Flow Rate	6482	ACFM
12.	Actual Stack Gas Flow Rate Dry	5984	CFMD
13.	Stack Gas Flow Rate STPD	5509	SCFMD
14.	Percent Isokinetic	96	%

Probe Wash	106.00 Mg	0.0299 Gr/SCF	1.41 Lbs/Hr
Filter	83.90 Mg	0.0237 Gr/SCF	1.12 Lbs/Hr
Totals	189.90 Mg	0.0536 Gr/SCF	2.53 Lbs/Hr

SHOLTES AND KOOGLER ENVIRONMENTAL CONSULTANTS

Source Sampling Calculations

Plant: N. CAROLINA SOLITE AQUADALE, N.C. Date: 4-6-83
Stack: NO. 5 KILN INLET Run 5 from 1229-1432
Weather conditions: OVERCAST Pb= [redacted] Ps= 30.08 In.Hg
As= 7 Sq.Ft. Ts= [redacted] F Tm= [redacted]
H= 0.266 In.H2O Del [redacted] In.H2O An= 0.001056 Sq.Ft. Cp= 0.84
Vm= 53.989 cf Vc= 139.2 ml Total time: [redacted]

1.	Volume Water Vapor	6.556	SCF
2.	Gas Volume Sampled - STPD	51.923	SCFD
3.	Total Volume	58.48	SCF
4.	Moisture in Stack Gas - Volume Fraction	0.112	
5.	Dry Stack Gas - Volume Fraction	0.888	
6.	Molecular Weight of Stack Gas - Dry Basis	29	
7.	Molecular Weight of Stack Gas - Stack Conditions	27.77	
8.	Specific Gravity of Stack Gas Relative to Air	0.96	
9.	Excess Air - Percent		
10.	Average Stack Velocity	1404.4	FPM
11.	Average Stack Gas Flow Rate	9831	ACFM avg = 9711.5
12.	Actual Stack Gas Flow Rate Dry	8729	CFMD
13.	Stack Gas Flow Rate STPD	3702	SCFMD
14.	Percent Isokinetic	96.8	%

Probe Wash	PPPPPPP	Mg	4.0776 Gr/SCF	129.67 Lbs/Hr
Filter	318.00	Mg	0.0943 Gr/SCF	3.00 Lbs/Hr
Totals	PPPPPPP	Mg	4.1719 Gr/SCF	132.67 Lbs/Hr

SHOLTES AND KOOGLER ENVIRONMENTAL CONSULTANTS

Source Sampling Calculations

Plant: N. CAROLINA SOLITE AQUADALE, N.C. Date: 4-6-83
Stack: NO. 5 KILN OUTLET Run 5 from 1301-1434
Weather conditions: CLOUDY RAIN Pb= 30.08 In.Hg Ps= 30.09 In.Hg
As= 7.27 Sq.Ft. Ts= [redacted] Tm= [redacted]
H= 0.251 In.H2O Del H= [redacted] In.H2O An= 0.001042 Sq.Ft. Cp= 0.84
Vm= 54.752 cf Vc= [redacted] Total time: [redacted]

1.	Volume Water Vapor	3.434*	SCF
2.	Gas Volume Sampled - STPD	53.702	SCFD
3.	Total Volume	57.136*	SCF
4.	Moisture in Stack Gas - Volume Fraction	0.06*	
5.	Dry Stack Gas - Volume Fraction	0.94*	
6.	Molecular Weight of Stack Gas - Dry Basis	29	
7.	Molecular Weight of Stack Gas - Stack Conditions	28.34*	
8.	Specific Gravity of Stack Gas Relative to Air	0.98	
9.	Excess Air - Percent		
10.	Average Stack Velocity	874	FPM
11.	Average Stack Gas Flow Rate	6354	ACFM
12.	Actual Stack Gas Flow Rate Dry	5972	CFMD
13.	Stack Gas Flow Rate STPD	5685	SCFMD
14.	Percent Isokinetic	91.5*	%

Probe Wash	72.30 Mg	0.0207 Gr/SCF	1.01 Lbs/Hr
Filter	78.00 Mg	0.0224 Gr/SCF	1.09 Lbs/Hr
Totals	150.30 Mg	0.0431 Gr/SCF	2.11 Lbs/Hr

```
Enter restart point or RETURN to end: q7
q7) Run number: 3
q8) Time begin: 1757
q9)   Time end: 1940
q10) Enter averages for:  Stack Vel, Diff. Actual, Stack Temp, Meter Temp
      .08 .306 708.6 74.6
0.08 0.306 708.6 74.6
q11) Enter: Total sampling time, Barometric pressure, Stack pressure
      62.2 30.24 30.24
62.2 30.24 30.24
q12) Enter: Stack area, Nozzle dia., Final meter, Init. meter, Cond vol.(ml)
      7 .3053 977.005 957.602 39
7 0.3053 977.005 957.602 39
Has the lab work been completed? (Y/n)  Y
Enter   Scrubber   weights in milligrams
1507.7 2104.1
1507.7 2104.1 0 0 0
```

.3053

```
Enter restart point or RETURN to end: q5
q5) Date sampled: 4-6-83
q6) Weather conditions:
OVERCAST
q7) Run number: 4
q8) Time begin: 0912
q9)   Time end: 1127
q10) Enter averages for:  Stack Vel, Diff. Actual, Stack Temp, Meter Temp
     .068 .955 791.1 73.8
0.068 0.955 791.1 73.8
q11) Enter: Total sampling time, Barometric pressure, Stack pressure
     96 30.08 30.08
96 30.08 30.08
q12) Enter: Stack area, Nozzle dia., Final meter, Init. meter, Cond vol.(ml)
     7 .44 1026.776 977.2 125.5
7 0.44 1026.776 977.2 125.5
Has the lab work been completed? (Y/n)  Y
Enter   Scrubber   weights in milligrams
9977.1 2886.7
9977.1 2886.7 0 0 0
```

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft³)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
3			85.3	.04	.40	.40	784	69	233	42	3
4			86.0	.04	.40	.40	785	69	239	40	3
5			86.7	.07	.71	.71	801	69	243	40	4
6			87.7	.07	.71	.71	804	69	234	40	4
3-1			88.6	.05	.72	.72	781	70	237	42	4
2			89.6	.05	.72	.72	766	71	239	41	4
3			90.5	.05	.72	.72	781	71	233	42	4
4			91.5	.085	1.23	1.23	807	71	245	41	6
5			92.7	.085	1.23	1.23	814	71	253	40	6
6			93.9	.10	1.44	1.44	808	71	250	40	7
4-1			95.2	.10	1.44	1.44	781	72	242	46	7
2			96.5	.09	1.29	1.29	786	72	259	42	7
3			97.8	.12	1.73	1.73	807	72	257	42	9
4			99.2	.14	2.01	2.01	810	72	256	41	10
5			100.8	.16	2.3	2.3	816	73	261	42	12
6			2.5	.16	2.3	2.3	825	73	257	43	12
5-1			4.1	.07	1.0	1.0	762	74	260	57	5
2			4.9	.07	1.0	1.0	772	74	257	51	5
3			6.0	.055	.79	.79	761	74	239	45	4
4			7.0	.06	.86	.86	761	74	232	44	5
5			8.0	.085	1.23	1.23	785	74	241	43	6
6			9.3	.10	1.44	1.44	792	74	250	43	6
6-1			~~10.3~~ 10.6	.025	.36	.36	775	74	241	47	3
2			11.3	.03	.43	.43	778		237	46	4

Change Meter throughout nozzle in Calculations

SK

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ($"H_2O$)	Meter Orifice Press. Diff. ($"H_2O$)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
3			12.1	.03	.43	.43	785	76	231	44	4
4			12.9	.08	1.15	1.15	793	76	230	43	6
5			13.9	.08	1.15	1.15	807	76	233	42	6
6			15.0	.08	1.15	1.15	806	77	231	42	6
7-1			16.2	.035	.5	.5	784	79	226	45	4
2			17.0	.035	.50	.50	796	79	250	44	4
3			17.8	.035	.50	.50	789	79	255	43	4
4			18.7	.07	1.0	1.0	810	80	245	43	6
5			19.7	.07	1.0	1.6	807	81	246	43	6
6			20.7	.09	1.29	1.29	832	81	234	43	8
8-1			21.9	.02	.29	.29	763	82	232	45	4
2			22.6	.03	.43	.43	768	82	231	45	4
3			23.3	.025	.36	.36	770	82	242	45	4
4			23.9	.02	.29	.29	778	83	245	45	4
5			24.5	.09	1.15	1.15	817	84	247	44	7
6			25.7	.08	1.15	1.15	817	84	253	44	7

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GAINESVILLE, FLORIDA 32601
(904) 377-5822

#1

SK

SOURCE SAMPLING FIELD DATA SHEET

Plant Carolina Solite
Sampling Location #5 Inlet
Type of Control None
Type of Samples Part
Date 4-6-83 Run No. 5
Time Start 1229 Time End 1432
Sample Time 2 min/pt 96 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. ____ "Hg, Stack Press. ____ "Hg
Moisture 11 %, FDA ____, Gas Density Factor ____
Temp. 62 °F, W/D Var, W/S 3-5
Weather Pt Cldy Thermocouple Readout sb7
Sample Box No. Sb-1 Meter Box No. sb-1
Meter ΔH@ 1.74 Pitot Corr. Factor 0.84
Nozzle Dia. 7/16 in., Probe Length Std ft
Probe Heater Setting 5 Nomograph C_f 14.468
Stack Dimensions ____ in
Stack Area 7.0 ft^2
Effective Stack Area 7.0 ft^2
Stack Height ____ ft

Stack Dimensions

Umbilical Cord (100') 200'

Mat'l Processing Rate ____
Final Gas Meter Reading 81.091 ft^3
Initial Gas Meter Reading 27.102 ft^3
Condensate Increase in Impingers 113 ml
Moisture in Silica Gel 26.2 gm
Silica Gel Container No. 5 Filter No. ____

Orsat:				
$\%CO_2$				
$\%O_2$				
%CO				
$\%N_2$				

Test Conducted By: R Paul, R Barton
Stack Test Observers: ____

Leak Check Meter Box
Initial 0006 cfm @ 15 In H_2
Final 0.003 cfm @ 13 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. (Stable) Leak
Static 3 In H_2O for 15 sec. (Stable) Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
1-1			27.1	.08	1.16	1.16	822	85	243	69	5
2			28.3	.08	1.16	1.16	816	85	241	52	5
3			29.5	.08	1.16	1.16	816	85	237	47	5
4			30.7	.095	1.37	1.37	826	85	232	46	6
5			32.1	.12	1.74	1.74	830	85	239	46	7
6			33.5	.14	2.03	2.03	834	85	247	47	8
2-1			35.0	.05	.72	.72	800	85	251	61	4
2			36.0	.05	.72	.72	804	85	253	57	4

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ($"H_2O$)	Meter Orifice Press. Diff. ($"H_2O$)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
3			37.0	.07	1.01	1.01	806	86	262	52	5
4			38.2	.07	1.01	1.01	813	86	267	52	5
5			39.2	.085	1.23	1.23	823	87	261	51	6
6			40.5	.11	1.59	1.59	833	88	262	51	7
3-1			41.8	.065	.94	.94	800	91	266	57	5
2			42.9	.065	.94	.94	806	92	265	55	5
3			44.0	.06	.87	.87	808	93	267	54	5
4			45.0	.065	.94	.94	818	93	268	52	5
5			46.1	.07	1.01	1.01	818	94	269	51	6
6			47.3	.11	1.59	1.59	836	94	264	51	8
4-1			48.6	.11	1.59	1.59	801	95	269	56	6
2			50.0	.10	1.45	1.45	805	95	267	51	6
3			51.3	.10	1.45	1.45	806	95	262	50	6
4			52.7	.16	2.3	2.3	831	96	271	51	10
5			54.2	.17	2.45	2.45	840	96	269	52	13
6			56	.16	2.3	2.3	844	96	262	52	13
5-1			57.7	.06	.87	.87	772	96	242	71	4
2			58.7	.065	.94	.94	772	96	240	59	5
3			59.8	.065	.94	.94	770	96	234	54	5
4			60.9	.07	1.01	1.01	776	96	231	52	5
5			62.0	.07	1.01	1.01	779	96	236	51	5
6			63.1	.12	1.74	1.74	802	96	241	50	9
6-1			64.5	.03	.43	.43	759	95	244	57	3
2			65.3	.03	.43	.43	755	95	239	54	3

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Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ($"H_2O$)	Meter Orifice Press. Diff. ($"H_2O$)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
3			66.0	.05	.72	.72	748	95	231	52	5
4			66.9	.04	.57	.57	749	95	229	50	4
5			67.9	.04	.57	.57	752	95	234	51	4
6			68.7	.08	1.16	1.16	785	95	233	50	7
7-1			69.9	.03	.43	.43	754	97	239	54	4
2			70.6	.03	.43	.43	753	97	230	53	4
3			71.4	.03	.43	.43	742	97	231	51	4
4			72.1	.03	.43	.43	737	97	239	51	4
5			72.9	.03	.43	.43	746	97	240	51	4
6			73.7	.09	1.3	1.3	773	98	242	50	9
8-1			74.7	.06	.87	.87	778	100	248	54	5
2			75.8	.06	.87	.87	777	100	246	51	5
3			76.8	.06	.87	.87	773	100	241	50	5
4			77.9	.06	.87	.87	761	99	242	49	5
5			79.0	.065	.94	.94	777	98	243	49	7
6			80.0	.065	.94	.94	777	96	249	48	7

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#5

SK

SOURCE SAMPLING FIELD DATA SHEET

Plant Carolina Solite
Sampling Location #5 Kiln Scrubber Stack
Type of Control Scrubber + Cyclone
Type of Samples Particulate + other
Date 4-5-89 Run No. 3
Time Start 1806 Time End 1940
Sample Time 6 min/pt 72 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. 30.24 "Hg, Stack Press. ____ "Hg
Moisture ____ %, FDA ____, Gas Density Factor ____
Temp. 60 °F, W/D ____, W/S ____
Weather Cloudy Thermocouple Readout 77 F
Sample Box No. ____ Meter Box No. #2
Meter ΔH@ 1.55 Pitot Corr. Factor 0.84
Nozzle Dia. 7/16 in., Probe Length 4 ft
Probe Heater Setting ____ Nomograph C$_a$ 26.307
Stack Dimensions 36 1/2 in
Stack Area 7.27 ft^2
Effective Stack Area 7.27 ft^2
Stack Height ____ ft

Stack Dimensions

Umbilical Cord 100' (200')

Mat'l Processing Rate ____
Final Gas Meter Reading 407.360 ft^3
Initial Gas Meter Reading 347.000 ft^3
Condensate Increase in Impingers 90 ml 101.5
Moisture in Silica Gel 11.5 gm
Silica Gel Container No. 1 Filter No. 73

Orsat: %CO_2 ____
%O_2 ____
%CO ____
%N_2 ____

Test Conducted By: R. Sholtes
Ben Eddins

Stack Test Observers: ____

Leak Check Meter Box
Initial <.005 cfm @ 15 In H_2
Final 0.00 cfm @ 13.5 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. ~~Stable~~ Leak
Static 3 In H_2O for 15 sec. Stable Leak

2.12

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O) .072	Meter Orifice Press. Diff. ("H_2O) Calc.	Meter Orifice Press. Diff. ("H_2O) Actual	Stack Gas Temp. (°F) 110.3	Meter Temp. (°F) 67.5	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
1		0	347.000	.06	1.58	1.58	99	68	280	47	5
2		6	51.5	.07	1.84	1.84	103	65	290	44	6
3		12	57 ?	.13	3.4	3.4	107	63	272	47	13
4		18	62.5	.13	3.4	3.4	109	65	262	50	13
5		24	69.1	.13	3.4	3.4	112	67	246	52	13 1/2
6		30	75.8	.11	2.9	2.9	110	68	230	53	12

```
Enter restart point or RETURN to end: q7
q7) Run number: 5
q8) Time begin: 1229
q9)   Time end: 1432
q10) Enter averages for:  Stack Vel, Diff. Actual, Stack Temp, Meter Temp
     .071 1.08
791.7 93.4
0.071 1.08 791.7 93.4
q11) Enter: Total sampling time, Barometric pressure, Stack pressure
     96 30.08 30.08
96 30.08 30.08
q12) Enter: Stack area, Nozzle dia., Final meter, Init. meter, Cond vol.(ml)
     7 .44 81.091 27.102 139.2
7 0.44 81.091 27.102 139.2
Has the lab work been completed? (Y/n)  Y
Enter   Scrubber   weights in milligrams
13748.3 318
13748.3 318 0 0 0
```

SHOLTES AND KOOGLER ENVIRONMENTAL CONSULTANTS

Source Sampling Calculations

Plant: N. CAROLINA SOLITE AQUADALE, N.C. Date: 4-5-83
Stack: NO. 5 KILN INLET Run 1 from 1031-1309
Weather conditions: OVERCAST Pb= 30.24 In.Hg Ps= 30.23 In.Hg
As= 7 Sq.Ft. Ts= 678.5 Deg. F Tm= 78.9 Deg. F
H= 0.52 In.H2O Del H= 0.53 In.H2O An= 0.000352 Sq.Ft. Cp= 0.84
Vm= 37.675 cf Vc= 53.2 ml Total time: 96 Minutes

1.	Volume Water Vapor	2.506	SCF
2.	Gas Volume Sampled - STPD	37.356	SCFD
3.	Total Volume	39.862	SCF
4.	Moisture in Stack Gas - Volume Fraction	0.063	
5.	Dry Stack Gas - Volume Fraction	0.937	
6.	Molecular Weight of Stack Gas - Dry Basis	29	
7.	Molecular Weight of Stack Gas - Stack Conditions	28.31	
8.	Specific Gravity of Stack Gas Relative to Air	0.98	
9.	Excess Air - Percent		
10.	Average Stack Velocity	2580.4	FPM
11.	Average Stack Gas Flow Rate	18062	ACFM
12.	Actual Stack Gas Flow Rate Dry	16927	CFMD
13.	Stack Gas Flow Rate STPD	7932	SCFMD
14.	Percent Isokinetic	97.6	%

Probe Wash	5862.80 Mg	2.4169 Gr/SCF	164.69 Lbs/Hr
Filter	1269.00 Mg	0.5231 Gr/SCF	35.65 Lbs/Hr
Totals	7131.80 Mg	2.9400 Gr/SCF	200.33 Lbs/Hr

```
Enter restart point or RETURN to end: q5
q5) Date sampled: 4-6-83
q6) Weather conditions: CLOUDY RAIN
q7) Run number: 4
q8) Time begin: 0905
q9)   Time end: 1022
q10) Enter averages for:  Stack Vel, Diff. Actual, Stack Temp, Meter Temp
     .063 1.664 116.8 68.1
0.063 1.664 116.8 68.1
q11) Enter: Total sampling time, Barometric pressure, Stack pressure
     72 30.08 30.09
72 30.08 30.09
q12) Enter: Stack area, Nozzle dia., Final meter, Init. meter, Cond vol.(ml)
     7.27 .437 462.108 408 96.5
7.27 0.437 462.108 408 96.5
Has the lab work been completed? (Y/n)  Y
Enter   Scrubber   weights in milligrams
106 83.9
106 83.9 0 0 0
```

```
Enter restart point or RETURN to end: q7
q7) Run number: 5
q8) Time begin: 1301
q9)   Time end: 1434
q10) Enter averages for:  Stack Vel, Diff. Actual, Stack Temp, Meter Temp
     .063 1.664 97.8 83.4
0.063 1.664 97.8 83.4
q11) Enter: Total sampling time, Barometric pressure, Stack pressure
     72 30.08 30.09
72 30.08 30.09
q12) Enter: Stack area, Nozzle dia., Final meter, Init. meter, Cond vol.(ml)
     7.27 .437 521.422 466.67 97.5
7.27 0.437 521.422 466.67 97.5
Has the lab work been completed? (Y/n)  Y
Enter   Scrubber   weights in milligrams
72.3 78
72.3 78 0 0 0
```

FIELD AND LAB DATA SHEETS

SHOLTES & KOOGLER
ENVIRONMENTAL CONSULTANTS, INC.
GAINESVILLE, FLORIDA 32601
(904) 377-5822

#2

SK

SOURCE SAMPLING FIELD DATA SHEET

Plant Carolina Solite
Sampling Location #5 Inlet
Type of Control None
Type of Samples Part
Date 4-5-83 Run No. 3
Time Start 1757 Time End 1940
Sample Time 2 min/pt 96 min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. ____ "Hg, Stack Press. ____ "Hg
Moisture 8 %, FDA ____, Gas Density Factor ____
Temp. 62 °F, W/D Var., W/S 2-3
Weather Overcast Thermocouple Reading ____
Sample Box No. Sb-1 Meter Box No. Sb-1
Meter ΔH@ 1.74 Pitot Corr. Factor 0.84
Nozzle Dia. 5/16 in., Probe Length Std ft
Probe Heater Setting 4 Nomograph C_f 3.72
Stack Dimensions ____ in
Stack Area 7.0 ft^2
Effective Stack Area 7.0 ft^2
Stack Height ____ ft

Stack Dimensions

Umbilical Cord (100') 200'

Mat'l Processing Rate ____
Final Gas Meter Reading 977.005 ft^3
Initial Gas Meter Reading 957.602 ft^3
Condensate Increase in Impingers 34 ml
Moisture in Silica Gel 5.0 gm
Silica Gel Container No. 28 Filter No. ____

Orsat: %CO_2 ____
%O_2 ____
%CO ____
%N_2 ____

Test Conducted By: R Paul
R Barton

Stack Test Observers: ____

Leak Check Meter Box: Initial 0.012 cfm @ 15 In H_2
Final 0.0 cfm @ 5 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec (Stable) Leak
Static 3 In H_2O for 15 sec (Stable) Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
1-1			57.6	.07	.26	.26	748	74	257	67	2
2			58.1	.07	.26	.26	729	74	261	61	2
3			58.8	.08	.29	.29	718	74	252	57	3
4			59.4	.08	.29	.29	733	74	244	56	3
5			60.1	.11	.41	.41	741	74	241	55	3
6			60.8	.12	.45	.45	748	74	249	53	3
2-1			61.6	.04	.05	.15	695	74	253	60	2
2			62.1	.04	.15	.15	696	74	255	59	2

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
3			62.5	.04	.15	.15	696	74	255	59	2
4			63.0	.06	.22	.22	705	74	268	58	3
5			63.5	.10	.37	.37	720	74	247	57	3
6			64.0	.10	.37	.37	729	74	236	56	3
3-1			64.8	.05	.19	.19	674	75	237	59	2
2			65.3	.05	.19	.19	669	75	241	59	2
3			65.8	.05	.19	.19	672	75	247	59	2
4			66.3	.07	.26	.26	698	75	257	60	3
5			66.9	.11	.41	.41	710	75	249	60	3
6			67.5	.11	.41	.41	721	75	252	60	3
4-1			68.3	.05	.19	.19	672	75	239	61	2
2			68.8	.06	.22	.22	661	75	243	60	3
3			69.4	.07	.26	.26	666	75	249	60	3
4			69.0	.09	.33	.33	674	75	253	59	3
5			70.6	.11	.41	.41	688	75	259	57	3
6			71.1	.12	.45	.45	695	75	261	55	3
5-1			72.0	.10	.37	.37	711	75	266	69	3
2			72.8	.10	.37	.37	717	75	256	67	3
3			73.5	.09	.33	.33	732	75	251	64	4
4			74.1	.11	.41	.41	750	75	249	64	4
5			74.9	.11	.41	.41	754	75	250	62	4
6			75.6	.11	.41	.41	750	75	254	61	4
6-1			76.3	.08	.30	.30	701	75	251	65	3
2											

SK

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					

SK

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#1

SOURCE SAMPLING FIELD DATA SHEET

Plant Carolina Sqlite
Sampling Location #5 Inlet
Type of Control None
Type of Samples Part
Date 4-6-83 Run No. 4
Time Start 0917 Time End 1127
Sample Time 2 min/pt 96 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. ____ "Hg, Stack Press. ____ "Hg
Moisture 10 %, FDA ____, Gas Density Factor ____
Temp. 57 °F, W/D Calm, W/S ____
Weather Overcast Thermocouple Readout Sb-1
Sample Box No. Sb-1 Meter Box No. Sb1
Meter ΔH@ 1.74 Pitot Corr. Factor 0.84
Nozzle Dia. 7/16 in., Probe Length Stnl ft
Probe Heater Setting 6 Nomograph C_f .1007 14.41
Stack Dimensions ____ in
Stack Area 7.0 ft^2
Effective Stack Area 7.0 ft^2
Stack Height ____ ft

Stack Dimensions

Umbilical Cord (100') 200'

Mat'l Processing Rate ____
Final Gas Meter Reading 1026.776 ft^3
Initial Gas Meter Reading 977.200 ft^3 49.576
Condensate Increase in Impingers 117 ml
Moisture in Silica Gel 8.5 gm
Silica Gel Container No. 11 Filter No. ____

Orsat:

$\%CO_2$				
$\%O_2$				
%CO				
$\%N_2$				

Test Conducted By: R Paul
R Baston

Stack Test Observers: ____

Leak Check Meter Box
Initial 8617 cfm @ 15 In H_2
Final 8.208 cfm @ 12 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. (Stable) Leak
Static 3 In H_2O for 15 sec. (Stable) Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
1-1			77.3	.07	.71	.71	789	66	231	69	3
2			78.2	.07	.71	.71	787	66	233	52	3
3			79.1	.08	.81	.81	782	66	241	42	4
4			80.1	.10	1.0	1.0	790	66	251	41	4
5			81.2	.15	1.51	1.51	797	67	~~503~~	40	5
6			82.6	.15	1.51	1.51	803	67	245	40	5
2-1			83.9	.04	.40	.40	751	68	240	46	3
2			84.6	.04	.40	.40	766	69	237	43	3

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
3			85.3	.04	.40	.40	784	69	233	42	3
4			86.6	.04	.40	.40	785	69	239	40	3
5			86.7	.07	.71	.71	801	69	243	40	4
6			87.7	.07	.71	.71	804	69	234	40	4
3-1			88.6	.05	.72	.72	781	70	231	42	4
2			89.6	.05	.72	.72	766	71	236	41	4
3			90.5	.05	.72	.72	781	71	233	42	6
4			91.5	.085	1.23	1.23	807	71	245	41	6
5			92.7	.085	1.23	1.23	814	71	253	40	6
6			93.9	.10	1.44	1.44	808	71	250	40	7
4-1			95.2	.10	1.44	1.44	781	72	242	46	7
2			96.5	.09	1.29	1.29	786	72	259	42	7
3			97.8	.12	1.73	1.73	807	72	257	42	9
4			99.2	.14	2.01	2.01	810	72	256	41	10
5			100.8	.16	2.3	2.3	816	73	260	42	12
6			2.5	.16	2.3	2.3	825	73	257	43	12
5-1			4.1	.07	1.0	1.0	762	74	260	57	5
2			4.9	.07	1.0	1.0	772	74	257	51	5
3			6.0	.055	.79	.79	761	74	239	45	4
4			7.0	.06	.86	.86	761	74	232	44	5
5			8.0	.085	1.23	1.23	785	74	241	43	6
6			9.3	.10	1.44	1.44	792	74	250	43	6
6-1			~~8.3~~ 10.6	.025	.36	.36	775	74	24[illegible]	47	3
2			11.3	.03	.43	.43	778		237	46	4

Many more errors made in Calculations

SK

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ($"H_2O$)	Meter Orifice Press. Diff. ($"H_2O$)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
3			12.1	.03	.43	.43	785	76	231	44	4
4			12.9	.08	1.15	1.15	793	76	230	43	6
5			13.9	.08	1.15	1.15	807	76	233	40	6
6			15.0	.08	1.15	1.15	806	77	231	42	6
7-1			16.2	.035	.5	.5	784	79	226	45	4
2			17.0	.035	.50	.50	796	79	250	40	4
3			17.8	.035	.50	.50	789	79	255	43	4
4			18.7	.07	1.0	1.0	810	80	245	43	6
5			19.7	.07	1.0	1.0	807	81	240	43	6
6			20.7	.09	1.29	1.29	832	81	234	43	8
8-1			21.9	.02	.29	.29	763	82	232	45	4
2			22.6	.03	.43	.43	768	82	231	45	4
3			23.3	.025	.36	.36	770	82	242	45	4
4			23.9	.02	.29	.29	778	83	245	45	4
5			24.5	.08	1.15	1.15	817	84	247	44	7
6			25.7	.08	1.15	1.15	817	84	253	44	7

SK

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GAINESVILLE, FLORIDA 32601
(904) 377-5822

#1

SOURCE SAMPLING FIELD DATA SHEET

Plant Carolina Solite
Sampling Location #5 Outlet
Type of Control None
Type of Samples Part
Date 4-6-83 Run No. 5
Time Start 1229 Time End 1432
Sample Time 2 min/pt 96 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. ____ "Hg, Stack Press. ____ "Hg
Moisture 11 %, FDA ____, Gas Density Factor ____
Temp. 62 °F, W/D Var, W/S 3-5
Weather Pt Cldy Thermocouple Readout Sk 7
Sample Box No. Sb-1 Meter Box No. Sk-1
Meter ΔH@ 1.74 Pitot Corr. Factor 0.84
Nozzle Dia. 7/16 in., Probe Length Std ft
Probe Heater Setting 5 Nomograph C_f 14.468
Stack Dimensions ____ in
Stack Area 7.0 ft^2
Effective Stack Area 7.0 ft^2
Stack Height ____ ft

Stack Dimensions

Umbilical Cord (100') 200'

Mat'l Processing Rate ____
Final Gas Meter Reading 84.097 ft^3
Initial Gas Meter Reading 27.102 ft^3
Condensate Increase in Impingers 113 ml
Moisture in Silica Gel 26.5 gm
Silica Gel Container No. 5 Filter No. ____

Orsat:				
$\%CO_2$				
$\%O_2$				
%CO				
$\%N_2$				

Test Conducted By: R Paul, R Barton
Stack Test Observers: ____

Leak Check Meter Box: Initial 0.006 cfm @ 15 In H_2, Final 0.003 cfm @ 13 In Hg
Pitot Tubes: Impact 3 In H_2O for 15 sec. (Stable) Leak; Static 3 In H_2O for 15 sec. (Stable), Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
1-1			27.1	.08	1.16	1.16	822	85	243	69	5
2			28.3	.08	1.16	1.16	816	85	241	52	5
3			29.5	.08	1.16	1.16	816	85	237	47	5
4			30.7	.095	1.37	1.37	826	85	232	46	6
5			32.1	.12	1.74	1.74	830	85	239	46	7
6			33.5	.14	2.03	2.03	834	85	247	47	8
2-1			35.0	.05	.72	.72	800	85	251	61	4
2			36.0	.05	.72	.72	804	85	253	57	4

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ($"H_2O$)	Meter Orifice Press. Diff. ($"H_2O$)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
3			37.0	.07	1.01	1.01	806	86	262	52	5
4			38.2	.07	1.01	1.01	813	86	267	52	5
5			39.2	.085	1.23	1.23	823	87	261	51	6
6			40.5	.11	1.59	1.59	833	88	262	51	7
3-1			41.8	.065	.94	.94	800	91	266	57	5
2			42.9	.065	.94	.94	806	92	265	55	5
3			44.0	.06	.87	.87	808	93	267	54	5
4			45.0	.065	.94	.94	818	93	268	52	5
5			46.1	.07	1.01	1.01	818	94	269	51	6
6			47.3	.11	1.59	1.59	836	94	264	51	8
4-1			48.6	.11	1.59	1.59	801	95	269	56	6
2			50.0	.10	1.45	1.45	805	95	267	51	6
3			51.3	.10	1.45	1.45	806	95	262	50	6
4			52.7	.16	2.3	2.3	831	96	271	51	10
5			54.2	.17	2.45	2.45	840	96	269	52	13
6			56	.16	2.3	2.3	844	96	262	52	13
5-1			57.7	.06	.87	.87	772	96	242	71	4
2			58.7	.065	.94	.94	772	96	240	59	5
3			59.8	.065	.94	.94	770	96	234	54	5
4			60.9	.07	1.01	1.01	776	96	231	52	5
5			62.0	.07	1.01	1.01	779	96	236	51	5
6			63.1	.12	1.74	1.74	802	96	241	50	9
6-1			64.5	.03	.43	.43	759	95	244	57	3
2			65.3	.03	.43	.43	755	95	239	54	3

SK

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
3			66.0	.05	.72	.72	748	95	231	52	5
4			66.9	.04	.57	.57	749	95	229	50	4
5			67.9	.04	.57	.57	752	95	234	51	4
6			68.7	.08	1.16	1.16	785	95	233	50	7
7-1			69.9	.03	.43	.43	754	97	239	54	4
2			70.6	.03	.43	.43	753	97	230	53	4
3			71.4	.03	.43	.43	742	97	231	51	4
4			72.1	.03	.43	.43	734	97	239	51	4
5			72.9	.03	.43	.43	746	97	240	51	4
6			73.7	.09	1.3	1.3	773	98	242	50	9
8-1			74.7	.06	.87	.87	778	100	248	54	5
2			75.8	.06	.87	.87	777	100	246	51	5
3			76.8	.06	.87	.87	773	100	241	50	5
4			77.9	.06	.87	.87	761	99	242	49	5
5			79.0	.065	.94	.94	777	98	243	49	7
6			80.0	.065	.94	.94	777	96	249	49	7

SHOLTES & KOOGLER
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(904) 377-5822

#5

SK

SOURCE SAMPLING FIELD DATA SHEET

Plant Carolina Solite
Sampling Location #5 Kiln Scrubber Stack
Type of Control Scrubber + Cyclone
Type of Samples Particulate + other
Date 4-5-89 Run No. 3
Time Start 1806 Time End 1940
Sample Time 6 min/pt 72 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. 30.24 "Hg, Stack Press. ____ "Hg
Moisture ____ %, FDA ____, Gas Density Factor ____
Temp. 60 °F, W/D ____, W/S ____
Weather Cloudy Thermocouple Readout 77 F
Sample Box No. ____ Meter Box No. #2
Meter ΔH@ 1.55 Pitot Corr. Factor 0.84
Nozzle Dia. 7/16 in., Probe Length 4 ft
Probe Heater Setting ____ Nomograph C_a 26.307
Stack Dimensions 36 1/2 in
Stack Area 7.27 ft²
Effective Stack Area 7.27 ft²
Stack Height ____ ft

Stack Dimensions

Umbilical Cord 100' (200')

Mat'l Processing Rate ____
Final Gas Meter Reading 407.360 ft³
Initial Gas Meter Reading 347.000 ft³
Condensate Increase in Impingers 90 ml 101.5
Moisture in Silica Gel 11.5 gm
Silica Gel Container No. 1 Filter No. 73
Orsat: %CO_2 ____
%O_2 ____
%CO ____
%N_2 ____

Test Conducted By: R. Sholtes
Ben Eddins
Stack Test Observers: ____

Leak Check Meter Box
Initial <.005 cfm @ 15 In H_2
Final 0.100 cfm @ 13.5 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. Stable Leak
Static 3 In H_2O for 15 sec. Stable Leak

2.12

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O) .072	Meter Orifice Press. Diff. ("H_2O) Calc.	Meter Orifice Press. Diff. ("H_2O) Actual	Stack Gas Temp. (°F) 110.2	Meter Temp. (°F) 67.5	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
1		0	347.000	.06	1.58	1.58	99	68	280	47	5
2		6	51.5	.07	1.84	1.84	103	65	290	44	6
3		12	57 ?	.13	3.4	3.4	107	63	272	47	13
4		18	62.5	.13	3.4	3.4	109	65	262	50	13
5		24	69.1	.13	3.4	3.4	112	67	246	52	13 1/2
6		30.	75.8	.11	2.9	2.9	110	68	230	53	12

Carolina Solite 4-5-83 Run 3 outlet

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ($"H_2O$)	Meter Orifice Press. Diff. ($"H_2O$)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
1		0	81.6	.04	1.05	1.05	110	68	250	52	4
2		6	85.2	.06	1.58	1.58	115	68	235	50	6
3		12	—	.07	1.84	1.84	112	69	240	49	7 1/2
4		18	94.4	.07	1.84	1.84	115	69	238	50	7 1/2
5		24	99.2	.06	1.58	1.58	116	70	253	50	7
6		30	03.8	.04	1.05	1.05	114	70	247	52	5
			final	meter	= 407.360						

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#5

SOURCE SAMPLING FIELD DATA SHEET

Plant Carolina Solite
Sampling Location #5 Kiln Stack
Type of Control Cyclones - Scrubber
Type of Samples Particulate + other
Date 4-6-83 Run No. 4
Time Start 0905 Time End 1022
Sample Time 6 min/pt 72 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. 30.08 "Hg, Stack Press. ____ "Hg
Moisture ____ %, FDA ____, Gas Density Factor ____
Temp. 68 °F, W/D ____, W/S ____
Weather Cloudy-Rain Thermocouple Readout ____
Sample Box No. ____ Meter Box No. #2
Meter ΔH@ 1.55 Pitot Corr. Factor ____
Nozzle Dia. 7/16 in., Probe Length 4 ft
Probe Heater Setting ____ Nomograph C_p 26.307
Stack Dimensions 36 1/2" in
Stack Area 7.27 ft^2
Effective Stack Area 7.27 ft^2
Stack Height ____ ft

Stack Dimensions

Umbilical Cord 100' (200')

Mat'l Processing Rate ____
Final Gas Meter Reading 462.108 ft^3
Initial Gas Meter Reading 408.000 ft^3
Condensate Increase in Impingers 90 ml
Moisture in Silica Gel 6.5 gm
Silica Gel Container No. 42 Filter No. 75

290
200
90

Orsat:				
$\%CO_2$				
$\%O_2$				
%CO				
$\%N_2$				

Test Conducted By: R. Sholtes
Ben Eddins

Stack Test Observers: ____

Leak Check Meter Box
Initial 0.016 cfm @ 15 In H_2
Final 0.00 cfm @ 7 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. (Stable) Leak
Static 3 In H_2O for 15 sec. (Stable) Leak

1.66 1

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O) .003	Meter Orifice Press. Diff. ("H_2O) Calc.	Meter Orifice Press. Diff. ("H_2O) Actual	Stack Gas Temp. (°F) 116.3	Meter Temp. (°F) 60.1	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
1		0	408.000	.06	1.58	1.58	121	61	255	60	4
2		6	12.4	.07	1.84	1.84	118	62	280	57	5
3		12	17.1	.07	1.84	1.84	117	63	253	53	5
4		18	—	.07	1.84	1.84	115	65	270	53	5
5		24	26.7	.06	1.58	1.58	114	66	233	54	5
6		30	30.8	.04	1.05	1.05	116*	69	250*	54*	4

* Thermocouple Readout Faulty

Run 4 Carolina Solite
Outlet Stack
4-6-85

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
1		0	34.5	.06	1.58	1.58	115	70	270	55	4½
2		6	–	.07	1.84	1.84	118	71	255	55	5½
3		12	–	.08	2.1	2.1	*	71	*	*	7
4		18	48.8	.07	1.84	1.84	|	72	|	|	6+
5		24	53.3	.06	1.58	1.58	|	73	|	|	5
6		30	57.9	.05	1.31	1.3	|	74	|	|	4½
			7 min units =		46	2.108					

* Thermocouple judged unreliable

SK

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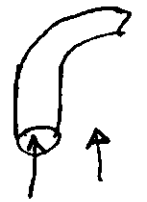
#5

SOURCE SAMPLING FIELD DATA SHEET

Plant Carolina Solite
Sampling Location #5 Kiln Stack
Type of Control Cyclones - Scrubber
Type of Samples Particulate + other
Date 4-6-83 Run No. 5
Time Start 1301 Time End 1434
Sample Time 6 min/pt 72 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. 30.08 "Hg, Stack Press. ____ "Hg
Moisture ____ %, FDA ____, Gas Density Factor ____
Temp. 72 °F, W/D ____, W/S ____
Weather Clearing Thermocouple Readout Bad
Sample Box No. ____ Meter Box No. # 2
Meter ΔH@ 1.55 Pitot Corr. Factor ____
Nozzle Dia. 7/16 in., Probe Length 4 ft
Probe Heater Setting ____ Nomograph C_f 26.307
Stack Dimensions 36½" in
Stack Area 7.27 ft^2
Effective Stack Area 7.27 ft^2
Stack Height ____ ft



Stack Dimensions

Umbilical Cord 100' (200')

Mat'l Processing Rate ____
Final Gas Meter Reading 521.422 ft^3
Initial Gas Meter Reading 466.670 ft^3
Condensate Increase in Impingers 85 ml
Moisture in Silica Gel 12.5 gm
Silica Gel Container No. 18 Filter No. 74

185
200
85
12.5

Orsat:				
%CO_2				
%O_2				
%CO				
%N_2				

Test Conducted By: R. Sholtes
Ben Eddins

Stack Test Observers: ____

Leak Check Meter Box
Initial 0.018 cfm @ 15 In H_2
Final 0.00 cfm @ 7 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. ~~Stable~~ Leak
Static 3 In H_2O for 15 sec. Stable Leak

1.6.84

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O) .063	Meter Orifice Press. Diff. ("H_2O) Calc.	Meter Orifice Press. Diff. ("H_2O) Actual	Stack Gas Temp. (°F) 97.8	Meter Temp. (°F) 234	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
1		0	66.6	.06	1.58	1.58	100	280	78	60	5
2		6	71.2	.07	1.84	1.84	98	270	78	54	6
3		12	76.4	.08	2.10	2.10	102	235	79	60	7
4		18	81.0	.07	1.84	1.84	98	233	80	65	6½
5		24	86.0	.05	1.31	131	101	225	82	65	5
6		30	89.9	.04	1.05	1.05	98	238	83	58	4

Run 2
Carolina Solite
Outlet
4-6-83

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Meter Temp. (°F)	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
1		0	93.5	.06	1.58	1.58	101	84	225	61	5½
2		6	98.1	.07	1.84	1.84	98	85	252	60	6½
3		12	02.4	.07	1.84	1.84	95	86	240	64	7
4		18	07.7	.07	1.84	1.84	93	87	225	64	7
5		24	12.4	.07	1.84	1.84	94	89	255	64	7
6		30	17.2	.05	1.31	1.31	95	90	240	64	5½
				final	Meter		521	.422			

SK

SHOLTES & KOOGLER, ENVIRONMENTAL CONSULTANTS

PARTICULATE LAB DATA SHEET

OUTLET

Date 4-5-83 Project No. N. CAROLINA SOLITE

PROBE WASH

	Run 3	Run 4	Run 5	Blank
Container No.	SK-1	SK-24	SK-38	SK-18
Total Volume (ml)	240	250	240	100
Aliquot Evaporated (ml)	240	250	240	100
Final Weight (g)	93.0397	93.9530	99.2010	93.7194
Tare Weight (g)	-92.7835	-93.8470	-99.1287	-93.7188
Gross Weight Gained (g)	.2562	.1060	.0723	.0006
Average Blank (g)	-	-	-	-
Net Weight (g)				
Aliquot Factor	x 1.0	x 1.0	x 1.0	x 1.0
Total Net Weight (mg)	256.2	106.0	72.3	0.6
Container No.	3F	1J	3J	
Filter No.	73	75	74	
Final Weight (g)	.5161	.4896	.4812	
Tare Weight (g)	-.4034	-.4057	-.4032	-
Gross Weight Gained (g)	.1127	.0839	.0780	
Average Blank	-	-	-	-
Total Net Weight (mg)	112.7	83.9	78.0	

Balance Check

0 0.0 JH 50g 50.0000 JH

10g 10.0000 JH 100g 100.0000 JH

0.5g 0.5000 JH

Analyzed by: JH

SHOLTES & KOOGLER

SHOLTES & KOOGLER, ENVIRONMENTAL CONSULTANTS

PARTICULATE LAB DATA SHEET

INLET

Date 4-5-83 Project No. N. CAROLINA SOLITE PROBE WASH

	Run 3	Run 4	Run 5	Blank
Container No.	SK-47	SK-10	SK-43	SK-41
Total Volume (ml)	240	250	260	100
Aliquot Evaporated (ml)	240	250	260	100
Final Weight (g)	98.8088	99.0559	112.9468	93.8478
Tare Weight (g)	-97.3006	-89.0788	-99.1985	-93.8475
Gross Weight Gained (g)	1.5077	9.9771	13.7483	.0003
Average Blank (g)	-	-	-	-
Net Weight (g)				
Aliquot Factor	x 1.0	x 1.0	x 1.0	x 1.0
Total Net Weight (mg)	1,507.7	9,977.1	13,748.3	0.3
	RUN 3	RUN 4		RUN 5
Container No.	3A	(1C + 2C)		3C
Filter No.	122	123	124	125
Final Weight (g)	2.5159	3.0802	.6304	.7328
Tare Weight (g)	-.4118	-.4111	-.4128	-.4148
Gross Weight Gained (g)	2.1041	2.6691	.2176	.3180
Average Blank	-	+.2176 ←	-	-
Total Net Weight (mg)	2,104.1	2,886.7		* 318.0

Balance Check

0 0.0 KK 50g 50.0000 KK

10g 10.0000 KK 100g 100.0000 KK

0.5g 0.5000 KK

Analyzed by: KK

* NOTE: EXCESS SAMPLE BUILDUP ON FILTER WAS PLACED IN WITH PROBE WASH.

SHOLTES & KOOGLER

April 21, 1983
File: 107-80-17

Sholtes & Koogler
Environmental Consultants
1213 N.W. 6th Street
Gainesville, Florida 32601

Attention: Mr. George Allen

RESULTS OF ANALYSIS

Samples received: 4/13/83

Lab ID No.	Sample Designation	Chloride (mg/l)
C4158	Blank (0.1N NaOH)	2.7
~~C4159~~	~~Impinger Run 3, Inlet~~	~~110~~ void
C4160	Impinger Run 3, Outlet	469
C4161	Impinger Run 4, Inlet	1960
C4162	Impinger Run 4, Outlet	928
C4163	Impinger Run 5, Inlet	2401
C4164	Impinger Run 5, Outlet	890

Katherine M. White

Katherine M. White for
Jennet K. Burí
Associate Chemist

/mgm

Breedlove Associates Inc.
Environmental Consultants

618 Northwest 13th Avenue/Gainesville, Florida 32601/(904) 377-5830

April 21, 1983
File: 107-80-17

Sholtes & Koogler
Environmental Consultants
1213 N.W. 6th Street
Gainesville, Florida 32601

Attention: Mr. George Allen

RESULTS OF ANALYSIS

Samples received: 4/13/83

Lab ID No.	Sample Designation	Total Chromium (µg)	Total Lead (µg)
C4165	Run 3, Inlet	6614	434
C4166	Run 3, Outlet	1917	274
C4167	Run 4, Inlet	6614	1713
C4168	Run 4, Outlet	588	202
C4169	Run 5, Inlet	5346	1261
C4170	Run 5, Outlet	402	101
C4171	Blank filter	2.2	6.0

Katherine M. White

Katherine M. White for
Jennet K. Buri
Associate Chemist

/mgm

Breedlove Associates Inc.
Environmental Consultants

618 Northwest 13th Avenue/Gainesville, Florida 32601/(904) 377-5830

SAMPLING RATE CALCULATIONS

S & K NOMOGRAPH

ΔH = ORIFICE READING (INCHES H_2O)
D_N = NOZZLE DIA. (INCHES)
$\Delta H@$ = METER BOX CONSTANT
B_W = MOISTURE FRACTION
T_M = METER TEMP (°F)
T_S = STACK TEMP (°F)
M_S = WET MOLECULAR WEIGHT OF STACK GAS (FROM TABLE)
ΔP = PITOT READING (INCHES H_2O

$$\left[\frac{T_M + 460}{M_S(T_S + 460)}(1 - B_W)^2 \Delta H@ (D_n)^4\ 17741\right]\Delta P = \Delta H$$

.2 — .7

MOISTURE FRACTION	M_S
0.0	29.0
0.05	28.5
0.10	27.9
0.15	27.4
0.20	26.8
0.25	26.2
0.30	25.7
0.35	25.2
0.40	24.6

$\frac{540}{28.2(1160)}$ 32712

$\frac{540}{27.0(595)}$ 135 179
16065 80 0.

$\frac{540}{28.2(1135)}$ 32007

$\frac{534}{27.8(580)}$ 16124

$\frac{530}{28.1(1160)}$ 32596

	RUN 1	Bobs	me	RUN 2 Bob	RUN 3 m
$\frac{T_M + 460}{M_S(T_S + 460)}$ =	0.01165	0.0336	0.01687	0.033	0.01626
$\times (1 - B_W)^2$ =	0.8649	0.6889	0.8649	0.7921	0.8464
$\times \Delta H@$ =	1.74	1.55	1.74	1.55	1.74
$\times (D_n)^4$ =	0.004162	0.0083 76	0.00869	0.0366	0.00876
$\times$ 17741 =	17741	17741	17741	17741	17741
$\times \Delta P$ =	1.833	5.1283	3.9459	26307	3.72

SAMPLING RATE CALCULATIONS

S & K NOMOGRAPH

ΔH = ORIFICE READING (INCHES H_2O)
D_N = NOZZLE DIA. (INCHES)
$\Delta H@$ = METER BOX CONSTANT
B_W = MOISTURE FRACTION
T_M = METER TEMP (°F)
T_S = STACK TEMP (°F)
M_S = WET MOLECULAR WEIGHT OF STACK GAS (FROM TABLE)
ΔP = PITOT READING (INCHES H_2O

$$\left[\frac{T_M + 460}{M_S(T_S + 460)}(1 - B_W)^2 \Delta H@ (D_n)^4 \, 17741\right]\Delta P = \Delta H$$

.05-.15

MOISTURE FRACTION	M_S
0.0	29.0
0.05	28.5
0.10	27.9
0.15	27.4
0.20	26.8
0.25	26.2
0.30	25.7
0.35	25.2
0.40	24.6

$\frac{530}{27.9(1235)}$ 34456.5

$\frac{553}{27.8(1260)}$ 35028

TS 775
109/120

	RUN 1		RUN 2		RUN 3
$\frac{T_M + 460}{M_S(T_S + 460)}$ =	.01538	———	0.01578	———	———
× $(1 - B_W)^2$ =	0.81	———	0.792	———	———
× $\Delta H@$ =	1.74	———	1.74	———	———
× $(D_n)^4$ =	~~0.03748~~ 0.03748	———	0.03748	———	———
× 17741 =	17741	17741	17741	17741	17741
× ΔP =	10.076	———	14.468	———	———

SAMPLING RATE CALCULATIONS

S & K NOMOGRAPH

ΔH = ORIFICE READING (INCHES H_2O)
D_N = NOZZLE DIA. (INCHES)
$\Delta H@$ = METER BOX CONSTANT
B_W = MOISTURE FRACTION
T_M = METER TEMP (°F)
T_S = STACK TEMP (°F)
M_S = WET MOLECULAR WEIGHT OF STACK GAS (FROM TABLE)
ΔP = PITOT READING (INCHES H_2O)

$$\left[\frac{T_M + 460}{M_S(T_S + 460)} (1 - B_W)^2 \, \Delta H@ \, (D_n)^4 \, 17741\right] \Delta P = \Delta H$$

TS 129 3/8

.3 - .35

5130 / 27.6 (589) 16256.4

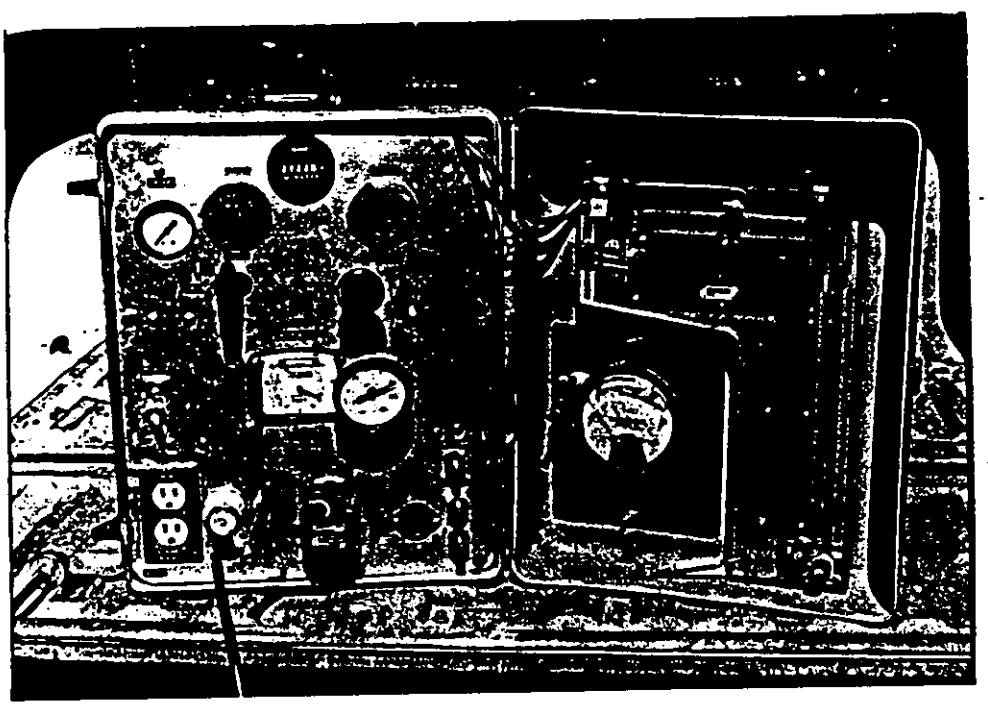
MOISTURE FRACTION	M_S
0.0	29.0
0.05	28.5
0.10	27.9
0.15	27.4
0.20	26.8
0.25	26.2
0.30	25.7
0.35	25.2
0.40	24.6

	RUN 1	RUN 2	RUN 3
$\frac{T_M + 460}{M_S(T_S + 460)}$ =	0.0326		
× $(1 - B_W)^2$ =	0.7744		
× $\Delta H@$ =	1.55		
× $(D_n)^4$ =	3/8 .009987	5/16 .008100	
× 17741 =	1774/	5.622	
× ΔP =	13.87		

CALIBRATIONS AND PROJECT PARTICIPANTS

SHOLTES & KOOGLER
ENVIRONMENTAL CONSULTANTS, INC.

SOURCE SAMPLING EQUIPMENT



S.K.E.C. Meter Box

Equipment used in Source Sampling is either manufactured by or assembled by SKEC. The guidelines followed are A.P.T.D. 0581, Details of Isokinetic Source Sampling Equipment, and A.P.T.D. 0576, Maintenance, Calibration and Operation of Isokinetic Source Sampling Equipment.

Nozzle #1

NOZZLE CALIBRATION

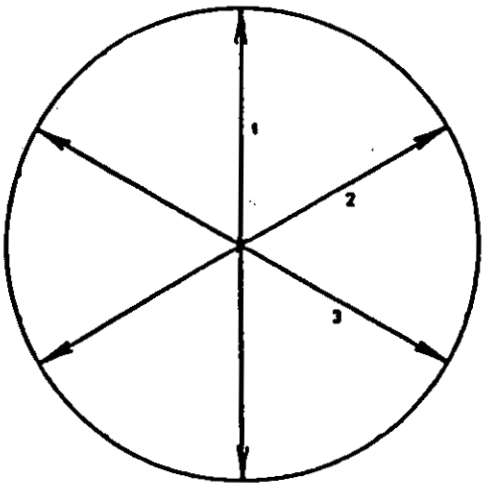
Nozzle 7/16 Date 4-5-83

Measurement No.	Inside Diameter (inches)
1	.439
2	.441
3	.440

Average 0.440

Area of Nozzle _____ Ft^2

Calibrated by: R Paul



Nozzle X-section

Nozzle #2

NOZZLE CALIBRATION

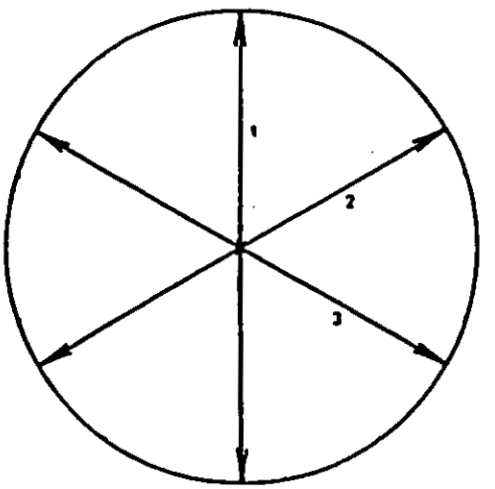
Nozzle 5/16 Date 4-5-83

Measurement No.	Inside Diameter (inches)
1	.306
2	.304
3	.306

Average 0.3053

Area of Nozzle _____ Ft^2

Calibrated by: _____



Nozzle X-section

Nozzle #3

NOZZLE CALIBRATION

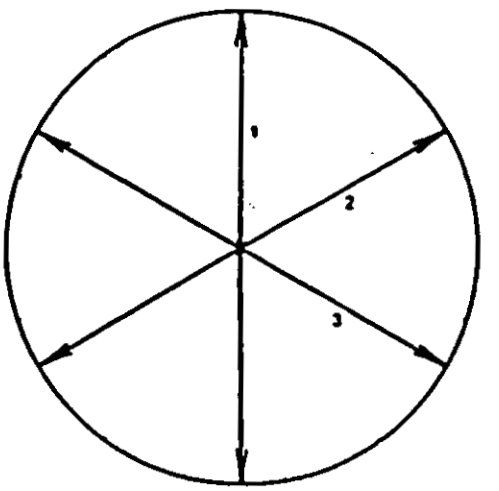
Nozzle 1/4 Date 4-5-83

Measurement No.	Inside Diameter (inches)
1	0.254
2	0.253
3	0.255

Average 0.254

Area of Nozzle _____ Ft^2

Calibrated by: RC Paul



Nozzle X-section

#4

NOZZLE CALIBRATION

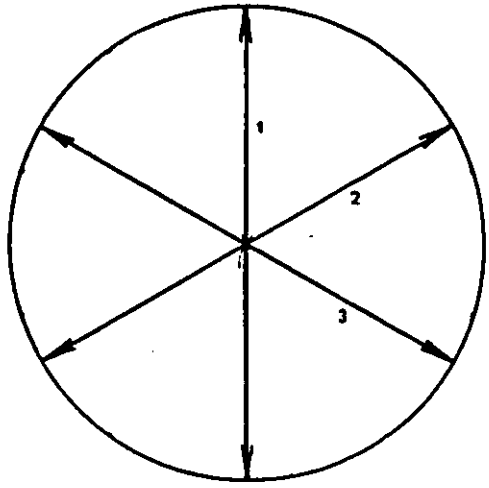
Nozzle 5/16 Date 4-5-83

Measurement No.	Inside Diameter (inches)
1	.307
2	.307
3	.307

Average .307

Area of Nozzle _____ Ft^2

Calibrated by: R Shotts



Nozzle X-section

#5

NOZZLE CALIBRATION

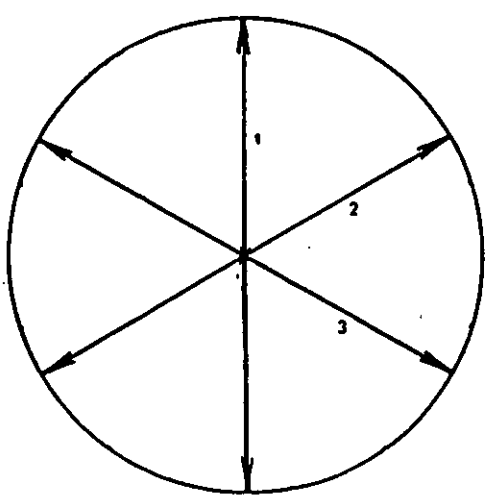
Nozzle 7/16 Date 4-5-83

Measurement No.	Inside Diameter (inches)
1	.438
2	.437
3	.437

Average .437

Area of Nozzle _____ Ft^2

Calibrated by: JRS.



Nozzle X-section

METER ORIFICE CHECK

Meter Box No. Nb-1 Δ Ha of Box 1.74

Date 4-5-87

Time for 10 ft^3 = 13 min. 24 sec.

10 ÷ 13.4 total minutes = 0.7462 Δ Ha_2

$\frac{0.75}{\Delta Ha_2}$ = 1005 x 100 = 100.5%

RC Paul
Signature

Procedure: Set flow rate of meter box at ΔHa of meter box--measure the amount of time required to sample 10.00 ft^3.

Note: If answer is within 5 percent meter is o.k. If not, recalibrate meter.

METER ORIFICE CHECK

Meter Box No. #2 Δ Ha of Box 1.55

Date 4-5-83 30.00

Time for 10 ft^3 = 13 min. 22 sec.

10 ÷ 13.37 total minutes = 0.748 Δ Ha_2

$\frac{0.75}{\Delta Ha_2}$ = 1.0027 x 100 = 100.27

Signature

Procedure: Set flow rate of meter box at ΔHa of meter box--measure the amount of time required to sample 10.00 ft^3.

Note: If answer is within 5 percent meter is o.k. If not, recalibrate meter.

SHOLTES & KOOGLER

100 FT. UMBILICAL CORD

SHOLTES & KOOGLER
ENVIRONMENTAL CONSULTANTS, INC.
THERMOCOUPLE CALIBRATIONS

Read Out No. SK-1 Date 9-22-82

PROBE NO.	N.B.S. °F	Probe °F	N.B.S. °F	Probe °F	N.B.S. °F	Probe °F
SK 2-1						
SK 4-1	56	54	32	30	228	226
SK 6-1	39	40	230	234	178	175
SK 6-2	33	36	82	85	190	193
SK 7-1	61	59	37	36	222	218
SK 8-1	66	63	39	38	217	216
SK 10-1	66	63	39	40	195	192
SK 11-1	55	56	40	40	197	195
SK 5-1-T	65	62	41	40	215	215
SK 10-T	52	50	37	36	260	258
Heated Box No. 1	254	253	45	41	221	221
Heated Box No. 2	198	194	264	259	220	218
Last Impinger Probe No. 1	42	44	204	206	65	64
Last Impinger Probe No. 2	56	54	34	32	185	181

J.K. Helstrom
Signature

200 Ft. Umbilical cord

SHOLTES & KOOGLER
ENVIRONMENTAL CONSULTANTS, INC.
THERMOCOUPLE CALIBRATIONS

Read Out No. SK-2 Date 9-21-82

Shott wire extension in probe

rob. in stack thermo.

PROBE NO.	AMBIENT N.B.S. °F	AMBIENT Probe °F	ICE WATER N.B.S. °F	ICE WATER Probe °F	HEATED BOX N.B.S. °F	HEATED BOX Probe °F
SK 2-1						
SK 4-1	69	71	39	37	237	233
SK 6-1	67	66	38	37	228	231
SK 6-2	91	90	46	40	242	244
SK 7-1	(71) 79	78	(46) 47	45	216	215
SK 8-1	176	751	34	31	177	178
SK 10-1	80	78	40	38	198	199
SK 11-1	145	143	40	42	243	239
SK 5-1-T	69	70	208	207	39	40
SK 10-T	62	61	274	270	40	40
Heated Box No. 1	72	71	212	208	271	273
Heated Box No. 2	(77) 79	77	35	32	259	257
Last Impinger Probe No. 1	74	74	36	37	261	261
Last Impinger Probe No. 2	78	79	35	34	269	270

Signature

SK-5-T

PITOT TUBE CALIBRATION MEASUREMENTS

DATE CALIBRATED 5-28-82

Pitot tube assembly level? X yes _____ no

Pitot tube openings damaged? _____ yes (explain below) X no

α_1 = 2.0 ° (<10°), α_2 = 0.5 ° (<10°), β_1 = 0.5 ° (<5°),

β_2 = 1.5 ° (<5°)

γ = 3.0 °, θ = 4.5 °, A = 0.863 in. = (Pa + Pb)

z = A sin γ = 0.045 in. ; <0.32 <1/8 in.

w = A sin θ = 0.068 in. ; <0.08 <1/32 in.

P_A 0.423 in. P_b 0.440 in.

D_t = 0.375

Comments: _____

_____

_____

Calibration required? _____ yes X no

Calibrated by George F. Kebel

SK-41

PITOT TUBE CALIBRATION MEASUREMENTS

DATE CALIBRATED 5-11-82

Pitot tube assembly level? X yes _____ no

Pitot tube openings damaged? _____ yes (explain below) X no

α_1 = 4.5 ° (<10°), α_2 = 2.5 ° (<10°), β_1 = 2.0 ° (<5°),

β_2 = 0.5 ° (<5°)

γ = 1.0 °, θ = 3.5 °, A = 1.284 in. = (Pa + Pb)

z = A sin γ = 0.0224 in. ; <0.32 <1/8 in.

w = A sin θ = 0.0784 in. ; <0.08 <1/32 in.

P_A .641 in. P_b .643 in.

D_t = .375

Comments: _____

_____

_____

Calibration required? _____ yes X no

Calibrated by George F. Gabel

CALIBRATION FORM

Date 3-30-83

Box No. SK-1

Barometric Pressure 30.09 inches Hg

ΔHT	ΔHD	Teledyne Mass Flow Meter		Gas Volume, Dry Gas Meter			Temp. Teledyne	Temp. of Dry Meter	Time Minutes
		Desired liters/min	Actual liters/min	Initial	Final	Actual ft.^{3}			
0	0.93	15	15	53.0	55.766	2.766	68	87	5
0	1.68	20	20	58.0	61.638	3.638	68	88	5
0	2.45	25	25	63.0	67.523	4.523	68	89	5
0	3.65	30	30	69.0	74.378	5.378	68	90	5
0	4.9	35	35	77.0	83.233	6.233	68	91	5

GAS METER THERMOMETER CALIBRATION

N.B.S. °F	METER BOX

						--MEAN--
DELTA-H :	1.781	1.806	1.683	1.738	1.711	1.744
Y :	0.989	1.003	1.008	1.017	1.022	1.008
SCFM :	0.533	0.710	0.888	1.065	1.243	
QF :	4.112	5.531	6.686	8.168	9.472	

Signature George F. Kabel

CALIBRATION FORM

Date 3-30-83

Box No. SK-2

Barometric Pressure 30.09 inches Hg

ΔHT	ΔHD	Teledyne Mass Flow Meter		Gas Volume, Dry Gas Meter			Temp. Teledyne	Temp. of Dry Meter	Time Minutes
		Desired liters/min	Actual liters/min	Initial	Final	Actual ft.^{3}			
0	0.81	15	15	54.5	57.278	2.778	68	90	5
0	1.43	20	20	50.0	53.682	3.682	68	90	5
0	2.22	25	25	39.0	43.575	4.575	68	88	5
0	3.22	30	30	32.0	37.429	5.429	68	87	5
0	4.35	35	35	24.0	30.244	6.244	68	86	5

GAS METER THERMOMETER CALIBRATION

N.B.S. °F	METER BOX
71	71
82	82
115	116
107	106
36	36

						--MEAN--
DELTA-H :	1.543	1.586	1.528	1.542	1.533	1.546
Y :	0.991	0.995	0.996	1.003	1.012	0.999
SCFM :	0.533	0.710	0.888	1.065	1.243	
QF :	3.848	5.201	6.359	7.651	8.884	

Signature George F. Label

PROJECT PARTICIPANTS

John B. Koogler, Ph.D, P.E.	Project Advisor
George F. Allen	Project Manager
Robert S. Sholtes, Ph.D, P.E.	Field Test Coordinator
Rodney C. Paul	Field Test Crew
Rick Barton	Field Test Crew

Memo:

To: Dick Peace / Keith Overcash

From: Michael Y Aldridge

Subject: Emissions tests performed at Carolina Solite Corp Aquadale N.C. on April 5 and 6, 1983 by Sholtes & Koogler Env. of Gainesville, Fla.

A report of the subject tests has been reviewed and found to be acceptable. The results appear reliable, and adequately represent the ~~discharge~~ emissions from the kiln, and the outlet emissions from the control equipment during the test period. There is some question, however, regarding the method used by Sholtes & Koogler to calculate control equipment efficiencies for the various test runs.

According to the text of the report: "All control efficiencies were calculated from concentration data rather than from source data because of the uncertainty involved in measuring air flow rates at the inlet to the control system." (Section 5.0, Page 8 of the subject report).

Exception is taken with the above method of calculation for the following reasons:

~~1) Because of the velocity data at the inlet to the control system [illegible] shows~~

1) the velocity data for the inlet to the control system appears to be constant from point to point and in spite of the fact that the inlet sampling location does not comply with [illegible] there is no real reason to doubt its reliability.

1. Concentration can be affected by air in-leakage such as around a fan shaft. Basing control efficiency on concentration, assumes that these leaks can be ignored.

2. In spite of the fact that the sampling location at the inlet to the control system does not comply with method 1, the inlet velocity data appears to be consistant from point to point. Assuming that these data are reliable appears ~~to be~~ (in the opinion of this reviewer) to be a better engineering assumption than ignoring the fan leakage.

Therefore, it is considered that basing control efficiency on mass emission rate is preferable to basing it on concentration.

The pollutants tested ~~were~~ were particulate, chromium, lead and chloride. The attached table shows the test results for each of the above pollutants and control ~~efficiencies~~ calculated both ways.

~~Compliance with 15NCAC 2D~~

~~.0511~~

~~Control of Particulate Emissions from the subject source complies~~ Particulate control equipment was demonstrated to be in compliance with 15A NCAC 2D .0511 during the test period.

Emission Measurements
No. 5 Kiln
Carolina Solite Corporation
Aquadale, North Carolina
April 5-6, 1983

	Particulate		Chromium		Lead		Chloride	
	Gr/DSCF	lb/hr	Gr/DSCF	lb/hr	Gr/DSCF	lb/hr	Gr/DSCF	lb/hr
Inlet								
Run 3	2.87	102.89	.00526	.188	.000341	.012	Void	Void
Run 4	4.01	125.40	.00207	.064	.000533	.017	.3852	12.02
Run 5	4.17	132.67	.00159	.050	.000373	.012	.4920	12.98
Average	3.68	120.32	.00297	.101	.000416	.014	.4386	12.50
Outlet								
Run 3	.093	4.94	.000481	.026	.000067	.004	.04628	2.46
Run 4	.054	2.53	.000166	.008	.000055	.003	.08881	4.19
Run 5	.043	2.11	.000115	.006	.000027	.001	.08278	4.03
Average	.063	3.19	.000254	.013	.000050	.003	.07262	3.56

Percent Pollutant Removal

	Particulate		Chromium		Lead		Chloride	
	Concentration	Mass Rate	Concentration	Mass Rate	Concentration	Mass Rate	Concentration	Mass Rate
Run 3	96.8	95.23	90.9	86.43	80.4	70.66	Void	Void
Run 4	98.7	97.98	92.0	87.87	89.7	84.34	76.9	65.07
Run 5	99.0	98.42	92.8	88.89	92.8	88.77	79.8	68.98
Average	98.2	97.21	91.9	87.73	87.6	81.26	78.4	67.03

DIVISION OF ENVIRONMENTAL MANAGEMENT
Air Quality Section

December 16, 1983

M E M O R A N D U M

TO: Dick Peace/Keith Overcash

FROM: Michael Y. Aldridge MYA

SUBJECT: Emissions Test Performed at
Carolina Solite Corporation
Aquadale, North Carolina
on April 5&6, 1983
by Sholtes & Koogler, Inc.
of Gainesville, Florida

A report of the subject tests has been reviewed and found to be acceptable. The results appear reliable and adequately represent the emissions from the kiln and the outlet emissions from the control equipment during the test period. There is some question, however, regarding the method used by Sholtes & Koogler to calculate control equipment efficiencies for the various test runs. According to the text of the report: "All control efficiencies were calculated from concentration data rather than from source data because of the uncertainty involved in measuring air flow rates at the inlet to the control system." (Section 5.0, page 8 of the subject report).

Exception is taken with the above method of calculation for the following reasons:

1. Concentration can be affected by air in-leakage such as around a fan shaft. Basing control efficiency on concentration, assumes that these leaks can be ignored.

2. In spite of the fact that the sampling location at the inlet to the control system does not comply with method 1, the inlet velocity data appears to be consistent from point to point. Assuming that this data is reliable appears (in the opinion of this reviewer) to be a better engineering assumption than ignoring the fan leakage.

Therefore, it is considered that basing control efficiency on mass emission rate is preferable to basing it on concentration.

The pollutants tested were particulate, chromium, lead and chloride. The attached table shows the test results for each of the above pollutants and control efficiencies calculated both ways.

Particulate control equipment was demonstrated to be in compliance with 15 NCAC 2D .0511 during the test period.

/la

Attachment

cc: Dennis Ramsey

SHOLTES & KOOGLER, ENVIRONMENTAL CONSULTANTS
1213 N.W. 6th Street Gainesville, Florida 32601 (904) 377-5822

SKEC 105-84-02

February 2, 1984

Mr. B. Keith Overcash, P.E.
Air Quality Regional Engineer
North Carolina Department of Natural
Resources and Community Development
Post Office Box 950
Mooresville, North Carolina 28115-0950

Subject: Source Emission Tests
Carolina Solite Corporation
Stanley County, North Carolina

Dear Mr. Overcash:

Your letter of January 16, 1984 regarding the emission measurements that our firm conducted at the Carolina Solite Aquadale, North Carolina plant was forwarded to us by Solite for comment. In this letter you questioned our reason for calculating the efficiency of the air pollution control system on the basis of particulate matter concentrations rather than on the basis of particulate matter mass flows.

We agree with your contention that it is more appropriate to determine the efficiency of control equipment on mass flow rates but, in our opinion, conditions at the Carolina Solite plant precluded the accurate determination of the mass flow rate of particulate matter at the inlet to the air pollution control system. If reference will be made to Figure 2, Page 5 of our report dated April 5-6, 1983, describing the results of the emission measurements, it will be noted that the gas flow at the inlet to the air pollution control system is through two square ducts which exit the kiln, immediately make approximately 60 degree turns to the vertical, and enter the feed rock bin. The undisturbed distance of gas flow both above and below the sampling ports is less than one-half an equivalent duct diameter. The

physical conditions that exist at the inlet sampling location result in extremely turbulent gas flow and, in our opinion, resulted in gas flow measurements that were much less than ideal.

The gas flow measurements made at the discharge end of the air pollution control system (in the stack as shown in Figure 1, Page 4, of our report) are made at a point approximately 20 diameters above a flow disturbance and approximately nine stack diameters below the top of the stack; an ideal location for making gas flow measurements.

The problem anticipated in making accurate gas flow measurements at the inlet to the air pollution control system proved to be a reality. This is demonstrated by comparing the flow measurements made at the inlet (Table 1, Page 9) and outlet (Table 2, Page 10) of the air pollution control system. The flow measured at the outlet of the system was 5800 standard cubic feet per minute while the flow measured at the inlet was just 3839 standard cubic feet per minute. The difference in flow is attributed, in our opinion, to the inaccuracies involved in the flow measurement at the inlet of the control system.

Supporting our opinion on this matter was an inspection of the control system for leaks conducted by Dr. Robert S. Sholtes of our staff who was present at the time the emission measurements were made. Dr. Sholtes is a Registered Professional Engineer and has had over 20 years experience in the field of air pollution control and air quality management. He found the components of the air pollution control system and the connecting ductwork to be sound and concluded that the difference in the measured flow rates was the result of errors associated with gas flow measurements at the inlet to the system.

Taking into consideration the facts set forth in the above paragraphs, we decided that the efficiency of the air pollution control system would most reasonably be represented by calculations based on particulate matter concentrations. As stated previously, we recognize that this is not the ideal method of calculating control system efficiencies but in the case of the Carolina Solite Aquadale Plant, it is the most acceptable.

I hope that the information provided herein will satisfy the concerns you have regarding this matter. If you have further questions or comments, please do not hesitate to contact me.

Very truly yours,

SHOLTES & KOOGLER,
ENVIRONMENTAL CONSULTANTS, INC.

John B. Koogler, Ph.D., P.E.

JBK:idh

cc: Mr. Ed Martin
Mr. Tom Purvis
Mr. George Eure

JAMES A. SUMMERS, SECRETARY

DIVISION OF ENVIRONMENTAL MANAGEMENT

January 16, 1984

Mr. E. E. Martin, Vice-President
Solite Corporation
Post Office Box 27211
Richmond, Virginia 23261

Subject: Source Emissions Test
Carolina Solite Corporation
Stanly County, N. C.

Dear Mr. Martin:

On April 5 and 6, 1983, a source emissions test was performed on the coal/coke/No. 2 oil/liquid waste fired light weight aggregate expanding kiln No. 5 (35 MBTU/hr. maximum heat input) controlled by a packed bed preconditioner, a multicyclone, a precooler and a crossflow gravity spray wet scrubber at Carolina Solite Corporation, Aquadale, N. C.

A review of the report of the results of the aforementioned test has been completed by our Source Test Unit in Raleigh. The test methods have been found to be acceptable and the results appear reliable and adequately represent the emissions from the kiln before and after the aforementioned air pollution control devices. However, the method used by Sholtes & Koogler to calculate control equipment efficiencies is questionable. In Section 5.0, Page 8 of the subject report, "All control efficiencies were calculated from concentration data rather than the source data because of the uncertainty involved in measuring air flow rates at the inlet to the control system." This Office considers that basing control efficiency on mass emission rate is preferable to basing it on concentration. Compliance with 15 NCAC 2D .0511, "Particulates, SO_2 from Lightweight Aggregate Processes", has been demonstrated based on the mass emission rate calculation.

If you have any questions concerning the above matter, please feel free to call Mr. Yin-Pong Chang or me at (704) 663-1699.

Sincerely,

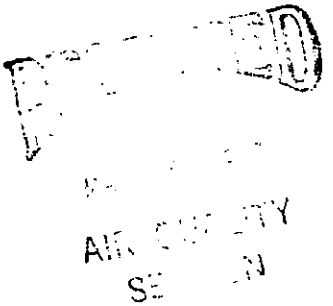
B. Keith Overcash, P. E.
Air Quality Regional Engineer

YPC:sju
ypc

SOLITE® CORPORATION

P. O. BOX 27211 • RICHMOND • VIRGINIA 23261 • PHONE AREA CODE 804 321-6761

April 29, 1983



Mr. Keith Overcash
919 North Main Street
Mooresville, North Carolina 28115

Dear Mr. Overcash:

Attached are three copies of the Sholtes & Koogler stack test results on emissions from the #5 kiln of Carolina Solite Corporation at Aquadale, North Carolina, condicted on April 5-6, 1983. These tests were conducted in order to satisfy the Provisos 10 and 11 of Permit No. 32 25 R 4 issued on February 10, 1983 by the North Carolina Department of Natural Resources and Community Development. These provisos are related to the combustion of liquid waste in kilns #5 - 8 to provide the heat necessary to produce lightweight aggregate.

In addition to the test results provided by Sholtes & Koogler, tests were conducted by our on-site laboratory to determine the Btu, chloride, water, ash and specific gravity of the fuels being burned during the course of the tests. These results are as follows:

Btu - 113,892 per gal.
Chloride - 1.9%
Water - none detected
Ash - 1.4%
Specific gravity - .871

If any additional information is required, please don't hesitate to contact me or George Eure, plant manager at Carolina Solite.

Sincerely,

SOLITE CORPORATION

E. E. Martin, Vice President

EEM:emd
Encl. (3)

cc: George Eure
Wm. T. Johnson

DISTRIBUTION

Yellow Copy - Mon. Mgt./Central Files
Blue Copy - Regional Office
(Optional) White Copy - Permits
Enforcement
Stack Test

NORTH CAROLINA DIVISION OF ENVIRONMENTAL MANAGEMENT
AIR QUALITY REPORT

REQUEST FOR ACTION TO BE TAKEN

The item listed below requires action to ascertain compliance under Article 21, Chapter 143 of the General Statutes of North Carolina, concerning rules and regulations governing the control of air pollution:

Name	Address	County
Carolina Solite Corp.	Aquadale	Stanly

Subject

Observe Stack Test in Permit No. 3225R4

Investigation Requested By	Address	County

Remarks

Assigned To: MRO — Date:

Investigated By	Date	Returned
Yin-Pong Chang	4/5 and 4/6/83	4/11/83

Action Recommended

Investigation Report

CONTACT: Ed. E. Martin, Vice-President
George Eure, Plant Manager

The subject stack test was performed on the light weight aggregate expanded kiln No. 5 fired by coal and 225 gallons/hr. liquid waste solvents for sampling particulate chromium, lead (Stip. No. 10), and hydrogen chloride (Stip. No. 11) emissions as required in Permit No. 3225R4. Two sample trains were sampled simultaneously, one each at the inlet and outlet of the air pollution control system, in order to determin whether the particulate emissions control efficiency of the multicyclone, precooler, and wet scrubber was greater than 95% as required in EMC Regulation 15 NCAC 2D .0511. The stack test was conducted by Sholtes & Koogler from Gainesville, Florida in accordance with EPA Method No. 5. Three runs of particulate emission test were performed on 4/5/83 at the outlet, and only two-thirds of the third run was performed at the inlet of the air pollution control system due to a melting tube in the main sample train (or hot box) from filter to the impingers.

It was discovered at the end of the second run that too much excess air flow had been sampled during those two runs and would result in higher particulate emission rat than normal operating conditions. Two additional runs were performed both on the inle and outlet of air pollution control system on 4/6/83. A 30 minutes visible emission evaluation of the kiln No. 5 revealed that the facility was in compliance with EMC Regulation 15 NCAC 2D .0521.

Correspondence To: _____

Signature: Yin Pong Chang

SOURCE TEST
OBSERVERS CHECKLIST

N. C. Division of Environmental Management

Source Name: Carolina Solite Corp.	Testing Firm: Sholtes & Koogler
Address: Aquadale, N.C.	Address: 1213 NW 6th St. Gainesville, Florida 32601
Plant Location:	Phone: (904) 377-5522
Source Contact: George Eure, Plant Manager	Test Engineer: Robert S. Sholtes, Ph.D., P.E.
Phone: (704) 474-3165	Assistant: Rodney C. Paul

Other Personnel Involved	Affiliation
Ed. E. Martin	Vice-President of Manufacturing

Process Description: coal/coke, No. 2 oil/liquid waste fired light weight aggregate expanded kilns No. 5

Process Rate During Test:

Maximum Process Rate: 35 MBTU/hr. maximum heat input

Burner Sizes (Incinerators) Pri: Sec:

TEST PARAMETERS

	Inlet	Outlet
Duct Size:	2 - 21"x24"	36½"
Distance Before Ports:		56'
Distance After Ports:		34'
Number of Test Points:	2x24	12
Number of Runs:	3	3
Sampling Time Per Run (min.):	96	72

Pollutant Sampled: Particulate, Chrome, Lead, Hydrogen Chloride

E. P. A. Method No.: #5

If method differs from E. P. A. method, explain:

4/5/83 Run #1 Run #2

Inlet	Outlet	Inlet	Outlet
0.00/0.02	0.01/0.00	0.016/0.009	0.005/0.00
10:31 A.M.	10:28 A.M.	14:40 P.M.	14:37 P.M.
13:09 P.M.	12:05 P.M.	17:40 P.M.	16:00 P.M.

For Method 5 sampling train record ΔHa ___

	Run #1 Inlet	Run #1 Outlet	Run #2 Inlet	Run #2 Outlet	Run #3 Inlet	Run #3 Outlet
Leakage Rate (ft^3/min.) (0.02 ft^3/min. or less)	0.012/0.000	0.005/0.000	0.017/0.011	0.016/0.00	0.006/-	0.018/-
Time Started (24 hr. Clock)	17:57	18:06	9:12	9:05	12:29	13:0
Time Ended	19:40	19:40	11:27	10:22	14:40	14:40
Test Date(s)	4/5/83	4/5/83	4/6/83	4/6/83	4/6/83	4/6/83

See Graph on Reverse Side For Number of Test Points.
Use Reverse Side for Comments.

Request 2 Copies of Report

Yu-Pong Chu
OBSERVERS SIGNATURE

DEPARTMENT OF NATURAL AND ECONOMIC RESOURCES
DIVISION OF ENVIRONOMENTAL MANAGEMENT

Plume Observation Record Form

Date 4/6/83
Observer Yi-Pong Chang
Checked By BK Duncan
Type of installation Coal/liquid waste fired light weight aggregate Kiln No. 5
Fuel Coal/liq. w. Stack Ht. 90'
Observers Distance from Stack 110 Ft.
Wind Speed 0~5mph Direct South
Sky Condition Sunny
Plume Color steam + tan
Plume Background sky
Start Time 13:25 P.M.
Ending Time 13:55 P.M.
Ending Weather
Wind Speed 0~5mph Direct South
Sky Condition sunny

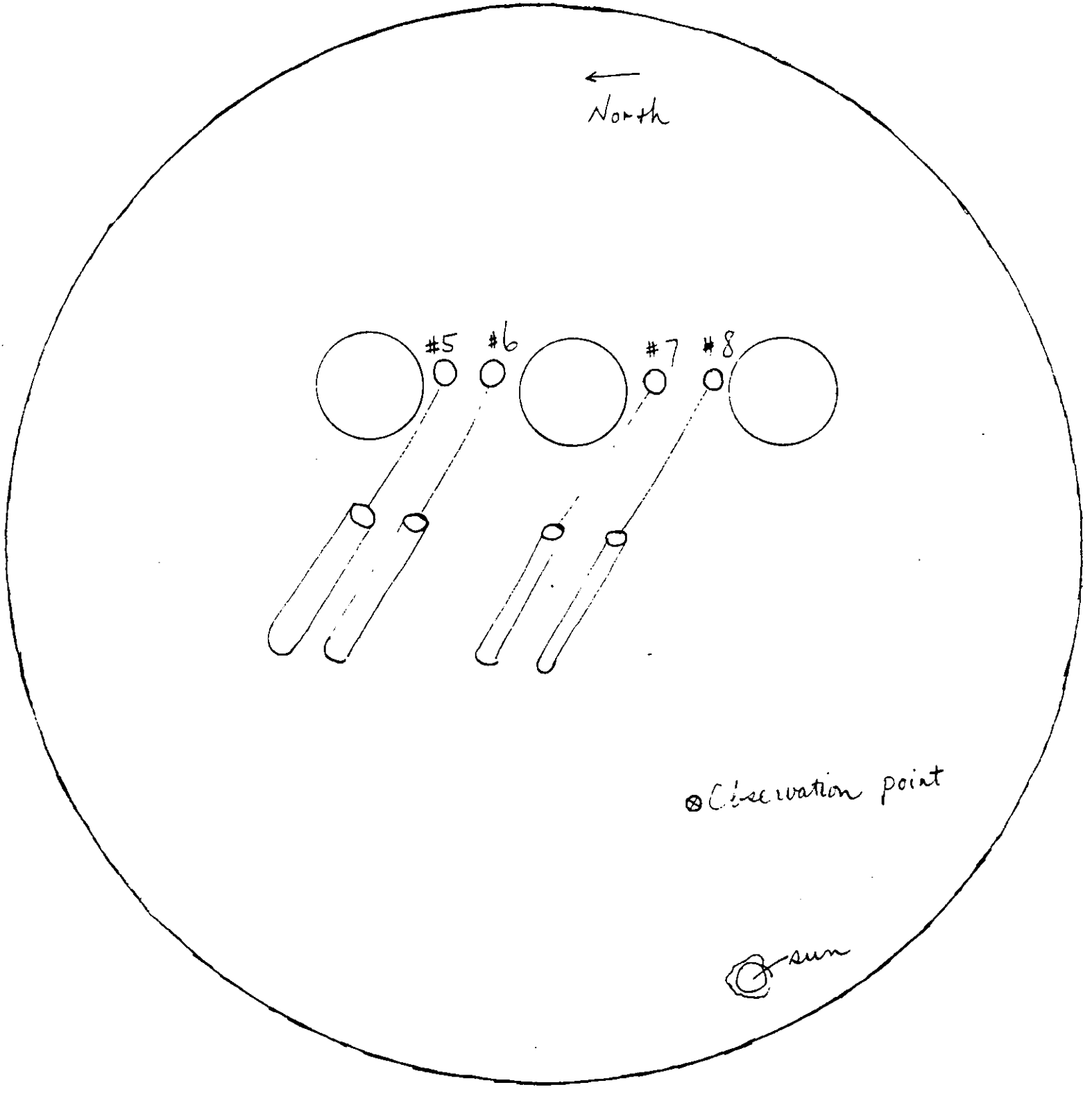
No. Units in Excess of standard 0
5 min/hr. allow 20
No. Units of VIO. 0

Remarks:

Source Carolina Solite Corp.
Address Aquadale, N.C.

Min. \ Sec.	0	15	30	45	Min. \ Sec.	0	15	30	45
0	15	15	10	10	30				
1	10	10	10	10	31				
2	10	5	5	10	32				
3	5	10	10	10	33				
4	10	10	10	10	34				
5	5	10	5	5	35				
6	10	10	10	5	36				
7	10	10	10	10	37				
8	10	10	10	10	38				
9	10	10	10	10	39				
10	10	10	10	10	40				
11	10	10	10	10	41				
12	10	10	10	10	42				
13	5	5	5	5	43				
14	10	10	10	10	44				
15	10	10	10	10	45				
16	5	5	5	5	46				
17	5	5	5	5	47				
18	—	—	—	—	48				
19	10	10	10	10	49				
20	10	10	10	10	50				
21	5	5	5	5	51				
22	10	10	15	10	52				
23	10	10	10	10	53				
24	5	5	5	5	54				
25	5	5	5	5	55				
26	5	5	5	5	56				
27	5	10	5	5	57				
28	5	5	10	5	58				
29	5	10	10	10	59				

Use circle to draw a diagram showing any pertinant buildings, trees, roads etc. in relationship to your point of observation of the source.



Emission Measurements
No. 5 Kiln
Carolina Solite Corp.
Aquadale N.C.
April 5-6, 1983

Particulate		Chromium		Lead		Chloride	
Gr/DSCF	lb/hr	Gr/DSCF	lb/hr	Gr/DSCF	lb/hr	Gr/DSCF	lb/hr
2.87	102.89	.00526	.188	.000341	.012	Void	Void
4.01	125.40	.00207	.064	.000533	.017	.3852	12.02
1.17	132.67	.00159	.050	.000373	.012	.4920	12.98
3.68	120.32	.00297	.101	.000416	.014	.4386	12.50
.093	4.94	.000481	.026	.000067	.004	.04628	2.46
.054	2.53	.000166	.008	.000055	.003	.08881	4.19
.043	2.11	.000115	.006	.000027	.001	.08278	4.03
.063	3.19	.000254	.013	.000050	.003	.07262	3.56

Percent Pollutant Removal

Particulate		Chromium		Lead		Chloride	
Concentration	mass rate	concentration	mass rate	concentration	mass rate	Condensation	mass rate
96.8	95.23	90.9	86.43	80.4	70.66	Void	Void
98.7	97.98	92.0	87.87	89.7	84.34	76.9	65.07
99.0	98.42	92.8	88.89	92.8	88.77	79.8	68.98
98.2	97.21	91.9	87.73	87.6	81.26	78.4	67.03