ENVIROTECH
EBSP
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Belmont, California 94002
Telephone (415) 593-1021
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STAPPA/ALAPCO
2.5

logged 1/20/86
#06
16

This Report was Reviewed by: _____
Date: 10/8/93
and found to be
Satisfactory: ☑
Unsatisfactory: ☐
Remarks: See Memo

incomplete

PERFORMANCE TEST REPORT

ROCKY MOUNT

WASTEWATER TREATMENT FACILITY

MHF SLUDGE INCINERATOR

☐ APPROVED ☑ APPROVED AS NOTED
☐ NOT APPROVED—RESUBSMIT ☐ SEE LETTER
For Use on 0081-B1
For general compliance with plans & specifications.
Contractor to check and verify quantities, dimensions, etc.
PEIRSON & WHITMAN, INC.
RL By 5-6-83 Date
☐ P & W Copy ☐ Inspt'r Copy ☐ City Copy
LOG ITEM # 242 IN LOG # 5954
SPEC. SECT. 1920

W.E. Nance
D.E.M.
D.A.Q.

☐ APPROVED ☐ APPROVED AS NOTED
☒ NOT APPROVED—RESUBSMIT ☒ SEE LETTER
For Use on 0081-B1
For general compliance with plans & specifications.
Contractor to check and verify quantities, dimensions, etc.
PEIRSON & WHITMAN, INC.
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SPEC. SECT. 1920

OFFICE COPY

DIVISION OF ENVIRONMENTAL MANAGEMENT
Air Quality Section

June 21, 1983

M E M O R A N D U M

TO: Robert Van Tilburg

ATTN: Ernie Fuller

FROM: Jule Shanklin

SUBJECT: SOURCE TEST REPORT REVIEW **(Revised Memo)**
Rocky Mount Wastewater Treatment Facility
SLUDGE INCINERATOR
Rocky Mount (Edgecombe County)

REF:
(A) 40 CFR 60, Subpart O; Standards of Performance for Sewage Treatment Plants
(B) 40 CFR 61, Subparts C & E; National Emission Standards for Beryllium and Mercury (NESHAPS)
(C) NCAC 2D .0501; "Compliance with Emission Standards; section (D)(3)"
(D) NCAC 2D .0505; "Control of Particulates from Refuse Burning"
(E) My memo, same subject, dated June 10, 1983

My previous memo on this subject cited the wrong NSPS standard. The applicable standard is Subpart O as cited above as Reference A. The particulate emission limit is 1.3 lb/ton of sludge charged and the summary has been rewritten to reflect this limit. Please mark-up the previous (Ref. E) memo and attach this memo to it.

The subject report for the 1/13/83 test performed by Envirotech/TRW has been reviewed and found acceptable to the extent of testing performed. This report covers only particulate testing concerned with our incinerator standard (Ref. D). However, NESHAPS for Mercury and Beryllium (Ref. B) as well as NSPS for Particulate (Ref. A) also apply to this source. There were no Hg or Be results.

We reserve the right to require that "back-half" extractions be included in certain Method 5 test results as explained in Ref. C. This was not done in the subject test. Because of the type source involved, I would recommend that in subsequent particulate tests we require a stipulation for back-half extractions.

Results are summarized as follows:

Emissions	Run 2	Run 3	Run 5	Avg.
Particulate* lb/hr	0.652	0.525	0.459	0.545
Particulate* gr/dscf @ 12% CO_2	.0474	.0340	.03177	.0377
Mercury	Not Meas.	Not Meas.	Not Meas.	—
Beryllium	Not Meas.	Not Meas.	Not Meas.	—
Charge Rates				
lb/hr	3946	4419	3997	—
Limits				
Part. (.0505) lb/hr	7.892	8.838	7.994	8.24
Part. (NSPS) lb/hr (based on 1.3 lb/ton limit)	2.56	2.87	2.60	2.67

*Based on front-half only

/la

cc: Dennis Ramsey
Walt Nance

DIVISION OF ENVIRONMENTAL MANAGEMENT
Air Quality Section

June 10, 1983

M E M O R A N D U M

TO: Robert Van Tilburg

ATTN: Ernie Puller

FROM: Jule Shanklin

SUBJECT: SOURCE TEST REPORT REVIEW
Rocky Mount Wastewater Treatment Facility
SLUDGE INCINERATOR
Rocky Mount (Edgecombe County)

should be Subp. O sewage sludge

REF:
(A) 40 CFR 60, Subpart E; Standards of Performance for Incinerators (NSPS)
(B) 40 CFR 61, Subparts C & E; National Emission Standards for Beryllium and Mercury (NESHAPS)
(C) NCAC 2D .0501; "Compliance with Emission Standards; section (D)(3)"
(D) NCAC 2D .0505; "Control of Particulates from Refuse Burning"

The subject report for the 1/13/83 test performed by Envirotech/TRW has been reviewed and found acceptable to the extent of testing performed. This report covers only particulate testing concerned with our incinerator standard (Ref. D). However, NESHAPS for Mercury and Beryllium (Ref. B) as well as NSPS for Particulate (Ref. A) also apply to this source. Using results and data in the report, I have calculated the emission concentrations at 12% CO_2, relative to NSPS limits, and included them in the test summary below. There were no Hg or Be results.

Also, we reserve the right to require that "back-half" extractions be included in certain Method 5 test results as explained in Ref. C. This was not done in the subject test. Because of the type source involved, I would recommend that in subsequent particulate tests we require a stipulation for back-half extractions.

Results are summarized as follows:

Emissions	Run 2	Run 3	Run 5	Avg.
Particulate* lb/hr	0.652	0.525	0.459	0.545
Particulate* gr/dscf @ 12% CO_2	0.0474	.0340	.0318	.0377
Mercury	Not Meas.	Not Meas.	Not Meas.	—
Beryllium	Not Meas.	Not Meas.	Not Meas.	—
Charge Rates lb/hr	3946	4419	3997	—

Emissions Limits	Run 2	Run 3	Run 5	Avg.
Part. (.0505) lb/hr	7.892	8.838	7.994	8.24
Part. (NSPS) gr/dscf @ 13% CO_2	0.08	0.08	0.08	—
Mercury (NESHAPS) lb/hr (based on 3200 g/24 hr)	0.294	0.294	0.294	—
Beryllium (NESHAPS) lb/hr (based on 10 g/24 hr)	.00092	0.00092	0.00092	—

* Based on front-half only

/la

cc: Dennis Ramsey

Calculation Summary

SOURCE ROCKY MOUNT/SLUDGE INCIN Date 1/13/83

LOCATION Rocky Mount

ENTRY	RUN 2	RUN 3	RUN 5	ANSWER
Ave. ΔH (in H_2O)	2.9750	3.1420	3.8170	
P_{atm} (in Hg)	30.2000	30.2000	30.2000	
	30.4188	30.4310	30.4807	P_m (in Hg)
P_s(gage)(in H_2O)	-0.2200	-0.2200	-0.2200	
	30.1838	30.1838	30.1838	P_s (in Hg)
T_m (^oR)	534.0000	534.0000	529.0000	
V_m (ft^3)	53.3230	55.0000	60.4900	
	53.7939	55.5081	61.7264	$V_{m_{std}}$ (ft^3)
V_{lq} (ml)	71.5000	38.0000	64.0000	
	3.3820	1.7974	3.0272	$V_{v_{std}}$ (ft^3)
	57.1759	57.3055	64.7536	V_{std} (ft^3)
	5.9150	3.1365	4.6750	%M
	0.9409	0.9686	0.9533	M_d
MW_d	29.4200	29.4500	29.3700	
	28.7445	29.0909	28.8385	M
T_s (^oR)	559.0000	558.6000	560.0000	
$\Sigma\sqrt{\Delta p}$	6.5902	6.8024	7.5099	
$n_{\Delta p}$	12.0000	12.0000	12.0000	
	0.5492	0.5669	0.6258	Ave $\sqrt{\Delta p}$
C_p	0.8400	0.8400	0.8400	
	31.6521	32.4646	36.0427	v_s (ft/sec)
D_s (in)	20.5000	20.5000	20.5000	
	2.2921	2.2921	2.2921	A_s (ft^2)
	4353.	4465.	4957.	Q_s (ft^3/min)
	4163.	4273.	4732.	Q_{std} (ft^3/min)
W_t (gm)	0.0676	0.0534	0.0470	
	0.6511	0.5267	0.4544	pmr_c (lb/hr)
D_n (in)	0.3100	0.3100	0.3100	
	0.0755	0.0755	0.0755	A_n (in^2)
Θ (min)	60.0000	60.0000	60.0000	
	0.6518	0.5149	0.4532	pmr_a (lb/hr)
	100.1097	97.7556	99.2443	%I
	0.6515	0.5208	0.4538	pmr_{avg} (lb/hr)
%CO				
$\%O_2$				
$\%N_2$				
				%EA
F Factor				
				HI (10^6 BTU/hr.
				pmr_u(lbs/10^6BTU

ENVIROTECH

EBSP P.O. Box 96
Belmont, California 94002
Telephone (415) 593-1021
Telex 348360

PERFORMANCE TEST REPORT

ESBP CONTRACT NO. 5073-11

ONE 16' 9" O.D. X 6 HEARTH MULTIPLE HEARTH

SLUDGE INCINERATOR

ROCKY MOUNT WASTEWATER TREATMENT FACILITY

THE CITY OF ROCKY MOUNT, NORTH CAROLINA

CONSULTING ENGINEER

PEIRSON & WHITMAN INC.

GENERAL CONTRACTOR

WRENN-WILSON CONSTRUCTION CO.

TEST DIRECTION & REPORT BY:

G. F. KRONEBERGER, PRINCIPAL PROCESS ENGINEER, LURGI CORP., BELMONT, CA.

REPORT APPROVAL & SUBMITTAL BY:

H. L. LANGE, REGIONAL MANAGER, EBSP-ENVIROTECH, BATON ROUGE, LA.

FEBRUARY 24, 1983

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I INTRODUCTION

II SUMMARY AND CONCLUSIONS

III DISCUSSION OF RESULTS

IV TEST OPERATION, PROCEDURES, SAMPLING & ANALYSES

V APPENDAGE: TRW REPORT COMPLETE WITH APPENDICES A THROUGH G

I. INTRODUCTION

Performance tests to demonstrate compliance with the EPA air pollution code CFR 40 and the specification requirements were conducted on the ESBP multiple hearth furnace at the Rocky Mount Wastewater Treatment Facility.

On January 13, 1982, this furnace demonstrated compliance with the specifications and applicable EPA requirements.

Present during the tests, either full or part time were:

City of Rocky Mount	North Carolina Department of Natural Resources
F. E. Beaudry	C. E. Fuller
Stanley Curtis	
R. Casper and participating laboratory personnel	

Peirson & Whitman Inc.	Wrenn-Wilson Construction Co.
H. M. Nance	O. Z. Wrenn
Don Raynor	Ralph Whitfield
	Roger McIntyre

EBSP/Envirotech

Hal Lange	Charlie Grace
Pat Owre	George Tabor

Independent Test Lab: TRW

Jim McReynolds	Dave Savia

Lurgi Corporation

G. F. Kroneberger

The following section summarizes applicable test results.

II. SUMMARY AND CONCLUSIONS

The plant stored sludge for a period to accumulate sufficient sludge for the emission tests. As established in pre-test meetings the week of the test, the furnace was to be operated within the constraints of normal current operations. The furnace operated well and has adapted to the current mode of operation. The main operational change from the specifications are that less ash is recycled to the dewatering system. This results in a reduction of total dry solids for a corresponding quantity of sludge solids and a higher moisture percentage. The furnace handles the material well and it is assumed that this mode of operation is beneficial to the plant from an overall point of view.

The following section summarizes pertinent test results in the sequence occasioned by the specifications.

Operating Performance Test (Spec. 1Q 20.30)

The furnace was proved operational during 1982.

Feed Characteristics (Spec. 1Q 20.31)
and Basis of Design and Testing (Spec. 1Q 20.37)

			Actual	
	Design	Specified Variation	Field Weight Basis	Weight Corrected By Analysis
Moisture content (% w.b.)	60%	60 to 65	64 to 70	67.7
Lbs. of dry sludge solids per hr	2320	1508 to 2320	1500 to 1908	1332
Lbs. of wet sludge cake per hr	5800	3770 to 5800	5000 to 5300	4124
Dry sludge combustibles as percent of d.s.	40	40 to 50	59 to 60	60
*Lbs. of volatile solids/hr.	928	527 to 928	985 to 1081	798
Wet feed based on new parameters	4686	2661 to 4686	---	4124
Calorific value of sludge (BTU/lb. of combustibles)	10,000	8,000 to 10,000	10,366 to 10,600	10,500

* Disposal Criteria

Basis of Design & Testing (Spec. IQ 20.37)

Pre-test meetings established that, in view of the proven past operation, the test period would be that required for the emission test.

1. No objectional odors were encountered.

2. Observation of the emission per standard procedures, indicated emissions were near Ringleman 0. Observations would be classified as marginally visible, with average opacity less than 9 percent.

3. Analytical Results of Particulate Samples:

   The prime criteria for emission compliance is a particulate emission not exceeding 1.3 pounds per ton of dry solids fed to the furnace.

   Test results for the three valid* tests are as follows:

Test	Emission Particulates (Pounds/hr)	Based on Field Feed Weight (lbs/dry ton)	Based on corrected calculated feed weight ** (lbs/dry ton
No. 2	0.652	0.79	1.00
No. 3	0.525	0.62	0.74
No. 5	0.459	0.54	0.72

* Tests 1 & 4 were invalidated due to sampling problems.

** The corrected feed weight basis is an accurate weight which corrects for a calibration anomaly and which has been verified by an analytical carbon balance calculation the field calibration figures were corrected for hold-up in the conveyor system when changing rates. See Appendix sheets G-1, G-2 and G-3 for graphic presentations.

Test Conditions

Operation of the furnace during the tests was steady and the furnace was fed within the capabilities of the feed system and filter. Moisture levels ranged from 66 to 70% with an average of 68% during the test periods. Under these conditions the furnace operated properly and reduced the wet sludge to a sterile ash.

SUMMARY OF PARTICULATE MATTER EMISSION TEST RESULTS:

Test	Run #2	Run #3	Run #5
Date	1-13-83	1-13-83	1-13-83
Time	1105-1207	1235-1337	1537-1610
Sample Duration (min)	60	60	60
Sample Volume (DSCF)	53.562	55.268	60.601
Stack Flow (DSCFM)	3,916	4,120	4,488
Stack Temperature (°F)	98.8	98.6	99.9
Moisture (%)	5.9	3.1	4.7
CO_2 (%)	4.92	5.25	4.51
O_2 (%)	15.89	15.36	16.27
Excess Air (%)	317	274	350
Isokinetic (%)	98.9	97.0	97.6
Particulate Matter (lb/hr)	0.652	0.525	0.459
Feed Cakes Dry Solids (%)	33	32	32

SUMMARY OF PARTICULATE MATTER EMISSION TEST RESULTS:
(Continued)

	Test	Run #2	Run #3	Run #5
*1	Wet Feed Rate (lb/hr)	5,000	5,300	5,300
*1	Dry Feed Rate (ton/hr)	0.82	0.85	0.85
*1	Emission Rate	0.79	0.62	0.54
*2	Wet Feed Rate (lb/hr)	3946	4419	3997
*2	Dry Feed Rate (ton/hr)	0.652	0.71	0.64
*2	Emission Rate	1.00	0.74	0.72
	Visible Emissions (% Opacity)	6.6	9.0	8.9

*1 Based on preliminary field weight information

*2 Based on corrected weight checked with analysis calculation.

Furnace Feed (Spec. 1Q 20.37E.)

By design, the feed did not exceed the maximum specified rate. The system has a new maximum feed rate based on current operation. Using the original disposal requirements of dry sludge solids, new rates were developed based on current cake compositions. These were listed in the table at the beginning of this section. Key items are listed below:

	Original Specification	Current Operation
Volatiles	40%	60%
Dry Solids	40%	33%
Max. Combustible Solids, PPH	928	928
Max. Wet, PPH	5800	4687
Min. Combustible Solids, PPH	603	603
Min. Wet PPH	3770	3047

The above table shows the current operation as compared to the rates projected in 1979. The current operation maintains the volatile sludge solid rate which is the key design parameter. Because of the reduced ash recycle the dry solids feed rate and the wet solids feed rate change. See Appendix sheets G-4 and G-5 for graphic presentations of these changes.

Electric Power (Spec. 1Q 20.37K.)

Nine measurements by a joint test team (3 phases, 3 times on each motor) indicated an average total of 110.8 amps

Average Amps	L_1	L_2	L_3	Ave
	111.2	110.8	110.5	110.8

Power = (Amps)(Volts)(P.F.)($\sqrt{3}$)

= (110.8)(488)(0.83)(1.737)

= 77.7 Kw Actual 200 Kw specified

Auxilliary Fuel (Spec 1Q 20.38)

During the pre-test meeting it was established that low-fire burners should be maintained for safety ignition and control purposes.

Fuel consumption during the test (0900 to 1600) averaged less than 0.1 GPM which equates to less than 0.8 mill BTU/hr. This is well within the normal allowance for ignition and control fuel.

The feed composition supplied during the test can be considered to be autogenous, with minimal fuel requirements for safety ignition and control purposes.

Warranty Test Procedure (Spec IQ 20.43)

The above specific paragraphs addressed the warranty requirements and show that the furnace is in compliance.

As part of the Emission Tests Envirotech normally takes other sample data for use in resolving any questions that may develop during evaluation of the data. These results are reported here as information.

Note: Moisture analyses used for the emission results were based on individual one-half hourly samples taken during the emission tests. The following are composite analyses:

Table 4-1. SUMMARY OF COMPOSITE SLUDGE, COMPOSITE ASH, SCRUBBER WATER IN, AND SCRUBBER WATER OUT ROCKY MOUNT WASTEWATER TREATMENT FACILITY

TRW #	Analysis	As received	Dry basis
Composite sample 0900-1645			
Sludge 4609	Ultimate analysis,		
	% Carbon		26.39
	% Hydrogen		0.27
	% Nitrogen		3.96
	% Sulfur	0.04	0.10
	% Ash	14.18	40.25
	Proximate analysis,		
	% Moisture	64.77	
	% Volatile Matter	20.08	
	% Fixed Carbon	0.97	
	Btu/lb	2182	6194
	Mercury (µg/gm)	0.328	
	Oxygen		29.03
Composite sample 1100-1645			
Sludge 4629	Ultimate analysis,		
	% Carbon		25.24
	% Hydrogen		0.23
	% Nitrogen		2.79
	% Sulfur	0.04	0.12
	% Ash	13.92	39.06
	Proximate analysis,		
	% Moisture	64.35	
	% Volatile Matter	21.08	
	% Fixed Carbon	0.65	
	Btu/lb	2269	6364
	Mercury (µg/gm)	0.187	
	Oxygen		32.56
Fuel oil 4617	% Ash	<0.01	
	% Sulfur	0.20	
	Btu/lb	18,736	
	Rams bottom carbon residue	0.185	

Air Pollution Test (spec IQ 20.47) & (Spec IQ 20.33)

The TRW report indicates that the system complies with EPA Code CFR 40, Part 60, Subpart O (which is the standard currently in effect and which was in effect at the time of bids).

SUMMARY OF PARTICULATE MATTER EMISSION TEST RESULTS:
INCINERATOR EXHAUST STACK - ROCKY MOUNT WASTEWATER TREATMENT PLANT

Test	Run #1[a]	Run #2	Run #3	Run #4[b]	Run #5
Date	1-13-83	1-13-83	1-13-83	1-13-83	1-13-83
Time	0940-1043	1105-1207	1235-1337	1410-1512	1537-1610
Sample Duration (min)	60	60	60	60	60
Sample Volume (DSCF)	N/A	53.562	55.268	64.151	60.601
Stack Flow (DSCFM)	N/A	3,916	4,120	4,782	4,488
Stack Temperature (°F)	N/A	98.8	98.6	99.1	99.9
Moisture (%)	N/A	5.9	3.1	5.0	4.7
CO^2 (%)	N/A	4.92	5.25	6.68	4.51
O^2 (%)	N/A	15.89	15.36	14.08	16.27
Excess Air (%)	N/A	317	274	206	350
Isokinetic (%)	N/A	98.9	97.0	N/A	97.6
Particulate Matter (lb/hr)	N/A	0.652	0.525	N/A	0.459
Feed Cake as % Dry Solids	32	33	32	32	32
Wet Feed Rate[d] (lb/hr)[d]	5,000	5,000	5,300	5,300	5,300
Wet Feed Rate[c] (lb/hr)	N/A	3,946	4,419	N/A	3,997
Dry Feed Rate (ton/hr)	0.80	0.82	0.85	0.85	0.85
Dry Feed Rate[e] (ton/hr)	N/A	.651	.707	N/A	.64
Emission Rate (lbs/ ton of dry feed)	N/A	0.79	0.62	N/A	0.54
Emission Rate[e] lbs/ ton or dry feed)	N/A	1.00	0.74	0.72	N/A
Visible Emissions (% opacity)[c]	8.0	6.6	9.0	7.4	8.9

[a]Particulate test invalid due to final leak check.

[b]Particulate test was not valid. After the final leak check impinger water was sucked back into the filter.

[c]Visible emissions were taken over the length of time particulate sample was being taken from the stack.

[d]Feed rate was provided by Envirotech.

[e]Rate determination revised to account for process field measurement inaccuracy.

IV. TEST OPERATION, PROCEDURE, SAMPLING & ANALYSES

Furnace temperatures were maintained at typical levels. These are established by selectable set points on the temperature controllers. Temperatures are shown on the Log Sheet, which is included in Appendix B of the TRW Report.

Draft is controlled automatically by a control damper, and pressure drop through the venturi throat is selected by set point. Scrubber water rates and shaft speed were steady and within normal operating ranges, as shown on the log sheets.

Emission sampling and the analytical procedures for the material followed EPA methods as previously submitted and approved.

The feed rates used in this report are as preliminarily established in the field and as refined by analysis and calculation. Both procedures indicate acceptable emission levels. The refined rates were checked by a carbon balance which is as accurate as the code approved test procedures. These verified the corrected feed rate.

Sampling

Sludge samples were collected half-hourly and dry solids were determined by the TRW laboratory.

In addition, a composite sample was made for the test consisting of small samples taken at the same time as the individual samples. Hourly feed rate and fuel readings were taken. Routine samples were taken of the ash, scrubber water in and out and the fuel oil. The appearance of these was normal.

Complete stack samples were taken by TRW; details are included in the test lab report.

Analyses

All sample analyses were the responsibility of TRW.

V. APPENDAGE

The official TRW report is appended to the official submittal copies of this report. That report contains the full details required by air pollution control agencies, and also contains field data detail.

The last appendix, Appendix G, of the TRW report was reserved for any appendix items that were supplied "by others", during the formulation of this report.

Appendix G contains the following:

- G-1 Feed rates calculated from TRW analyses and carbon balances
- G-2 Field calibration chart showing refined line correcting for conveyor lag
- G-3 Expanded scale chart suggested for future plant operation
- G-4 Chart showing revised feed composition
- G-5 Chart showing revised feed target corresponding to current feed composition.

PREPARED FEBRUARY 1983 BY:

G. F. Kroneberger
Principal Process Engineer
Lurgi Corporation

APPROVED BY

ENVIROTECH EBSP

Date 3/4/83

Hal Lange
Regional Manager

TRW

ENERGY AND ENVIRONMENTAL DIVISION
TRW ENERGY DEVELOPMENT GROUP
Redondo Beach, California • Research Triangle Park, North Carolina • McLean, Virginia • Denver, Colorado • Morgantown, West Virginia • Oakridge, Tennessee

SOURCE TESTING AND ANALYSIS AT ROCKY MOUNT WASTEWATER TREATMENT FACILITY ROCKY MOUNT, NORTH CAROLINA

P. #9002-5073-11
SN #95622.010
SN #540163

Technical Managers: Hal Lange
G. F. Kroneberger

Prepared for:
ENVIROTECH EBSP
One Davis Drive
Belmont, California 94002

February 1983

TRW Energy and Environmental Division
Post Office Box 13000
Research Triangle Park, North Carolina 27709

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To Whom It May Concern:

I certify that I have read and reviewed the results, calculations and testing methods contained in the TRW report (February 1983) performed on January 13, 1983, "Source Testing and Analysis at Rocky Mount Wastewater Treatment Facility in Rocky Mount, North Carolina." The results and calculations are accurate based on the data obtained. The methods utilized are in conformance with EPA methods for testing sewage treatment plants. The only exception was the shortage of available sludge which required a shorter sampling duration of the sludge than normal.

Signed Michael W. Hartman

Michael W. Hartman
Section Head, Field Services
TRW Energy and Environmental Division

NOTARY PUBLIC

Joanne Beauregard

My Commission Expires 5-20-87

1.0 INTRODUCTION

TRW Energy and Environmental Division, on January 13, 1983, conducted a source and analysis program at the Rocky Mount Wastewater Treatment Facility located near Rocky Mount, North Carolina under contract to the Envirotech Corporation (EBSP Division). The sewage sludge incinerator was tested for particulate matter emissions and odors, to determine compliance with the North Carolina State environmental regulations.

The emission tests consisted of a set of four test runs for determination of particulate matter emissions, stack opacity emissions, stack volumetric flowrate, and stack stationary gas analysis. Particulate matter, stack volumetric flowrate, opacity, and stack gas analysis were determined by standard EPA Methods 1, 2, 3, 5, and 9.

TRW conducted analysis on samples of feed, ash scrubber inlet, scrubber outlet, fuel and composite feed samples. The samples were collected by plant and test team personnel.

2. SUMMARY AND DISCUSSION OF RESULTS

Five one-hour long Method 5 tests were run on the incinerator exhaust stack. At the end of the first test it was discovered that the last impinger had opened during the test. This test was voided. At the end of the fourth test, impinger water was inadvertently flushed back into the filter. This test was also voided but analyzed for future knowledge. No known problems were encountered during tests #2, #3 and #5. The average emission rate for these three tests was 0.65 pounds for each ton of dry sludge fired as compared to the allowable standard of 1.30 pounds per ton dry sludge. A summary of the results can be found in Table 2-1. The wet feed rates and sludge samples were provided by Envirotech.

Opacity readings were taken during the time that each test was being run. The average for all five tests is 8.0% opacity with no readings being higher than 20.0%.

No odors that could be traced to the exhaust stack at a fifty foot distance were noticed while the testers were on the roof. A very slight smell was noticed in gas bag samples, when they were directly blown at the tester's nose.

The sludge samples as fired were taken each half hour and analyzed for moisture by standard method 209A. The results are reported in Table 2-2.

Table 2-1. SUMMARY OF PARTICULATE MATTER EMISSION TEST RESULTS: INCINERATOR EXHAUST STACK - ROCKY MOUNT WASTEWATER TREATMENT PLANT

Test	Run #1[a]	Run #2	Run #3	Run #4[b]	Run #5
Date	1-13-83	1-13-83	1-13-83	1-13-83	1-13-83
Time	0940-1043	1105-1207	1235-1337	1410-1512	1537-1610
Sample Duration (min)	60	60	60	60	60
Sample Volume (DSCF)	N/A	53.562	55.268	64.151	60.601
Stack Flow (DSCFM)	N/A	3,916	4,120	4,782	4,488
Stack Temperature (°F)	N/A	98.8	98.6	99.1	99.9
Moisture (%)	N/A	5.9	3.1	5.0	4.7
CO^2 (%)	N/A	4.92	5.25	6.68	4.51
O^2 (%)	N/A	15.89	15.36	14.08	16.27
Excess Air (%)	N/A	317	274	206	350
Isokinetic (%)	N/A	98.9	97.0	N/A	97.6
Particulate Matter (lb/hr)	N/A	0.652	0.525	N/A	0.459
Feed Cake as % Dry Solids	32	33	32	32	32
Wet Feed Rate[d] (lb/hr)[d]	5,000	5,000	5,300	5,300	5,300
Wet Feed Rate[c] (lb/hr)	N/A	3,946	4,419	N/A	3,997
Dry Feed Rate (ton/hr)	0.80	0.82	0.85	0.85	0.85
Dry Feed Rate[e] (ton/hr)	N/A	.651	.707	N/A	.64
Emission Rate (lbs/ ton of dry feed)	N/A	0.79	0.62	N/A	0.54
Emission Rate[e] lbs/ ton or dry feed)	N/A	1.00	0.74	0.72	N/A
Visible Emissions (% opacity)[c]	8.0	6.6	9.0	7.4	8.9

[a] Particulate test invalid due to final leak check.

[b] Particulate test was not valid. After the final leak check impinger water was sucked back into the filter.

[c] Visible emissions were taken over the length of time particulate sample was being taken from the stack.

[d] Feed rate was provided by Envirotech.

[e] Rate determination revised to account for process field measurement inaccuracy.

Table 2-2. ANALYTICAL RESULTS - FURNACE FEED % MOISTURE

Sample Time	% Moisture*
0800	66
0830	68
0900	68
0930	69
1000	67
1030	70
1100	67
1130	66
1200	67
1230	67
1300	68
1330	70
1400	68
1430	66
1500	68
1530	69
1600	67
1630	67
1645	69

*Standard Method 209A.

3. DISCUSSION OF METHODS

3.1 PARTICULATE MATTER EMISSION TESTS

Particulate matter emissions were determined according to standard Environmental Protection Agency (EPA) Methods 1, 2, 3, and 5.

EPA Method 1

The criteria described in EPA Reference Method 1 (Sample and Velocity Traverses for Stationary Sources Federal Register 42 FR 41754, August 18, 1977) were used to select appropriate sampling sites. The eight diameters and two diameters rule, upstream and downstream, respectively, of any flow disturbance is the primary criteria. The sampling points were located more than 8 duct diameters upstream from the nearest flow disturbance and 2 duct diameters downstream from the stack exit. Twelve points were sampled at 5 minutes a point for 1 hour of total test time. A diagram of the incinerator exhaust stack location is shown in Figure 3-1. The traverse points for the stack were calculated and reported on a standardized form (Appendix B - Field Data Sheets).

EPA Method 2

EPA Reference Method 2 (Determination of Stack Gas Velocity and Volumetric Flow Rate, Federal Register 42 FR 41759, August 18, 1977) was followed to determine flue gas velocity, stack temperature, stack pressure, and volumetric flow rate. A check for cyclonic flow was made. The flow was not cyclonic.

EPA Method 3

EPA Reference Method 3 (Gas Analysis, for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight - Federal Register 42 FR 41768) was utilized to characterize the stationary gas analysis. As permitted under Section 1.2, paragraph 2 of the reference document a modification to the sampling procedures and use of an alternative analytical procedure was implemented. A single point integrated sample was collected. In

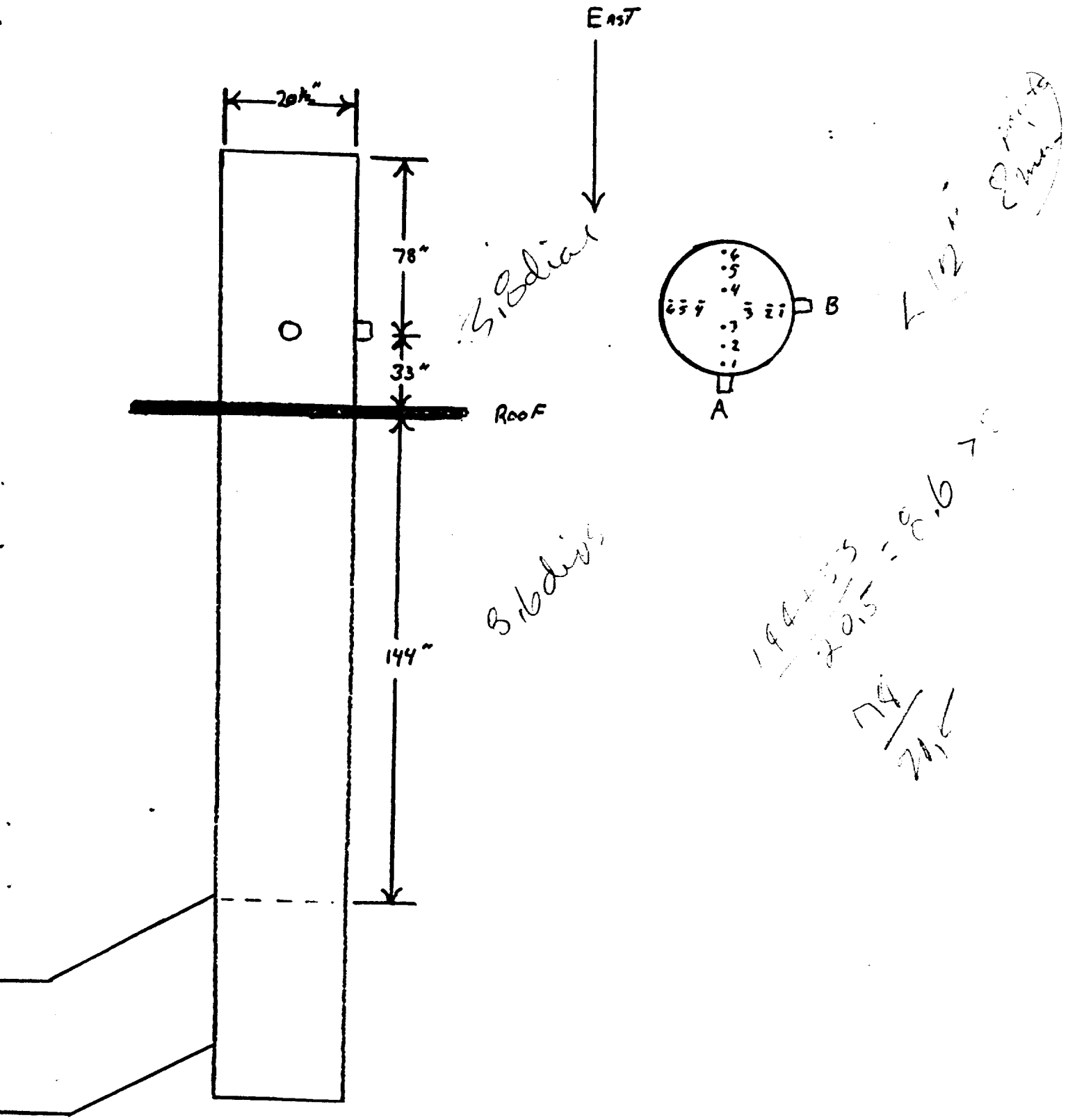


Figure 3-1. Diagram of sampling locations - incinerator exhaust stack.

lieu of an Orsat analyzer, a gas chromatograph with a thermal conductivity detector (GC/TCD) was utilized to measure the concentrations of oxygen (O_2), carbon dioxide (CO_2), and nitrogen (N_2) in the integrated bag sample.

Helium was the carrier gas. Compound separation was achieved with a packed stainless steel Chromosorb 102/Molecular Sieve column. Calibration gas standards was injected prior to and after sample by injection for a quantification by retention time and peak area. A one point calibration method was employed utilizing a Scotty II-Mix 35 calibration mixture (±2% certified). This mixture contains stationary gas components as follows:

- CO_2 - 2.88%
- O_2 - 16.8%
- N_2 - 80.3%

EPA Method 5

EPA Reference Method 5 - (Determination of Particulate Emissions from Stationary Sources - Federal Register 42 FR 41776, August 18, 1977) was utilized to measure particulate matter in the flue gas streams. The particulate mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after removal of uncombined water. The filter box temperature of 250°F ± 25°F was used. The operating and maintenance procedures for the sampling train was followed as described in APTD-0576. Quality control procedures have been implemented to ensure proper calibration and operation techniques. Equipment calibration forms are in Appendix E. Figure 3-2 is a schematic illustration of the EPA Method 5 sampling train.

EPA Method 9

EPA Reference Method 9 - (Visual Determination of the Opacity of Emissions from Stationary Sources - Federal Register 42 FR 41776, August 18, 1977) was utilized to measure the percent opacity of the stack gas. This was based on 15 second readings during the 1 hour Method 5 test.

3.2 SLUDGE

Samples were taken by grab sampling according to standard sampling methods.

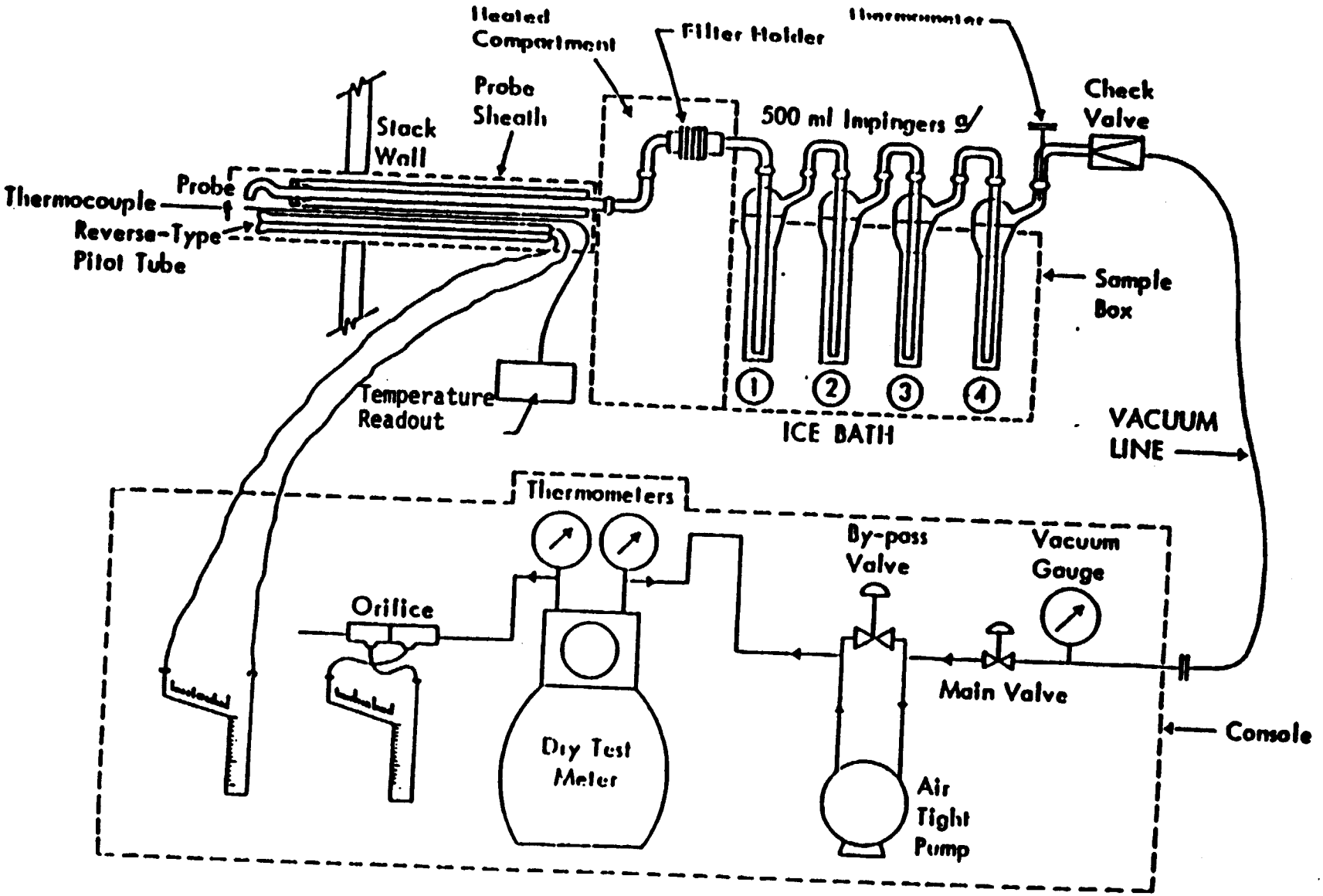


Figure 3-2. Schematic illustration of EPA Method 5 sampling train.

4.0 COMPOSITE SLUDGES, ASH, SCRUBBER WATER AND FUEL OIL

The samples were taken by Lurgi personnel, composited by TRW personnel, and analyzed by an independent laboratory. The results are reported in Table 4-1.

SAMPLE ANALYSIS SCHEDULE

Test lab samples are to be analyzed as follows:

Sludge Samples: (3 each)

One composite sample for each test day is to be analyzed as follows:

1. Proximate: ASTM D3172-73 (Low temperature determination of volatiles)
2. Ultimate: ASTM D3176-74
3. Heating Value: ASTM D2015-66
4. Mercury

Ash Sample: (1 each)

A composite ash sample is to be analyzed per ASTM D3172-73.

Scrubber Water: (2 each)

Inlet and outlet scrubber water samples are to be analyzed as follows:

1. Settleable Solids: Standard Methods 208F
2. Total Suspended Solids: Standard Methods 208D
3. Total Solids (including dissolved): Standard Methods 208A

Fuel Oil: (1 each)

General reference specification for fuel oil is ASTM D-396-73. Specific tests to be performed are:

Moisture and Sediment	D-473-69
Residual Carbon	D-524
Sulfur	D-129
Heat Value	D-240-72
Ash	D-482-73

March 9, 1983

SUPPLEMENTAL

Table 4-1. SUMMARY OF COMPOSITE SLUDGE, COMPOSITE ASH, SCRUBBER WATER IN, AND SCRUBBER WATER OUT INCINERATOR EXHAUST STACK - ROCKY MOUNT WASTEWATER TREATMENT FACILITY

TRW #	Analysis	As received	Dry basis
TRW # 4609 Sludge 0800-1645 1-13-83	Ultimate analysis,		
	Weight % Carbon		26.39
	Weight % Hydrogen		0.27
	Weight % Nitrogen		3.96
	Weight % Oxygen		29.03
	Weight % Sulfur	0.04	0.10
	Weight % Ash	14.18	40.25
	Proximate analysis,		
	Weight % Moisture	64.77	
	Weight % Ash	14.18	40.25
	Weight % Volatile Matter	20.08	
	Weight % Fixed Carbon	0.97	
	Btu/lb	2182	6194
TRW # 4629 Sludge 1100-1645 1-13-83	Ultimate analysis,		
	Weight % Carbon		25.24
	Weight % Hydrogen		0.23
	Weight % Nitrogen		2.79
	Weight % Oxygen		32.56
	Weight % Sulfur	0.04	0.12
	Weight % Ash	13.92	39.06
	Proximate analysis,		
	Weight % Moisture	64.35	
	Weight % Ash	13.92	39.06
	Weight % Volatile Matter	21.08	
	Weight % Fixed Carbon	0.65	
	Btu/lb	2269	6364
TRW # 4628 Ash	Proximate Analysis		
	Weight % Moisture	28.56	
	Weight % Ash	60.24	84.32
	Weight % Volatile Matter	0	0
	Sulfur	<.01	

(continued)

Table 4-1. Concluded

TRW #	Analysis	As received	Dry basis
TRW # 4615 Scrubber in	Total Solids (mg/l)	625	
	Total Suspended Solids (mg/l)	41	
	Settleable Solids (mg/l/hr)	<0.1	
TRW # 4616 Scrubber out	Total Solids (mg/l)	1040	
	Total Suspended Solids (mg/l)	101	
	Settleable Solids (mg/l/hr)	<0.1	
TRW # 4617 Fuel oil	Weight % Ash[a]	<0.01	
	Weight % Sulfur[b]	0.20	
	Btu/lb[c]	18,736	
	Weight % Rams bottom carbon residue[d]	0.185	
TRW # 4629 Sludge	Mercury (μg/g)[e]	0.187	
TRW # 4609 Sludge	Mercury (μg/g)[e]	0.328	

[a]Determined by method ASTM D-482-73.

[b]Determined by method ASTM D-129.

[c]Determined by method ASTM D-240-72.

[d]Determined by method ASTM D-524.

* Volatile matter and ash were determined at 550°C.

[e]Determined by Method EPA 105 by Grainger Labs.

APPENDIX A

SAMPLE PARTICULATE CALCULATION

SAMPLE PARTICULATE CALCULATIONS

1. Volume of dry gas sampled at standard conditions - 70°F, 29.92" Hg, ft^3.

$$V_{m_{std}} = \frac{17.64 \times V_m \quad P_B + \frac{P_m}{13.6}}{(T_m + 460)} = Ft^3 =$$

2. Volume of water vapor at 70°F and 29.92" Hg, Ft^3.

$$V_{w_{gas}} = 0.0471 \times V_w = ft^3$$

3. % moisture in stack gas

$$\%M = \frac{100 \times V_{w_{gas}}}{V_{m_{std}} + V_{w_{gas}}} = \%$$

4. Mole fraction of dry gas

$$M_d = \frac{100 - \%M}{100}$$

5. Average molecular weight of dry stack gas

$$M W_d = (\%CO_2 \times \frac{44}{100}) + (\%O_2 \times \frac{32}{100}) + (\%N_2 \times \frac{28}{100})$$

---

[a]The variations between these calculations and those used as shown on the load sheets are due to rounding in these manual calculations.

6. Molecular weight of stack gas

$$MW = MW_d \times M_d + 18 (1 - M_d)$$

7. Stack velocity @ stack conditions, fpm

$$V_s = 4310 \times \overline{\Delta P_s \times (T_s + 460)} \quad \frac{1}{\overline{P_s \times MW}}^{1/2} = \text{fpm}$$

8. Stack gas volume @ actual conditions

$$ACFM = \frac{V_s \times A_s}{144}$$

9. Stack gas volume @ standard conditions (DSCFM)

$$Q_s = \frac{0.123 \times V_s \times A_s \times M_d \times P_s}{(T_s + 460)} = \text{DSCFM}$$

10. Percent isokinetic

$$\%I = \frac{1032 \times (T_s + 460) \times V_{m_{std}}}{V_s \times T_t \times P_s \times M_d \times (D_n)^2} = \%$$

11. Particulate - probe, cyclone, and filter (gr/DSCF)

$$C_{an} = 0.0154 \times \frac{M_f}{V_{mstd}} = \text{gr/DSCF}$$

12. Particulate - probe, cyclone and filter, gr/ACF at stack conditions

$$C_{at} = \frac{17.7 \times C_{an} \times P_s \times M_d}{(T_s + 460)} = \text{gr/ACF}$$

13. Particulate - probe, cyclone, filter, lb/hr.

$$C_{aw} = 0.00857 \times C_{ah} \times Q_s = \text{lb/hr.}$$

14. Particulate - probe, cyclone, and filter, gr/DSCF corrected to 12 percent CO_2

$$\frac{12}{\text{Stack } CO_2} \times C_{an} = \text{gr/DSCF corrected to 12\% } CO_2$$

15. Particulate - probe, cyclone and filter, gr/ACF at stack conditions

$$C_{at} = \frac{17.7 \times C_{an} \times P_s \times M_d}{(T_s + 460)} = \text{gr/ACF}$$

16. Particulate - probe, cyclone, filter, lb/hr.

$$C_{aw} = 0.00857 \times C_{ah} \times Q_s = \text{lb/hr.}$$

Particulate Nomenclature.

A_n = Cross-sectional area of nozzle, m^2 (ft^2).

A_s = Cross-sectional area of stack, m^2 (ft^2).

B_{ws} = Water vapor in the gas stream, proportion by volume.

C_a = Acetone blank residue concentration, mg/g.

C_{act} = Concentration of particulate matter in stack gas, at stack conditions (gr/ACF).

C_{std} = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscm (g/dsc

E = Particulate matter emission rate (lb/hr).

I = Percent of isokinetic sampling.

L_a = Maximum acceptable leakage rate for either a pretest leak check or for a leak check following a component change; equal to 0.00057 m^3/min (0.02 cfm) or 4 percen of the average sampling rate, whichever is less.

L_i = Individual leakage rate observed during the leak check conducted prior to the "i^{th}" component change (i = 1, 2, 3....n), m^3/min (cfm).

L_p = Leakage rate observed during the post-test leak check, m^3/min (cfm).

K_p = Pitot tube constant.

M_d = Mole fraction of dry gas.

M_f = Particulate matter collected in sampling train (probe, cyclone and filter) in milligrams (mg).

m_n = Total amount of particulate matter collected, mg.

MW_a = Average molecular weight of dry stack gas.

M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mc

MW = Molecular weight of stack gas (wet).

m_a = Mass of residue of acetone after evaporation, mg.

P_{bar} = Barometric pressure at the sampling site, mm Hg (in. Hg

P_S = Stack static pressure, mmHg (in. Hg).

P_s = Absolute stack gas pressure, mm Hg (in. Hg).

= $P_{bar} + P_g$

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscm (dscf).

R = Ideal gas constant, 0.06236 mm Hg-m^3/°K-g-mole (21.85 in. Hg-ft^3/°R-lb-mole).

T_m = Absolute average dry gas meter temperature, °K (°R).

T_s = Absolute average stack gas temperature (see Figure 5-2), °K (°R).

T_{std} = Standard absolute temperature, 293°K (528°R).

T_t = Total time of process feed rate determination (min).

V_a = Volume of acetone blank, ml.

V_{aw} = Volume of acetone used in wash, ml.

V_{lc} = Total volume of liquid collected in impingers and silica gel, ml.

V_m = Volume of gas sample as measured by dry gas meter, dcm (dcf).

$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).

$V_{w(std)}$ = Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf).

V_s = Stack gas velocity, calculated by Method 2, using data obtained from Method 5, m/sec (ft/sec).

W_a = Weight of residue in acetone wash, mg.

Y = Dry gas meter calibration factor.

ΔH = Average pressure differential across the orifice meter (see Figure 5-2), mm H_2O (in. H_2O).

ΔP = Velocity head of stack gas, mmH_2O (in H_2O).

ρ_a = Density of acetone, mg/ml.

ρ_w = Density of water, 0.9982 g/ml (0.002201 lb/ml).

θ = Total sampling time, min.

θ_1 = Sampling time interval, from the beginning of a run until the first component change, min.

θ_i = Sampling time interval, between two successive component changes, beginning with the interval between the first and second changes, min.

θ_p = Sampling time interval, from the final (n^{th}) component change until the end of the sampling run, min.

13.6 = Specific gravity of mercury.

60 = Sec/min.

4310 = Conversion factor: Pitot tube coefficient (C_p) X Pitot tube constant (K_p) X 60, where K_p = 85.49 and C_p = .84.

2000 = Conversion pound to ton.

100 = Conversion to percent.

LOAD SHEET
STACK TEST - PARTICULATE

Test # 2

Part 1

Enter	(Initial) Value	y Only) Location
	0.028317	04
	17.64	05
	.0471	06
	1032	07

			Test # 3			Test # 4		
			Enter	Value	Location	Enter	Value	Location
$\overline{Ts}$(Min)	60	09	$\overline{Ts}$(Min)	60	09	$\overline{Ts}$(Min)	60	09
(DN)^2(in^2)	.0961	10	(DN)^2(in^2)	.0961	10	(DN)^2(in^2)	.0961	10
PS(in Hg)	30.18	11	PS(in Hg)	30.18	11	PS(in Hg)	30.18	11
VM(ft^3)	53.323	12	VM(ft^3)	55.000	12	VM(ft^3)	63.72	12
VW(ml)	71.5	13	VW(ml)	38.	13	VW(ml)	71.6	13
% CO_2	4.92	14	% CO_2	5.25	14	% CO_2	6.68	14
% O_2	15.89	15	% O_2	15.36	15	% O_2	14.08	15
% N_2	79.19	16	% N_2	79.39	16	% N_2	79.24	16
4310$\sqrt{}$	56200.67	17	4310$\sqrt{}$	57751.04	17	4310$\sqrt{}$	68345.69	17
As(ft^2)	2.29	18	As(ft^2)	2.29	18	As(ft^2)	2.29	18
(Ts+460)	558.8	19	(Ts+460)	558.6	19	(Ts+460)	559.1	19
	Part 2			Part 2			Part 2	
mf (mg)		00	mf (mg)		00	mf (mg)		00
mt (mg)	67.6	01	mt (mg)	53.4	01	mt (mg)	79.3	01
VMSTD(f^3)	53.562	02	VMSTD(f^3)	55.268	02	VMSTD(f^3)	64.151	02
Ps ("Hg)	30.18	03	Ps ("Hg)	30.18	03	Ps ("Hg)	30.18	03
Md	0.941	04	Md	.969	04	Md	0.950	04
(Ts+460)	558.8	05	(Ts+460)	558.6	05	(Ts+460)	559.1	05
Qs(scfm)	3916.5	06	Qs(scfm)	4120.0	06	Qs(scfm)	4781.7	06
Tm	74.2		Tm	74.2		Tm	75.2	
Pm	2.95		Pm	3.14		Pm	4.37	
Pb	30.20		Pb	30.20		Pb	30.22	

RESULTS
STACK TEST - PARTICULATE

Test # 2		Test # 3		Test # 4	
Value		Value		Value	
Vm (DSCF)	53.562	Vm (DSCF)	55.268	Vm (DSCF)	64.151
Vm (DSCM)	1.516	Vm (DSCM)	1.564	Vm (DSCM)	1.815
Vw gas (SCF)	3.368	Vw gas (SCF)	1.790	Vw gas (SCF)	3.372
% Moisture	5.915	% Moisture	3.137	% Moisture	4.994
Md	0.941	Md	0.969	Md	0.950
MWd	29.423	MWd	29.454	MWd	29.632
MW	28.747	MW	29.095	MW	29.051
Vs (fpm)	1908.029	Vs (fpm)	1948.903	Vs (fpm)	2308.164
ACFM	4369.4	ACFM	4463.0	ACFM	5285.7
Flow (DSCFM)	3916.5	Flow (DSCFM)	4120.0	Flow (DSCFM)	4751.7
Flow (DSCMM)	110.84	FTow (DSCMM)	116.60	FTow (DSCMM)	135.32
% I	98.9	% I	97.0	% I	97.0
% EA	316.8	% EA	274.3	% EA	265.9
Front gr/dscf	—	Front gr/dscf	—	Front gr/dscf	—
Front gm/dscm	—	Front gm/dscm	—	Front gm/dscm	—
Total gr/dscf	0.01944	Total gr/dscf	0.01488	Total gr/dscf	0.01904
Total gm/dscm	0.04451	Total gm/dscm	0.03407	Total gm/dscm	0.04359
Front gr/acf	—	Front gr/acf	—	Front gr/acf	—
Front gm/acm		Front gm/acm	—	Front gm/acm	—
Total gr/acf	0.01742	Total gr/acf	0.01374	Total gr/acf	0.01722
Total gm/acm	0.03990	Total gm/acm	0.03147	Total gm/acm	0.03943
Front lb/hr	—	Front lb/hr	—	Front lb/hr	—
Front kg/hr	—	Front kg/hr	—	Front kg/hr	—
Total lb/hr	0.652	Total lb/hr	0.525	Total lb/hr	0.795
Total kg/hr	0.296	Total kg/hr	0.238	Total kg/hr	0.354

LOAD SHEET
STACK TEST - PARTICULATE

Test # 5

Part 1

Enter	(Initial	y Only)
	Value	Location
	0.028317	04
	17.64	05
	.0471	06
	1032	07

			Test #			Test #		
			Enter	Value	Location	Enter	Value	Location
T_T(Min)	60	09	T_T(Min)		09	T_T(Min)		09
$(DN)^2(in^2)$	.0961	10	$(DN)^2(in^2)$		10	$(DN)^2(in^2)$		10
PS(in Hg)	30.18	11	PS(in Hg)		11	PS(in Hg)		11
$VM(ft^3)$	60.490	12	$VM(ft^3)$		12	$VM(ft^3)$		12
VW(ml)	64.0	13	VW(ml)		13	VW(ml)		13
% CO_2	4.51	14	% CO_2		14	% CO_2		14
% O_2	16.27	15	% O_2		15	% O_2		15
% N_2	79.22	16	% N_2		16	% N_2		16
$4310\sqrt{}$	63824.19	17	$4310\sqrt{}$		17	$4310\sqrt{}$		17
$As(ft^2)$	2.29	18	$As(ft^2)$		18	$As(ft^2)$		18
(Ts+460)	559.9	19	(Ts+460)		19	(Ts+460)		19
	Part 2			Part 2			Part 2	
mf (mg)		00	mf (mg)		00	mf (mg)		00
mt (mg)	47.0	01	mt (mg)		01	mt (mg)		01
$V_{MSTD}(f^3)$	60.601	02	$V_{MSTD}(f^3)$		02	$V_{MSTD}(f^3)$		02
Ps ("Hg)	30.18	03	Ps ("Hg)		03	Ps ("Hg)		03
Md	0.953	04	Md		04	Md		04
(Ts+460)	559.9	05	(Ts+460)		05	(Ts+460)		05
Qs(scfm)	4487.8	06	Qs(scfm)		06	Qs(scfm)		06
Tm	76.7		Tm			Tm		
Pm	3.82		Pm			Pm		
Pb	30.20		Pb			Pb		

RESULTS

STACK TEST - PARTICULATE

Test #	5	Test #		Test #	
Value		Value		Value	
Vm (DSCF)	60.601	Vm (DSCF)		Vm (DSCF)	
Vm (DSCM)	1.715	Vm (DSCM)		Vm (DSCM)	
Vw gas (SCF)	3.014	Vw gas (SCF)		Vw gas (SCF)	
% Moisture	4.738	% Moisture		% Moisture	
Md	0.953	Md		Md	
MWd	29.372	MWd		MWd	
MW	28.834	MW		MW	
Vs (fpm)	2163.599	Vs (fpm)		Vs (fpm)	
ACFM	4954.6	ACFM		ACFM	
Flow (DSCFM)	4487.8	Flow (DSCFM)		Flow (DSCFM)	
Flow (DSCMM)	127.01	FTow (DSCMM)		FTow (DSCMM)	
% I	97.6	% I		% I	
% EA	350.3	% EA		% EA	
Front gr/dscf	—	Front gr/dscf		Front gr/dscf	
Front gm/dscm	—	Front gm/dscm		Front gm/dscm	
Total gr/dscf	0.01194	Total gr/dscf		Total gr/dscf	
Total gm/dscm	0.02735	Total gm/dscm		Total gm/dscm	
Front gr/acf	—	Front gr/acf		Front gr/acf	
Front gm/acm	—	Front gm/acm		Front gm/acm	
Total gr/acf	0.01082	Total gr/acf		Total gr/acf	
Total gm/acm	0.02478	Total gm/acm		Total gm/acm	
Front lb/hr	—	Front lb/hr		Front lb/hr	
Front kg/hr	-	Front kg/hr		Front kg/hr	
Total lb/hr	0.459	Total lb/hr		Total lb/hr	
Total kg/hr	0.208	Total kg/hr		Total kg/hr	

APPENDIX B

FIELD DATA

TRW
ENVIRONMENTAL ENGINEERING DIVISION

NOMOGRAPH DATA

PLANT Rocky Mount

DATE 1-13-83

SAMPLING LOCATION Incinerator Exhaust

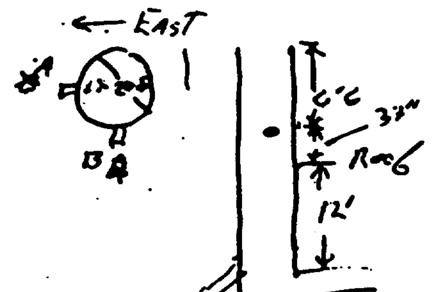
CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.95
AVERAGE METER TEMPERATURE (AMBIENT + 20°F), °F	$T_{m\,avg.}$	70
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	5
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	30.20
STATIC PRESSURE IN STACK, in. Hg, H_2O ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H_2O)	P_s	-.22
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s\,avg.}$	100
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.25
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.32
C FACTOR	1.08	
CALCULATED NOZZLE DIAMETER, in.	5/16	
ACTUAL NOZZLE DIAMETER, in.	.310	
REFERENCE Δp, in. H_2O	.19	

EPA (Dur) 234
4 72

TRW
ENVIRONMENTAL ENGINEERING DIVISION

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Rocky Mount
DATE 1-13-83
SAMPLING LOCATION Incinerator Exhaust
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) A = 24.75 B = 25.5
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) A = 4.25 B = 5.0
STACK I.D., (DISTANCE A - DISTANCE B) 20.5
NEAREST UPSTREAM DISTURBANCE 177"
NEAREST DOWNSTREAM DISTURBANCE 78"
CALCULATOR MCR



SCHEMATIC OF SAMPLING LOCATION

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 POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	.044	20.5	.902	A=4.25 B=5.0	A 5.25 B 6.0
2	.146	↓	2.99	one inch From wall	7.25 8.0
3	.296		6.07		10.3 11.1
4	.704		14.43		15.6 19.4
5	.854		17.51		21.8 22.5
6	.956		19.60	one inch From wall	23.8 24.5
					The Port Nipples were different lengths MCR

PRELIMINARY VELOCITY TRAVERSE

PLANT Rocky Mount
DATE 1-13-83
LOCATION Incinerator Exhaust
STACK I.D. 20.5"
BAROMETRIC PRESSURE, in. Hg 30.20
STACK GAUGE PRESSURE, in. H_2O ~~—~~ -.22
OPERATORS MCR DCS

Not Cyclonic Flow

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-1	.20	98
2	.22	
3	.21	
4	.29	
5	.35	
6	.36	
B-1	.24	
2	.23	
3	.27	
4	.26	
5	.32	
6	.39	
AVERAGE		

EPA (Dur) 233
4/72

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

ENVIRONMENTAL ENGINEERING DIVISION

FIELD DATA

PLANT Rocky Mount
DATE 1-13-93
SAMPLING LOCATION Incinerator Exhaust
SAMPLE TYPE Part.
RUN NUMBER 1
OPERATOR MCR DS
AMBIENT TEMPERATURE 40
BAROMETRIC PRESSURE 30.20
STATIC PRESSURE, (P_s)
FILTER NUMBER (s) 116 .6941
METER$_a$ FACTOR .992

INVALID
Final Leak NoGood
Leak at S.G. Sup.

PROBE LENGTH AND TYPE 4' SS
NOZZLE I.D. .310
ASSUMED MOISTURE, % 5
SAMPLE BOX NUMBER 96
METER BOX NUMBER 96
METER $\Delta H_@$ 1.95
C FACTOR .61
PROBE HEATER SETTING 270
REHEATER BOX SETTING 250
REFERENCE Δp .19

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY _____ MINUTES

Leak Check .015 at 15"

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	0940	403.802									
A-1	5	945	407.40	.20	2.0	2.0	99	52	52	1	238	40
2	10	950	411.15	.22	2.1	2.1	100	62	54	1	242	36
3	15	955	414.85	.21	2.0	2.0	101	70	56	1	236	39
4	20	1000	419.7	.28	2.5	2.4	95	74	58	1	236	35
5	25	05	423.8	.35	3.4	3.4	96	78	60	1	250	36
6	30	10	428.685	.36	3.5	3.5	96	79	62	1	232	36
~~START~~	~~30~~	~~1013~~	~~428.685~~	~~.24~~	~~2.3~~	~~2.3~~	~~99~~	~~77~~	~~60~~	~~1~~	~~246~~	~~39~~
B-1	35	18	432.35	.24	2.3	2.3	99	74	62	1	246	38
2	40	23	436.30	.23	2.2	2.2	96	74	62	1	245	34
3	45	28	440.53	.27	2.6	2.6	97	76	62	1	243	34
4	50	33	7445.02	.26 ~~.27~~	2.5	2.5	96	78	64	1	243	36
5	55	38	449.60	.32	3.1	3.1	98	90	64	1	243	36
6	60	1043	454.758	.39	3.8	3.8	97	94	66	1	245	35

COMMENTS:

EPA •Out 225

ENVIRONMENTAL ENGINEERING DIVISION

FIELD DATA

PLANT Rocky Mount
DATE 1-13-93
SAMPLING LOCATION Incinerator Exhaust
SAMPLE TYPE Part.
RUN NUMBER 2
OPERATOR McA D.S
AMBIENT TEMPERATURE 40
BAROMETRIC PRESSURE 30.20
STATIC PRESSURE, (P_s) -.22
FILTER NUMBER (s) 112 .7693
METER, FACTOR .992

PROBE LENGTH AND TYPE 4' SS
NOZZLE I.D. .310
ASSUMED MOISTURE, % 5
SAMPLE BOX NUMBER 96
METER BOX NUMBER 96
METER $\Delta H_@$ 1.95
C FACTOR 1.69
PROBE HEATER SETTING 700
HEATER BOX SETTING 250
REFERENCE Δp .019

SCHEMATIC OF TRAVERSE POINT LAYOUT

Pre Leak Check .015 @ 13" READ AND RECORD ALL DATA EVERY _____ MINUTES Final .015 @ 15"

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	1105	456.352									
B-1	5	10	460.05	.23	2.2	2.2	99	63	62	7	210	40
2	10	15	464.15	.25	2.4	2.4	98	72	62	7	218	40
3	15	20	468.26	.27	2.6	2.6	102	78	64	8	223	44
4	20	25	472.60	.28	2.7	2.7	98	82	64	9	225	46
5	25	30	477.15	.33	3.2	3.2	99	85	66	10	227	48
6	30	35	482.119	.38	3.7	3.7	99	88	66	12	228	48
START A-1	30	1132	482.119									
	39	46	486.20	.24	2.3	2.3	92	84	66	8	223	52
2	40	47	490.19	.25	2.4	2.4	99	84	68	8	230	52
3	49	52	494.45	.23	2.7	2.7	101	86	65	9	238	52
4	50	1257	499.40	.37	3.6	3.6	95	88	65	13	231	56
5	55	1102	504.46	.40	3.9	3.9	98	90	65	14	234	56
6	60	07	509.675	.41	4.0	4.0	98	90	70	14	235	56
	60		53.323			2.98	98.8	74.25				
			Delta 562.00-.67	.90				(82.5)	(66)			
				6.5								
				.549		2.995						

COMMENTS:

EPA Dust 275 71.5 mL.

55% 53.4

B-5

ENVIRONMENTAL ENGINEERING DIVISION

FIELD DATA

PLANT Rocky Mount
DATE 1-13-82
SAMPLING LOCATION Incinerator Exhaust
SAMPLE TYPE Part
RUN NUMBER 3
OPERATOR McR
AMBIENT TEMPERATURE 45
BAROMETRIC PRESSURE 30.20
STATIC PRESSURE, (P_s) -0.22
FILTER NUMBER (s) 111 .7103
METER FACTOR .992

30.12

PROBE LENGTH AND TYPE 4' ss
NOZZLE I.D. .314
ASSUMED MOISTURE, % 5
SAMPLE BOX NUMBER 96
METER BOX NUMBER 96
METER ΔH@ 1.95
C FACTOR 6.6
PROBE HEATER SETTING 70
HEATER BOX SETTING 250
REFERENCE Δp .19

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY ____ MINUTES

Pre Leak .005 at 15 | Final Leak Rate .005 at 15

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	1335	510.293									
A-1	5	40	513.92	.22	2.1	2.1	97	62	62	5	216	52
2	10	45	518.5	.28	2.2	2.2	99	70	64	5	212	52
3	15	50	522.28	.26	2.5	2.5	99	80	64	5	220	52
4	20	55	527.37	.40	3.9	3.9	100	82	66	6	221	54
5	25	1300	532.25	.36	3.5	3.5	99	84	66	6	222	58
6	30	05	537.365	.42	4.0	4.0	99	84	68	7	221	60
Start 30		1307	537.805									
B-1	35	12	541.80	.24	2.3	2.3	95	82	68	5	225	58
2	40	17	546.10	.27	2.6	2.6	98	81	70	5	223	54
3	45	22	550.28	.29	2.8	2.8	98	86	70	6	222	58
4	50	27	554.85	.30	2.9	2.9	98	86	70	5	216	58
5	55	32	559.85	.40	3.9	3.9	99	85	70	7	219	60
6	60	37	565.293	.47	4.5	4.5	102	84	70	8	232	60
	60		55.000			3.14	98.58	74.17				
			Delps 57751.0	4.00% 61.0%								
				15667								

COMMENTS:

55.916 534

EPA-Dwi 235 38 Mc

ENVIRONMENTAL ENGINEERING DIVISION

FIELD DATA

PLANT Rocky Mount
DATE 1-13-83
SAMPLING LOCATION Incinerator Exhaust
SAMPLE TYPE Part.
RUN NUMBER 4
OPERATOR MR DS
AMBIENT TEMPERATURE 45
BAROMETRIC PRESSURE 30.20
STATIC PRESSURE, (P_s) -.22" H_2O
FILTER NUMBER (s) 127 , 209
METER$_x$ FACTOR .972

30.18

PROBE LENGTH AND TYPE 4' SS
NOZZLE I.D. .310
ASSUMED MOISTURE, % 5
SAMPLE BOX NUMBER 96
METER BOX NUMBER 96
METER ΔH@ 1.95
C FACTOR 1.58
PROBE HEATER SETTING 202
HEATER BOX SETTING 250
REFERENCE Δp .19

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY ____ MINUTES

Pre Leak .005 at 15"

Final Leak Rate .008 at 15"

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	1410	566.289 / 565.976									
B-1	5	15	570.31	.28	2.7	2.7	98	62	62	5	240	36
2	10	20	574.90	.34	3.3	3.3	99	70	62	5	210	39
3	15	25	579.94	.40	3.9	3.9	98	78	62	6	227	40
4	20	30	584.95	.39	3.8	3.8	99	82	64	6	235	42
5	25	35	590.60	.51	4.8	4.8	98	86	66	8	249	42
6	30	40	597.100	.65	6.2	6.2	99	88	66	10	241	44
START	30	1442	597.100									
A-1	35	47	602.00	.37	3.6	3.6	98	84	68	6	240	48
2	40	52	607.30	.43	4.1	4.1	101	86	70	7	237	45
3	45	57	612.60	.43	4.1	4.1	102	88	70	7	236	48
4	50	1502	618.30	.55	5.3	5.3	99	92	72	9	245	50
5	55	07	624.15	.56	5.3	5.3	99	92	72	9	245	50
6	60	12	630.059	.56	5.3	5.3	99	92	72	9	241	50
	60		63.770			4.37	99.08	75.25				
			Delps 68345.09									

COMMENTS: At the end of the final leak check impinger water went into the filter about 5 ml. of this was spilled while taking the filter out of the box. The rest was saved and will be included as a front weight

EPA (Dur) 235

71.6 ml

FIELD DATA

PLANT Rocky Mount
DATE 1-13-'83
SAMPLING LOCATION Incinerator Exhaust
SAMPLE TYPE Part.
RUN NUMBER 5
OPERATOR MCR DS
AMBIENT TEMPERATURE 45
30.18 BAROMETRIC PRESSURE 30.20
STATIC PRESSURE, (P_s) -.22
FILTER NUMBER (s) 113 .2073

PROBE LENGTH AND TYPE 4' SS
NOZZLE I.D. .310
ASSUMED MOISTURE, % 5
SAMPLE BOX NUMBER 9E
METER BOX NUMBER 9E
METER $\Delta H_@$ 1.95
C FACTOR 1.03
PROBE HEATER SETTING 70
HEATER BOX SETTING 250
REFERENCE Δp .19

SCHEMATIC OF TRAVERSE POINT LAYOUT

Pre Leak Rate .001 at 15"

READ AND RECORD ALL DATA EVERY ______ MINUTES

Final Leak Rate .001 at 15"

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	1537	653.246									
A-1	5	42	658.15	.36	3.5	3.5	99	70	68	5	205	50
2	10	47	663.25	.41	3.9	3.9	99	76	66	6	216	44
3	15	52	668.60	.40	3.8	3.8	99	82	66	6	222	48
4	20	57	674.10	.50	4.8	4.8	99	86	68	8	228	48
5	25	1602	679.85	.55	5.3	5.3	99	90	70	9	231	52
6	30	07	686.695	.55	5.3	5.3	100	90	70	9	230	54
Start	30	1610	686.695									
B-1	35	15	690.70	.24	2.3	2.3	99	80	70	4	230	50
2	40	20	695.25	.32	3.1	3.1	99	80	70	5	230	48
3	45	25	699.72	.30	2.9	2.9	101	86	70	5	232	48
4	50	30	704.16	.30	2.9	2.9	102	88	70	5	231	44
5	55	35	709.30	.40	3.8	3.8	101	90	72	7	231	48
6	60	40	713.736	.44	4.2	4.2	102	90	72	7	234	50
								84	69.3			
	60		60.490			3.82	99.92	76.67				
			Dolps 63824.19	1.5079 / 12								

COMMENTS

EPA (Dur) 235 4/72 64.0 ml.

5

Plume Observation Record Form

EPA VALIDATION
BY _____
DATE _____

Date 1/13/83
Observer David Sayre
Checked By _____
Type of installation Stulz Incinerator
Fuel _____ Stack Ht. _____
Observers Distance from Stack 30' Ft.
Wind Speed 5-10 Direct ___
Sky Condition Clear
Plume Color Brown
Plume Background Blue
Plume Behavior _____
Steam Plume
detached ____ Ft. from stack
attached ____ Ft. dissipated
Start Time 0940
Ending Time 1043
Ending Weather Clear
Wind Speed 5-10 Direct ___
Sky Condition Clear
No. Units in Excess of standard 0
5 min/hr. allow 20
No. Units of VIO. 0
Remarks:

Source Envirotech Inc. Plant (Rock Mount)
Address _____

Run #I

Min. \ Sec.	0	15	30	45
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				

Min. \ Sec.	30	45
30		
31		
32		
33		
34		
35		
36		
37		
38		
39		
0940	10	10
41	10	0
42	10	5
43	5	5
44	5	10
45	10	5
46	5	5
47	15	15
48	5	5
49	5	5
50	10	10
51	5	5
52	5	10
53	10	10
54	10	5
55	20	20
56	20	15
57	10	10
58	15	15
59	15	15

REV. AQ-23 6/1/78

DATA VALIDATION
BY ________
DATE ________

Plume Observation Record Form

Date 1/13/83

Observer [illegible]

Checked By ________

Type of installation ________

Sludge Incinerator

Fuel ______ Stack Ht. ______

Observers Distance from Stack

20 Ft.

Wind Speed 5 Direct ____

Sky Condition Clear

Plume Color ________

Plume Background ________

Plume Behavior ________

Steam Plume

detached ______ Ft. from stack

attached ______ Ft. dissipated

Start Time ________

Ending Time ________

Ending Weather ________

Wind Speed ______ Direct ____

Sky Condition ________

No. Units in Excess of standard ________

5 min/hr. allow 20

No. Units of VIO. ________

Remarks:

0 = 4 = 0

5 = 132 = 660

10 = 78 = 780

15 = 27 = 405

20 = 7 = 140

248 1,985

1,985 / 248 = 8.00

Source Incinerator

Address TAR River [illegible] Rocky Mount

#1

Min. \ Sec.	0	15	30	45	Min. \ Sec.	0	15	30	45
1020 0	5	15	15	5	30	10	5	5	5
1	15	15	15	10	31	5	5	5	5
2	20	10	10	5	32	5	5	5	5
3	15	5	10	10	33	5	5	5	5
4	15	15	15	5	34	5	5	5	0
5	10	5	5	5	35	5	5	5	5
6	10	5	[illegible]	5	36	5	5	0	5
7	5	5	10	10	37	5	10	5	5
8	5	5	10	10	38	5	10	5	10
9	5	5	[illegible]	10	39	10	10	5	5
10	10	10	10	10	40	5	10	5	10
11					41	5	5	5	5
12					42	10	5	5	5
13	10	15	10	20	43	5	5	5	5
14	10	15	[illegible]	10	44				
15	10	10	[illegible]	10	45				
16	10	5	10	5	46				
17	5	10	10	10	47				
18	5	5	10	10	48				
19	10	5	10	10	49				
20	5	10	5	5	50				
21	5	5	5	5	51				
22	5	5	10	5	52				
23	5	5	5	5	53				
24	5	5	5	5	54				
25	5	5	5	5	55				
26	5	5	5	5	56				
27	5	5	5	5	57				
28	5	5	10	10	58				
29	5	5	5	5	59				

REV. AQ-23 6/1/78

DATA VALIDATION
BY
DATE

Plume Observation Record Form

Date 1/13/83
Observer David Sivia
Checked By
Type of installation
Sludge Incinerator
Fuel ____ Stack Ht. ____
Observers Distance from Stack
20 Ft.
Wind Speed 5-10 Direct ____
Sky Condition B Clear
Plume Color Brown
Plume Background Blue
Plume Behavior
Steam Plume
detached ____ Ft. from stack
attached ____ Ft. dissipated
Start Time 1105
Ending Time 1207
Ending Weather Clear
Wind Speed 5-10 Direct ____
Sky Condition Clear

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

Remarks:

0 = 5 = 0
5 : 167 = 835
10 : 68 = 680
15 : 8 = 120
20 : 0 = 0
248 1,635
1635
248 = 6.6

Source Envirotech
Address Tar River
Rocky Mount N.C

Run #2

Sec. / Min.	0	15	30	45	Sec. / Min.	0	15	30	45
0	~~10~~	~~10~~	~~5~~	~~5~~	30	5	5	5	5
1	~~15~~	~~5~~	~~5~~	~~5~~	31	5	5	5	5
2	5				32	5	5	5	5
3					33	5	5	.2V	10
4					34	10	5	5	5
1105	10	10	5	5	35	5	5	5	.5
6	10	5	5	5	36				
7	5	10	5	10	1137	5	5	5	5
8	10	5	5	5	38	5	5	5	5
9	5	5	5	5	39	5	5	5	5
10	5	5	5	5	40	10	10	10	10
11	5	5	10	10	41	5	10	10	5
12	10	10	10	5	42	10	5	5	5
13	5	5	5	5	43	5	5	5	5
14	0	5	5	5	44	5	5	5	5
15	5	10	5	5	45	5	5	5	10
16	5	10	10	5	46	5	5	5	10
17	5	5	10	5	47	10	10	5	10
18	5	0	5	5	48	5	10	5	5
19	5	5	5	0	49	10	15	10	5
20	5	10	5	5	50	10	5	10	10
21	5	10	5	5	51	5	10	5	5
22	5	10	5	5	52	5	5	5	5
23	5	10	5	5	53	5	10	5	5
24	5	5	5	5	54	5	5	5	5
25	5	10	5	5	55	5	10	5	5
26	5	10	5	10	56	5	5	5	10
27	5	5	5	5	57	5	5	10	10
28	5	5	5	5	58	10	5	10	5
29	5	5	5	5	59	10	5	5	5

REV. AQ-23 6/1/78

Plume Observation Record Form

Run #2

DATA VALIDATION
BY _____
DATE _____

Date 1/13/83
Observer David Sims
Checked By _____
Type of installation Sludge Incinerator
Fuel _____ Stack Ht. _____
Observers Distance from Stack 20 Ft.
Wind Speed 5 Direct V
Sky Condition Clear
Plume Color Dark
Plume Background Blue
Plume Behavior _____
Steam Plume
detached _____ Ft. from stack
attached _____ Ft. dissipated
Start Time _____
Ending Time _____
Ending Weather _____
Wind Speed _____ Direct ___
Sky Condition _____
No. Units in Excess of standard _____
5 min/hr. allow 20
No. Units of VIO. _____
Remarks:

Source _____
Address _____

Min. \ Sec.	0	15	30	45	Min. \ Sec.	0	15	30	45
1300	5	10	10	10	30				
1	5	5	5	5	31				
2	5	5	10	5	32				
3	5	10	10	5	33				
4	15	15	15	15	34				
5	10	10	10	10	35				
6	10	15	10	10	36				
7	5	5	10	15	37				
8					38				
9					39				
10					40				
11					41				
12					42				
13					43				
14					44				
15					45				
16					46				
17					47				
18					48				
19					49				
20					50				
21					51				
22					52				
23					53				
24					54				
25					55				
26					56				
27					57				
28					58				
29					59				

REV. AQ-23 6/1/78

DATA VALIDATION
BY
DATE

Plume Observation Record Form

Date 1-13-82
Observer David Sowa
Checked By MCR
Type of installation
Study Incinerator
Fuel ____ Stack Ht. 10
Observers Distance from Stack
20 Ft.
Wind Speed 5 Direct N.E
Sky Condition Clear
Plume Color Brown
Plume Background Blue
Plume Behavior
Steam Plume
detached ____ Ft. from stack
attached ____ Ft. dissipated
Start Time 1235
Ending Time 1336
Ending Weather Clear
Wind Speed 5-10 Direct
Sky Condition Clear

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

Remarks:
Run 3

0 = 2 = 0
5 = 84 = 420
10 = 119 = 1190
15 = 37 = 555
20 = 2 = 40
244 2205

2205 / 24 = 90.0

Source Environ. C.
Address Tar River
Rocky Mount N.C.

Run # III

Min. \ Sec.	0	15	30	45
0	10	10		
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				

Min. \ Sec.	0	15	30	45
30				
31				
32				
33				
34				
35	10	10	10	0
36	5	0	0	10
37	10	15	15	15
38	15	10	10	10
39	10	5	5	5
40	5	5	5	5
41	5	10	5	5
42	5	5	5	10
43	10	5	5	10
44	5	5	10	5
45	10	5	5	5
46	5	5	10	5
47	10	10	5	10
48	10	5	5	5
49	5	5	5	5
50	10	0	5	0
51	5	5	5	5
52	10	5	5	5
53	5	5	5	5
54	5	5	5	5
55	5	10	15	15
56	15	15	15	15
57	15	15	15	15
58	10	10	10	15
59	15	10	15	15

REV. AQ-23 6/1/78

Plume Observation Record Form

DATA VALIDATION
BY _____
DATE _____

Date 1/13/83
Observer David Sawyer
Checked By _____
Type of installation _____
Sludge Incinerator
Fuel _____ Stack Ht. _____
Observers Distance from Stack 20 Ft.
Wind Speed 5 Direct _____
Sky Condition Clear
Plume Color Brown
Plume Background Blue
Plume Behavior _____
Steam Plume
detached _____ Ft. from stack
attached _____ Ft. dissipated
Start Time _____
Ending Time _____
Ending Weather _____
Wind Speed _____ Direct _____
Sky Condition _____
No. Units in Excess of standard _____
5 min/hr. allow 20
No. Units of VIO. _____
Remarks:

Source Envirotech
Address Tar River
Rocky Mount

Run # III

Min \ Sec.	0	15	30	45	Min \ Sec.	0	15	30	45
1300	10	15	10	15	30	5	10	10	10
1	10	20	10	10	31	10	10	10	10
2	10	10	15	10	32	10	15	10	10
3	10	10	10	10	33	10	10	10	10
4	15	15	10	10	34	10	15	15	10
5	10	10	10	10	35	10	10	10	5
6					36	10	10	15	5
7	10	10	5	5	37				
8	5	10	5	5	38				
9	5	5	5	10	39				
10	5	5	5	5	40				
11	5	5	5	5	41				
12	5	10	10	5	42				
13	5	10	10	10	43				
14	15	10	15	10	44				
15	10	5	5	10	45				
16	10	10	5	10	46				
17	10	5	5	5	47				
18	5	10	10	10	48				
19	10	15	10	10	49				
20	10	10	15	15	50				
21	10	10	10	15	51				
22	15	10	10	10	52				
23	10	10	10	10	53				
24	5	10	10	5	54				
25	10	10	5	10	55				
26	5	10	15	15	56				
27	10	10	15	10	57				
28	15	10	10	10	58				
29	10	10	10	10	59				

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DATA VALIDATION
BY
DATE

Plume Observation Record Form

Date 1/13-82
Observer [illegible]
Checked By A.C.R
Type of installation
Stack Ht.
Observers Distance from Stack
30 Ft.
Wind Speed 5-10 Direct
Sky Condition Clear
Plume Color Brown
Plume Background Blue
Plume Behavior
Steam Plume
detached Ft. from stack
attached Ft. dissipated
Start Time 1410
Ending Time 1512
Ending Weather Clear
Wind Speed 5-10 Direct
Sky Condition Clear
No. Units in Excess of standard 0
5 min/hr. allow 20
No. Units of VIO. 0
Remarks:

Source Environtech
Address Tar River
Rocky Mount

Run # II

Min \ Sec.	0	15	30	45
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10	10	5	5	5
11	5	5	5	5
12	5	0	10	15
13	10	5	5	5
14	10	15	10	10
15	10	5	10	5
16	10	10	10	10
17	10	10	10	10
18	10	5	5	5
19	5	5	5	5
20	5	10	10	10
21	5	10	5	5
22	5	5	5	5
23	5	5	5	5
24	5	5	5	5
25	5	5	10	5
26	10	5	10	5
27	5	5	5	10
28	5	5	10	5
29	5	10	10	5

Min \ Sec.	0	15	30	45
30	10	10	10	10
31	10	10	10	10
32	10	10	10	5
33	5	5	5	5
34	5	5	5	5
35	10	10	10	5
36	5	10	5	5
37	5	10	5	10
38	5	10	10	10
39	10	5	10	5
40	5	5	5	10
41	5	5	5	5
42	0	10	15	10
43	5	5	5	10
44	10	5	5	5
45	10	5	5	10
46	10	10	5	10
47	10	10	10	10
48	5	10	10	5
49	15	15	10	10
50	15	10	10	15
51	10	5	5	10
52	5	5	5	5
53	5	10	5	5
54	5	10	10	10
55	5	5	10	10
56	10	10	10	5
57	10	10	5	0
58	5	5	5	10
59	10	5	5	10

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Plume Observation Record Form

DATA VALIDATION
BY
DATE

Date 1/10/83
Observer Doug Sams
Checked By
Type of installation
Sludge Incinerator
Fuel ____ Stack Ht. ____
Observers Distance from Stack
20 Ft.
Wind Speed 5 Direct
Sky Condition Clear
Plume Color Brown
Plume Background
Plume Behavior
Steam Plume
detached ____ Ft. from stack
attached ____ Ft. dissipated
Start Time 1410
Ending Time 1512
Ending Weather
Wind Speed ____ Direct
Sky Condition
No. Units in Excess of standard
5 min/hr. allow 20
No. Units of VIO.
Remarks:

0 = 4 = 0
5 = 134 = 670
10 = 105 = 1050
15 = 0 = 135
20 = 0 = 0
252 1855
1855
252 = 7.4

Source Envirotech
Address Tar River
Rocky Mount N.C.

Run # IV

Sec. / Min.	0	15	30	45	Sec. / Min.	0	15	30	45
1500	10	5	5	10	30				
1	5	0	5	5	31				
2	0	10	5	5	32				
3	10	5	5	5	33				
4	5	5	10	5	34				
5	5	5	5	5	35				
6	5	5	5	10	36				
7	10	15	15	10	37				
8	10	10	5	5	38				
9	5	5	10	10	39				
10	5	5	5	0	40				
11	5	10	5	10	41				
12	10	5	5	10	42				
13					43				
14					44				
15					45				
16					46				
17					47				
18					48				
19					49				
20					50				
21					51				
22					52				
23					53				
24					54				
25					55				
26					56				
27					57				
28					58				
29					59				

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Plume Observation Record Form

DATA VALIDATION
BY
DATE

Source Envirotech

Address Jay River
Rocky Mount

Run # IV

Date 1/13/93

Observer David Kaus

Checked By

Type of installation
Sludge Incinerator

Fuel ____ Stack Ht. ____

Observers Distance from Stack
20 Ft.

Wind Speed 5-10 Direct ____

Sky Condition Clear

Plume Color Brown

Plume Background Blue

Plume Behavior

Steam Plume

detached ____ Ft. from stack
attached ____ Ft. dissipated

Start Time 1537

Ending Time 1640

Ending Weather Clear

Wind Speed 5-10 Direct ____

Sky Condition Blue

No. Units in Excess of
standard 0

5 min/hr. allow 20

No. Units of VIO. 0

Remarks:

0 : 0 : 0

5 : 72 : 360

10 : 153 : 1,530

15 : 19 : 285

20 : 0 : 0

244 2175

2175

244 = 8.9

Min. \ Sec.	0	15	30	45
0	5	5	5	5
1	5	10	5	5
2	10			
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				

Min. \ Sec.	0	15	30	45
30				
31				
32				
33				
34				
35				
36				
1537	5	5	5	5
38	5	10	5	5
39	10	5	10	5
40	5	5	10	5
41	5	5	5	5
42	5	10	5	5
43	10	10	15	10
44	10	10	10	5
45	5	10	10	10
46	10	5	5	10
47	10	5	10	10
48	5	10	5	5
49	5	5	5	5
50	5	10	10	5
51	5	10	10	5
52	10	10	5	10
53	10	5	10	5
54	5	5	10	10
55	10	5	10	10
56	5	5	5	5
57	10	10	15	15
58	10	10	10	10
59	10	10	10	10

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Plume Observation Record Form

DATA VALIDATION
BY _____
DATE _____

Date 1-13-83
Observer David Sain
Checked By _____
Type of installation _____
Sludge Incinerator
Fuel _____ Stack Ht. _____
Observers Distance from Stack
30 Ft.
Wind Speed 5-10 Direct _____
Sky Condition Clear
Plume Color Brown
Plume Background Blue
Plume Behavior _____
Steam Plume
detached _____ Ft. from stack
attached _____ Ft. dissipated
Start Time 1537
Ending Time 1640
Ending Weather _____
Wind Speed 5-10 Direct _____
Sky Condition Clear
No. Units in Excess of
standard 0
5 min/hr. allow 20
No. Units of VIO. 0
Remarks:

Source Environtech
Address Tar River
Rocky Mount

Run #1

Min. \ Sec.	0	15	30	45	Min. \ Sec.	0	15	30	45
1600	10	10	10	10	30	10	5	5	10
1	10	10	15	10	31	5	5	10	5
2	10	10	10	15	32	10	10	10	10
3	10	10	10	10	33	5	10	10	10
4	10	10	10	10	34	5	10	10	10
5	10	10	10	10	35	5	10	10	10
6	10	10	10	15	36	10	10	10	5
7	10	10	10	15	37	5	10	15	15
8					38	15	10	10	10
9					39	10	10	10	10
10	10	10	15	10	40				
11	10	15	10	15	41				
12	10	10	10	10	42				
13	10	5	5	10	43				
14	10	10	10	10	44				
15	10	10	10	10	45				
16	10	10	15	15	46				
17	10	10	10	15	47				
18	10	10	10	10	48				
19	15	15	10	10	49				
20	10	10	10	10	50				
21	10	5	10	5	51				
22	10	5	5	10	52				
23	10	10	5	5	53				
24	10	10	5	5	54				
25	5	5	5	5	55				
26	10	10	10	5	56				
27	10	10	10	10	57				
28	10	10	5	15	58				
29	10	10	5	10	59				

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FEED RATE CHECK — CONVEYOR TO TARED TRUCK WHICH WAS WEIGHED AFTER EACH TEST RUN

SAMPLE ORDER #	BELT SPEED %	TIME OF RUN	WEIGHT OF RUN	EQUIVALENT LBS/HOUR
4	30	30 MIN	2220	4440
2	40	30 MIN	2940	5880
3	50	30 MIN	3000	6000
1	60	30 MIN	4820	9640

18480

NORTH CAROLINA PUBLIC WEIGHMASTER LICENSE EXPIRES JUNE 30, 1988 Mary Jo-Ann Burnette 9563 WEIGHED UNLESS MARKED

4440 30%

TRUCK TARE

110700
8480
2220

NORTH CAROLINA PUBLIC WEIGHMASTER LICENSE EXPIRES JUNE 30, 1988 Mary Jo-Ann Burnette 9563 WEIGHED UNLESS MARKED

30%

5720 /HR

111420
8480
2940

40%

NORTH CAROLINA PUBLIC WEIGHMASTER LICENSE EXPIRES JUNE 30, 1988 Mary Jo-Ann Burnette 9563 WEIGHED UNLESS MARKED

40%

50%

11480
8480
3000

6000

NORTH CAROLINA PUBLIC WEIGHMASTER LICENSE EXPIRES JUNE 30, 1988 Mary Jo-Ann Burnette 9563 WEIGHED UNLESS MARKED

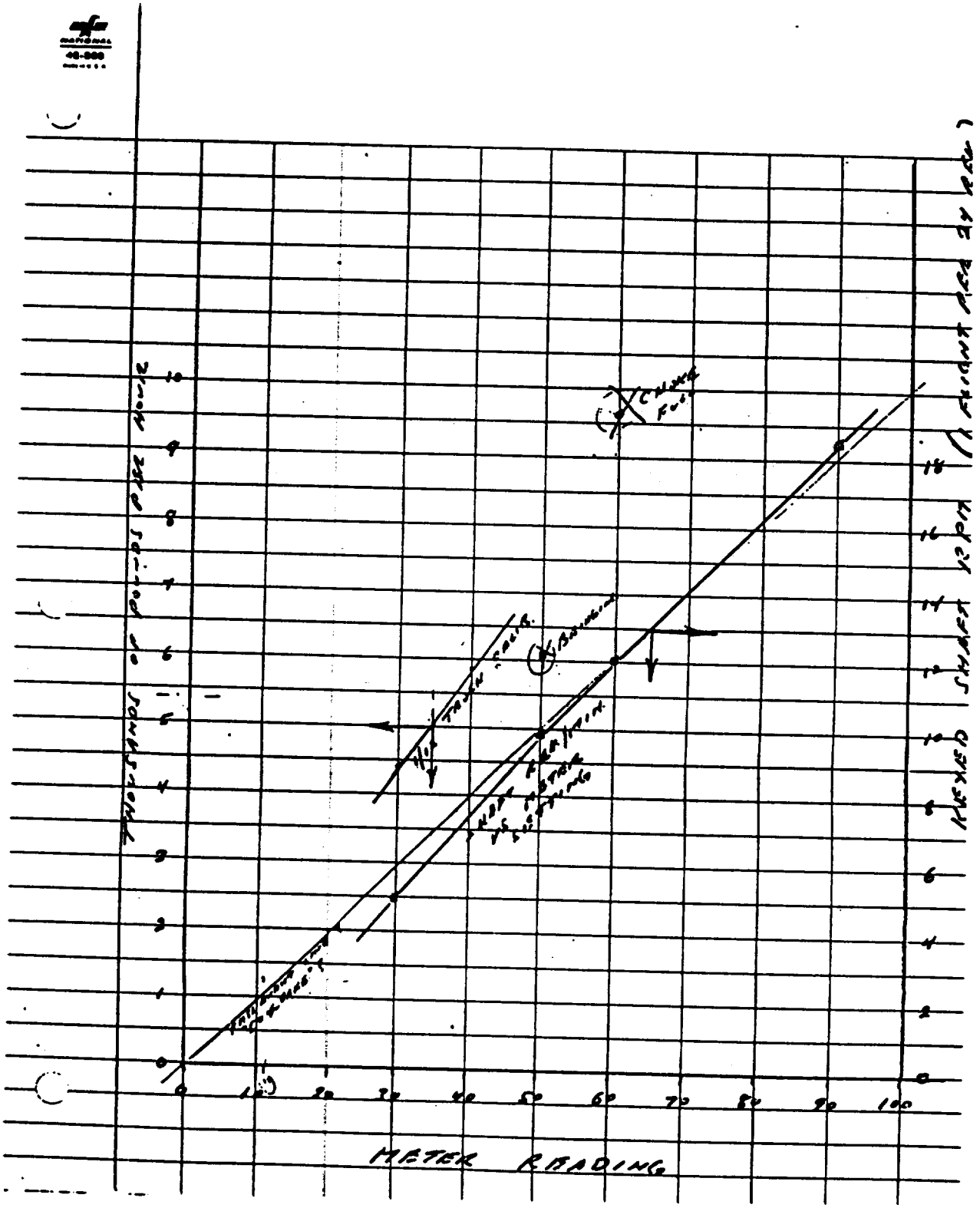
50%

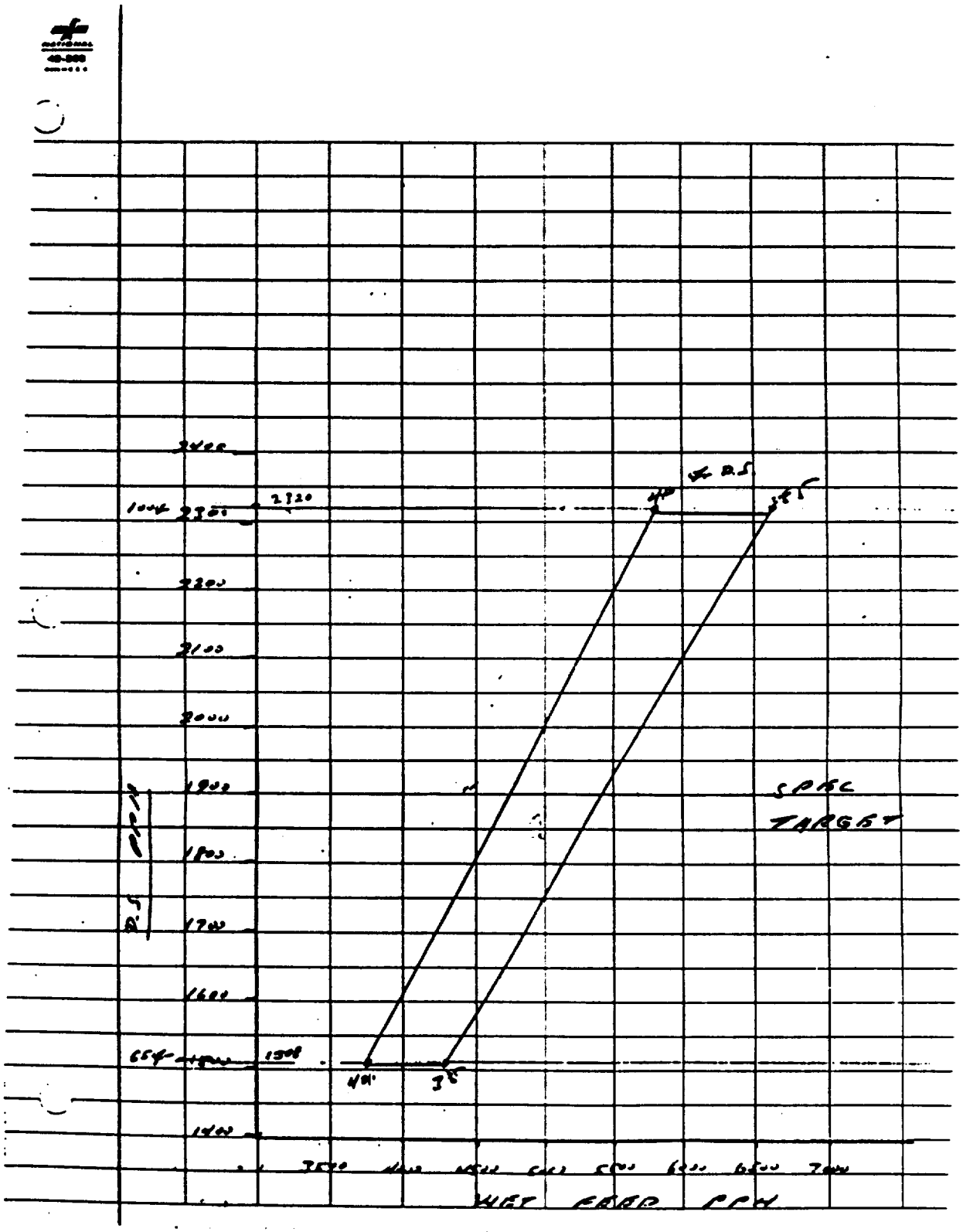
60%

113300
8480
4820

NORTH CAROLINA PUBLIC WEIGHMASTER LICENSE EXPIRES JUNE 30, 1988 Mary Jo-Ann Burnette 9563 WEIGHED UNLESS MARKED

60%


METER READING


2320
SPEC
TARGET

ROCKY 17.T.

SHIFT I

SHIFT II

SHIFT III

Date 1/13/83

TIME	TEMPS. 1	2	3	4	5	6	7	8	9	10
0000	900	1200	1245	1170	925	300	175	70	240	
0100	875	1235	1275	1180	800	325	180	68	240	
0200	885	[illegible]	1200	1150	780	340	180	70	240	
0300	870	1140	1265	1155	725	360	180	70	240	
0400	860	1135	1190	1065	925	370	155	70	240	
0500	815	1035	1175	1146	800	460	150	70	240	
0600	750	1165	1400	1225	700	405	175	70	240	
0700	1000	1210	1200	1305	700	375	145	70	240	
0800	1010	1255	1570	1320	725	375	150	70	250	
0900	965	1315	1150	1200	670	360	170	70	270	
1000		1100	1200	1170	670	350	160	68	250	
1100	365	1110	1260	1080	775	295	150	65	255	
1200	575	1175	1160	1160	775	280	140	65	255	
1300	850	[illegible]	1170	1135	760	385	140	65	225	
1400	800	1110	1140	1110	725	300	135	65	225	
1500	765	1100	1160	1005	645	305	145	70	210	
1600	825	1070	1320	1100	625	305	135	70	215	
1700										
1800										
1900										
2000										
2100										
2200										
2300										

TIME	11	O_2 12	% 13	SCRUBBER SYSTEM 14	15	16	17	18	19	20	21	22	23	Rabble Speed	ROTATION Feed Setting	
0000	-0.1	10.5	40	[illegible]	5.0	41	175	32	30	OFF	[illegible]	OFF	[illegible]	48 Sec	22.5	
0100	-0.1	10.5	50	[illegible]	6.6	41	175	31	60	OFF	[illegible]	OFF	[illegible]	48 Sec	30	
0200	-0.5	[illegible]	48	[illegible]	6.9	41	175	31	62	OFF	[illegible]	OFF	[illegible]	38 Sec	30	
0300	-0.19	10.1	57	[illegible]	7.1	41	175	31	75	OFF	9%	OFF	55642	33 Sec	35	
0400	-0.1	10.2	55	[illegible]	7.9	41	175	31	80	25	100	OFF	55645	30 Sec	40	Loss of Feed
0500	-0.1	12.1	40	[illegible]	5.8	41	175	32	60	OFF	OFF	OFF	55657	30 Sec	35	
0600	-0.1	12.6	62	[illegible]	7.9	41	175	32	100	OFF	5	OFF	55658	30 Sec	40	
0700	-0.1	9.4	28	[illegible]	6.5	[illegible]	175	33	[illegible]	[illegible]	[illegible]	[illegible]	55663	30 Sec	37	
0800	-0.1	8.0	55	[illegible]	8.0	41	175	32	[illegible]	[illegible]	[illegible]	[illegible]	55681	30 Sec	35	
0900	-0.1	11.2	58	[illegible]	7.4	40	175	33	[illegible]	[illegible]	[illegible]	[illegible]	55692	30 Sec	35	5030 #/HR
1000	-0.1	11.8	62	[illegible]	7.6	40	175	32	[illegible]	[illegible]	[illegible]	[illegible]	55696	30 Sec	35	
1100	-0.1	15.0	60	[illegible]	7.6	40	175	32	[illegible]	[illegible]	[illegible]	[illegible]	55701	30 Sec	35	
1200	-0.1	15.0	60	[illegible]	7.6	40	175	32	[illegible]	[illegible]	[illegible]	[illegible]	55707	30 Sec	35	
1300	-0.1	11.5	60	[illegible]	8.9	40	175	33	[illegible]	[illegible]	[illegible]	[illegible]	55711	30 Sec	37	5300 #/HR
1400	-0.1	11	65	[illegible]	9.8	40	175	32	[illegible]	[illegible]	[illegible]	[illegible]	55720	30 Sec	37	
1500	-0.1	12.5	60	[illegible]	9.2	40	175	32	[illegible]	[illegible]	[illegible]	[illegible]	55725	30 Sec	37	
1600	-0.1	15	70	[illegible]	9.3	40	175	33	70	[illegible]	[illegible]	[illegible]	55733	30 Sec	37	
1700																
1800																
1900																
2000																
2100																
2200																
2300																

APPENDIX C

FIELD ANALYTICAL DATA SHEETS

TRW

ANALYTICAL DATA

PLANT Rocky Mount

DATE 1-13-83

SAMPLING LOCATION Incinerator Exhaust

SAMPLE TYPE Part

RUN NUMBER 1

SAMPLE BOX NUMBER 9E

CLEAN-UP MAN mcR

COMMENTS:

FRONT HALF Invalid

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER 110 _____ — CONTAINER _____ _____ mg

_____ _____

_____ _____

FRONT HALF SUBTOTAL _____ mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

ETHER-CHLOROFORM EXTRACTION _____ mg

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

BACK HALF SUBTOTAL _____ mg

TOTAL WEIGHT _____ mg

MOISTURE

IMPINGERS

FINAL VOLUME _____ ml

INITIAL VOLUME 200 ml

NET VOLUME _____ ml

SILICA GEL

FINAL WEIGHT	_____ g	_____ g	_____ g
INITIAL WEIGHT	200 g	_____ g	_____ g
NET WEIGHT	_____ g	_____ g	_____ g

TOTAL MOISTURE _____ g

EPA (Dur) 231
4/72

TRW

ANALYTICAL DATA

PLANT Rocky Mount

DATE 1-13-83

SAMPLING LOCATION Incinerator Exhaust

SAMPLE TYPE Port

RUN NUMBER Run #2

SAMPLE BOX NUMBER _____

CLEAN-UP MAN MCR DS

COMMENTS:

FRONT HALF

		LABORATORY RESULTS
ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER	CONTAINER 4618	20.0 mg
FILTER NUMBER # 112	CONTAINER 4623	47.6 mg
FRONT HALF SUBTOTAL		67.6 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER	CONTAINER _____	_____ mg
	ETHER-CHLOROFORM EXTRACTION	_____ mg
ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER	CONTAINER _____	_____ mg
	BACK HALF SUBTOTAL	_____ mg
	TOTAL WEIGHT	67.6 mg

MOISTURE

IMPINGERS

FINAL VOLUME	220.0 ml
INITIAL VOLUME	200.0 ml
NET VOLUME	20.0 ml

SILICA GEL

FINAL WEIGHT	2906 g	2951.5 g	_____ g	
INITIAL WEIGHT	2891 g	2900.0 g	_____ g	
NET WEIGHT	15.5 g	51.5 g	_____ g	TOTAL MOISTURE 71.5 g

EPA (Dur) 231
4/72

TRW

ANALYTICAL DATA

PLANT Rocky Mount

DATE 1-13-83

SAMPLING LOCATION Incinerator Exhaust

SAMPLE TYPE Part.

RUN NUMBER Run # 3

SAMPLE BOX NUMBER _____

CLEAN-UP MAN MCR DS

COMMENTS:

FRONT HALF

		LABORATORY RESULTS
ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER	CONTAINER 4619	5.3 mg
FILTER NUMBER 111	CONTAINER 4624	48.1 mg
	FRONT HALF SUBTOTAL	53.4 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER	CONTAINER _____	_____ mg
	ETHER-CHLOROFORM EXTRACTION	_____ mg
ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER	CONTAINER _____	_____ mg
	BACK HALF SUBTOTAL	_____ mg
	TOTAL WEIGHT	_____ mg

MOISTURE

IMPINGERS

FINAL VOLUME	933 ml		
INITIAL VOLUME	900 ml		
NET VOLUME	33 ml		

SILICA GEL

FINAL WEIGHT	916 g	_____ g	_____ g
INITIAL WEIGHT	900 g	_____ g	_____ g
NET WEIGHT	16 g	_____ g	_____ g

TOTAL MOISTURE 33 - g

EPA (Dur) 231
4/72

TRW

ANALYTICAL DATA

PLANT Rocky Mount

DATE 1-13-83

SAMPLING LOCATION Incinerator Exhaust

SAMPLE TYPE Part.

RUN NUMBER Run #4

SAMPLE BOX NUMBER

CLEAN-UP MAN MCR DS

COMMENTS:

Fifteen Back Flush at End of Test

FRONT HALF

		LABORATORY RESULTS
ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER	CONTAINER 4620	26.3 mg
	CONTAINER 4622	46.9 mg
FILTER NUMBER 117	CONTAINER 4625	6.1 mg
FRONT HALF SUBTOTAL		79.3 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER	CONTAINER	mg
	ETHER-CHLOROFORM EXTRACTION	mg
ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER	CONTAINER	mg
	BACK HALF SUBTOTAL	mg
	TOTAL WEIGHT	79.3 mg

MOISTURE

IMPINGERS	211.9			
FINAL VOLUME	[illegible] ml	ml	ml	
INITIAL VOLUME	200 ml	ml	ml	
NET VOLUME	11.9 ml	ml	ml	
SILICA GEL				
FINAL WEIGHT	859.7 g	g	g	
INITIAL WEIGHT	800.0 g	g	g	
NET WEIGHT	59.7 g	g	g	

TOTAL MOISTURE 71.6 g

EPA (Dur) 231
4/72

TRW

ANALYTICAL DATA

PLANT Envirotech Rocky Mount

DATE 1/13/93

SAMPLING LOCATION Incinerator Exhaust

SAMPLE TYPE Particulate

RUN NUMBER Run # 5

SAMPLE BOX NUMBER #5

CLEAN-UP MAN D. SAVIA

COMMENTS:

FRONT HALF

		LABORATORY RESULTS
ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER	CONTAINER 4621	8.2 mg
FILTER NUMBER 113	CONTAINER 4626	38.8 mg
FRONT HALF SUBTOTAL		47.0 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER	CONTAINER	mg
	ETHER-CHLOROFORM EXTRACTION	mg
ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER	CONTAINER	mg
	BACK HALF SUBTOTAL	mg
	TOTAL WEIGHT	47.0 mg

MOISTURE

IMPINGERS

FINAL VOLUME	232 ml
INITIAL VOLUME	200 ml
NET VOLUME	32 ml

SILICA GEL

FINAL WEIGHT	232 g	g	g
INITIAL WEIGHT	200 g	g	g
NET WEIGHT	32 g	g	g

TOTAL MOISTURE 64.0 g

EPA (Dur) 231
4/72

WORK SHEET

P[illegible] M[illegible]

G.C. R[illegible]lts

	Run 2	2		3	3		4	4		5	5			
CO_2	30	30	x64	32	32	x64	40.5	41	x64	27.5	27.5	x64		
O_2	52.5	52.5	x64	50.5	51	x64	46.5	46.5	x64	53.5	54	x64		
N_2	56	56	x128	56	56	x128	56	56	x128	56	56	x128		
% CO_2	4.92				5.25		6.68			4.51				
% O_2	15.89				15.36		14.08			16.27			based on Mix 35	
See Cal Gas ?H2		79.19			79.39			79.24			79.22			
CO_2 14.8%	83.5	x64												
O_2 7.07%	27	x64												
N_2 78.13%	56	x128												
Cal. Gas #35														
CO_2 2.88%	17.5	x64	→	used for value										
O_2 16.8%	55.5	x64	→											
N_2 80.32%	56.5	x128	→											
Cal. Gas #10														
CO_2 15.6	86	x64												
O_2 5.08	19.5	x64												
N_2 72.32	53.5	x128												
CO 7.00	61	x4												

CALCULATED FEED RATE FROM TRW ANALYSES

LINE NO.	ITEM	ITEM UNITS	TEST TIME AVE.	TEST 2 16:07/16:27	TEST 3 12:35/13:37	TEST 5 15:27/16:10	DATA SOURCE (No) INDICATES LINE NUMBER
1							
2	STACK FLOW	DSCFM		3916	4120	4488	TRW
3							
4	CO_2	% D.B.		4.92	5.2	4.51	TRW
5							
6	CO_2	70°F DSCFM		192.7	216.3	202.4	(2) × (4)
7							
8	CO_2	PPH		1321	1483	1388	(6) × 60/385 × 44 ∴ (6) × 6.86
9							
10	FUEL	GPH		4	6.5	8.0	LOG SHEET
11	FUEL	PPH		28.3	46.0	56.6	7.08 #/GAL.
12	FUEL CARBON	PPH		24.4	39.7	48.7	TRW ANALYSIS ∴ 0.861 × (11)
13							
14	FUEL CO_2	PPH		90	146	179	(12) × 44/12 ∴ 3.67 × (12)
15							
16	CO_2 FROM VOL.	PPH	1259	1231	1337	1209	(8) − (14)
17							(PPHVS)(AREA F.)(47/41) = PPMCO FROM TRAV. VEL.
18	FEED VOL.	PPH	798	780	847	766	∴ FEED VOL = (16)/1.578
19							
20	FEED VOL	% D.B.	59.9	59.9	59.9	59.9	59.75 + 60.0 TRW ANALYSIS
21							
22	FEED D.S.	PPH	1332	1302	1414	1279	(18) ÷ (20)
23							
24	FEED D.S.	% W.B.	32.3	33	32	32	TRW ANALYSIS
25							
26	TOTAL WET FEED	PPH	4124	3916	4419	3997	(22) ÷ 24/100
27							
28							

TRW

PROJECT Envirotech Rocky Mount

A	B	C	D	E	F	G	H	J	K	
Sample #	Container #	Time	Wet Gross	Tare	WetGross - Tare / Wet Net	Dry Gross	Tare	DryGross - Tare / Dry Net	wet Net / Dry Net = Dry Moisture	% Moisture
4590	1	8:00 A	25.2321	1.5400	23.6923	9.6347	1.5400	2.0797	34	66
4591	2	8:30	25.2925	1.4287	23.8638	8.8505	1.4287	2.5218	32	65
4592	3	9:00	25.6465	1.4286	24.2179	9.0413	1.4286	2.6627	32	
4593	4	9:30	25.1915	1.5484	24.6431	9.2728	1.5484	2.7244	31	
4594	5	10:00	25.5300	1.5523	24.2777	9.4814	1.5523	2.9291	33	67
4595	6	10:30	24.9060	1.5493	23.3567	8.6037	1.5493	2.0534	30	70
4596	7	11:00	24.9457	1.5479	23.4478	9.3168	1.5479	2.6689	33	67
4597	8	11:30	25.4316	1.5555	23.8761	9.2036	1.5555	2.1481	34	66
4598	9	12:00 P	25.6671	1.5485	24.1186	9.4994	1.5485	2.9509	33	67
4599	10	12:30	25.4875	1.5539	23.9336	9.5304	1.5539	2.9719	33	67

L	M	N	P	Q	R	S
Blank	Container #	Volume	Gross -Tare / Net			Blank Wt

Date Jan. 18, 1983
Analyst David Savia
Wt Units Grams

NOTE:

TRW

PROJECT Envirotech Rocky Mount

A	B	C	D	E	F	G	H	J	K	
Sample #	Container #	Time	Wet Gross	Tare	Wet Gross − Tare = Net	Dry Gross	Tare	Dry Gross − Tare = Dry Net	wet Net / Dry Net × 100 = % Moisture	% Moisture
4600	11	1300	25.5817	1.5519	24.0298	9.1911	1.5519	7.6392	32	68
4601	12	1330	25.5089	1.5414	23.9675	8.7983	1.5414	7.2569	30	70
4602	13	1400	24.9688	1.5467	23.4221	9.0984	1.5467	7.5017	32	68
4603	14	1430	25.5142	1.5444	23.9698	9.7596	1.5444	8.2152	34	66
4604	15	1500	26.2976	1.5476	24.7500	9.4393	1.5476	7.8917	32	68
4605	16	1530	27.3018	1.5417	25.7601	9.4677	1.5417	7.9260	31	69
4606	17	1600	24.2597	1.5527	22.7070	8.9838	1.5527	7.4311	33	67
4607	18	1630	25.0160	1.5458	23.4702	9.4036	1.5458	7.8568	33	67
4608	19	1645	25.4952	1.5515	23.9461	8.9558	1.5515	7.4073	31	69
4609	20	Composite	24.3984	1.5533	22.8451	8.8116	1.5533	7.2583	32	68

L	M	N	P	O	R	S
Blank	Container #	Volume	Gross − Tare = Net	Orig. wt.	Final wt.	Blank Wt Gain
Aluminum weighing pan	21			1.5401	1.5401	00.00

NOTE:

Date Jan 18, 1983
Analyst David Silva
Wt Units Grams

TRW

PROJECT Envirotech Rocky Mount

	A	B	C	D	E	F	G	H	J	K	
	Sample #	Container #	Sample Volume	Aliquot	Gross	Tare	Net				
Filters	Run #2	4623			0.7559	0.7083	.0476				
	Run #3	4624			0.7494	0.7013	.0481				
	Run #4	4625			0.7070	0.7009	.0061				
	Run #5	4626			0.7761	0.7073	.0388				
Beakers	Run #2	4618	175		155.1672	155.1472	.0200				
	Run #3	4619	160		154.0734	154.0678	.0053				
	Run #4	4620	325		155.3791	155.3528	.0263				
	Run #4	4622	250		155.5552	155.5083	.0469				
	Run #5	4621	4		154.2704	154.2652	.0052				

L	M	N	P	Q	R	S
Blank	Container #	Volume	Gross -Tare Net	Gross	Tare	Blank Wt
Acetone	4627	100ML		156.0961	156.0967	-.0006

NOTE:

Date 1-18-82
Analyst D.S. MCR
Wt Units grams

APPENDIX E

METER BOX CALIBRATION SHEETS

DRY GAS METER CALIBRATION DATA

(English Units) Pretest ☒ Post Test ☐

Date 12/9/82 Barometric Pressure, Bp = 30.19

Meter Box # 9E Dry Gas Meter # 523600

Orifice manometer setting, ΔH, in. H_2O	Manometer Pressure Of Wet Test Meter ± HW	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Temperature: Dry gas meter Outlet t_{do}, °F	Temperature: Dry gas meter Average t_d, °F	Time, Min. .00	Y	ΔH@
.5	2.0	4.998 / 0 / 4.998	963.300 / 958.300 / 5.000	71	93 / 94 / 94	81 / 82 / 82	87.5	13.20	1.00	1.87
1.0	2.3	10.000 / 0 / 10.000	973.395 / 963.000 / 10.395	71	88 / 92 / 94 / 94	82 / 84 / 85 / 85	87.8	19.1	.984	1.92
2.0	2.65	10.500 / 0 / 10.500	984.895 / 973.395 / 10.720	71	88 / 90 / 92 / 92	82 / 84 / 84 / 84	88.0	14.27	.999	1.98
3.0	3.4	10.003 / 0 / 10.003	994.468 / 984.465 / 10.175	71	86 / 92 / 94 / 100	83 / 84 / 84 / 85	89.25	11.27	1.001	2.05
								ΔH@ Avg.	1.001	1.95

Y

$$\frac{V_w\left(P_b - \frac{\Delta H_w}{13.6}\right)\left(t_d + 460\right)}{V_d\left(P_b + \frac{\Delta H_w}{13.6}\right)\left(T_w + 460\right)}$$

$$\frac{0.0317\,\Delta H}{P_b\left(t_d + 460\right)}\left[\frac{t_w + 460}{V_w}\,\theta\right]^2$$

$\frac{4.998 \times 30.04 \times 547.5}{5.000 \times 30.02 \times 531.0} = 1.02$	$.0000009\,55\left[1966728.284\right] = 1.87$
$\frac{10.000 \times 30.02 \times 547.9}{10.395 \times 30.06 \times 531.0} = .984$	$.0000018\,74 \times 1023691.424 = 1.92$
$\frac{10.500 \times 30.00 \times 548}{10.720 \times 30.34 \times 531} = .999$	$.0000038\,07 \times 520\,254.899 = 1.98$
$\frac{10.003 \times 29.94 \times 549.25}{10.175 \times 30.31 \times 531} = 1.001$	$.0000057\,35 \times 358\,18.063 = 2.05$

Y = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ±0.01.

ΔH@ = Orifice pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in. H_2O. Tolerance = ±0.15.

Post test tolerance must be within ± 0.05 and within a range of 0.10

Meter Leak Check Front ✓ Back ✓ Calibrating technician DSS

Pitot Leak Check ✓

Electrical Check ✓

Remarks

DRY GAS METER CALIBRATION DATA

(English Units) Pretest ☐ Post Test ☒

Date 11/25/93 Barometric Pressure, Bp = 29.87

Meter Box # 9E Dry Gas Meter # _____

Orifice manometer setting, ΔH, in. H_2O	Manometer Pressure Of Wet Test Meter ± Hw	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Temperature: Dry gas meter Outlet t_{do}, °F	Temperature: Dry gas meter Average t_d, °F	Time M, Min. .00	Y	ΔH@
2.0	-2.6	10.500	757.790 746.600 11.190	63.0	108 112	90 94	101		.994	
2.0	-2.6	.950 11.0	769.565 757.790 11.775	63.0	112 113 113	94 96 97	105.6		.998	

Y

ΔH@ Avg. _____ _____

$$\frac{V_w\left(P_b - \frac{\Delta H_w}{13.6}\right)(t_d + 460)}{V_d\left(P_b + \frac{\Delta H_w}{13.6}\right)(T_w + 460)}$$

$$\frac{0.0317\ \Delta H}{P_b\ (t_d + 460)}\left[\frac{t_w + 460\ \theta}{V_w}\right]^2$$

10.500 x 29.67 x 561 = .994
11.190 x 30.02 x 523

x 29.67 x 565.6
11.775 x 30.02 x 523 = .998

Y = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ±0.01.

ΔH@ = Orifice pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in. H_2O. Tolerance = ±0.15.

Post test tolerance must be within ± 0.05 and within a range of 0.10

Meter Leak Check Front ✓ Back ✓ Calibrating technician DBS

Pitot Leak Check ✓

Electrical Check ✓

Remarks

APPENDIX F

PERSONNEL

PERSONNEL

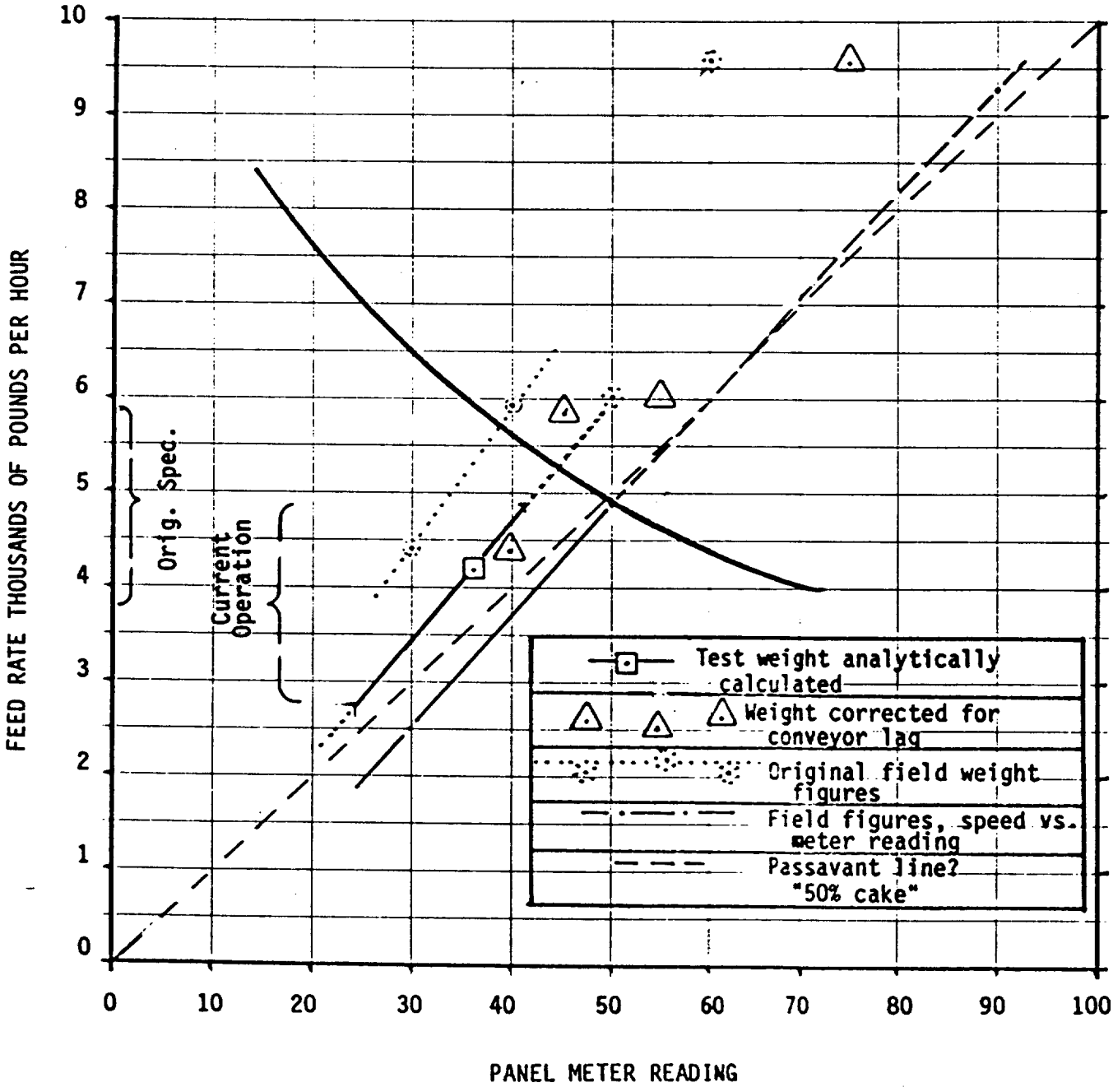
1.	Mr. E. Fuller	State of North Carolina
2.	J. McReynolds	TRW
3.	D. Savia	TRW

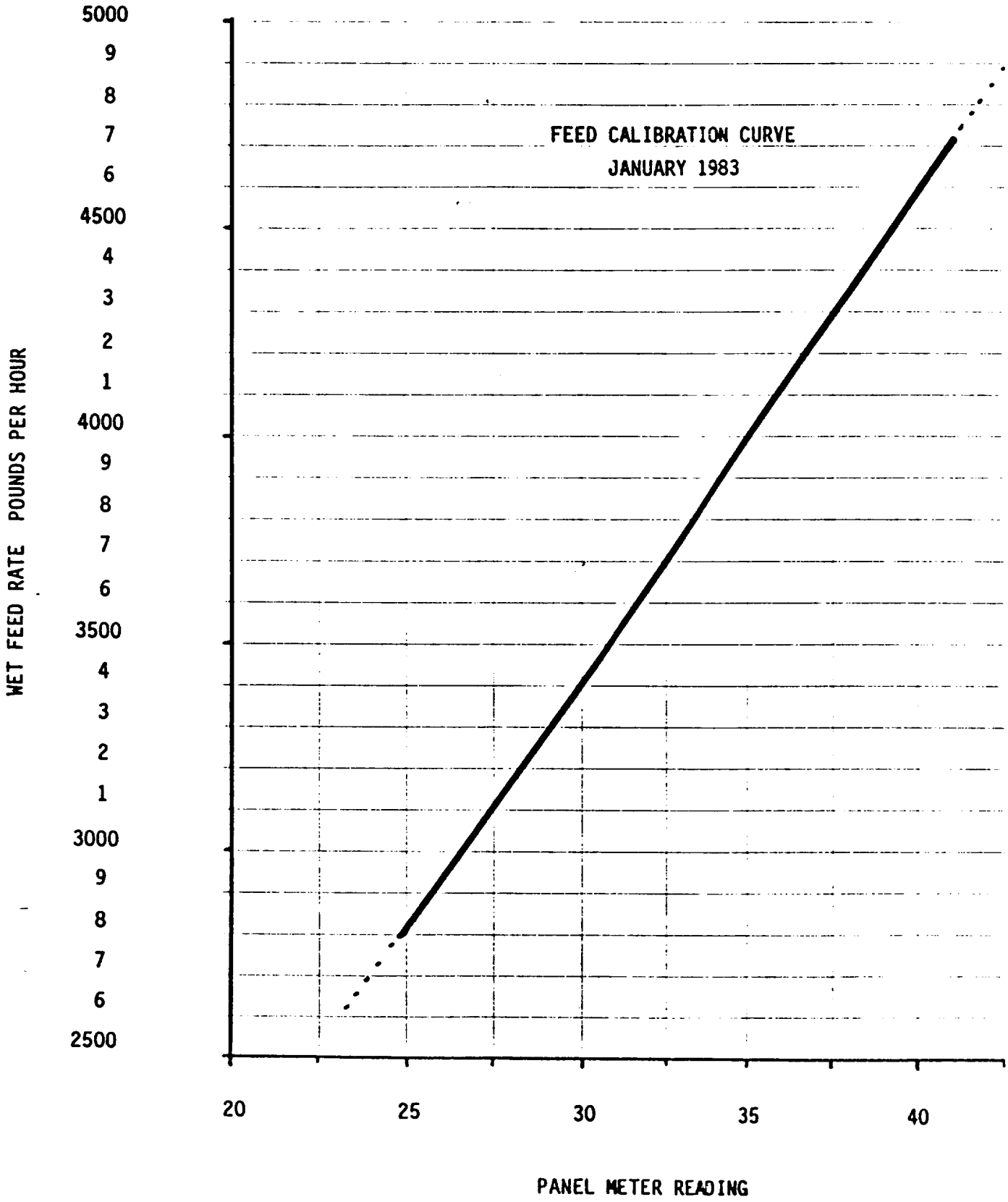
APPENDIX G

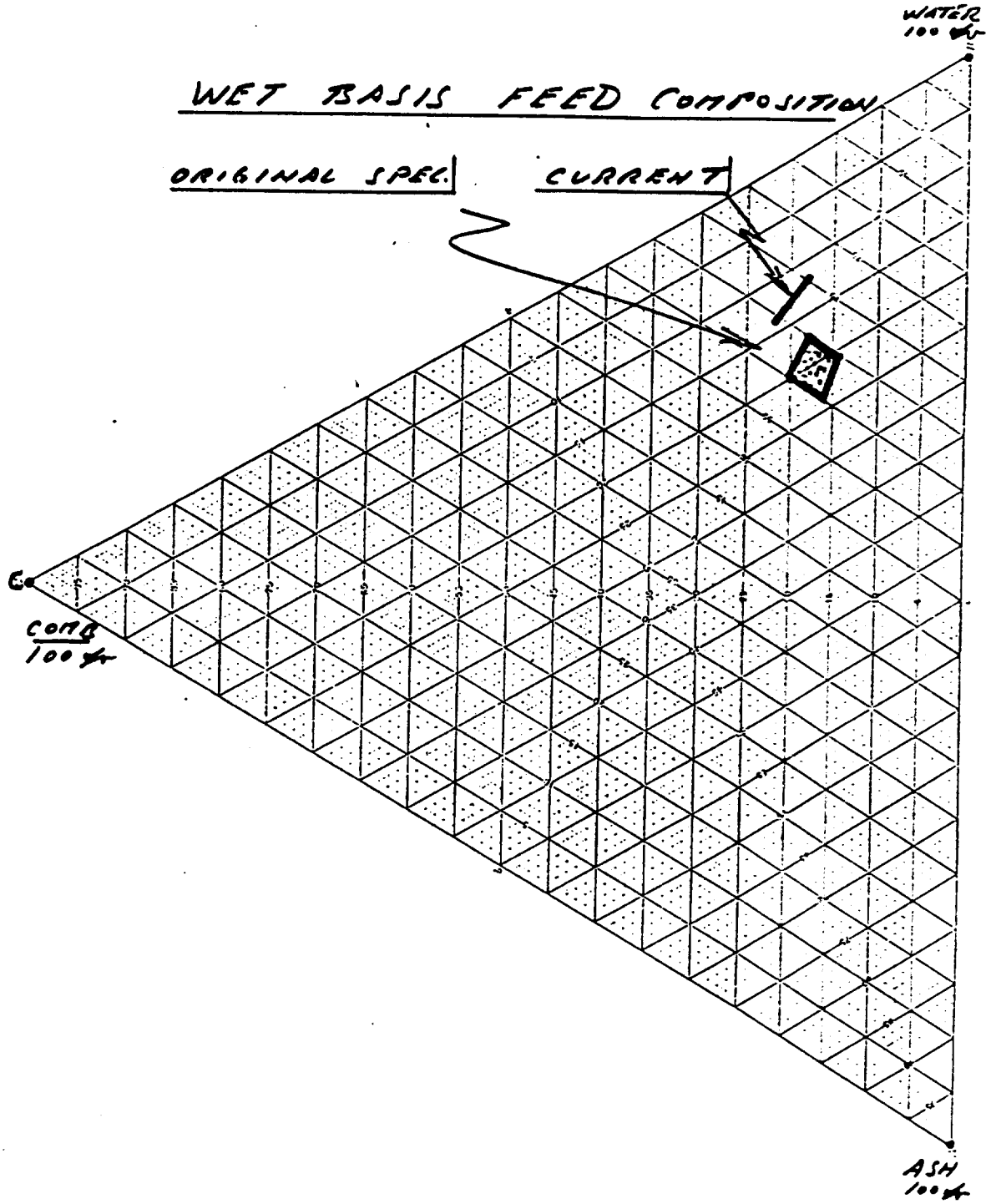
REPORT SUPPLEMENT BY OTHERS

CALCULATED FEED RATE FROM TRW ANALYSES

LINE NO.	ITEM	ITEM UNITS	TEST TIME AVE.	TEST 2 16:07/16:27	TEST 3 12:35/13:37	TEST 5 15:27/16:10	DATA SOURCE (No) INDICATES LINE NUMBER
1							
2	STACK FLOW	DSCFM		3916	4120	4488	TRW
3							
4	CO_2	% D.B.		4.92	5.2	4.51	TRW
5							
6	CO_2	70°F DSCFM		192.7	216.3	202.4	(2) × (4)
7							
8	CO_2	PPH		1321	1483	1388	(6) × 60/385 × 44 ∴ (6) × 6.86
9							
10	FUEL	GPH		4	6.5	8.0	LOG SHEET
11	FUEL	PPH		28.3	46.0	56.6	7.08 #/GAL.
12	FUEL CARBON	PPH		24.4	39.7	48.7	TRW ANALYSIS ∴ 0.861 × (11)
13							
14	FUEL CO_2	PPH		90	146	179	(12) × 44/12 ∴ 3.67 × (12)
15							
16	CO_2 FROM VOL.	PPH	1259	1231	1337	1209	(8) − (14)
17							(PPHVS)(AREA F.)(47/41) = PPMCO FROM TRAV. VEL.
18	FEED VOL.	PPH	798	780	847	766	∴ FEED VOL = (16)/1.578
19							
20	FEED VOL	% D.B.	59.9	59.9	59.9	59.9	59.75 + 60.0 TRW ANALYSIS
21							
22	FEED D.S.	PPH	1332	1302	1414	1279	(18) ÷ (20)
23							
24	FEED D.S.	% W.B.	32.3	33	32	32	TRW ANALYSIS
25							
26	TOTAL WET FEED	PPH	4124	3916	4419	3997	(22) ÷ 24/100
27							
28							


FEED RATE THOUSANDS OF POUNDS PER HOUR
PANEL METER READING
Orig. Spec.
Current Operation
Test weight analytically calculated
Weight corrected for conveyor lag
Original field weight figures
Field figures, speed vs. meter reading
Passavant line? "50% cake"


FEED CALIBRATION CURVE
JANUARY 1983
WET FEED RATE POUNDS PER HOUR
5000
9
8
7
6
4500
4
3
2
1
4000
9
8
7
6
3500
4
3
2
1
3000
9
8
7
6
2500
20
25
30
35
40
PANEL METER READING


WATER
100 %
WET BASIS FEED COMPOSITION
ORIGINAL SPEC.
CURRENT
C
COMB
100 %
ASH
100 %

REVISED FEED TARGET
CORRESPONDING TO CURRENT OPERATION