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**Air**

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## Final Report - Volume I of II

### Lime Manufacturing Emissions Test Report

Chemical Lime Company  
(Formerly APG Lime Company)  
Ripplemead, Virginia



LIME MANUFACTURING  
EMISSION TEST REPORT  
CHEMICAL LIME COMPANY  
(FORMERLY APG LIME COMPANY)  
RIPPLEMEAD, VIRGINIA

VOLUME I OF II  
REPORT TEXT  
APPENDICES A & B

EPA Contract No. 68D70069  
Work Assignment No. 2-12

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## **DISCLAIMER**

This document was prepared by Pacific Environmental Services, Inc. (PES) under EPA Contract No. 68D70069, Work Assignment No. 2-12. The field sampling, analyses, and draft report were completed under EPA Contract No. 68D20162, Work Assignment No. 4-01. This document has passed PES' internal quality assurance review and has been approved for distribution. The contents of this document do not necessarily reflect the views and policies of the U.S. EPA. Mention of trade names does not constitute endorsement by the EPA or PES.

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## 1.0 INTRODUCTION

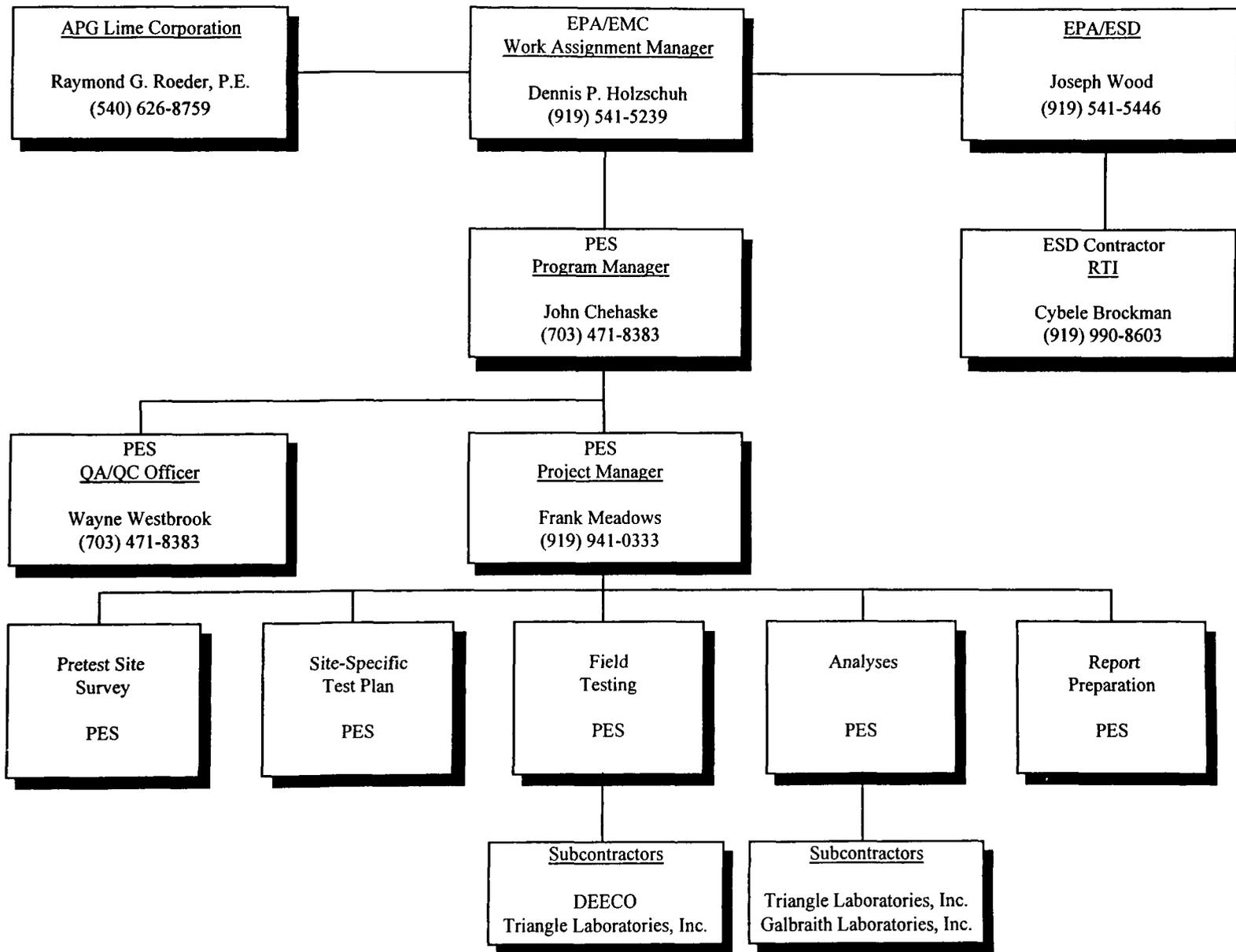
The U.S. EPA's Emissions Standards Division, Minerals and Inorganic Chemicals Group (ESD/MICG) is investigating lime manufacturing processes to (1) identify hazardous air pollutants (HAPs) emitted by coal-fired rotary kilns, (2) identify the sources of the HAPs emitted, and (3) confirm the existence of major sources. Because lime manufacturing is similar to portland cement manufacturing, it is believed by EPA that lime plants may also be major sources of HAPs. There are limited data on HAP emissions from lime manufacturing processes; therefore additional data are needed to identify which of the 189 HAPs listed in Section 112(b) of the Clean Air Act (CAA), as amended in 1990, are emitted from these sources.

As part of its investigation, the ESD/MICG has requested that the EPA's Emissions, Monitoring and Analysis Division (EMAD) test two lime manufacturing facilities. EMAD issued a work assignment to Pacific Environmental Services, Inc. (PES) to plan and conduct the air emissions testing program to gather emissions data from lime manufacturing processes as specified in the ESD/MICG test request. The testing program was conducted through EPA Contract No. 68D20162, Work Assignment No. 4-01.

The APG Lime Company in Ripplemead, Virginia was selected for testing because: (1) the Kiln No. 1 baghouse stack had a testing platform, and (2) the fabric filter system on Kiln No. 1 was recently installed. Testing at APG Lime also afforded EPA the opportunity to compare the performance of a new fabric filter system to that of an existing scrubber system on a similarly operated kiln at a second lime manufacturing facility that the EPA planned to test. APG Lime Company is located in close proximity to the second lime manufacturing facility. If both were tested during one field trip, then the total cost of the testing program could be reduced.

The primary objective of the testing program was to obtain data on the emissions from Kiln No. 1. Measurements were made of total hydrocarbons (THC), dioxin/furan (CDD/CDF), particulate matter, and metals at the baghouse inlet and outlet. Visible emissions were read on the baghouse outlet stack. A secondary objective of the testing program were to obtain data on the emissions of particulate matter and metals from the Kiln No. 2 cooler exhaust stack.

Figure 1.1 presents the test program organization and major lines of communication. Figure 1.2 shows the proposed sampling/monitoring locations at APG Lime Company.



1-2

Figure 1.1 Key Personnel and Responsibility for Testing at APG Lime Corporation, EPA Contract No. 68D20162, WA No. 4-01.

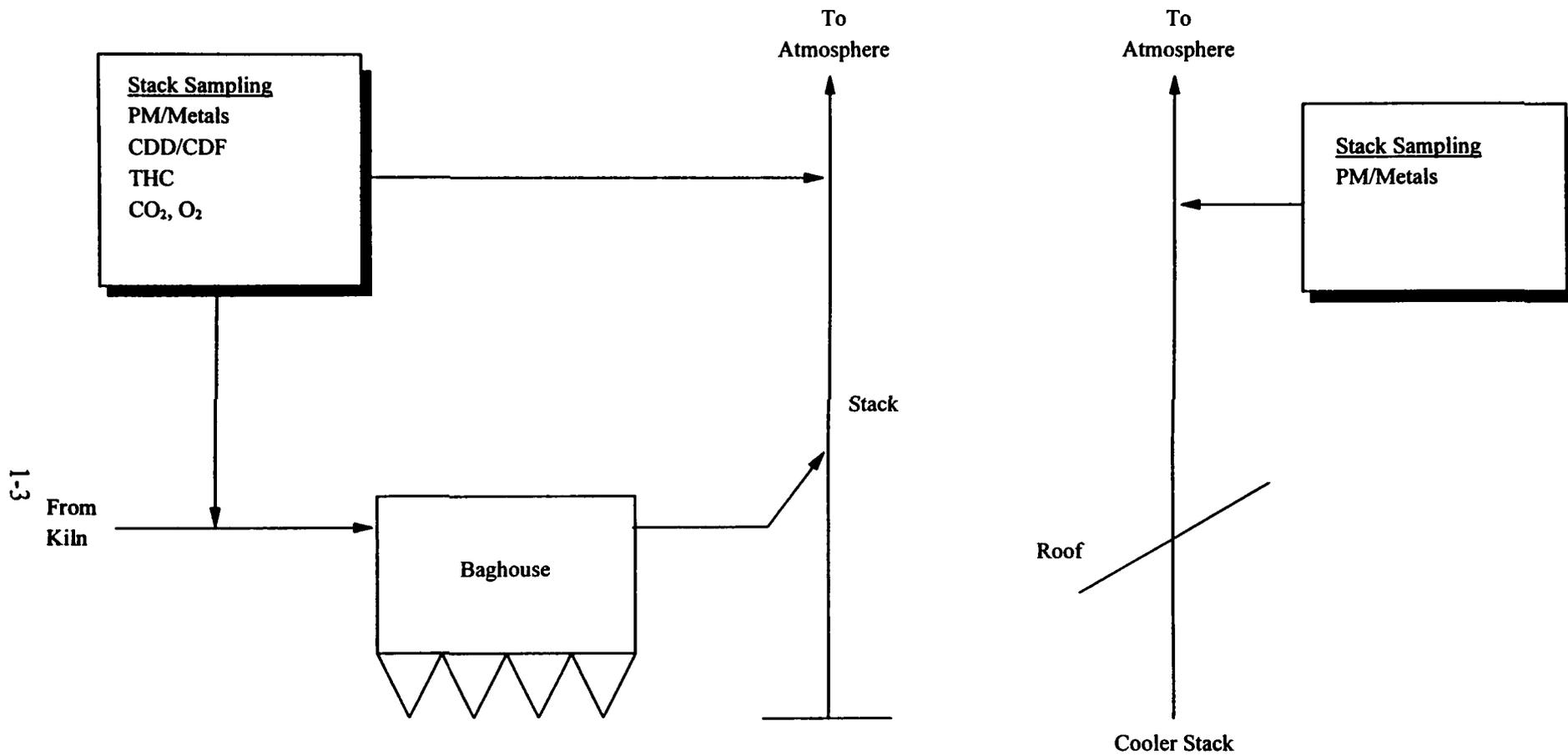


Figure 1.2 Sampling/Monitoring Location, at APG Lime, Ripplemead, VA.

## 2.0 SUMMARY OF RESULTS

This section provides summaries of the test results obtained from the testing program at the APG Lime Company. Included are the results of the tests conducted for THC, CDD/CDF, and particulate matter/metals on the Kiln No. 1 baghouse inlet and outlet and particulate matter/metals on the Kiln No. 2 cooler exhaust stack.

### 2.1 EMISSIONS TEST LOG

Sampling on Kiln No. 1 was conducted on three consecutive days from October 22, 1996 through October 24, 1996. Sampling on the Kiln No. 2 cooler exhaust stack was conducted on October 21, 1996. Table 2.1 summarizes the emissions test log. Presented are the run numbers, test dates, pollutants, run times and downtime for filter changes, port changes, and CEM calibrations.

### 2.2 KILN NO. 1

#### 2.2.1 CDD/CDF

The Method 23 sample extracts were first analyzed using a DB-5 capillary column to determine the concentration of each isomer of CDD's and CDF's (tetra- through octa-). Tetra-chlorinated dibenzofurans were detected in this analysis; therefore, another aliquot of the sample was analyzed using a DB-225 capillary column to measure the 2,3,7,8 tetra-chloro dibenzofuran isomers.

The CDD/CDF test results are presented in actual concentrations and mass emission rates, concentrations adjusted to 7% oxygen (O<sub>2</sub>), and concentrations adjusted to 7% O<sub>2</sub> in 2378 toxic equivalents. The concentrations, adjusted to 7% O<sub>2</sub>, were adjusted by each congeners respective Toxic Equivalency Factor (TEF). The TEFs used are the international TEF values.

During Run No. M23-8-I it was discovered half-way through the run that the sample nozzle had been pointing downstream in the duct. As a result it was necessary to restart this run. In order that the inlet and outlet sampling could be conducted somewhat simultaneously completion of the corresponding outlet run (M23-8-O) was delayed until the inlet run was restarted.

TABLE 2.1

EMISSIONS TEST LOG  
APG LIME COMPANY - RIPPLEMEAD, VIRGINIA

Run No.	Date	Pollutant	Run Time	Downtime, Minutes
<u>Kiln No. 1 BH Inlet</u>				
M25A-4-I	10/22/96	CDD/CDF	1135-1755	45
M23-6-I	10/22/96	PM/Metals	1130-1743	155
M29-13-I	10/22/96	THC	1130-1735	163
M25A-5-I	10/23/96	CDD/CDF	1047-1600	53
M23-7-I	10/23/96	PM/Metals	1040-1540	60
M29-14-I	10/23/96	THC	1040-1540	60
M25A-6-I	10/24/96	CDD/CDF	1054-1945	53
M23-8-I	10/24/96	PM/Metals	1515-1945	30
M29-15-I	10/24/96	THC	1054-1715	41
<u>Kiln No. 1 BH Outlet</u>				
M25A-4-O	10/22/96	CDD/CDF	1130-1800	30
M23-6-O	10/22/96	PM/Metals	1130-1753	143
M29-13-O	10/22/96	THC	1130-1749	139
M25A-5-O	10/23/96	CDD/CDF	1040-1600	37
M23-7-O	10/23/96	PM/Metals	1040-1544	64
M29-14-O	10/23/96	THC	1041-1542	71
M25A-6-O	10/24/96	CDD/CDF	1056-1945	42
M23-8-O	10/24/96	PM/Metals	1122-1731	129
M29-15-O	10/24/96	THC	1121-1731	130
<u>Kiln No. 2 Cooler</u>				
M29-10	10/21/96	PM/Metals	1125-1331	6
M29-11	10/21/96	PM/Metals	1404-1607	3
M29-12	10/21/96	PM/Metals	1625-1828	3

## **Baghouse Inlet**

Table 2.2 summarizes the CDD/CDF emissions sampling and stack gas parameters at the baghouse inlet. The total sampling time for each run was 240 minutes. The average sample volume was 96.693 dry standard cubic feet (dscf) or 2.724 dry standard cubic meters (dscm). The average stack gas temperature was 497°F and contained 10.3 percent (%) carbon dioxide (CO<sub>2</sub>), 13.7% oxygen (O<sub>2</sub>), and 3.8% moisture. The average stack gas volumetric flow rate was 108,440 actual cubic feet per minute (acfm) or 53,938 dry standard cubic feet per minute (dscfm) or 1,527 dry standard cubic meters per minute (dscmm).

Table 2.3 presents the CDD/CDF stack gas concentrations and emission rates. The average concentration of total CDD was 75 nanograms per dry standard cubic meter (ng/dscm). The average concentration of total CDD/CDF was 77 ng/dscm. These values corresponded to average emission rates of 6,968 micrograms per hour (µg/hr) and 7,108 µg/hr, respectively.

Table 2.4 presents CDD/CDF concentrations adjusted to 7% O<sub>2</sub>. The measured average stack gas O<sub>2</sub> concentration was 3.8%. Therefore, the adjusted CDD/CDF concentrations were nearly double the actual concentrations. The average adjusted concentration of total CDD was 149 ng/dscm @ 7% O<sub>2</sub>. The average adjusted concentration of total CDD/CDF was 152 ng/dscm @ 7% O<sub>2</sub>.

Table 2.4 also presents the adjusted concentrations in 2378 toxic equivalents. The average TEF concentration for total CDD/CDF was 0.30 ng/dscm @ 7% O<sub>2</sub>.

## **Baghouse Outlet**

Table 2.5 summarizes the CDD/CDF emissions sampling and stack gas parameters at the baghouse outlet. The total sampling time for each run was 240 minutes. The average sample volume was 158.341 dscf or 4.460 dscm. The average stack gas temperature was 404°F and contained 9.0% CO<sub>2</sub>, 14.6% O<sub>2</sub>, and 3.6% moisture. The average stack gas volumetric flow rate was 95,671 acfm or 53,228 dscfm or 1,507 dscmm.

Table 2.6 presents the CDD/CDF stack gas concentrations and emission rates. The average concentration of total CDD was 1.4 ng/dscm. The average concentration of total CDD/CDF was also 1.4 ng/dscm. These values corresponded to average emission rates of 122 µg/hr and 123 µg/hr, respectively.

Table 2.7 presents the CDD/CDF concentrations adjusted to 7% O<sub>2</sub>. The measured stack gas O<sub>2</sub> concentration was 3.6%. Therefore, the adjusted CDD/CDF concentrations were more than double the actual concentrations. The average adjusted concentration of total CDD was 2.9 ng/dscm @ 7% O<sub>2</sub>. The average adjusted concentration of total CDD/CDF was also 2.9 ng/dscm @ 7% O<sub>2</sub>.

TABLE 2.2  
 CDD/CDF EMISSIONS SAMPLING AND STACK GAS PARAMETERS  
 KILN NO. 1 BAGHOUSE INLET  
 APG LIME COMPANY - RIPPLEMEAD, VA

Run No.	M23-6-I	M23-7-I	M23-8-I	Average
Date	10/22/96	10/23/96	10/24/96	
Total Sampling Time, min.	240	240	240	
Average Sampling Rate, dscfm <sup>a</sup>	0.391	0.415	0.402	0.403
Sample Volume:				
dscf <sup>b</sup>	93.834	99.690	96.556	96.693
dscm <sup>c</sup>	2.643	2.808	2.720	2.724
Average Stack Gas Temp., °F	497	498	497	497
O <sub>2</sub> Concentration, % by volume	13.2	13.9	14.0	13.7
CO <sub>2</sub> Concentration, % by volume	10.7	10.3	10.1	10.4
Moisture, % by volume	3.9	3.6	4.0	3.8
Stack Gas Volumetric Flow Rate:				
acfm <sup>d</sup>	103,295	109,590	112,436	108,440
dscfm <sup>a</sup>	51,576	54,368	55,870	53,938
dscmm <sup>e</sup>	1,451	1540	1,582	1,527
Isokinetic Sampling Ratio, %	102.0	102.8	103.1	102.6

a Dry standard cubic feet per minute at 68°F and 1 atm

b Dry standard cubic feet at 68°F and 1 atm

c Dry standard cubic meters at 20°C and 1 atm.

d Actual cubic feet per minute at stack conditions.

e Dry standard cubic meters per minute at 20°C and 1 atm.

TABLE 2.3

CDD/CDF STACK GAS CONCENTRATIONS AND EMISSION RATES  
KILN NO. 1 BAGHOUSE INLET  
APG LIME COMPANY - RIPPLEMEAD, VA

CONGENER	CONCENTRATION <sup>a</sup> ng/dscm, as measured				EMISSION RATE <sup>b</sup> μg/hr			
	M23-6-I	M23-7-I	M23-8-I	Average	M23-6-I	M23-7-I	M23-8-I	Average
<b>Dioxins</b>								
2378 TCDD	{0.0076}	{0.0071}	0.0074	0.0074	{0.66}	{0.66}	0.70	0.70
Total TCDD	13	80	23	39	1,144	7,434	2,195	3,591
12378 PeCDD	0.049	0.25	0.085	0.13	4.3	23	8.0	12
Total PeCDD	6.4	62	13	27	557	5,724	1,263	2,515
123478 HxCDD	0.053	0.30	0.11	0.15	4.6	28	10	14
123678 HxCDD	0.038	0.53	0.13	0.23	3.3	49	12	22
123789 HxCDD	0.034	0.43	0.12	0.19	3.0	39	11	18
Total HxCDD	1.3	20	4.3	8.4	113	1,809	408	777
1234678 HpCDD	0.053	0.85	0.19	0.37	4.6	79	18	34
Total HpCDD	0.098	1.8	0.40	0.76	8.6	164	38	71
Octa CDD	0.30	0.15	0.059	0.17	27	14	5.6	15
Total CDD	21	164	41	75	1,849	15,146	3,911	6,968
<b>Furans</b>								
2378 TCDF	0.015	0.039	0.018	0.024	1.3	3.6	1.7	2.2
Total TCDF	0.61	2.2	0.77	1.2	53	201	7.3	109
12378 PeCDF	{0.011}	{0.039}	{0.015}	0.00	{1.0}	{3.6}	{1.4}	0.00
23478 PeCDF	{0.011}	{0.043}	{0.018}	0.00	{1.0}	{3.9}	{1.7}	0.00
Total PeCDF	0.068	0.43	0.17	0.22	6.0	39	16	21
123478 HxCDF	{0.0076}	0.039	0.022	0.031	{0.66}	3.6	2.1	2.9
123678 HxCDF	0.0038	0.014	0.0074	0.0085	0.33	1.3	0.70	0.78
234678 HxCDF	{0.011}	{0.018}	0.011	0.011	{1.0}	{1.6}	1.0	1.0
123789 HxCDF	{0.0076}	{0.0071}	{0.0074}	0.00	{0.66}	{0.66}	{0.70}	0.00
Total HxCDF	0.053	0.14	0.088	0.092	4.6	12	8.4	8.5
1234678 HpCDF	0.0076	{0.014}	{0.011}	0.0076	0.66	{1.3}	{1.0}	0.66
1234789 HpCDF	{0.0076}	{0.011}	{0.0074}	0.00	{0.66}	{1.0}	{0.70}	0.00
Total HpCDF	0.019	{0.014}	{0.011}	0.019	1.7	{1.3}	{1.0}	1.7
Octa CDF	0.023	{0.018}	{0.018}	0.023	2.0	{1.6}	{1.7}	2.0
Total CDF	0.77	2.7	1.0	1.5	67	253	98	139
Total CDD + CDF	22	167	42	77	1,916	15,398	4,009	7,108

<sup>a</sup> Nanogram per dry standard cubic meter at 20°C and 1 atm.

<sup>b</sup> Micrograms per hour.

{ } Non Detectable - Results are below target analyte detection limits. ND values are not counted in totals or averages.

{ } Estimated Maximum Possible Concentration. EMPC values are not counted in totals or averages.

TABLE 2.4

CDD/CDF STACK GAS CONCENTRATIONS AND 2378 TOXIC EQUIVALENT STACK  
GAS CONCENTRATIONS ADJUSTED TO 7 PERCENT OXYGEN  
KILN NO. 1 BAGHOUSE INLET  
APG LIME COMPANY - RIPPLEMEAD, VA

CONGENER	CONCENTRATION <sup>a</sup> ng/dscm, adjusted to 7 percent O <sub>2</sub>				2378- TCDD <sup>b</sup> Toxic Equiv. Factor	2378 TOXIC EQUIVALENCIES ng/dscm, adjusted to 7 percent O <sub>2</sub>			
	M23-6-I	M23-7-I	M23-8-I	Average		M23-6-I	M23-7-I	M23-8-I	Average
<b>Dioxins</b>									
2378 TCDD	(0.014)	{0.014}	0.015	0.015	1.000	(0.014)	{0.014}	0.015	0.015
Total TCDD	24	160	47	77					
12378 PeCDD	0.089	0.49	0.17	0.25	0.500	0.044	0.24	0.085	0.12
Total PeCDD	11	123	27	54					
123478 HxCDD	0.096	0.60	0.21	0.30	0.100	0.0096	0.060	0.021	0.030
123678 HxCDD	0.068	1.1	0.25	0.46	0.100	0.0068	0.11	0.025	0.046
123789 HxCDD	0.061	0.85	0.24	0.38	0.100	0.0061	0.085	0.024	0.038
Total HxCDD	2.3	39	8.7	17					
1234678 HpCDD	0.096	1.7	0.39	0.73	0.010	0.00096	0.017	0.0039	0.0073
Total HpCDD	0.18	3.5	0.81	1.5					
Octa CDD	0.55	0.30	0.12	0.32	0.001	0.00055	0.00030	0.00012	0.00032
Total CDD	38	326	83	149		0.068	0.51	0.17	0.25
<b>Furans</b>									
2378 TCDF	0.027	0.078	0.037	0.047	0.100	0.0027	0.0078	0.0037	0.0047
Total TCDF	1.1	4.3	1.6	2.3			{0.0039}		
12378 PeCDF	{0.020}	{0.078}	{0.030}	0.00	0.050	{0.0010}	{0.042}	{0.0015}	0.00
23478 PeCDF	{0.020}	{0.085}	{0.037}	0.00	0.500	{0.010}		{0.019}	0.00
Total PeCDF	0.12	0.85	0.35	0.44			0.0078		
123478 HxCDF	{0.014}	0.078	0.044	0.061	0.100	{0.0014}		0.0044	0.0061
123678 HxCDF	0.0068	0.028	0.015	0.017	0.100	0.00068	0.0028	0.0015	0.0017
234678 HxCDF	{0.020}	{0.035}	0.022	0.022	0.100	{0.0020}	{0.0035}	0.0022	0.0022
123789 HxCDF	{0.014}	{0.014}	{0.015}	0.00	0.100	{0.0014}	{0.0014}	{0.0015}	0.00
Total HxCDF	0.096	0.27	0.18	0.18					
1234678 HpCDF	0.014	{0.028}	{0.022}	0.014	0.010	0.00014	{0.00028}	{0.0022}	0.00014
1234789 HpCDF	{0.014}	{0.021}	{0.015}	0.00	0.010	{0.00014}	{0.00021}	{0.00015}	0.00
Total HpCDF	0.034	{0.028}	{0.022}	0.034					
Octa CDF	0.041	{0.035}	{0.037}	0.041	0.001	0.000041	{0.000035}	{0.000037}	0.000041
Total CDF	1.4	5.4	2.1	3.0		0.0029	0.018	0.012	0.011
Total CDD + CDF	39	331	85	152		0.071	0.53	0.29	0.30

<sup>a</sup> Nanogram per dry standard cubic meter adjusted to 7 percent oxygen at 20°C and 1 atm.

<sup>b</sup> North Atlantic Treaty Organization, Committee on the Challenges of Modern Society. Pilot study on International Information Exchange on Dioxins and Related Compounds: International Toxicity Equivalency Factor (I-TEF) Methods of Risk Assessment for Complex Mixtures of Dioxins and Related Compounds. Report No. 176, August 1988.

{ } Non Detectable - Results are below target analyte detection limits. ND values are not counted in totals or averages.

{ } Estimated Maximum Possible Concentration. EMPC values are not counted in totals or averages.

TABLE 2.5  
 CDD/CDF EMISSIONS SAMPLING AND STACK GAS PARAMETERS  
 KILN NO. 1 BAGHOUSE OUTLET  
 APG LIME COMPANY - RIPPLEMEAD, VA

Run No.	M23-6-O	M23-7-O	M23-8-O	Average
Date	10/22/96	10/23/96	10/24/96	
Total Sampling Time, min.	240	240	240	
Average Sampling Rate, dscfm <sup>a</sup>	0.616	0.658	0.705	0.660
Sample Volume:				
dscf <sup>b</sup>	147.758	158.021	169.242	158.341
dscm <sup>c</sup>	4.162	4.451	4.767	4.460
Average Stack Gas Temp., °F	400	401	410	404
O <sub>2</sub> Concentration, % by Volume	14.9	14.2	14.7	14.6
CO <sub>2</sub> Concentration, % by Volume	8.5	9.6	8.8	9.0
Moisture, % by Volume	3.5	3.3	3.8	3.6
Stack Gas Volumetric Flow Rate:				
acfm <sup>d</sup>	92,465	93,134	101,413	95,671
dscfm <sup>a</sup>	51,888	51,890	55,904	53,228
dscmm <sup>e</sup>	1,469	1,469	1,583	1,507
Isokinetic Sampling Ratio %	99.1	102.7	102.1	101.3

<sup>a</sup> Dry standard cubic feet per minute at 68°F and 1 atm

<sup>b</sup> Dry standard cubic feet at 68°F and 1 atm

<sup>c</sup> Dry standard cubic meters at 20°C and 1 atm

<sup>d</sup> Actual cubic feet per minute at stack conditions

<sup>e</sup> Dry standard cubic meters per minute at 20°C and 1 atm

TABLE 2.6

CDD/CDF STACK GAS CONCENTRATIONS AND EMISSION RATES  
KILN NO. 1 BAGHOUSE OUTLET  
APG LIME COMPANY - RIPPLEMEAD, VA

CONGENER	CONCENTRATION <sup>a</sup> ng/dscm, as measured				EMISSION RATE <sup>b</sup> µg/hr			
	M23-6-O	M23-7-O	M23-8-O	Average	M23-6-O	M23-7-O	M23-8-O	Average
<u>Dioxins</u>								
2378 TCDD	(0.0048)	(0.0045)	(0.0021)	0.00	(0.42)	(0.40)	(0.20)	0.00
Total TCDD	0.060	1.5	0.0094	0.56	5.3	134	9.0	50
12378 PeCDD	(0.010)	(0.0090)	(0.0063)	0.00	(0.85)	(0.79)	(0.60)	0.00
Total PeCDD	0.077	1.2	0.086	0.46	6.8	107	8.2	41
123478 HxCDD	(0.0072)	0.0067	(0.0042)	0.0070	(0.64)	0.59	(0.40)	0.59
123678 HxCDD	(0.0070)	0.0090	0.0020	0.0060	(0.64)	0.79	0.20	0.50
123789 HxCDD	(0.0072)	0.0090	{0.0021}	0.0090	(0.64)	0.79	{0.20}	0.79
Total HxCDD	0.060	0.76	0.044	0.29	5.3	67	4.2	26
1234678 HpCDD	0.0072	0.052	(0.0063)	0.029	0.64	4.6	(0.60)	2.6
Total HpCDD	0.014	0.079	(0.013)	0.047	1.3	6.9	1.2	4.1
Octa CDD	0.050	0.049	0.0084	0.036	4.5	4.4	0.80	3.2
Total CDD	0.26	3.6	0.23	1.4	23	320	22	122
<u>Furans</u>								
2378 TCDF	0.0012	(0.0022)	(0.0042)	0.0012	0.11	(0.20)	(0.40)	0.11
Total TCDF	0.0048	{0.00045}	0.010	0.0076	0.42	{0.040}	1.0	0.71
12378 PeCDF	(0.0048)	(0.0045)	(0.0021)	0.00	(0.42)	(0.40)	(0.20)	0.00
23478 PeCDF	(0.0048)	(0.0045)	(0.0021)	0.00	(0.42)	(0.40)	(0.20)	0.00
Total PeCDF	(0.0048)	(0.0045)	(0.0021)	0.00	(0.42)	(0.40)	(0.20)	0.00
123478 HxCDF	(0.0048)	(0.0045)	(0.0021)	0.00	(0.42)	(0.40)	(0.20)	0.00
123678 HxCDF	(0.0048)	(0.0045)	(0.0021)	0.00	(0.42)	(0.40)	(0.20)	0.00
234678 HxCDF	0.0024	{0.0022}	0.0021	0.0023	0.21	{0.20}	0.20	0.21
123789 HxCDF	(0.0048)	(0.0045)	(0.00021)	0.00	(0.42)	(0.40)	(0.20)	0.00
Total HxCDF	0.0022	{0.0022}	{0.0042}	0.0032	0.21	{0.20}	0.40	0.31
1234678 HpCDF	{0.0024}	0.0022	{0.0021}	0.0022	{0.21}	0.20	{0.20}	0.20
1234789 HpCDF	(0.0048)	(0.0045)	(0.0042)	0.00	(0.42)	(0.40)	(0.40)	0.00
Total HpCDF	{0.0024}	0.0022	{0.0021}	0.0022	{0.21}	0.20	{0.20}	0.20
Octa CDF	{0.0072}	(0.0090)	0.0042	0.0042	{0.64}	(0.79)	0.40	0.40
Total CDF	0.0072	0.0022	0.019	0.0094	0.64	0.20	1.8	0.88
Total CDD + CDF	0.27	3.6	0.25	1.4	24	320	24	123

<sup>a</sup> Nanogram per dry standard cubic meter at 20°C and 1 atm.

<sup>b</sup> Micrograms per hour.

( ) Non Detectable - Results are below target analyte detection limits. ND values are not counted in totals or averages.

{ } Estimated Maximum Possible Concentration. EMPC values are not counted in totals or averages.

TABLE 2.7

CDD/CDF STACK GAS CONCENTRATIONS AND 2378 TOXIC EQUIVALENT STACK GAS CONCENTRATIONS ADJUSTED TO 7 PERCENT OXYGEN  
KILN NO. 1 BAGHOUSE OUTLET  
APG COMPANY - RIPPLEMEAD, VA

CONGENER	CONCENTRATION <sup>a</sup> ng/dscm, adjusted to 7 percent O <sub>2</sub>				2378- TCDD <sup>b</sup> Toxic Equiv. Factor	2378 TOXIC EQUIVALENCIES ng/dscm, adjusted to 7 percent O <sub>2</sub>			
	M23-6-O	M23-7-O	M23-8-O	Average		M23-6-O	M23-7-O	M23-8-O	Average
<b>Dioxins</b>									
2378 TCDD	(0.011)	(0.0093)	(0.0047)	0.00	1.000	(0.011)	(0.0093)	(0.047)	0.00
Total TCDD	0.14	3.2	0.21	1.2					
12378 PeCDD	(0.022)	(0.019)	(0.014)	0.00	0.500	(0.011)	(0.0093)	(0.0071)	0.00
Total PeCDD	0.18	2.5	0.19	1.0					
123478 HxCDD	(0.017)	0.014	(0.0094)	0.014	0.100	(0.0017)	0.0014	(0.00094)	0.0014
123678 HxCDD	(0.017)	0.019	(0.0047)	0.012	0.100	(0.0017)	0.0019	0.00047	0.0012
123789 HxCDD	(0.017)	0.019	{0.0047}	0.012	0.100	(0.0017)	0.0019	{0.00047}	0.0012
Total HxCDD	0.14	1.6	0.10	0.61					
1234678 HpCDD	0.017	0.11	(0.014)	0.037	0.010	0.00017	0.0011	(0.00014)	0.00047
Total HpCDD	0.033	0.16	(0.028)	0.056					
Octa CDD	0.12	0.10	0.019	0.079	0.001	0.00012	0.00010	0.000019	0.000061
Total CDD	0.61	7.5	0.52	2.9		0.00029	0.0064	0.000489	0.00239
<b>Furans</b>									
2378 TCDF	0.0028	(0.0047)	(0.0094)	0.00	0.100	0.00028	(0.00047)	(0.00094)	0.00028
Total TCDF	0.011	{0.00093}	0.024	0.12					
12378 PeCDF	(0.011)	(0.0093)	(0.0047)	0.00	0.050	(0.00056)	(0.00047)	(0.00024)	0.00
23478 PeCDF	(0.011)	(0.0093)	(0.0047)	0.00	0.500	(0.0056)	(0.0047)	(0.0024)	0.00
Total PeCDF	(0.011)	(0.0093)	(0.0047)	0.00					
123478 HxCDF	(0.011)	(0.0093)	(0.0047)	0.00	0.100	(0.0011)	(0.00093)	(0.00047)	0.00
123678 HxCDF	(0.011)	(0.0093)	(0.0047)	0.00	0.100	(0.0011)	(0.00093)	(0.00047)	0.00
234678 HxCDF	0.0056	{0.0047}	0.0047	0.00	0.100	0.00056	0.00047	0.00047	0.00
123789 HxCDF	(0.011)	(0.0093)	(0.0047)	0.00	0.100	(0.0011)	(0.00093)	(0.00047)	0.00
Total HxCDF	0.0056	{0.0047}	(0.0094)	0.0065					
1234678 HpCDF	{0.0056}	0.0047	{0.0047}	0.0051	0.010	{0.000056}	0.000047	{0.000047}	0.000051
1234789 HpCDF	(0.011)	(0.0093)	(0.0094)	0.00	0.010	(0.00011)	(0.000093)	(0.000094)	0.00
Total HpCDF	{0.0056}	0.0047	{0.0047}	0.0050					
Octa CDF	{0.017}	(0.019)	{0.0094}	0.013	0.001	{0.000017}	(0.000019)	0.0000094	0.000013
Total CDF	0.017	0.0047	0.042	0.021					
<b>Total CDD + CDF</b>	<b>0.62</b>	<b>7.5</b>	<b>0.56</b>	<b>2.9</b>		<b>0.00084</b>	<b>0.00052</b>	<b>0.000479</b>	<b>0.00061</b>

<sup>a</sup> Nanogram per dry standard cubic meter adjusted to 7 percent oxygen at 20°C and 1 atm.

<sup>b</sup> North Atlantic Treaty Organization, Committee on the Challenges of Modern Society. Pilot study on International Information Exchange on Dioxins and Related Compounds: International Toxicity Equivalency Factor (I-TEF) Methods of Risk Assessment for Complex Mixtures of Dioxins and Related Compounds. Report No. 176, August 1988.

( ) Non Detectable - Results are below target analyte detection limits. ND values are not counted in totals or averages.

{ } Estimated Maximum Possible Concentration. EMPC values are not counted in totals or averages.

Table 2.7 also presents the adjusted concentrations in 2378 toxic equivalents. The average TEF concentration for total CDD/CDF was 0.00061 ng/dscm @ 7% O<sub>2</sub>.

### **2.2.2 Particulate Matter/metals**

During Run No. M29-13-I the filter media in the sample train ruptured. The sample train was turned off immediately. Upon examination of the filter it was discovered that some particulate matter had broken through the filter into the first empty impinger. Rather than void this run, it was decided by the PES Project Manager and EPA WAM to keep the first impinger catch separate from the other samples and then filter this solution through a tared quartz fiber filter in order to recover the lost particulate matter. Due to the large mass of particulate matter in the total sample, we do not believe that the particulate matter or metals results for this run were compromised.

Also, when the filter ruptured, some acidic potassium permanganate solution backed up into the empty impinger that separates the acidic hydrogen peroxide and acidic potassium permanganate absorbing solutions. PES recovered this sample fraction separately and had intended to analyze this fraction separately for mercury. However, PES did not instruct the analytical laboratory to analyze this sample fraction separately. As a result, the sample fraction was combined with the sample fractions for the metals other than mercury. This resulted in high manganese results for this run. Therefore, the manganese results for this run are not valid. All other metals results are valid.

At the conclusion of Run No. M29-13-O on the baghouse outlet the glass sample nozzle dropped off the end of the probe and could not be recovered. Due to the low particulate concentration at this location it is believed by PES that the loss of this small portion of the sample did not compromise the particulate matter or metals results for this run.

### **Baghouse Inlet**

Table 2.8 summarizes the particulate matter/metals emissions sampling and stack gas parameters at the baghouse inlet. The total sampling time for each test run was 240 minutes. The average sample volume was 89.266 dscf or 2.528 dscm. The average stack gas temperature was 503°F and contained 10.3% CO<sub>2</sub>, 13.7% O<sub>2</sub>, and 4.2% moisture. The average stack gas volumetric flow rate was 104,363 acfm or 51,395 dscfm or 1,455 dscm.

Table 2.9 summarizes the stack gas particulate matter concentrations and emission rates at the baghouse inlet. The average concentration was 5.443 grains per dry standard cubic foot (gr/dscf) or 12.45 grams per dry standard cubic meter (g/dscm). The concentrations are also shown adjusted to 7% O<sub>2</sub>. The average mass emission rate was 2,394 pounds per hour (lb/hr) or 1,086 kilograms per hour (kg/hr).

Table 2.10 summarizes the stack gas metals concentrations and emission rates. All of the target metals were found to be present in all three samples. Average concentrations ranged

TABLE 2.8

PARTICULATE/METALS EMISSIONS SAMPLING AND STACK GAS PARAMETERS  
KILN NO. 1 BAGHOUSE INLET  
APG LIME COMPANY - RIPPLEMEAD, VA

Run No.	M29-13-I	M29-14-I	M29-15-I	Average
Date	10/22/96	10/23/96	10/24/96	
Total Sampling Time, min.	240	240	240	
Average Sampling Rate, dscfm <sup>a</sup>	0.381	0.356	0.379	0.372
Sample Volume:				
dscf <sup>b</sup>	91.332	85.519	90.946	89.266
dscm <sup>c</sup>	2.586	2.422	2.575	2.528
Average Stack Gas Temp., °F	500	503	504	503
O <sub>2</sub> Concentration, % by Volume	13.2	13.9	14.0	13.7
CO <sub>2</sub> Concentration, % by Volume	10.7	10.3	9.9	10.3
Moisture, % by Volume	4.0	4.2	4.4	4.2
Stack Gas Volumetric Flow Rate:				
acfm <sup>d</sup>	100,324	102,889	109,878	104,363
dscfm <sup>a</sup>	49,866	50,439	53,880	51,395
dscmm <sup>e</sup>	1,412	1,428	1,526	1,455
Isokinetic Sampling Ratio, %	99.8	101.5	101.0	100.8

<sup>a</sup> Dry standard cubic feet per minute at 68°F and 1 atm.

<sup>b</sup> Dry standard cubic feet at 68°F and 1 atm.

<sup>c</sup> Dry standard cubic meters at 20°C and 1 atm.

<sup>d</sup> Actual cubic feet per minute at stack conditions.

<sup>e</sup> Dry standard cubic meters per minute at 20°C and 1 atm.

TABLE 2.9

PARTICULATE MATTER CONCENTRATIONS AND EMISSION RATES  
 KILN NO. 1 BAGHOUSE INLET  
 APG LIME COMPANY - RIPPLEMEAD, VA

Run No.	M29-13-I	M29-14-I	M29-15-I	Average
Date	10/22/96	10/23/96	10/24/96	
Clock Time, 24-hr clock	1130-1743	1040-1540	1054-1715	
Concentration:				
gr/dscf <sup>a</sup>	5.472	5.802	5.053	5.443
gr/dscf @ 7% O <sub>2</sub> <sup>b</sup>	9.879	11.52	10.18	10.53
g/dscm <sup>c</sup>	12.52	13.28	11.56	12.45
g/dscm @ 7% O <sub>2</sub> <sup>d</sup>	22.61	26.37	23.30	24.09
Emission Rate:				
lb/hr <sup>e</sup>	2,339	2,508	2,334	2,394
kg/hr <sup>f</sup>	1,061	1,138	1,059	1,086

<sup>a</sup> Grains per dry standard cubic foot at 68°F and 1 atm.

<sup>b</sup> Grains per dry standard cubic foot at 68°F and 1 atm adjusted to 7 percent O<sub>2</sub>.

<sup>c</sup> Grams per dry standard cubic meter at 20°C and 1 atm.

<sup>d</sup> Grams per dry standard cubic meter at 20°C and 1 atm adjusted to 7 percent O<sub>2</sub>.

<sup>e</sup> Pounds per hour.

<sup>f</sup> Kilograms per hour.

TABLE 2.10

**STACK GAS METALS CONCENTRATIONS AND EMISSION RATES  
KILN NO. 1 BAGHOUSE INLET  
APG LIME COMPANY RIPPLEMEAD, VA**

Run No.	M29-13-I	M29-14-I	M29-15-I	Average
Date	10/22/96	10/23/96	10/24/96	
Clock Time, 24-hr Clock	1130-1743	1040-1540	1054-1715	
<b>Antimony (Sb)</b>				
$\mu\text{g/dscm}^{\text{a}}$	5.84	4.79	4.81	5.15
$\mu\text{g/dscm @ 7\% O}_2^{\text{b}}$	10.5	9.51	9.70	9.92
$\text{g/hr}^{\text{c}}$	0.495	0.410	0.441	0.449
<b>Arsenic (As)</b>				
$\mu\text{g/dscm}^{\text{a}}$	26.9	52.9	70.3	50.0
$\mu\text{g/dscm @ 7\% O}_2^{\text{b}}$	48.6	105	142	98.4
$\text{g/hr}^{\text{c}}$	2.28	4.53	6.43	4.41
<b>Beryllium (Be)</b>				
$\mu\text{g/dscm}^{\text{a}}$	24.2	14.4	18.9	19.2
$\mu\text{g/dscm @ 7\% O}_2^{\text{b}}$	43.8	28.5	38.0	36.8
$\text{g/hr}^{\text{c}}$	2.05	1.23	1.73	1.67
<b>Cadmium (Cd)</b>				
$\mu\text{g/dscm}^{\text{a}}$	0.746	2.62	2.40	1.92
$\mu\text{g/dscm @ 7\% O}_2^{\text{b}}$	1.35	5.21	4.83	3.80
$\text{g/hr}^{\text{c}}$	0.0632	0.225	0.220	0.169
<b>Total Chromium (Cr)</b>				
$\mu\text{g/dscm}^{\text{a}}$	68.1	82.2	89.7	80.0
$\mu\text{g/dscm @ 7\% O}_2^{\text{b}}$	123	163	181	156
$\text{g/hr}^{\text{c}}$	5.77	7.04	8.21	7.01
<b>Cobalt (Co)</b>				
$\mu\text{g/dscm}^{\text{a}}$	32.2	46.7	48.9	42.6
$\mu\text{g/dscm @ 7\% O}_2^{\text{b}}$	58.2	92.7	98.6	83.1
$\text{g/hr}^{\text{c}}$	2.73	4.00	4.48	3.74
<b>Lead (Pb)</b>				
$\mu\text{g/dscm}^{\text{a}}$	38.0	84.2	83.1	68.5
$\mu\text{g/dscm @ 7\% O}_2^{\text{b}}$	68.7	167	167	134
$\text{g/hr}^{\text{c}}$	3.22	7.22	7.61	60.2
<b>Manganese (Mn)</b>				
$\mu\text{g/dscm}^{\text{a}}$		240	190	215
$\mu\text{g/dscm @ 7\% O}_2^{\text{b}}$	-	477	383	430
$\text{g/hr}^{\text{c}}$	-	20.6	17.4	19.0
<b>Mercury (Hg)</b>				
$\mu\text{g/dscm}^{\text{a}}$	0.456	0.681	1.05	0.730
$\mu\text{g/dscm @ 7\% O}_2^{\text{b}}$	0.824	1.35	2.12	1.43
$\text{g/hr}^{\text{c}}$	0.0387	0.0584	0.0963	0.0645
<b>Nickel (Ni)</b>				
$\mu\text{g/dscm}^{\text{a}}$	53.4	73.5	72.2	66.4
$\mu\text{g/dscm @ 7\% O}_2^{\text{b}}$	96.3	146	145	129
$\text{g/hr}^{\text{c}}$	4.52	6.30	6.61	5.81
<b>Selenium (Se)</b>				
$\mu\text{g/dscm}^{\text{a}}$	40.2	28.3	39.6	36.0
$\mu\text{g/dscm @ 7\% O}_2^{\text{b}}$	72.6	56.3	79.8	69.5
$\text{g/hr}^{\text{c}}$	3.41	2.43	3.63	3.15

<sup>a</sup> Micrograms per dry standard cubic meter @ 20° C and 1 atm.

<sup>b</sup> Micrograms per dry standard cubic meter @ 20°C and 1 atm, adjusted to 7% O<sub>2</sub>.

<sup>c</sup> Grams per hour.

from 0.730 micrograms per dry standard cubic meter ( $\mu\text{g}/\text{dscm}$ ) for mercury to 215  $\mu\text{g}/\text{dscm}$  for manganese.

### **Baghouse Outlet**

Table 2.11 summarizes the particulate matter/metals emissions sampling and stack gas parameters. The total sampling time for each test run was 240 minutes. The average sample volume was 162.167 dscf or 4.592 dscm. The average stack gas temperature was 410°F and contained 9.0% CO<sub>2</sub>, 14.6% O<sub>2</sub>, and 3.6% moisture. The average stack gas volumetric flow rate was 97,499 acfm or 53,822 dscfm or 1,524 dscmm.

Table 2.12 summarizes the stack gas particulate matter concentrations and emission rates. The average concentration was 1.42 E-02 gr/dscf or 3.26 E-02 g/dscm. The concentrations are also shown adjusted to 7% O<sub>2</sub>. The average emission rate was 6.54 lb/hr or 2.96 kg/hr.

Table 2.13 summarizes the stack gas metals concentrations and emission rates. All of the target metals were found to be present in all three samples. Average concentrations ranged from 0.206  $\mu\text{g}/\text{dscm}$  for cadmium to 37.5  $\mu\text{g}/\text{dscm}$  for manganese.

### **2.2.3 Total Hydrocarbons**

Total hydrocarbons (THC) were measured using a flame ionization analyzer (FIA) calibrated with propane-in-air gases. Two FIAs were used, one for the Kiln No. 1 baghouse inlet and one for the baghouse outlet. The FIAs were operated on a 0-100 parts per million by volume (ppmv) range. The instrument sensitivity was  $\pm 2\%$  of span or 2 ppmv. The sample lines, pump, and detector were heated; therefore the THC concentrations were measured on a wet basis. The measured moisture contents in each stack were used to correct the measured concentrations on a wet basis to concentrations on a dry basis. The average moistures obtained for each run from the Method 23 and Method 29 moisture determinations were used.

#### **Kiln No. 1**

Table 2.14 summarizes the THC emissions from Kiln No. 1. In all cases the THC concentrations were very low, near the instrument detection of 2 ppmv. At the baghouse inlet the average THC concentration was 2.5 ppmv, dry basis, or 4.9 ppmv adjusted to 7% O<sub>2</sub>. The average emission rate was 0.91 lb/hr. At the baghouse outlet the average THC concentration was 2.2 ppmv or 4.8 ppmv adjusted to 7% O<sub>2</sub>. The average emission rate was 0.80 lb/hr.

### **2.3 KILN NO. 2 COOLER EXHAUST**

Table 2.15 summarizes the particulate matter/metals emissions sampling and stack gas parameters. The total sampling time for each test run was 120 minutes. The average sample volume was 76.750 dscf or 2.173 dscm. The average stack gas temperature was 211°F and contained 1.1% moisture. The stack gas was assumed to be comprised of 20.9% O<sub>2</sub> and no

TABLE 2.11

PARTICULATE/METALS EMISSIONS SAMPLING AND STACK GAS PARAMETERS  
KILN NO. 1 BAGHOUSE OUTLET  
APG LIME COMPANY RIPPLEMEAD, VA

Run No.	M29-13-O	M29-14-O	M29-15-O	Average
Date	10/22/96	10/23/96	10/24/96	
Total Sampling Time, min.	240	240	240	
Average Sampling Rate, dscfm <sup>a</sup>	0.651	0.667	0.709	0.676
Sample Volume:				
dscf <sup>b</sup>	156.196	160.166	170.140	162.167
dscm <sup>c</sup>	4.423	4.535	4.818	4.592
Average Stack Gas Temp., °F	411	406	413	410
O <sub>2</sub> Concentration, % by volume	14.9	14.2	14.7	14.6
CO <sub>2</sub> Concentration, % by volume	8.5	9.6	8.8	9.0
Moisture, % by volume	3.6	3.5	3.8	3.6
Volumetric Flow Rate:				
acfm <sup>d</sup>	96,040	95,852	100,603	97,499
dscfm <sup>a</sup>	53,162	53,039	55,265	53,822
dscmm <sup>e</sup>	1,505	1,502	1,565	1,524
Isokinetic Sampling Ratio, %	98.3	105.1	107.2	103.5

<sup>a</sup> Dry standard cubic feet per minute at 68°F and 1 atm.

<sup>b</sup> Dry standard cubic feet at 68°F and 1 atm.

<sup>c</sup> Dry standard cubic meters at 20°C and 1 atm.

<sup>d</sup> Actual cubic feet per minute at stack conditions.

<sup>e</sup> Dry standard cubic meters per minute at 20°C and 1 atm.

TABLE 2.12

PARTICULATE MATTER CONCENTRATIONS AND EMISSION RATES  
KILN NO. 1 BAGHOUSE OUTLET  
APG LIME COMPANY - RIPPLEMEAD, VA

Run No.	M29-13-O	M29-14-O	M29-15-O	Average
Date	10/22/96	10/23/96	10/24/96	
Clock Time, 24-hr clock	1130-1749	1041-1542	1121-1731	
Concentration:				
gr/dscf <sup>a</sup>	0.0142	0.0184	0.0101	0.0142
gr/dscf @ 7% O <sub>2</sub> <sup>b</sup>	0.0330	0.0381	0.0226	0.0312
g/dscm <sup>c</sup>	0.0326	0.0420	0.0231	0.0326
g/dscm @ 7% O <sub>2</sub> <sup>d</sup>	0.0754	0.0871	0.0518	0.0715
Emission Rate:				
lb/hr <sup>e</sup>	6.48	8.34	4.78	6.54
kg/hr <sup>f</sup>	2.94	3.79	2.17	2.96

<sup>a</sup> Grains per dry standard cubic foot at 68°F and 1 atm.

<sup>b</sup> Grains per dry standard cubic foot at 68°F and 1 atm adjusted to 7 percent O<sub>2</sub>.

<sup>c</sup> Grams per dry standard cubic meter at 20°C and 1 atm.

<sup>d</sup> Grams per dry standard cubic meter at 20°C and 1 atm adjusted to 7 percent O<sub>2</sub>.

<sup>e</sup> Pounds per hour.

<sup>f</sup> Kilograms per hour.

TABLE 2.13

**STACK GAS METALS CONCENTRATIONS AND EMISSION RATES  
KILN NO.1 BAGHOUSE OUTLET  
APG LIME COMPANY - RIPPLEMEAD, VA**

Run No.	M29-13-O	M29-14-O	M29-15-O	Average
Date	10/22/96	10/23/96	10/24/96	
Clock Time, 24-hr Clock	1130-1749	1041-1542	1121-1731	
Antimony (Sb)				
$\mu\text{g}/\text{dscm}^{\text{a}}$	1.42	1.31	1.14	1.29
$\mu\text{g}/\text{dscm}$ @ 7% O <sub>2</sub> <sup>b</sup>	3.29	2.72	2.55	2.86
g/hr <sup>c</sup>	0.128	0.118	0.107	0.118
Arsenic (As)				
$\mu\text{g}/\text{dscm}^{\text{a}}$	0.439	0.547	0.565	0.517
$\mu\text{g}/\text{dscm}$ @ 7% O <sub>2</sub> <sup>b</sup>	1.02	1.13	1.27	1.14
g/hr <sup>c</sup>	0.0396	0.0493	0.0530	0.0473
Beryllium (Be)				
$\mu\text{g}/\text{dscm}^{\text{a}}$	0.301	0.265	0.190	0.252
$\mu\text{g}/\text{dscm}$ @ 7% O <sub>2</sub> <sup>b</sup>	0.697	0.549	0.426	0.557
g/hr <sup>c</sup>	0.0272	0.0238	0.0179	0.230
Cadmium (Cd)				
$\mu\text{g}/\text{dscm}^{\text{a}}$	0.289	0.195	0.133	0.206
$\mu\text{g}/\text{dscm}$ @ 7% O <sub>2</sub> <sup>b</sup>	0.670	0.405	0.298	0.458
g/hr <sup>c</sup>	0.0261	0.0176	0.0125	0.0187
Total Chromium (Cr)				
$\mu\text{g}/\text{dscm}^{\text{a}}$	4.39	4.45	3.69	4.18
$\mu\text{g}/\text{dscm}$ @ 7% O <sub>2</sub> <sup>b</sup>	10.2	9.24	8.28	9.23
g/hr <sup>c</sup>	0.396	0.401	0.347	0.381
Cobalt (Co)				
$\mu\text{g}/\text{dscm}^{\text{a}}$	1.26	1.28	0.890	1.14
$\mu\text{g}/\text{dscm}$ @ 7% O <sub>2</sub> <sup>b</sup>	2.92	2.65	2.00	2.52
g/hr <sup>c</sup>	0.114	0.115	0.0836	0.104
Lead (Pb)				
$\mu\text{g}/\text{dscm}^{\text{a}}$	3.12	2.36	1.98	2.49
$\mu\text{g}/\text{dscm}$ @ 7% O <sub>2</sub> <sup>b</sup>	7.23	4.89	4.43	5.52
g/hr <sup>c</sup>	0.282	0.213	0.186	0.227
Manganese (Mn)				
$\mu\text{g}/\text{dscm}^{\text{a}}$	62.4	6.81	43.2	37.5
$\mu\text{g}/\text{dscm}$ @ 7% O <sub>2</sub> <sup>b</sup>	145	14.1	96.8	85.2
g/hr <sup>c</sup>	5.64	0.614	4.05	3.43
Mercury (Hg)				
$\mu\text{g}/\text{dscm}^{\text{a}}$	0.00	0.260	0.820	0.360
$\mu\text{g}/\text{dscm}$ @ 7% O <sub>2</sub> <sup>b</sup>	0.00	0.540	1.84	0.793
g/hr <sup>c</sup>	0.00	0.0234	0.0770	0.0335
Nickel (Ni)				
$\mu\text{g}/\text{dscm}^{\text{a}}$	2.80	2.76	2.86	2.81
$\mu\text{g}/\text{dscm}$ @ 7% O <sub>2</sub> <sup>b</sup>	6.49	5.72	6.42	6.21
g/hr <sup>c</sup>	0.253	0.248	0.269	0.257
Selenium (Se)				
$\mu\text{g}/\text{dscm}^{\text{a}}$	3.48	3.20	4.73	36.80
$\mu\text{g}/\text{dscm}$ @ 7% O <sub>2</sub> <sup>b</sup>	8.07	6.63	10.6	8.44
g/hr <sup>c</sup>	0.314	0.288	0.444	0.349

<sup>a</sup> Micrograms per dry standard cubic meter @ 20° C and 1 atm.

<sup>b</sup> Micrograms per dry standard cubic meter @ 20°C and 1 atm, adjusted to 7% O<sub>2</sub>.

<sup>c</sup> Grams per hour.

TABLE 2.14

SUMMARY OF TOTAL HYDROCARBON EMISSIONS KILN NO. 1  
APG LIME COMPANY RIPPLEMEAD, VA

Run No.	M25A-4	M25A-5	M25A-6	Average
Date	10-22-96	10-23-96	10-24-96	
<u>Baghouse Inlet</u>				
Flow Rate, dscfm <sup>a,b</sup>	50,721	52,404	54,875	52,667
Oxygen, %	13.2	13.9	14.0	13.7
THC Concentration				
ppmvd <sup>c</sup>	2.3	3.2	2.1	2.5
ppmvd @ 7% O <sub>2</sub> <sup>d</sup>	4.2	6.3	4.1	4.9
THC Emission Rate				
lb/hr <sup>e</sup>	0.82	1.14	0.78	0.91
<u>Baghouse Outlet</u>				
Flow Rate, dscfm <sup>a,b</sup>	52,525	52,465	55,585	53,525
Oxygen, %	14.9	14.2	14.7	14.6
THC Concentration				
ppmvd <sup>c</sup>	1.8	2.9	1.9	2.2
ppmvd @ 7% O <sub>2</sub> <sup>d</sup>	4.2	5.9	4.3	4.8
THC Emission Rate				
lb/hr <sup>e</sup>	0.65	1.03	0.73	0.80

<sup>a</sup> Dry standard cubic feet per minute at 68°F and 1 atm.

<sup>b</sup> Average of Method 23 and Method 29 results.

<sup>c</sup> Parts per million by volume, as propane, dry basis.

<sup>d</sup> Parts per million by volume, as propane, dry basis, adjusted to 7% oxygen.

<sup>e</sup> Pounds per hour.

TABLE 2.15

PARTICULATE/METALS EMISSIONS SAMPLING AND STACK GAS PARAMETERS  
 KILN NO. 2 COOLER EXHAUST STACK  
 APG LIME COMPANY - RIPPLEMEAD, VA

Run No.	M29-10	M29-11	M29-12	Average
Date	10/21/96	10/21/96	10/21/96	
Total Sampling Time, min.	120	120	120	
Average Sampling Rate, dscfm <sup>a</sup>	0.653	0.625	0.641	0.640
Sample Volume:				
dscf <sup>b</sup>	78.328	74.946	76.976	76.750
dscm <sup>c</sup>	2.218	2.122	2.180	2.173
Average Stack Gas Temp., °F	201	226	207	211
O <sub>2</sub> Concentration, % by volume	20.9	20.9	20.9	20.9
CO <sub>2</sub> Concentration, % by volume	0	0	0	0
Moisture, % by volume	1.0	1.4	0.9	1.1
Stack Gas Volumetric Flow Rate:				
acfm <sup>d</sup>	7,862	7,767	7,653	7,760
dscfm <sup>a</sup>	5,887	5,571	5,677	5,711
dscmm <sup>e</sup>	167	158	161	162
Isokinetic Sampling Ratio, %	100.6	101.7	102.5	101.6

<sup>a</sup> Dry standard cubic feet per minute at 68°F and 1 atm.

<sup>b</sup> Dry standard cubic feet at 68°F and 1 atm.

<sup>c</sup> Dry standard cubic meters at 20°C and 1 atm.

<sup>d</sup> Actual cubic feet per minute at stack conditions.

<sup>e</sup> Dry standard cubic meters per minute at 20°C and 1 atm.

CO<sub>2</sub>. The average stack gas volumetric flow rate was 7,760 acfm or 5,711 dscfm or 162 dscmm

Table 2.16 summarizes the stack gas particulate matter concentrations and emission rates. The average concentration was 1.27 E-01 gr/dscf or 2.92 E-02 g/dscm. The concentrations are also shown adjusted to 7% O<sub>2</sub>. The average emission rate was 6.26 lb/hr or 2.84 kg/hr.

Table 2.17 summarizes the stack gas metals concentrations and emission rates. All of the target metals except beryllium and mercury were found to be present in all three samples. Average concentrations of those metals detected ranged from 0.763 µg/dscm for cadmium to 135 µg/dscm for manganese.

TABLE 2.16

PARTICULATE MATTER CONCENTRATIONS AND EMISSION RATES  
 KILN NO. 2 COOLER EXHAUST STACK  
 APG LIME COMPANY - RIPPLEMEAD, VA

Run No.	M29-10	M29-11	M29-12	Average
Date	10/21/96	10/21/96	10/21/96	
Clock Time, 24-hr Clock	1125-1334	1404-1607	1625-1828	
Concentration:				
gr/dscf <sup>a</sup>	0.145	0.0978	0.139	0.127
g/dscm <sup>b</sup>	0.332	0.224	0.319	0.292
Emission Rate:				
lb/hr <sup>c</sup>	7.33	4.67	6.78	6.26
kg/hr <sup>f</sup>	3.33	2.12	3.07	2.84

<sup>a</sup> Grains per dry standard cubic foot at 68°F and 1 atm.

<sup>b</sup> Grains per dry standard cubic foot at 68°F and 1 atm adjusted to 7 percent O<sub>2</sub>.

<sup>c</sup> Grams per dry standard cubic meter at 20°C and 1 atm.

<sup>d</sup> Grams per dry standard cubic meter at 20°C and 1 atm adjusted to 7 percent O<sub>2</sub>.

<sup>e</sup> Pounds per hour.

<sup>f</sup> Kilograms per hour.

TABLE 2.17

STACK GAS METALS CONCENTRATIONS AND EMISSION RATES  
KILN NO.2 COOLER EXHAUST STACK  
APG LIME COMPANY - RIPPLEMEAD, VA

Run No.	M29-10	M29-11	M29-12	Average
Date	10/21/96	10/21/96	10/21/96	
Clock Time, 24-hr Clock	1125-1334	1404-1607	1625-1828	
Antimony (Sb)				
$\mu\text{g/dscm}^{\text{a}}$	4.13	4.01	4.59	4.24
$\text{g/hr}^{\text{c}}$	0.0413	0.0379	0.0442	0.0412
Arsenic (As)				
$\mu\text{g/dscm}^{\text{a}}$	0.947	0.565	0.798	0.770
$\text{g/hr}^{\text{c}}$	0.00947	0.00535	0.00770	0.00751
Beryllium (Be)				
$\mu\text{g/dscm}^{\text{a}}$	0.00	0.00	0.00	0.00
$\text{g/hr}^{\text{c}}$	0.00	0.00	0.00	0.00
Cadmium (Cd)				
$\mu\text{g/dscm}^{\text{a}}$	0.414	1.33	0.541	0.763
$\text{g/hr}^{\text{c}}$	0.00414	0.0126	0.00522	0.00733
Total Chromium (Cr)				
$\mu\text{g/dscm}^{\text{a}}$	9.96	10.0	8.90	9.63
$\text{g/hr}^{\text{c}}$	0.0997	0.0950	0.0858	0.0935
Cobalt (Co)				
$\mu\text{g/dscm}^{\text{a}}$	5.18	5.51	6.10	5.60
$\text{g/hr}^{\text{c}}$	0.0519	0.0522	0.0588	0.0543
Lead (Pb)				
$\mu\text{g/dscm}^{\text{a}}$	120	84.3	200	135
$\text{g/hr}^{\text{c}}$	1.20	0.798	1.93	1.31
Manganese (Mn)				
$\mu\text{g/dscm}^{\text{a}}$	19.3	28.4	63.3	37.0
$\text{g/hr}^{\text{c}}$	0.193	0.269	0.611	0.357
Mercury (Hg)				
$\mu\text{g/dscm}^{\text{a}}$	0.00	0.00	0.00	0.00
$\text{g/hr}^{\text{c}}$	0.00	0.00	0.00	0.00
Nickel (Ni)				
$\mu\text{g/dscm}^{\text{a}}$	6.00	6.03	4.77	5.60
$\text{g/hr}^{\text{c}}$	0.0600	0.0571	0.0460	0.0544
Selenium (Se)				
$\mu\text{g/dscm}^{\text{a}}$	2.86	3.38	2.57	2.94
$\text{g/hr}^{\text{c}}$	0.0286	0.0320	0.0248	0.0285

<sup>a</sup> Micrograms per dry standard cubic meter @ 20° C and 1 atm.

<sup>b</sup> Micrograms per dry standard cubic meter @ 20° C and 1 atm, adjusted to 7% O<sub>2</sub>.

<sup>c</sup> Grams per hour.

### **3.0 PROCESS DESCRIPTION**

The APG Lime Company is located in Ripplemead, Virginia. The facility has three coal-fired rotary kilns. The emissions from each kiln are controlled by a fabric filter baghouse. In addition, each kiln has a cooler exhaust stack that is presently uncontrolled.

During this testing program, Research Triangle Institute (RTI), under contract to ESD/MICG, was responsible for monitoring and documenting all process and emission control system operational parameters. RTI was also responsible for development of a detailed narrative for this section of the final report. At the present time this information is being handled as confidential business information (CBI) and is not included in this draft report.

## 4.0 SAMPLING LOCATIONS

### 4.1 NO. 1 KILN

#### 4.1.1 Baghouse Inlet

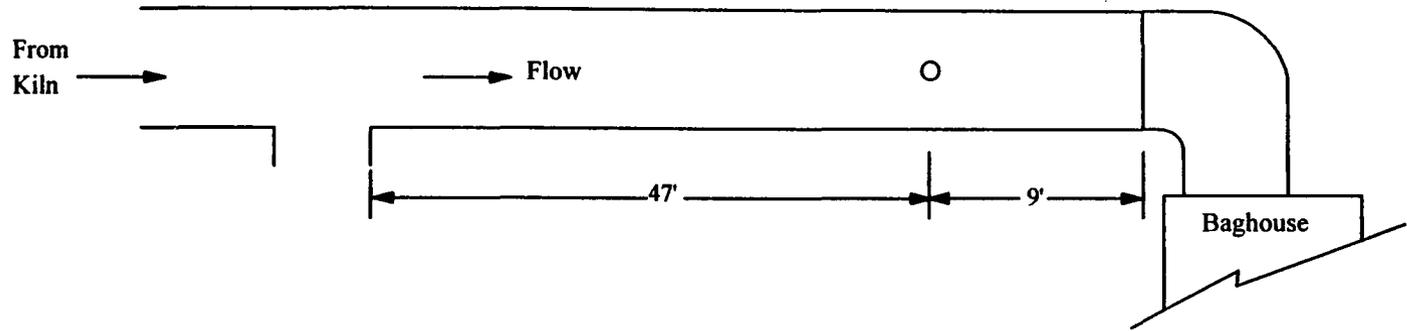
The inlet measurement site was located in a 71.25-inch inside diameter (ID) round, horizontal duct 564 inches (7.9 equivalent duct diameters) downstream of the nearest flow disturbance (T-duct) and 108 inches (1.5 equivalent duct diameters) upstream of the nearest flow disturbance (90° elbow). According to EPA Method 1 criteria this site required a minimum of 20 sample traverse points, 10 along each of two perpendicular diameters. PES elected to use 24 sample traverse points, 12 along each diameter. Figure 4.1 shows a simplified schematic of the baghouse inlet measurement site and sample traverse point locations. Access to the site will be via scaffold provided by an outside contractor.

#### 4.1.2 Baghouse Outlet

The baghouse outlet sampling location was located in a 72.25-inch ID round vertical stack 390 inches (5.4 equivalent stack diameters) downstream of the flow disturbance (Y-intersection) and 390 inches (5.4 equivalent stack diameters) upstream of the stack exit. According to EPA Method 1, this location required 20 sample traverse points, 10 along each of two perpendicular diameters. Sampling was conducted through four existing sample ports located at 90°. Figure 4.2 shows a simplified schematic of the outlet measurement site and sample traverse point locations. The site had a 360° permanent testing platform and was accessible via a caged ladder.

### 4.2 NO. 2 KILN COOLER STACK

The measurement site for the kiln No. 2 cooler stack was located in a 71.25-inch ID round vertical stack 372 inches (5.2 equivalent stack diameters) downstream of the nearest flow disturbance (45° elbow) and 192 inches (2.7 equivalent stack diameters) upstream of the stack exit. According to EPA Method 1 criteria, this measurement site required 20 sample traverse points, 10 along each of two perpendicular diameters. PES elected to use 24 traverse points, 12 along each diameter. The measurement site was accessible from ground level via a walkway alongside the coal conveyor. Sampling was conducted indoors just above floor level. Figure 4.3 shows a simplified schematic of the cooler measurement site and sample traverse point locations.



4-2

**SAMPLE TRAVERSE POINT LOCATIONS**

Point Number	Fraction of Stack ID	Distance Inches
1	.026	1.9
2	.082	5.9
3	.146	10.5
4	.226	16.3
5	.342	24.6
6	.658	47.4
7	.774	55.7
8	.854	61.5
9	.918	66.1
10	.974	70.1

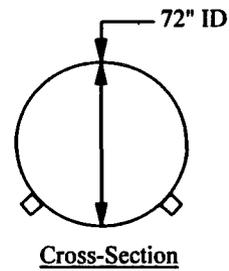


Figure 4.1 APG Lime Kiln Baghouse Inlet Sampling Location.

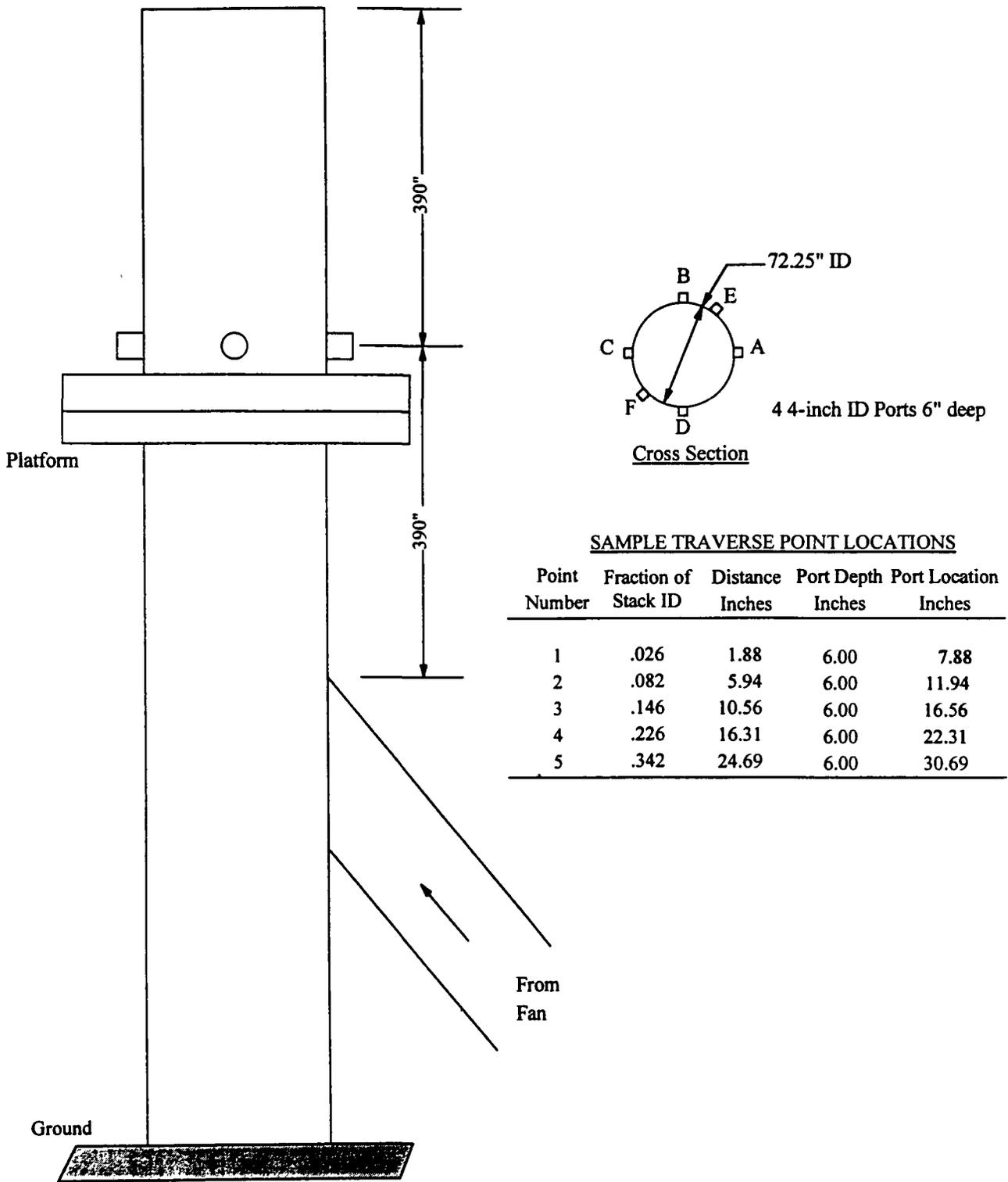


Figure 4.2 APG Lime Kiln No. 1 Baghouse Outlet Sampling Location.

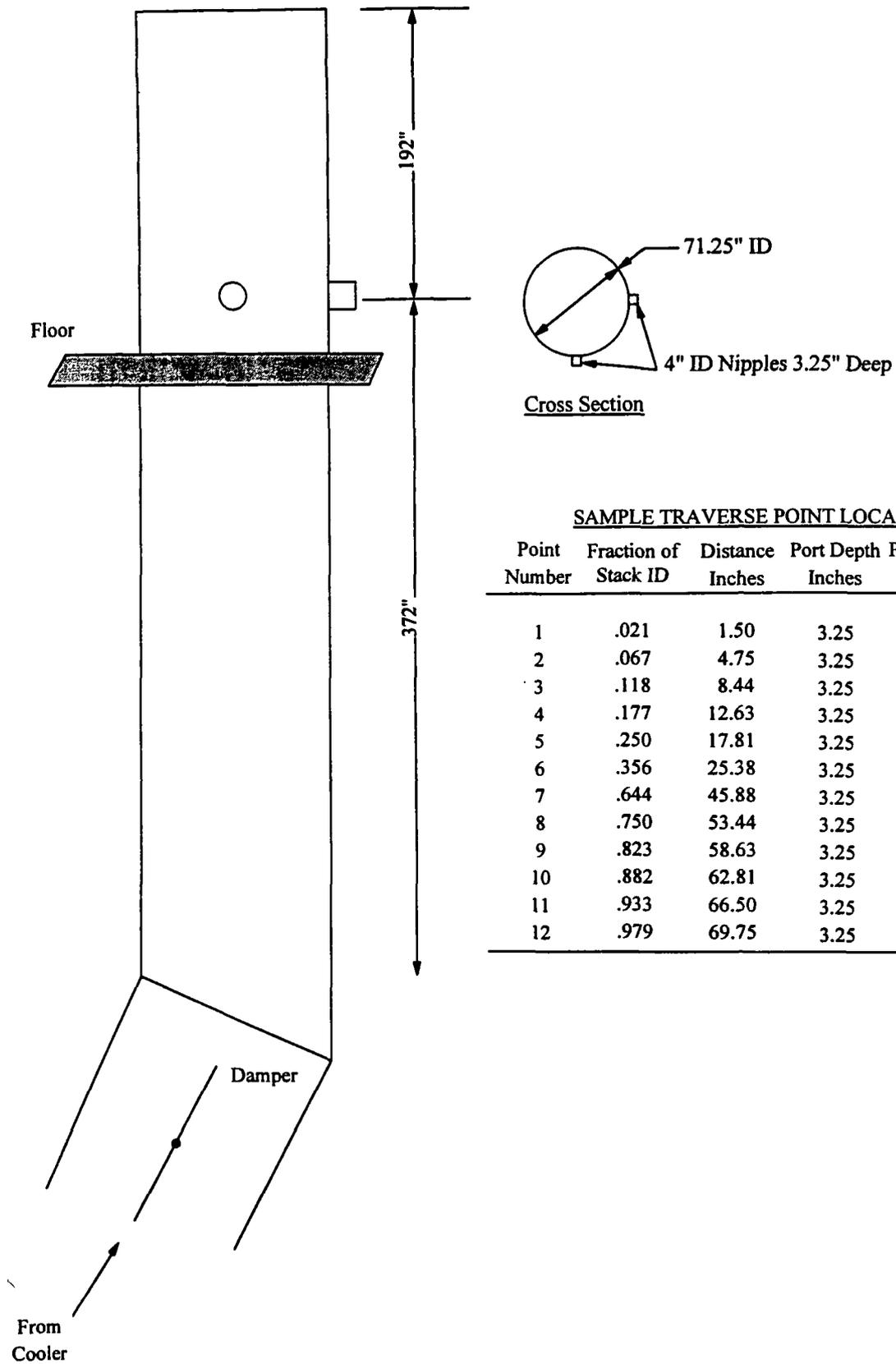


Figure 4.3 APG Lime Kiln No. 2 Cooler Stack Sampling Location.

## **5.0 SAMPLING AND ANALYTICAL PROCEDURES**

Table 5.1 summarizes the sources, test parameters, test methods, number of tests, and planned duration of each event. Sampling of the baghouse inlet and outlet was conducted simultaneously for CDD/CDF, THC, and PM/Metals. Brief descriptions of each method follow:

### **5.1 LOCATION OF MEASUREMENT SITES AND SAMPLE/VELOCITY TRAVERSE POINTS**

EPA Method 1, "Sample and Velocity Traverses for Stationary Sources," will be used to select the measurement sites and to establish velocity and sample traverse point locations. The measurement sites are discussed in Section 4.0.

### **5.2 DETERMINATION OF STACK GAS VOLUMETRIC FLOW RATE**

EPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)," was used to determine stack gas volumetric flow rate at the baghouse inlet and outlet and cooler stack. A Type S pitot tube, constructed according to Method 2 criteria and having an assigned coefficient of 0.84 and connected to an inclined-vertical manometer was used to measure velocity pressure. On the cooler stack the velocity pressure was found to be too low to measure with a conventional manometer. Therefore, PES used a digital reading micro manometer with a range of 0 to 0.1 inch of water and 0.001 inch resolution. A calibrated Type K thermocouple attached directly to the pitot tube was used to measure stack gas temperature. The average stack gas velocity was calculated from the average square roots of the velocity pressure, average stack gas temperature, stack gas molecular weight, and absolute stack pressure. The volumetric flow rate is the product of velocity and the stack cross-sectional area.

### **5.3 DETERMINATION OF DRY MOLECULAR WEIGHT AND EMISSION CORRECTION FACTORS**

EPA Method 3B, "Gas Analysis for the Determination of Emission Rate Correction Factor or Excess Air," was used to measure carbon dioxide and oxygen content of the stack gases. Gas samples were extracted from each stack using the integrated, single-point bag sampling technique. The bag contents were analyzed onsite within 6 hours after sample

collection using an Orsat® analyzer to determine percent concentrations of carbon dioxide and oxygen. The Orsat analyzer had 0.1 percent subdivisions.

#### **5.4 DETERMINATION OF STACK GAS MOISTURE CONTENT**

EPA Method 4, “Determination of Moisture Content in Stack Gases,” was to determine stack gas moisture content. The quantity of condensed water was determined gravimetrically and then compared to the total volume of gas sampled to determine the volume percent moisture content. The Method 4 procedure was conducted simultaneously with the Method 23 and Method 29 pollutant measurement runs.

#### **5.5 DETERMINATION OF POLYCHLORINATED DIBENZO-P-DIOXINS AND POLYCHLORINATED DIBENZOFURANS**

EPA Method 23, “Determination of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans From Stationary Sources” was used to determine polychlorinated dibenzo-p-dioxins (CDD’s) and polychlorinated dibenzofurans (CDF’s) at the baghouse inlet and outlet. A schematic of the Method 23 sampling apparatus used at the baghouse outlet is shown in Figure 5.1. A schematic of the Method 23 sampling apparatus used at the baghouse inlet is shown in Figure 5.1A. At the inlet an unheated Teflon® connector was used between the filter and condenser. The connector was cleaned in the same manner as the condenser during sample recovery. Samples were withdrawn from the gas streams isokinetically and collected in the sample probe, on a glass fiber filter, and on a packed column of XAD-2 adsorbent material. Each measurement run was 240 minutes in duration. The CDD’s and CDF’s were extracted from the samples, separated by high resolution gas chromatography, and measured by high resolution mass spectrometry. PES selected Triangle Laboratories, Inc., Research Triangle Park, North Carolina to prepare the filters and adsorbent traps, and perform the required analyses.

#### **5.6 DETERMINATION OF TOTAL HYDROCARBONS**

EPA Method 25A, “Determination of Total Gaseous Organic Concentrations Using a Flame Ionization Analyzer” was used to measure total hydrocarbon (THC) concentrations at the baghouse inlet and outlet. Two flame ionization analyzers (FIAs) were used, one for the inlet and one for the outlet. Heated sample lines and FIAs were used. THC concentrations were expected to be less than 25 parts per million by volume (ppmv) as propane. Therefore, PES operated both FIAs on a 0-50 ppmv range. Span gases consisting of propane-in-air, prepared according to EPA Protocol, were used.

Figure 5.2 is a schematic of the FIA sampling system. The two FIAs were equipped with a strip chart recorder and a data logger. Prior to beginning the testing program, the two FIA systems were assembled and a bias check and a response time test were conducted.

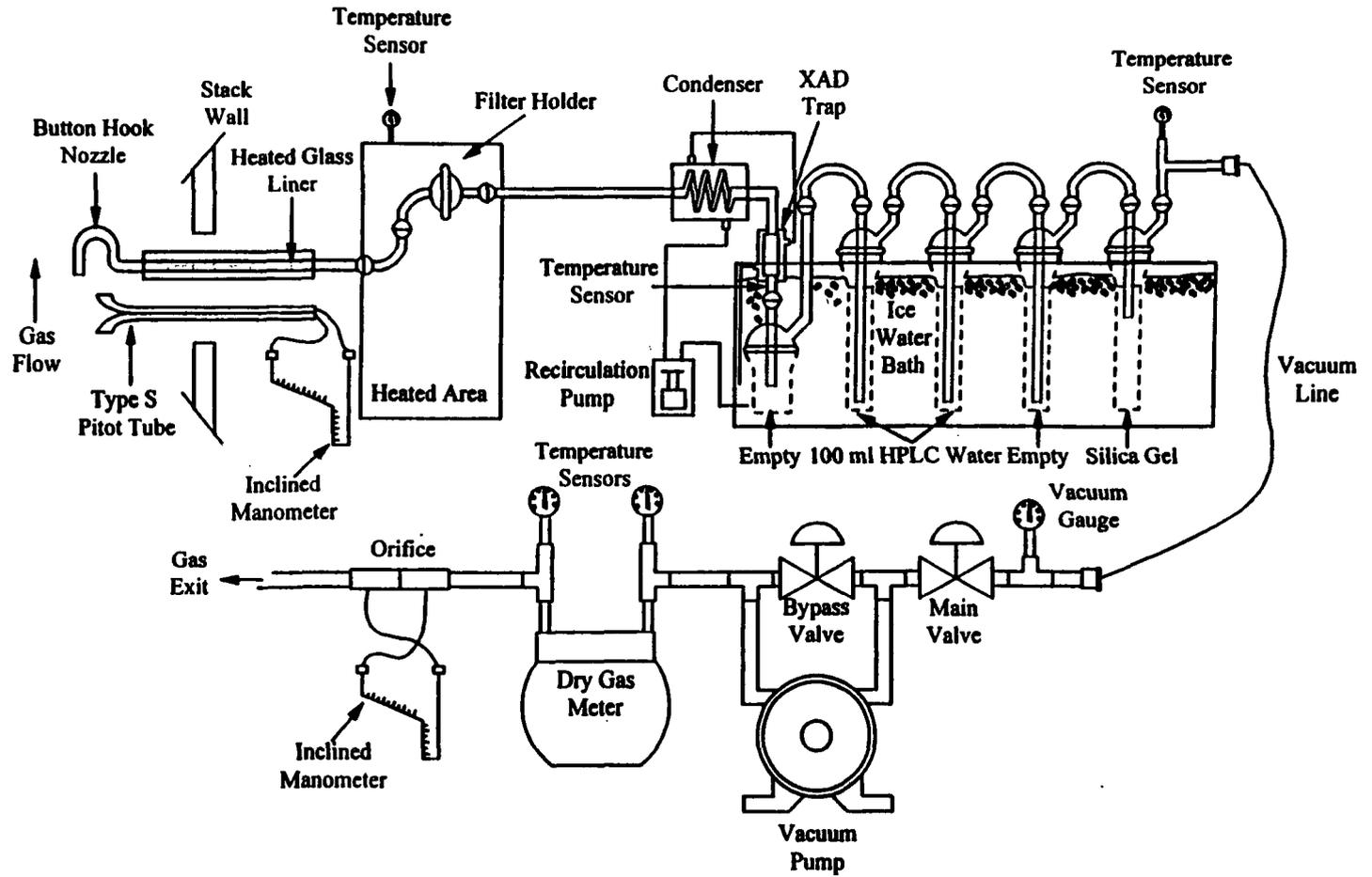


Figure 5.1 Method 23 CDD/CDF Outlet Sampling Train.

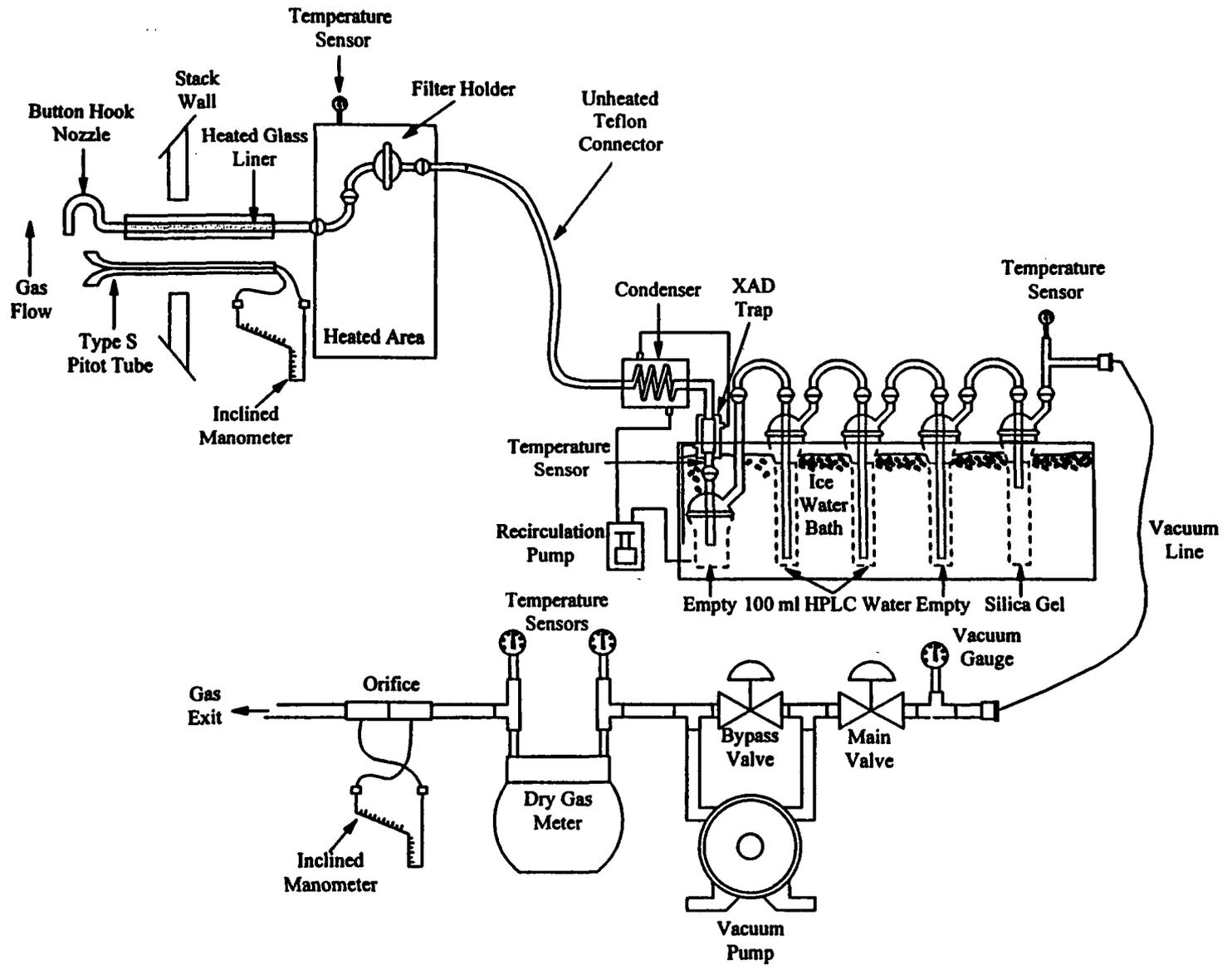


Figure 5.1A Method 23 CDD/CDF Inlet Sampling Train.

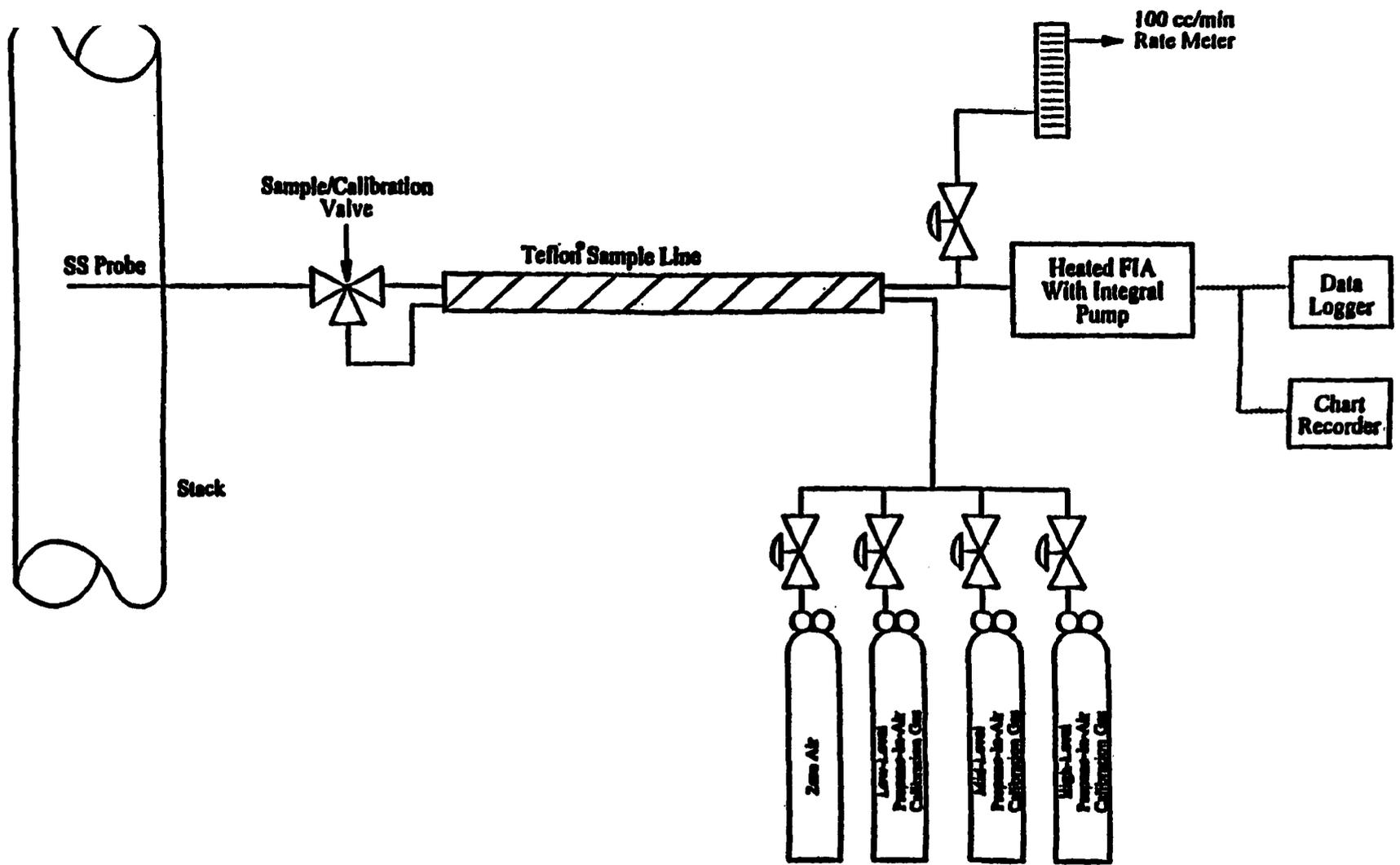


Figure 5.2 Method 25A Measurement System for THC.

Acceptability criteria for the bias check is a difference of not more than five percent between the value measured by direct injection of calibration gas at the analyzer and the value obtained by injection of the calibration gas at the calibration gas valve. (Details of the bias check are presented in EPA Method 6C). Prior to testing, PES performed the bias checks, response time tests, and calibration error tests. Calibration drift checks were performed periodically and at the conclusion of each measurement run.

## **5.7 DETERMINATION OF PARTICULATE MATTER AND METALS**

EPA Method 29, "Determination of Metals Emissions From Stationary Sources," was used to determine filterable particulate matter and metals at the baghouse inlet and outlet, and at the cooler stack. The target metals included: Antimony (Sb), Arsenic (As), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), and Selenium (Se). Samples were withdrawn from the gas streams isokinetically and collected in the sample probe, on a tared quartz-fiber filter and in a series of impingers containing acidic hydrogen peroxide solution followed by acidified potassium permanganate. The probe and filter fractions were analyzed gravimetrically in the PES laboratory to determine filterable particulate matter. Upon completion of the particulate matter analyses, the particulate fractions and aqueous fractions were submitted to the laboratory for metals analyses. PES has also selected Triangle Laboratories, Inc. to perform the metals analyses.

A schematic of baghouse outlet and cooler Method 29 sampling train is shown in Figure 5.3. A schematic of the baghouse inlet Method 29 sampling train is shown in Figure 5.3A. At the inlet location it was necessary to use an unheated Teflon<sup>®</sup> connector between the filter and first impinger. The sample recovery scheme for metals is shown in Figure 5.4. The sample recovery scheme for the additional Hg fraction is shown in Figure 5.5. The sample preparation and analysis scheme is shown in Figure 5.6. Metals other than Hg were analyzed by graphite furnace atomic absorption spectroscopy (GFAAS) or inductively coupled argon plasma (ICP) emission spectroscopy. Hg was analyzed by cold vapor atomic absorption spectroscopy (CVAAS).

## **5.8 PULVERIZED COAL FEED**

Pulverized coal feed samples were collected by APG plant personnel during each air pollutant measurement run on the kiln No. 1 baghouse. Grab samples were collected at the beginning, middle and end of each measurement run. The grab samples were composited into a single sample for each run. The samples were submitted to Galbraith Laboratories, Inc. for proximate and ultimate analysis, including a gross calorific value.

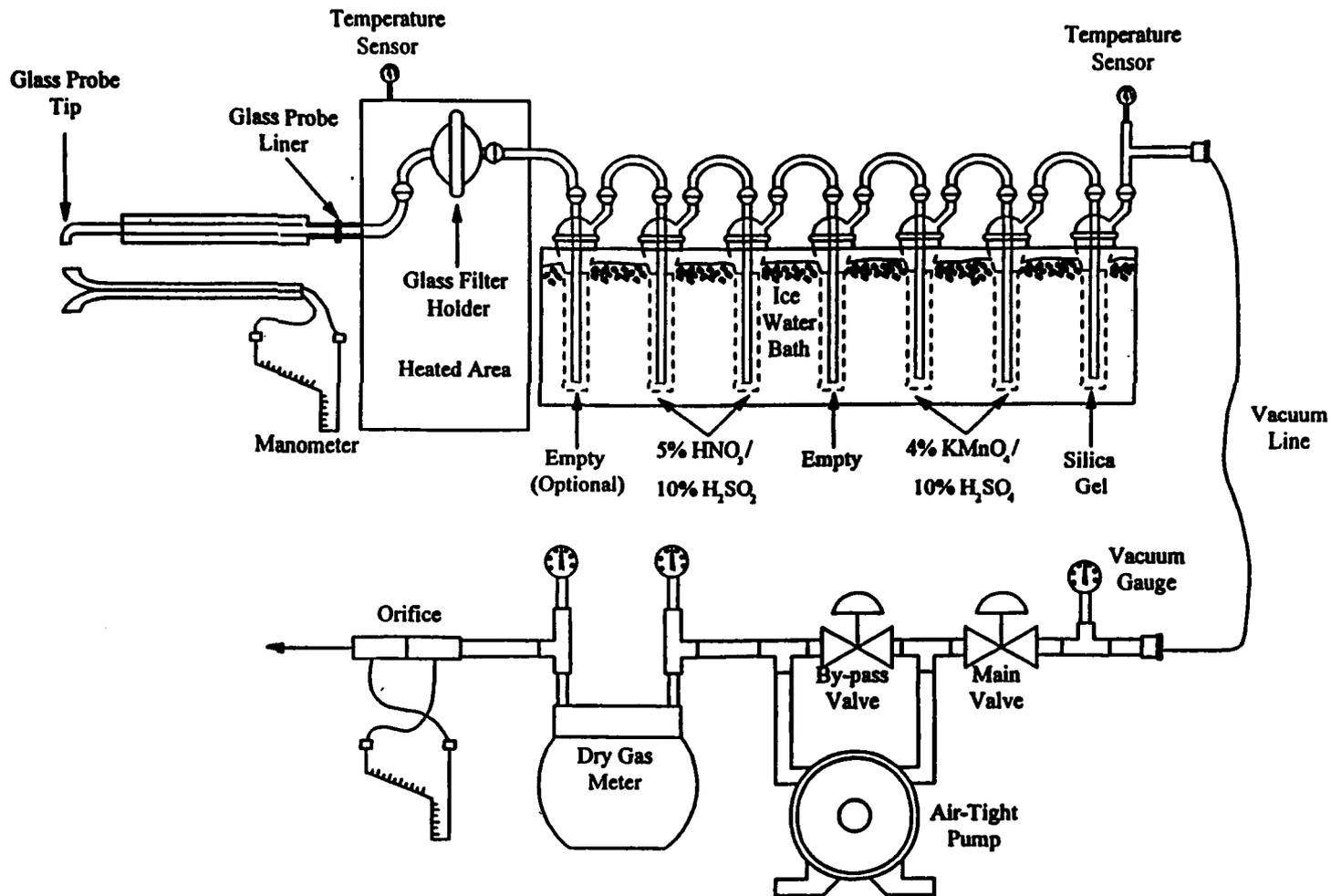


Figure 5.3 Method 29 Particulate Matter/Metals Baghouse Outlet and Cooler Sampling Train.

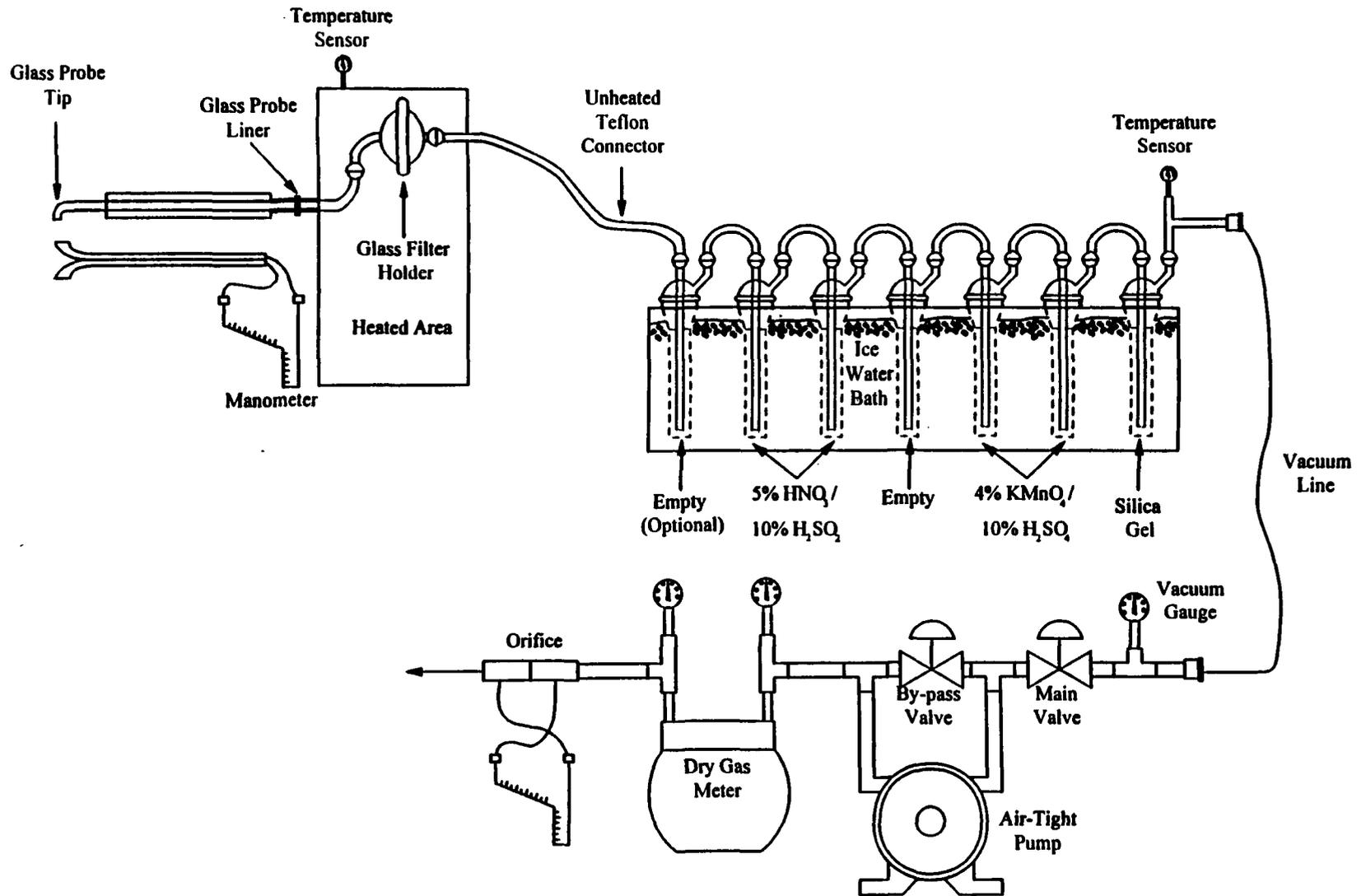
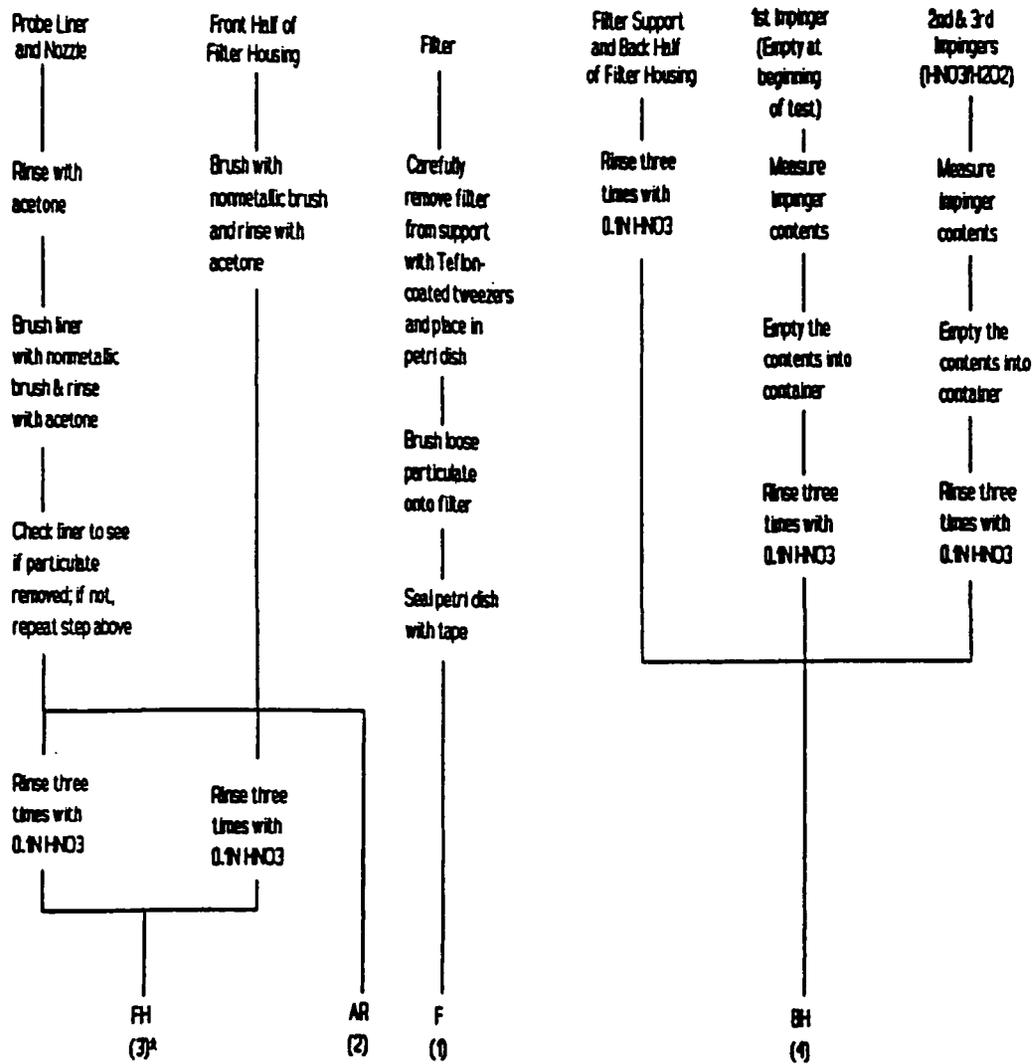


Figure 5.3A Method 29 Particulate Matter/Metals Inlet Sampling Train.



<sup>A</sup> Number in parentheses indicates container number

Figure 5.4 Method 29 Sample Recovery Scheme (Sample Fractions 1-4).

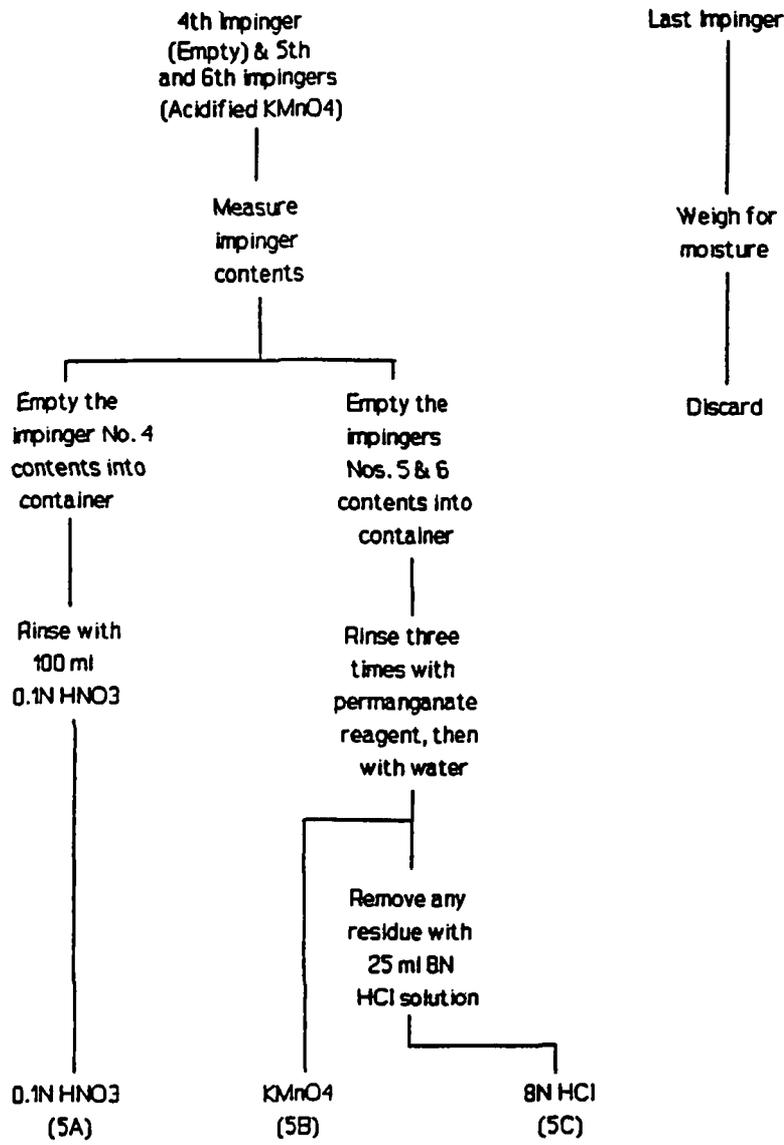
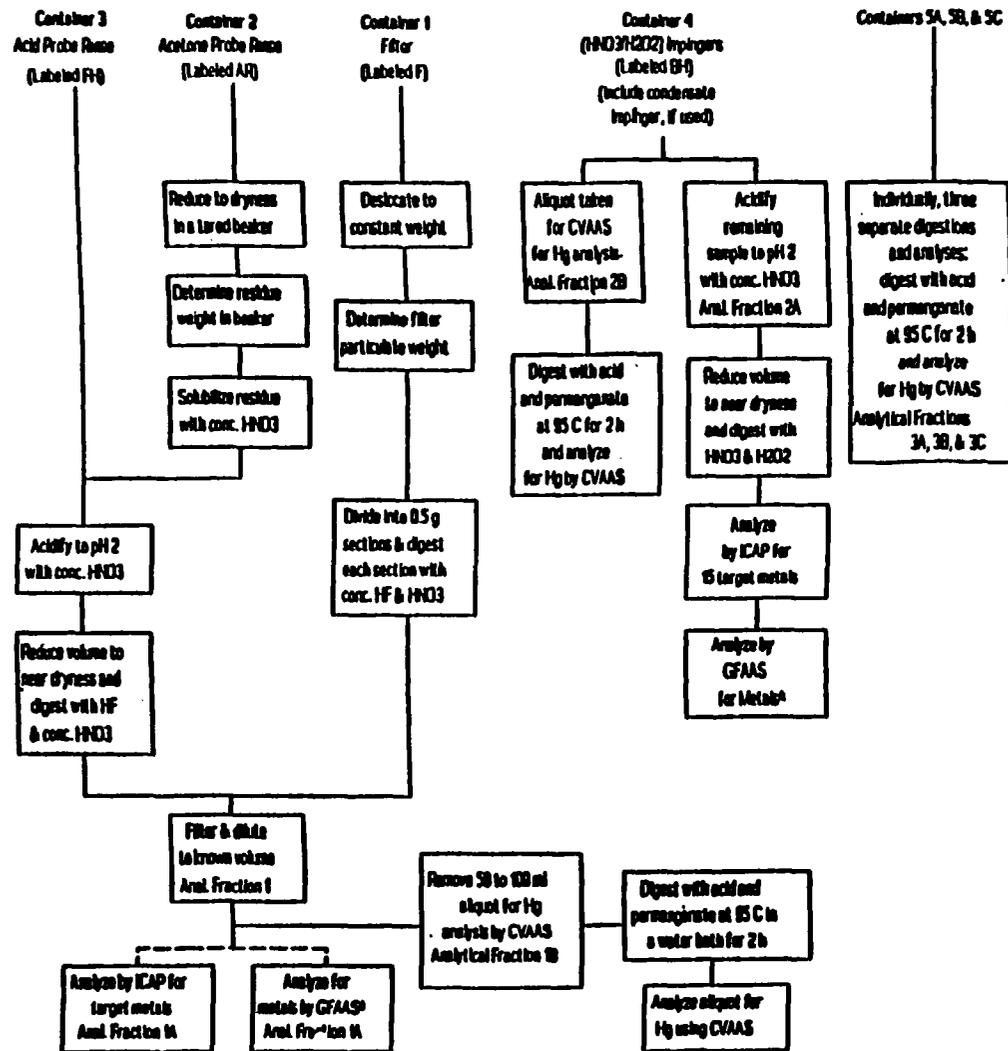


Figure 5.5 Method 29 Sample Recovery Scheme (Sample Fraction 5).



\*Analyze by AAS for metals found in less than 2 mg/ml digests solution, if desired. Or analyze for each metal by AAS, if desired.

Figure 5.6 Method 29 Sample Preparation and Analysis Scheme.

## 5.9 PULVERIZED COAL FEED RATE

The pulverized coal feed rate was determined using an oxygen-based F-factor approach. This approach is based on a stoichiometric relationship between the heat input rate, stack gas flow rate, F-factor, and oxygen content of the stack gas. The coal usage rate was calculated by dividing the heat input rate by the “as-fired” gross calorific value of the coal. The following equation was used:

$$C_{FR} = \frac{Q_{std} (20.9 - O_2) 60}{F_d 20.9 GCV}$$

where:

$C_{FR}$	=	Pulverized coal feedrate, lb/hr, as-fired
$Q_{STD}$	=	Stack gas flow rate, dscfm
$F_d$	=	Calculated F-factor, dscfm/mmBtu
$O_2$	=	Oxygen content of the stack gas, %
60	=	Conversion, minutes to hour
$GCV$	=	Gross calorific value (Btu/lb) of the fuel combusted on an as-fired basis

The limestone feed has no Btu value; therefore its contribution to the total heat input was ignored.

## 5.10 VISIBLE EMISSIONS

EPA Method 9, “Visual Determination of the Opacity of Emissions from Stationary Sources” was used to read visible emissions from the Kiln No. 2 baghouse outlet stack. PES provided a certified visible emissions evaluator (Certificate No. 255264, issued September 26, 1996).

## **6.0 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES AND RESULTS**

This section describes the specific QA/QC procedures employed by PES in performing this series of tests. The procedures contained in the "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods," EPA-600/77-027B, and in the reference test methods served as the basis for performance for all testing and related work activities in this project.

### **6.1 CALIBRATION OF APPARATUS**

The preparation and calibration of source sampling equipment is essential in maintaining data quality. Brief descriptions of the calibration procedures used by PES follow.

#### **6.1.1 Barometers**

PES used aneroid barometers which are calibrated against a station pressure value reported by a nearby National Weather Service Station corrected for elevation.

#### **6.1.2 Temperature Sensors**

Bimetallic dial thermometers and Type K thermocouples were calibrated using the procedure described in Section 3.4.2 of the Quality Assurance Handbook. Each temperature sensor was calibrated over the expected range of use against an ASTM 3C or 3F thermometer. Table 6.1 summarizes the type of calibrations performed, the acceptable levels of variance, and the results. Digital thermometers were calibrated using a thermocouple simulator having a range of 0-2400°F.

#### **6.1.3 Pitot Tubes**

PES used Type S pitot tubes which are constructed to EPA Method 2 specifications. Pitot tubes meeting these specifications are assigned to a baseline coefficient to 0.84 and need not be calibrated. The dimensional criteria and results for each pitot tube used are summarized in Table 6.2.

TABLE 6.1

## SUMMARY OF TEMPERATURE SENSOR CALIBRATION DATA

Temp. Sensor I.D.	Usage	Temperature, °F		Temp. Difference %	EPA Criteria %
		Reference	Sensor		
7C	Stack Gas	34	37	-0.6	< ±1.5
		88	89	-0.2	< ±1.5
		215	214	-0.1	< ±1.5
		325	322	-0.4	< ±1.5
7E	Stack Gas	34	37	-0.6	< ±1.5
		84	87	-0.6	< ±1.5
		209	208	-0.2	< ±1.5
		321	331	-1.3	< ±1.5
RT3	Stack Gas	31	33	-0.2	< ±1.5
		204	204	0	< ±1.5
		380	380	0	< ±1.5
4C	Stack Gas	71	70	-0.2	< ±1.5
		33	34	-0.2	< ±1.5
		209	208	-0.2	< ±1.5
		383	386	-0.4	< ±1.5
5C	Stack Gas	36	38	-0.4	< ±1.5
		82	83	-0.2	< ±1.5
		199	198	0.2	< ±1.5
		284	280	0.5	< ±1.5
SH-1	Impinger Outlet	64	64	0.0*	< ±1.5
		34	34	0.0	< ±1.5
SH-2	Impinger Outlet	63	63	0.0	< ±1.5
		33	33	0.0	< ±1.5
SH-3	Impinger Outlet	64	66	-0.2	< ±1.5
		34	34	0.0	< ±1.5

TABLE 6.2

SUMMARY OF PITOT TUBE DIMENSIONAL DATA

Measurement	Criteria	RESULTS					
		Pitot Tube Identification					
		RIP 19	5C	7C	7E	4C	RT3
$\alpha_1$	$< 10^\circ$	5	1	0	0	0	0.5
$\alpha_2$	$< 10^\circ$	5	1	0	0	0	0.5
$\beta_1$	$< 5^\circ$	0	0	3	0	0	1
$\beta_2$	$< 5^\circ$	0	0	3	0	0	0
$\gamma$	-	1	1	2	2	0	0
$\theta$	-	1	0	1	0	1	0
A	-	0.939	1.004	0.974	0.997	0.973	0.929
Z	$\leq 0.125$ in.	0.016	0.018	0.034	0.035	0.0	0.0
W	$\leq 0.03125$ in.	0.016	0.0	0.017	0.0	0.017	0.0
$D_t$	$0.1875" \leq D_t \leq 0.375"$	0.376	0.375	0.371	0.376	0.375	0.375
$A/2D_t$	$1.05 D_t \leq A \leq 1.50 D_t$	1.25	1.34	1.31	1.33	1.30	1.24
Acceptable		Yes	Yes	Yes	Yes	Yes	Yes
Assigned Coefficient		0.84	0.84	0.84	0.84	0.84	0.84

#### **6.1.4 Differential Pressure Gauges**

PES uses Dwyer inclined/vertical manometers to measure differential pressures. These include velocity pressure, static pressure, and meter orifice pressure. Manometers are selected with sufficient sensitivity to accurately measure pressures over the entire range of expected values. Manometers are primary standards and require no calibration.

#### **6.1.5 Method 5 Dry Gas Meter and Orifice**

The Method 23 and 29 dry gas meters and orifices were calibrated in accordance with Section 3.3.2 of the Quality Assurance Handbook. This procedure involves direct comparison of the dry gas meter to a reference dry test meter. The reference dry test meter is routinely calibrated using a wet test meter or a liquid displacement technique. Before its initial use in the field, the metering system was calibrated over the entire range of operation. After field use, the metering system was calibrated at a single intermediate setting based on the previous field test. Acceptable tolerances for the initial and final dry gas meter factors and orifice calibration factors are  $\pm 0.05$  and  $\pm 0.20$  from average, respectively. The results for the gas meter and orifice used in this test program are summarized in Table 6.3.

### **6.2 ON-SITE MEASUREMENTS**

The on-site QA/QC activities include:

#### **6.2.1 Measurement Sites**

Prior to sampling, the stack was checked dimensionally to determine measurement site locations, location of velocity and sample test ports, inside stack dimensions, and sample traverse point locations. Inside stack dimensions were checked through both test ports to ensure uniformity of the stack inside diameter. The inside stack dimensions, wall thickness, and sample port depths were measured to the nearest 0.1 inch.

#### **6.2.2 Velocity Measurements**

All velocity measurement apparatus were assembled, leveled, zeroed, and leak-checked prior to use and at the end of each determination. The static pressure was determined at a single point near the center of the stack cross-section.

#### **6.2.3 Flue Gas Sampling**

Integrated flue gas samples were collected in Tedlar<sup>®</sup> gas bags from the kiln exhaust and scrubber outlets. Prior to use the bags were leak checked and purged with nitrogen to ensure cleanliness. Prior to and after completion of each sampling run the entire sampling system was leak checked from the tip of the probe.

TABLE 6.3

## SUMMARY OF DRY GAS METER AND ORIFICE CALIBRATION DATA

Meter No.	Gamma				Orifice Coefficient			
	Pre-test	Post-test	% Diff.	EPA Criteria	Average	Range	EPA Criteria	
MB-13	0.985	0.976	0.91	± 5%	1.66	1.56-1.74	1.66	± 0.20
MB-14	1.003	1.008	-0.50	± 5%	1.77	1.68-1.84	1.77	± 0.20
M5-6	0.990	0.999	-0.90	± 5%	1.84	1.72-1.94	1.84	± 0.20
M5-7	0.978	0.982	-0.41	± 5%	1.74	1.73-1.76	1.74	± 0.20
M5-9	1.009	1.023	-1.39	± 5%	1.88	1.82-2.02	1.88	± 0.20

The bag samples were analyzed on-site using an Orsat® analyzer. Prior to use the Orsat analyzer was assembled and replenished with fresh reagents and leak checked as per the manufacturer's procedures. Known concentrations of EPA Protocol carbon dioxide and oxygen in nitrogen were then analyzed to confirm proper operation of the Orsat analyzer. These results are shown in Table 6.4.

#### **6.2.4 Moisture**

During sampling, the exit gas of the last impinger was maintained below 68°F to ensure complete condensation of stack gas water vapor. The total moisture was determined gravimetrically using a digital reading top-loading electronic balance. At the scrubber outlets there was potential for the presence of water droplets in the gas streams. Therefore, a second moisture determination was made simultaneously with the reference method by measuring the stack gas temperature at each sample traverse point and assuming that the gas streams were saturated at that average temperature. The moisture content was then calculated using vapor pressure tables. The lower moisture value obtained using the reference method and saturation method was subsequently used in all Method 23 and Method 29 calculations.

#### **6.2.5 Method 23/Method 29**

The field sampling QA/QC for Method 23 and method 29 were similar. Table 6.5 summarizes the critical measurements made and the EPA's acceptability criteria. All pre- and post-test sample train leaks met the acceptance criteria. The isokinetic sampling rates deviated by no more than 5.2% thereby meeting each method criteria of 90-110%.

Method 23 and Method 29 field blanks were collected near the sampling locations to check for any sample contamination at the sites. Sample trains were assembled and pre- and post-test leak checks were conducted. The sample trains were recovered in the same manner as the actual sample runs.

An acetone blank and quartz fiber filter were taken as control samples for the particulate analysis and subsequent analysis for the target metals. Blanks were taken of the metals absorbing and recovery reagents.

#### **6.2.6 Method 25A**

The field QA/QC activities for Method 25A included the use of EPA Protocol calibration gases; pretest calibration error tests, system bias checks, and response time tests; and post-test zero and calibration drift determinations. Table 6.6 lists the calibration gas cylinder numbers, concentrations, and expiration dates. Calibration error tests, system bias checks, calibration drift checks, and response time checks are shown in Appendix B.1.4.

TABLE 6.4

## SUMMARY OF ORSAT ANALYZER CALIBRATION RESULTS

Run No.	Cylinder No. and Contents	Expiration Date	Analysis				
			1	2	3	Avg.	Diff., %
10/22/96	ALMO57024 9.85% CO <sub>2</sub> in N <sub>2</sub> 13.1% O <sub>2</sub> in N <sub>2</sub>	05/20/99	9.8 13.0	9.8 13.0	9.8 13.0	9.8 13.0	0.5 0.8
10/23/96	ALMO57024 9.85% CO <sub>2</sub> in N <sub>2</sub> 13.1% O <sub>2</sub> in N <sub>2</sub>	05/20/99	9.8 13.0	9.7 13.1	9.9 13.0	9.8 13.0	0.5 0.8
10/24/96	ALMO57024 9.85% CO <sub>2</sub> in N <sub>2</sub> 13.1% O <sub>2</sub> in N <sub>2</sub>	05/20/99	9.9 13.0	9.9 13.0	9.9 13.0	9.9 13.0	-0.5 0.8

TABLE 6.5

## SUMMARY OF METHOD 23/PROPOSED METHOD 29 FIELD SAMPLING QA/QC DATA

Date	Site	Run No.	Pre-Test Leak Rate acfm	Post-Test Leak Rate acfm	EPA Criteria	Percent Isokinetic	EPA Criteria
<u>Kiln No. 1</u>							
10/22/96	Baghouse Inlet	M23-6-I	0.004 @ 18.5" Hg	0.008 @ 18" Hg	0.02	102.0	90-110%
		M29-13-I	0.008 @ 15" Hg	0.005 @ 18" Hg	0.02	99.8	90-110%
	Baghouse Outlet	M23-6-O	0.003 @ 15" Hg	0.006 @ 11" Hg	0.02	99.1	90-110%
		M29-13-O	0.012 @ 16" Hg	0.004 @ 9" Hg	0.02	98.3	90-110%
10/23/96	Baghouse Inlet	M23-7-I	0.003 @ 19" Hg	0.005 @ 10" Hg	0.02	102.8	90-110%
		M29-14-I	0.014 @ 15" Hg	0.005 @ 9" Hg	0.02	101.5	90-110%
	Baghouse Outlet	M23-7-O	0.006 @ 15" Hg	0.004 @ 10" Hg	0.02	102.7	90-110%
		M29-14-O	0.008 @ 15" Hg	0.004 @ 7" Hg	0.02	105.1	90-110%
10/24/96	Baghouse Inlet	M23-8-I	0.002 @ 15" Hg	0.002 @ 15" Hg	0.02	103.1	90-110%
		M29-15-I	0.010 @ 15" Hg	0.007 @ 13.5" Hg	0.02	99.7	90-110%
	Baghouse Outlet	M23-8-O	0.005 @ 15" Hg	0.001 @ 11" Hg	0.02	102.1	90-110%
		M29-15-O	0.003 @ 15" Hg	0.001 @ 10" Hg	0.02	107.2	90-110%
<u>Kiln No. 2</u>							
10/21/96	Cooler	M29-10	0.014 @ 18" Hg	0.001 @ 10" Hg	0.02	100.6	90-110%
		M29-11	0.001 @ 10" Hg	0.001 @ 9.5" Hg	0.02	101.7	90-110%
		M29-12	0.003 @ 15" Hg	0.003 @ 10" Hg	0.02	102.5	90-110%

TABLE 6.6

## SUMMARY OF CALIBRATION GAS CYLINDERS

Cylinder Number	Contents	Expiration Date
AAL2583	Hydrocarbon Free Air	-
ALM012950	30.04 ppm C <sub>3</sub> H <sub>8</sub> in air	03-17-98
ALM-029561	49.72 ppm C <sub>3</sub> H <sub>8</sub> in air	04-18-98
ALM060903	87.86 ppm C <sub>3</sub> H <sub>8</sub> in air	05-15-99

TABLE 6.7

## SUMMARY OF METHOD 23 STANDARDS RECOVERY EFFICIENCIES

	Percent Recovery								QC Limits
	TLI XAD-2 Blank	M23-9 Field Blank	M23-6-I	M23-6-O	M23-7-I	M23-7-O	M23-8-I	M23-8-O	
<b>FULL SCREEN ANALYSIS</b>									
<u>Internal Standards</u>									
2,3,7,8-TCDF	72.8	72.8	90.8	89.9	68.0	84.0	92.6	81.1	40-130%
2,3,7,8-TCDD	69.4	65.4	82.0	82.5	65.0	75.6	83.0	74.5	40-130%
1,2,3,7,8-PeCDF	76.1	59.3	82.7	87.9	70.7	80.7	88.9	73.4	40-130%
1,2,3,7,8-PeCDD	71.4	57.2	79.2	85.0	60.4	77.5	82.0	67.0	40-130%
1,2,3,6,7,8-HxCDF	81.2	86.7	79.7	86.9	73.6	78.3	94.9	81.6	40-130%
1,2,3,6,7,8-HxCDD	89.6	92.9	85.8	96.5	79.5	97.3	100	90.6	40-130%
1,2,3,4,6,7,8-HpCDF	85.9	83.8	86.3	96.9	78.0	83.6	95.9	86.4	25-130%
1,2,3,4,6,7,8-HpCDD	89.7	88.2	87.4	99.9	79.6	88.9	97.4	89.1	25-130%
1,2,3,4,6,7,8,9-OCDD	75.5	64.4	74.6	88.1	63.4	73.5	71.9	71.4	25-130%
<u>Surrogate Standards</u>									
2,3,7,8-TCDD	105	108	110	106	106	105	105	106	70-140%
2,3,4,7,8-PeCDF	99.1	105	112	102	98.1	100	104	99.1	70-140%
1,2,3,4,7,8-HxCDF	103	100	113	107	113	109	111	106	70-140%
1,2,3,4,7,8-HxCDD	101	106	113	78.1	109	69.9	109	103	70-140%
1,2,3,4,7,8,9-HpCDF	92.3	87.7	101	92.5	99.4	94.5	98.8	93.6	70-140%
<u>Alternate Standards</u>									
1,2,3,7,8,9-HxCDF	94.5	92.5	96.9	91.9	85.6	91.1	108	90.2	40-130%
2,3,4,6,7,8-HxCDF	99.8	97.0	102	95.6	85.9	88.5	114	92.9	40-130%
<b>CONFIRMATION ANALYSIS</b>									
<u>Internal Standards</u>									
2,3,7,8-TCDF			85.8	96.8	79.4	*	88.6	12.0	40-130%

\* Confirmation analysis was not necessary on this sample because no TCDF were detected in the full screen analysis.

TABLE 6.8

## SUMMARY OF METHOD 29 ANALYSIS QC DATA

<u>Lab Control Spikes</u>				
Analyte	Spike Amt $\mu\text{g}$	LCS Recovery	LCS 2 Recovery	Recovery Limits
As	50	89%	92%	80-120%
Be	50	108%	101%	80-120%
Cd	50	98%	93%	80-120%
Co	50	84%	94%	80-120%
Cr	50	96%	96%	80-120%
Mn	50	97%	95%	80-120%
Ni	50	94%	91%	80-120%
Pb	50	94%	96%	80-120%
Sb	50	98%	98%	80-120%
Se	50	88%	90%	80-120%
<u>Matrix Spikes (Post-Digestion), Run No. M29-1-B</u>				
Analyte	Spike Amt $\mu\text{g}$	Recovery *	Recovery Limit	
As	50	62%	75-125%	
Be	2.5	94%	75-125%	
Cd	2.5	100%	75-125%	
Co	25	78%	75-125%	
Cr	50	63%	75-125%	
Mn	50	LS	75-125%	
Ni	50	LS	75-125%	
Pb	50	LS	75-125%	
Sb	50	58%	75-125%	
Se	50	LS	75-125%	
* LS - Low spike; % Recovery is not considered valid when spike amount is less than 20% of recovered amount				

TABLE 6.8 (Continued)

<u>Duplicate, Run No. M29-13-I</u>				
Analyte	Sample $\mu\text{g}$	Duplicate $\mu\text{g}$	RPD	RPD Limits
As	69.6	69.9	0.4%	$\pm 20\%$
Cd	1.93	1.88	2.6%	$\pm 20\%$
Co	83.4	85.2	2.1%	$\pm 20\%$
Cr	176	179	1.7%	$\pm 20\%$
Ni	138	141	2.2%	$\pm 20\%$
Pb	98.4	101	2.6%	$\pm 20\%$
Sb	15.1	13.8	9.0%	$\pm 20\%$
Se	104	106	1.9%	$\pm 20\%$
Note: Duplicate analysis not reported for elements analyzed by GFAA. Be was analyzed by GFAA				
<u>Serial Dilution, Run M29-1-A</u>				
Analyte	Sample $\mu\text{g}$	Serial Dilution $\mu\text{g}$	RPD *	RPD Limits
As	9.17	11.7	< 10 RDL	$\pm 10\%$
Be	38.1	45.8	< 5 RDL	$\pm 10\%$
Cd	3.79	4.17	< 5 RDL	$\pm 10\%$
Co	38.4	44.9	15.6%	$\pm 10\%$
Cr	56.2	76.9	31.0%	$\pm 10\%$
Mn	78.4	85.1	8.20%	$\pm 10\%$
Ni	95.9	112	15.5%	$\pm 10\%$
Pb	74.2	91.1	20.4%	$\pm 10\%$
Sb	23.5	26.9	< 10 RDL	$\pm 10\%$
Se	194	232	17.8%	$\pm 10\%$
* < 10 RDL / 5 RDL - Serial dilution analyte results are not considered valid when the concentration in the analyte is less than 10 times the Reported Detection Limit (RDL) for ICP analysis and 5 times the RDL for GFAA analysis. RPD = Relative percent deviation.				

TABLE 6.8 (Continued)

<u>Method Blank*</u>			
Analyte	Detection Limit $\mu\text{g/L}$	MB Recovered Amount $\mu\text{g/L}$	MB 1 Recovered Amount $\mu\text{g/L}$
As	5	-2.37	-2.62
Be	1	0.01	0.04
Cd	1	0.00	-0.67
Co	1.5	0.00	-0.83
Cr	2	-0.02	-0.06
Mn	2	0.49	0.94
Ni	3	-1.26	-2.70
Pb	2	-0.40	0.76
Sb	4	2.02	0.40
Se	3	-3.06	-0.26

\* Method Blank considered "Pass" when recovered amount is less than the detection limit

<u>Field Blank and Reagent Blank</u>			
Analyte	Field Blank $\mu\text{g}$	1A Reagent Blank $\mu\text{g}$	2A Reagent Blank $\mu\text{g}$
As	< 0.500	<0.500	<0.500
Be	< 0.100	< 0.100	0.100
Cd	0.450	0.230	<0.100
Co	1.43	0.260	<0.150
Cr	8.03	11.3	0.397
Mn	60.0	4.74	0.390
Ni	4.08	5.67	<0.300
Pb	2.14	1.39	0.739
Sb	3.36	5.56	0.432
Se	3.34	4.51	<0.300

TABLE 6.8 (Continued)

<u>Lab Control Spikes - Mercury Summary Report</u>			
Sample ID	Spike Amt $\mu\text{g}$	Recovery	Recovery Limits
LCS 2	5	94%	80-120%
LCS 2 Dup	5	98%	80-120%
LCS 3	5	87%	80-120%
LCS 3 Dup	5	90%	80-120%
LCS 4	5	95%	80-120%
LCS 4 Dup	5	95%	80-120%
LCS	5	98%	80-120%
LCS Dup	5	103%	80-120%
<u>Matrix Spikes (Pre-Digestion) - Mercury Summary Report</u>			
Sample ID	Spike Amt $\mu\text{g}$	Recovery *	Recovery Limits
M29-11	5	98%	75-125%
M29-11 Dup	5	95%	75-125%
M29-12	5	101%	75-125%
M29-12 Dup	5	99%	75-125%
M29-14-I	5	102%	75-125%
M29-14-I Dup	5	102%	75-125%
M29-15-I	5	99%	75-125%
M29-15-I Dup	5	98%	75-125%

TABLE 6.8 (Concluded)

<u>Method Blank - Mercury Summary Report</u>		
Sample ID	Detection Limit $\mu\text{g/L}$	Recovered Amount $\mu\text{g/L}$
MB-2	0.2	0.003
MB-2 Dup	0.2	0.003
MB-3	0.2	-0.006
MB-3 Dup	0.2	-0.008
MB-4	0.2	0.025
MB-4 Dup	0.2	0.020
MB	0.2	-0.026
MB Dup	0.2	-0.026
<u>Field Blank and Reagent Blank - Mercury Summary Report</u>		
Sample ID	Field Blank $\mu\text{g}$	Reagent Blank $\mu\text{g}$
FH	< 0.40	< 0.40
FH Dup	<0.40	<0.40
BH	< 0.60	< 1.20
BH- Dup	<0.60	<1.20
HNO3	< 0.20	< 0.40
HNO3 - Dup	<0.20	<0.40
KMnO4	< 1.60	< 1.60
KmnO4 - Dup	<1.60	<1.60
HCL	< 0.90	< 0.90
HCL - Dup	<0.90	<0.90

APPENDIX A  
PROCESS DATA



# RESEARCH TRIANGLE INSTITUTE

Center for Environmental Analysis

## MEMORANDUM

TO: Joseph Wood, ESD/MICG (MD-13)  
U.S. Environmental Protection Agency  
Research Triangle Park, NC 27711

FROM: Cybele Brockmann,<sup>CB</sup> RTI

DATE: July 31, 1997

SUBJECT: Process Description for APG Lime

REFERENCE: Information Gathering and Analysis for the Lime  
Manufacturing Industry NESHAP  
EPA Contract 68-D1-0118  
ESD Project 95/06  
RTI Project 6750-017

Attached is the description of processes at APG Lime; processes were monitored during testing at the plant October 21-24, 1997.

## I. Process Description of the APG Plant

Lime (calcium oxide, CaO) is typically produced in the U.S. by crushing and then heating limestone (CaCO<sub>3</sub>) in an inclined, rotating kiln. The limestone is heated to temperatures of around 2000 degrees Fahrenheit (deg F) which cause it to breakdown chemically into lime and CO<sub>2</sub>. Some of the lime produced in the U.S. is hydrated (Ca(OH)<sub>2</sub>). At APG, lime is sold as CaO and Ca(OH)<sub>2</sub>.<sup>1</sup>

Limestone at the APG plant is extracted from an underground mine located at the plant. The limestone is milled and screened to yield three sizes of stone: less than 3/8 inch, 3/8 inch to 1<sup>1</sup>/<sub>8</sub> inches, and 1<sup>1</sup>/<sub>8</sub> inches to 2 inches.<sup>2</sup>

During testing, emissions were measured at the inlet and outlet of the fabric filter (FF) that cleans the exhaust from the number one kiln and at the stack associated with the cooler of the number two kiln. Process data from the number one kiln were collected during testing of its FF. Process data from the number two kiln were collected during testing of its cooler stack.

The number one and two kilns are inclined rotating kilns with design capacities of 300 tons of lime per day and 265 tons of lime per day, respectively.<sup>3</sup> Both kilns are approximately 300 feet long with tapered diameters (10 feet in diameter at the front end of each kiln and 8 feet in diameter the remaining length of the kilns).<sup>4</sup> The incline of the kilns is 1/2 inch per foot.<sup>5</sup> Limestone enters at the back end of each kiln (the highest point of incline) and tumbles through the kiln via gravity and the rotating motion of the kilns (typical rotating rates for both kilns are 0.25 to 1.2 revolution per minute).<sup>6</sup> The residence time of the feed material in the kiln is 2.5 hours.<sup>7</sup> Approximately two tons of limestone are consumed to produce one ton of lime.<sup>8</sup>

The combustion of fuel, which consists of pulverized coal suspended in air, occurs at the front end of each kiln (coal samples were obtained during testing). Coal for both kilns is pulverized to the consistency of powder in a single ball mill. Heated air from the cooling process (described below) is pulled into the ball mill to preheat and dry the coal. A fan on the mill blows the air and dry pulverized coal from the mill into each kiln. Typically a third of a ton of coal is consumed per ton of lime.<sup>9</sup>

Lime exiting each kiln is deposited onto the kiln's moving grate cooler. Ambient air is blown upward through the grates to cool the lime. Most of the air that cools the lime is routed to the kilns or to the ball mill to preheat and dry the coal. A

small portion of the air exiting each cooler is released to the atmosphere through its own stack via natural draft. This was the gas stream from the number two cooler that was tested. Lime from each cooler is conveyed to a screener, separated by particle size, and stored in silos.

## II. Kiln Emissions Control

Exhaust gases exiting the number one kiln pass through a FF. The FF, manufactured by Amerex, was installed in 1994.<sup>10</sup> The FF has six compartments. The bags within the compartments are made of 22 ounce fiberglass with a teflon finish.<sup>11</sup> The air-to-cloth ratio is 3.4 actual cubic feet per minute per square foot of fabric.<sup>12</sup> The inlet gas temperature for the FF is 495 degrees F, and the pressure drop across the FF is 6 to 8 inches of water.<sup>13</sup> The FF runs continuously; during cleaning, one of the six compartments is taken off-line and cleaned by pulse-jet, while the other five compartments continue to treat kiln exhaust.<sup>14</sup>

Refer to Figure 1 for a diagram of the number two kiln and cooler (the cooler stack is uncontrolled). Refer to Figure 2 for a diagram of the number one kiln, and the FF that cleans the exhaust from the number one kiln. The diagrams indicate the relative locations for each unit operation, direction of flow for material and gas, input and output of materials and gas, and approximate locations where process parameters and gas samples were measured.

## III. Process Operation

Data indicating the operation of the number one and two kilns and the FF on the number one kiln are presented in this section. Data for the number two kiln were collected to provide an indication of the operation of the number two cooler since no other cooler operating parameters were monitored by the plant. Process data for the kilns and the FF were manually recorded every 15 minutes during the testing from instrument panel screens in the kiln control room; the recorded data were measured with instruments already in place and used by the plant for process control of the kiln.

Table 1 is a statistical summary of the process data collected during testing. Tables 2a, 2b, and 2c display all of process data collected during testing.

## Notes Pertaining to Test Runs

### Limestone feed rate

A constant size of calcitic limestone (3/8 inch to 1<sup>1/8</sup> inch) was burned in the number one and number two kilns during testing. The limestone feed rate into the kilns is not directly measured by the plant. During testing, the plant provided an approximate feed rate of limestone into each kiln by weighing a 6 foot section of limestone on the feed belt to each kiln (see "b" on Figures 1 and 2 for location of feed belts). According to the plant, the speed of both feed belts is held constant at 199 feet per minute; however, the quantity of feed on the belts varies with the amount of limestone brought up by the bucket elevators (see Figures 1 and 2 for location of bucket elevators). The amount of limestone in the elevators is a function of the speed of the belt beneath the crushed limestone bin; the speed of this belt is indirectly measured by the %Feed-0-Weight (FOW).<sup>15</sup> The higher the %FOW, the faster the speed of the belt beneath the bin, which in turn leads to more limestone deposited into the bucket elevators, and, more feed deposited onto the feed belt which conveys limestone to the kiln.

The limestone bin conveyor belt speed is varied with the rotating speed of the kiln (indicated by the motor speed 1, 2, 3, or 4). When the rotation of the kiln is decreased, the limestone bin conveyor belt speed is reduced to reduce the amount of feed going into the kiln. When the rotation of the kiln is increased, the limestone bin conveyor belt speed is increased to increase the amount of feed going into the kiln.

Plant personnel weighed a six foot section of limestone on the feed belt for the number two kiln during testing on 10/21/96. The six foot section was weighed while the limestone bin conveyor belt speed was running at 64% (FOW) (the most frequent belt speed for that day - see Table 2a). At 64% FOW, the weight of the limestone on a 6 foot section of the feed belt was 22 lb. This corresponds to a limestone feed rate of 525 tons per day (TPD) and a lime production rate of 262 TPD. This compares with the typical production rate of the number two kiln reported by the plant to be 265 TPD.<sup>16</sup>

Plant personnel weighed two different times a six foot section of limestone from the feed belt of the number one kiln during testing on 10/22/96. One six foot section was weighed while the limestone bin conveyor belt speed was running at 50% FOW (the most frequent speed for that day - see Table 2b); the other section was weighed while the limestone bin conveyor belt

speed was running at 26% FOW. At 50% FOW, the weight of the limestone on a 6 foot section of the feed belt was 20 lb limestone (corresponds to a production rate of 238 TPD of lime). At 26% FOW, the weight of the limestone on a 6 foot section of the feed belt was 14 lb limestone (167 TPD of lime). This compares with the typical production rate of the number one kiln reported by the plant to be 240 TPD of lime.<sup>17</sup>

Plant personnel did not weigh a six foot section of limestone from the feed belt during testing of the number one kiln on 10/23 and 10/24; on these days, the average limestone bin conveyor belt speed was 45% FOW and 44% FOW, respectively. To approximate the limestone feed rates at these settings, the three known limestone bin conveyor belt speeds and their corresponding weights from above (i.e., 64% and 22 lb; 50% and 20 lb; 26% and 14 lb) were fitted to a curve (see Figure 3). The equation for the curve (shown in Figure 3) was used to predict the weight of a six foot section of limestone on the feed belt at the two limestone bin conveyor belt speeds. At 44% FOW, the predicted weight was 18.7 lb (approximately 224 tons of lime per day). At 45%, the predicted weight was 18.9 lb (approximately 226 tons of lime per day).

In summary, the average indirectly measured lime production rates during testing were typical of the production rates reported in the questionnaire.<sup>18</sup>

#### Coal Feed Rate

During each test run, three samples of pulverized coal were collected upstream of the kiln. The samples were collected at the beginning, middle, and end of each test run. The three samples from each test run were mixed together and a sample of the mixture sent off for an F-factor analysis. The F-factor analysis uses the thermal value of coal, along with air flow measurements, to calculate coal feed rate.

#### Percent Damper Opening

As indicated in Figures 1 and 2, a single ball mill pulverizes coal for the number one and number two kilns. Heated air from each kiln's lime cooler is pulled into the ball mill to preheat and dry the coal. A fan on the mill blows the air and dry pulverized coal from the mill to each kiln. Dampers control the distribution of air and coal to each kiln. Plant personnel adjust the dampers based on a visual inspection of the FF dust from each kiln. The color of the FF dust serves as a surrogate measure of combustion efficiency. FF dust that is too dark

indicates that coal is passing through the kiln unburned; consequently, the damper setting is increased to increase the flow of air to the kiln to improve combustion efficiency. The plant also has oxygen analyzers at the exhaust end of each kiln to indicate combustion efficiency. Oxygen readings for the number one kiln were not recorded during testing because the kiln operators indicated that the analyzer was not working. It was later learned (several months after testing) that the analyzer was working during testing.

During testing, the percent damper opening to the number one kiln was recorded as a possible indicator of coal feed rate consistency. The damper to the number one kiln is fully open at 74.6%; as shown in Table 1, average settings during kiln 1 testing were 59.6%, 50.9%, and 66.6%.<sup>19</sup>

### Kiln Speed

The speed, i.e., the revolutions per minute (rpm) of the number one and number two kilns is controlled by four motor settings. The fourth motor setting is the fastest kiln speed (1.90 rpm), followed by the third motor setting (1.38 rpm), second motor setting (0.95 rpm), and first motor setting (0.69 rpm). The number one and two kilns typically operate in the fourth motor setting, however, if the front end temperature of either kiln drops, the speed of that kiln is slowed down (usually to second or third motor setting) to raise the front end temperature back up. According to the kiln operator, slowing the kiln speed raises the temperature of the feed traveling through the kiln, which in turn transports more heat to the front end of the kiln.<sup>20</sup>

### Secondary air and back end temperatures

According to one of the kiln operators, target back end and secondary air temperatures for the number one kiln are 750 deg F and 300 deg F, respectively, when burning medium stone (the size of stone burned during testing).<sup>21</sup> Target back end and secondary air temperatures for the number two kiln are 680 deg F and 550 deg F, respectively, when burning medium stone.<sup>22</sup> Table 1 shows the average values of back end and secondary air temperatures for the number one and two kilns during testing; these temperatures were close to the target temperatures specified by the kiln operator.

## FF temperature and pressure drop

The 1995 questionnaire reports that the inlet temperature and pressure drop of the FF that treats the number one kiln are 495 deg F and 6 to 8 inches of water, respectively.<sup>23</sup> As shown in Table 1, the average inlet temperature and pressure drop of the FF were within these reported ranges during testing.

Table 1. Statistical Summary of Process Data Collected at APG

Runs 1,2 & 3, of #2 Cooler Tests

10/21/96; data recorded from 11:32 am to 6:28 pm

Parameters for Kiln #2	mean	std. dev.	min.	max.	n <sup>1</sup>
Kiln back end temperature (deg F)	672	24	632	750	29
% FOW (% of motor capacity of feed belt to bucket elevators )	59	11	32	65	27
Temperature of secondary air to kiln (deg F)	536	45	395	596	29
Gear Setting on kiln speed (1 through 4; 4 is the highest speed)	4	1	2	4	29

Run 1 of Kiln 1 Baghouse Test

10/22/96; data recorded from 11:35 am to 5:47 pm

Parameters for Kiln #1	mean	std. dev.	min.	max.	n
Pressure drop across baghouse (in. of H <sub>2</sub> O)	8.3	0.2	7.9	8.6	23
Temperature of gas at inlet to baghouse (deg F)	492	1	490	494	23
Kiln back end temperature (deg F)	751	20	720	791	23
Temperature of secondary air to kiln (deg F)	290	60	30	342	23
Gear Setting on kiln speed (1 through 4; 4 is the highest speed)	4	1	2	4	23
% FOW (% of motor capacity of feed belt to bucket elevators )	45	12	20	50	23
Damper opening for air/coal feeding kiln (%)	59.6	1.9	58.3	62.7	23

Run 2 of Kiln 1 Baghouse Test

10/23/96; data recorded from 10:41 am to 3:39 pm

Parameters for Kiln #1	mean	std. dev.	min.	max.	n
Pressure drop across baghouse (in. of H <sub>2</sub> O)	8.0	0.2	7.8	8.3	18
Temperature of gas at inlet to baghouse (deg F)	492	1	491	494	18
Kiln back end temperature (deg F)	751	10	737	768	18
Temperature of secondary air to kiln (deg F)	293	16	262	321	18
Gear Setting on kiln speed (1 through 4; 4 is the highest speed)	4	0	3	4	18
% FOW (% of motor capacity of feed belt to bucket elevators )	45	6	22	48	18
Damper opening for air/coal feeding kiln (%)	50.9	1.0	50.3	54.8	18

Run 3 of Kiln 1 Baghouse Test

10/24/96; data recorded from 11:05 am to 7:52 pm

Parameters for Kiln #1	mean	std. dev.	min.	max.	n
Pressure drop across baghouse (in. of H <sub>2</sub> O)	7.9	0.3	7.5	8.3	27
Temperature of gas at inlet to baghouse (deg F)	491	1	489	494	27
Kiln back end temperature (deg F)	768	13	737	791	27
Temperature of secondary air to kiln (deg F)	289	22	255	327	27
Gear Setting on kiln speed (1 through 4; 4 is the highest speed)	4	0	2	4	27
% FOW (% of motor capacity of feed belt to bucket elevators )	44	9	21	49	27
Damper opening for air/coal feeding kiln (%)	66.6	4.6	60.2	74.4	27

<sup>1</sup>n = number of recordings

Table 2a. Process Data

10/21/96; Runs 1, 2, & 3 of Kiln 2 Cooler Tests

Day Kiln Operator = Randy

Time	BET (deg F)	FOW (%)	Sec T (deg F)	Gear Setting
started testing approximately 11:25 am				
11:32 AM	681	65	596	4
11:47 AM	670	65	577	4
12:02 PM	665	65	550	4
after 12:02 PM recording, operator changed FOW to 41% and gear setting to 3				
12:17 PM	678	41	488	3
12:32 PM	683	62	515	4
12:47 PM	654	62	526	4
12:48 PM stopped feed b/c of a hole in the belt (FOW set to 0%); coal was still burning				
12:51 PM FOW turned back on to 62%.				
12:58 PM	731	32	505	2
Feed shut off (FOW set to 0%) to weigh feed samples; process still running				
1:03 PM	750		395	3
1:18 PM	644		474	4
1:32 run 1 completed				
1:40 PM	632	64	570	4
2:09 PM	649	64	573	4
2:25 PM	660	41	553	3
2:40 PM	658	64	500	4
3:00 PM	652	64	570	4
3:15 PM	646	64	565	4
3:30 PM	654	64	586	4
3:45 PM	649	64	585	4
4:00 PM	679	64	582	4
4:25 PM	689	64	554	4
4:36 PM	682	41	541	3
4:51 PM	677	41	491	3
4:52 PM	677	64	489	4
5:07 PM	672	64	543	4
5:22 PM	681	64	553	4
5:37 PM	680	64	540	4
5:48 PM	683	41	581	3
6:03 PM	689	64	476	4
6:18 PM	669	64	529	4
6:28 PM	662	64	541	4

BET (deg F) = back end temperature of kiln

FOW (%) = % of motor capacity of feed belt

Sec T (deg F) = temperature of secondary air to kiln

Table 2b. Process Data

10/22/96; Run 1 of Baghouse Tests  
 Day Kiln Operator = Tommy  
 Stone size = 3/8" by 1 and 1/8"

Time	BH delta P	BH T (deg F)	BET (deg F)	Sec T (deg F)	Gear Setting	FOW (%)	Damper (%)
11:30 AM	8.4	494	734	294			62.6
FOW stopped around 11:30 AM to weigh feed sample							
11:35 AM	8.4	493	738	296	4	50	62.7
11:50 AM	8.4	493	738	288	4	50	62.7
12:05 PM	8.4	493	733	296	4	50	62.7
12:25 PM	8.4	492	733	306	4	50	62.6
12:40 PM	8.5	494	726	307	4	50	62.7
12:56 PM	8.6	494	740	311	4	50	58.6
shortly after 1:00 PM, testing halted for filter change							
1:20 PM	8.5	493	724	325	4	50	58.5
1:36 PM	8.6	493	720	342	4	50	58.6
1:50 PM	8.4	493	744	338	4	50	58.5
2:05 PM	8.4	490	746	327	4	50	58.5
2:20 PM	8.2	493	747	312	4	50	58.6
port change around 2:45 PM							
2:55 PM	8.2	494	770	30	2	20	58.5
3:37 PM	8.1	493	774	275	4	50	58.5
3:59 PM	8.2	493	746	298	2	20	58.4
4:05 PM	8.2	491	752	256	4	50	58.5
4:20 PM	8.1	491	791	296	4	50	58.4
4:35 PM	8.1	490	788	304	4	50	58.4
4:36 PM					2	20	
4:51 PM	8.1	491	761	283	4	50	58.4
5:06 PM	8.1	493	762	293	4	50	58.3
5:21 PM	8	491	784	296	4	50	58.4
5:35 PM	8	491	764	302	4	50	58.4
5:47 PM	7.9	491	750	301	2	20	58.4

BH delta P = Pressure drop across baghouse (in. of H<sub>2</sub>O)  
 BH T (deg F) = Temperature of gas at inlet to baghouse (deg F)  
 BET (deg F) = Back end temperature of kiln  
 Sec T (deg F) = temperature of secondary air to kiln  
 FOW (%) = % of motor capacity of feed belt

Table 2c. Process Data

10/23/96; Run 2 of Baghouse Tests

Day Kiln Operator = Randy

Stone size = 3/8" by 1 and 1/8"

Time	BH delta P	BH T (deg F)	BET (deg F)	Sec T (deg F)	Gear Setting	FOW (%)	Damper (%)
10:41 AM	8.1	494	744	262	3	22	50.3
10:56 AM	8.1	493	737	266	4	46	50.3
11:15 AM	8.3	493	741	275	4	46	54.8
11:30 AM	8.1	493	745	287	4	46	50.7
11:51 AM	7.9	491	753	286	4	46	50.7
12:06 PM	7.9	491	749	285	4	46	50.7
12:22 PM	7.8	491	742	288	4	46	50.7
12:37 PM	7.8	491	745	290	4	46	50.7
12:52 PM	7.9	494	747	295	4	46	50.7
1:15 PM	8.2	493	743	295	4	46	50.7
1:40 PM	8.3	493	744	291	4	46	50.7
1:55 PM	8.2	492	746	295	4	46	50.7
2:25 PM	7.9	491	768	302	4	46	50.7
2:35 PM	8	492	760	316	4	46	50.7
2:45 PM	7.8	491	761	320	4	48	50.7
3:07 PM	7.9	493	763	321	4	48	50.7
3:22 PM	7.9	491	762	303	4	48	50.7
3:39 PM	7.8	491	767	296	4	48	50.6

BH delta P = Pressure drop across baghouse (in. of H<sub>2</sub>O)

BH T (deg F) = Temperature of gas at inlet to baghouse (deg F)

BET (deg F) = Back end temperature of kiln

Sec T (deg F) = temperature of secondary air to kiln

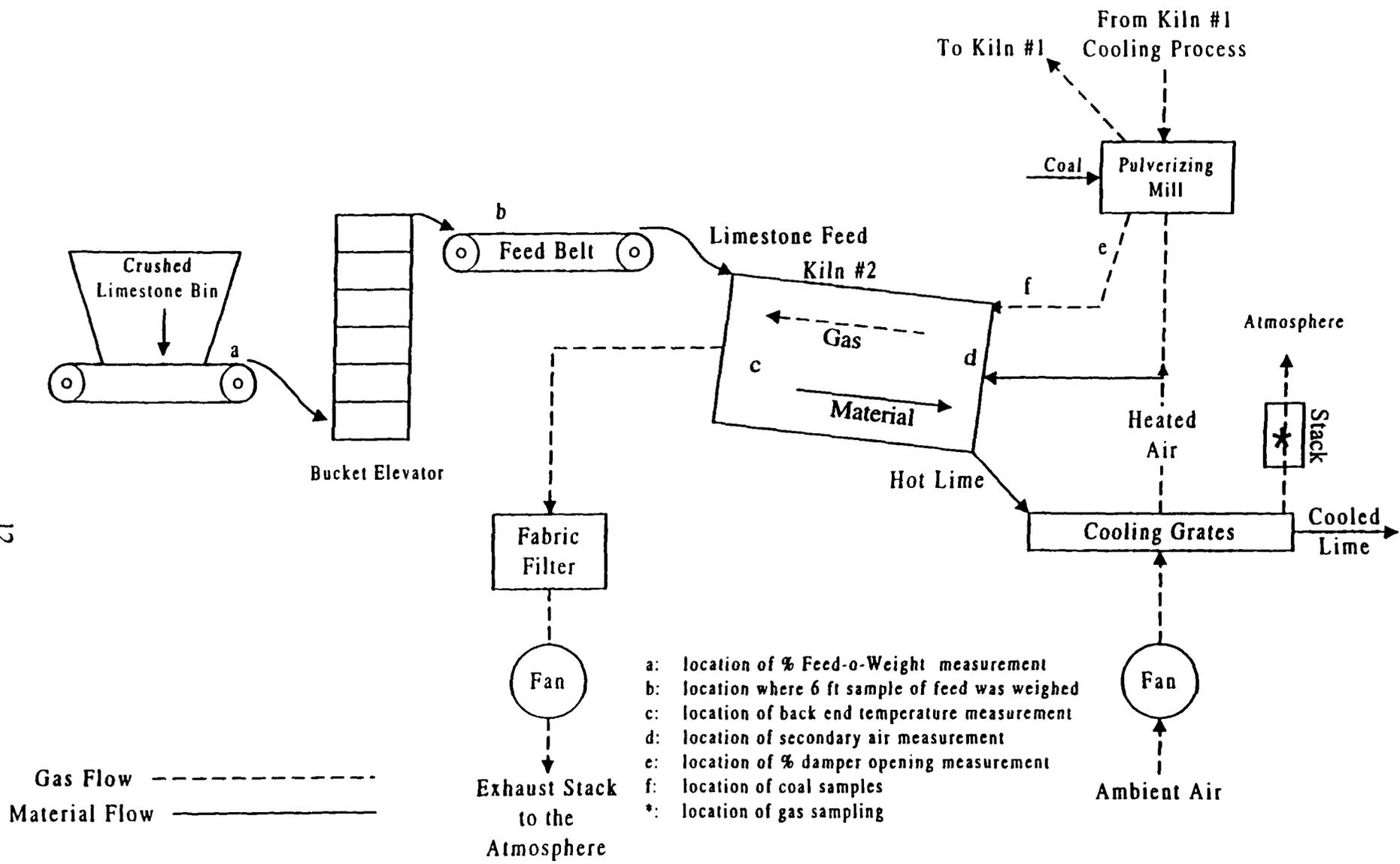
FOW (%) = % of motor capacity of feed belt

Table 2d. Process Data

10/24/96; Run 3 of Baghouse Tests  
 Day Kiln Operator = Tommy

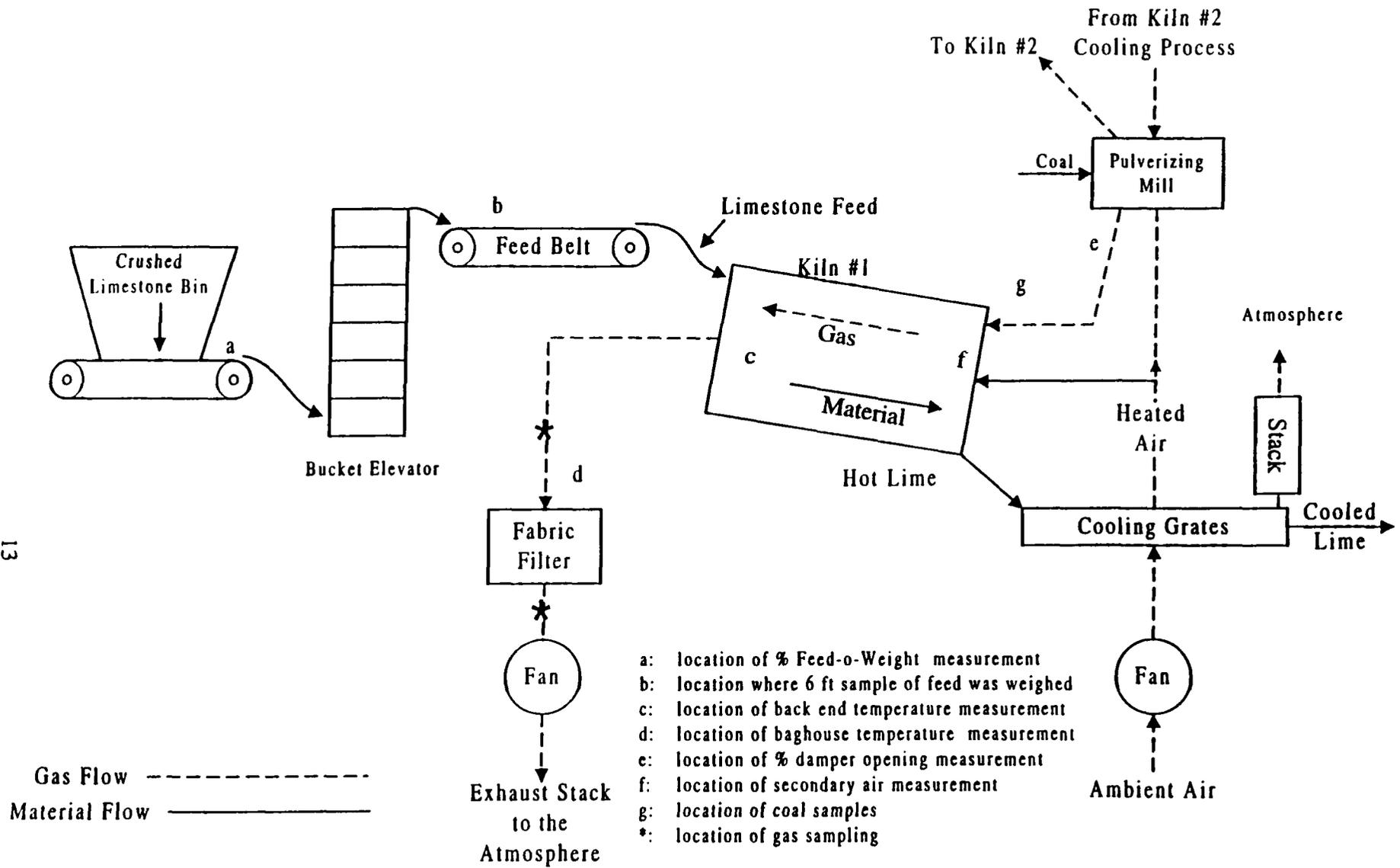
Time	BH delta P	BH T (deg F)	BET (deg F)	Sec T (deg F)	Gear Setting	FOW (%)	Damper (%)
Stone size = 3/8" by 1 and 1/8"							
11:05 AM	8.3	490	764	302	4	49	60.2
11:20 AM	8.2	489	775	309	4	49	60.3
11:35 AM	8	490	764	316	4	49	60.2
11:50 AM	8	491	764	315	4	49	60.2
12:07 PM	7.9	491	759	309	4	49	60.2
12:35 PM	8.2	493	769	293	4	49	60.2
12:50 PM	8.1	491	777	269	4	49	62.6
1:05 PM	8.1	490	791	256	3	24	64.3
1:06 PM	8.2	490	791	255	4	48	64.3
1:21 PM	8.1	493	787	259	4	47	64.2
1:36 PM	8.2	490	782	264	4	47	64.3
3:34 PM	8.1	490	764	262	4	47	68.3
3:49 PM	8.2	491	765	266	4	47	68.3
4:05 PM	8	493	772	270	2	22	68.3
4:36 PM	8.1	491	774	281	4	46	68.3
4:54 PM	8.1	491	758	299	4	47	68.3
5:14 PM	7.9	491	754	304	4	47	68.3
5:30 PM	8	491	737	318	4	47	68.3
5:45 PM	7.9	493	763	323	4	47	68.3
6:00 PM	7.9	491	760	327	4	47	68.3
6:17 PM	7.7	493	778	299	3	22	68.3
6:31 PM	7.6	493	785	268	4	48	68.3
6:47 PM	7.5	492	776	283	4	48	68.3
7:07 PM	7.5	491	768	289	4	48	74.4
7:22 PM	7.5	494	767	281	3	21	74.4
7:37 PM	7.5	493	766	288	4	42	74.4
7:52 PM	7.6	490	737	299	4	47	74.4

BH delta P = Pressure drop across baghouse (in. of H<sub>2</sub>O)  
 BH T (deg F) = Temperature of gas at inlet to baghouse (deg F)  
 BET (deg F) = Back end temperature of kiln  
 Sec T (deg F) = temperature of secondary air to kiln  
 FOW (%) = % of motor capacity of feed belt



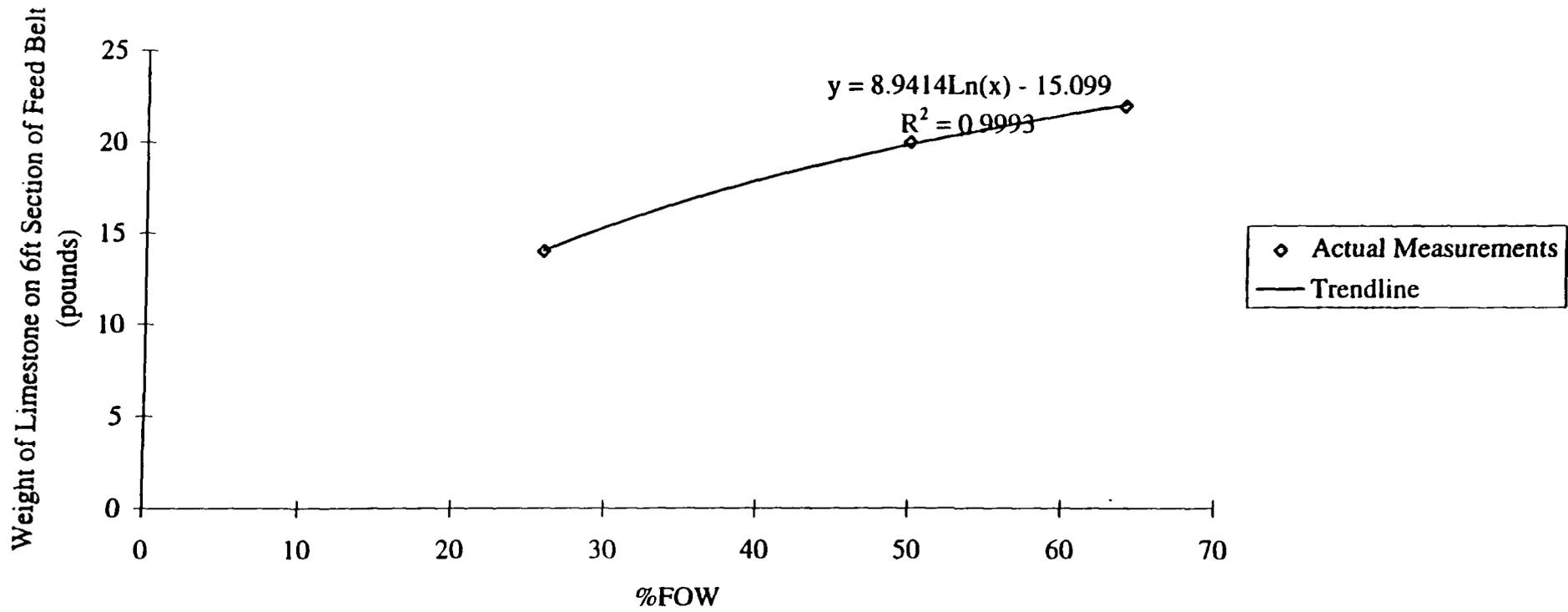
FILENAME Kiln #2, #2 Lime Cooler, and Associated Emission Control at APG Lime.vsd

**Figure 1. Kiln #2, #2 Lime Cooler, and Associated Emission Control at APG Lime**



FILENAME Kiln #1, #1 Lime Cooler, and Associated Emission Control at APG Lime.vxd

**Figure 2. Kiln #1, #1 Lime Cooler, and Associated Emission Control at APG Lime**



**Figure 3. Weight of Limestone on 6 ft Section of Feed Belt vs. % FOW (Feed-O-Weight)**

## REFERENCES

1. APG response to questionnaire sent out in 1995 by the National Lime Association as part of a voluntary effort with the Environmental Protection Agency to obtain data/information for the MACT program.
2. Heath, Elizabeth, Research Triangle Institute. Site Survey of APG Lime, Inc., Ripplemead, Virginia. February, 1996.
3. Ref 1.
4. Ref 2.
5. Ref 2.
6. Ref 2.
7. Brockmann, Cybele, Research Triangle Institute. Conversation with plant personnel during testing (10/21/96 through 10/24/96).
8. Ref 1.
9. Ref 2.
10. Ref 1.
11. 1.
12. 1.
13. 1.
14. Telecommunication between Cybele Brockmann of Research Triangle Institute and plant personnel on November 25, 1996.
15. Ref 14.
15. 1.
16. 1.
18. Reference 1

APPENDIX B  
RAW FIELD DATA

Appendix B.1

Raw Field Data

Kiln No. 1

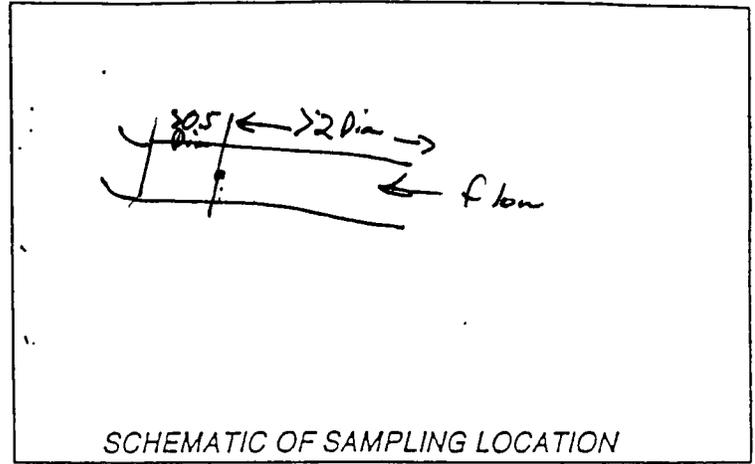
Appendix B.1.1

Raw Field Data

Kiln No. 1 Baghouse Inlet

EPA METHOD 1  
TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT APG Lime  
 CITY Rippon STATE VA  
 SAMPLING LOCATION Baghouse Inlet  
 INSIDE OF FAR WALL TO OUTSIDE  
 OF NIPPLE, (DISTANCE A) 74 1/4  
 INSIDE OF NEAR WALL TO OUTSIDE  
 OF NIPPLE, (DISTANCE B) 3  
 NEAREST UPSTREAM DISTURBANCE  
 DISTURBANCE > 0.5 Diameter  
 NEAREST DOWNSTREAM DISTURBANCE  
 DISTURBANCE > 2 Diameter  
 SAMPLER AR/BDR DATE 10/21/96



TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8-INCH)	DISTANCE B	TRAVERSE DISTANCE FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.021	71 1/4"	1.5 → 1 1/2"	3"	4 1/2"
2	0.067		4 3/4"		7 3/4"
3	0.118		8 3/8"		11 3/8"
4	0.177		12 5/8"		15 5/8"
5	0.250		17 7/8"		20 7/8"
6	0.356		25 3/8"		28 3/8"
7	0.644		45 7/8"		48 7/8"
8	0.750		53 3/8"		56 3/4"
9	0.823		58 5/8"		61 5/8"
10	0.882		62 3/8"		65 7/8"
11	0.933		66 1/2"		69 1/2"
12	0.979		69 3/4"		72 3/4"

GAS ANALYSIS DATA FORM

PLANT APG Line  
 DATE 10-22-96 TEST NO 3-6-I  
 SAMPLING TIME (24-hr CLOCK) KILN 1130-1735  
 SAMPLING LOCATION KILN NO.1 BH INLET  
 SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) INTEGRATED BAG  
 ANALYTICAL METHOD ORSAT  
 AMBIENT TEMPERATURE 70°F  
 OPERATOR [Signature]

COMMENTS:

RUN GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M <sub>d</sub>
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO <sub>2</sub>	10.8	10.8	10.7	10.7	10.7	10.7	10.7	44/100	4.708
O <sub>2</sub> (NET IS ACTUAL O <sub>2</sub> READING MINUS ACTUAL CO <sub>2</sub> READING)	24.0	13.2	23.9	13.2	23.9	13.2	13.2	32/100	4.224
CO (NET IS ACTUAL CO READING MINUS ACTUAL O <sub>2</sub> READING)		0		0		0	0	28/100	0
N <sub>2</sub> (NET IS 100 MINUS ACTUAL CO READING)		76.0		76.1		76.1	76.1	28/100	21.308
<b>TOTAL</b>									<b>30.24</b>

# METHOD 5 TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
APG Ripelkand VA	10/22/6	Bayhouse inlet	M23 (Diox/Fur)	M23-15-01 1

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. Hg)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Op	PROBE LENGTH AND LINER TYPE	NOZZLE	
								NUMBER	DIAMETER
MH	28.38	-2.8	60	—	7 1/4	0.84	8' Glass	Field	0.197

Tm 70  
 Tc K  
 425 0.923  
 450 0.898  
 475 0.874  
 500 0.851  
 525 0.830

ASSUMED MOISTURE (%)	DGM BOX No.	DGM HQ	DGM GAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
5%	M59	1.883	1.009	7E	7E	PES	0.004 @ 15.5"	0.008 @ 18"	13	9	Variable

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	SIL GEL IMPINGER TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)	Aux Temp
A 1	0	11:20	344.788	0.45	0.39	474	246	245	66	64	3.2	29
2	10		348.33	0.47	0.41	481	258	253	67	67	3.9	29
3	20		351.94	0.53	0.45	500	256	254	41	69	5.0	29
4	30		355.74	0.45	0.37	516	261	255	42	70	5.0	29
5	40		359.19	0.55	0.47	508	263	257	43	71	6.8	30
6	50		363.09	0.59	0.50	506	264	256	43	72	8.1	30
7	60*	12:36 / 13:40	367.11	0.83	0.71	505	263	256	45	73	11	30
8	70		371.91	0.60	0.51	503	254	242	45	75	12	29
9	80		375.99	0.75	0.66	481	248	244	43	76	14.5	29
10	90		380.58	0.67	0.59	486	236	233	44	77	15.0	29
11	100		384.93	0.73	0.66	485	233	234	46	77	17.0	30
12	110		389.50	0.73	0.66	466	236	233	42	76	20	28
	120	14:34	394.053									
TOTAL TIME			DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE TEMP				AVE TEMP.		

\* Stopped due to filter change

Intermediate leak check + change filter  
 Before 0.006 @ 26" Hg  
 After 0.004 @ 21" Hg



Used flex line

Blue Ink

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA



Plant: APG Lime					Run No.: 23-6-I		
Sample Date: 10-22-96		Filter No.(s): NA			Job No.: 5401.003		
Sample Location: Kiln No. 1 Inlet BAGHOUSE							
Recovery Date: 10-22-96		XAD-2 Trap No.(s): 23-6-I					
Sample Recovery Person: CER							
<b>Moisture Data</b>							
Impingers	XAD - 2 Trap	1 (knockout)	2 (100 ml H2O) (untipped)	3 (100 ml H2O) (tipped)	4 (knockout) (untipped)	Silica gel (untipped)	
Final wt.	314.9	542.2	579.0	580.3	477.0	922.2 g	
Initial wt.	310.3	488.8	581.2	579.9	476.0	899.2 g	
Net wt.	4.6	53.4	-2.2	0.4	1.0	23.2 g	
<b>Description</b>						80.4	
Train System: M-23							
Probe: 8 ft glass							
Filter: Color - black/grey Loading - heavy (changed filter?)							
Impinger Contents: <del>clear</del> clear							
Silica Gel: @Grams Used - 450 Color - good % Spent - 60							
Condensate Observed In Front Half: no							
<b>Recovered Sample Fractions</b>							
Filter Container No. 23-6-I FH/BH					marked/sealed: ✓		
XAD Module Container No.: 23-6-I XAD					marked/sealed: ✓		
Probe (FH) & Back Half Rinse (Acetone) Container No. 23-6-I					Liquid level marked/sealed: ✓		
Probe (FH) & Back Half Rinse (Toluene) Container No.: 23-6-I					Liquid level marked/sealed: ✓		
Impinger Contents Container No.:					Liquid level marked/sealed:		
Impinger Rinse (Acetone/MeCl2) Container No.:					Liquid level marked/sealed:		

FH fractions - FH / BH acetone, toluene rinsings & filter  
 XAD fractions - XAD trap

**GAS ANALYSIS DATA FORM**

PLANT APG Lime  
 DATE 10-23-96 TEST NO 3-7-I  
 SAMPLING TIME (24-hr CLOCK) 1040 - 1540  
 SAMPLING LOCATION KILN NO.1 BAG-HOUSE INLET  
 SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) INTEGRATED BAG  
 ANALYTICAL METHOD ORSAT  
 AMBIENT TEMPERATURE 70°F  
 OPERATOR *Meadow*

COMMENTS:

RUN GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M <sub>d</sub>
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO <sub>2</sub>	10.3	10.3	10.2	10.2	10.3	10.3	10.3	44/100	4.532
O <sub>2</sub> (NET IS ACTUAL O <sub>2</sub> READING MINUS ACTUAL CO <sub>2</sub> READING)	24.2	13.9	24.2	14.0	24.2	13.9	13.9	32/100	4.448
CO (NET IS ACTUAL CO READING MINUS ACTUAL O <sub>2</sub> READING)		-		-		-	-	28/100	0
N <sub>2</sub> (NET IS 100 MINUS ACTUAL CO READING)		75.8		75.8		75.8	75.8	28/100	21.224
<b>TOTAL</b>									30.204

METHOD 5 TESTING FIELD DATA SHEET

$T_m = 74$

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
APG Lime Pipelead VA	10/23/96	Baghouse Inlet	M23 (Diox/Furan)	M23-7-I 2

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. Hg) $H_2O$	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE	
								NUMBER	DIAMETER
MH AB	28.17	-2.8	60	—	71.25	0.84	8' Glass	Field Cal.	0.197

Variable k-factor

ASSUMED MOISTURE (%)	DGM BOX No.	DGM HQ	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
5	M5-9	1.883	1.009	7E	7E	PES	0.003 @ 19"	0.005 @ 10"	~13	~9	Variable

$T_s$	K
425	0.930
450	0.905
475	0.880
500	0.858
525	0.836

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING $V_m$ (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	SIL GEL IMPINGER TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)	Aux Temp
B 1	0	10:40	446.172	0.51	0.44	489	233	256	60	64	3.8	30
2	10		449.93	0.58	0.50	493	228	248	55	65	4.8	29
3	20		453.92	0.63	0.54	496	228	238	50	67	7.0	29
4	30		458.09	0.58	0.50	505	234	256	49	68	7.5	29
5	40		462.14	0.61	0.52	499	232	253	51	70	6.8	31
6	50		466.23	0.67	0.57	493	236	256	51	71	8.0	31
7	60		470.50	0.71	0.61	508	230	253	51	72	9.0	32
8	70		474.95	0.74	0.63	502	233	249	51	72	10.0	32
9	80		477.42	0.74	0.63	505	231	251	51	72	11.0	33
10	90		483.89	0.68	0.58	497	231	243	52	71	11.8	33
11	100		488.26	0.79	0.68	489	227	237	53	70	13.0	33
12	110		492.90	0.80	0.69	501	229	242	53	70	14.8	35
	120	12:42	497.604									

TOTAL TIME	DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE TEMP.	AVE TEMP.

+ Lost power for ~1 min

Intermediate leak check  
 Before 0.008 atm @ 15.5" Hg  
 After 0.003 atm @ 15" Hg

EMISSION TESTING LD DATA

PLANT AND CITY			DATE	SAMPLING LOCATION			SAMPLE TYPE		RUN NUMBER			
APG Koppershead VA			10/23/16	Baghouse Inlet			M23 (Dioxin/Furan)		M23-7-I 2			
TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (lit)	P VELOCITY HEAD (in. H <sub>2</sub> O)	H ORIFICE (in. H <sub>2</sub> O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN ACUU (In. Hg)
A 1	120	1340	497.926	0.60	0.56	477	230	248	62	65	32	3.2
2	130		502.17	0.56	0.48	503	232	250	53	67	33	3.5
3	140		506.14	0.56	0.48	500	234	252	46	69	30	4.2
4	150		510.10	0.54	0.46	511	235	250	47	70	30	4.5
5	160		513.98	0.56	0.48	510	241	248	47	70	30	4.9
6	170		517.95	0.58	0.50	511	247	247	48	71	30	5.0
7	180		522.01	0.85	0.71	520	249	255	48	71	30	6.2
8	190		526.79	0.88	0.76	495	253	253	48	72	30	6.8
9	200		531.69	0.88	0.76	501	257	252	50	73	30	7.2
10	210		536.61	0.90	0.77	490	241	239	53	73	31	7.8
11	220		541.59	0.94	0.83	481	235	239	54	73	31	8.2
12	230		546.77	0.90	0.77	479	234	238	55	73	27	8.4
	240	1540	551.699									
TOTAL TIME			DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F					
Page Totals			105.205	0.8326	0.602	498	70					

used flex line

Blue Inlet

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA



Plant: <i>APG Lim</i>	Run No.: <i>23-7-T</i>
Sample Date: <i>10/23/96</i>	Filter No.(s): <i>NA</i>
Sample Location: <i>HILW NO. 1 BAGHOUSE INLET</i>	
Recovery Date: <i>10/23/96</i>	XAD-2 Trap No.(s): <i>23-7-T</i>
Sample Recovery Person: <i>C-E Ritey</i>	

Moisture Data

Impingers	XAD - 2 Trap	1 (knockout)	2 (100 ml H2O) (untipped)	3 (100 ml H2O) (tipped)	4 (knockout) (untipped)	Silica gel (untipped)	
Final wt.	<i>303.3</i>	<i>523.5</i>	<i>578.0</i>	<i>579.0</i>	<i>479.5</i>	<i>942.0</i>	g
Initial wt.	<i>297.7</i>	<i>474.4</i>	<i>579.0</i>	<i>580.2</i>	<i>477.2</i>	<i>922.0</i>	g
Net wt.	<i>5.6</i>	<i>49.1</i>	<i>-1.0</i>	<i>-1.2</i>	<i>2.3</i>	<i>20.0</i>	g

Description

*74.8*

Train System: *M-23*

Probe: *8ft glass*

Filter: Color - *black/grey* Loading - *heavy (changed filter)*

Impinger Contents: *Water*

Silica Gel: @Grams Used - *450* Color - *good* % Spent - *60*

Condensate Observed In Front Half: *no*

Recovered Sample Fractions

Filter Container No.	marked/sealed: <input checked="" type="checkbox"/>
XAD Module Container No.:	marked/sealed: <input checked="" type="checkbox"/>
Probe (FH) & Back Half Rinse (Acetone) Container No.:	Liquid level marked/sealed: <input checked="" type="checkbox"/>
Probe (FH) & Back Half Rinse (Toluene) Container No.:	Liquid level marked/sealed: <input checked="" type="checkbox"/>
Impinger Contents Container No.:	Liquid level marked/sealed: <input checked="" type="checkbox"/>
Impinger Rinse (Acetone/MeCl2) Container No.:	Liquid level marked/sealed: <input checked="" type="checkbox"/>

*FH fraction - FH/BH acetone, toluene rinsing & filter*

*XAD fraction - XAD trap*

GAS ANALYSIS DATA FORM

PLANT APG LIME  
 DATE 10-24-96 TEST NO 3-8-I  
 SAMPLING TIME (24-hr CLOCK) 1040 - 1540  
 SAMPLING LOCATION KILN NO.1 BH INLET  
 SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) INTEGRATED BAG  
 ANALYTICAL METHOD ORSAT  
 AMBIENT TEMPERATURE 70°F  
 OPERATOR [Signature]

COMMENTS:

RUN GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M <sub>d</sub>
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO <sub>2</sub>	10.0	10.0	9.9	9.9	9.9	9.9	9.9	44/100	4.356
O <sub>2</sub> (NET IS ACTUAL O <sub>2</sub> READING MINUS ACTUAL CO <sub>2</sub> READING)	24.0	14.0	24.0	14.1	23.9	14.0	14.0	32/100	4.480
CO (NET IS ACTUAL CO READING MINUS ACTUAL O <sub>2</sub> READING)		-		-		-	-	28/100	0
N <sub>2</sub> (NET IS 100 MINUS ACTUAL CO READING)		76.0		76.0		76.1	76.1	28/100	21.308
<b>TOTAL</b>									<b>30.144</b>

GAS ANALYSIS DATA FORM

PLANT APG Line  
 DATE 10-24-96 TEST NO 3-8A-I  
 SAMPLING TIME (24-hr CLOCK) \_\_\_\_\_  
 SAMPLING LOCATION KILN NO. 1 BH INLET  
 SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) INTEGRATED BAG  
 ANALYTICAL METHOD ORSAT  
 AMBIENT TEMPERATURE 70°F  
 OPERATOR Meadow

COMMENTS:

RUN GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M <sub>d</sub>
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO <sub>2</sub>	10.2	10.2	10.1	10.1	10.2	10.2	10.2	44/100	4.488
O <sub>2</sub> (NET IS ACTUAL O <sub>2</sub> READING MINUS ACTUAL CO <sub>2</sub> READING)	24.0	13.8	24.0	13.9	24.1	13.9	13.9	32/100	4.448
CO (NET IS ACTUAL CO READING MINUS ACTUAL O <sub>2</sub> READING)		—		—		—	—	28/100	—
N <sub>2</sub> (NET IS 100 MINUS ACTUAL CO READING)		76.0		76.0		75.9	75.9	28/100	21.252
								TOTAL	30.188

METHOD 5 TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
APG F. pp. med VA	10/24/96	Baghouse Inlet	M23 / Dist. air	84

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. Hg)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE	
								NUMBER	DIAMETER
M of AB	28.30	-2.8	65	-	71.25	0.84	7' Glass	Field Cell	0.191

ASSUMED MOISTURE (%)	DGM BOX No.	DGM HQ	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
5	M5-6	1.883	1.008	7E	7E	PES	0.0020	0.0020	13	7	Variable

Variable  
 $\frac{k_{factor}}{T_s}$   
 425 0.82:  
 450 0.799  
 475 0.778  
 500 0.751  
 525 0.739

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	SIL GEL IMPINGER TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
B 1	0	15:15	602.615	0.61	0.47	480	254	234	66	65	2.6
2	10		606.53	0.54	0.42	475	255	229	61	67	2.9
3	20		610.17	0.65	0.49	489	259	237	58	69	4.5
4	30		614.17	0.76	0.58	511	260	240	57	72	5.8
5	40		618.48	0.68	0.52	511	260	241	52	73	5.0
6	50		622.60	0.82	0.62	504	258	242	55	74	7.21
7	60		627.07	0.88	0.67	506	258	238	54	74	8.1
8	70		631.72	0.82	0.62	503	260	243	53	74	8.7
9	80		636.22	0.71	0.54	506	251	239	54	74	9.2
10	90		640.43	0.74	0.56	507	258	242	54	73	9.9
11	100		644.63	0.74	0.56	504	261	242	54	73	10.8
12	110		648.90	0.70	0.53	487	263	244	54	72	11.2
	120	17:15	653.038								

due Temp

TOTAL TIME	DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE TEMP	AVE TEMP.

Intermediate Lk chk  
 Before 0.005 CFM @ 13" Hg  
 After 0.003 CFM @ 20.5" Hg

PLANT AND CITY			DATE	SAMPLING LOCATION			SAMPLE TYPE		RUN NUMBER			
APG Ripplenead VA			10/24/46	Bayhouse Inlet			M23 (Dip. Prod)		8A			
TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (lit)	P VELOCITY HEAD (in. H <sub>2</sub> O)	H ORIFICE (in. H <sub>2</sub> O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP (F)	SAMPLE TRAIN ACUU (in. Hg)
B 1	120	17:45	653.342	0.56	0.44	463	229	230	65	67	30	3.0
2	130		657.09	0.62	0.47	495	248	236	45	68	29	3.8
3	140		661.00	0.58	0.44	508	250	239	43	69	30	4.0
4	150		664.78	0.61	0.45	526	249	239	46	69	30	4.2
5	160		668.61	0.65	0.48	525	249	240	47	69	30	4.8
6	170		672.53	0.65	0.49	511	254	250	44	67	29	5.0
7	180		676.48	0.83	0.63	507	244	247	43	67	29	6.0
8	190		680.94	0.90	0.68	492	250	236	42	66	30	6.8
9	200		685.57	0.90	0.68	483	251	236	42	65	29	7.6
10	210		690.18	0.94	0.73	484	251	238	44	65	29	8.8
11	220		694.94	0.94	0.73	475	250	239	43	63	30	9.7
12	230		699.70	0.86	0.67	478	253	235	42	63	29	10.3
	240	19:45	704.208									
TOTAL TIME			DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F					
			101.289	0.9218	0.56	497	69					

Page Totals

0.855  
CJW 11/20/46

Sheet Checked By: \_\_\_\_\_

Date \_\_\_\_\_

Used flex line

Blue Inlet  
restart

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA



Plant: <u>APG Line</u>	Run No.: <u>23-8A-I</u>
Sample Date: <u>10-24-96</u>	Filter No.(s): <u>NA</u>
Job No.: <u>5401</u>	
Sample Location: <u>Kiln No. 1 Baghouse Inlet</u>	
Recovery Date: <u>10-24-96</u>	XAD-2 Trap No.(s): <u>23-8-I</u>
Sample Recovery Person: <u>CEB</u>	

Moisture Data

Impingers	XAD - 2 Trap	1 (knockout)	582.1 (100 ml H2O) (untipped)	580.3 (100 ml H2O) (tipped)	4 (knockout)	Silica gel (untipped)	
Final wt.	<u>308.1</u>	<del>582.1</del>	<u>580.3</u>	<del>480.7</del>	<u>480.7</u>	<u>917.3</u>	g
Initial wt.	<u>301.8</u>	<u>498.4</u>	<u>578.4</u>	<u>579.2</u>	<u>478.4</u>	<u>898.9</u>	g
Net wt.	<u>6.3</u>	<u>54.9</u>	<u>3.7</u>	<u>1.1</u>	<u>1.1</u>	<u>18.4</u>	g

Description

85.5

Train System: M-23

Probe: 8 ft glass

Filter: Color - black/grey Loading - heavy (changed filter)

Impinger Contents: clean

Silica Gel: @Grams Used - 500 Color - good % Spent - 100

Condensate Observed In Front Half: no

Recovered Sample Fractions

Filter Container No.	marked/sealed: <input checked="" type="checkbox"/>
XAD Module Container No.:	marked/sealed: <input checked="" type="checkbox"/>
Probe (FH) & Back Half Rinse (Acetone) Container No.:	Liquid level marked/sealed: <input checked="" type="checkbox"/>
Probe (FH) & Back Half Rinse (Toluene) Container No.:	Liquid level marked/sealed: <input checked="" type="checkbox"/>
Impinger Contents Container No.:	Liquid level marked/sealed: <input checked="" type="checkbox"/>
Impinger Rinse (Acetone/MeCl2) Container No.:	Liquid level marked/sealed: <input checked="" type="checkbox"/>

FH fraction - FH/BH acetone, toluene rinsings + filter  
XAD fraction - XAD trap

# METHOD 5 TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
APG LIME-RIPPLEHEAD, VA.	10-22-96	BAGHOUSE INLET	MMTL	M29-13-I

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. Hg)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE	
BDR	28.38	-2.80	62	301646	71.25"	0.84	7 FT. GLASS	FIELD CAL.	0.197

ASSUMED MOISTURE (%)	DGM BOX No.	DGM HQ	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
5%	M5-7	1.893	0.978	5C	5C	PES	0.008	0.0050	7	13	0.864

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	SIL GEL IMPINGER TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
B-12	0	1130	240.312	0.79	0.68	400	242	247	67	75	2
11	10	1140	244.92	0.85	0.73	505	245	258	60	78	4
10	20	1150	249.61	0.72	0.63	504	256	268	52	81	5
9	30	1200	254.07	0.74	0.65	506	248	251	48	82	7
8	40	1210	258.55	0.73	0.64	508	245	263	48	80	9
7	50	1220	262.17	0.65	0.57	511	241	269	50	80	11
6	60	1230	267.50	0.58	0.50	512	240	251	53	81	12
5	70	1344	270.071	0.55	0.48	507	230	236	66	85	2
4	80	1349	277.77	0.57	0.50	473	231	234	64	85	3
3	90	1353	281.86	0.54	0.47	495	232	240	64	85	3
2	100	1358	285.73	0.52	0.45	502	231	244	50	86	4
1	110	1403	289.81	0.47	0.42	497	230	240	48	86	5
A-12	120	1505	293.613	0.63	0.55	484	222	225	67	87	2
TOTAL TIME			DGM VOLUME	AVE SORT delta P	AVE delta H	AVE TEMP				AVE TEMP.	

RESTART  
1340  
\*

0.88-85

.876

\* L.C. @ 15" = 0.000 270.071  
272.208

⊗ L.C. @ 16" = 0.004



13, 14, 15

Used Flex Lins

29-13-I

MULTI-METALS SAMPLE RECOVERY DATA 13



Plant: APG Lime Company	Run No.: 29-13-I
Date: 10/22/96	Sample Box No.: 29-13-I
Job No.: S-401	
Sample Location: No 1 Kiln BAGHOUSE INLET	
Sample Type: Metho 2g	
Sample Recovery Person: MDM CLR	

Container	Description	Volume, ml	Sealed/Level Marked
<b>Front Half</b>			
1	Filter No.(s) 301647/301646		F1 ✓
2	Acetone Rinse		AR2 -
3	Nitric Rinse		FH3 ✓
<b>Back Half</b>			
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter		BH4 ✓
5A	Nitric Rinse - Impinger No. 4		SA ✓
5B	KMNO4/H2O Rinse - Impingers 5 & 6		SB -
5C	HCl Rinse - Impingers 5 & 6		SC -

Moisture Data

Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	WT	0	729.5	841.2	111.7
2	5% HNO <sub>3</sub> / 10% H <sub>2</sub> O <sub>2</sub>	100	590.3	610.6	20.3
3	"	100	577.3	537.6	-39.7
4	WT	0	489.4	571.5	82.1
5	4% KMnO <sub>4</sub> / 10% H <sub>2</sub> SO <sub>4</sub>	100	592.9	544.7	-48.2
6	"	100	645.7	578.4	-67.3
7	Si gel	-	901.7	922.7	21.0
			total 79.9		

Twin backed up during run due to high grain loading. (MnO<sub>2</sub> backed into #4 & #3 impingers showed drops in #3 imp. room. Run was wiped clean and #3 recovered into BH4 fraction. No SA fraction. Metals Lab to filter particulates from fraction BH4; filter break through. (MnO<sub>2</sub> in SA fraction combined w/ SB)

METHOD 5 TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
APG LIME - RIPPLEHEAD, VA.	10-23-96	BAGHOUSE INLET	MS/29	M29-14-I

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. Hg)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE	
								NUMBER	DIAMETER
BDR	28.17	<del>28.17</del> -3	60°	301673	71.25"	0.84	7 FT GLASS	FIELD CAL	0.188

301637

ASSUMED MOISTURE (%)	DGM BOX No.	DGM HQ	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
4	M5-7	1.893	0.978	5C	5C	PES	0.014	0.005	13	9	0.728

0.721

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	SIL GEL IMPINGER TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
A-12	0	1040	348.936	0.68	0.50	491	232	232	67	72	3
11	10	1050	352.74	0.70	0.51	492	234	251	60	73	3
10	20	1100	356.70	0.77	0.56	493	237	240	56	74	5
9	30	1110	361.00	0.80	0.58	496	235	239	54	75	6
8	40	1122	364.93	0.80	0.58	497	234	236	54	75	7
7	50	1132	369.44	0.79	0.58	513	232	229	54	76	8
6	60	1142	373.70	0.59	0.43	512	227	231	55	76	8
5	70	1152	377.53	0.54	0.39	514	224	225	56	76	8
4	80	1202	381.03	0.56	0.40	512	225	233	57	75	8
3	90	1212	384.91	0.56	0.40	509	226	233	59	75	9
2	100	1222	388.48	0.48	0.35	506	228	231	59	75	9
1	110	1232	391.96	0.46	0.34	498	229	232	60	75	9
	120	1242	395.340								

TOTAL TIME	DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE TEMP.	AVE TEMP.
------------	------------	------------------	-------------	-----------	-----------

Intermediate Leak Check  
 Bobo 0.017 CFM @ 12.5" Hg  
 Mike 0.001 CFM @ 15" Hg

PLANT AND CITY			DATE	SAMPLING LOCATION			SAMPLE TYPE		RUN NUMBER			
APG LIME CO.				BAGHOUSE/ULET			MS/MMTL		M29-14-I			
TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (lit)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (°F)	PROBE TEMP (°F)	FILTER OVEN TEMP (°F)	SIL GEL IMPINGER TEMP (°F)	DGM IN/OUT TEMP (°F)	AUX. TEMP. (°F)	SAMPLE TRAIN ACU (In. Hg)
B-12	120	1340	396.990	0.68	0.50	499	230	244	66	74	-	3
11	130	1350	401.02	0.77	0.56	506	231	240	61	75	-	3
10	140	1400	405.54	0.73	0.53	496	233	240	59	76	-	4
9	150	1410	409.73	0.73	0.53	506	230	234	60	76	-	5
8	160	1420	413.87	0.68	0.49	509	232	240	61	76	-	5
7	170	1430	417.92	0.66	0.48	509	233	242	50	78	-	5
6	180	1440	421.86	0.66	0.48	511	236	245	50	78	-	5
5	190	1450	425.96	0.68	0.49	512	234	230	50	77	-	6
4	200	1500	430.04	0.68	0.49	505	232	238	53	77	-	6
3	210	1510	434.06	0.50	0.36	507	236	243	60	78	-	6
2	220	1520	437.72	0.50	0.36	496	235	238	60	80	-	6
1	230	1530	441.20	0.49	0.36	490	227	230	63	80	-	6
	240 OFF	1540	444.774									

Page Totals	TOTAL TIME	DGM VOLUME	AVG. SQRT P	AVG H	AVG STK F	AVG DGM F
		94.188	0.800	0.47	503	76

Sheet Checked By: \_\_\_\_\_ Date: \_\_\_\_\_

Used Flex Line

MULTI-METALS SAMPLE RECOVERY DATA



Plant: AP6 Lime Co.	Run No.: M29-14-I
Date: 10/23/96	Sample Box No.: 29-K-T
Job No.: S-46L	
Sample Location: No. 1 Kiln Baghouse Inlet	
Sample Type: Mended 29	
Sample Recovery Person: CLR, MDM	

Container	Description	Volume, ml	Sealed/Level Marked
<b>Front Half</b>			
1	Filter No.(s) 301673/301637		F1 ✓
2	Acetone Rinse		AR2 ✓
3	Nitric Rinse		FH3 ✓

<b>Back Half</b>			
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter		BH4 ✓
5A	Nitric Rinse - Impinger No. 4		SA ✓
5B	KMNO4/H2O Rinse - Impingers 5 & 6		SB ✓
5C	HCl Rinse - Impingers 5 & 6		SC ✓

<b>Moisture Data</b>					
Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	MT	6	772.7	772.2	43.5
2	5% HNO3 / 10% H2O2	100	589.0	601.7	12.7
3	"	100	577.6	579.4	1.8
4	MT	6	490.0	490.3	0.3
5	4% KMnO4 / 10% H2O2	100	596.9	623.8	26.9
6	"	100	646.8	(620.4)	-26.4
7	Sigalite	-	887.7	908.9	21.2
Total					80.0

Comments: Probe liner broken 15" end at union.

METHOD 5 TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
APG Lime Rippland VA	10/24/96	Bayhouse Inlet	M29	M29-15-I 25

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. Hg)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE	
								NUMBER	DIAMETER
BDR	28.30	<del>28</del> 3.5	65	301639 301644	71.25	0.84	7' Glass	Field Cal	0.188

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
5	M5-7	1.893	0.978	7C	7C	PES	0.010	0.0070	13	9	0.728

0.714

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	SIL GEL IMPINGER TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)	13.5" Hg
												0.721
12	0	1054	440.338	0.78	0.57	500	238	266	56	66	3	
11	10	1104	450.24	0.80	0.57	501	239	247	49	68	3	
10	20	1114	454.56	0.83	0.59	503	240	240	48	71	3	
9	30	1124	458.81	0.76	0.55	508	222	225	49	72	4	
8	40	1134	462.86	0.75	0.55	512	230	239	44	72	4	
7	50	1144	467.02	0.70	0.51	512	232	238	44	73	4	
6	60	1154	470.98	0.80	0.57	514	231	237	44	73	4	
5	70	1204	475.36	0.72	0.52	512	230	237	44	73	5	
4	80	1214	479.66	0.74	0.53	508	228	232	45	74	5	
3	90	1224	483.55	0.74	0.53	496	230	233	46	75	5	
2	100	1234	487.62	0.77	0.55	508	229	229	46	75	6	
1	110	1244	491.76	0.57	0.41	507	233	238	48	76	6	
	120	1254	495.655									

TOTAL TIME	DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE TEMP.

Intand, to  
ilk chk Before 0.005cm@ 7" Hg  
After

PLANT AND CITY			DATE	SAMPLING LOCATION			SAMPLE TYPE		RUN NUMBER			
Al6 Line Rippon VA			10/24/88	Baghouse Inlet			M5/29		M29-15			
TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (lit)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (°F)	PROBE TEMP (°F)	FILTER OVEN TEMP (°F)	SIL GEL IMPINGER TEMP (°F)	DGM IN/OUT TEMP (°F)	AUX. TEMP. (°F)	SAMPLE TRAIN ACUU (in. Hg)
12	120	1515	498.445	0.88	0.66	475	236	255	68	77	-	4
11	130	1525	502.97	0.88	0.66	478	236	264	55	79	-	4
10	140	1535	507.83	0.95	0.71	489	238	249	51	80	-	5
9	150	1545	512.66	0.98	0.73	491	240	269	47	83	-	6
8	160	1555	517.61	0.88	0.65	499	248	261	47	85	-	7
7	170	1605	522.16	0.62	0.46	507	236	245	50	85	-	6
6	180	1615	526.20	0.62	0.44	519	232	245	51	85	-	6
5	190	1625	529.96	0.55	0.40	513	235	240	54	85	-	7
4	200	1635	533.78	0.57	0.41	509	231	238	54	84	-	7
3	210	1645	537.76	0.58	0.43	511	234	242	59	85	-	8
2	220	1655	541.64	0.59	0.43	518	230	232	61	84	-	9
1	230	1705	545.28	0.59	0.43	508	234	241	62	82	-	9
	240	1715 off	549.128									
TOTAL TIME			DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F					
Page Totals			100.000	0.8544	0.54	504	78					

475 - .754  
500 - .734  
510 - .726

\*

\* L.C. @ 15" = 0.005

Shoot Checked By: \_\_\_\_\_ Date \_\_\_\_\_

Used Flex Line

MULTI-METALS SAMPLE RECOVERY DATA



Plant: <u>APG Lime Co.</u>	Run No.: <u>MTA-15-I</u>
Date: <u>10/24/96</u>	Sample Box No.: <u>MTA-15-I</u> Job No.: <u>S-401</u>
Sample Location: <u>No 1 Kiln BAGHOUSE INLET</u>	
Sample Type: <u>METHOD 29</u>	
Sample Recovery Person: <u>MDM, CLR</u>	

Container	Description	Volume, ml	Sealed/Level Marked
<b>Front Half</b>			
1	Filter No.(s) <u>301639/301644</u>		<u>F1</u> ✓
2	Acetone Rinse		<u>A02</u> ✓
3	Nitric Rinse		<u>F#3</u> ✓

<b>Back Half</b>			
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter		<u>BH4</u> ✓
5A	Nitric Rinse - Impinger No. 4		<u>SA</u> ✓
5B	KMNO4/H2O Rinse - Impingers 5 & 6		<u>SB</u> ✓
5C	HCl Rinse - Impingers 5 & 6		<u>SC</u> ✓

<b>Moisture Data</b>					
Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	<u>MT</u>	0	728.8	785.5	56.7
2	<u>5% HNO3 / 10% H2O</u>	100	590.7	604.9	14.2
3	"	100	577.8	579.6	1.8
4	<u>MT</u>	0	489.4	489.8	0.4
5	<u>4% KMNO4 / 10% H2O</u>	100	595.6	<u>(595.3)</u>	-0.3
6	"	100	650.7	<u>651.2</u>	0.5
7	<u>Seal <del>MT</del></u>	-	907.9	<u>924.2</u>	16.3
<b>Total</b>					<u>89.6</u>

651.2

Comments:

Appendix B.1.2

Raw Field Data

Kiln No. 1 - Baghouse Outlet





## GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: APG Lime Date: 10-21-96  
 Sampling Location: Bargasse Outlet Clock Time: \_\_\_\_\_  
 Run #: Prelim. Operators: TA/DF  
 Barometric Pressure, in. Hg: 28.3 Static Pressure, in. H<sub>2</sub>O: -.68  
 Moisture, %: 4.6 Molecular wt., Dry: 29.96 Pitot Tube, Cp: .84  
 Stack Dimension, in. Diameter or Side 1: 72.25 Side 2: \_\_\_\_\_  
 Wet Bulb, °F: \_\_\_\_\_ Dry Bulb, °F: \_\_\_\_\_

	Traverse Point Number	Velocity Head in. H <sub>2</sub> O	Stack Temp. °F
A	1	.71	409
	2	.70	410
	3	.67	410
	4	.62	410
	5	.40	403
B	1	.65	410
	2	.65	412
	3	.63	407
	4	.56	408
	5	.33	395
C	1	.66	410
	2	.64	410
	3	.62	410
	4	.56	410
	5	.39	404
D	1	.68	410
	2	.70	408
	3	.65	410
	4	.54	408
	5	.34	398
		$\overline{\Delta P} = 0.7602$	$\overline{T_s} = 408$

$\Delta P = 0.585$

Mat. DN = 255  
 Org. DN = 250 (49, 52)

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

$$M_d = (0.44 \times \frac{9}{100}) + (0.32 \times \frac{13}{100}) + (0.28 \times \frac{77}{100})$$

$$M_d = 29.96$$

$$M_s = M_d \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$$

$$M_s = (29.96) \times (1 - \frac{4.6}{100}) + 18 (\frac{4.6}{100})$$

$$M_s = 29.41$$

$$\overline{T_s} = \text{°F} = 867.6 \text{ °R} (\text{°F} + 460)$$

$$P_s = P_b + \frac{S.P.}{13.6} = (28.3) + \frac{-.68}{13.6}$$

$$P_s = 28.25 \text{ in. Hg}$$

$$\overline{\Delta P} = 0.7602$$

$$V_s = 85.49 \times C_p \times \sqrt{\overline{\Delta P}} \times \sqrt{\frac{T_s (\text{°R})}{P_s \times M_s}}$$

$$V_s = 85.49 \times (0.84) \times (0.7602) \times \sqrt{\frac{867.6}{28.25 \times 29.41}}$$

$$V_s = 55.79 \text{ ft/s}$$

$$A_s = 28.47 \text{ ft}^2$$

$$Q_s = V_s \times A_s \times 60 \text{ s/m}$$

$$Q_s = 55.79 \times 28.47 \times 60$$

$$Q_s = 95,301 \text{ acfm}$$

$$Q_{s, \text{std}} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times (1 - \frac{\%H_2O}{100})$$

$$Q_{s, \text{std}} = 95,301 \times 17.647 \times \frac{28.25}{867.6} \times (1 - \frac{4.6}{100})$$

$$Q_{s, \text{std}} = 52,241 \text{ dscfm}$$

DN = 0.265





### SAMPLE RECOVERY DATA

Plant: ARC Lime Company Run No.: MA - 1000

Date: 10/21/96 Sample Box No.: \_\_\_\_\_ Job No.: 5-401

Sample Location: Nel KILN BAGHOUSE INLET

Sample Type: PRELIMINARY MOISTURE Filter No.: \_\_\_\_\_

Sample Recovery Person: MDM

Comments: \_\_\_\_\_

#### FRONT HALF

Acetone Liquid  
Container No.: \_\_\_\_\_ Level Marked: \_\_\_\_\_ Sealed: \_\_\_\_\_

Filter  
Container No.: \_\_\_\_\_ Sealed: \_\_\_\_\_

Description of Filter: \_\_\_\_\_

Samples Stored and Locked: \_\_\_\_\_

#### BACK HALF/MOISTURE

Container No.: \_\_\_\_\_

Liquid Level Marked: \_\_\_\_\_ Sealed: \_\_\_\_\_

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	MIT SS to Cond.		1989.6	2009.5	
2	Ki Gel Impinger.		836.8	845.2	
3					
4					
5					
6					
TOTAL					

Description of Impinger Catch: \_\_\_\_\_  
\_\_\_\_\_

GAS ANALYSIS DATA FORM

PLANT APG LIME  
 DATE 10-22-96 TEST NO. 3-6-0  
 SAMPLING TIME (24-hr CLOCK) 1130-1753  
 SAMPLING LOCATION KILN NO. 1 BH OUTLET  
 SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) INTEGRATED BAG  
 ANALYTICAL METHOD ORSAT  
 AMBIENT TEMPERATURE 70°F  
 OPERATOR Meador

COMMENTS:

RUN GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M <sub>d</sub>
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO <sub>2</sub>	8.5	8.5	8.5	8.5	8.6	8.6	8.5	44/100	3.740
O <sub>2</sub> (NET IS ACTUAL O <sub>2</sub> READING MINUS ACTUAL CO <sub>2</sub> READING)	23.4	14.9	23.4	14.9	23.4	14.8	14.9	32/100	4.768
CO (NET IS ACTUAL CO READING MINUS ACTUAL O <sub>2</sub> READING)		-		-		-	-	28/100	0
N <sub>2</sub> (NET IS 100 MINUS ACTUAL CO READING)		76.6		76.6		76.6	76.6	28/100	21.448
<b>TOTAL</b>									<b>29.956</b>

$\Delta H = K \Delta P$  2.57

$\Delta H_{check} = 185$  Mark

$K = 1.551$   
 $K = 3.815$   
 $0.73$   
 $0.72$

# FIELD DATA SHEET

Plant: APG Lima Company  
 Sampling Location: Baghouse Outlet  
 Run Number: M23-60 ~~M23-13~~ Date: 10-22-96  
 Pretest Leak Rate: 0.003 cfm @ 15 in. Hg.  
 Pretest Leak Check: Pitot:  Orsat:

Sample Type: M-23 Operator: mm/BF  
 Pbar: 28.38 Ps: -5.0  
 CO2: 11 O2: 13  
 Probe Length/Type: 4' Glass Pitot #: RTP  
 Stack Diameter: 72, 25 As:

Nozzle ID: .250 Thermocouple #: RTP  
 Assumed Bws: .05 Filter #: NA  
 Meter Box #: 14 Y: 1.003  $\Delta H$ @: 1.765  
 Post-Test Leak Rate: .006 cfm @ 11 in. Hg.  
 Post-Test Leak Check: Pitot:  Orsat:

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft <sup>3</sup>	Velocity Head ( $\Delta P$ ) in H <sub>2</sub> O	Orifice Pressure Differential ( $\Delta H$ ) in H <sub>2</sub> O		Stack Temp. (T <sub>s</sub> )	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (T <sub>m in</sub> °F)	Outlet (T <sub>m out</sub> °F)	
0	0	1130	618.140										
1	12	1142	-	0.68	2.6	2.0 <sup>70</sup>	409	249	255	58	71	67	5
2	24	1154	635.1	0.67	2.5	2.0 <sup>70</sup>	410	249	254	58	71	67	6
3	36	1206	640.8 (642.0)	0.65	1.7	1.7	410	246	253	60	74	68	6
4	48	1218	649.8	0.54	1.32	1.32	405	248	253	62	77	70	10
5	60	1230	656.435	0.32	0.80	0.80	361	250	255	69	81	73	9
		1340 - <del>1342</del>											
B 1	72	1342	664.8	0.65	1.7	1.7	412	241	254	65	82	80	8.5
B 2	84	1354	673.1	0.65	1.7	1.7	411	249	255	57	87	82	9.5
B 3	96	1416	682.3	0.65	1.7	1.7	410	248	255	67	91	83	10
B 4	108	1428	690.8	0.55	1.38	1.38	408	247	256	64	93	85	10
B 5	120	1448	696.255	0.23	0.58	0.58	273	247	258	65	95	87	9
		Sample 1520											
C 1	132	1538	705.3	.71	1.7	1.7	415	255	249	60	93	91	10
C 2	144	1556	714.0	0.65	1.7	1.7	416	252	257	65	98	92	10
C 3	156	1602	722.6	0.60	1.5	1.5	413	250	255	70	100	93	6
C 4	168	1614	731.0	0.55	1.38	1.38	408	251	254	72	101	94	9
C 5	180	1628	738.83	0.42	1.05	1.05	400	252	257	74	101	94	8
		1641											
D 1	192	1653	746.9	0.66	1.65	1.65	414	249	253	71	95	94	8
D 2	204	1715	755.6	0.65	1.7	1.7	412	249	253	73	100	95	9
D 3	216	1729	764.0	0.56	1.4	1.4	410	249	258	73	99	94	9
D 4	228	1741	772.4	0.50	1.3	1.3	406	250	259	78	102	95	9
D 5	240	1753	779.115	0.36	0.90	0.90	396	247	255	81	102	95	9

Leak check  
 46.253  
 46.400

0.202 @ 10" h.  
 2e  
 3e  
 4e  
 104

XAD Temp

$\Delta V_m = 1600 \times 636 \times \sqrt{\Delta P} = 74385$   $\Delta H = 1.984 \times 46$   $T_s = 255$   
 $\Delta H = 1.984 \times 46$   $T_s = 255$   
 $T_m = 88$   $57.9$   $35.35$   $767 = 10.2$

yellow Ductlet  
23-6-0

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA



Plant: <i>ABG Lima</i>						Run No.: <i>23-6-0 Ductlet</i>	
Sample Date: <i>10-22-96</i>			Filter No.(s): <i>NA</i>			Job No.: <i>5401</i>	
Sample Location: <i>Ruby No. 1 Ductlet Baghouse</i>							
Recovery Date: <i>10-22-96</i>			XAD-2 Trap No.(s): <i>23-6-<del>0</del></i>				
Sample Recovery Person: <i>CEA</i>							
<b>Moisture Data</b>							
Impingers	XAD - 2 Trap	1 (knockout)	2 (100 ml H2O) (untipped)	3 (100 ml H2O) (tipped)	4 (knockout) (untipped)	892.9 Silica gel (untipped)	
Final wt.	<i>312.7</i>	<i>563.0</i>	<i>583.2</i>	<i>574.4</i>	<i>482.2</i>	<i>862.7</i>	g
Initial wt.	<i>308.5</i>	<i>482.8</i>	<i>585.3</i>	<i>574.8</i>	<i>480.3</i>	<i>862.3</i>	g
Net wt.	<i>4.2</i>	<i>80.2</i>	<i>-2.1</i>	<i>-0.4</i>	<i>1.9</i>	<i>30.6</i>	g
<b>Description</b>						<i>114.4</i>	
Train System: <i>M-23</i>							
Probe: <i>4 ft glass</i>							
Filter: Color - <i>light grey</i> Loading - <i>med tight</i>							
Impinger Contents: <i>clean</i>							
Silica Gel: @Grams Used - <i>400</i> Color - <i>good</i> % Spent - <i>70</i>							
Condensate Observed In Front Half: <i>no</i>							
<b>Recovered Sample Fractions</b>							
Filter Container No. <i>23-6-0</i>						marked/sealed: <input checked="" type="checkbox"/>	
XAD Module Container No.: <i>23-6-0</i>						marked/sealed: <input checked="" type="checkbox"/>	
Probe (FH) & Back Half Rinse (Acetone) Container No.: <i>23-6-0</i>						Liquid level marked/sealed: <input checked="" type="checkbox"/>	
Probe (FH) & Back Half Rinse (Toluene) Container No.: <i>23-6-0</i>						Liquid level marked/sealed: <input checked="" type="checkbox"/>	
Impinger Contents Container No.:						Liquid level marked/sealed: <input checked="" type="checkbox"/>	
Impinger Rinse (Acetone/MeCl2) Container No.:						Liquid level marked/sealed: <input checked="" type="checkbox"/>	

FH fraction - FH/BH acetone, toluene rinsing & filter  
XAD fraction - XAD trap

**GAS ANALYSIS DATA FORM**

PLANT APG LIME  
 DATE 10-23-96 TEST NO. 3-70  
 SAMPLING TIME (24-hr CLOCK) 1040-1544  
 SAMPLING LOCATION KILN NO. 1 BIT OUTLET  
 SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) INTEGRATED BAG  
 ANALYTICAL METHOD ORSAT  
 AMBIENT TEMPERATURE 70°F  
 OPERATOR [Signature]

COMMENTS:

RUN GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M <sub>d</sub>
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO <sub>2</sub>	9.6	9.6	9.5	9.5	9.6	9.6	9.6	44/100	4.224
O <sub>2</sub> (NET IS ACTUAL O <sub>2</sub> READING MINUS ACTUAL CO <sub>2</sub> READING)	23.8	14.2	23.8	14.3	23.8	14.2	14.2	32/100	4.544
CO (NET IS ACTUAL CO READING MINUS ACTUAL O <sub>2</sub> READING)		—		—		—	—	28/100	0
N <sub>2</sub> (NET IS 100 MINUS ACTUAL CO READING)		76.2		76.2		76.2	76.2	28/100	21.336
<b>TOTAL</b>									<b>30.104</b>

$$\Delta H = K \Delta P$$

$$\Delta H_{tot} = 1.85$$

$$\Delta P_r = 0.675$$

# FIELD DATA SHEET

No. 0.675 K = 2.74

Plant: APG Lime Company Sample Type: M-23 Operator: MM/BF Nozzle ID: .254 Thermocouple #: 4C  
 Sampling Location: Baghouse Outlet (No. 11, 12) Pbar: 28.17 Ps: -0.43 Assumed Bws: .05 Filter #: N/A  
 Run Number: 123-7-0 Date: 10-22-96 CO2: 11 O2: 20 12 Meter Box #: 14 Y: 1.003  $\Delta H@$ : 1.765  
 Pretest Leak Rate: 0.006 cfm @ 15 in. Hg. Probe Length/Type: 4' Glass Pitot #: 4C Post-Test Leak Rate: 0.004 cfm @ 10 in. Hg.  
 Pretest Leak Check: Pitot:  Orsat:  Stack Diameter: 48" As: \_\_\_\_\_ Post-Test Leak Check: Pitot: \_\_\_\_\_ Orsat: \_\_\_\_\_

OK FOR PULTRANGE  
PIT @ 1152

OK FOR PULTRANGE  
PIT @ 1330

START @ 43

2-572  
C.A.W.S.

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Nm) ft <sup>3</sup>	Velocity Head ( $\Delta p$ ) in H <sub>2</sub> O	Orifice Pressure Differential ( $\Delta H$ ) in H <sub>2</sub> O		Stack Temp. (T <sub>s</sub> )	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (T <sub>m in</sub> °F)	Outlet (T <sub>m out</sub> °F)	
0	0	1040	779.533										
1	12	1052	787.8	0.70	1.93	1.93	403	246	252	54	69	68	9
2	24	1104	796.9	0.62	1.71	1.71	408	249	256	55	77	70	9
3	36	1116	806.1	0.64	1.76	1.76	408	250	254	54	81	73	9
4	48	1128	814.4	0.49	1.35	1.35	403	251	254	52	84	75	9
5	60	1140	821.6	0.35	0.96	0.96	371	251	255	57	86	77	6
1	72	1204	830.4	0.70	1.93	1.93	408	232	252	62	82	78	10
2	84	1216	840.2	0.75	2.06	2.06	407	238	250	66	86	79	10
3	96	1230	848.7	0.55	1.51	1.51	402	246	254	66	87	80	10
4	108	1242	857.2	0.55	1.51	1.51	385	241	255	66	88	80	9
5	120	1252	865.255	0.46	1.27	1.27	384	241	250	67	88	80	9
			865.468	0.722	1.999	1.999	367				87.8	76	
1	132	1342	874.8	0.68	1.87	1.87	410	248	252	50	81	80	10
2	144	1354	884.2	0.65	1.79	1.79	409	247	254	51	87	81	16
3	156	1406	893.0	0.58	1.60	1.60	407	247	253	50	89	82	9
4	168	1418	901.5	0.51	1.40	1.40	403	251	257	54	91	83	9
5	180	1430	909.757	0.42	1.16	1.16	396	250	253	58	92	84	8.5
1	192	1455	918.7	0.68	1.87	1.87	409	229	256	59	87	84	16
2	204	1507	927.6	0.64	1.76	1.76	410	244	254	60	92	85	10
3	216	1519	936.6	0.54	1.49	1.49	408	247	253	57	92	86	16
4	228	1531	944.1	0.42	1.16	1.16	402	250	256	57	92	85	7
5	240	1544	951.480	0.38	1.05	1.05	391	246	253	66	93	86	7

$\Delta V_m =$  \_\_\_\_\_  $\sqrt{\Delta P} =$  0.7479  $\Delta H =$  1.56  $T_s =$  401  $T_m =$  83

yellow outlet

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA



Plant: <i>APG Lima</i>	Run No.: <i>23-7-0</i>	
Sample Date: <i>10-23-96</i>	Filter No.(s): <i>NA</i>	Job No.: <i>5401</i>
Sample Location: <i>Kils No.1 Baghouse Outlet</i>		
Recovery Date: <i>10-23-96</i>	XAD-2 Trap No.(s): <i>23-7-0</i>	
Sample Recovery Person: <i>C E Oels</i>		

Moisture Data

Impingers	XAD - 2 Trap	1 (knockout)	2 (100 ml H2O) (untipped)	3 (100 ml H2O) (tipped)	4 (knockout) (untipped)	Silica gel (untipped)	
Final wt.	<i>300.0</i>	<i>559.5</i>	<i>579.4</i>	<i>576.1</i>	<i>494.8</i>	<i>920.2</i>	<i>g</i>
Initial wt.	<i>295.9</i>	<i>482.1</i>	<i>583.4</i>	<i>574.6</i>	<i>482.3</i>	<i>886.0</i>	<i>g</i>
Net wt.	<i>4.1</i>	<i>77.4</i>	<i>-4.0</i>	<i>1.5</i>	<i>2.5</i>	<i>34.2</i>	<i>g</i>

Description

*115.7*

Train System: <i>M-23</i>
Probe: <i>4ft glass</i>
Filter: Color - <i>light grey</i> Loading - <i>light</i>
Impinger Contents: <i>Red</i>
Silica Gel: @Grams Used - <i>4.00</i> Color - <i>good</i> % Spent - <i>65</i>
Condensate Observed In Front Half: <i>no</i>

Recovered Sample Fractions

Filter Container No.	marked/sealed: <input checked="" type="checkbox"/>
XAD Module Container No.:	marked/sealed: <input checked="" type="checkbox"/>
Probe (FH) & Back Half Rinse (Acetone) Container No.:	Liquid level marked/sealed: <input checked="" type="checkbox"/>
Probe (FH) & Back Half Rinse (Toluene) Container No.:	Liquid level marked/sealed: <input checked="" type="checkbox"/>
Impinger Contents Container No.:	Liquid level marked/sealed: <input type="checkbox"/>
Impinger Rinse (Acetone/MeCl2) Container No.:	Liquid level marked/sealed: <input type="checkbox"/>

*FH fraction - FH/BH acetone, toluene rinsing, & filter*  
*XAD fraction - XAD trap*

**GAS ANALYSIS DATA FORM**

PLANT APG LIME  
 DATE 10-24-96 TEST NO. 3-8-0  
 SAMPLING TIME (24-hr CLOCK) 1122-1731  
 SAMPLING LOCATION KILN No.1 BIT OUTLET  
 SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) INTEGRATED BAG  
 ANALYTICAL METHOD ORSAT  
 AMBIENT TEMPERATURE 70°F  
 OPERATOR *J. Meador*

COMMENTS:

RUN GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M <sub>d</sub>
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO <sub>2</sub>	8.7	8.7	8.8	8.8	8.8	8.8	8.8	44/100	3.872
O <sub>2</sub> (NET IS ACTUAL O <sub>2</sub> READING MINUS ACTUAL CO <sub>2</sub> READING)	23.4	14.7	23.6	14.8	23.5	14.7	14.7	32/100	4.704
CO (NET IS ACTUAL CO READING MINUS ACTUAL O <sub>2</sub> READING)		-		-		-	-	28/100	0
N <sub>2</sub> (NET IS 100 MINUS ACTUAL CO READING)		76.6		76.4		76.5	76.5	28/100	21.420
<b>TOTAL</b>									<b>29.996</b>

# FIELD DATA SHEET

K = 1.4

Plant: APG Lime Co Sample Type: M23 Operator: MDM  
 Sampling Location: Nul. Ken Baghouse Street Pbar: 28.30 Ps: -0.45  
 Run Number: M23-8-0 Date: 10/24/96 CO2: 11 O2: 12  
 Pretest Leak Rate: 0.005 cfm @ 5 in. Hg. Probe Length/Type: 4' Glass Pitot #: 44  
 Pretest Leak Check: Pitot:  Orsat:  Stack Diameter: 48" As: \_\_\_\_\_

Nozzle ID: 0.254 Thermocouple #: AL  
 Assumed Bws: 3.5 Filter #: N/A  
 Meter Box #: MB-14 Y: 1.003 ΔH@: 1.765  
 Post-Test Leak Rate: 0.001 cfm @ 11 in. Hg.  
 Post-Test Leak Check: Pitot: \_\_\_\_\_ Orsat: \_\_\_\_\_

top @ 1222  
at p.c.  
start 1237

top for pull  
change @ 1337  
start @ 1515

last out @ 1631

(X) (H)  
Temp.  
4F

33  
35  
37  
36  
Int. 9.1.10

30  
37  
40  
40  
40

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Nm) ft <sup>3</sup>	Velocity Head (Δp) in H <sub>2</sub> O	Orifice Pressure Differential (ΔH) in H <sub>2</sub> O		Stack Temp (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
0	0	1122	951.922										
1	12	1134	961.0	0.76	2.05	2.05	414	249	254	35	65	64	8.9
2	24	1146	970.5	0.78	2.11	2.11	412	248	254	30	73	65	9
3	36	1158	980.2	0.78	2.11	2.11	413	253	254	41	77	67	8.5
4	48	1210	988.9	0.57	1.5	1.5	407	249	254	49	79	69	8
5	60	1222	997.24	0.54	1.46	1.46	395	247	250	38	80	71	7
1	72	1244	1006.5	0.78	2.11	2.11	416	255	244	53	78	72	7
2	84	1301	1016.4	0.80	2.16	2.16	415	248	256	44	83	75	9
3	96	1313	1026.2	0.75	2.0	2.0	414	250	256	47	85	76	9
4	108	1325	1036.1	0.65	1.76	1.76	411	231	257	48	87	77	9
5	120	1337	1044.860	0.55	1.49	1.49	411	247	254	48	89	79	9
			1045.020										8
1	132	1527	1054.6	0.74	2.13	2.13	405	248	254	60	78	77	10
2	144	1539	1064.1	0.72	1.94	1.94	415	247	257	61	83	78	9
3	156	1551	1073.1	0.62	1.67	1.67	411	247	255	62	87	79	9
4	168	1603	1081.7	0.84	1.46	1.46	408	252	255	67	90	81	8
5	180	1615	1090.126	0.85	1.49	1.49	407	247	257	66	91	82	7
1	192	1643	1099.6	0.78	2.11	2.11	414	245	253	73	86	83	8.5
2	204	1655	1108.7	0.78	2.11	2.11	414	245	253	73	86	83	8.5
3	216	1707	1118.0	0.66	1.78	1.78	412	247	251	65	93	84	8.5
4	228	1719	1126.5	0.50	1.35	1.35	409	247	252	63	92	85	7
5	240	1731	1133.880	0.44	1.19	1.19	393	254	256	63	92	85	6
											85.8	76.5	

2.780  
59 ml  
 $\Delta V_m = 181.966$      $\sqrt{\Delta p} = 0.810$      $\Delta H = 1.782$      $T_s = 409.6$      $T_m = 540.3$   
 0.030    0.832    1.875    410.8    79.0    71.5

yellow outlet

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA



Plant: <i>APG Linn</i>	Run No.: <i>23-8-0</i>
Sample Date: <i>10-24-96</i>	Filter No.(s): <i>NA</i>
Job No.: <i>S401</i>	
Sample Location: <i>Kiln No.1 Baghouse Outlet</i>	
Recovery Date: <i>10-24-96</i>	XAD-2 Trap No.(s): <i>23-8-0</i>
Sample Recovery Person: <i>CEA</i>	

Moisture Data

Impingers	XAD - 2 Trap	1 (knockout)	2 (100 ml H2O) (untipped)	3 (100 ml H2O) (tipped)	4 (knockout) (untipped)	Silica gel (untipped)	
Final wt.	<i>319.6</i>	<i>577.1</i>	<i>576.0</i>	<i>576.6</i>	<i>487.7</i>	<i>898.8</i>	<i>g</i>
Initial wt.	<i>312.7</i>	<i>474.7</i>	<i>579.4</i>	<i>576.1</i>	<i>484.8</i>	<i>864.5</i>	<i>g</i>
Net wt.	<i>6.9</i>	<i>102.4</i>	<i>-3.4</i>	<i>0.5</i>	<i>3.9</i>	<i>34.3</i>	<i>g</i>

Description:

Train System: <i>M-20</i>	<i>144.6</i>
Probe: <i>4 ft glass</i>	<i>143.6</i>
Filter: Color - <i>light gray</i>	Loading - <i>light</i>
Impinger Contents: <i>clean</i>	
Silica Gel: @Grams Used - <i>450</i>	Color - <i>good</i> % Spent = <i>75</i>
Condensate Observed In Front Half: <i>no</i>	

Recovered Sample Fractions

Filter Container No.	marked/sealed: <input checked="" type="checkbox"/>
XAD Module Container No.:	marked/sealed: <input checked="" type="checkbox"/>
Probe (FH) & Back Half Rinse (Acetone) Container No.:	Liquid level marked/sealed: <input checked="" type="checkbox"/>
Probe (FH) & Back Half Rinse (Toluene) Container No.:	Liquid level marked/sealed: <input checked="" type="checkbox"/>
Impinger Contents Container No.:	Liquid level marked/sealed: <input type="checkbox"/>
Impinger Rinse (Acetone/MeCl2) Container No.:	Liquid level marked/sealed: <input type="checkbox"/>

*FH fractions - FH/BH acetone, toluene rinsings + filter*  
*XAD fractions - XAD trap*

2.24

# FIELD DATA SHEET

K = 3.831

Plant: APB Lime Company  
 Sampling Location: Baghouse Outlet  
 Run Number: A 29-13-0 Date: 10-22-96  
 Pretest Leak Rate: .012 cfm @ 16 in. Hg.  
 Pretest Leak Check: Pitot:  Orsat: NA

Sample Type: m-29 Operator: JA/BF  
 Pbar: 28.38 Ps: -.40  
 CO2: 11 O2: 13  
 Probe Length/Type: 4' Glass Pitot #: 4C  
 Stack Diameter: 72.25 As: \_\_\_\_\_

Nozzle ID: .255 Thermocouple #: 4C  
 Assumed Bws: .05 Filter #: 301654  
 Meter Box #: 13 Y: .985 ΔH@: 1.656  
 Post-Test Leak Rate: .004 cfm @ 9 in. Hg.  
 Post-Test Leak Check: Pitot: \_\_\_\_\_ Orsat: NA

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft <sup>3</sup>	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
B 0	0	1130	458.020										
1	12	1142	467.2	.69	1.6	1.6	412	240	248	62	70	69	7
2	24	1154	475.7	.66	1.5	1.5	411	240	252	51	78	70	7
3	36	1200	484.2	.59	1.4	1.4	412	253	245	35	82	72	7
4	48	1218	492.5	.55	1.3	1.3	412	259	240	37	85	74	7
5	60	1730	500.417	.45	1.1	1.1	405	245	260	58	88	77	7
			42.397										
C 1	72	1352	509.3	.69	1.6	1.6	416	264	246	52	84	84	7
2	84	1405	518.5	.68	1.6	1.6	413	264	250	47	87	84	7
3	96	1416	527.6	.64	1.5	1.5	413	266	246	48	93	84	7
4	108	1429	535.1	.57	1.4	1.4	410	259	443	49	95	86	6
5	120	1441	543.523	.42	1.0	1.0	401	256	245	50	96	87	5
				20035									
D 1	132	1538	552.9	.71	1.7	1.7	419	290	244	66	93	92	7
2	144	1550	562.4	.71	1.7	1.7	417	261	244	50	99	93	7
3	156	1602	571.4	.64	1.5	1.5	415	260	243	48	102	93	6
4	168	1615	580.4	.55	1.3	1.3	410	254	241	58	103	94	7
5	180	1627	587.729	.37	1.1	1.1	403	254	244	53	103	94	5
		1641	587.907										
A 1	192	1653	597.2	0.70	21.7	21.7	419	256	240	52	99	95	7
2	204	1702	606.1	0.65	1.5	1.5	416	261	249	48	104	96	7
3	216	1725	614.0	.57	1.4	1.4	410	260	242	50	102	95	6
4	228	1737	624.2	0.50	1.5	1.3	410	259	250	53	103	96	7
5	240	1749	631.763	.53	1.0	1.0	390	255	250	55	104	96	5

$\Delta V_m = 173.579$   $\sqrt{\Delta P} = .74955$   $\Delta H = 1.43$   $T_s = 411$

$T_m = 97$

%I = 101.1

leak check  
543 523  
-913, 644

cc. o.w.3  
@ 10" Hg.

410.46  
76.5

47  
85.5

MULTI-METALS SAMPLE RECOVERY DATA #14



Plant: APG Lime Company Run No.: 29-13-0  
 Date: 10/22/96 Sample Box No.: 29-13-0 Job No.: S-401  
 Sample Location: No. 1 CKX Outlet  
 Sample Type: Method 29  
 Sample Recovery Person: MDM, CLR

Container	Description	Volume, ml	Sealed/Level Marked
<b>Front Half</b>			
1	Filter No.(s) <u>301659</u>		<u>F1</u> ✓
2	Acetone Rinse		<u>AR2</u> ✓
3	Nitric Rinse		<u>F#3</u> ✓
<b>Back Half</b>			
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter		<u>B#4</u> ✓
5A	Nitric Rinse - Impinger No. 4		<u>SA</u> ✓
5B	KMNO4/H2O Rinse - Impingers 5 & 6		<u>SB</u> ✓
5C	HCl Rinse - Impingers 5 & 6		<u>SC</u> ✓

<b>Moisture Data</b>					
Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	MT	0	744.2	806.8	62.6
2	5% HNO <sub>3</sub> / 10% H <sub>2</sub> O	100	678.6	709.3	30.7
3	"	100	635.5	640.0	4.5
4	MT	0	559.6	560.4	0.8
5	4% KMnO <sub>4</sub> / 10% H <sub>2</sub> SO <sub>4</sub>	100	644.5	<u>643.5</u>	<del>0.5</del> 1.0
6	"	100	653.8	654.0	0.2
7	Si gel.	-	846.6	872.5	25.9
					123.7
Total					<del>124.2</del>

Comments: Nozzle lost at stack port outlet

# FIELD DATA SHEET

$K = 3.567$   
~~3.16~~

Plant: APG Lime Company  
 Sampling Location: Baghouse Outlet  
 Run Number: m-29-14-0 Date: 10-22-96  
 Pretest Leak Rate: .008 cfm @ 15 in. Hg.  
 Pretest Leak Check: Pitot: ✓ Orsat: N/A

Sample Type: m-29 Operator: JA/BF  
 Pbar: 20.17 Ps: -43  
 CO2: 11 O2: 12  
 Probe Length/Type: 4' Glass Pitot #: RTP  
 Stack Diameter: 12.25 As: \_\_\_\_\_

Nozzle ID: .250 Thermocouple #: RTP  
 Assumed Bws: .035 Filter #: 301648  
 Meter Box #: 13 Y: .985 ΔH@: 1.656  
 Post-Test Leak Rate: .004 cfm @ 7 in. Hg.  
 Post-Test Leak Check: Pitot: \_\_\_\_\_ Orsat: ND

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft <sup>3</sup>	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
0	0	1041	632.242										
1	12	1052	641.9	.65	<del>2.016</del>	<del>2.016</del>	410	230	237	63	72	71	3
2	24	1105	✓	.58	<del>2.814</del>	<del>1.814</del>	409	254	244	49	79	70	4
3	36	1116	661.1	.55	1.7	1.7	407	258	242	46	83	73	3
4	48	1229	668.2	.46	1.1	1.1	402	238	242	49	86	76	2
5	60	1131	676.1	.36	0.88	0.88	398	250	240	49	86	77	3
		1152	682.8	.75	1.8	1.8	410	239	241	52	81	79	4
1	72	1204	684.8	.75	1.8	1.8	410	239	241	52	81	79	4
2	84	1216	692.2	0.66	1.6	1.6	407	257	241	46	87	80	3
3	96	1228	702.1	0.63	1.5	1.5	407	250	242	47	88	80	3
4	108	1240	710.4	0.55	1.4	1.4	403	241	243	48	88	80	3
5	120	1252	718.667	0.50	1.2	1.2	396	251	249	48	88	82	2
		1327	718.894	.72	1.8	1.8	413	250	256	52	82	82	3
1	132	1342	728.6	.72	1.8	1.8	413	250	256	52	82	82	3
2	144	1354	738.3	.69	1.7	1.7	413	250	251	49	90	82	3
3	156	1406	747.7	.65	1.6	1.6	410	240	250	52	92	82	3
4	168	1418	756.7	.58	1.4	1.4	403	240	246	52	92	84	3
5	180	1430	764.658	.48	1.2	1.2	393	241	247	52	94	84	2
				.70	1.7	1.7	413	239	245	53	88	86	3
1	192	1454	774.3	.70	1.7	1.7	413	241	250	52	90	87	3
2	204	1505	783.6	.70	1.7	1.7	413	241	250	52	90	87	3
3	216	1518	792.9	.65	1.6	1.6	413	268	248	52	95	87	3
4	228	1530	801.8	.55	1.4	1.4	408	254	246	51	95	87	3
5	240	1542	809.865	.46	1.1	1.1	392	254	248	53	95	88	3

c. o. w. z @ 11"

$\Delta V_m = 177.396$   $\sqrt{\Delta P} = .7808$   $\Delta H = 1.51$   $T_s = 408$

$T_m = 89$

%I @ 35% ΔH = 102.8

MULTI-METALS SAMPLE RECOVERY DATA



Plant: <i>MCG Lime Co.</i>	Run No.: <i>M29-14-0</i>
Date: <i>10/23/96</i>	Sample Box No.: <i>29-14-0</i> Job No.: <i>S-401</i>
Sample Location: <i>12110 No. 1 BROTHOUSE OUTLET</i>	
Sample Type: <i>M29 multi-metals</i>	
Sample Recovery Person: <i>m. maret</i>	

Container	Description	Volume, ml	Sealed/Level Marked
<b>Front Half</b>			
1	Filter No.(s) <i>301648</i>		<i>F1</i> ✓
2	Acetone Rinse		<i>AB2</i> ✓
3	Nitric Rinse		<i>F#3</i> ✓
<b>Back Half</b>			
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter		<i>BH4</i> ✓
5A	Nitric Rinse - Impinger No. 4		<i>SA</i> ✓
5B	KMNO <sub>4</sub> /H <sub>2</sub> O Rinse - Impingers 5 & 6		<i>SB</i> ✓
5C	HCl Rinse - Impingers 5 & 6		<i>SC</i> ✓

**Moisture Data**

Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	<i>MT</i>	0	742.9	800.7	57.8
2	<i>5% HNO<sub>3</sub> / 10% H<sub>2</sub>O</i>	100	678.3	708.6	30.3
3	"	100	630.7	635.7	5.0
4	<i>MT</i>	0	558.9	560.5	1.6
5	<i>4% KMnO<sub>4</sub> / 10% H<sub>2</sub>O</i>	100	653.7	653.7	0
6	"	100	645.9	646.1	0.2
7	<i>Seal</i>	-	845.6	872.6	27.0
Total					<i>121.9</i>

Comments:

# FIELD DATA SHEET

Plant: APC Lime  
 Sampling Location: Byphase Outlet  
 Run Number: M-29-15-0 Date: 10-23-96  
 Pretest Leak Rate: 1003 cfm @ 15 in. Hg.  
 Pretest Leak Check: Pitot:  Orsat: NA

Sample Type: M-29 Operator: TA/BF  
 Pbar: 28.30 Ps: - .45  
 CO2: 11 O2: 12  
 Probe Length/Type: 4 Gases Pitot #: RTP  
 Stack Diameter: 72.25 As: \_\_\_\_\_

Nozzle ID: .250 Thermocouple #: RTP  
 Assumed Bws: .035 Filter #: 301624  
 Meter Box #: 13 Y: .985  $\Delta H@$ : 1.656  
 Post-Test Leak Rate: 0.001 cfm @ 10 in. Hg.  
 Post-Test Leak Check: Pitot: \_\_\_\_\_ Orsat: NA

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft <sup>3</sup>	Velocity Head ( $\Delta p$ ) in H <sub>2</sub> O	Orifice Pressure Differential ( $\Delta h$ ) in H <sub>2</sub> O		Stack Temp (T <sub>s</sub> )	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (T <sub>m in</sub> °F)	Outlet (T <sub>m out</sub> °F)	
0	0	1121	811.188										
1	12	1133	820.7	.72	1.8	1.8	414	250	250	60	62	61	3
2	24	1145	830.1	.70	1.7	1.7	414	260	253	48	72	65	4
3	36	1157	838.8	.61	1.5	1.5	415	257	253	49	77	66	2
4	48	1209	847.8	.58	1.4	1.4	415	253	254	50	80	69	2
5	60	1222	855.3	.52	1.2	1.2	399	251	249	50	81	71	2
1	72	1247	865.2	.72	1.8	1.8	416	252	246	60	75	73	3
2	84	1301	875.0	.75	1.8	1.8	417	259	254	52	84	75	3
3	96	1313	884.5	.72	1.7	1.7	417	255	254	51	86	77	3
4	108	1325	893.5	.63	1.5	1.5	414	255	250	50	88	78	4
5	120	1337	902.150	.56	1.4	1.4	411	250	254	51	90	80	3
1	132	1327	912.6	.78	1.9	1.9	411	258	255	62	78	78	4
2	144	1539	923.1	.80	1.9	1.9	419	258	254	52	85	78	4
3	156	1551	939.0	0.69	1.8	1.8	415	247	252	52	85	78	4
4	169	1603	942.5	.61	1.6	1.6	411	250	253	54	95	83	4
5	180	1615	950.850	.51	1.3	1.3	410	251	254	52	96	84	2
1	192	1643	961.2	.75	1.9	1.9	419	250	250	60	87	85	4
2	204	1655	971.3	0.70	1.7	1.7	418	255	250	54	95	86	4
3	216	1706	981.4	.62	1.6	1.6	417	256	258	56	96	86	4
4	228	1718	990.4	.52	1.4	1.4	410	256	253	52	96	86	3
5	240	1731	998.019	.45	1.2	1.2	401	259	253	56	95	86	2

$\Delta V_m = 186.489$   $\sqrt{\Delta p} = .7821$

$\Delta H = 1.58$   $T_s = 2113$   
873°R

$T_m = 89$   
549°R

# FOX PAULT  
MFE @ 1337  
WS @ 13

88 m/s

MULTI-METALS SAMPLE RECOVERY DATA

29-15-0  
PACIFIC ENVIRONMENTAL SERVICES, INC.

Plant: APG, Lone Co Run No.: M29-150  
 Date: 10/24/96 Sample Box No.: M29-150 Job No.: S-441  
 Sample Location: M61 1/2 in BAGHOUSE Outlet  
 Sample Type: METHOD 29  
 Sample Recovery Person: MMM, CLR

Container	Description	Volume, ml	Sealed/Level Marked
<b>Front Half</b>			
1	Filter No.(s) <u>301624</u>		<u>F1</u> ✓
2	Acetone Rinse		<u>AR2</u> ✓
3	Nitric Rinse		<u>F#3</u> ✓
<b>Back Half</b>			
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter		<u>BH4</u> ✓
5A	Nitric Rinse - Impinger No. 4		<u>5A</u> ✓
5B	KMNO4/H2O Rinse - Impingers 5 & 6		<u>5B</u> ✓
5C	HCl Rinse - Impingers 5 & 6		<u>5C</u> ✓

Moisture Data

Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	<u>MT</u>	<u>0</u>	<u>744.9</u>	<u>812.7</u>	<u>67.8</u>
2	<u>5% HNO<sub>3</sub> / 10% H<sub>2</sub>O<sub>2</sub></u>	<u>100</u>	<u>679.5</u>	<u>719.0</u>	<u>39.5</u>
3	<u>"</u>	<u>100</u>	<u>632.0</u>	<u>637.2</u>	<u>5.2</u>
4	<u>MT</u>	<u>0</u>	<u>559.8</u>	<u>561.2</u>	<u>1.4</u>
5	<u>4% KMnO<sub>4</sub> / 10% H<sub>2</sub>SO<sub>4</sub></u>	<u>100</u>	<u>652.4</u>	<u>644.0</u>	<u><del>13.4</del> 8.4</u>
6	<u>"</u>	<u>100</u>	<u>643.4</u>	<u>651.2</u>	<u>7.8</u>
7	<u>HAAT Seal.</u>	<u>-</u>	<u>866.5</u>	<u>896.2</u>	<u>29.7</u>
					<u>143.0</u>
					<u><del>138.0</del></u>
					<u>443.0</u>
<b>Total</b>					

Comments:

Appendix B.1.3

Raw Field Data

Kiln No. 1 - Total Hydrocarbons



# CEM DATA REDUCTION - BAG ANALYSIS OR STEADY READINGS

Plant: APG LIME CORP. Parameter: SO<sub>2</sub>, CO<sub>2</sub>, O<sub>2</sub>, NO<sub>x</sub>\*, (THC) CO  
 Location: OUTLET OF BAGHOUSE Operator: P. SIEGEL  
 Date: 10-22-96 Project #: S401.003

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.508)}{(0.9693)}$$

Run #	Time** (24-Hr)	Average Chart Division	Concentration ppm <sub>wet</sub>	Comments
	11:40 - 12:00	1.9	1.4	KILN No. 1
	- 12:20	2.0	1.5	
	- 12:40	2.0	1.5	
	- 13:00	2.0	1.5	
	- 13:20	2.0	1.5	
	- 13:40	2.0	1.5	
	14:00 - 14:20	2.0	1.5	
	- 14:40	1.8	1.3	
	- 15:00	1.3	0.8	
	- 15:20	1.7	1.2	
	- 15:40	1.7	1.2	
	16:20 - 16:40	1.3	0.8	
	- 17:00	1.5	1.0	
	- 17:20	1.7	1.2	
	- 17:40	1.5	1.0	

\* For NO<sub>x</sub> Indicate whether NO, NO + NO<sub>2</sub>, or NO<sub>2</sub> for specific interval.

\*\* Indicate whether time interval is from beginning of first time to beginning of second time or to end of second time (circle one, or describe alternate).

Calculated By: Paul T. Siegel Date: 10-22-96  
 Checked By: \_\_\_\_\_ Date: \_\_\_\_\_



# CEM DATA REDUCTION - BAG ANALYSIS OR STEADY READINGS

Plant: APG LIME CORP. Parameter: SO<sub>2</sub>, CO<sub>2</sub>, O<sub>2</sub>, NO<sub>x</sub>\*, (THC), CO  
Location: INLET TO BAGHOUSE Operator: P. SIEGEL  
Date: 10-22-96 Project #: S401.003

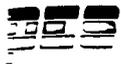
$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.329)}{(1.0099)}$$

Run #	Time** (24-Hr)	Average Chart Division	Concentration ppm <sub>wet</sub>	Comments
	11:40 - 12:00	2.7	2.3	KILN No. 1
	- 12:20	2.8	2.4	
	- 12:40	2.8	2.4	
	- 13:00	2.9	2.5	
	- 13:20	3.0	2.6	
	- 13:40	3.0	2.6	
	14:00 - 14:20	3.0	2.6	
	- 14:40	2.7	2.3	
	- 15:00	2.3	2.0	
	- 15:20	2.6	2.2	
	- 15:40	2.3	2.0	
	16:20 - 16:40	2.8	2.4	
	- 17:00	2.8	2.4	
	- 17:20	2.8	2.4	
	- 17:40	2.5	2.1	

\* For NO<sub>x</sub> Indicate whether NO, NO + NO<sub>2</sub>, or NO<sub>2</sub> for specific interval.

\*\* Indicate whether time interval is from beginning of first time to beginning of second time or to end of second time (circle one, or describe alternate).

Calculated By: Paul T. Siegel Date: 10-22-96  
Checked By: \_\_\_\_\_ Date: \_\_\_\_\_



# CEM DATA REDUCTION - BAG ANALYSIS OR STEADY READINGS

Plant: APG LIME CORP Parameter: SO<sub>2</sub>, CO<sub>2</sub>, O<sub>2</sub>, NO<sub>x</sub>\*, (THC) CO  
 Location: OUTLET OF BAGHOUSE Operator: P. SIEGEL  
 Date: 10-24-96 Project #: S401.003

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 1.583)}{(0.9591)}$$

Run #	Time** (24-Hr)	Average Chart Division	Concentration ppm <sub>wet</sub>	Comments
	17:10-17:30	4.7	3.2	KILN No. 1
	-17:50	3.9	2.4	
	-18:10	3.3	1.7	
	-18:30	3.3	1.7	
	-18:50	3.3	1.7	
	<del>-19:00</del>			
	-19:10	3.5	2.0	
	-19:30	3.7	2.2	
	-19:50	4.0	2.5	

\* For NO<sub>x</sub> Indicate whether NO, NO + NO<sub>2</sub>, or NO<sub>2</sub> for specific interval.

\*\* Indicate whether time interval is from beginning of first time to beginning of second time or to end of second time (circle one, or describe alternate).

Calculated By: Paul T. Siegel Date: 10-24-96  
 Date: \_\_\_\_\_



# CEM DATA REDUCTION - BAG ANALYSIS OR STEADY READINGS

Plant: APG LIME CORP.

Parameter: SO<sub>2</sub>, CO<sub>2</sub>, O<sub>2</sub>, NO<sub>x</sub>\*, (THC), CO

Location: OUTLET OF BAGHOUSE

Operator: P. SIEGEL

Date: 10-24-96

Project #: 8401.003

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 1.583)}{(0.9591)}$$

Run #	Time** (24-Hr)	Average Chart Division	Concentration ppm wet	Comments
	11:00 - 11:20	2.5	1.0	KILN No. 1
	- 11:40	2.3	0.7	
	- 12:00	2.3	0.7	
	- 12:20	2.2	0.6	
	- 12:40	2.1	0.5	
	13:00 - 13:20	2.1	0.5	
	- 13:40	2.2	0.6	
	- 14:00	2.3	0.7	
	- 14:20	2.4	0.9	
	- 14:40	2.7	1.2	
	15:10 - 15:30	3.4	1.9	
	- 15:50	4.2	2.7	
	- 16:10	3.8	2.3	
	- 16:30	3.2	1.7	
	- 16:50	3.7	2.2	

\* For NO<sub>x</sub> Indicate whether NO, NO + NO<sub>2</sub>, or NO<sub>2</sub> for specific interval.

\*\* Indicate whether time interval is from beginning of first time to beginning of second time or to end of second time (circle one, or describe alternate).

Calculated By: Paul T. Siegel

Date: 10-24-96

Checked By: \_\_\_\_\_

Date: \_\_\_\_\_

# CEM DATA REDUCTION - BAG ANALYSIS OR STEADY READINGS

Plant: APG LIME CORP Parameter: SO<sub>2</sub>, CO<sub>2</sub>, O<sub>2</sub>, NO<sub>x</sub>\*, THC, CO  
 Location: INLET TO BAGHOUSE Operator: P. SIEGEL  
 Date: 10-24-96 Project #: S401.003

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(\text{CD} - 0.554)}{(1.0063)}$$

Run #	Time** (24-Hr)	Average Chart Division	Concentration PPM wet	Comments
	15:10 - 15:30	2.6	2.0	KILN No. 1
	-15:50	3.7	3.1	
	-16:10	3.3	2.7	
	-16:30	2.5	1.9	
	-16:50	3.0	2.4	
	17:10 - 17:30	3.9	3.3	
	-17:50	3.0	2.4	
	-18:10	2.8	2.2	
	-18:30	2.2	1.6	
	-18:50	2.3	1.7	
	-19:10	2.4	1.8	
	-19:30	2.5	1.9	
	-19:50	2.9	2.3	

\* For NO<sub>x</sub> Indicate whether NO, NO + NO<sub>2</sub>, or NO<sub>2</sub> for specific interval.

\*\* Indicate whether time interval is from beginning of first time to beginning of second time or to end of second time (circle one, or describe alternate).

Calculated By: Paul T. Siegel Date: 10-24-96  
 Date: \_\_\_\_\_



# CEM DATA REDUCTION - BAG ANALYSIS OR STEADY READINGS

Plant: APG LIME CORP.  
 Location: INLET TO BAGHOUSE  
 Date: 10-24-96

Parameter: SO<sub>2</sub>, CO<sub>2</sub>, O<sub>2</sub>, NO<sub>x</sub>\*, THC, CO  
 Operator: P. SIEGEL  
 Project #: S401.003

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.278)}{(0.9545)}$$

Run #	Time** (24-Hr)	Average Chart Division	Concentration ppm <sub>wet</sub>	Comments
	11:00 - 11:20	2.0	1.8	KILN No. 1
	- 11:40	1.7	1.5	
	- 12:00	1.7	1.5	
	- 12:20	1.4	1.2	
	- 12:40	1.3	1.1	
	13:00 - 13:20	1.3	1.1	
	- 13:40	1.6	1.4	
	- 14:00	1.6	1.4	
	- 14:20	1.7	1.5	
	- 14:40	1.9	1.7	

\* For NO<sub>x</sub> Indicate whether NO, NO + NO<sub>2</sub> . or NO<sub>2</sub> for specific interval.

\*\* Indicate whether time interval is from beginning of first time to beginning of second time or to end of second time (circle one, or describe alternate).

Calculated By: Paul T. Siegel Date: 10-24-96  
 Checked By: \_\_\_\_\_ Date: \_\_\_\_\_



# CEM DATA REDUCTION - BAG ANALYSIS OR STEADY READINGS

Plant: APG LIME Corp.  
 Location: OUTLET OF BAGHOUSE  
 Date: 10-23-96

Parameter: SO<sub>2</sub>, CO<sub>2</sub>, O<sub>2</sub>, NO<sub>x</sub>\*, (THC), CO  
 Operator: P. SIEGEL  
 Project #: S401.003

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 1.079)}{(0.9646)}$$

Run #	Time** (24-Hr)	Average Chart Division	Concentration ppm <sub>wet</sub>	Comments
	10:45 - 11:05	3.8	2.8	KILN No. 1
	- 11:25	4.5	3.5	
	11:40 - 12:00	4.4	3.4	
	- 12:20	4.4	3.4	
	- 12:40	4.5	3.5	
	- 13:00	4.5	3.5	
	- 13:20	4.5	3.5	
	14:00 - 14:20	3.7	2.7	
	- 14:40	2.4	1.4	
	- 15:00	2.1	1.1	
	- 15:20	2.3	1.3	
	- 15:40	2.0	1.0	
	- 16:00	3.5	2.5	

\* For NO<sub>x</sub> Indicate whether NO, NO + NO<sub>2</sub>, or NO<sub>2</sub> for specific interval.

\*\* Indicate whether time interval is from beginning of first time to beginning of second time or to end of second time (circle one, or describe alternate).

Calculated By: Paul T. Siegel  
 Checked By: \_\_\_\_\_

Date: 10-23-96  
 Date: \_\_\_\_\_



# CEM DATA REDUCTION - BAG ANALYSIS OR STEADY READINGS

Plant: APG LIME CORP.  
 Location: INLET TO BAGHOUSE  
 Date: 10-23-96

Parameter: SO<sub>2</sub>, CO<sub>2</sub>, O<sub>2</sub>, NO<sub>x</sub>\*, THC, CO  
 Operator: P. SIEGEL  
 Project #: S401.003

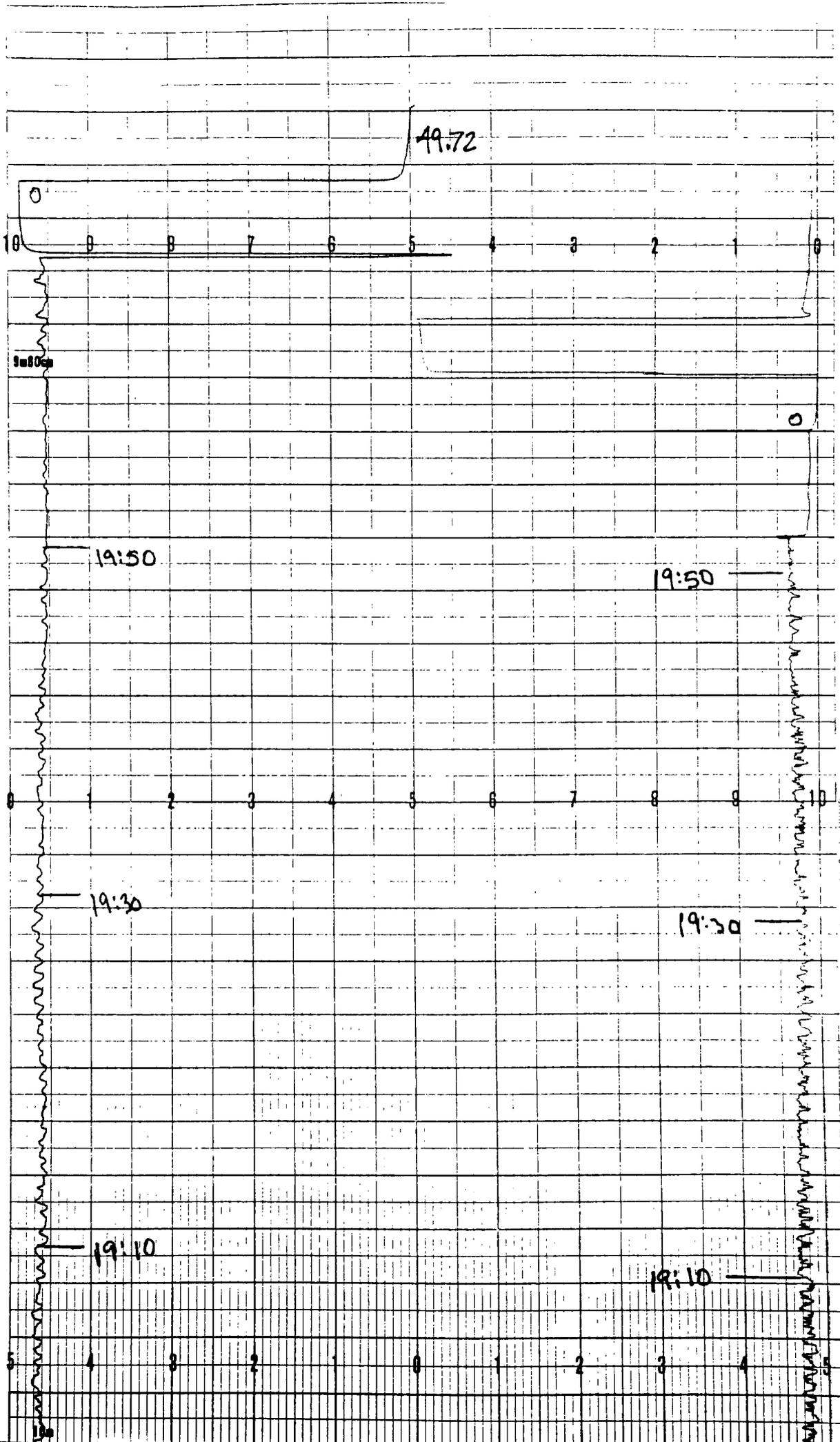
$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.356)}{(0.9574)}$$

Run #	Time** (24-Hr)	Average Chart Division	Concentration ppm <sub>wet</sub>	Comments
	10:48 - 11:05	3.0	2.8	KILN No. 1
	- 11:25	3.7	3.5	
	11:40 - 12:00	3.8	3.6	
	- 12:20	3.6	3.4	
	- 12:40	3.7	3.5	
	- 13:00	3.5	3.3	
	- 13:20	3.7	3.5	
	14:00 - 14:20	3.5	3.3	
	- 14:40	2.0	1.7	
	- 15:00	1.7	1.4	
	- 15:20	1.8	1.5	
	- 15:40	1.4	1.1	
	- 16:00	3.0	2.7	

\* For NO<sub>x</sub> Indicate whether NO, NO + NO<sub>2</sub>, or NO<sub>2</sub> for specific interval.

\*\* Indicate whether time interval is from beginning of first time to beginning of second time or to end of second time (circle one, or describe alternate).

Calculated By: Paul T. Siegel Date: 10-23-96  
 Checked By: \_\_\_\_\_ Date: \_\_\_\_\_



49.72

0

10 9 8 7 6 5 4 3 2 1 0

9.80

0

19:50

19:50

19:30

19:30

19:10

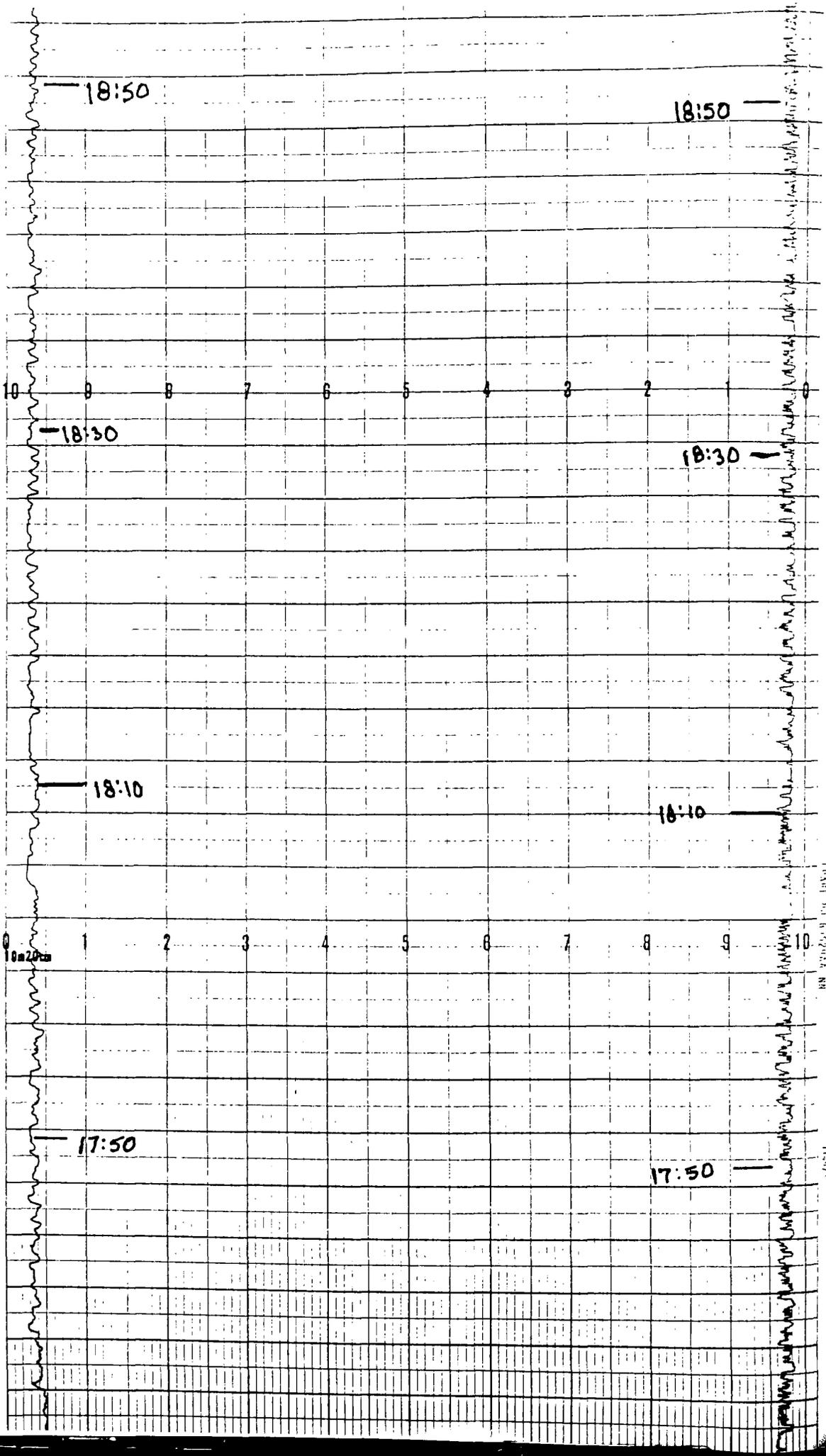
19:10

0 1 2 3 4 5 6 7 8 9 10

5 4 3 2 1 0 1 2 3 4

CHART NO. 603294-11

11497



18:50

18:50

18:30

18:30

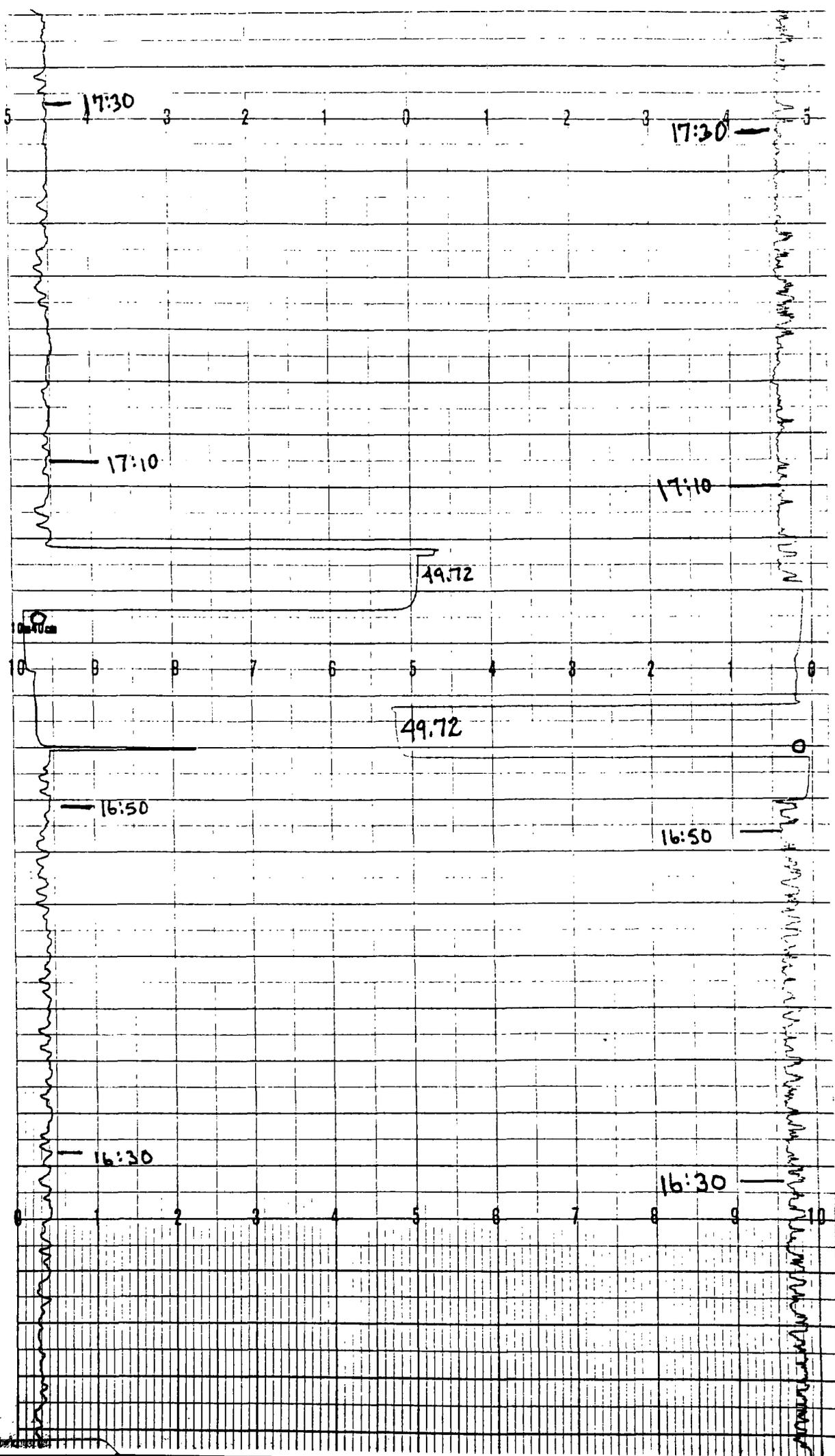
18:10

18:10

17:50

17:50

Handwritten notes on the right edge of the ECG strip, including the name 'M. J. ...' and other illegible text.



04881 No. 005294A HS

(11497)

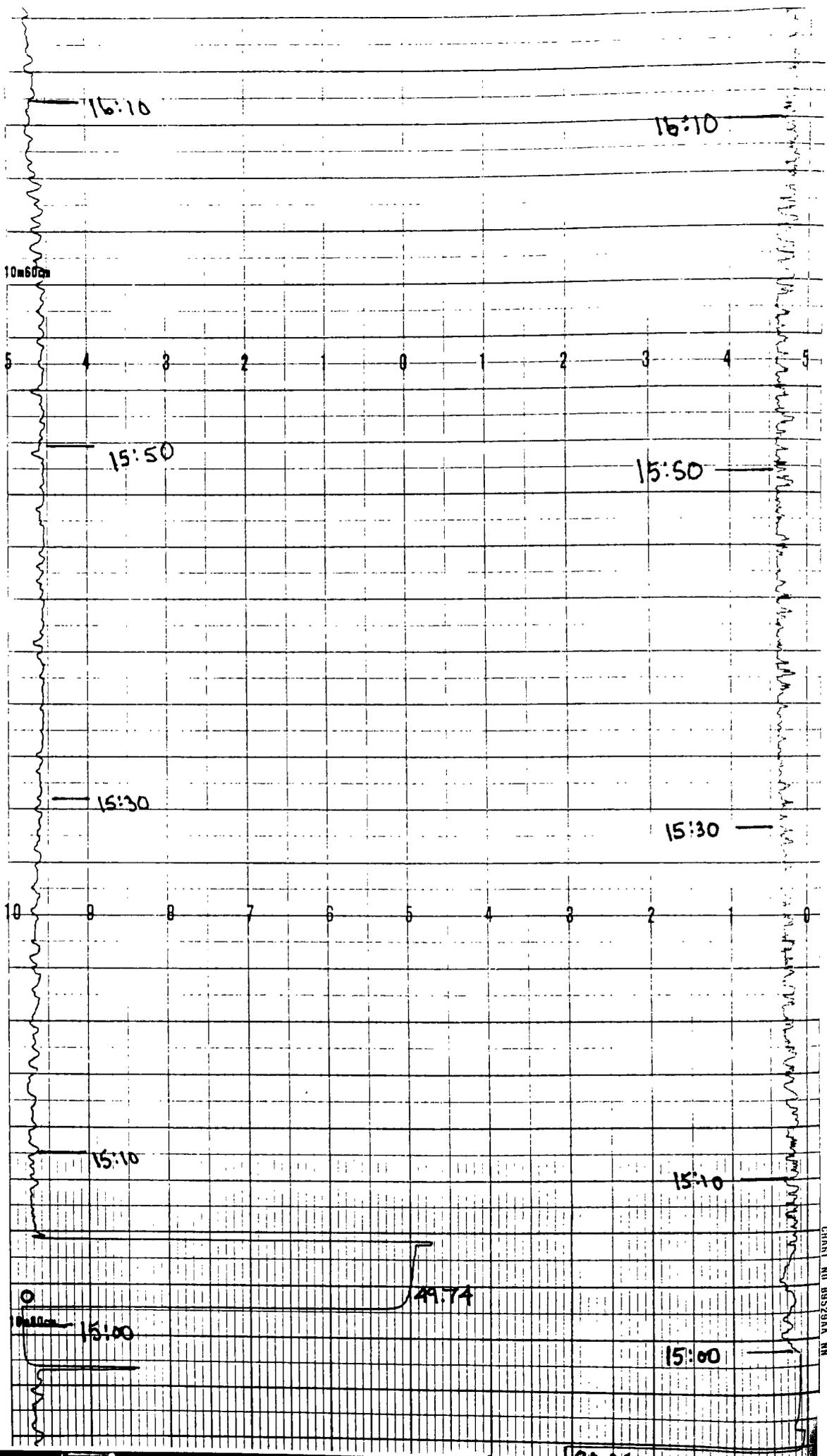
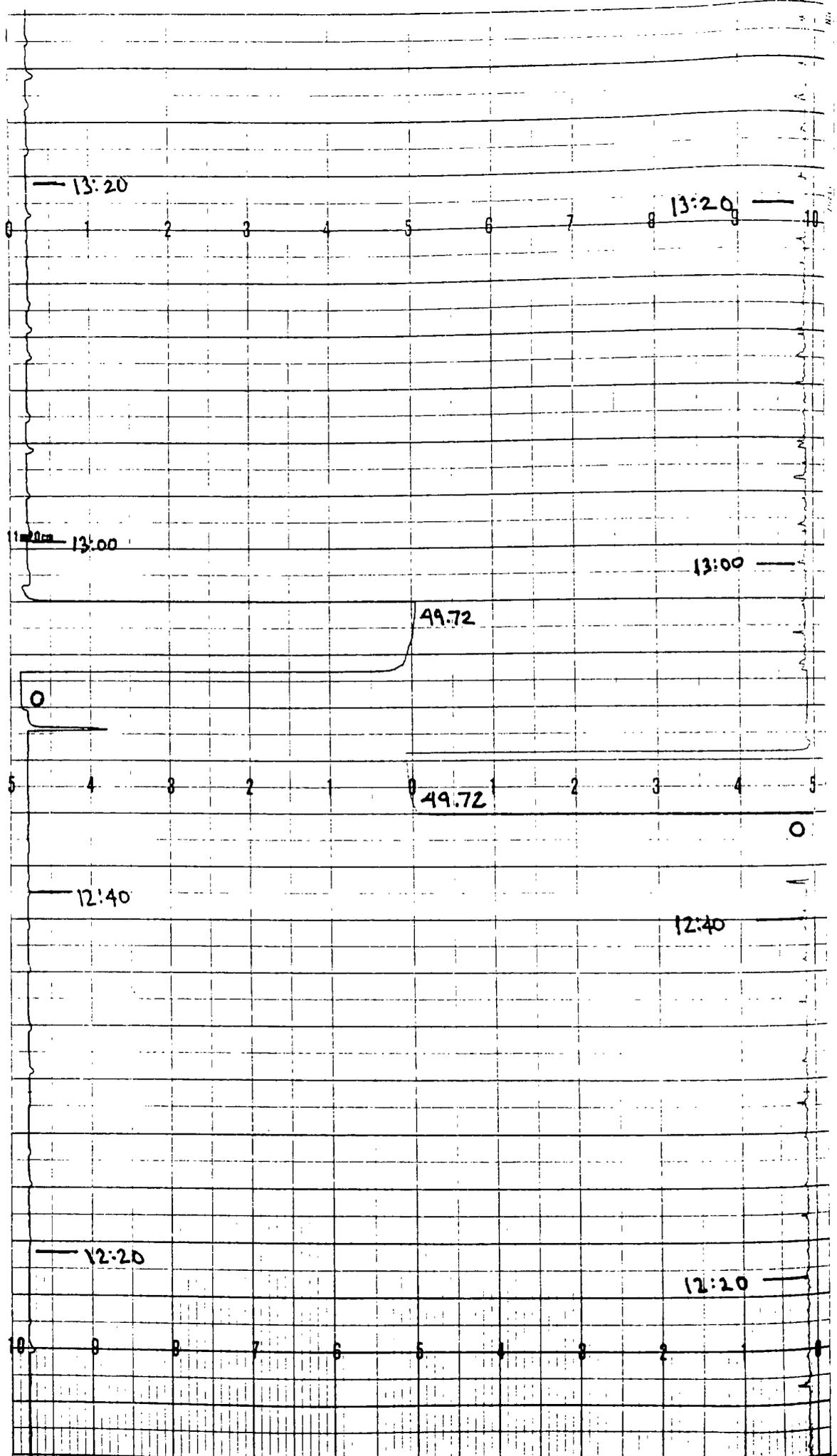


CHART NO. BBS29AA NH

2A 24





11:40 12:00

12:00

0 1 2 3 4 5 6 7 8 9 10

11:40

11:40

11:30

11:30

11:20

11:20

5 4 3 2 1 0 1 2 3 4 5

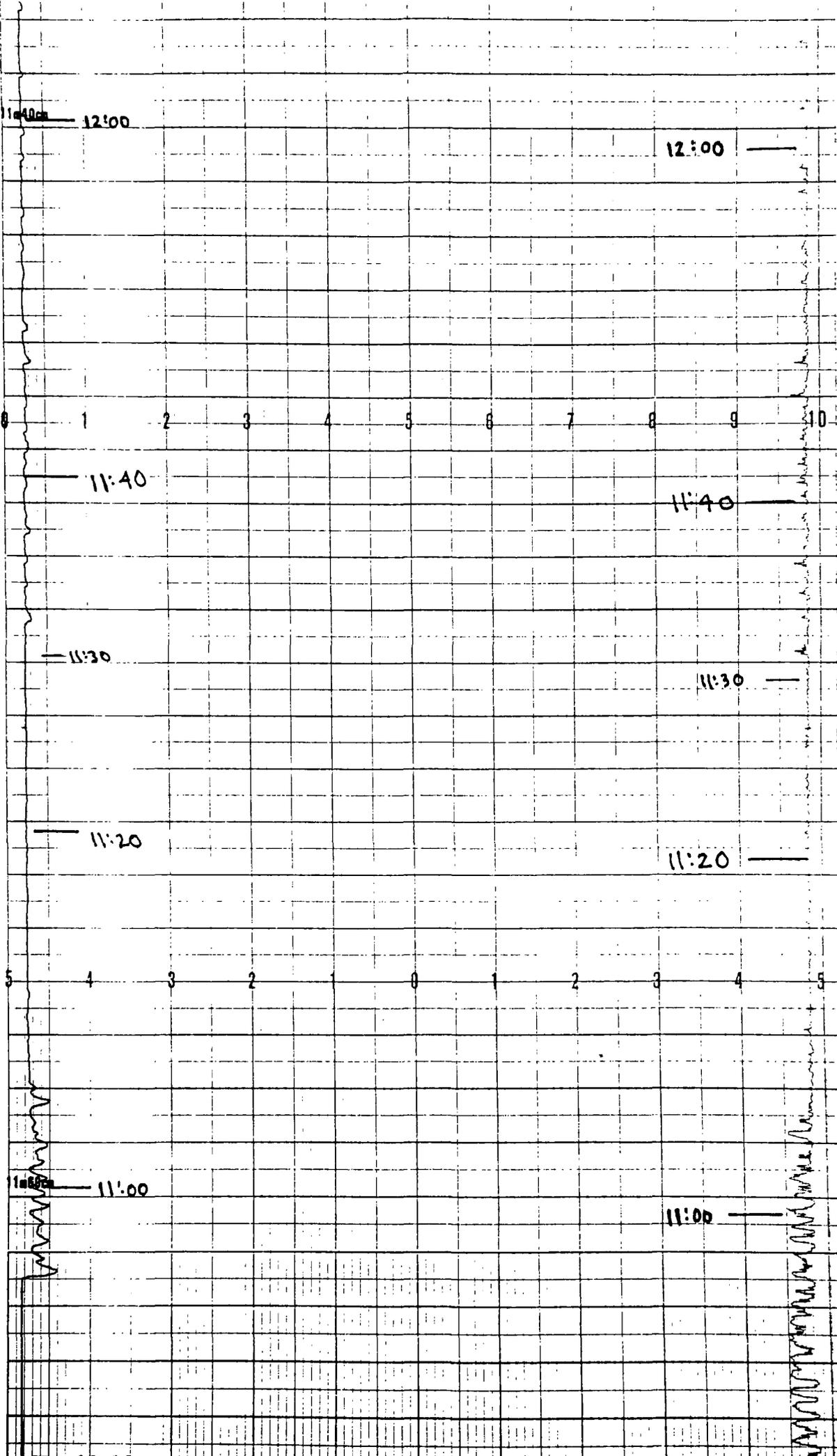
11:00

11:00

10:45

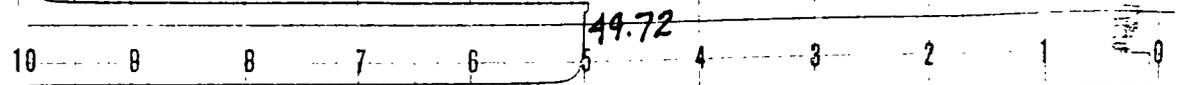
Vertical text on the left margin, possibly recording station or channel information.

Vertical text on the right margin, possibly recording station or channel information.



10:45

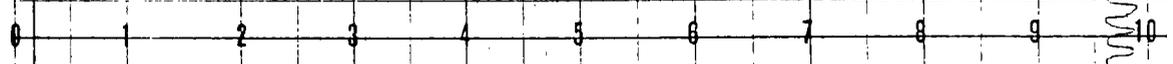
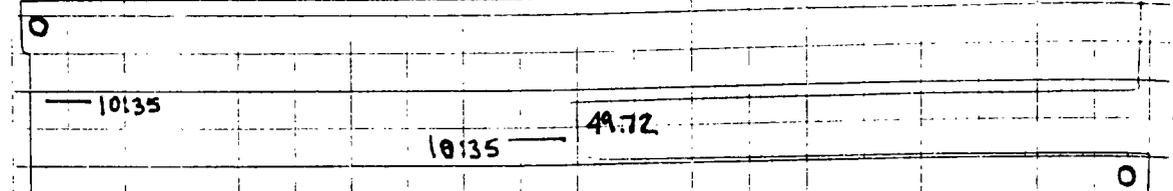
10:45



10:35

10:35

49.72



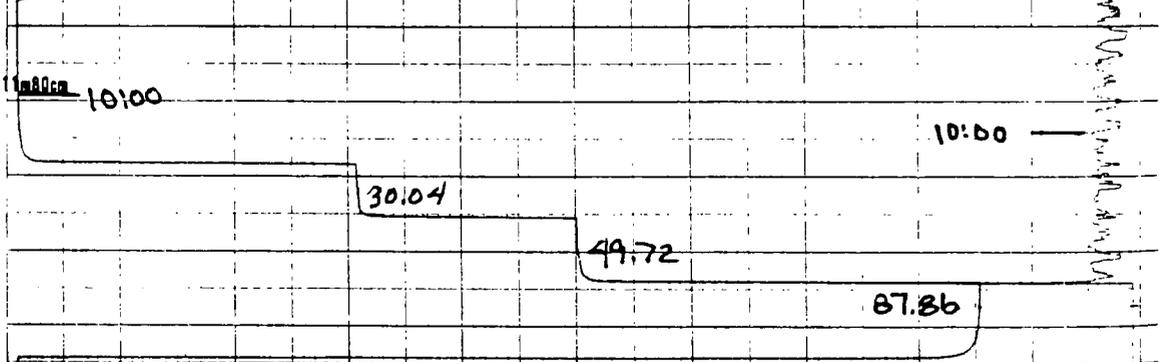
10:00

10:00

30.04

49.72

87.86

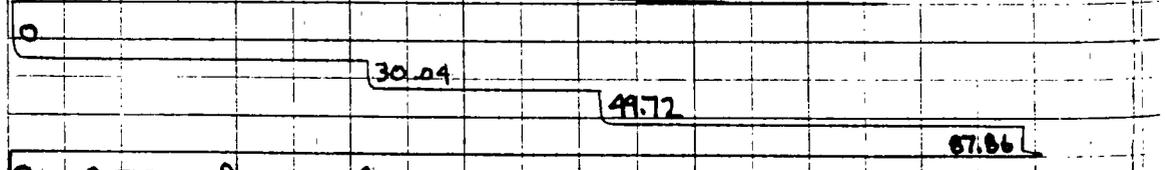


SYSTEM CALIBRATION

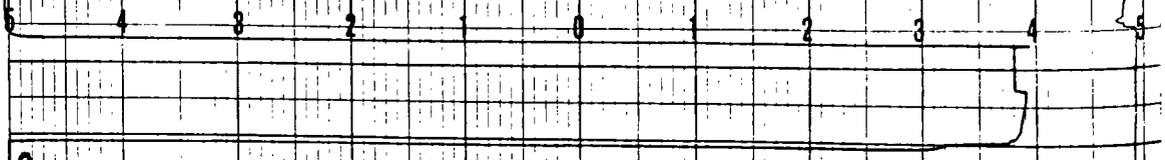
30.04

49.72

87.86



OUTLET DIRECT CALIBRATION



30.04

49.72

87.86

← Tightened fittings at probe

10 9 8 7 6 5 4 3 2 1 0

49.72

30.04

87.86

7:00 9:00

10-24-96 APG LIME CORP. KILN No.1 S401.003 9:00

CHART NO. 88529AA RM

1187

49.72

49.72

### SYSTEM DRIFT CHECKS

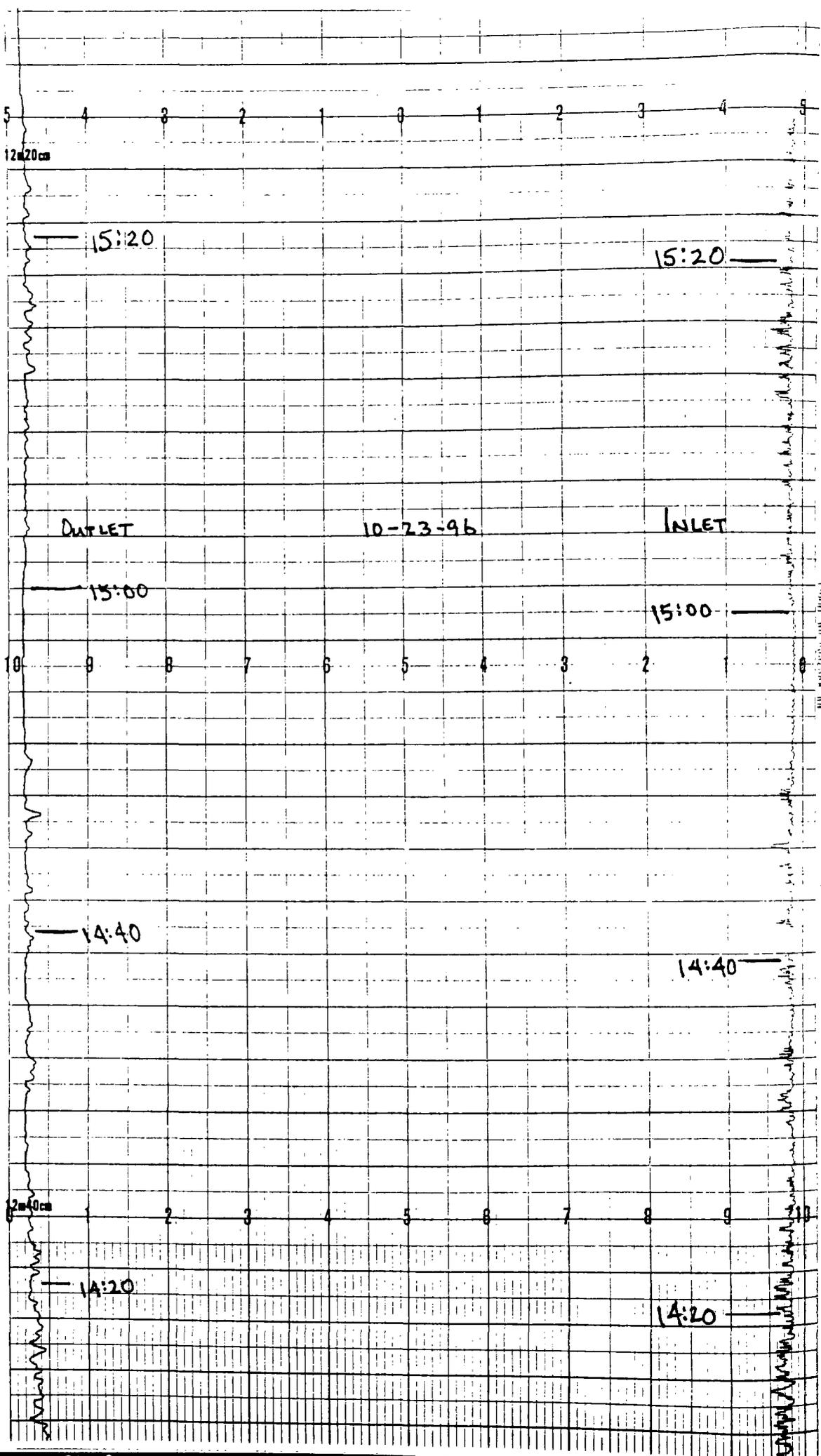
16:00 1 2 3 4 5 6 7 8 16:00 9 10

OUTLET

INLET

15:40

15:40



12.20 cm

15:20

15:20

OUTLET

10-23-96

INLET

15:00

15:00

10

9

8

7

6

5

4

3

2

1

0

14:40

14:40

12.40 cm

14:20

14:20

10

9

8

7

6

5

4

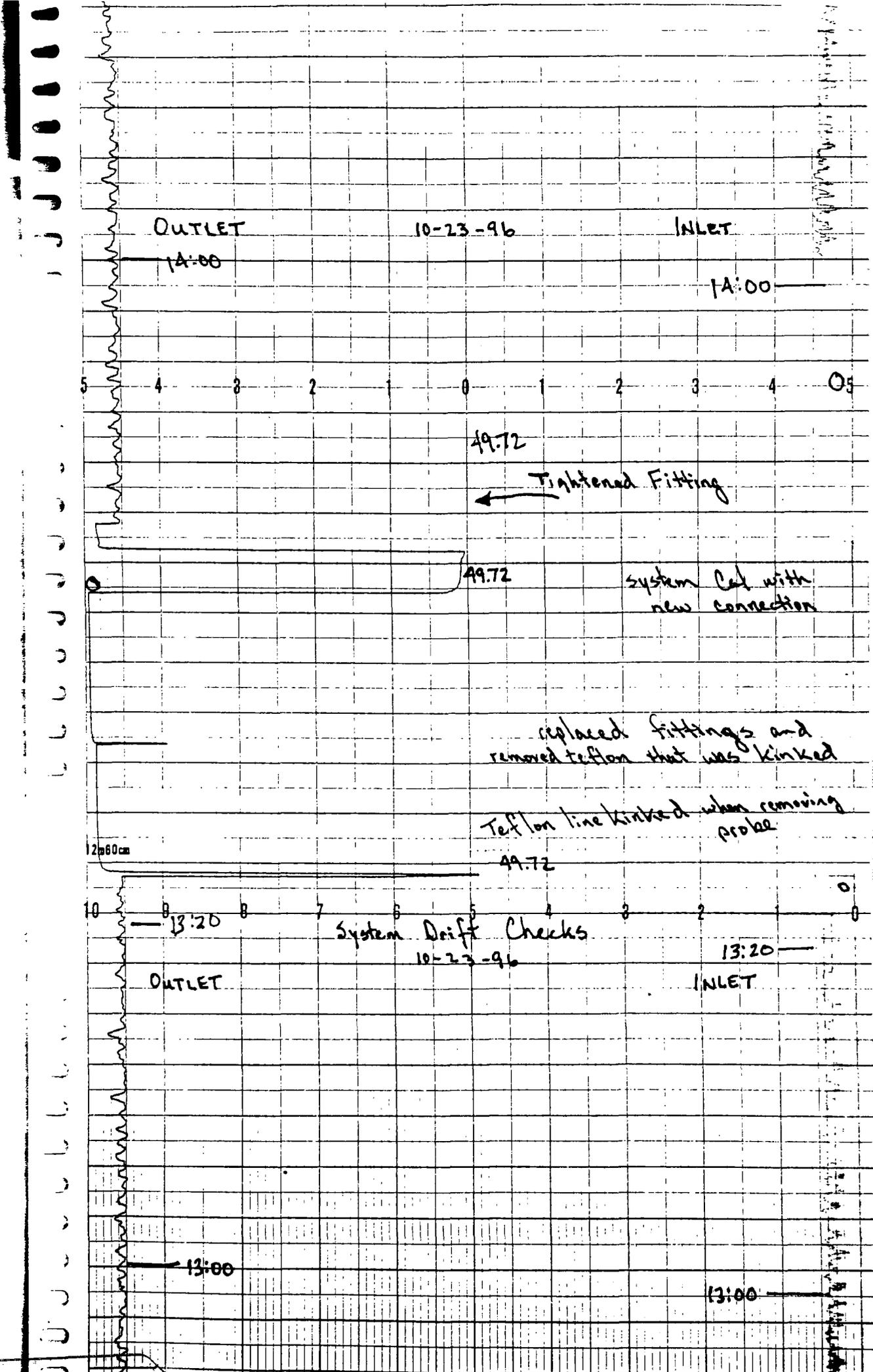
3

2

1

0

CHART NO. 48523A



OUTLET

10-23-96

INLET

14:00

14:00

49.72

Tightened Fitting

49.72

system Cal with new connection

replaced fittings and removed teflon that was kinked

Teflon line kinked when removing probe

2000cm

49.72

13:20

System Drift Checks

10-23-96

13:20

OUTLET

INLET

13:00

13:00

CHART BY 10/23/96 HJ

11/25

0 1 2 3 4 5 6 7 8 9 10

OUTLET

10-23-96

INLET

12:40

12:40

2m80m

12:20

12:20

12:00

12:00

0 1 2 3 4 5 6 7 8 9 10

11:40 OUTLET

INLET

49.72

11:40

00006666

UNIT IN PROGRAM MM  
CARRI

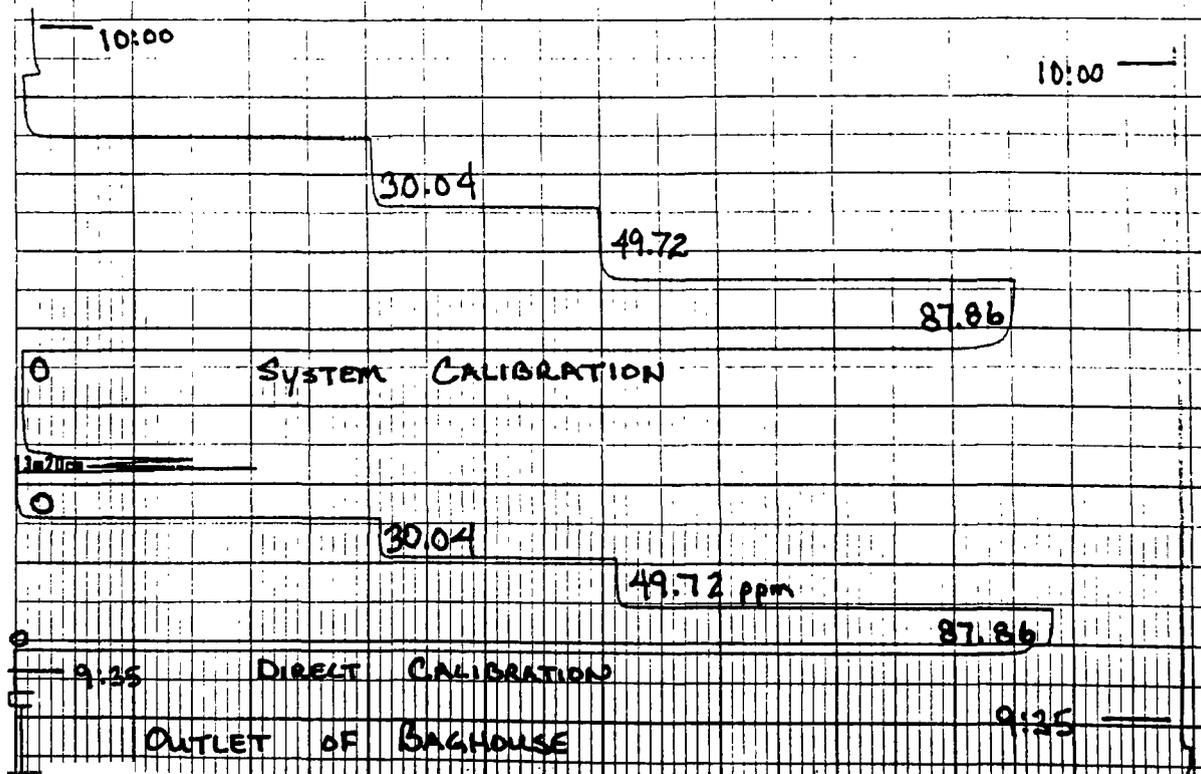
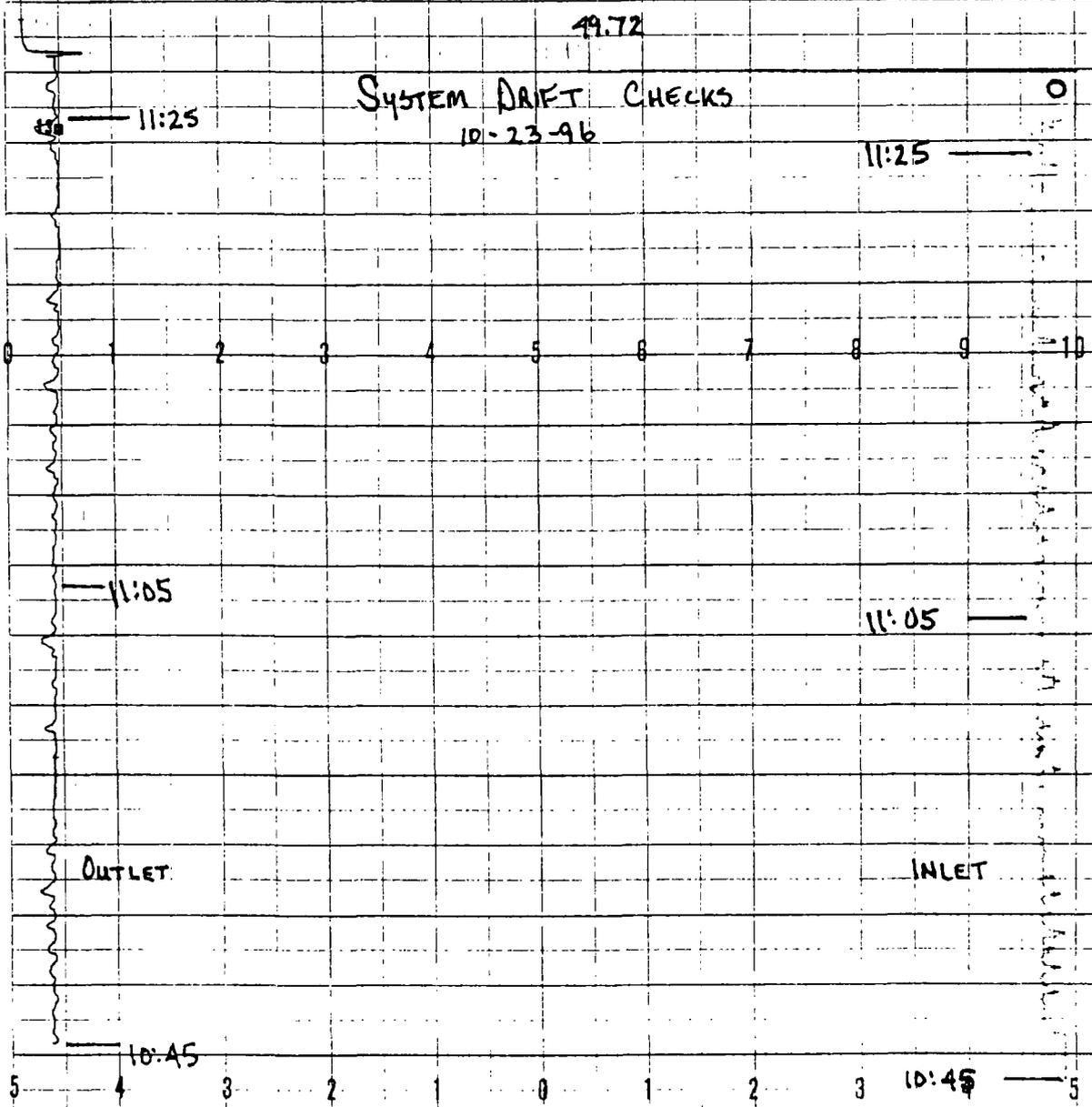
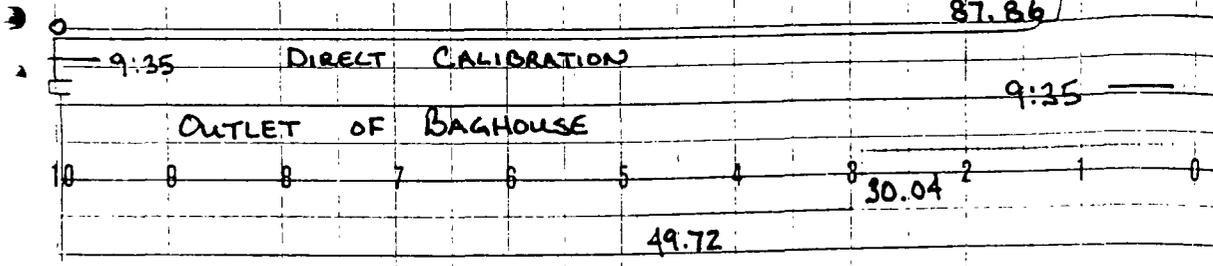


CHART NO. 095904 HN  
1128

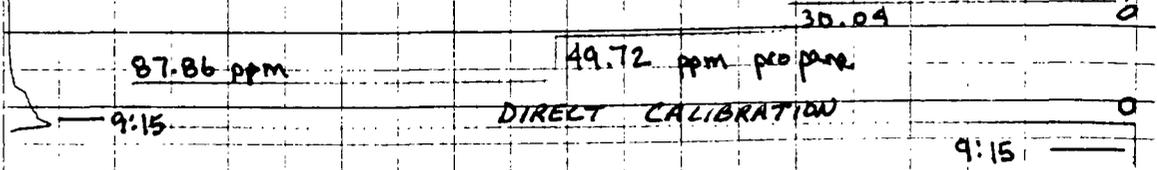
87.86



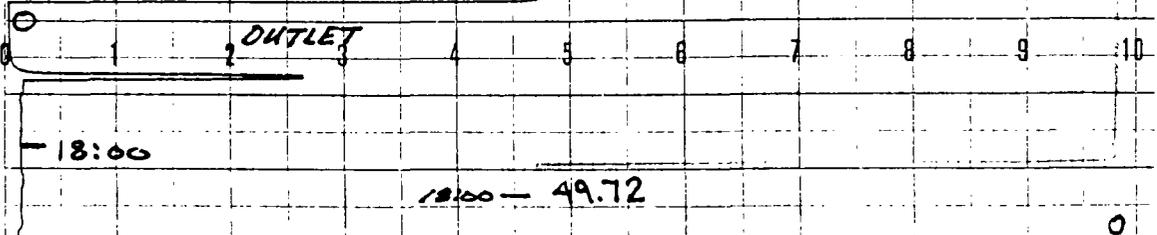
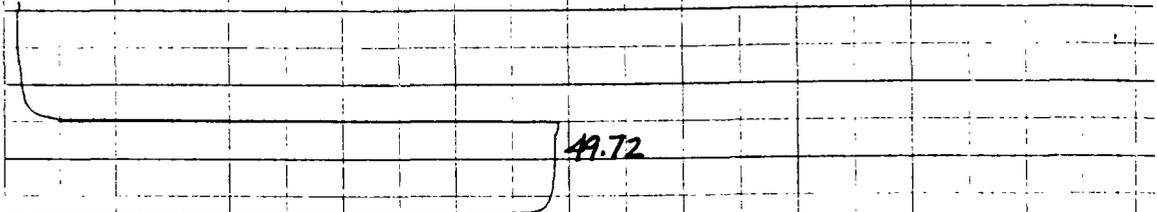
87.86

SYSTEM CALIBRATION

INLET TO BAGHOUSE



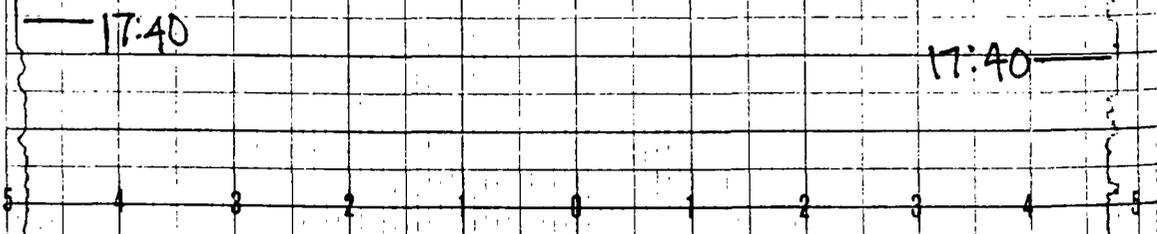
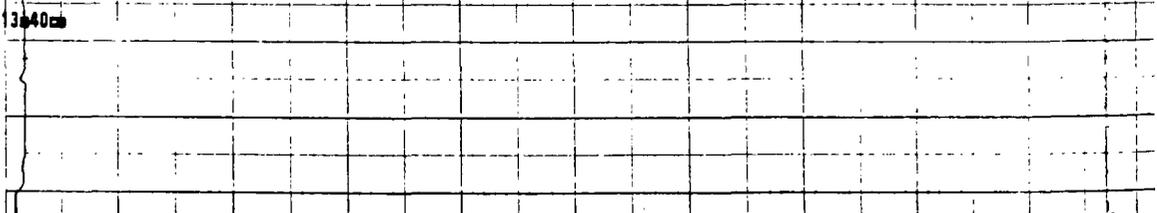
10-23-96 APG LIME Corp. KILN No. 1 S401.003



SYSTEM DRIFT CHECKS

INLET

10-22-96



17:20

OUTLET

10-22-96

INLET

17:00 8 7 6 5 4 3 2 1 0

17:00

13.60cm

16:40

16:40

0 1 2 3 4 5 6 7 8 9 10

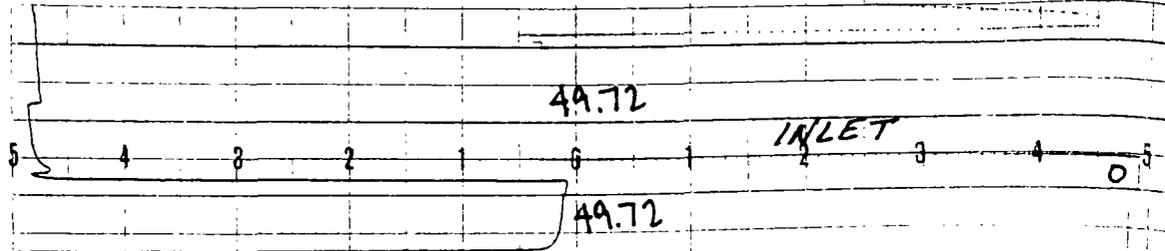
16:20

16:20

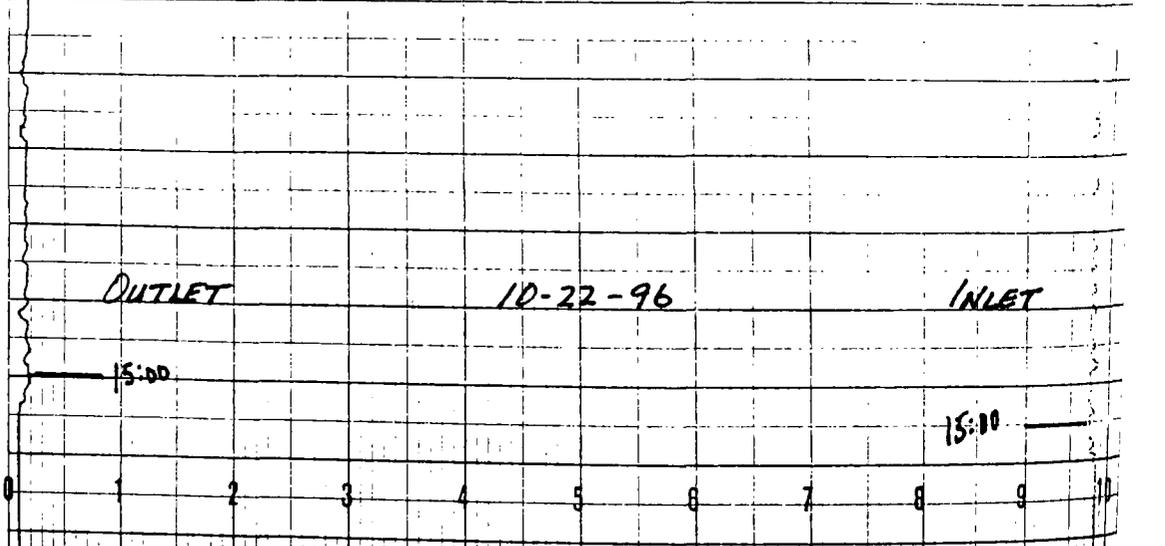
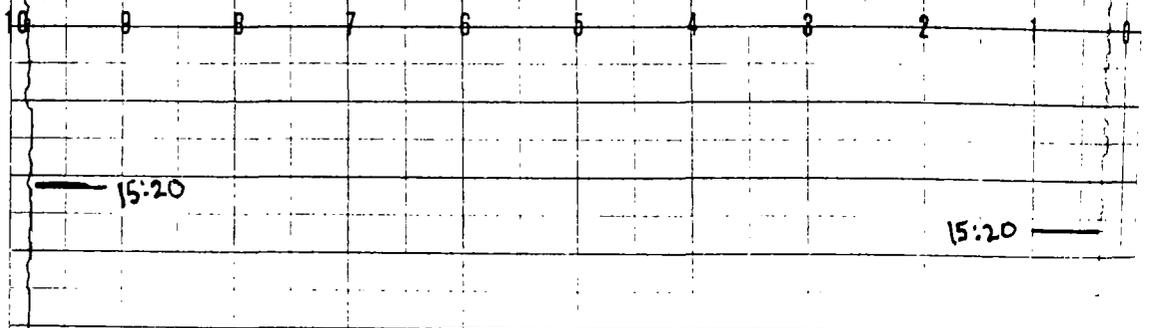
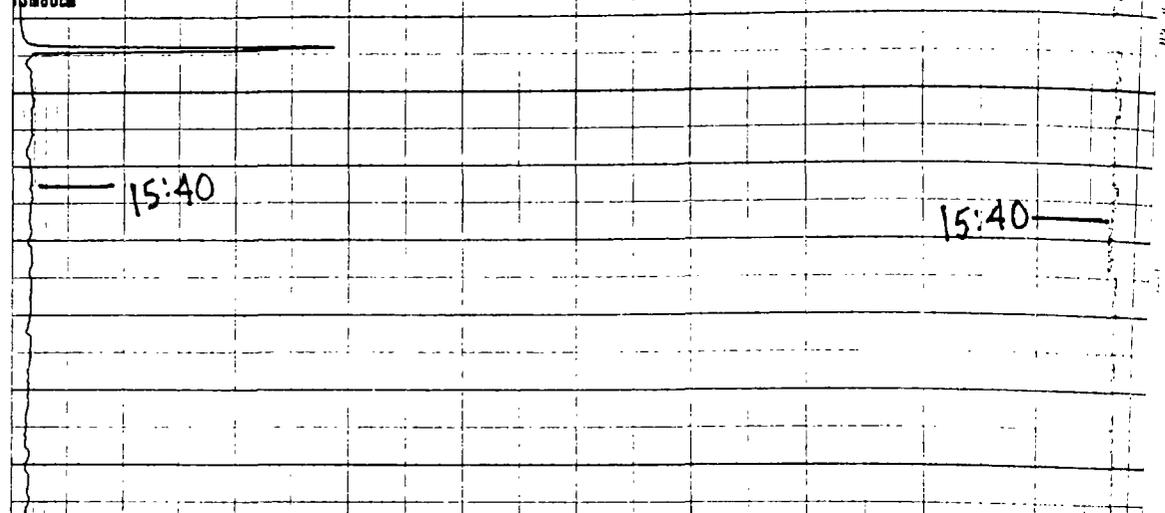
49.72

INLET

0



OUTLET  
SYSTEM DRIET CHECKS  
10-22-96



14:40

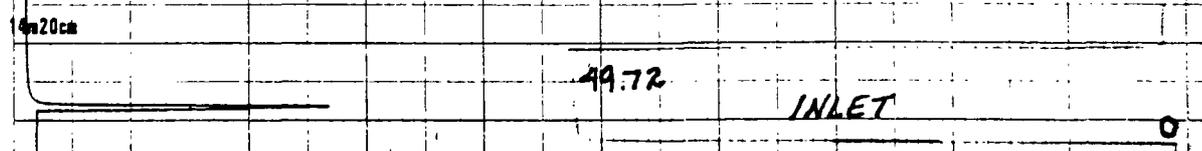
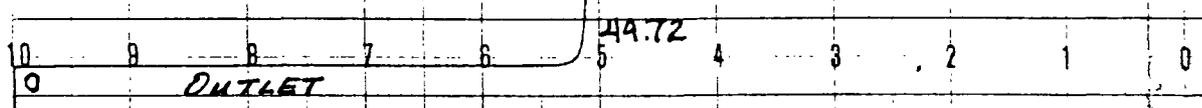
14:40

14:20

14:20

14:00

14:00



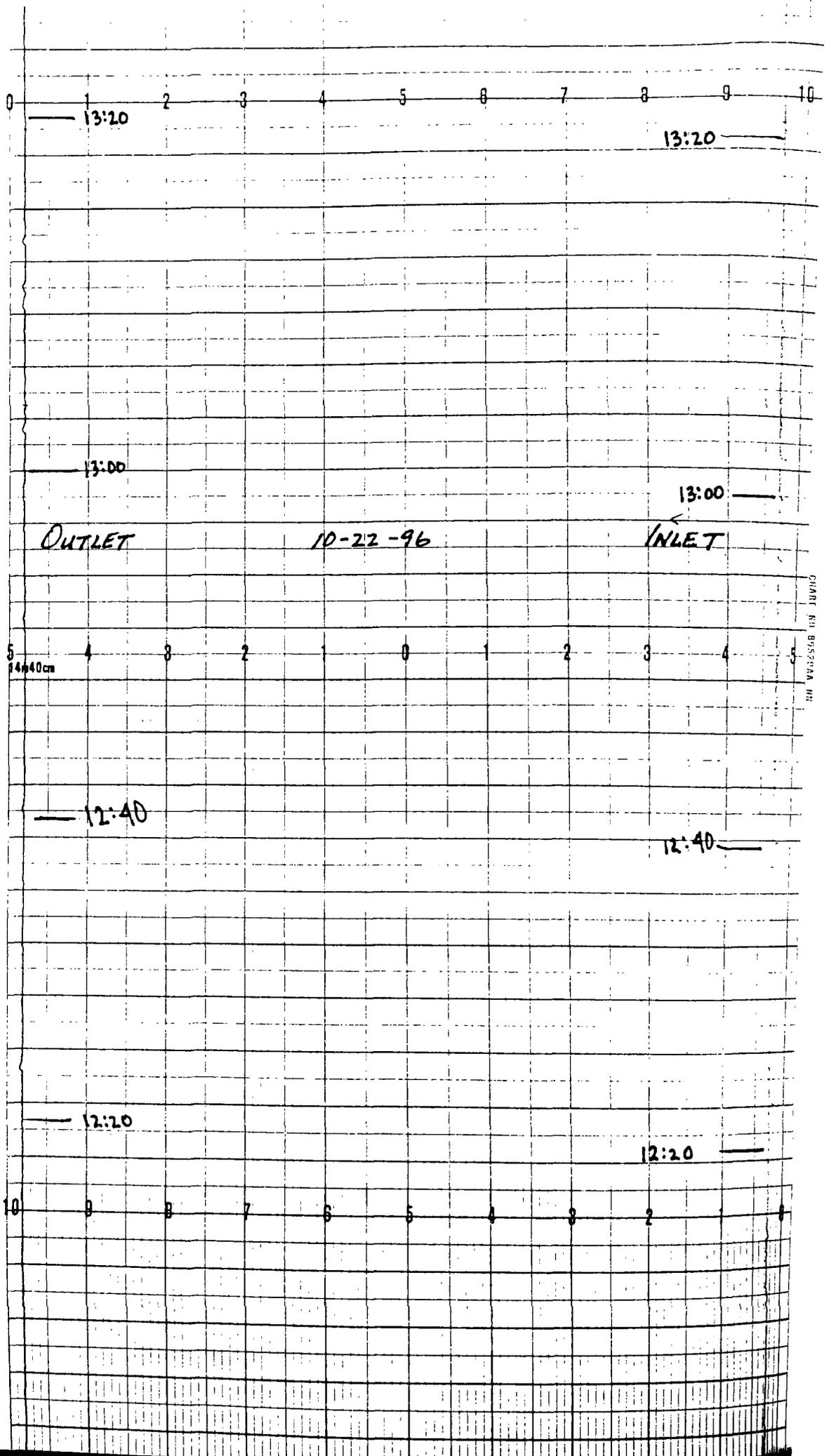
SYSTEM DRIFT Checks  
10-22-96

13:40

13:40

CHART NO. 835220A IN

11:47



0 1 2 3 4 5 6 7 8 9 10

13:20

13:20

13:00

13:00

OUTLET

10-22-96

INLET

14.40 cm

5 4 3 2 1 0 1 2 3 4 5

12:40

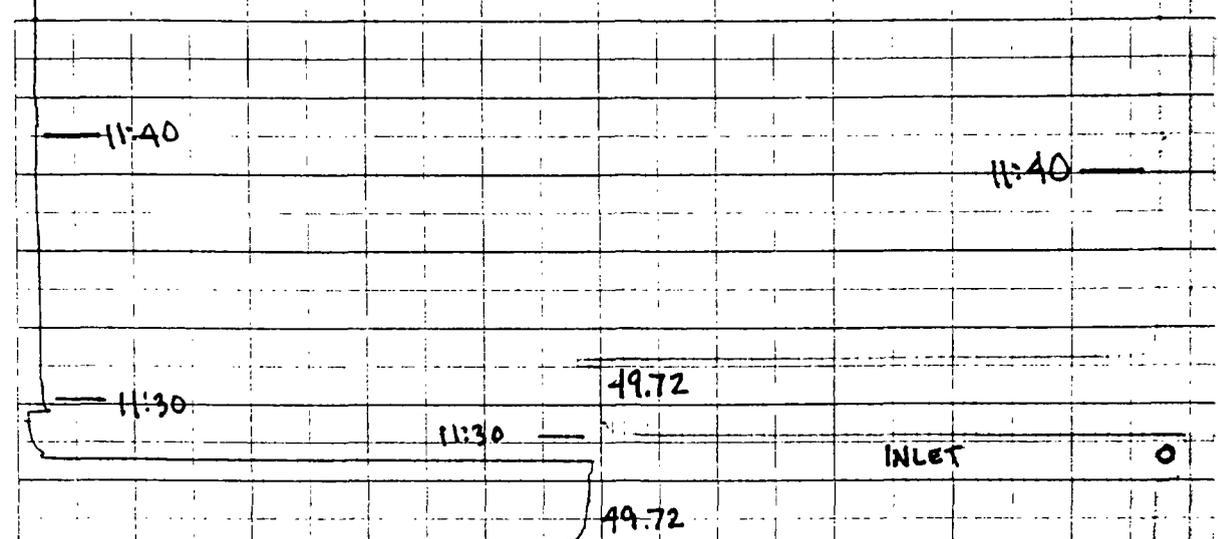
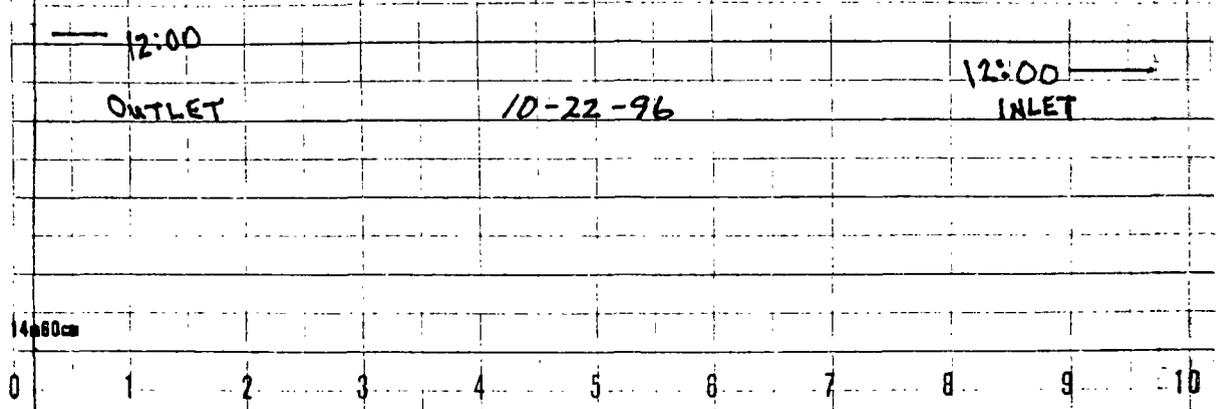
12:40

12:20

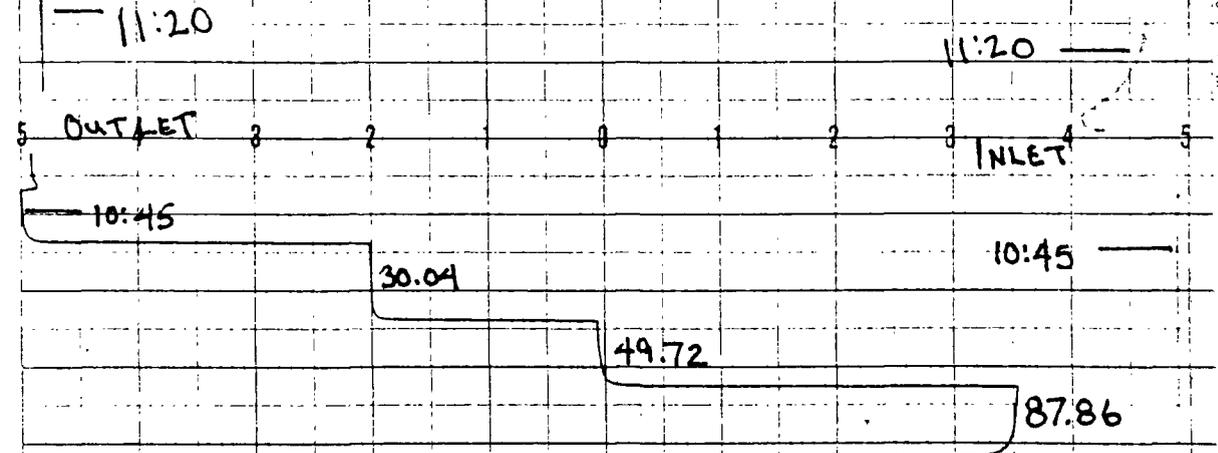
12:20

10 9 8 7 6 5 4 3 2 1 0

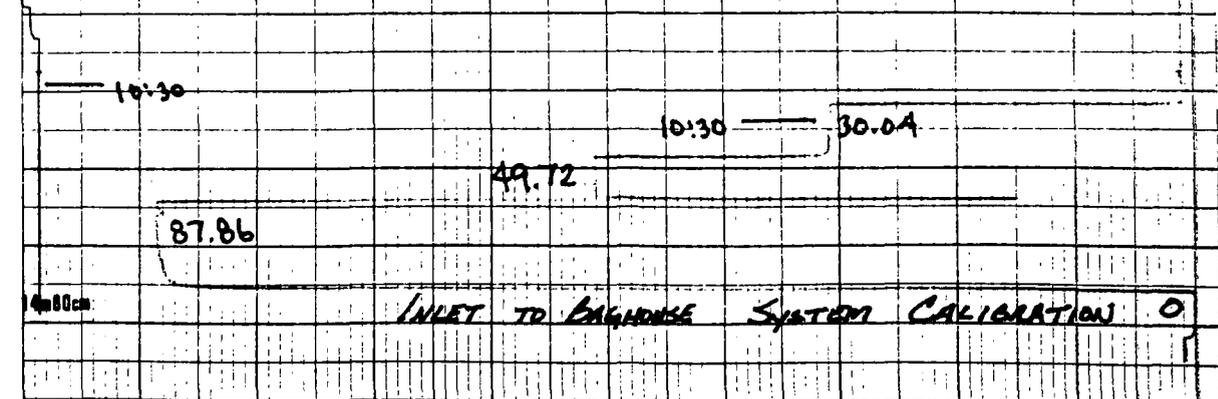
CHART NO. B08230A NH



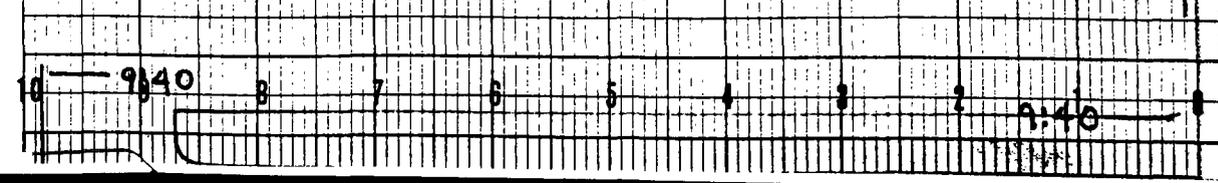
System Drift Checks  
10-22-96



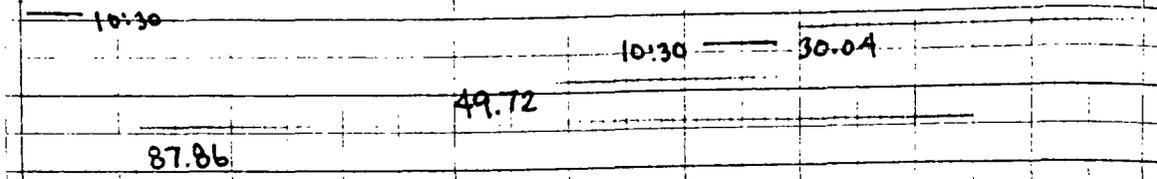
OUTLET OF BATHHOUSE SYSTEM CALIBRATION



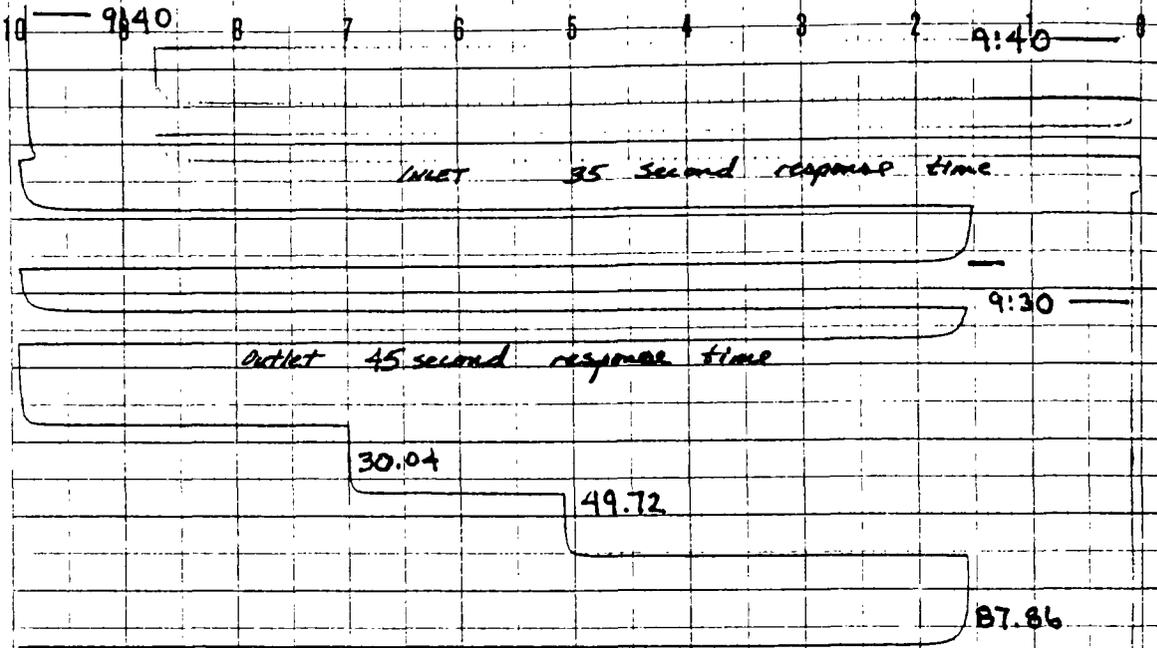
INLET TO BATHHOUSE SYSTEM CALIBRATION



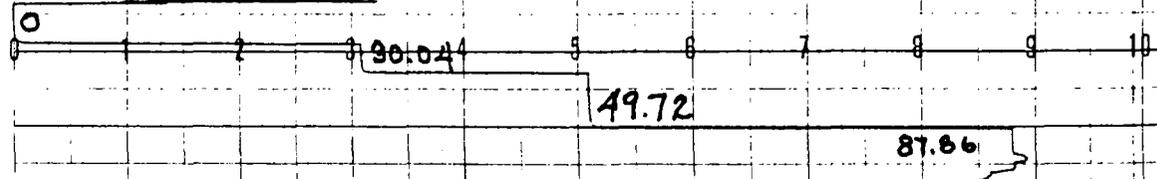
OUTLET OF BAGHOUSE SYSTEM CALIBRATION



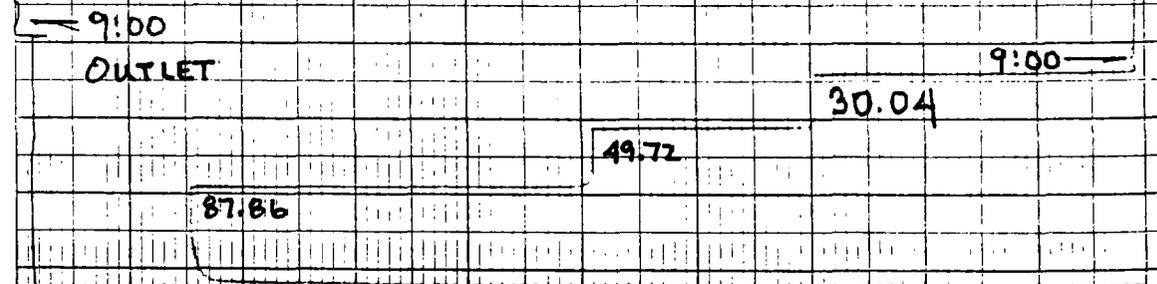
INLET TO BAGHOUSE SYSTEM CALIBRATION



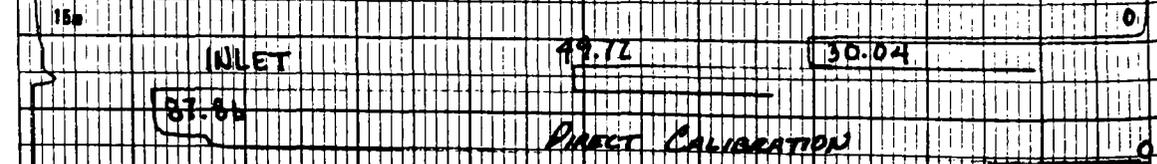
SYSTEM CALIBRATION



DIRECT CALIBRATION



SYSTEM CALIBRATION



DIRECT CALIBRATION

CHART NO. 89529AA NH

Appendix B.1.4

Raw Field Data

Kiln No. 1 Visible Emissions

# VISIBLE EMISSIONS EVALUATOR

*This is to certify that*

*Paul Grable*

*met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue.*

*Thomas Rose*  
President

*William Lee*  
Vice President

*David B. Savage, Jr.*  
Program Manager

255264

Certificate Number

*Roanoke, Virginia*

Location

*September 26, 1996*

Date of Issue

Congratulations.

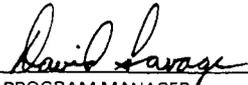
Here is the wallet card signifying your successful Visible Emissions Evaluator certification on the date printed below. This certification is valid for six (6) months. To maintain continuous certification, you must recertify before or on the expiration date. Please mark your calendar accordingly. We appreciate your business and look forward to serving your certification needs in the future.

ETA can support your program with a wide range of environmental services from measurement to litigation support. Please give us a call if we can be of service.

**EASTERN TECHNICAL ASSOCIATES  
CERTIFIES THAT  
PAUL GRABLE**

met the specifications of Federal Reference Method 9 and qualifies as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue and expires on the date below.

 _____ DIRECTOR OF TRAINING	Sep 26, 1996 _____ DATE OF SCHOOL
255264 _____ CERTIFICATE NUMBER	Mar 28, 1997 _____ EXPIRATION DATE
_____ BEARER	

 _____ DIRECTOR OF TRAINING	 _____ PROGRAM MANAGER
---	---

EASTERN TECHNICAL ASSOCIATES  
P.O. BOX 58495  
RALEIGH, NC 27658  
(919) 878-3188

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One) Method 9 203A 203B Other: \_\_\_\_\_

Company Name APL LIME CORPORATION  
 Facility Name KIMBALLTON PLANT  
 Street Address STATE ROUTE 635  
 City RIPPLEMEAD State VA Zip 24150

Process LIME MANUFACTURING Unit # \_\_\_\_\_ Operating Mode CONTINUOUS  
 Control Equipment BAG HOUSE - FABRIC FILTERS Operating Mode CONTINUOUS

Describe Emission Point STACK 100 FT TALL,  $\approx$  94" DIA.  
EXHAUST FROM FABRIC FILTER  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background  
 Start BLUE SKY WITH SOME WISPY WHITE CLOUDS End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start 0-5 End 5-10 Start N End N  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start 68 End 68

Source Layout Sketch

Draw North Arrow  TN  MN

Observer's Position

Observation Point

Sun Location Line

140°

40 FEET

450 FEET

Side View

Stack With Plume

Sun

Wind

Longitude \_\_\_\_\_ Latitude \_\_\_\_\_ Declination 60

Additional Information \_\_\_\_\_

Form Number APG01 Page 2 of 2  
 Continued on VEO Form Number APG01 2 of 2

Sec Min	Time Zone				Start Time	End Time
	0	15	30	45		
	<u>EDST</u>				<u>11:50 AM</u>	<u>12:50 PM</u>
	<u>OCT 28, 1996</u>					
1	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>SOME HEAT/LIGHT</u>	
2	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>REFRACTION - BT</u>	
3	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>STACK CLEAR</u>	
4	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
5	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
6	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
7	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
8	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
9	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
10	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
11	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
12	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
13	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
14	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
15	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
16	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
17	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
18	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
19	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
20	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
21	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
22	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
23	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
24	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
25	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
26	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
27	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
28	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
29	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
30	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		

Observer's Name (Print) PAUL D. GRABLE  
 Observer's Signature Paul D. Grable Date OCT 28, 1996  
 Organization PACIFIC ENVIRONMENTAL SERVICES  
 Certified by EASTERN TECHNICAL ASSOCIATES Date 9/26/96

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Form Number	APG01	Page	2	of	2
Continued on VEO Form Number					

Method Used (Circle One)  
 Method 9      203A      203B      Other: \_\_\_\_\_

Company Name: **AP & LIME CORPORATION**  
 Facility Name: **KIMBALLTOD PLANT**  
 Street Address: **STATE ROUTE 635**  
 City: **RIPPLEMEAD**      State: **VA**      Zip: **24150**

Process: \_\_\_\_\_ Unit #: \_\_\_\_\_ Operating Mode: \_\_\_\_\_  
 Control Equipment: \_\_\_\_\_ Operating Mode: \_\_\_\_\_

Describe Emission Point  
 \_\_\_\_\_  
 \_\_\_\_\_  
 Height of Emiss. Pt.      Height of Emiss. Pt. Rel. to Observer  
 Start      End      Start      End  
 Distance to Emiss. Pt.      Direction to Emiss. Pt. (Degrees)  
 Start      End      Start      End

Vertical Angle to Obs. Pt.      Direction to Obs. Pt. (Degrees)  
 Start      End      Start      End  
 Distance and Direction to Observation Point from Emission Point  
 Start      End

Describe Emissions  
 Start      End  
 Emission Color      Water Droplet Plume  
 Start      End      Attached       Detached       None

Describe Plume Background  
 Start      End  
 Background Color      Sky Conditions  
 Start      End      Start      End  
 Wind Speed      Wind Direction  
 Start      End      Start      End  
 Ambient Temp.      Wet Bulb Temp.      RH Percent  
 Start      End

Source Layout Sketch      Draw North Arrow  
 TN       MN  
  
 Longitude      Latitude      Declination: **60**

Observation Date	Time Zone	Start Time	End Time				
Oct 22, 96	EDST	12:20	12:50				
Sec	0	15	30	45	Comments		
1	0	0	0	0			
2	0	0	0	0			
3	0	0	0	0			
4	0	0	0	0			
5	0	0	0	0			
6	0	0	0	0			
7	0	0	0	0			
8	0	0	0	0			
9	0	0	0	0			
10	0	0	0	0			
11	0	0	0	0			
12	0	0	0	0			
13	0	0	0	0			
14	0	0	0	0			
15	0	0	5	0	ACTUALLY LESS THAN		
16	0	0	0	0	5% - BUT SOME.		
17	0	0	0	0			
18	0	0	0	0			
19	0	0	0	0			
20	0	0	0	0			
21	0	0	0	0			
22	0	0	0	0			
23	0	0	0	0			
24	0	0	0	0			
25	0	0	0	0			
26	0	0	0	0			
27	0	0	0	0			
28	0	0	0	0			
29	0	0	0	0			
30	0	0	0	0	STOPPED TO REPOSITION OBSERVER'S POSITION.		

Observer's Name (Print): **PAUL D. GRABLE**  
 Observer's Signature: *Paul D. Grable*      Date: **Oct 22, 1996**  
 Organization: **PACIFIC ENVIRONMENTAL SERVICES**  
 Certified by: **EASTERN TECHNICAL ASSOCIATES**      Date: **9/26/96**

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9 203A 2038 Other: \_\_\_\_\_

Company Name  
 APG LINE CORPORATION  
 Facility Name  
 KIMBALLTON PLANT  
 Street Address  
 STATE ROUTE 635  
 City  
 RIPPLEMEAD State  
 VA Zip  
 24150

Process  
 LINE MANUFACTURING Unit #  
 Operating Mode  
 CONTINUOUS  
 Control Equipment  
 FABRIC FILTER Operating Mode  
 CONTINUOUS

Describe Emission Point  
 FABRIC FILTER BASHORSE STACK  
 Height of Emiss. Pt.  
 Start 7 100 FT End 100 FT  
 Height of Emiss. Pt. Rel. to Observer  
 Start 20 FT End 20 FT  
 Distance to Emiss. Pt.  
 Start 400' End 400' Direction to Emiss. Pt. (Degrees)  
 Start WEST End WEST

Vertical Angle to Obs. Pt.  
 Start End  
 Direction to Obs. Pt. (Degrees)  
 Start End  
 Distance and Direction to Observation Point from Emission Point  
 Start End

Describe Emissions  
 Start End  
 Emission Color Water Droplet Plume  
 Start End Attached  Detached  None

Describe Plume Background  
 Start End  
 Background Color Sky Conditions  
 Start End  
 Wind Speed Wind Direction  
 Start VARIABLE End VARIABLE Start SOUTH End SOUTH  
 Ambient Temp. Wet Bulb Temp. RH Percent  
 Start 68 F End SAME

Source Layout Sketch  
 Draw North Arrow  
 TN  MN  
  
 Longitude Latitude Declination 70

Additional Information

Form Number APG 02 Page 1 of 34  
 Continued on VEO Form Number APG 02 2 of 4

Observation Date		Time Zone		Start Time	End Time	Comments
Oct 22, 1996		EDST		12:59 PM	13:29	
Sec	Min	0	15	30	45	
1	0	0	0	0		REPOSITIONED TO NEW LOCATION
2	0	0	0	0		
3	0	0	0	0		
4	0	0	0	5		LESS THAN 5
5	0	0	0	0		
6	0	0	0	0		
7	0	0	0	5		LESS THAN 5
8	0	0	0	0		
9	0	0	0	0		
10	0	0	0	0		
11	0	0	0	0		
12	0	0	0	0		
13	0	0	0	0		
14	5	0	5	0		LESS THAN 5
15	0	0	0	0		
16	0	0	0	0		
17	0	0	0	5		LESS THAN 5
18	5	5	0	0		LESS THAN 5
19	0	0	0	0		
20	0	0	0	0		
21	0	0	0	0		
22	0	0	0	0		
23	0	0	0	0		
24	0	0	5	5		SLIGHTLY LESS 5
25	0	5	5	5		
26	5	0	0	5		
27	5	0	5	0		
28	0	5	0	0		
29	0	0	0	0		
30	0	5	0	0		

Observer's Name (Print)  
 PAUL D. GRABLE  
 Observer's Signature  
 Paul D. Grable Date  
 October 22, 1996  
 Organization  
 PACIFIC ENVIRONMENTAL SERVICES  
 Certified By  
 EASTERN TECHNICAL ASSOCIATES Date  
 9/26/96

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9 203A 203B Other: \_\_\_\_\_

Company Name **APG LIME CORPORATION**  
 Facility Name **KIMBALLTON PLANT**  
 Street Address **STATE ROUTE 635**  
 City **RIPPLEMEAD** State **VA** Zip **24150**

Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point  
 \_\_\_\_\_  
 \_\_\_\_\_  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Source Layout Sketch  
 Draw North Arrow  TN  MN  
  
 Longitude \_\_\_\_\_ Latitude \_\_\_\_\_ Declination \_\_\_\_\_

Additional Information  
 \_\_\_\_\_  
 \_\_\_\_\_

Form Number **APG 02** Page **2** of **3** of **4**  
 Continued on VEO Form Number **APG 02** 3 of 4

Observation Date		Time Zone		Start Time	End Time
OCT 22, 1996		EST		1:29 PM	
Sec	0	15	30	45	Comments
Min					
1	0	0	0	0	
2	5	0	0	0	
3	0	0	0	5	
4	5	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	5	LESS THAN 5%
9	0	5	0	0	
10	0	5	5	5	
11	5	0	5	5	
12	5	0	5	0	LESS THAN 5%
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	5	5	5	
17	5	5	5	5	
18	5	5	5	5	
19	5	5	5	5	
20	5	5	5	0	
21	*5	*5	0	*5	* LESS THAN 5%
22	*5	0	0	0	* LESS THAN 5%
23	5	0	0	0	
24	0	*5	5	0	* LESS THAN 5%
25	5	*5	0	0	* LESS THAN 5%
26	0	0	5	5	
27	0	0	0	*5	LESS THAN 5%
28	5	*5	0	0	* LESS THAN 5%
29	*5	0	5	5	* LESS THAN 5%
30	0	0	0	0	

Observer's Name (Print) **PAUL D. GRABLE**  
 Observer's Signature **Paul D. Grable** Date **10/22/96**  
 Organization **PACIFIC ENVIRONMENTAL SERVICES**  
 Certified by **EASTERN TECHNICAL ASSOCIATES** Date **9/26/96**

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9 203A 203B Other: \_\_\_\_\_

Company Name  
**APG LIME CORPORATION**

Facility Name  
**KIMBALLTON PLANT**

Street Address  
**STATE ROUTE 635**

City **RIPPLEMEAD** State **VA** Zip **24150**

Process Unit # Operating Mode

Control Equipment Operating Mode

Describe Emission Point

Height of Emiss. Pt. Height of Emiss. Pt. Rel. to Observer

Start End Start End

Distance to Emiss. Pt. Direction to Emiss. Pt. (Degrees)

Start End Start End

Vertical Angle to Obs. Pt. Direction to Obs. Pt. (Degrees)

Start End Start End

Distance and Direction to Observation Point from Emission Point

Start End

Describe Emissions

Start End

Emission Color Water Droplet Plume

Start End Attached  Detached  None

Describe Plume Background

Start End

Background Color Sky Conditions

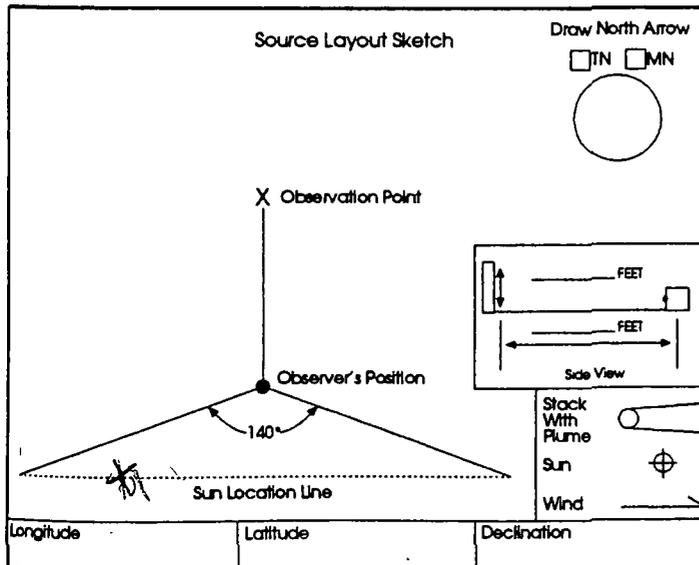
Start End Start End

Wind Speed Wind Direction

Start End Start End

Ambient Temp. Wet Bulb Temp. RH Percent

Start End Start End



Additional Information

Form Number **AP602** Page **3** of **3/4**

Continued on VEO Form Number **AP602 4/4**

Observation Date	Time Zone	Start Time	End Time					
<b>07/22/96</b>	<b>EDST</b>	<b>1:59 PM</b>	<b>2:28 PM</b>					
Sec	0	15	30	45	Comments			
Min								
1	0	0	0	0				
2	0	0	0	0				
3	0	0	0	0				
4	0	0	0	0				
5	0	0	0	0				
6	0	0	0	0				
7	0	0	0	0				
8	0	*5	0	0	LESS THAN 5%			
9	0	0	0	0				
10	0	0	0	0				
11	0	0	0	0				
12	5	5	5	0				
13	0	0	0	0				
14	0	5	5	5				
15	5	5	5	*5	LESS THAN 5%			
16	*5	0	*5	0				
17	0	0	0	0				
18	0	5	5	0				
19	0	0	0	0				
20	0	0	0	0				
21	0	0	0	0				
22	0	0	*5	0	* LESS THAN 5%			
23	0	0	*5	5	* LESS THAN 5%			
24	5	5	*5	0	* LESS THAN 5%			
25	0	0	0	0				
26	0	0	0	*5	* LESS THAN 5%			
27	0	0	0	0				
28	0	5	5	0				
29	0	0	0	0				
30	0	0	0	0	END - REPOSITIONING			

Observer's Name (Print) **PAUL D. GRABLE**

Observer's Signature **Paul D. Grable** Date **10/22/96**

Organization **PACIFIC ENVIRONMENTAL SERVICES**

Certified By **EASTERN TECHNICAL ASSOCIATES** Date **9/26/96**

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One) Method 9 203A 203B Other: \_\_\_\_\_

Company Name APG - LIME CORPORATION  
 Facility Name KIMBALLTOD  
 Street Address STATE ROUTE 635  
 City RIPPLEHEAD State VA Zip 24150

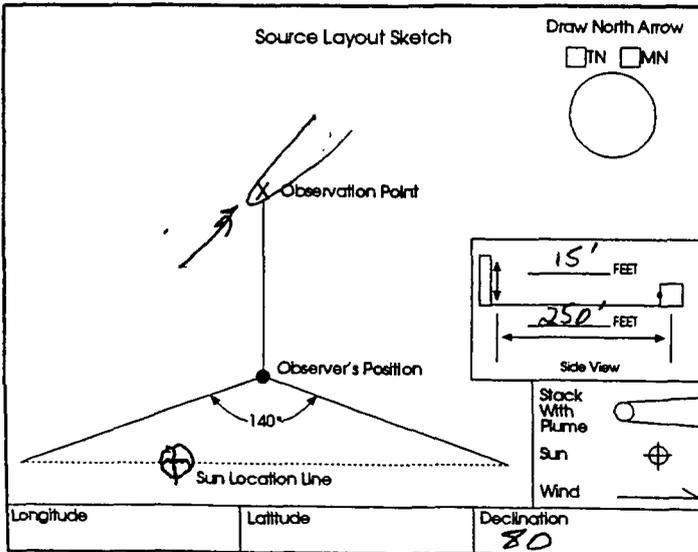
Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point \_\_\_\_\_  
 \_\_\_\_\_  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_



Additional Information \_\_\_\_\_  
 \_\_\_\_\_

Form Number APG 02 Page 4 of 4  
 Continued on VEO Form Number END

Min	Time Zone				Start Time	End Time	Comments
	0	15	30	45			
	OCT 22, 96 EDT				14:40	14:45	
1	0	0	0	0			REPOSITIONED
2	0	0	0	0			
3	0	0	0	0			
4	0	0	0	0			
5	0	0	0	0			
6	0	0	0	0			
7							END OBSERVATIONS
8							WHILE PROBES
9							SHIFTED.
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

Observer's Name (Print) PAUL D. GRABLE  
 Observer's Signature Paul D. Grable Date October 22, 1996  
 Organization PACIFIC ENVIRONMENTAL SERVICES  
 Certified by EASTERN TECHNICAL ASSOC. Date 9/26/1996

VISIBLE EMISSION OBSERVATION FORM 1

Form Number APG 03 Page 2 of 5  
 Continued on VEO Form Number APG 03 2 of 5

Method Used (Circle One)  
 (Method 9) 203A 203B Other: \_\_\_\_\_

Company Name APG LIME CORPORATION  
 Facility Name KIMBALTON PLANT  
 Street Address STATE ROUTE 635  
 City RIPPLEMEAD State VA Zip 24150

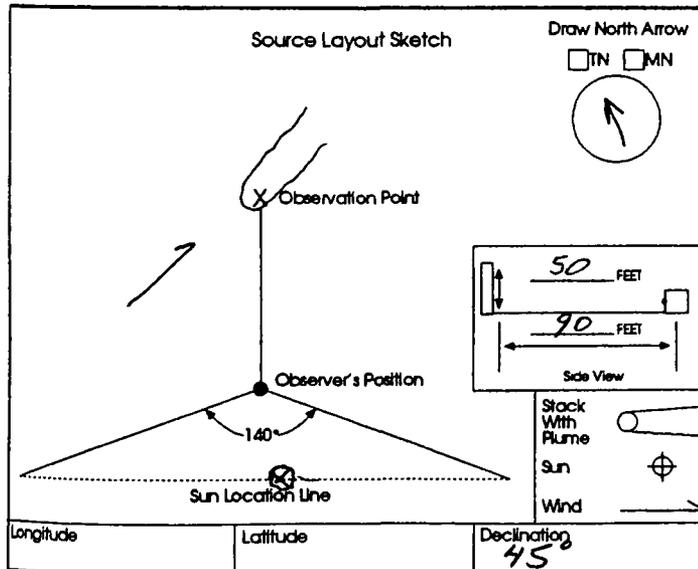
Process LIME MANUFACTURING Unit # \_\_\_\_\_ Operating Mode CONTINUOUS  
 Control Equipment FABRIL FILTERS Operating Mode CONTINUOUS

Describe Emission Point  
BAG HOUSE STACK  
 Height of Emiss. Pt. Start 2100' End 100' Height of Emiss. Pt. Rel. to Observer Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. Start \_\_\_\_\_ End \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. Start \_\_\_\_\_ End \_\_\_\_\_ Direction to Obs. Pt. (Degrees) Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions  
 Start \_\_\_\_\_ End \_\_\_\_\_ Emission Color \_\_\_\_\_ Water Droplet Plume Attached  Detached  None   
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Plume Background  
 Start BLUE SKY WITH HIGH WISPY CLOUDS End \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Background Color BLUE End BLUE Start PL. End \_\_\_\_\_  
 Wind Speed Start LIGHT End \_\_\_\_\_ Wind Direction Start N End N  
 Ambient Temp. Start 68°F End 68°F Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_



Additional Information

Sec Min	Time Zone				Start Time	End Time	Comments
	0	15	30	45			
1	0	0	0	0	15:49		New position: On
2	0	0	0	0			old house.
3	0	0	0	0			
4	0	0	0	0			
5	0	0	0	0			
6	0	0	0	0			
7	0	0	0	0			
8	0	0	0	0			
9	0	0	0	0			
10	0	0	0	0			
11	0	0	0	0			
12	0	0	0	0			
13	0	0	0	0			
14	5	5	5	5			*25% LESS 5%
15	0	0	0	5			*25%
16	5	5	5	0			
17	0	5	0	0			*25%
18	0	0	0	0			
19	0	0	0	0			
20	0	0	0	0			
21	0	0	0	5			
22	5	5	5	5			*25%
23	5	0	0	0			
24	5	5	5	5			*25%
25	5	0	0	0			*25%
26	0	0	0	0			
27	0	0	0	0			
28	0	0	0	0			
29	0	0	0	0			
30	0	0	0	0			

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Form Number APG 03 Page 2 of 5  
 Continued on VEO Form Number APG 03 3 of 5

Method Used (Circle One)  
 Method 9 203A 2038 Other: \_\_\_\_\_

Company Name APG LIME CORPORATION  
 Facility Name KIMBALLTOD PLANT  
 Street Address STATE ROUTE 635  
 City RIPPLEMEAD State VA Zip 24150

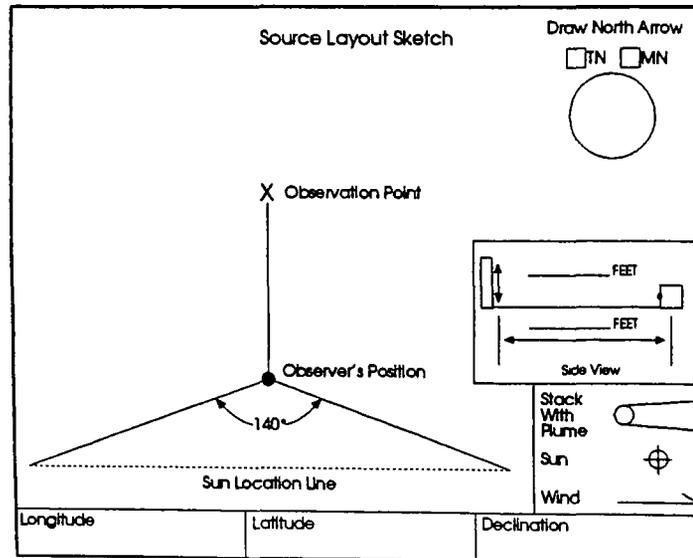
Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point \_\_\_\_\_  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_



Additional Information \_\_\_\_\_

Sec Min	Time Zone				Start Time	End Time
	0	15	30	45		
1	0	0	0	0	16:19	
2	0	0	0	0		
3	0	0	0	0		
4	0	0	0	0		
5	0	0	0	0		
6	0	0	0	0		
7	0	0	0	0		
8	0	0	0	0		
9	0	0	0	0		
10	0	0	0	0		
11	0	*5	*5	0		* < 5%
12	0	0	0	0		
13	0	0	0	0		
14	0	0	0	0		
15	0	0	0	0		
16	0	0	0	0		
17	0	0	0	0		
18	0	0	0	0		
19	0	0	0	0		
20	0	0	0	0		
21	0	0	0	0		
22	0	0	0	0		
23	0	0	0	0		
24	0	0	0	0		
25	0	0	0	0		
26	0	0	0	0		
27	0	0	0	0		
28	0	0	0	0		
29	0	0	0	0		
30	0	0	0	0		

Observer's Name (Print) PAUL D. GRABLE  
 Observer's Signature Paul D. Grable Date Oct 22, 1996  
 Organization PACIFIC ENVIRONMENTAL SERVICES  
 Certified by EASTERN TECHNICAL ASSOC. Date 9/26/96

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 (Method 9) 203A 203B Other: \_\_\_\_\_

Company Name **APG LIME CORPORATION**  
 Facility Name **KIMBALLTON PLANT**  
 Street Address **STATE ROUTE 635**  
 City **TRIPPLEMEAD** State **VA** Zip **24150**

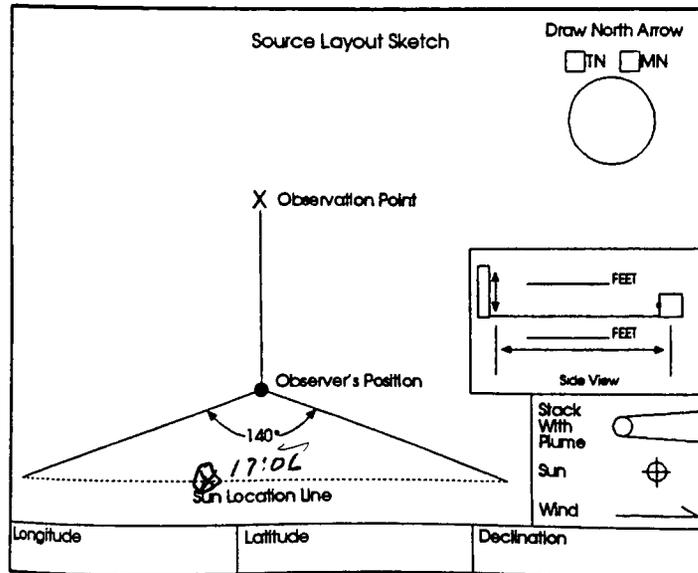
Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point  
 \_\_\_\_\_  
 \_\_\_\_\_  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_



Additional Information  
 \_\_\_\_\_  
 \_\_\_\_\_

Form Number **APG 03** Page **3** of **5**  
 Continued on VEO Form Number **APG 03 4 of 5**

Observation Date	Time Zone	Start Time	End Time					
10/22/96	EDST	16:49						
Sec Min	0	15	30	45	Comments			
1	0	0	0	0				
2	0	0	0	0				
3	0	0	0	0				
4	0	0	0	0				
5	0	0	0	0				
6	0	0	0	0				
7	0	0	0	0				
8	0	0	0	0				
9	0	0	0	0				
10	0	0	0	0				
11	0	0	0	0				
12	0	0	0	0				
13	0	0	0	0				
14	0	0	0	0				
15	0	0	0	0				
16	0	0	0	0				
17	0	0	0	0				
18	0	0	0	0				
19	0	0	0	0				
20	0	0	0	0				
21	0	0	0	0				
22	0	0	0	0				
23	0	0	0	0				
24	0	0	0	0				
25	0	0	0	0				
26	0	0	0	0				
27	0	0	0	0				
28	0	0	0	0				
29	0	0	0	5	< 5%			
30	0	0	0	0				

Observer's Name (Print) **PAUL D. GRABLE**  
 Observer's Signature **Paul D. Grable** Date **Oct 22, 1996**  
 Organization **PACIFIC ENVIRONMENTAL SERVICES**  
 Certified by **EASTERN TECHNICAL ASSOC.** Date **9/26/96**

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9    203A    203B    Other: \_\_\_\_\_

Company Name: **APG LIME CORPORATION**  
 Facility Name: **KIMBALLTON PLANT**  
 Street Address: **STATE ROUTE 635**  
 City: **RIPPLEMEAD**    State: **VA**    Zip: **24150**

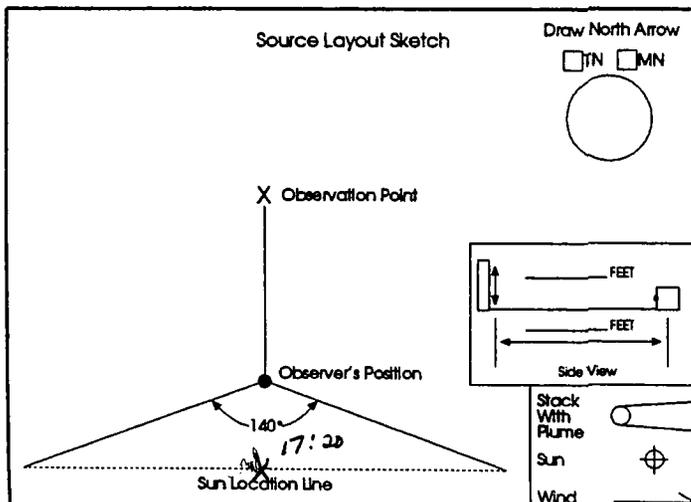
Process: \_\_\_\_\_ Unit #: \_\_\_\_\_ Operating Mode: \_\_\_\_\_  
 Control Equipment: \_\_\_\_\_ Operating Mode: \_\_\_\_\_

Describe Emission Point: \_\_\_\_\_  
 Height of Emiss. Pt. Start: \_\_\_\_\_ End: \_\_\_\_\_  
 Height of Emiss. Pt. Rel. to Observer Start: \_\_\_\_\_ End: \_\_\_\_\_  
 Distance to Emiss. Pt. Start: \_\_\_\_\_ End: \_\_\_\_\_  
 Direction to Emiss. Pt. (Degrees) Start: \_\_\_\_\_ End: \_\_\_\_\_

Vertical Angle to Obs. Pt. Start: \_\_\_\_\_ End: \_\_\_\_\_  
 Direction to Obs. Pt. (Degrees) Start: \_\_\_\_\_ End: \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point Start: \_\_\_\_\_ End: \_\_\_\_\_

Describe Emissions  
 Start: \_\_\_\_\_ End: \_\_\_\_\_  
 Emission Color: \_\_\_\_\_  
 Attached  Detached  None

Describe Plume Background  
 Start: \_\_\_\_\_ End: \_\_\_\_\_  
 Background Color: \_\_\_\_\_ Sky Conditions: \_\_\_\_\_  
 Wind Speed Start: \_\_\_\_\_ End: \_\_\_\_\_  
 Wind Direction Start: \_\_\_\_\_ End: \_\_\_\_\_  
 Ambient Temp. Start: \_\_\_\_\_ End: \_\_\_\_\_  
 Wet Bulb Temp. Start: \_\_\_\_\_ End: \_\_\_\_\_  
 RH Percent Start: \_\_\_\_\_ End: \_\_\_\_\_



Longitude: \_\_\_\_\_ Latitude: \_\_\_\_\_ Declination: \_\_\_\_\_

Additional Information: \_\_\_\_\_

Form Number: **APG 03** Page **4** of **5**  
 Continued on VEO Form Number: **APG 03 545**

Observation Date	Time Zone	Start Time	End Time	Comments				
10/22/96	EDST	17:19						
Sec Min	0	15	30	45				
1	0	0	0	0				
2	0	0	0	0				
3	0	0	0	0				
4	0	0	0	0				
5	0	0	0	0				
6	0	0	0	0				
7	0	0	0	0				
8	0	0	0	0				
9	0	0	0	0				
10	0	0	0	0				
11	0	0	0	0				
12	0	0	0	0				
13	0	0	0	0				
14	0	0	0	0				
15	0	5	5	0	* < 5%			
16	0	0	0	0				
17	0	0	0	0				
18	0	0	0	0				
19	0	0	0	0				
20	0	0	0	0				
21	0	0	0	0				
22	0	0	0	0				
23	0	0	0	0				
24	0	0	0	0				
25	0	0	0	0				
26	0	0	0	0				
27	0	0	0	0				
28	0	0	0	0				
29	0	0	0	0				
30	0	0	0	0				

Observer's Name (Print): **PAUL D. GRABLE**  
 Observer's Signature: *Paul D. Grable* Date: **Oct 22, 1996**  
 Organization: **PACIFIC ENVIRONMENTAL SERVICES**  
 Certified By: **EASTERN TECHNICAL ASSO** Date: **9/26/96**

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Form Number	APG 03	Page	5	of	5
Continued on VEO Form Number					
END					

Method Used (Circle One)  
 Method 9    203A    203B    Other: \_\_\_\_\_

Company Name: **APG LIME CORPORATION**  
 Facility Name: **KIMBALLTDD PLANT**  
 Street Address: **STATE ROUTE 635**  
 City: **RIPPLEMEAD**    State: **VA**    Zip: **24150**

Process: \_\_\_\_\_ Unit #: \_\_\_\_\_ Operating Mode: \_\_\_\_\_  
 Control Equipment: \_\_\_\_\_ Operating Mode: \_\_\_\_\_

Describe Emission Point

Height of Emiss. Pt.    Height of Emiss. Pt. Rel. to Observer  
 Start    End    Start    End  
 Distance to Emiss. Pt.    Direction to Emiss. Pt. (Degrees)  
 Start    End    Start    End

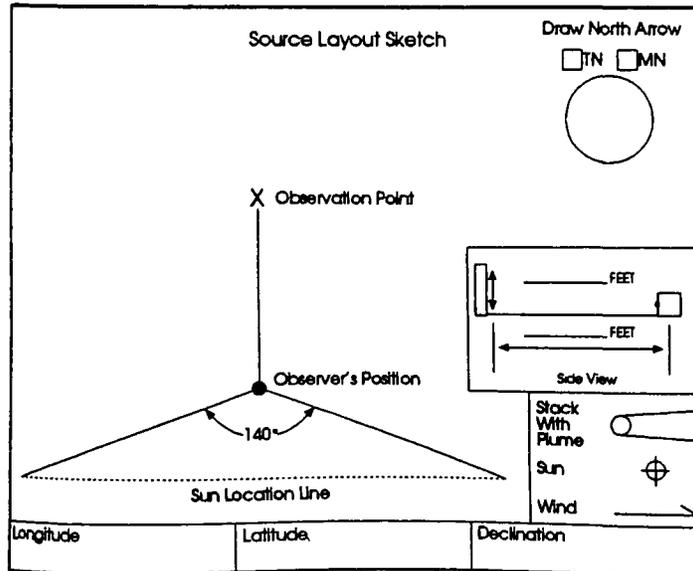
Vertical Angle to Obs. Pt.    Direction to Obs. Pt. (Degrees)  
 Start    End    Start    End  
 Distance and Direction to Observation Point from Emission Point  
 Start    End

Describe Emissions

Start    End  
 Emission Color    Water Droplet Plume  
 Start    End    Attached     Detached     None

Describe Plume Background

Start    End  
 Background Color    Sky Conditions  
 Start    End    Start    End  
 Wind Speed    Wind Direction  
 Start    End    Start    End  
 Ambient Temp.    Wet Bulb Temp.    RH Percent  
 Start    End



Additional Information

Observation Date	Time Zone	Start Time	End Time				
10/22/96	EDST	17:49	17:52				
Sec	0	15	30	45	Comments		
1	0	0	0	0			
2	0	0	0	0			
3	0	0	0	0			
4	17:52 TESTING COMPLETED.						
5	APGable						
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

Observer's Name (Print): **PAUL D. GRABLE**  
 Observer's Signature: *Paul D. Grable*    Date: **9/22/96**  
 Organization: **PACIFIC ENVIRONMENTAL SERVICES**  
 Certified by: **EASTERN TECHNICAL ASSOC.**    Date: **9/26/96**



VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9    203A    203B    Other: \_\_\_\_\_

Company Name **APG NINE CORPORATION**  
 Facility Name **KIMBALLTON PLANT**  
 Street Address **STATE ROUTE 635**  
 City **RIPPLEMEAD** State **VA** Zip **24150**

Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point \_\_\_\_\_  
 Height of Emis. Pt. \_\_\_\_\_ Height of Emis. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emis. Pt. \_\_\_\_\_ Direction to Emis. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Source Layout Sketch      Draw North Arrow  
 TN     MN  
  
 Longitude \_\_\_\_\_ Latitude \_\_\_\_\_ Declination \_\_\_\_\_

Additional Information \_\_\_\_\_  
 \_\_\_\_\_

Form Number **APG 04** Page **2** of **5**  
 Continued on VEO Form Number **APG 04 3 45**

Observation Date		Time Zone		Start Time	End Time
10/23/96		EST		11:16 AM	
Sec	0	15	30	45	Comments
Min					
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	5	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print) **PAUL D. GRABLE**  
 Observer's Signature **Paul D. Grable** Date **10/23/96**  
 Organization **PACIFIC ENVIRONMENTAL SERVICES**  
 Certified by **EASTERN TECHNICAL ASSOC.** Date **9/26/96**

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Form Number APG 04 Page 3 of 5  
 Continued on VEO Form Number APG 04 4 of 5

Method Used (Circle One)  
 Method 9    203A    203B    Other: \_\_\_\_\_

Company Name APG LIME CORPORATION  
 Facility Name KIMBALLTON PLANT  
 Street Address STATE ROUTE 635  
 City RIPPLEMEAD State VA Zip 24150

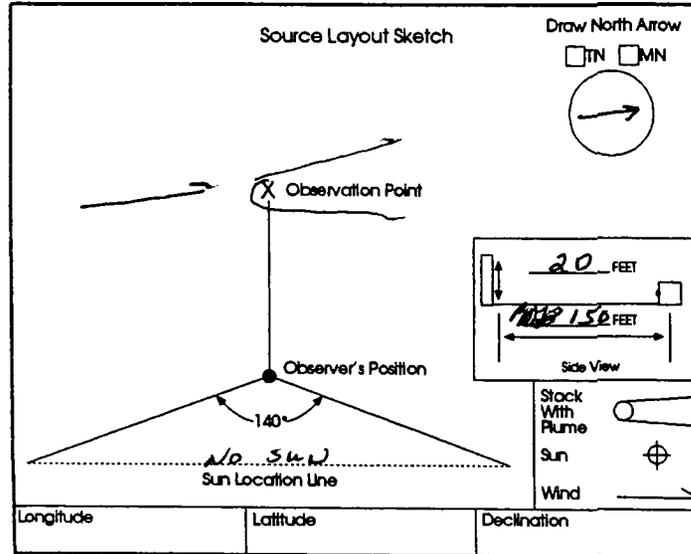
Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point \_\_\_\_\_  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_



Sec Min	Time Zone <u>EDST</u>				Start Time <u>11:46</u>	End Time
	0	15	30	45		
1	0	0	0	0		
2	0	0	0	0		
3	0	0	0	0		
4	0	0	0	0		
5	0	0	0	0		
6	0	0	0	0		
7	0	0	0	0		
8	0	0	0	0		
9	0	0	0	0		
10	0	0	0	0		
11	5	0	0	0		
12	6	6	0	0		
13	0	0	0	0		
14	0	0	0	0		
15	0	0	0	0		
16	0	0	0	0		
17	0	0	0	0		
18	0	0	0	0		
19	0	0	0	0		
20	0	0	0	0		
21	0	0	0	0		
22	0	0	0	0		
23	0	0	0	0		
24	0	0	0	0		
25	0	0	0	0		
26	0	0	0	0		
27	0	0	0	0		
28	0	0	0	0		
29	0	0	0	0		
30	0	0	0	0		

VISIBLE EMISSION OBSERVATION FORM 1

Form Number **AP604** Page **4** of **5**  
 Continued on VEO Form Number **AP604 5 of 5**

Method Used (Circle One) **Method 9** 203A 203B Other: \_\_\_\_\_

Company Name **APG LIME CORPORATION**  
 Facility Name **KIMBALLTOD PLANT**  
 Street Address **STATE ROUTE 635**  
 City **RIPPLEMEAD** State **VA** Zip **24150**

Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point \_\_\_\_\_  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Source Layout Sketch

Draw North Arrow  TN  MN

X Observation Point  
 Observer's Position  
 Sun Location Line  
 140°  
 FEET  
 FEET  
 Side View  
 Stack With Plume  
 Sun  
 Wind

Longitude \_\_\_\_\_ Latitude \_\_\_\_\_ Declination \_\_\_\_\_

Additional Information \_\_\_\_\_

Observation Date	Time Zone	Start Time	End Time	Comments	
10/23/96	EDST	12:16 PM	1:00 PM		
Sec	0	15	30	45	
Min	0	0	0	0	
1	0	0	0	0	
2	0	0	0	5	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	5	5	
25	5	0	0	0	* < 5 ft
26	0	5	5	5	* < 5 ft
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print) **PALL D. GRABLE**  
 Observer's Signature **Paul D. Grable** Date **OCT 23, 1996**  
 Organization **PACIFIC ENVIRONMENTAL SERVICES**  
 Certified By **PACIFIC TECH. ASSOC** Date **9/26/96**

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9 203A 203B Other: \_\_\_\_\_

Company Name APG LIME CORPORATION  
 Facility Name KIMBALLTON PLANT  
 Street Address STATE ROUTE 635  
 City RIPPLEMEAD State VA Zip 22150

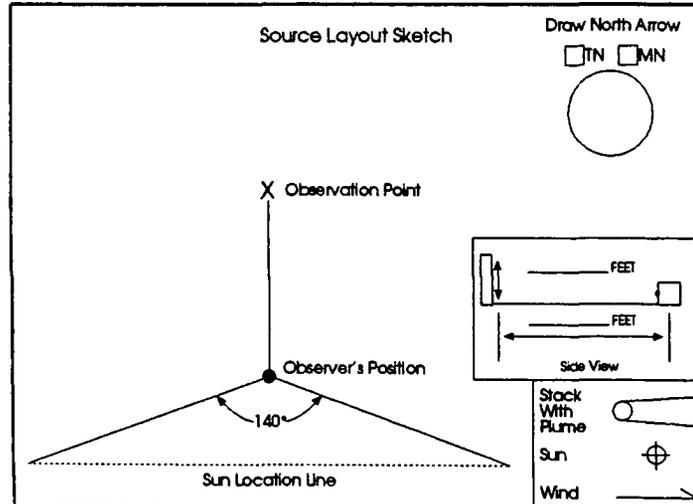
Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point  
 \_\_\_\_\_  
 \_\_\_\_\_  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_



Longitude \_\_\_\_\_ Latitude \_\_\_\_\_ Declination \_\_\_\_\_

Additional Information  
 \_\_\_\_\_  
 \_\_\_\_\_

Form Number APG 04 Page 5 of 5  
 Continued on VEO Form Number END

Observation Date	Time Zone	Start Time	End Time	Comments	
10/23/96	EDST	12:46 AM	12:59		
Sec	0	15	30	45	
Min					
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	-	-	STOPPED AT 12:59
15					NO SAMPLING
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

Observer's Name (Print) PAUL D. GRABLE  
 Observer's Signature Paul D. Grable Date OCT 23, 1996  
 Organization PACIFIC ENVIRONMENTAL SERVICES  
 Certified by EPSTEIN TECHNICAL ASSOC. Date SEPT 26, 96

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One) Method 9 203A 203B Other: \_\_\_\_\_

Company Name APG LIME CORPORATION  
 Facility Name KIMBALLTON PLANT  
 Street Address STATE ROUTE 635  
 City RIDPLEMEAD State VA Zip 24150

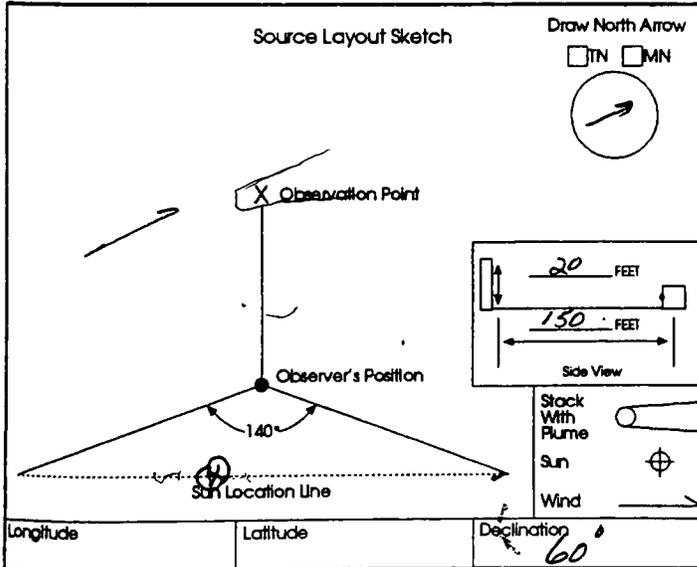
Process MANUFACTURING LIME Unit # \_\_\_\_\_ Operating Mode CONTINUOUS  
 Control Equipment BAG FILTERS Operating Mode CONTINUOUS

Describe Emission Point BAG FILTER HOUSE GROUND MOUNTED STACK.  
 Height of Emiss. Pt. Start 100' End 100' Height of Emiss. Pt. Rel. to Observer Start 20' End 20'  
 Distance to Emiss. Pt. Start 150 End \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. Start \_\_\_\_\_ End \_\_\_\_\_ Direction to Obs. Pt. (Degrees) Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions Start \_\_\_\_\_ End \_\_\_\_\_ Emission Color \_\_\_\_\_ Water Droplet Plume Attached  Detached  None

Describe Plume Background Start FALL COLORED POPARS End \_\_\_\_\_ Background Color Start YELLOW End YELLOW Sky Conditions Start BLUE End BRIGHT SUN  
 Wind Speed Start 5-10 End 10-25 MPH Wind Direction Start N End N  
 Ambient Temp. Start 58°F End \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_



Additional Information FRONT PASSED THROUGH - ALL OVERCAST  
BONE.

PLEASE NOTE: APG 05 NUMBER SKIPPED.

Form Number APG 06 Page 1 of 5  
 Continued on VEO Form Number APG 06 2 of 5

Sec Min	Time Zone <u>EDST</u>				Comments
	0	15	30	45	
1	0	0	0	0	TESTING RESUMED.
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print) PAUL D. GRABLE  
 Observer's Signature Paul D. Grable Date October 23, 1996  
 Organization PACIFIC ENVIRONMENTAL SERVICES  
 Certified By EASTERN TECHNICAL ASSOCIATES Date SEPT. 26/96

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9    203A    203B    Other: \_\_\_\_\_

Company Name  
**APG LIME CORPORATION**

Facility Name  
**KIMBALLTON PLANT**

Street Address  
**STATE ROUTE 635**

City  
**RIPPLEMEAD**    State  
**VA**    Zip  
**24150**

Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_

Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point

Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_

Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_

Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_

Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Distance and Direction to Observation Point from Emission Point

Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions

Start \_\_\_\_\_ End \_\_\_\_\_

Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_

Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background

Start \_\_\_\_\_ End \_\_\_\_\_

Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_

Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_

Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_

Start \_\_\_\_\_ End \_\_\_\_\_

Source Layout Sketch

Draw North Arrow  
 TN  MN

Observer's Position

Observation Point

Sun Location Line

140°

Stack With Plume

Sun

Wind

Longitude \_\_\_\_\_ Latitude \_\_\_\_\_ Declination \_\_\_\_\_

Additional Information

Form Number **APG 06** Page **2** of **5**

Continued on VEO Form Number **APG 06 3 of 5**

Observation Date		Time Zone		Start Time	End Time
10/23/96		EDST		14:14	
Sec	0	15	30	45	Comments
Min					
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print)  
**PAUL D. GRABLE**

Observer's Signature  
*Paul D. Grable*    Date  
**OCT 23, 1996**

Organization  
**PACIFIC ENVIRONMENTAL SERVICES**

Certified By  
**EASTERN TECHNICAL ASSOC.**    Date  
**SEPT 26, 1996**

VISIBLE EMISSION OBSERVATION FORM 1

Form Number	AP606	Page	3	of	5
Continued on VEO Form Number					
AP606 4 of 5					

Method Used (Circle One)  
 Method 9    203A    2038    Other: \_\_\_\_\_

Company Name  
**- APG LIME CORPORATION**

Facility Name  
**KIMBALLTUD PLANT**

Street Address  
**STATE ROUTE 635**

City    State    Zip  
**RIPPLEMEAD    VA    24150**

Process	Unit #	Operating Mode
Control Equipment		Operating Mode

Describe Emission Point

Height of Emiss. Pt. Start    End	Height of Emiss. Pt. Rel. to Observer Start    End
Distance to Emiss. Pt. Start    End	Direction to Emiss. Pt. (Degrees) Start    End

Vertical Angle to Obs. Pt. Start    End	Direction to Obs. Pt. (Degrees) Start    End
Distance and Direction to Observation Point from Emission Point Start    End	

Describe Emissions

Start	End	Water Droplet Plume
Start	End	Attached <input type="checkbox"/> Detached <input type="checkbox"/> None <input type="checkbox"/>

Describe Plume Background

Start	End	Background Color	Sky Conditions
Start	End	Wind Speed	Wind Direction
Start	End	Ambient Temp.	Wet Bulb Temp.    RH Percent
Start	End		

Source Layout Sketch

Draw North Arrow  
 TN     MN

Observer's Position

Observation Point

Sun Location Line

14:46

15:20

140°

FEET

FEET

Side View

Stack With Plume

Sun

Wind

Longitude	Latitude	Declination
-----------	----------	-------------

Sec Min	Time Zone				Start Time	End Time	Comments
	0	15	30	45			
1	0	0	0	0	14:44		
2	0	0	0	0			
3	0	0	0	0			
4	0	0	0	0			
5	0	0	0	0			
6	0	0	0	0			
7	0	0	0	0			
8	0	0	0	0			
9	0	0	0	0			
10	0	0	0	0			
11	0	0	0	0			
12	0	0	0	0			
13	0	0	0	0			
14	0	0	0	0			
15	0	0	0	0			
16	0	0	0	0			
17	0	0	0	0			
18	0	0	0	0			
19	0	0	0	0			
20	0	0	0	0			
21	0	0	0	0			
22	0	0	0	0			
23	0	0	0	0			
24	0	0	0	0			
25	0	0	0	0			
26	0	0	0	0			
27	0	0	0	0			
28	0	0	0	0			
29	0	0	0	0			
30	0	0	0	0			

Observer's Name (Print) **PAUL D. GRABLE**

Observer's Signature **Paul D. Grable**    Date **OCT 23, 1996**

Organization **PACIFIC ENVIRONMENTAL SERVICES**

Certified by **EASTERN TECHNICAL ASSOC.**    Date **SEPT 26, 96**

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9    203A    203B    Other: \_\_\_\_\_

Company Name  
*APG LIME CORPORATION*

Facility Name  
*KIMBALLTON PLANT*

Street Address  
*STATE ROUTE 635*

City  
*RIPPLEMEAD*    State  
*VA*    Zip  
*24150*

Process    Unit #    Operating Mode

Control Equipment    Operating Mode

Describe Emission Point

Height of Emiss. Pt.    Height of Emiss. Pt. Rel. to Observer

Start    End    Start    End

Distance to Emiss. Pt.    Direction to Emiss. Pt. (Degrees)

Start    End    Start    End

Vertical Angle to Obs. Pt.    Direction to Obs. Pt. (Degrees)

Start    End    Start    End

Distance and Direction to Observation Point from Emission Point

Start    End

Describe Emissions

Start    End

Emission Color    Water Droplet Plume

Start    End    Attached     Detached     None

Describe Plume Background

Start    End

Background Color    Sky Conditions

Start    End    Start    End

Wind Speed    Wind Direction

Start    End    Start    End

Ambient Temp.    Wet Bulb Temp.    RH Percent

Start    End

Source Layout Sketch

Draw North Arrow  
 TN     MN

X Observation Point

Observer's Position

140°

Sun Location Line

15:15

FEET

FEET

Side View

Stack With Plume

Sun

Wind

Longitude    Latitude    Declination

Additional Information

Form Number *AP 606* Page *4* of *5*

Continued on VEO Form Number *AP 606 5 of 5*

Sec Min	Time Zone				Start Time	End Time	Comments
	0	15	30	45			
1	0	0	0	0	15:14		
2	0	0	0	0			
3	0	0	0	0			
4	0	0	0	0			
5	0	0	0	0			
6	0	0	0	0			
7	0	0	0	0			
8	0	0	0	0			
9	0	0	0	0			
10	0	0	0	0			
11	0	0	0	0			
12	0	0	0	0			
13	0	0	0	0			
14	0	0	0	0			
15	0	0	0	0			
16	0	0	0	0			
17	0	0	0	0			
18	0	0	0	0			
19	0	0	0	0			
20	0	0	0	0			
21	0	5	5	0			* < 5%
22	0	0	0	0			
23	0	0	0	0			
24	0	0	0	0			
25	0	0	0	0			
26	0	0	0	0			
27	0	0	0	0			
28	0	0	0	0			
29	0	0	0	0			
30	0	0	0	0			

Observer's Name (Print) *PAUL D. GRABLE*

Observer's Signature *Paul D. Grable*    Date *OCT 23, 1996*

Organization *PALMCO ENVIRONMENTAL SERVICES*

Certified by *EASTERN TECHNICAL ASSOC*    Date *SEPT 26, 1996*



EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9 203A 2038 Other: \_\_\_\_\_

Company Name  
**APG LIME COMPANY**

Facility Name  
**KIMBALLTON PLANT**

Street Address  
**STATE ROUTE 235**

City **RIPPLEMEAD** State **VA** Zip **24150**

Process **ABRAVATING LIME** Unit # \_\_\_\_\_ Operating Mode **CONTINUOUS**

Control Equipment **FABRIC FILTERS** Operating Mode **CONTINUOUS**

Describe Emission Point  
**GROUND MOUNTED STACK FROM FABRIC FILTER ROOF HOUSE - KILN**

Height of Emiss. Pt. Start **100** End **100** Height of Emiss. Pt. Rel. to Observer Start **20'** End **20'**

Distance to Emiss. Pt. Start **150** End **150** Direction to Emiss. Pt. (Degrees) Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. Start **10°** End \_\_\_\_\_ Direction to Obs. Pt. (Degrees) Start **320°** End **320°**

Distance and Direction to Observation Point from Emission Point Start **150** End **150**

Describe Emissions  
 Start **CLEAR STACK** End \_\_\_\_\_ Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_

Start **N/A** End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background  
 Start **MOUNTAIN ON OPPOSITE SIDE OF VALLEY** End \_\_\_\_\_ Background Color **BLUE YELLOW** Sky Conditions **BLUE SKY**

Start **SMALL CLOUDS** End \_\_\_\_\_ Wind Speed Start **2-3 MPH** End \_\_\_\_\_ Wind Direction Start **180°** End \_\_\_\_\_

Ambient Temp. Start **67.5°F** End \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_

Source Layout Sketch

Draw North Arrow  TN  MN

Observer's Name (Print)  
**PAUL D. GRABLE**

Observer's Signature  
*Paul D. Grable*

Date  
**October 24, 1996**

Organization  
**PACIFIC ENVIRONMENTAL SERVICES**

Certified by  
**EASTERN TECHNICAL ASSOC.**

Date  
**9/26/1996**

Form Number **AP607** Page **1** of **6**

Continued on VEO Form Number **AP607 2 of 6**

Sec Min	Time Zone				Start Time	End Time	Comments
	0	15	30	45			
1	0	0	0	0	10:57 AM		START
2	0	0	0	0			
3	0	0	0	0			
4	0	0	0	0			
5	0	0	0	0			
6	0	0	0	0			
7	0	0	0	0			
8	0	0	0	0			
9	0	0	0	0			
10	0	0	0	0			
11	0	0	0	0			
12	0	0	0	0			
13	0	0	0	0			
14	0	0	0	0			
15	0	0	0	0			
16	0	0	0	0			
17	0	0	0	0			
18	0	0	0	0			
19	0	0	0	0			
20	0	0	0	0			
21	0	0	0	0			
22	0	0	0	0			
23	0	0	0	0			
24	0	0	0	0			
25	0	0	0	0			
26	0	0	0	0			
27	0	0	0	0			
28	0	0	0	0			
29	0	0	0	0			
30	0	0	0	0			

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9 203A 203B Other \_\_\_\_\_

Company Name **APG LIME CORPORATION**  
 Facility Name **KIMBALLTON PLANT**  
 Street Address **STATE ROUTE 635**  
 City **RIPPLEMEAD** State **VA** Zip **24150**

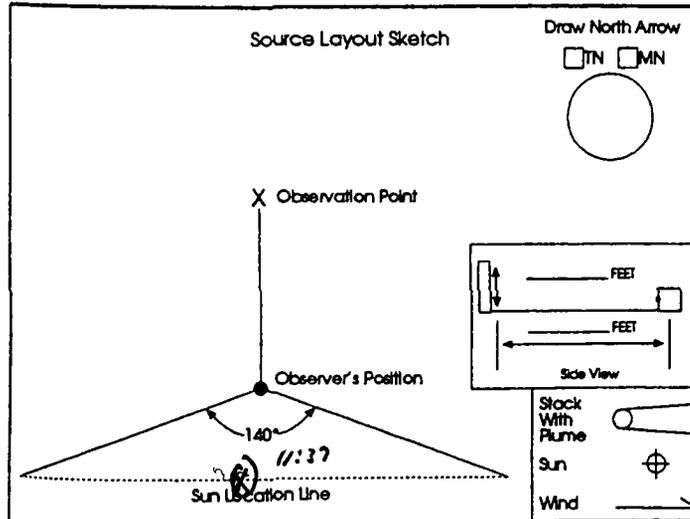
Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point \_\_\_\_\_  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_



Longitude \_\_\_\_\_ Latitude \_\_\_\_\_ Declination \_\_\_\_\_

Additional Information \_\_\_\_\_

Form Number **APG07** Page **2** of **6**  
 Continued on VEO Form Number **APG07 3 of 6**

Observation Date	Time Zone	Start Time	End Time				
10/24	EDST	11:26/7:00					
Sec	Min	0	15	30	45	Comments	
1	0	0	0	0	0		
2	0	0	0	0	0		
3	0	0	0	0	0		
4	0	0	0	0	0		
5	0	0	0	0	0		
6	0	0	0	0	0		
7	0	0	0	0	0		
8	0	0	0	0	0		
9	0	0	0	0	0		
10	0	0	0	0	0		
11	0	0	0	0	0		
12	0	0	0	0	0		
13	0	0	0	0	0		
14	0	0	0	0	0		
15	0	0	0	0	0		
16	0	0	0	0	0		
17	0	0	0	0	0		
18	0	0	0	0	0		
19	0	0	0	0	0		
20	0	0	0	0	0		
21	0	0	0	0	0		
22	0	0	0	0	0		
23	0	0	0	0	0		
24	0	0	0	0	0		
25	0	0	0	0	0		
26	0	0	0	0	0		
27	0	0	0	0	0		
28	0	0	0	0	0		
29	0	0	0	0	0		
30	0	0	0	0	0		

Observer's Name (Print) **PAUL D. GRABLE**  
 Observer's Signature **Paul D. Grable** Date **OCT 24, 1996**  
 Organization **PACIFIC ENVIRONMENTAL SERVICES**  
 Certified by **EASTARD TECHNICAL ASSOC.** Date **9/26/96**

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Form Number **AP607** Page **3** of **6**  
 Continued on VEO Form Number **AP607 4/6**

Method Used (Circle One)  
 Method 9    203A    2038    Other: \_\_\_\_\_

Company Name **APG LIME CORPORATION**  
 Facility Name **KIMBALLION PLANT**  
 Street Address **STATE ROUTE 635**  
 City **RIFFLEMEAD** State **VA** Zip **24150**

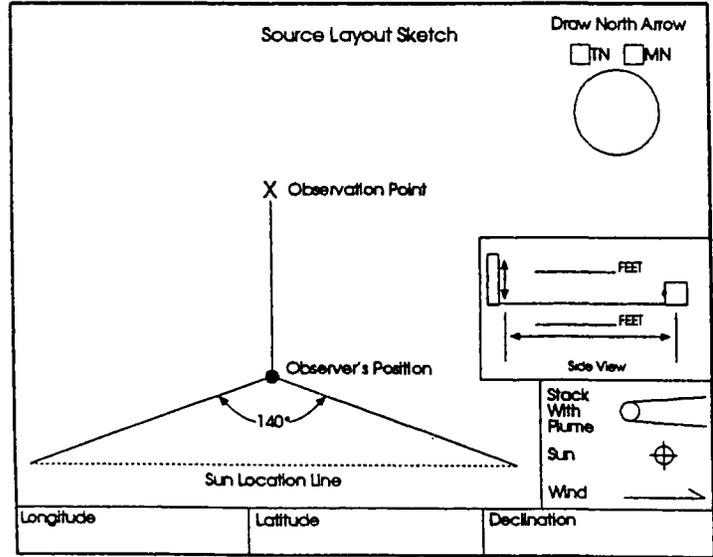
Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point \_\_\_\_\_  
 \_\_\_\_\_  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_



Sec Min	Time Zone				Start Time	End Time	Comments
	0	15	30	45			
1	0	0	0	0	11:57 AM		
2	0	0	0	0			
3	0	0	0	0			
4	0	0	0	0			
5	0	0	0	0			
6	0	0	0	0			
7	0	0	0	0			
8	0	0	0	0			
9	0	0	0	0			
10	0	0	0	0			
11	0	0	0	0			
12	0	0	0	0			
13	0	0	0	0			
14	0	0	0	0			
15	0	0	0	0			
16	0	0	0	0			
17	0	0	0	0			
18	0	0	0	0			
19	0	0	0	0			
20	0	0	0	0			
21	0	0	0	0			
22	0	0	0	0			
23	0	0	0	0			
24	0	0	0	0			
25	0	0	0	0			
26	0	0	0	0			
27	0	0	0	0			
28	0	0	0	0			
29	0	0	0	0			
30	0	0	0	0			

Observer's Name (Print) **PAUL D. GRABLE**  
 Observer's Signature **Paul D. Grable** Date **Oct 24, 1996**  
 Organization **PACIFIC ENVIRONMENTAL SERVICES**  
 Certified by **STEPHEN TECHNICAL ASSOC** Date **9/10/96**

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9 203A 203B Other: \_\_\_\_\_

Company Name **APG LIME CORPORATION**  
 Facility Name **KIMBALLTON PLANT**  
 Street Address **STATE ROUTE 635**  
 City **RIPPLEMEAD** State **VA** Zip **24150**

Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point  
 \_\_\_\_\_  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees)  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees)  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent  
 Start \_\_\_\_\_ End \_\_\_\_\_

Source Layout Sketch  
 Draw North Arrow  TN  MN  
  
 X Observation Point  
 Observer's Position  
 140°  
 12:28  
 Sun Location Line  
 Stack With Plume  
 Sun  
 Wind  
 FEET  
 FEET  
 Side View  
 Longitude \_\_\_\_\_ Latitude \_\_\_\_\_ Declination \_\_\_\_\_

Additional Information  
 \_\_\_\_\_  
 \_\_\_\_\_

Form Number **APG 07** Page **4** of **6**  
 Continued on VEO Form Number **APG 07 546**

Observation Date		Time Zone		Start Time	End Time
10/24/96		EDST		12:27 PM	
Sec	0	15	30	45	Comments
Min					
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print) **PAUL D. GRABLE**  
 Observer's Signature **Paul D. Grable** Date **Oct 24, 1996**  
 Organization **PACIFIC ENVIRONMENTAL SERVICES**  
 Certified by **EASTERN TECHNICAL ASSO.** Date **9/26/96**

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One) Method 9 203A 2038 Other: \_\_\_\_\_

Company Name APG LIME CORPORATION  
 Facility Name KIMBALLTON PLANT  
 Street Address STATE ROUTE 635  
 City RIPPLEMEAD State USA Zip 24150

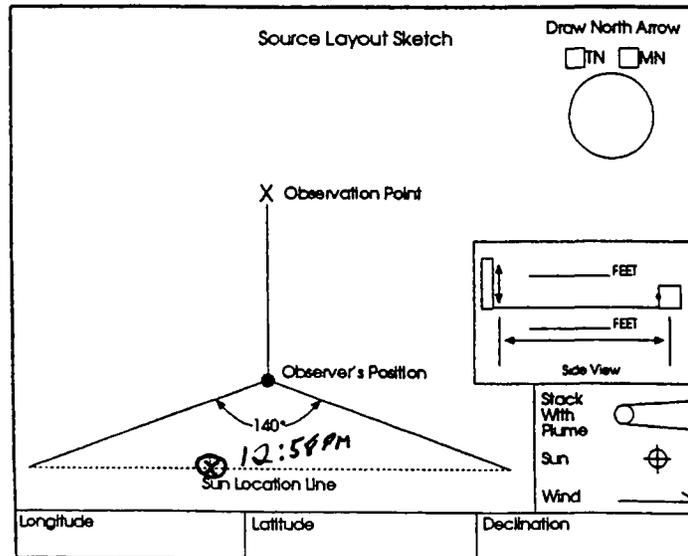
Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point \_\_\_\_\_  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_



Additional Information \_\_\_\_\_

Form Number APG 07 Page 5 of 6  
 Continued on VEO Form Number APG 07 6/6

Sec Mn	Time Zone				Start Time	End Time	Comments
	0	15	30	45			
1	0	0	0	0	10:57 AM		
2	0	0	0	0			
3	0	0	0	0			
4	0	0	0	0			
5	0	0	0	0			
6	0	0	0	0			
7	0	0	0	0			
8	0	0	0	0			
9	0	0	0	0			
10	0	0	0	0			
11	0	0	0	0			
12	0	0	0	0			
13	0	0	0	0			
14	0	0	0	0			
15	0	0	0	0			
16	0	0	0	0			
17	0	0	0	0			
18	0	0	0	0			
19	0	0	0	0			
20	0	0	0	0			
21	0	0	0	0			
22	0	0	0	0			
23	0	0	0	0			
24	0	0	0	0			
25	0	0	0	0			
26	0	0	0	0			
27	0	0	0	0			
28	0	0	0	0			
29	0	0	0	0			
30	0	0	0	0			

Observer's Name (Print) PAUL D. GRABLE  
 Observer's Signature Paul D. Grable Date OCT 24, 1996  
 Organization PACIFIC ENVIRONMENTAL SERVICES  
 Certified By EASTERN TECHNICAL ASOC Date 9/26/96

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9 203A 2038 Other: \_\_\_\_\_

Company Name **APG LIME CORPORATION**  
 Facility Name **KIMBAWTON PLANT**  
 Street Address **STATE ROUTE 635**  
 City **RIPPLEMEAD** State **VA** Zip **24150**

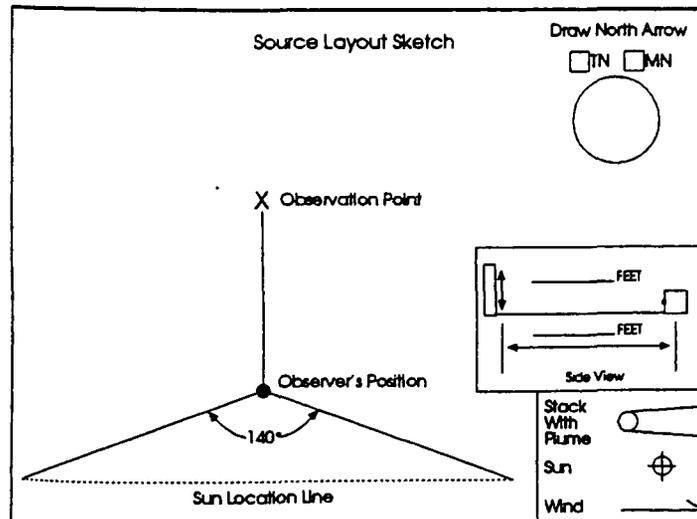
Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point \_\_\_\_\_  
 Height of Emiss. Pt. Start \_\_\_\_\_ End \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. Start \_\_\_\_\_ End \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. Start \_\_\_\_\_ End \_\_\_\_\_ Direction to Obs. Pt. (Degrees) Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions  
 Start \_\_\_\_\_ End \_\_\_\_\_ Emission Color \_\_\_\_\_ Water Droplet Plume Attached  Detached  None

Describe Plume Background  
 Start \_\_\_\_\_ End \_\_\_\_\_ Background Color \_\_\_\_\_ Sky Conditions Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed Start \_\_\_\_\_ End \_\_\_\_\_ Wind Direction Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. Start \_\_\_\_\_ End \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_



Longitude \_\_\_\_\_ Latitude \_\_\_\_\_ Declination \_\_\_\_\_

Additional Information \_\_\_\_\_

Form Number **APG07** Page **6** of **6**  
 Continued on VEO Form Number **END**

Sec	0	15	30	45	Comments
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	ENDING READINGS FOR PROBE CHANGES
5					<i>Paul D. Greable</i>
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

Observer's Name (Print) **PAUL D. GREABLE**  
 Observer's Signature *Paul D. Greable* Date **OCT 24, 1996**  
 Organization **PACIFIC ENVIRONMENTAL SERVICES**  
 Certified by **EASTERN TECHNICAL ASSOC** Date **9/26/96**

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9    203A    203B    Other: \_\_\_\_\_

Company Name  
**APG LIME COMPANY**

Facility Name  
**KIMBALLTON PLANT**

Street Address  
**STATE ROUTE 635**

City    State    Zip  
**RIPPLEMEAD    VA    24150**

Process    Unit #    Operating Mode  
**MANUFACTURING LIME**       **CONTINUOUS**

Control Equipment    Operating Mode  
**FABRIC FILTERS**    **CONTINUOUS**

Describe Emission Point  
**GROUND MOUNTED STACK FROM KILN EXHAUST BAG HOUSE**

Height of Emiss. Pt.    Height of Emiss. Pt. Rel. to Observer  
Start **100**    End **100**    Start **20**    End **20**

Distance to Emiss. Pt.    Direction to Emiss. Pt. (Degrees)  
Start **150**    End **150**    Start **150**    End **150**

Vertical Angle to Obs. Pt.    Direction to Obs. Pt. (Degrees)  
Start **10°**    End **10°**    Start **320°**    End **320°**

Distance and Direction to Observation Point from Emission Point  
Start **150'**    End **150'**

Describe Emissions  
Start **CLEAR STACK**    End \_\_\_\_\_

Emission Color    Water Droplet Plume  
Start **NA**    End \_\_\_\_\_    Attached     Detached     None

Describe Plume Background  
Start **MOUNTAIN ON OPPOSITE SIDE OF VALLEY**    End \_\_\_\_\_

Background Color    Sky Conditions  
Start **FALL PAPAIR**    End \_\_\_\_\_    Start **BLUE**    End \_\_\_\_\_

Wind Speed    Wind Direction  
Start **VARIABLE**    End \_\_\_\_\_    Start **SOUTH**    End \_\_\_\_\_

Ambient Temp.    Wet Bulb Temp.    RH Percent  
Start **60.8**    End \_\_\_\_\_

Source Layout Sketch

Draw North Arrow  
 TN     MN

Observer's Position

Observation Point

WIND

Sun Location Line

140°

20 FEET

150 FEET

Side View

Stack With Plume

Sun

Wind

Longitude    Latitude    Declination **70°**

Additional Information  
**THE HOT EXHAUST GASES (400°F±) CAUSES LIGHT DISTORTIONS - BUT THERE IS NO EMISSIONS**

VEOF1.1

VISIBLE ABOVE THERMAL PLUME.

Form Number **APG 08**    Page **1**    of **5**

Continued on VEO Form Number **APG 08 2 of 5**

Observation Date		Time Zone		Start Time	End Time	Comments
Sec	Min	0	15	30	45	
1	0	0	0	0		START
2	0	0	0	0		
3	0	0	0	0		
4	0	0	0	0		
5	0	0	0	0		
6	0	0	0	0		
7	0	0	0	0		
8	0	0	0	0		
9	0	0	0	0		
10	0	0	0	0		
11	0	0	0	0		
12	0	0	0	0		
13	0	0	0	0		
14	0	0	0	0		
15	0	0	0	0		
16	0	0	0	0		
17	0	0	0	0		
18	0	0	0	0		
19	0	0	0	0		
20	0	0	0	0		
21	0	0	0	0		
22	0	0	0	0		
23	0	0	0	5		* < 5%
24	5	5	5	0		* < 5%
25	5	0	0	0		* < 5%
26	0	0	0	5		
27	5	0	5	0		* < 5%
28	0	0	5	5		* < 5%
29	0	0	0	0		
30	0	0	0	0		

Observer's Name (Print)  
**PAUL D. GRABLE**

Observer's Signature  
*Paul D. Grable*

Organization  
**PACIFIC ENVIRONMENTAL SERVICES**

Certified by  
**EASTERN TECHNICAL ASSOC.**

Date  
**October 24, 1996**

Date  
**9/26/96**

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9 203A 203B Other: \_\_\_\_\_

Company Name **APG LIME CORPORATION**  
 Facility Name **KIMBALLTON PLANT**  
 Street Address **STATE ROUTE 635**  
 City **RIPPLEMEAD** State **VA** Zip **24150**

Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point \_\_\_\_\_  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Source Layout Sketch

Draw North Arrow  
 TN  MN

Observer's Position

Observation Point

Sun Location Line

140°

FEET

FEET

Side View

Stack With Plume

Sun

Wind

Longitude \_\_\_\_\_ Latitude \_\_\_\_\_ Declination \_\_\_\_\_

Additional Information \_\_\_\_\_  
 \_\_\_\_\_

Form Number **APG08** Page **2** of **5**  
 Continued on VEO Form Number **APG08 3/5**

Observation Date	Time Zone	Start Time	End Time		
10/24/96	EDST	15:48			
Sec	0	15	30	45	Comments
Min					
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	5	*5	0	0	* < 5%
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	5	*5	0	* < 5%
11	0	0	5	0	
12	0	*5	0	0	* < 5%
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	5	*5	0	0	* < 5%
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print) **PAUL D. GRABLE**  
 Observer's Signature **Paul D. Grable** Date **03/24/1996**  
 Organization **PACIFIC ENVIRONMENTAL SERVICES**  
 Certified By **EASTERN TECHNICAL ASSOC.** Date **9/26/96**

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One)  
 Method 9    203A    2038    Other: \_\_\_\_\_

Company Name **APG LIME CORPORATION**  
 Facility Name **KIMBALLTON PLANT**  
 Street Address **STATE ROUTE 635**  
 City **RIPPLEHEAD** State **VA** Zip **24150**

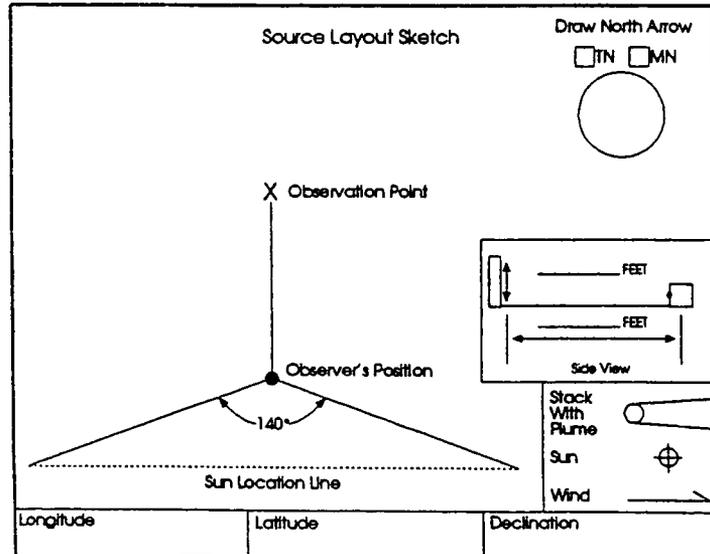
Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point \_\_\_\_\_  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_



Additional Information \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Form Number **APG08** Page **3** of **5**  
 Continued on VEO Form Number **APG08 4 of 5**

Observation Date	Time Zone	Start Time	End Time						
10/24/96	EDST	16:18							
Sec	0	15	30	45	Comments				
Min									
1	0	0	0	0					
2	0	0	0	0					
3	0	0	0	0					
4	0	0	0	0					
5	0	0	0	0					
6	0	0	0	0					
7	0	0	0	0					
8	*5	0	0	0	* < 5% Small Puff				
9	0	0	0	0					
10	0	0	0	0					
11	0	0	0	0					
12	0	*5	0	0	* < 5%				
13	0	0	0	0					
14	0	0	0	0					
15	0	0	0	0					
16	0	0	0	0					
17	*5	5	5	0	* < 5%				
18	0	0	0	*5	* < 5%				
19	0	0	0	0					
20	0	0	0	0					
21	0	0	0	0					
22	0	0	0	0					
23	5	0	0	0					
24	0	0	0	*5	* < 5% Puff				
25	0	0	0	0					
26	0	0	0	0					
27	0	0	0	0					
28	0	0	0	0					
29	0	0	0	5					
30	*5	0	0	0	* < 5%				

Observer's Name (Print) **PAUL D. GRABLE**  
 Observer's Signature **Paul D. Grable** Date **Oct 24, 1996**  
 Organization **PACIFIC ENVIRONMENTAL SERVICES**  
 Certified by **EASTERN TECHNICAL ASSOC.** Date **9/26/96**

VISIBLE EMISSION OBSERVATION FORM 1

Form Number **AP608** Page **4** of **5**  
 Continued on VEO Form Number **AP608 5 of 5**

Method Used (Circle One)  
 Method **9** 203A 203B Other: \_\_\_\_\_

Company Name **APL LIME CORPORATION**  
 Facility Name **KIMBALLTON PLANT**  
 Street Address **STATE ROUTE 635**  
 City **RIFFLETOWN** State **VA** Zip **24150**

Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point

Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Source Layout Sketch  
 Draw North Arrow  TN  MN  
  
 X Observation Point  
 Observer's Position  
 140°  
 Sun Location Line  
 Longitude \_\_\_\_\_ Latitude \_\_\_\_\_ Declination \_\_\_\_\_

Additional Information  
*Although the sun is reaching out of  
 normal sun line - position best possible.*

Observation Date	Time Zone	Start Time	End Time						
10/24/96	EDST	16:48		Sec	0	15	30	45	Comments
1	0	0	0	0					
2	0	0	0	0					
3	0	0	0	0					
4	0	0	0	0					
5	0	0	0	0					
6	0	0	0	0					
7	0	0	0	0					
8	0	0	0	0					
9	0	0	0	0					
10	0	0	*5	0	* < 5%				
11	0	0	0	0					
12	0	0	0	0					
13	0	0	0	0					
14	*5	0	*5	0	* < 5%				
15	0	0	0	0					
16	0	0	0	0					
17	0	0	0	0					
18	0	0	0	0					
19	0	0	0	0					
20	0	0	0	0					
21	0	0	5	5					
22	0	0	*5	0	* < 5%				
23	0	*5	0	*5	* < 5%				
24	0	5	5	*5	* < 5%				
25	0	5	0	0					
26	*5	0	0	0	* < 5%				
27	0	0	0	0					
28	0	0	0	*5	* < 5%				
29	*5	0	0	0	* < 5%				
30	0	0	0	0					

Observer's Name (Print) **PAUL D. GRABLE**  
 Observer's Signature **Paul D. Grable** Date **OCT 24, 1996**  
 Organization **PACIFIC ENVIRONMENTAL SERVICES**  
 Certified By **EASTERN TECHNICAL ASSOC.** Date **9/26/96**

*Paul Grable*  
 7.03

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One) Method 9 203A 2038 Other: \_\_\_\_\_

Company Name APG LIME CORPORATION  
 Facility Name KIMBALLTON PLANT  
 Street Address STATE ROUTE 635  
 City RIPPLEMEAD State VA Zip 24150

Process \_\_\_\_\_ Unit # \_\_\_\_\_ Operating Mode \_\_\_\_\_  
 Control Equipment \_\_\_\_\_ Operating Mode \_\_\_\_\_

Describe Emission Point \_\_\_\_\_  
 Height of Emiss. Pt. \_\_\_\_\_ Height of Emiss. Pt. Rel. to Observer \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance to Emiss. Pt. \_\_\_\_\_ Direction to Emiss. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

Vertical Angle to Obs. Pt. \_\_\_\_\_ Direction to Obs. Pt. (Degrees) \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Distance and Direction to Observation Point from Emission Point \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Describe Emissions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Emission Color \_\_\_\_\_ Water Droplet Plume \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Attached  Detached  None

Describe Plume Background \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_  
 Background Color \_\_\_\_\_ Sky Conditions \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Wind Speed \_\_\_\_\_ Wind Direction \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Ambient Temp. \_\_\_\_\_ Wet Bulb Temp. \_\_\_\_\_ RH Percent \_\_\_\_\_  
 Start \_\_\_\_\_ End \_\_\_\_\_

Source Layout Sketch

Draw North Arrow  TN  MN

Observer's Position

Observation Point

Sun Location Line

140°

FEET

FEET

Side View

Stack With Plume

Sun

Wind

Longitude \_\_\_\_\_ Latitude \_\_\_\_\_ Declination \_\_\_\_\_

Additional Information \_\_\_\_\_

Form Number APG08 Page 5 of 5  
 Continued on VEO Form Number APG08 END

Min	Time Zone <u>EST</u>				Start Time <u>17:18</u>	End Time <u>17:38</u>	Comments
	0	15	30	45			
1	0	0	0	0			
2	0	0	0	0			
3	0	0	0	0			
4	0	0	*5	0		* < 5%	
5	0	0	*5	0		* < 5%	
6	5	*5	0	0		* < 5%	
7	5	5	5	*5		* < 5%	
8	0	*5	0	0		* < 5%	
9	*5	0	0	*5		* < 5%	
10	0	0	0	*5		* < 5%	
11	*5	5	*5	5		* < 5%	
12	*5	*5	*5	*5		* < 5%	
13	5	5	10	5			
14	*5	0	0	*5		* < 5%	
15	0	5	5	5			
16	0	0	0	*5		* < 5%	
17	*5	0	0	0		* < 5%	
18	*5	0	*5	0		* < 5%	
19	0	0	*5	*5		* < 5%	
20	5	*5	*5	0		* < 5%	
21	0	0	0	0			
22	0	0	0	0			
23	0	0	0	0			
24	0	0	0	0			
25	0	0	*5	0		* < 5%	
26	0	0	0	0			
27	0	0	0	*5		* < 5%	
28	5	*5	5	5		* < 5%	
29	5	5	5	5			
30	*5	*5	*5	*5		* < 5%	END

Observer's Name (Print) PAUL D. GRABLE  
 Observer's Signature Paul D. Grable Date OCT. 24, 1996  
 Organization PACIFIC ENVIRONMENTAL SERVICES  
 Certified By EASTERN TECHNICAL ASSOC. Date SEPT 26, 1996

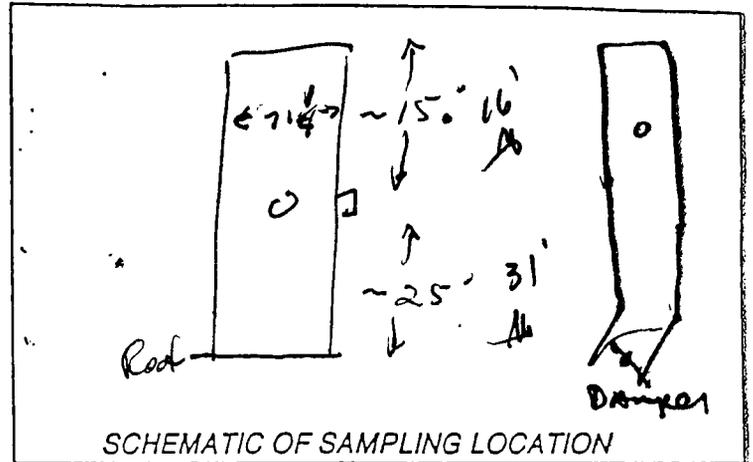
Appendix B.2

Raw Field Data

Kiln No. 2 - Cooler

# EPA METHOD 1 TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT APG Lime  
 CITY Rippon STATE VA  
 SAMPLING LOCATION Cooler Kilo 2  
 INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) 74 1/2  
 INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) 3 1/4  
 NEAREST UPSTREAM DISTURBANCE DISTURBANCE ~15 31.5  
 NEAREST DOWNSTREAM DISTURBANCE DISTURBANCE ~28 15.5'  
 SAMPLER DR/MH DATE 10/12/96



TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8-INCH)	DISTANCE B	TRAVERSE DISTANCE FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.021	71 1/4	1.5 → 1 1/2	3 1/4	4 3/4"
2	0.067		4 3/4		8"
3	0.118		8 3/8		11 5/8"
4	0.177		12 5/8		15 7/8"
5	0.250		17 7/8"		21 1/8"
6	0.356		25 3/8"		28 5/8"
7	0.644		45 7/8		49 1/8"
8	0.750		53 3/8"		56 5/8"
9	0.823		58 5/8"		61 7/8"
10	0.882		62 7/8"		66 1/8"
11	0.933		66 1/2"		69 3/4"
12	0.979		69 3/4		73"

METHOD 5 TESTING FIELD DATA SHEET

PAGE 1 of 2

$T_s = 125$   
 $T_m = 95$

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
APG Rippland VA	10/21/96	Cooler Kiln 2	M29	M29-10

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. Hg)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE	
								NUMBER	DIAMETER
M4	28.31	0.0	85	301486	7 1/4	0.84	8' Glass	Field Cal	0.748

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
3	M56	1.816	1.008	7E	7E	-	0.014 @	0.001 @	Ambient		305.3

18" 10" 20.9 →  $M_w = 29.0$

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING $V_m$ (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	SIL GEL IMPINGER TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
A 1	0	11:25	778.506	0.002	0.61	127	233	246	68	90	3.0
2	5		780.83	0.005	1.49	180	232	247	52	93	5.2
3	10		784.40	0.006	1.67	186	232	246	47	95	6.0
4	15		788.26	0.007	1.77	234	237	251	47	97	6.9
5	20		792.28	0.009	2.30	243	232	242	48	98	8.0
6	25		796.79	0.009	2.30	235	236	248	50	99	8.01
7	30		801.32	0.007	1.79	257	236	251	54	101	6.5
8	35		805.35	0.006	1.53	239	234	250	56	101	5.5
9	40		809.02	0.007	1.79	251	230	254	57	102	6.5
10	45		813.02	0.006	1.53	228	234	249	56	102	5.5
11	50		816.76	0.005	1.40	195	231	250	56	103	5.2
12	55		820.38	0.004	1.12	180	239	247	57	104	4.4
	60	12:25	823.524								
TOTAL TIME			DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE TEMP					AVE TEMP

Change K factor  
 $K = 278.0$   
for  $T_s$   
 $T_s = 240$   
 $K = 255$

$H_2O$  Catal = 15.0 g



MULTI-METALS SAMPLE RECOVERY DATA



Plant: <b>APG</b>		Run No.: <b>29-10</b>			
Date: <b>10-21-96</b>	Sample Box No.: <b>29-10</b>	Job No.: <b>5401.003</b>			
Sample Location: <b>Kiln No. 2 Cooler</b>					
Sample Type: <b>m-29 Multi-metals</b>					
Sample Recovery Person: <b>C.E. Riley</b>					
Container	Description	Volume, ml	Sealed/Level Marked		
<b>Front Half</b>					
1	Filter No.(s) <b>301486</b>		<b>F1</b> ✓		
2	Acetone Rinse		<b>AB2</b> ✓		
3	Nitric Rinse		<b>FH3</b> ✓		
<b>Back Half</b>					
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter		<b>BH4</b> ✓		
5A	Nitric Rinse - Impinger No. 4		<b>SA</b> ✓		
5B	KMNO4/H2O Rinse - Impingers 5 & 6		<b>SB</b> ✓		
5C	HCl Rinse - Impingers 5 & 6		<b>SC</b> ✓		
<b>Moisture Data</b>					
Impinger No.	Contents	Initial Volume, ml	733.8 Weight, grams		
			Initial	Final	Net
1	Empty	0	<del>725.7</del>	<b>727.9</b>	-5.9
2	5% HNO <sub>3</sub> / 10% H <sub>2</sub> O <sub>2</sub>	100	592.0	<b>591.1</b>	-0.9
3	" "	100	578.0	583.3	5.3
4	Empty	0	491.9	493.1	1.2
5	KMnO <sub>4</sub>	100	594.7	596.2	1.5
6	"	100	652.3	652.4	0.1
7	Silica gel	—	920.0	934.7	14.7
<b>Total</b>					<b>16.0</b>
Comments:					

METHOD 5 TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
APG Ripplened VA	10/21/96	Cooler Kilo 2	M29	M29-11

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. Hg)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE	
								NUMBER	DIAMETER
MH	28.31	0.0	85	301679	71 1/2	0.84	8' Glass	Fi	0.748

ASSUMED MOISTURE (%)	DGM BOX No.	DGM HQ	DGM GAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	OHSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
3	M56	1.816	1.008	7C	7C	-	0.0010	0.0010	Ambient		Variable

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Ym (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	SIL GEL IMPINGER TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
1	0	14:04	865.745	0.006	1.67	209	251	234	66	96	7.0
2	5		869.69	0.003	0.84	183	254	252	64	98	4.0
3	10		872.47	0.005	1.40	209	250	255	63	100	5.5
4	15		876.00	0.006	1.56	219	246	255	59	102	6.0
5	20		879.23	0.008	2.08	279	244	256	58	104	7.8
6	25		884.06	0.008	2.08	232	242	255	59	104	7.8
7	30		888.36	0.005	1.42	193	240	256	60	105	5.6
8	35		891.92	0.005	1.42	201	242	257	60	105	5.6
9	40		895.57	0.005	1.42	196	241	256	59	106	5.7
10	45		899.20	0.004	1.04	221	241	255	60	107	4.5
11	50		902.35	0.004	1.04	227	243	256	59	106	4.5
12	55		905.43	0.004	1.04	231	239	255	59	106	4.5
	60	15:04	908.514								
	TOTAL TIME		DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE TEMP.				AVE TEMP.	
			83.919								

DGM 95  
 T K  
 125 305  
 180 279  
 240 255

DGM 105  
 T K  
 125 311  
 180 284  
 240 260

PLANT AND CITY			DATE	SAMPLING LOCATION			SAMPLE TYPE		RUN NUMBER			
APG Ripple near VA			10/21/66	Cooler - Kiln 2			M29		M29-11 2			
TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (lit)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP (F)	SAMPLE TRAIN ACU (In. Hg)
1	60	15:07	908.514	0.005	1.42	175	239	254	63	105	NA	5.6
2	65		912.09	0.003	0.85	185	237	255	57	107		3.8
3	70		914.93	0.005	1.3	229	242	252	59	107		5.2
4	75		<del>917.7</del> 918.38	0.006	1.56	238	240	255	58	107		6.0
5	80		922.12	0.009	2.34	236	242	254	58	108		8.7
6	85		926.72	0.007	1.82	255	244	256	59	108		6.9
7	90		930.76	0.006	1.56	248	242	255	61	109		6.0
8	95		934.53	0.007	1.82	253	245	255	62	109		6.9
9	100		938.58	0.005	1.3	255	244	256	58	110		5.2
10	105		942.09	0.003	0.78	261	239	256	57	110		3.6
11	110		944.76	0.003	0.78	245	246	256	57	108		3.6
12	115		947.44	0.002	0.52	256	242	255	57	109		2.9
	120	16:07	949.664									
TOTAL TIME			DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F					
			83.919	0.0208	1.38		106					

T  
125  
180  
240  
K  
311  
284  
260

Page Totals

**MULTI-METALS SAMPLE RECOVERY DATA**



Plant: <b>APG</b>	Run No.: <b>29-11</b>
Date: <b>10-21-96</b>	Sample Box No.: <b>29-11</b>
Job No.: <b>S401.003</b>	
Sample Location: <b>KILN No. 2 Cooler</b>	
Sample Type: <b>M-29 Multi-metals</b>	
Sample Recovery Person: <b>C. E. Riley / M. Maret</b>	

Container	Description	Volume, ml	Sealed/Level Marked
<b>Front Half</b>			
1	Filter No.(s) <b>301679</b>		<b>F1</b> ✓
2	Acetone Rinse		<b>AR2</b> ✓
3	Nitric Rinse		<b>FH3</b> ✓
<b>Back Half</b>			
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter		<b>BH4</b> ✓
5A	Nitric Rinse - Impinger No. 4		<b>SA</b> ✓
5B	KMNO4/H2O Rinse - Impingers 5 & 6		<b>SB</b> ✓
5C	HCl Rinse - Impingers 5 & 6		<b>SC</b> ✓

<b>Moisture Data</b>					
Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	Empty	0	744.5	742.3	-2.2
2	5% HNO <sub>3</sub> / 10% H <sub>2</sub> O	100	680.8	681.0	0.2
3	" "	100	634.4	639.3	4.9
4	Empty	0	560.6	562.5	1.9
5	KMnO <sub>4</sub>	100	646.0	646.8	0.8
6	"	100	658.5	658.6	0.1
7	Silver gel	-	832.6	846.7	14.1
<b>Total</b>					<b>20.1</b> <del>22.8</del>

**Comments:**

METHOD 5 TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
AP6 Kieple road NA	10/21/96	Unit 2 Cooler STACK	M29	M29-12 <span style="float:right">→</span>

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. Hg)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE	
								NUMBER	DIAMETER
Mike DR	28.31	0.0	85	301643	Ø 71/4	0.81	8' Glass	FIELD CAL	0.248

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
3	M56	1.86	1.008	7E	7E	NA	0.003		AMBIENT		

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	SIL GEL IMPINGER TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
1	0	1625	945.942	0.003	2.48	138	240	250	67	101	2
2	5	1630	952.61	0.004	1.77	160	241	252	60	103	3
3	10	1635	955.16	0.006	1.71	196	243	251	54	105	3
4	15	1640	960.06	0.003	0.82	238	243	252	51	106	2
5	20	1645	967.71	0.005	1.42	210	240	253	51	107	3
6	25	1650	966.37	0.005	1.43	201	239	254	51	108	3
7	30	1655	969.92	0.006	1.72	187	238	255	53	109	3
8	35	1700	973.90	0.007	2.01	212	241	255	55	110	3
9	40	1705	978.17	0.004	1.12	215	245	256	52	110	2
10	45	1710	981.44	0.006	1.63	237	246	253	53	110	3
11	50	1715	985.30	0.007	2.01	250	261	255	53	110	3
12	55	1720	989.62	0.005	1.34	251	250	256	54	111	3
	60		993.06								
TOTAL TIME			DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE TEMP				AVE TEMP.	

DGM @ 100

Ts	K factor
125	318.1
150	305.4
180	284
175	292.3
240	260
200	287.2
225	271.9
250	262.4

DGM @ 95°F

Ts	K factor
125	311
180	284
250	260
240	260
	264.7

175	296
200	287.8
225	274.4
250	264.7

PLANT AND CITY			DATE	SAMPLING LOCATION			SAMPLE TYPE		RUN NUMBER			
APG Ripplemead VA			10/1/88	Cooler Kit 2			M29		M29-12			
TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft <sup>3</sup> )	P VELOCITY HEAD (in. H <sub>2</sub> O)	H ORIFICE (in. H <sub>2</sub> O)	STACK TEMP (°F)	PROBE TEMP (°F)	FILTER OVEN TEMP (°F)	SIL GEL IMPINGER TEMP (°F)	DGM IN/OUT TEMP (°F)	AUX. TEMP (°F)	SAMPLE TRAIN ACU (in. Hg)
1	60	1728	993.05	0.003	0.91	165	238	255	67	108	NA	2
2	65	1733	995.83	0.007	2.13	171	241	255	49	110		3
3	70	1738	999.99	0.006	1.70	208	246	255	42	110		3
4	75	1743	1004.22	0.008	2.18	237	242	256	41	111		4
5	80	1748	8.36	0.009	2.45	236	240	256	41	111		4
6	85	1753	13.38	0.007	1.92	234	244	257	41	112		3
7	90	1758	17.30	0.005	1.42	210	246	256	41	111		3
8	95	1803	21.26	0.004	1.18	186	242	256	42	111		3
9	100	1808	24.20	0.004	1.18	185	238	256	41	111		3
10	105	1813	27.77	0.002	0.57	205	236	254	40	111		2
11	110	1818	30.05	0.004	1.12	220	240	253	42	110		3
12	115	1823	33.13	0.004	1.12	219	244	256	41	110		3
	120/Off	1828	36.622									
TOTAL TIME			DGM VOLUME	AVG SORT P	AVG H	AVG STR F		AVG DGM F				
Page Totals			86.680	0.0708	1.46	207		109				

MULTI-METALS SAMPLE RECOVERY DATA



Plant: <i>APG Lime</i>	Run No.: <i>29-12</i>
Date: <i>10-21-96</i>	Sample Box No.: <i>29-12</i>
Job No.: <i>S 401.003</i>	
Sample Location: <i>KILN No. 2 Coder</i>	
Sample Type: <i>M-29 Multi-metals</i>	
Sample Recovery Person: <i>C. E. Riley / M. Maret</i>	

Container	Description	Volume, ml	Sealed/Level Marked
<b>Front Half</b>			
1	Filter No.(s) <i>301643</i>		<i>F1 ✓</i>
2	Acetone Rinse		<i>AR2 ✓</i>
3	Nitric Rinse		<i>FR3 ✓</i>
<b>Back Half</b>			
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter		<i>BR4 ✓</i>
5A	Nitric Rinse - Impinger No. 4		<i>SA ✓</i>
5B	KMNO4/H2O Rinse - Impingers 5 & 6		<i>SB ✓</i>
5C	HCl Rinse - Impingers 5 & 6		<i>SC ✓</i>

<b>Moisture Data</b>					
Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	<i>Empty</i>	<i>0</i>	<i>731.3</i>	<i>728.3</i>	<i>-3.0</i>
2	<i>5% HNO3 / Pd-HCl</i>	<i>100</i>	<i>590.3</i>	<i>591.5</i>	<i>1.2</i>
3	<i>" "</i>	<i>100</i>	<i>576.4</i>	<i>579.4</i>	<i>3.0</i>
4	<i>Empty</i>	<i>0</i>	<i>489.2</i>	<i>489.8</i>	<i>0.6</i>
5	<i>KMnO4</i>	<i>100</i>	<i>595.5</i>	<i>595.6</i>	<i>0.1</i>
6	<i>"</i>	<i>100</i>	<i>649.0</i>	<i>649.2</i>	<i>0.2</i>
7	<i>Silica gel</i>	<i>-</i>	<i>888.7</i>	<i>901.6</i>	<i>12.9</i>
<b>Total</b>					<i>15.0</i>

Comments:

## TECHNICAL REPORT DATA

Please read instructions on the reverse before completing

1. REPORT NO.  EPA-454/R-99-045a	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE  Lime Manufacturing Emissions Test Report Chemical Lime Company (Formerly APG Lime Company) Ripplemead, Virginia  Volume I of II	5. REPORT DATE  September 1999	
	6. PERFORMING ORGANIZATION CODE	
7. AUTHOR(S)  <del>XXXXXXXXXX</del> EMAD	8. PERFORMING ORGANIZATION REPORT NO.	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Pacific Environmental Services, Inc. Post Office Box 12077 Research Triangle Park, NC 27709-2077	10. PROGRAM ELEMENT NO.	
	11. CONTRACT/GRANT NO. 68D70069	
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Office of Air Quality Planning and Standards Emission, Monitoring and Analysis Division Research Triangle Park, NC 27711	13. TYPE OF REPORT AND PERIOD COVERED Final	
	14. SPONSORING AGENCY CODE EPA/200/04	
15. SUPPLEMENTARY NOTES		
16. ABSTRACT  This report presents the results of a testing program conducted at the Chemical Lime Company (formerly APG Lime Company), Ripplemead, Virginia to obtain air emissions data to support the EPA's development of the lime manufacturing NESHAP. Testing was conducted on a coal-fired rotary kiln to determine total hydrocarbons, particulate matter, metals, and dioxin/furan at the inlet and outlet of the baghouse. In addition, testing was conducted on a cooler exhaust stack to determine uncontrolled emissions of particulate matter and metals.  Volume I of II - Report Text and Appendices A & B ( 220 Pages)		
17. KEY WORDS AND DOCUMENT ANALYSIS		
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