Commonwealth of Pennsylvania
Environmental Resources
May 7, 1991

Subject: Stack Test Review

To: Data File
National Waste and Energy Corporation
Valley Landfill
Penn Township, Westmoreland County

From: Jaydeb Pal
Air Pollution Control Engineer
Division of Technical Services
and Monitoring
Bureau of Air Quality Control

Through: Chief, Source Testing and Monitoring Section

National Waste and Energy Corporation operates a McGill enclosed flare system to incinerate the landfill gases at an average rate of 600 CFM at the aforementioned location. The incinerated gases are discharged to the atmosphere from the flare stack at a point 40 feet above grade.

Flare outlet NO_x tests, simultaneous flare inlet and outlet TGNMO tests and flare outlet tests for benzene, chloroform, 1,2-dichloroethane, methyl chloride, methylene chloride, perchloroethylene, trichloroethylene, carbon tetrachloride, vinyl chloride and 1,1-dichloroethylene were conducted to demonstrate compliance with the plan approval conditions (Plan Approval No. 65-323-001A). In addition, flare outlet tests for SO_2, and flare inlet tests for H_2S and NO_x were performed for company's use only. All of these tests were conducted by ARI Environmental, Inc. on January 22 and 23, 1991. Following are the comments on these tests:

1. NO_x tests were done in accordance with EPA Method 7 and are acceptable to the Department.

2. H_2S and SO_2 tests were performed in accordance with EPA Methods 11 and 6, respectively. Although these tests were not conducted per Departmental test procedures and were not required by the Department, the results can be used for estimation purposes.

3. The organic compound testing conducted using EPA Method 18 is not acceptable to the Department. Only 1,2-dichloroethane was detected using this method. All other nine compounds were below detectable limit. VOST method instead of EPA Method 18 was suggested by Mr. Richard St. Louis in his pre-test proposal review memo to Mr. Joseph Pezze dated January 4, 1991. Future testing for these ten organic compounds are to be performed by VOST method.

4. TGNMO tests were performed using EPA Method 25. The purpose was to determine the destruction efficiency for total nonmethane organic compounds. It appears from the test results, that EPA Method 25 is not an appropriate method for this source. The inlet samples contained significant amounts of CO_2 (39.8%, 40.1% and 40.2%) and H_2O (4.2%, 4.7% and 4.6%). According to the "Applicability" section of EPA Method 25, these conditions can produce a positive bias in the sample. The TGNMO concentrations for outlet test runs (38 ppm, 38 ppm and 48 ppm) were below the minimum limit of 50 ppm for EPA Method 25. For these reasons, the reported TGNMO destruction efficiencies (82.7%, 82.1% and 73%) may not be valid. As recommended by the consultant, EPA Method 25A may be a more appropriate method to determine the TGNMO destruction efficiency. Since the inlet gas does not have enough oxygen, it will be necessary to introduce an outside source of oxygen to the FID to support the flame.

The following NO_x results were extracted from the test reports:

Flare Outlet NO_x Tests

Test Run No.	1	2	3
Test Date	1/22/91	1/22/91	1/23/91
Volumetric Flow Rate (dscfm)	11,966	11,972	11,852
Stack Temperature (°F)	1550	1563	1571
NO_x as NO_2 Concentration (ppm)	8.3	7	10.1
NOx as NO2 Emission Rate (lb./hr.)	0.71	0.61	0.85

Notes: Gas flow rates at the flare inlet were 849 acfm, 846 acfm and 832 acfm for runs 1, 2 and 3, respectively.

cc: Joseph Penzze, Region V, Pittsburgh
File No. 65-322-001A
EPA/RSL
Krishnan Ramamurthy, Central Office
Reading File

JPerjr

Key fact

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April 1, 1991

Mr. Joseph P. Pezze
Regional Air Pollution Control Engineer
Pennsylvania Department of Environmental Resources
Bureau of Air Quality Control
Highland Building
121 South Highland Avenue
Pittsburgh, PA 15206-3988

RE: Valley Landfill Enclosed Flare Source Testing

Dear Mr. Pezze:

Enclosed for your review and comment is a copy of the source testing report, prepared by ARI Environmental, Inc., for the Enclosed Flare (Ground Flare) at Valley Landfill, Penn Township, Westmoreland County, (Permit No. 65-322-001A) as provided by our consultant, Waste Energy Technology, Inc. The results presented in this report show the Ground Flare to be operating at a temperature greater than 1500 Deg. F, with a retention time that is greater than .3 seconds, and a Destructive Removal Efficiency for total gaseous nonmethane organics (TGNMO), as C_1 of greater than 98%.

Should there be any questions or need of clarification on the information presented in this report, please do not hesitate to give me a call.

Very truly yours,

MID-AMERICAN WASTE SYSTEMS, INC.

Gregory J. Grudovich
Regional Environmental Director

GJG/dms

Enclosure

cc: Bruce Jensen, WET
Denny Marchetti
Jay Roberts
Mike Rodgers, WET

EMISSION TEST PROGRAM
McGILL ENCLOSED FLARE SYSTEM
VALLEY LANDFILL
IRWIN, PENNSYLVANIA

ARI PROJECT NO. 531-01

PREPARED FOR:

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JANUARY 1991 TEST

EMISSION TEST PROGRAM
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I. INTRODUCTION

ARI Environmental, Inc. was retained by Waste Energy Technologies to conduct a stack emission compliance test on the McGill Enclosed Flare System at Valley Landfill in Irwin, Pennsylvania. The flare system treats offgas from the landfill.

The purpose of this test program was to determine the concentration, emission rate and destruction efficiency of total gaseous nonmethane organics (TGNMO). Separate measurements of other various sulfur, nitrogen and organic components on both the inlet and outlet of the flare system were also determined.

Specifically, inlet measurements were made for TGNMO, hydrogen sulfide and nitrogen oxides. Stack measurements were made for TGNMO, sulfur dioxide, nitrogen oxides and the following organic compounds; benzene, chloroform, 1,2-dichloroethane, methyl chloride, methylene chloride, perchloroethylene, trichloroethylene, carbon tetrachloride, vinyl chloride and 1,1 dichloroethylene.

Test methods, where applicable, followed USEPA methods as detailed in the Code of Federal Regulations, CFR40, Part 60, 1990.

Testing was conducted on January 22 and 23, 1991 by Mr. D. Chapman, Mr. L. Goldfine, Mr. E. Brennan and Mr. J. Whitaker of ARI Environmental. Mr. B. Meyer of Waste Energy Technologies coordinated the on-site testing. Mr. K. Gratzmiller of the Department of Environmental Resources for the Commonwealth of Pennsylvania was also present to witness the testing.

It should be noted that is is ARI Environmental's opinion that the TGNMO testing done by USEPA Method 25 was not an appropriate choice for determination of VOC destruction efficiency for the inlet and stack conditions encountered and the stack numbers are probably biased on the high side.

We feel it is more appropriate to calculate VOC destruction efficiency based on the specific VOC compound analysis.

If this calculation is not acceptable by the appropriate agency, it is recommended that on-site testing be done by USEPA Method 25A with simultaneous determinations of both methane and nonmethane organics at the inlet and stack locations.

The results of the emission test are summarized in the following tables:

FLARE SYSTEM DESTRUCTION EFFICIENCY

SUMMARY OF TGNMO RESULTS

Run No.	Inlet TGNMO Concentration (ppm as C_1)	Inlet Emission Rate (lb/hr as C_1)	Stack TGNMO Concentration (ppm as C_1)	Stack Emission Rate (lb/hr as C_1)	Destruction Efficiency (%)
1	3453	4.91	38	0.849	82.7
2	3357	4.74	38	0.849	82.1
3	2685	3.76	46	1.017	73.0

SUMMARY OF VOC RESULTS
Concentration (ppb)

Compound	Run 1	Run 2	Run 3
Benzene	BDL*	BDL*	BDL*
Chloroform	BDL	BDL	BDL
1,2 Dichloroethane	41.7	33.6	37.0
Methyl chloride	BDL	BDL	BDL
Methylene chloride	BDL	BDL	BDL
Perchloroethylene	BDL	BDL	BDL
Trichloroethylene	BDL	BDL	BDL
Carbon tetrachloride	BDL	BDL	BDL
Vinyl chloride	BDL	BDL	BDL
1,1-dichloroethylene	BDL	BDL	BDL

Run No.	Inlet (Method 25) TGNMO Concentration (ppm as C_1)	Inlet (Method 25) Emission Rate (lb/hr as C_1)	Stack (VOC Method) VOC Concentration (ppb as C_1)	Stack (VOC Method) Emission Rate (lb/hr as C_1)	Destruction Efficiency (%)
1	3453	4.91	10.1	0.0019	99.96
2	3357	4.74	8.2	0.0015	99.97
3	2685	3.76	9.0	0.0016	99.96

* BDL = Denotes below detectable limits

SUMMARY OF HYDROGEN SULFIDE AND SULFUR DIOXIDE RESULTS

Run No.	Inlet: Hydrogen Sulfide Concentration (ppm)	Inlet: Hydrogen Sulfide Emission Rate (lb/hr)	Stack: Sulfur Dioxide Concentration (ppm)	Stack: Sulfur Dioxide Emission Rate (lb/hr)
1	377	1.52	18	2.15
2	374	1.50	19	2.28
3	344	1.36	17	1.97

SUMMARY OF NITROGEN OXIDE RESULTS

Run No.	Inlet: Nitrogen Oxide Concentration (ppm)	Inlet: Nitrogen Oxide Emission Rate (lb/hr)	Stack: Nitrogen Oxide Concentration (ppm)	Stack: Nitrogen Oxide Emission Rate (lb/hr)
1	BDL*	0.00	8.3	0.71
2	BDL	0.00	7.0	0.61
3	BDL	0.00	10.1	0.85

*BDL - denotes below detectable limits

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II. TESTING AND ANALYTICAL PROCEDURES

An emission test program was conducted on the flare system serving Valley Landfill in Irwin, Pennsylvania on January 22 and 23, 1991.

Inlet Testing

For each sampling run on the inlet, the following gas parameters were determined:

- Temperature - °F
- Velocity - fps
- Volume flow - acfm, scfm, dscfh
- Moisture - % by volume
- Orsat - CO_2, O_2 and N_2 (by difference), % by volume
- TGNMO concentration - ppm (as C_1)
- TGNMO emission rate - lbs/hr (as C_1), lbs/hr
- Nitrogen oxides concentration - ppm
- Nitrogen oxides emission rate - lbs/hr
- Hydrogen sulfide concentration - ppm
- Hydrogen sulfide emission rate - lbs/hr

Outlet Testing

For each sampling run on the outlet, the following gas parameters were determined:

- Temperature - °F
- Velocity - fps
- Volume flow - acfm, scfm, dscfh
- Moisture - % by volume
- Orsat - CO_2, O_2 and N_2 (by difference), % by volume
- TGNMO concentration - ppm (as C_1)
- TGNMO emission rate - lbs/hr (as C_1), lbs/hr
- TGNMO destruction efficiency - %
- Sulfur dioxide concentration - ppm
- Sulfur dioxide emission rate - ppm
- Nitrogen oxides concentration - ppm
- Nitrogen oxides emission rate - lbs/hr
- Specific organic compounds concentration - ppm
  - Benzene
  - Chloroform
  - 1,2-dichloroethane
  - Methyl chloride
  - Methylene chloride
  - Perchloroethylene
  - Trichloroethylene
  - Carbon tetrachloride
  - Vinyl chloride

Where applicable, sampling and analyses were conducted following USEPA Methods as detailed in the Code of Federal Regulations, CFR40, Part 60, 1990 and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

Sampling on the inlet location was done using the two 2" diameter ports located on the 8 inch diameter schedule 80 pipe just after the blower. Sampling was done on the 10 foot diameter stack using the two 4 inch diameter ports provided.

Sampling Point Locations (EPA Method 1)

The sampling port and traverse point locations used for the gas velocity and volume flow rate at the inlet duct and exhaust stack locations were determined following the procedural requirements as detailed in EPA Method 1.

Velocity and Volume Flow Rate Determination (EPA Method 2)

The stack gas velocity and volume flow rate were determined following EPA Method 2 as detailed in the CFR40. Specifically, the velocity traverse at the inlet location was performed using the two sampling ports provided and conducted at a total of 16 points (8 on each of two traverses) in the 87.625 inch I.D. inlet pipe.

Velocity determinations were performed using an S-type pitot tube and an oil gauge manometer. A Dwyer micro oil manometer was used to determine the pitot tube differential pressure readings.

Velocity traverses at the stack were conducted at a total of 16 points (8 on each of two traverses) in the 10.0 foot I.D. flare stack. The gas temperature was determined using a Keithley digital potentiometer and chromel-alumel thermocouple.

CO_2, O_2 and Molecular Weight Determination (EPA Method 3)

Carbon dioxide, oxygen and molecular weight of the process gas at the inlet duct and exhaust stack were determined following EPA Method 3 as detailed in the CFR40. An Orsat type analyzer was used to determine the carbon dioxide and oxygen content of the exhaust gas.

Gas samples were also taken at the inlet location and analyzed at the ARI laboratory for methane content by gas chromatography. The % methane was used in the inlet gas molecular weight determination.

Moisture Content (EPA Method 4)

Moisture content of the inlet and exhaust gas was determined following EPA Method 4 and was conducted simultaneously at both locations.

Total Gaseous Nonmethane Organics Determination (EPA Method 25)

Volatile organic material or total gaseous nonmethane organics (TGNMO) as carbon (C_1) was determined at the incinerator inlet duct and exhaust stack following EPA Method 25 procedures. The analyses were performed by Hayden Environmental laboratory in Miamisburg, Ohio.

The complete test consisted of three one-hour sampling runs with simultaneous sampling conducted at the inlet and exhaust locations.

VOC Organic Compound Sampling

Three one-hour VOC samples were taken on the stack simultaneously with the Method 25 sampling. Gas samples were taken using XAD-2 resin as a collection media. The sampling traps were extracted with carbon disulfide and analyzed for the following compounds:

Benzene
Chloroform
1,2-dichloroethane
Methyl chloride
Methylene chloride
Perchloroethylene
Trichloroethylene
Carbon tetrachloride
Vinyl chloride
1,1-dichlorethylene (Vinylidene chloride)

Specifically, the sampling system used at the stack duct consisted of a stainless steel probe connected to the first of two (primary and back-up) VOC traps containing XAD resin. The in-series traps were installed on the inlet arm of a Greenburg-Smith impinger containing 200 grams of Drierite. Flow rate through the sampling train was controlled using a pump and calibrated rotameter. Flow rate through the traps was a constant rate of approximately 2.0 liter/minute for each 60 minute sampling run. Following the completion of each sampling run, the VOC traps were capped, sealed and stored at approximately 4° C prior to analysis.

At the ARI laboratory, analysis of the collected samples was conducted using a Carle Analytical gas chromatograph equipped with a separation column and a flame ionization detector (FID). The separation column used was 6 feet in length by 0.125 inch O.D. stainless steel packed with Alltech 10% AT-1000 on Chromosorb W-AW.

The gas chromatograph conditions were as follows:

Column:	6 ft. x 1/8 inch SS
Packing:	10% AT-1000 on Chromosorb W-AW
Temperature:	120° C
Flowrate:	Helium 30 ml/min

The XAD-2 samples were emptied into glass vials equipped with Teflon lined septum caps. Twenty-five milliliters of carbon disulfide were added to each vial to extract the absorbed VOCs from the resin. A 2 microliter sample of each carbon disulfide extract was injected into the gas chromatograph. The primary and back-up traps were analyzed separately to insure sample collection efficiency. The chromatograms were plotted and the organic peak areas integrated using a Hewlett-Packard integrator-printer.

Calibration standards were developed from primary standards from Aldrich Chemical Company, Milwaukee, Wisconsin. Standards were gravimetrically prepared in volumes of carbon disulfide. Where applicable, gas standards were prepared from organic liquids and gases primary standards using USEPA 18 methods. Two microliters of these known concentrations were then injected into the gas chromatograph to calibrate the response of the FID and to obtain retention time data. A calibration graph was then developed plotting peak area against mass of each organic compound.

Hydrogen Sulfide Determination (EPA Method 11)

H_2S sampling and analyses on the inlet location were conducted following the procedures detailed in EPA Method 11.

The sampling system consisted of a Teflon line connected to a series of six midget impingers followed by a pump, calibrated rotameter and dry gas meter.

The midget impingers contained 15 mls of hydrogen peroxide in the first impinger, the second impinger was empty, the third, fourth and fifth impingers contained 15 mls of cadmium sulfate absorbing solution and the sixth impinger contained 25 grams of silica gel.

The sampling system was leak checked before and after each sampling run. At the end of each run, a 15 minute purge was conducted.

A total of three Method 11 tests, consisting of two runs per test, were conducted at the inlet location.

Analysis of the collected samples, following EPA Method 11 procedures, was conducted by ARI on-site directly following each sampling run.

Sulfur Dioxide Determination (EPA Method 6)

Sulfur dioxide concentration and emission rate was determined following EPA Method 6 as detailed in the CFR40. Specifically, sulfur dioxide samples were collected in the back half of a Method 5 sampling train and conducted simultaneously with the inlet hydrogen sulfide sampling.

The sampling train consisted of a stainless steel probe connected to a heated glass filter holder containing a glass fiber filter followed by 5 Greenburg-Smith type impingers. The first impinger contained 100 mls of 80% IPA followed with a plug of glass wool placed in the exit arm. The second and third impingers contained 100 mls each of 6% hydrogen peroxide. The fourth impinger was empty and the fifth impinger contained 200 grams of silica gel.

Three 30 minute tests followed with a 20 minute purge conducted on the stack.

Nitrogen Oxides Determination (EPA Method 7)

Nitrogen oxides concentration and emission rate was determined following EPA Method 7 of the CFR40. Four grab samples were collected at 15 minute intervals during each of the three one hour sampling runs on both the inlet and stack locations.

The samples were analyzed at ARI's laboratory using wet chemistry methods outlined in EPA Method 7.

III. RESULTS

The results of the emission test program conducted on the flare system at Valley Landfill in Irwin, Pennsylvania are listed in Tables III-1 through III-3.

All field test data, summary calculation data, laboratory analysis data and test equipment calibration data are included in the Appendices.

The following points should be noted regarding the TGNMO results via USEPA Method 25:

1.) The minimum detectable limit for the Method is 50 ppm as C_1. All three stack results are below the minimum detectable limit of the method.

2.) The XAD resin traps indicated only trace amounts of VOC in the stack which indicate the stack TGNMO numbers suspect from this combustion source.

3.) The inlet samples were taken from a source with significant amounts of carbon dioxide and water vapor. When carbon dioxide and water vapor are present together in stack sources, they can produce a positive bias in the sample.

4.) There is a significant difference in volume flow rates between the inlet and stack locations due to the introduction of dilution air into the flare system. Therefore, the detection limit for the method at the stack location is too high to apply for accurate destruction efficiency determination based on the current VOC levels coming into the flare system. It is ARI Environmental's opinion that Method 25 should not be an applicable choice for this type of flare system for determination of VOC destruction efficiency.

5.) Based on the above points, it is recommended that VOC destruction efficiency be based on the stack VOC analysis. If this calculation is not acceptable by the appropriate Agency, it is recommended that on-site testing be done by USEPA Method 25A with simultaneous determinations of both methane and nonmethane organics at the inlet and stack locations.

The average TGNMO destruction efficiency was 79.3% during the testing based on TGNMO lb/hr as C_1 on the inlet and stack locations. The inlet TGNMO emission rates were 4.91, 4.74 and 3.76 lb/hr as C_1 for runs 1, 2 and 3. The stack TGNMO emission rates were 0.849, 0.849 and 1.017 lb/hr as C_1 for runs 1, 2 and 3. The TGNMO inlet concentrations were 3453, 3357 and 2685 ppm as C_1 for runs 1, 2 and 3 respectively. The TGNMO stack concentrations were 38, 38 and 46 ppm as C_1 for runs 1-3.

The destruction efficiency based on inlet TGNMO Method 5 results and the stack VOC results calculated as C_1 was 99.96%.

The only VOC compound found from the list of those tested was 1,2 dichloroethane. The other VOC compounds were all below detectable limits. The concentration of 1,2 dichloroethane was 41.7, 33.6 and 37.0 ppb for runs 1, 2 and 3.

The inlet hydrogen sulfide concentrations were 377.0, 374.0 and 343.6 ppm for runs 1, 2 and 3. These concentrations corresponded to emission rates of 1.52, 1.50 and 1.36 lb/hr.

The stack sulfur dioxide concentrations were 18.0, 19.0 and 16.6 ppm for runs 1, 2 and 3. These concentrations correspond to emission rates of 2.15, 2.28 and 1.97 lb/hr.

The stack nitrogen oxide concentrations were 8.3, 7.0 and 10.1 ppm for runs 1, 2 and 3. These concentrations correspond to emission rates of 0.71, 0.61 and 0.85 lb/hr. Nitrogen oxides were below the detectable level at the inlet location.

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SUMMARY OF EMISSION TEST RESULTS

TABLE: III-1
COMPANY: Waste Energy Technologies, Inc.
LOCATION: Valley Landfill - Inlet
TEST DATE: 1/22/91 - 1/23/91

TEST RUN:	1	2	3
TEST DATE:	1-22-91	1-22-91	1-23-91
TIME:	3:00-14:00	15:00-16:00	7:55-8:55
STACK GAS			
Temperature, °F	98.0	96.6	90.0
Velocity, fps	44.6	44.5	43.7
Volume flow, acfm	849.3	846.4	832.2
Volume flow, dscfh	45,679.7	45,414.4	44,963.9
Moisture, % by vol	4.2	4.7	4.6
CO_2, % by volume	39.8	40.1	40.2
O_2, % by volume	1.0	1.2	1.1
HYDROGEN SULFIDE			
Concentration			
ppm	377.0	374.0	343.6
lb/dscf x 10^{-5}	3.326	3.296	3.030
Emission rate			
lb/hr	1.52	1.50	1.36
NITROGEN OXIDES			
Concentration			
ppm	BDL	BDL	BDL
lb/dscf x 10^{-5}	-----	-----	-----
Emission rate			
lb/hr	0.00	0.00	0.00
TGNMO			
Concentration			
ppm as C_1	3453	3357	2685
lb/dscf x 10^{-4}	1.074	1.044	0.8350
Emission rate			
lb/hr	4.91	4.74	3.76

* BDL denotes below detectable limits

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SUMMARY OF EMISSION TEST RESULTS

TABLE: III-2
COMPANY: Waste Energy Technologies, Inc.
LOCATION: Valley Landfill - Inlet Outlet
TEST DATE: 1/22/91 - 1/23/91

TEST RUN:	1	2	3
TEST DATE:	1-22-91	1-22-91	1-23-91
TIME:	3:00-14:00	15:00-16:00	7:55-8:55
STACK GAS			
Temperature, °F	1550.4	1563.2	1570.6
Velocity, fps	10.2	10.3	10.3
Volume flow, acfm	48,117.6	48,637.3	48,688.0
Volume flow, dscfh	718,093.8	718,318.4	711,125.8
Moisture, % by vol	2.0	2.4	2.5
CO_2, % by volume	4.3	4.9	4.4
O_2, % by volume	19.5	19.9	20.0
SULFUR DIOXIDE			
Concentration			
ppm	18.0	19.0	16.6
lb/dscf x 10^{-5}	2.991	3.167	2.762
Emission rate			
lb/h	2.15	2.28	1.97
NITROGEN OXIDES			
Concentration			
ppm	8.3	7.0	10.1
lb/dscf x 10^{-7}	9.9350	8.4325	11.9975
Emission rate			
lb/hr	0.71	0.61	0.85
TGNMO			
Concentration			
ppm as C_1	38	38	46
Emission rate			
lb/hr	0.849	0.849	1.017

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TABLE: III-3
COMPANY: Waste Energy Technologies, Inc.
LOCATION: Valley Landfill - Stack
TEST DATE: 1/22/91 - 1/23/91

TEST RUN:	1	2	3
TEST DATE:	1-22-91	1-22-91	1-23-91
TIME:	13:00-14:00	15:00-16:00	7:55-8:55

VOC Concentration, ppb by volume

Benzene	BDL*	BDL*	BDL*
Chloroform	BDL	BDL	BDL
1,2-dichloroethane	41.7	33.6	37.0
Methyl chloride	BDL	BDL	BDL
Methylene chloride	BDL	BDL	BDL
Perchloroethylene	BDL	BDL	BDL
Trichloroethylene	BDL	BDL	BDL
Carbon tetrachloride	BDL	BDL	BDL
Vinyl chloride	BDL	BDL	BDL

* BDL - Denotes below detectable limits

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APPENDIX A

Inlet and Stack Gas Flow Rate Calculation Summary and Data

STACK VOLUME FLOW RATE CALCULATION SUMMARY

COMPANY: Valley Landfill

SOURCE: Inlet

REPETITION NO: 1

TEST DATE: 7-22-97

Dry molecular weight of stack gas

$$M_d = 0.44 \overset{39.8}{(\%CO_2)} + 0.32 \overset{4.6}{(\%O_2)} + 0.28 \overset{79}{(\%N_2}} + \overset{.03}{\%CO}) + 0.16 \overset{5\%}{(\%C_1-C_4)}$$

= 28.288 lb/lb-mole

Molecular weight of stack gas, wet basis

$M_s = M_d (1-B_{ws}) + 18 B_{ws}$ = 27.855 lb/lb-mole

Pitot tube coefficient

C_p (from calibration curve) = 0.99

Average velocity head of stack gas, inches H_2O

$(\sqrt{\Delta p})$ avg. = 0.6410

Average absolute stack gas temperature

(T_s) avg. = 980 °F + 460 = 1440 °R

Absolute stack gas pressure

$P_s = P_b$ + (Static Pressure/13.6) = 29.59 in. Hg

Stack gas velocity

$$(V_s) \text{ avg.} = (85.49)\, C_p\, (\sqrt{\Delta p})\text{ avg.} \sqrt{\frac{(T_s)\text{ avg.}}{P_s M_s}}$$

= 44.636 ft/sec.

Stack gas volume flow rate

$60 V_s A_s$ A_s = .03111 ft^2 = 849.3 acfm

Stack gas volume flow rate, dry basis

$$Q_s = 3{,}600\ (1-B_{ws})\ V_s A_s \left[\frac{T_{std} \cdot P_s}{(T_s)\text{ avg} \cdot P_{std}}\right]$$

= 45,619.7 dscf/hr

MOISTURE CALCULATION SUMMARY

COMPANY: Valley Landfill

SOURCE: Inlet

REPETITION NO.: 1

TEST DATE: 1-22-97

ENGLISH UNITS
(29.92 in. Hg 68°F)

Volume of sample at standard conditions on dry basis

$$V_{mstd} = \left[17.64\right] V_m Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] = 24.7850 \text{ dscf}$$

$Y = 1.029$

Volume of water vapor in sample at standard conditions

$$V_{wstd} = \left[0.04707 \frac{\text{cu. ft.}}{\text{ml}}\right] V_{lc} = 1.1768 \text{ scf}$$

$V_{lc} = 25 \text{ ml}$

Fractional moisture content of stack gas

$$B_{ws} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}} = 4.2084$$

Isokinetic sampling rate

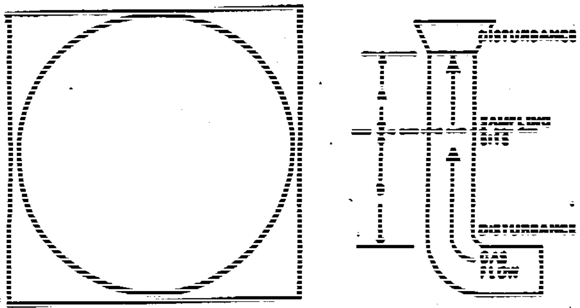
$$I = \left(1.667 \frac{\text{min}}{\text{sec}}\right) T_s \left[\frac{\left(0.002669 \frac{\text{in.Hg.cu.ft.}}{\text{ml.} \ ^\circ\text{R}} V_{lc}\right) + \frac{V_m Y}{T_m}\left(P_{bar} + \frac{\Delta H}{13.6}\right)}{\theta V_s P_s A_n}\right]$$

$= \_\_\_\_\_$ %

($A_n = \_\_\_\_\_$ sq. ft.)

PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION Stack 13:00

PLANT Valley Landfill
DATE 1/29/91
LOCATION [illegible]
OPERATOR [illegible]
STACK NO.
RUN NO. 1 Moisture
SAMPLE BOX NO.
METER BOX NO. 2905

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 29.93
ASSUMED MOISTURE, % 5
PROBE LENGTH, in. —
NOZZLE DIAMETER, in. —
STACK DIAMETER, in. 4"
PROBE HEATER SETTING —
HEATER BOX SETTING —

METER ΔH@
C FACTOR
PROCESS WEIGHT RATE

WEIGHT OF PARTICULATE COLLECTED, mg		
SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_S), °F	VELOCITY HEAD (ΔP_S)	($\sqrt{\Delta P_S}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³ (Y=1.009)	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	5					2.4		616.90	19	18				
2	5					|		621.1	24	20				
3	5					|		625.3	32	22				
4	5					|		629.5	38	24				
5	5					|		633.7	41	24				
6	5					V		637.9	44	25				
								642.105						
TOTAL														
AVERAGE					X	2.4		25.205	27.5					

CH_4 = 51%

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL	121	102			202
INITIAL	100	100	—	Sg	200
LIQUID COLLECTED	21	2			2
TOTAL VOLUME COLLECTED					[illegible]

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
Bad Bag 1		39.9	1.0	0.3	79
2					
3					
4					

COMMENTS: Leak check
SYSTEM
Pre : 0 cfm at 15" Hg
Post : 0 cfm at 15" Hg
PITOTS
Pre ✓
Post ✓

STACK VOLUME FLOW RATE CALCULATION SUMMARY

COMPANY: Valley Landfill

SOURCE: Inlet

REPETITION NO.: 2

TEST DATE: 1-22-91

Dry molecular weight of stack gas

$$M_d = 0.44\ (\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO) + 0.16\ (\%C_nH_m)$$

$$= 29.104 \text{ lb/lb-mole}$$

Molecular weight of stack gas, wet basis

$$M_s = M_d\ (1-B_{ws}) + 18\ B_{ws} = 27.630 \text{ lb/lb-mole}$$

Pitot tube coefficient

C_p (from calibration curve) = 0.99

Average velocity head of stack gas, inches H_2O

$(\sqrt{\Delta p})$ avg. = 0.6371

Average absolute stack gas temperature

(T_s) avg. = 955.55 °F + 460 = 1415.5 °R

Absolute stack gas pressure

$P_s = P_b$ + (Static Pressure/13.6) = 29.59 in. Hg

Stack gas velocity

$$(V_s)\ \text{avg.} = (85.49)\ C_p\ (\sqrt{\Delta p})\ \text{avg.} \sqrt{\frac{(T_s)\ \text{avg.}}{P_s M_s}}$$

$$= 44.487 \text{ ft/sec.}$$

Stack gas volume flow rate

$60\ V_s\ A_s$ A_s = 0.3171 ft^2 = 846.4 acfm

Stack gas volume flow rate, dry basis

$$Q_s = 3{,}600\ (1-B_{ws})\ V_s\ A_s \left[\frac{T_{std}\ .\ P_s}{(T_s)\ \text{avg}\ .\ P_{std}}\right]$$

= 45,414.4 dscf/hr

MOISTURE CALCULATION SUMMARY

COMPANY: Valley Landfill

SOURCE: Inlet

REPETITION NO.: 2

TEST DATE: 1-22-91

ENGLISH UNITS
(29.92 in. Hg 68°F)

Volume of sample at standard conditions on dry basis

$$V_{mstd} = \left[17.64\right] V_m Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] = 25802 \text{ dscf}$$

$Y = 1.059$

Volume of water vapor in sample at standard conditions

$$V_{wstd} = \left[0.04707 \frac{\text{cu. ft.}}{\text{ml}}\right] V_{lc} = 1.2709 \text{ scf}$$

$V_{lc} = 27 \text{ ml}$

Fractional moisture content of stack gas

$$B_{ws} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}} = 4.6943 \%$$

Isokinetic sampling rate

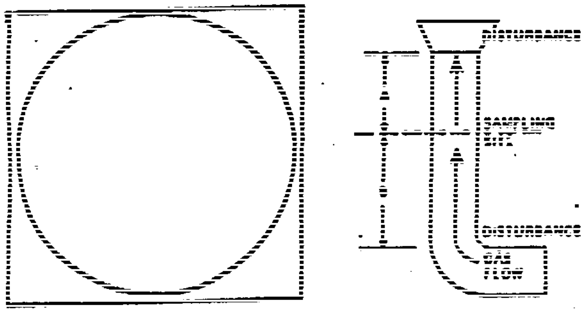
$$I = \left(1.667 \frac{\text{min}}{\text{sec}}\right) T_s \left[\frac{\left(0.002669 \frac{\text{in.Hg.cu.ft.}}{\text{ml.} \cdot {}^\circ\text{R}} V_{lc}\right) + \frac{V_m Y}{T_m}\left(P_{bar} + \frac{\Delta H}{13.6}\right)}{\theta v_s P_s A_n}\right]$$

$= \quad \%$

($A_n = \quad$ sq. ft.)

PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION: Start 15:00

PLANT Valley Landfill
DATE 4/7/91
LOCATION Inlet
OPERATOR
STACK NO.
RUN NO. 2-Moisture
SAMPLE BOX NO.
METER BOX NO. 2805

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 26.93
ASSUMED MOISTURE, %
PROBE LENGTH, in.
NOZZLE DIAMETER, in.
STACK DIAMETER, in.
PROBE HEATER SETTING
HEATER BOX SETTING

METER ΔH@
C FACTOR
PROCESS WEIGHT RATE

WEIGHT OF PARTICULATE COLLECTED, mg		
SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

Y = 1.009

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (Vm), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	5					2.4		642.521	30	24				
2	5					↓		646.6	31	24				
3	5							650.6	32	24				
4	5							654.7	33	24				
5	5							658.8	33	25				
6	5					✓		662.8	35	26				
								666.847						
TOTAL								24.326		28.9				
AVERAGE					⊠									

CH_4 = 53 %

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL	121	104			202
INITIAL	100	100	[illegible]	59	200
LIQUID COLLECTED	21	4		7	2

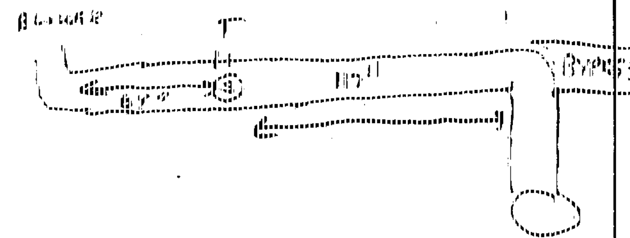
ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
Gas Bag 1		40.1	1.2	0.2	53
2					
3					
4					

COMMENTS: LEAK check
SYSTEM
Pre: ____ cfm at 15" Hg
Post: ____ cfm at 15" Hg
Pitots
Pre ✓

ARI Environmental Inc.

VELOCITY TRAVERSE

PLANT: Valley Landfill
DATE: 1/22/91
LOCATION: Flare Inlet (Closed Exhaust)
STACK I.D.: 7.625"
BAROMETRIC PRESSURE, in. Hg: 2893
STACK GAUGE PRESSURE, in. H_2O:
OPERATORS:



SCHEMATIC OF TRAVERSE POINT LAYOUT

Static + 9.0

Run 1

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
T	0.42	98.0
	0.42	
	0.44	
	0.43	
S	0.37	98.0
	0.43	
	0.42	
	0.38	
	$\sqrt{\Delta P}$ = 0.64	
AVERAGE	$\sqrt{\Delta P}$ = 0.6410	98

Run 2 = 9.0"

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
T 1	0.40	96.5
2	0.42	
3	0.42	
4	0.43	
S 1	0.36	96.6
2	0.42	
3	0.42	
4	0.38	
	$\sqrt{\Delta P}$ = 0.64	
AVERAGE	$\sqrt{\Delta P}$ = 0.6371	96.55

STACK VOLUME FLOW RATE CALCULATION SUMMARY

COMPANY: Valley Landfill

SOURCE: Inlet

REPETITION NO.: 3

TEST DATE: 1-23-91

Dry molecular weight of stack gas

$$M_d = 0.44\ (\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO) + 0.16\ (\%C_1H_4)$$

$$= \underline{28.596} \text{ lb/lb-mole}$$

Molecular weight of stack gas, wet basis

$$M_s = M_d\ (1-B_{ws}) + 18\ B_{ws} = \underline{27.814} \text{ lb/lb-mole}$$

Pitot tube coefficient

C_p (from calibration curve) = 0.99

Average velocity head of stack gas, inches H_2O

$(\sqrt{\Delta p})$ avg. = 0.6305

Average absolute stack gas temperature

(T_s) avg. = 90.0 °F + 460 = 550.0 °R

Absolute stack gas pressure

$P_s = P_b + (\text{Static Pressure}/13.6)$ = 29.42 in. H_g

Stack gas velocity

$$(V_s)\text{ avg.} = (85.49)\ C_p\ (\sqrt{\Delta p})\text{ avg.} \sqrt{\frac{(T_s)\text{ avg.}}{P_s\ M_s}}$$

= 43.742 ft/sec.

Stack gas volume flow rate

$60\ V_s\ A_s$ = 8322 acfm

Stack gas volume flow rate, dry basis

$$Q_s = 3{,}600\ (1-B_{ws})\ V_s\ A_s \left[\frac{T_{std}\ .\ P_s}{(T_s)\text{ avg}\ .\ P_{std}}\right]$$

= 44,963 dscfh

MOISTURE CALCULATION SUMMARY

COMPANY: VALLEY LANDFILL

SOURCE: INLET

REPETITION NO.: 3

TEST DATE: 1-23-91

ENGLISH UNITS
(29.92 in. Hg 68°F)

Volume of sample at standard conditions, on dry basis

$$V_{mstd} = \left[17.64\right] V_m Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] = \underline{\quad 24.389 \quad} \text{ dscf}$$

$Y = \underline{\quad 1.009 \quad}$

Volume of water vapor in sample at standard conditions

$$V_{wstd} = \left[0.04707 \frac{\text{cu. ft.}}{\text{ml.}}\right] V_{lc} = \underline{\quad 1.2709 \quad} \text{ scf}$$

$V_{lc} = \underline{\quad 27 \quad}$ ml

Fractional moisture content of stack gas

$$B_{ws} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}} = \underline{\quad 4.4047 \quad}$$

Isokinetic sampling rate

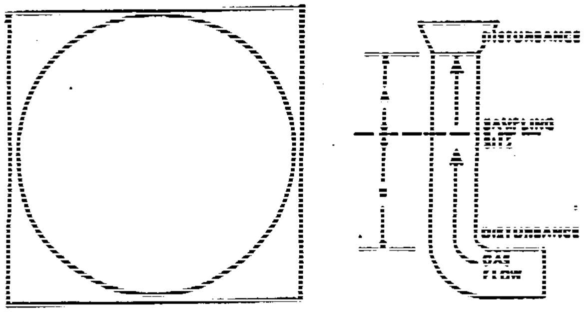
$$I = \left(1.667 \frac{\text{min}}{\text{sec}}\right) T_s \left[\frac{\left(0.002669 \frac{\text{in.Hg.cu.ft.}}{\text{ml.} \cdot {}^\circ\text{R}} V_{lc}\right) + V_m Y \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right)}{6 V_s P_s A_n}\right]$$

$= \underline{\quad\quad\quad\quad} \%$

($A_n = \underline{\quad\quad\quad\quad}$ sq. ft.)

PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION

PLANT: Y.Ohm Canfield
DATE: 11/23/86
LOCATION: Inlet
OPERATOR: Le
STACK NO.:
RUN NO.: 3-Maculate
SAMPLE BOX NO.:
METER BOX NO.: 2805

AMBIENT TEMPERATURE:
BAROMETRIC PRESSURE: 29.75
ASSUMED MOISTURE, %:
PROBE LENGTH, in.:
NOZZLE DIAMETER, in.:
STACK DIAMETER, in.:
PROBE HEATER SETTING:
HEATER BOX SETTING:

METER ΔH@:
C FACTOR:
PROCESS WEIGHT RATE:

WEIGHT OF PARTICULATE COLLECTED, mg		
SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

Y=1.009

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	5					2.4		668.60	12	13				
2	5					|		672.8	22	16				
3	5					|		676.9	32	19				
4	5					|		681.2	35	22				
5	5					|		685.2	37	22				
6	5					↓		689.31	37	22				
								693.39						
TOTAL														
AVERAGE				⊠				(24.751)	(24.0)					

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL	121	103	—		203
INITIAL	100	100	—	59	200
LIQUID COLLECTED	21	3		1	3

CH_4 = 49.%

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
Gas bag		40.2	1.1	0.2	9.5

COMMENTS: Leak check
System
Pre. : 0 cfm at 15" Hg
Post : 0 cfm at 15" Hg
Pitots
Pre ✓

VELOCITY TRAVERSE

PLANT [illegible]
DATE [illegible]
LOCATION
STACK I.D.
BAROMETRIC PRESSURE, in. Hg 28.93
STACK GAUGE PRESSURE, in. H_2O
OPERATORS LG

SCHEMATIC OF TRAVERSE POINT LAYOUT

Run 3 + 9.1

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
S 1	0.37	90
2	0.42	90
3	0.41	90
4	0.38	90
T 1	0.39	90
2	0.40	90
3	0.41	90
4	0.39	90
	$\sqrt{\Delta P} = 0.63$	
AVERAGE	$\sqrt{\Delta P} = 0.6304$	90

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

STACK VOLUME FLOW RATE CALCULATION SUMMARY

COMPANY: Valley Landfill

SOURCE: Stack

REPETITION NO.: 1

TEST DATE: 4-22-91

Dry molecular weight of stack gas

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

$\%CO_2 = 4.3$, $\%O_2 = 11.5$

= 29.448 lb/lb-mole

Molecular weight of stack gas, wet basis

$M_s = M_d\ (1-B_{ws}) + 18\ B_{ws}$ = 29.241 lb/lb-mole

Pitot tube coefficient

C_p (from calibration curve) = 0.84

Average velocity head of stack gas, inches H_2O

$(\sqrt{\Delta p})$ avg. = 0.0922

Average absolute stack gas temperature

(T_s) avg. = 1509.4 °F + 460 = 1,969.4 °R

Absolute stack gas pressure

$P_s = P_b + (\text{Static Pressure}/13.6)$ = 28.91 in. H_g

Stack gas velocity

$$(V_s)\text{ avg.} = (85.49)\ C_p\ (\sqrt{\Delta p})\text{ avg.}\ \sqrt{\frac{(T_s)\text{ avg.}}{P_s\ M_s}}$$

= 60.21 ft/sec.

Stack gas volume flow rate

$60\ V_s\ A_s$ = 48,117.4 acfm

Stack gas volume flow rate, dry basis

$$Q_s = 3{,}600\ (1-B_{ws})\ V_s\ A_s \left[\frac{T_{std}\ .\ P_s}{(T_s)\text{ avg}\ .\ P_{std}}\right]$$

= 118,093.8 dscfh

MOISTURE CALCULATION SUMMARY

COMPANY: Valley Landfill

SOURCE: Stack

REPETITION NO.: 1

TEST DATE: 1-22-91

ENGLISH UNITS
(29.92 in. Hg 68°F)

Volume of sample at standard conditions on dry basis

$$V_{mstd} = \left[17.64\right] V_m Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] = \underline{\quad 25.6457 \quad} \text{ dscf}$$

$$Y = \underline{\quad 0.986 \quad}$$

Volume of water vapor in sample at standard conditions

$$V_{wstd} = \left[0.04707 \ \frac{\text{cu. ft.}}{\text{ml}}\right] V_{lc} = \underline{\quad 2.5178 \quad} \text{ scf}$$

$$V_{lc} = \underline{\quad 11 \quad} \text{ml}$$

Fractional moisture content of stack gas

$$B_{ws} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}} = \underline{\quad 1.9790 \% \quad}$$

Isokinetic sampling rate

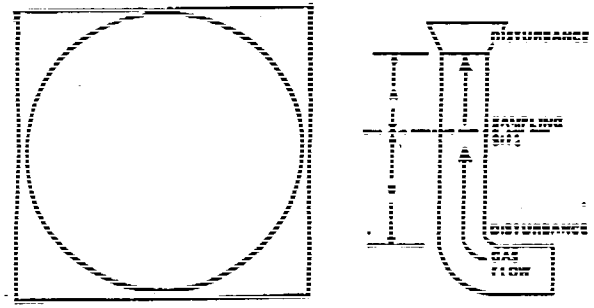
$$I = \left(1.667 \ \frac{\text{min}}{\text{sec}}\right) T_s \left[\frac{\left(0.002669 \ \frac{\text{in.Hg.cu.ft.}}{\text{ml.}\ ^\circ\text{R}} \ V_{lc}\right) + \frac{V_m Y}{T_m}\left(P_{bar} + \frac{\Delta H}{13.6}\right)}{\theta V_s P_s A_n}\right]$$

$$= \underline{\quad \diagup \quad} \%$$

(A_n = _____ sq. ft.)

PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION
Stack (3:00

PLANT Valley Landfill
DATE 1/22/91
LOCATION Tewksbury, PA
OPERATOR DB/DC
STACK NO. Stack - #1
RUN NO. SO_2/Moisture
SAMPLE BOX NO.
METER BOX NO. 2390

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 29.93
ASSUMED MOISTURE, %
PROBE LENGTH, in. 6 FT
NOZZLE DIAMETER, in.
STACK DIAMETER, in.
PROBE HEATER SETTING 250
HEATER BOX SETTING 250

METER $\Delta H_@$
C FACTOR
PROCESS WEIGHT RATE

WEIGHT OF PARTICULATE COLLECTED, mg

SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		

TOTAL

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	Y= 0.986 GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m(in)}$), °F	OUTLET ($T_{m(out)}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. H_g gauge	VELOCITY in.
1	5					2.4		168.60	18	18	260	17	4	
2	5					2.4		173.8	30	20	262	19	4	
3	5					2.4		176.9	34	22	265	20	4	
4	5					2.4		181.2	38	26	266	20	4	
5	5					2.4		185.2	41	27	264	20	4	
6	5					2.4		189.3	40	29	260	20	4	
								193.351						
TOTAL														
AVERAGE				X				24.751		28.6				

VOLUME OF LIQUID WATER COLLECTED	H_2O IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL	163	107	101		200
INITIAL	100	100	100	50	200
LIQUID COLLECTED	3	7	1		0

ORSAT MEASUREMENT (Dry Basis)

TIME	CO_2	O_2	CO	N_2
	4.3	19.6	—	

COMMENTS: Leak Check
System
Pre: 0 cfm at 15" H_g
Post: 0 cfm at 15" H_g
Orsats
Pre ✓

STACK VOLUME FLOW RATE CALCULATION SUMMARY

COMPANY: Valley Landfill

SOURCE: STACK

REPETITION NO.: 2

TEST DATE: 1-22-91

Dry molecular weight of stack gas

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

$= \underline{29.586}$ lb/lb-mole

Molecular weight of stack gas, wet basis

$M_s = M_d\ (1-B_{ws}) + 18\ B_{ws}$ $= \underline{29.305}$ lb/lb-mole

Pitot tube coefficient

C_p (from calibration curve) $= \underline{0.84}$

Average velocity head of stack gas, inches H_2O

$(\sqrt{\Delta p})$ avg. $= \underline{0.0930}$

Average absolute stack gas temperature

(T_s) avg. $= \underline{1543.2}\ ^\circ F + 460$ $= \underline{2,003.2}\ ^\circ R$

Absolute stack gas pressure

$P_s = P_b + (\text{Static Pressure}/13.6)$ $= \underline{28.91}$ in. H_g

Stack gas velocity

$$(V_s)\ \text{avg.} = (85.49)\ C_p\ (\sqrt{\Delta p})\ \text{avg.} \sqrt{\frac{(T_s)\ \text{avg.}}{P_s\ M_s}}$$

$= \underline{10.321}$ ft/sec.

Stack gas volume flow rate

$60\ V_s\ A_s$ $= \underline{49,437.3}$ acfm

Stack gas volume flow rate, dry basis

$$Q_s = 3,600\ (1-B_{ws})\ V_s\ A_s \left[\frac{T_{std}\ .\ P_s}{(T_s)\ \text{avg}\ .\ P_{std}}\right]$$

$= \underline{718,318.4}$ dscfh

MOISTURE CALCULATION SUMMARY

COMPANY: Jacket Laboratories

SOURCE: Stack

REPETITION NO.: 2

TEST DATE: 12/2/91

ENGLISH UNITS
(29.92 in. Hg 68°F)

Volume of sample at standard conditions on dry basis

$$V_{mstd} = \left[17.64\right] V_m Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] = \underline{\quad 25.1684 \quad} \text{ dscf}$$

$$Y = \underline{\quad 0.986 \quad}$$

Volume of water vapor in sample at standard conditions

$$V_{wstd} = \left[0.04707 \frac{\text{cu. ft.}}{\text{ml}}\right] V_{lc} = \underline{\quad 0.6119 \quad} \text{ scf}$$

$$V_{lc} = \underline{\quad 13 \quad} \text{ ml}$$

Fractional moisture content of stack gas

$$B_{ws} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}} = \underline{\quad 2.3736 \% \quad}$$

Isokinetic sampling rate

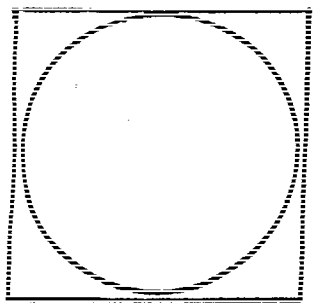
$$I = \left(1.667 \frac{\text{min}}{\text{sec}}\right) T_s \left[\frac{\left(0.002669 \frac{\text{in.Hg.cu.ft.}}{\text{ml.}\ ^\circ R} V_{lc}\right) + V_m Y \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right)}{\theta v_s P_s A_n}\right]$$

$$= \underline{\quad \quad} \%$$

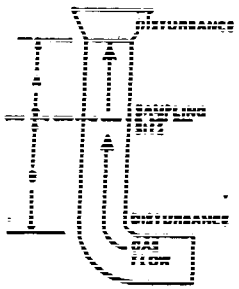
(A_n = _____ sq. ft.)

PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION



PLANT Valley Landfill
DATE 11/22/91
LOCATION Dewain, PA
OPERATOR DB/DK
STACK NO. Stack #2
RUN NO. SO2/Moisture
SAMPLE BOX NO. _____
METER BOX NO. 2390

AMBIENT TEMPERATURE _____
BAROMETRIC PRESSURE 28.93
ASSUMED MOISTURE, % _____
PROBE LENGTH, in. 11
NOZZLE DIAMETER, in. .4
STACK DIAMETER, in. _____
PROBE HEATER SETTING 250
HEATER BOX SETTING 250

METER $\Delta H_@$ _____
C FACTOR _____
PROCESS WEIGHT RATE _____

WEIGHT OF PARTICULATE COLLECTED, mg

SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		

TOTAL _____

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s) ($\sqrt{\Delta P}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH), in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³ Y=0.984	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. H_g gauge	VELOCITY lb.
1					2.4		194.160	24	22	260	15	4	
2					2.4		198.2	30	23	259	16	4	
3					2.4		202.3	32	24	258	18	4	
4					2.4		206.3	36	25	258	19	4	
5					2.4		210.3	37	25	255	19	4	
6					2.4		214.4	38	25	255	20	4	
							218.431						
TOTAL							24.281						
AVERAGE				X									

29.4

VOLUME OF LIQUID WATER COLLECTED

	Knock Out	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL	104	10 C	108			201
INITIAL	100	100	100	56		200
LIQUID COLLECTED	4	6	8			1
TOTAL VOLUME COLLECTED						

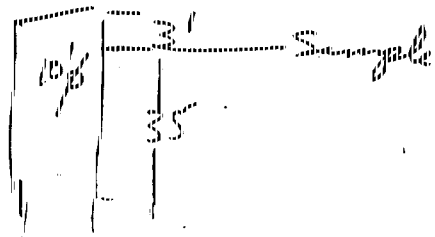
ORSAT MEASUREMENT

	TIME	CO_2	O_2	CO	N_2
1		4.8	19.9		
2					
3					
4					

COMMENTS: Leak Check
System
Pre: 0 cfm at 15" H_g
Post: 0 cfm at 15" H_g
Orsat
Pre ±

VELOCITY TRAVERSE

PLANT Ureek Energy
DATE 1-22-97
LOCATION Stack
STACK I.D. 60'
BAROMETRIC PRESSURE, in. Hg
STACK GAUGE PRESSURE, in. H_2O
OPERATORS DS/AC



SCHEMATIC OF TRAVERSE POINT LAYOUT

Run 1 Static = -.3"

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
East port		
1	0.006	1540
2	0.007	1560
3	0.008	1565
4	0.012	1580
5	0.015	1592
6	0.011	1625
7	0.008	1650
8	0.006	1645
South port		
1	0.004	1514
2	0.006	1505
3	0.009	1480
4	0.012	1470
5	0.015	1495
6	0.011	1510
7	0.006	1544
8	0.005	1542
AVERAGE	0.0092	1550

Run 2 Static = -.32

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	0.003	1550
2	0.009	1565
3	0.009	1572
4	0.011	1590
5	0.015	1592
6	0.010	1636
7	0.006	1650
8	0.007	1655
1	0.004	1528
2	0.007	1532
3	0.007	1499
4	0.014	1489
5	0.016	1505
6	0.011	1523
7	0.007	1558
8	0.006	1557
AVERAGE	0.0090	1562

STACK VOLUME FLOW RATE CALCULATION SUMMARY

COMPANY: Valley Landfill

SOURCE: Stack

REPETITION NO.: 3

TEST DATE: 1/23/91

Dry molecular weight of stack gas

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

$= 29.504$ lb/lb-mole

Molecular weight of stack gas, wet basis

$$M_s = M_d\ (1-B_{ws}) + 18\ B_{ws}$$

$= 29.217$ lb/lb-mole

Pitot tube coefficient

C_p (from calibration curve) $= 0.84$

Average velocity head of stack gas, inches H_2O

$(\sqrt{\Delta p})$ avg. $= 0.0925$

Average absolute stack gas temperature

(T_s) avg. $= 1570.6$ °F + 460 $= 2030.6$ °R

Absolute stack gas pressure

$P_s = P_b + (\text{Static Pressure}/13.6)$ $= 28.73$ in. H_g

Stack gas velocity

$$(V_s)\ \text{avg.} = (85.49)\ C_p\ (\sqrt{\Delta p})\ \text{avg.} \sqrt{\frac{(T_s)\ \text{avg.}}{P_s\ M_s}}$$

$= 10.32$ ft/sec.

Stack gas volume flow rate

$60\ V_s\ A_s$ $= 48,688.0$ acfm

Stack gas volume flow rate, dry basis

$$Q_s = 3,600\ (1-B_{ws})\ V_s\ A_s \left[\frac{T_{std} \cdot P_s}{(T_s)\ \text{avg} \cdot P_{std}}\right]$$

$= 11,125.5$ dscfm

MOISTURE CALCULATION SUMMARY

COMPANY: VALLEY LANDFILL

SOURCE: STACK

REPETITION NO.: 3

TEST DATE: 7-23-91

ENGLISH UNITS
(29.92 in. Hg 68°F)

Volume of sample at standard conditions on dry basis

$$V_{mstd} = \left[17.64\right] V_m Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] = \underline{25.7386} \text{ dscf}$$

$Y = \underline{1.009}$

Volume of water vapor in sample at standard conditions

$$V_{wstd} = \left[0.04707 \frac{\text{cu. ft.}}{\text{ml}}\right] V_{lc} = \underline{2.6590} \text{ scf}$$

$V_{lc} = \underline{126}$ ml

Fractional moisture content of stack gas

$$B_{ws} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}} = \underline{2.4964} \%$$

Isokinetic sampling rate

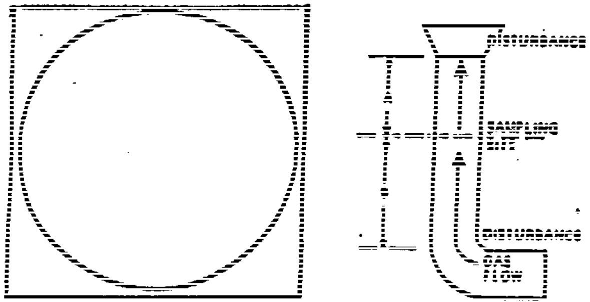
$$I = \left(1.667 \frac{\text{min}}{\text{sec}}\right) T_s \left[\frac{\left(0.002669 \frac{\text{in.Hg.cu.ft.}}{\text{ml.} \cdot °R} V_{lc}\right) + \frac{V_m Y}{T_m}\left(P_{bar} + \frac{\Delta H}{13.6}\right)}{60 V_s P_s A_n}\right]$$

$= \underline{\quad\quad}$ %

($A_n = \underline{\quad\quad}$ sq. ft.)

PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION Start 8:00

PLANT Valley Landfill
DATE 1/23/91
LOCATION Irwin PA
OPERATOR DC/DB
STACK NO. STACK -3
RUN NO. SO_2 / MOISTURE
SAMPLE BOX NO. ______
METER BOX NO. 2390

AMBIENT TEMPERATURE ______
BAROMETRIC PRESSURE 28.75
ASSUMED MOISTURE, % ______
PROBE LENGTH, in. 6'
NOZZLE DIAMETER, in. ______
STACK DIAMETER, in. ______
PROBE HEATER SETTING 250
HEATER BOX SETTING 250

METER ΔH@ ______
C FACTOR ______
PROCESS WEIGHT RATE ______

WEIGHT OF PARTICULATE COLLECTED, mg

SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	Y=0.986 GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	5					2.4		218.609	16	15	255	15	4	
2	5					2.4		222.7	20	17	255	16	4	
3	5					2.4		226.8	31	20	257	16	4	
4	5					2.4		230.96	37	22	257	16	4	
5	5					2.4		235.0	38	24	257	18	4	
6	5					2.4		239.25	38	25	258	18	4	
								243.436						
TOTAL								(24.827)						
AVERAGE				☒					(25.3)					

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1 (H_2O)	2 (H_2O)	3 (H_2O) IPA	4	SILICA GEL WEIGHT, g
FINAL	103	104	103		200
INITIAL	100	100	100	56	200
LIQUID COLLECTED	3	4	3		0

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
Int Bag 1		4.4	20.0		
2					
3					
4					

COMMENTS: Leak check system
Pre: 0.0 cfm at 15" Hg
Post: 0.0 cfm at 15" Hg
DNS
Pre 1

VELOCITY TRAVERSE

PLANT Miller Landfill
DATE 1-23-91
LOCATION
STACK I.D.
BAROMETRIC PRESSURE, in. Hg
STACK GAUGE PRESSURE, in. H_2O
OPERATORS

12:44 - 3:30

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	0.006	1550
2	0.009	1570
3	0.010	1590
4	0.012	1592
5	0.016	1627
6	0.012	1636
7	0.005	1645
8	0.002	1650
1	0.003	1530
2	0.007	1545
3	0.009	1510
4	0.015	1505
5	0.015	1518
6	0.011	1552
7	0.008	1549
8	0.007	1560
AVERAGE	0.0925	1570.6

SCHEMATIC OF TRAVERSE POINT LAYOUT

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

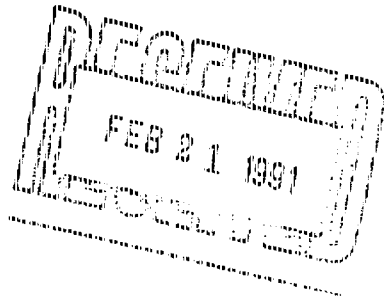
EMISSION TEST PROGRAM
McGILL ENCLOSED FLARE SYSTEM
VALLEY LANDFILL
IRWIN, PENNSYLVANIA

APPENDIX B

Inlet and Stack TGNMO Calculation Summary and Data

HAYDEN ENVIRONMENTAL GROUP, INC.

February 15, 1991



Ms. Judy Steiger
ART ENVIRONMENTAL
3407 N. Ridge Ave.
Arlington Heights, IL 60004

Subject: HEG Lab Task # 91020021
HEG Sample Number(s) 9102083 - 9102088

Project Name: Valley Landfill

Dear Ms. Steiger:

We are pleased to submit the report of analysis for the sample(s) you recently submitted to our laboratory. This report contains results for samples you submitted on 2/4/91.

If you need additional information regarding these samples or if you have any questions regarding the results, please contact one of the persons listed below at 513/866-5909. We can provide additional report copies, method summaries or quality control data reports that you may require for full documentation of your samples. Please request pricing for these additional reports.

Thank you for choosing HEG for your environmental or industrial hygiene laboratory needs. We hope to continue to provide you with quality analytical services and support. If you have any comments on the services we have provided, we would appreciate hearing from you.

Sincerely,

HAYDEN ENVIRONMENTAL GROUP, INC.

Kevin G. Michlewicz, Ph.D.
Laboratory Director

Gregory J. Landsman
Client Services Representative

cc: Client File

TGNMO EMISSION RATE SUMMARY DATA

COMPANY: VALLEY LANDFILL

TEST LOCATION: INLET

TRAP NO.:

TANK NO.:

RUN NO.: 1

TEST DATE: 4-22-9

Sample Volume

$$V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$$

0.00541 DSCM

Sample tank noncondensible organics concentration

$$C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}} \right] \left[\frac{1}{n} \sum_{j=1}^{n} C_{tmj} - B_a \right]$$

90 ppm C_1

Condensate trap condensible organics concentration

$$C_c = 0.386\ \frac{V_v}{V_s} \frac{P_f}{T_f} \left[\frac{1}{q} \sum_{k=1}^{q} C_{cm_k} - B_t \right]$$

363 ppm C_1

TGNMO concentration

$$C = C_t + C_c$$

453 ppm C_1

TGNMO mass concentration

M_c (metric) = 0.498C

mgC_1/DSCM

$M_c = 3.11 \times 10^{-8} C$

1.3884×10^{-5} lbC_1/DSCF

TGNMO mass emission rate

$M_e = M_c \times Q_s$

4.905 lbC_1/hr

with Q_s = 45,079.7 DSCFH

METHOD 25 ANALYSIS CALCULATIONS

Client: ARI

PN:

Task: 91020021

Source: Valley Landfill

Site: Inlet

Run: 1

HEG Sample Number: 9102083

Analyst: rh

Recovery Date: 2/4/91

Analysis Date: 2/4/91

Sample Volume

DTc=((Pb(f test)-Ptk(f test))/(T(f test)+273.2))-
((Pb(i test)-Ptk(i test))/(T(i test)+273.2)) = 1.8534906

Vs = 0.3857*Vtk(cal)*DTc = 4.4106795

Trap Concentration

dK(ctp)=(Vicv(cal)/Vs)*((Pb(tp lab)-Picv(f lab))/T(tp lab)+273.2))

dK(ctp) = 4.397413

Ctp = 0.3857*(Ctp(m)2)*(dK(ctp)) = 3363.3309909

Tank Concentration

dK(ctk) = ((Pb(tk lab)+Ptk(f lab))/(T(tk lab)+273.2))/DTc

dK(ctk) = 2.2537018

Ctk = (Ctk(m)2)*(dK(ctk)) = 90.148072

Source Concentration, Converted to Mass Basis

Cvoc1 = Ctp+Ctk = 3453.4790629

Cvoc2 = (Ctp+Ctk)*((12.011)/(24.055*100)) = 1.7267395

TOTAL CONCENTRATION	= 3453	ppm Cl	
	= 1.727	mg/L	Today's Date 2/5/91
TANK CONCENTRATION	= 90	ppm Cl	Verified RH
TRAP CONCENTRATION	= 3363	ppm Cl	
SAMPLE VOLUME	= 4.411	Liters	

DTc = Value determined using differance of pre- and post- test data from the field data sheet
Vs = Volume of sample collected in Liters
dk(ctp)/dk(ctk) = Dilution factor of the sample trap or tank respectively
Ctp/Ctk = Concentration of VOC (ppm Cl) in either trap or tank
Cvoc1 = Total corrected concentration of VOC, ppm Cl
Cvoc2 = Total corrected concentration of VOC, mg/L

METHOD 25 LABORATORY DATA

Client: ARI HEG Sample #: 9102083 Date: 1/22/91

Source: Valley Landfill Site: Inlet Run: 1

Recovery Date: 2/4/91 Analysis Date: 2/4/91

FIELD DATA

Vtk(cal): 6.17 Liters

Pb(i test)	734.8	mm Hg	Pb(f test)	734.8	mm Hg
T(i test)	-7.8	oC	T(f test)	-6.7	oC
Ptk(i test)	724	mm Hg	Ptk(f test)	230	mm Hg

TRAP DATA 4			TANK DATA 3		
Pb(tp lab)	753	mm Hg	Pb(tk lab)	753	mm Hg
T(tp lab)	25	oC	T(tk lab)	27	oC
ICV Number	58				
Vicv(cal)	4.808	Liter			
Picv(f lab)	450	mm Hg	Ptk(f lab)	501	mm Hg

Ctp(ml)	1990	ppm Cl	Ctk(ml)	79	ppm Cl
Ctp(ml)	1984	ppm Cl	Ctk(ml)	22	ppm Cl
Ctp(ml)	1976	ppm Cl	Ctk(ml)	20	ppm Cl
Ctp(m)2	1983	ppm Cl	Ctk(m)2	40	ppm Cl

Analyst: [signature]

Comments: Large amount of methane (appx 10%)

Pb(tp lab) = lab barometric pressure during sample recovery
T(tp lab) = lab temperature during recovery
ICV = Intermediate Collection Vessel
Vicv(cal) = Volumn of Intermediate Collection Vessel
Picv(f lab) = Final pressure of ICV
Ctp(ml) = GC analyzed and reported concentration of VOC in ICV
Ctp(m)2 = Average concentration of VOC in trap sample
tk = Subscript used vice "tp" for tank related data

TGNMC FIELD DATA

ERT

Client [illegible]
Facility [illegible]
City [illegible] PA
Sample Location INLET
Process
Regulator No. 4
Tank Number(s) 3 [illegible]

PN
Run Number 1
Date 1-22-91
Operator [illegible]
Regulator Setting 70 cc/min
Stack Temperature °F
Trap Number(s) 4

		Pre-Test	Post-Test
Barometric Press.,	"Hg	28.93	28.93
Tank Vacuum	mm Hg	724	230
Gauge Vacuum	" Hg	27	8.3
Leak Check	cm/10 min.	0	0
Ambient Temperature	°F	18	20

SAMPLE TIME 24 hr clock/ minutes	GAUGE VACUUM inches Hg	COMMENTS
1300	27.0	
05	25.0	
10	23.0	
15	21.2	
20	19.5	
25	18.0	
30	16.5	
35	15.0	
40	13.4	
45	12.1	
50	10.9	
55	9.6	
[illegible]	8.3	

TGNMO EMISSION RATE SUMARY DATA

COMPANY: Valley Landfill

TEST LOCATION: Inlet

TRAP NO.:

TANK NO.:

RUN NO.: 2

TEST DATE: 1-22-91

Sample Volume

$$V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$$

0.904483 DSCM

Sample tank noncondensible organics concentration

$$C_t = \left[\frac{P_{tf}}{T_{tf}} \Big/ \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right) \right] \left[\frac{1}{n} \sum_{j=1}^{n} C_{tmj} - B_a \right]$$

486 ppm C_1

Condensate trap condensible organics concentration

$$C_c = 0.386\ \frac{V_w}{V_s} \frac{P_f}{T_f} \left[\frac{1}{q} \sum_{k=1}^{q} C_{cm_k} - B_t \right]$$

2872 ppm C_1

TGNMO concentration

$C = C_t + C_c$

3357 ppm C_1

TGNMO mass concentration

M_c (metric) = $0.498c$ _____ $mgC_1/DSCM$

$M_c = 3.11 \times 10^{-8} c$ 10.4402 x 10^{-5} $lbC_1/DSCF$

TGNMO mass emission rate

$M_e = M_c \times Q_s$ 4.7541 lbC_1/hr

with Q_s = 45,414.4 DSCFH

METHOD 25 ANALYSIS CALCULATIONS

Client: ARI PN: Task: 91020021

Source: Valley Landfill Site: Inlet Run: 2

HEG Sample Number: 9102084 Analyst: rh

Recovery Date: 2/7/91 Analysis Date: 2/7/91

Sample Volume

DTc=((Pb(f test)-Ptk(f test))/(T(f test)+273.2))-
((Pb(i test)-Ptk(i test))/(T(i test)+273.2)) = 1.9536585

Vs = 0.3857*Vtk(cal)*DTc = 4.4827746

Trap Concentration

dK(ctp)=(Vicv(cal)/Vs)*((Pb(tp lab)+Picv(f lab))/T(tp lab)+273.2))

dK(ctp) = 4.1594108

Ctp = 0.3857*(ctp(m)2)*(dK(ctp)) = 2871.6696946

Tank Concentration

dK(ctk) = ((Pb(tk lab)+Ptk(f lab))/(T(tk lab)+273.2))/DTc

dK(ctk) = 2.11122

Ctk = (Ctk(m)2)*(dK(ctk)) = 485.5806

Source Concentration, Converted to Mass Basis

Cvoc1 = Ctp+Ctk = 3357.2502946

Cvoc2 = (Ctp+Ctk)*((12.011)/(24.055*100)) = 1.6786251

TOTAL CONCENTRATION	= 3357	ppm Cl	
	= 1.679	mg/L	Today's Date 2/15/91
TANK CONCENTRATION	= 486	ppm Cl	Verified RCH.
TRAP CONCENTRATION	= 2872	ppm Cl	
SAMPLE VOLUME	= 4.463	Liters	

DTc = Value determined using differance of pre- and post- test data from the field data sheet
Vs = Volume of sample collected in Liters
dk(ctp)/dk(ctk) = Dilution factor of the sample trap or tank respectively
Ctp/Ctk = Concentration of VOC (ppm Cl) in either trap or tank
Cvoc1 = Total corrected concentration of VOC, ppm Cl
Cvoc2 = Total corrected concentration of VOC, mg/L

METHOD 25 LABORATORY DATA

Client: ARI

HEG Sample #: 9102084 Date: 1/22/91

Source: Valley Landfill Site: Inlet Run: 2

Recovery Date: 2/7/91 Analysis Date: 2/7/91

FIELD DATA

Vtk(cal): 6.27 Liters

Pb(i test) 734.8 mm Hg Pb(f test) 734.8 mm Hg

T(i test) -6.7 oC T(f test) -6.7 oC

Ptk(i test) 723 mm Hg Ptk(f test) 729 mm Hg

TRAP DATA 27			TANK DATA 20	
Pb(tp lab)	751	mm Hg	Pb(tk lab) 751	mm Hg
T(tp lab)	25	oC	T(tk lab) 25	oC
ICV Number	44			
Vicv(cal)	4.724	Liter		
Picv(f lab)	426	mm Hg	Ptk(f lab) 416	mm Hg
Ctp(m1)	1818	ppm C1	Ctk(m1) 260	ppm C1
Ctp(m1)	1778	ppm C1	Ctk(m1) 251	ppm C1
Ctp(m1)	1775	ppm C1	Ctk(m1) 179	ppm C1
Ctp(m)2	1790 ✓	ppm C1	Ctk(m)2 230 ✓	ppm C1

Analyst: [signature]

Comments: Large amount of methane

Pb(tp lab) = lab barometric pressure during sample recovery
T(tp lab) = lab temperature during recovery
ICV = Intermediate Collection Vessel
Vicv(cal) = Volumn of Intermediate Collection Vessel
Picv(f lab) = Final pressure of ICV
Ctp(m1) = GC analyzed and reported concentration of VOC in ICV
Ctp(m)2 = Average concentration of VOC in trap sample
tk = Subscript used vice "tp" for tank related data

TGNMO FIELD DATA

Client
Facility Valley Landfill
City
Sample Location TOILET
Process
Regulator No. 4
Tank Number(s) 20 6270ml

PN
Run Number 2
Date 12-8-91
Operator TOM G
Regulator Setting 70 cc/min
Stack Temperature °F
Trap Number(s) 27

		Pre-Test	Post-Test
Barometric Press.,	in Hg	28.93	28.93
Tank Vacuum	mm Hg	723	243
Gauge Vacuum	" Hg	27.2	8.6
Leak Check	cm/10 min.	0.0	0.0
Ambient Temperature	°F	20	20

CO_2 = 38.1
O_2 = 1.6

SAMPLE TIME 24 hr clock/ minutes	GAUGE VACUUM inches Hg	COMMENTS
1500	27.2	
05	25.4	
10	23.8	
15	22.2	
20	20.6	
25	18.9	
30	17.4	
35	16.0	
40	14.6	
45	13.1	
50	11.6	
55	10.0	
00	8.6	

TGNMO EMISSION RATE SUMMARY DATA

COMPANY: VALLEY CANCER

TEST LOCATION: INLET

TRAP NO.:

TANK NO.:

RUN NO.: 3

TEST DATE: 1-23-91

Sample Volume

$$V_s = 0.386\ v\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)$$

0.00594 DSCM

Sample tank noncondensible organics concentration

$$C_t = \left[\frac{\frac{P_{ti}}{T_{ti}}}{\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}}\right]\left[\frac{1}{n}\sum_{j=1}^{n} C_{tmj} - B_a\right]$$

596 ppm C_1

Condensate trap condensible organics concentration

$$C_c = 0.386\ \frac{V_v}{V_s}\ \frac{P_f}{T_f}\left[\frac{1}{q}\sum_{k=1}^{q} C_{cm_k} - B_t\right]$$

2089 ppm C_1

TGNMO concentration

$$C = C_t + C_c$$

2685 ppm C_1

TGNMO mass concentration

M_c (metric) = 0.498C

mgC_1/DSCM

$M_c = 3.11 \times 10^{-8} C$

2.3503×10^{-5} lbC_1/DSCF

TGNMO mass emission rate

$M_e = M_c \times Q_s$

3.755 lbC_1/hr

with Q_s = 44,963.9 DSCFH

METHOD 25 LABORATORY DATA

Client: ART

HEG Sample #: 9102085 Date: 1/22/91

Source: Valley Landfill Site: Inlet Run: 3A

Recovery Date: 2/7/91 Analysis Date: 2/7/91

FIELD DATA

Vtk(cal): 6.2 Liters

Pb(i test)	730.3	mm Hg	Pb(f test)	730.3	mm Hg
T(i test)	-9.4	oC	T(f test)	-8.9	oC
Ptk(i test)	723	mm Hg	Ptk(f test)	160	mm Hg

TRAP DATA 17406			TANK DATA 13		
Pb(tp lab)	751	mm Hg	Pb(tk lab)	751	mm Hg
T(tp lab)	25	oC	T(tk lab)	25	oC
ICV Number	81				
Vicv(cal)	4.803	Liter			
Picv(f lab)	424	mm Hg	Ptk(f lab)	424	mm Hg

Ctp(ml)	1470	ppm Cl	Ctk(ml) 273	ppm Cl
Ctp(ml)	1454	ppm Cl	Ctk(ml) 363	ppm Cl
Ctp(ml)	1449	ppm Cl	Ctk(ml) 331	ppm Cl
Ctp(m)2	1458	ppm Cl	Ctk(m)2 322	ppm Cl

Analyst: DGG

Comments: Large amount of methane & CO_2 present in Tank Sample.

Pb(tp lab) = lab barometric pressure during sample recovery
T(tp lab) = lab temperature during recovery
ICV = Intermediate Collection Vessel
Vicv(cal) = Volumn of Intermediate Collection Vessel
Picv(f lab) = Final pressure of ICV
Ctp(ml) = GC analyzed and reported concentration of VOC in ICV
Ctp(m)2 = Average concentration of VOC in trap sample
tk = Subscript used vice "tp" for tank related data

TGNMO FIELD DATA

Client

Facility Valley Landfill

City

Sample Location EAST

Process

Regulator No. 4

Tank Number(s) 13 620 SCC

PN

Run Number 3A

Date 1-28-91

Operator SWL&K

Regulator Setting 70 cc/min

Stack Temperature °F

Trap Number(s) 17406

		Pre-Test	Post-Test
Barometric Press.,	in Hg	28.75	28.75
Tank Vacuum	mm Hg	723	160
Gauge Vacuum	" Hg	27.4	25
Leak Check	cm/10 min.	0.0	0.0
Ambient Temperature	°F	15	16

SAMPLE TIME 24 hr clock/ minutes	GAUGE VACUUM inches Hg	COMMENTS
0755	27.4	
00	26.0	
05	24.5	
10	23.0	
15	21.5	
20	20	
25	18.5	
30	16.7	
35	15	
40	13.3	
45	11.7	
50	10.0	
55	8.8	

TGNMO EMISSION RATE SUMMARY DATA

COMPANY: Valley Landfill

TEST LOCATION: Stack

TRAP NO.:

TANK NO.:

RUN NO.: 1

TEST DATE: 1-22-91

Sample Volume

$$V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$$

0.005613 dscm

Sample tank noncondensible organics concentration

$$C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}} \right] \left[\frac{1}{r} \sum_{j=1}^{r} C_{tmj} - B_a \right]$$

< 5 ppm C_1

Condensate trap condensible organics concentration

$$C_c = 0.386\ \frac{V_v}{V_s}\ \frac{P_f}{T_f} \left[\frac{1}{q} \sum_{k=1}^{q} C_{cm_k} - B_t \right]$$

38 ppm C_1

TGNMO concentration

$$C = C_t + C_c$$

38 ppm C_1

TGNMO mass concentration

M_c (metric) = $0.498C$

mgC_1/DSCM

$M_c = 3.11 \times 10^{-8} C$

1.181×10^{-6} lbC_1/DSCF

TGNMO mass emission rate

$M_e = M_c \times Q_s$

0.849 lbC_1/hr

with Q_s = 719,093.8 DSCFH

METHOD 25 ANALYSIS CALCULATIONS

Client: ARI PN: Task: 91020021

Source: Valley Landfill Site: Stack Run: 1B

HES Sample Number: 9102086 Analyst: zh

Recovery Date: 2/5/91 Analysis Date: 2/5/91

Sample Volume

DTc=((Pb(f test)-Ptk(f test))/(T(f test)+273.2))-
((Pb(i test)-Ptk(i test))/(T(i test)+273.2)) = 2.3414634

Vs = 0.3857*Vtk(cal)*DTc = 5.6122816

Trap Concentration

dK(ctp)=(Vicv(cal)/Vs)*((Pb(tp lab)+Picv(f lab))/T(tp lab)+273.2))

dK(ctp) = 5.1600463

Ctp = 0.3857*(Ctp(m)2)*(dK(ctp)) = 37.814382

Tank Concentration

dK(ctk) = ((Pb(tk lab)+Ptk(f lab))/(T(tk lab)+273.2))/DTc

dK(ctk) = 1.0365158

Ctk = (Ctk(m)2)*(dK(ctk)) = 0

Source Concentration, Converted to Mass Basis

Cvoc1 = Ctp+Ctk = 37.814382

Cvoc2 = (Ctp+Ctk)*((12.011)/(24.055*100)) = 0.0189072

TOTAL CONCENTRATION	= 38	ppm Cl	
	= 0.019	mg/L	Today's Date 2/5/91
TANK CONCENTRATION	= 55	ppm Cl	Verified RCH.
TRAP CONCENTRATION	= 38	ppm Cl	
SAMPLE VOLUME	= 5.613	Liters	

DTc = Value determined using differance of pre- and post- test data from the field data sheet
Vs = Volume of sample collected in Liters
dk(ctp)/dk(ctk) = Dilution factor of the sample trap or tank respectively
Ctp/Ctk = Concentration of VOC (ppm Cl) in either trap or tank
Cvoc1 = Total corrected concentration of VOC, ppm Cl
Cvoc2 = Total corrected concentration of VOC, mg/L

METHOD 25 LABORATORY DATA

Client: ARI HEG Sample #: 9102086 Date: 1/22/91

Source: Valley Landfill Site: Stack Run: 1B

Recovery Date: 2/5/91 Analysis Date: 2/5/91

FIELD DATA

Vtk(cal): 6.215 Liters

Pb(i test)	736.6	mm Hg	Pb(f test)	736.6	mm Hg
T(i test)	-6.7	oC	T(f test)	-6.7	oC
Ptk(i test)	724	mm Hg	Ptk(f test)	100	mm Hg

TRAP DATA 7			TANK DATA 22		
Pb(tp lab)	751	mm Hg	Pb(tk lab)	751	mm Hg
T(tp lab)	24	oC	T(tk lab)	24	oC
ICV Number	32				
Vicv(cal)	4.433	Liter			
Picv(f lab)	1019	mm Hg	Ptk(f lab)	527	mm Hg

Ctp(ml)	20	ppm Cl	Ctk(ml)	0	ppm Cl
Ctp(ml)	19	ppm Cl	Ctk(ml)	0	ppm Cl
Ctp(ml)	19	ppm Cl	Ctk(ml)	0	ppm Cl
Ctp(m)2	19	ppm Cl	Ctk(m)2	0	ppm Cl

Analyst: [signature]

Comments:

Pb(tp lab) = lab barometric pressure during sample recovery
T(tp lab) = lab temperature during recovery
ICV = Intermediate Collection Vessel
Vicv(cal) = Volumn of Intermediate Collection Vessel
Picv(f lab) = Final pressure of ICV
Ctp(ml) = GC analyzed and reported concentration of VOC in ICV
Ctp(m)2 = Average concentration of VOC in trap sample
tk = Subscript used vice "tp" for tank related data

TO-NMO FIELD DATA

Client _____ PN _____

Facility _____ Run Number 1-10

City _____ Date 3-22-07

Sample Location Stack Operator _____

Process _____ Regulator Setting 20 cc/min

Regulator No. 2 Stack Temperature _____ °F

Tank Number(s) 32 Trap Number(s) 7

		Pre-Test	Post-Test
Barometric Press.,	mm Hg	2893	2893
Tank Vacuum	mm Hg	760	100 mm
Gauge Vacuum	" Hg	29	8
Leak Check	cm/10 min.	0	0
Ambient Temperature	°F	20	20

SAMPLE TIME 24 hr clock/ minutes	GAUGE VACUUM inches Hg	COMMENTS
13:00	29	
13:05	21	
13:10	25	
13:15	23	
13:20	22	
13:25	20.5	
13:30	19	
13:35	17.5	
13:40	16.5	
13:45	14	
13:50	12	
13:55	9	
14:00	7	

TGNMO EMISSION RATE SHEET

COMPANY: VALLEY LANDFILL

TEST LOCATION: STACK

TRAP NO.:

TANK NO.:

RUN NO.: 2

TEST DATE: 1-22-91

Sample Volume

$$V_s = 0.386\ v \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$$

= 5.22 dscm

Sample tank noncondensible organics concentration

$$C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}} \right] \left[\frac{1}{r} \sum_{j=1}^{r} C_{tmj} - B_a \right]$$

= -- ppm C_1

Condensate trap condensible organics concentration

$$C_c = 0.386\ \frac{V_v}{V_s} \frac{P_f}{T_f} \left[\frac{1}{q} \sum_{k=1}^{q} C_{cm_k} - B_t \right]$$

= 12 ppm C_1

TGNMO concentration

$$C = C_t + C_c$$

= 28 ppm C_1

TGNMO mass concentration

M_c (metric) = 0.498C

= ---- $mgC_1/dscm$

$M_c = 3.11 \times 10^{-8} C$

= 1.4×10^{-6} $lbC_1/dscf$

TGNMO mass emission rate

$M_e = M_c \times Q_s$

= 2.449 lbC_1/hr

with Q_s = 115,318.4 dscfm

BERKELEY ANALYTICAL LABORATORY

Client: BRI PN: Task: 91030152

Source: Stack Site: Valley Landfill Run: 2A

BAL Sample Number: 9104421 Analyst: kh

Recovery Date: 3/20/91 Analysis Date: 3/21/91

Sample Volume

DFc=((Pb(f test)-Ptk(f test))/(T(f test)+273.2))-
((Pb(i test)-Ptk(i test))/(T(i test)+273.2)) = 2.0637869 ✓

Vs = 0.3857*Vtk(cal)*DFc = 4.9909436 ✓

Trap Concentration

dK(ctp)=(Vlev(cal)/Vs)*((Pb(tp lab)+Plev(f lab))/T(tp lab)+273.2))

dK(ctp) = 3.2693245

Ctp = 0.3857*(Ctp(m)2)*(dK(ctp)) = 11.611959 ✓

Tank Concentration

dK(ctk) = ((Pb(tk lab)+Ptk(f lab))/(T(tk lab)+273.2))/DFc

dK(ctk) = 1.9025909 ✓

Ctk = (Ctk(m)2)*(dK(ctk)) = 24.295433 ✓

Source Concentration, Converted to Mass Basis

Cvoc1 = Ctp+Ctk = 35.907392 ✓

Cvoc2 = (Ctp+Ctk)*((12.011)/(24.055+100)) = 0.0191567

TOTAL CONCENTRATION	= 36 ✓	ppm C1	
	= 0.019	mg/L	Today's date 3/22/91
TANK CONCENTRATION	= 24 ✓	ppm C1	Verified
TRAP CONCENTRATION	= 12 ✓	ppm C1	
SAMPLE VOLUME	= 4.991	Liters	

DFc = Value determined using difference of pre- and post- test data from the field data sheet
Vs = Volume of sample collected in Liters
dk(ctp)/dk(ctk) = Dilution factor of the sample trap or tank respectively
Ctp/Ctk = Concentration of VOC (ppm C1) in either trap or tank
Cvoc1 = Total corrected concentration of VOC, ppm C1
Cvoc2 = Total corrected concentration of VOC, mg/L

METHOD 25 LABORATORY DATA

Client: BEI ERG Sample #: 910421 Date: 1/23/91

Source: Stack Site: Valley Landfill Run: 2A

Recovery Date: 1/30/91 Analysis Date: 2/21/91

FIELD DATA

Vtk(cal): 6.22 Liters

Pb(i test) 29.8 mm Hg Pb(f test) 29.8 mm Hg

T(i test) -6.7 oC T(f test) -6.7 oC

Ptk(i test) 732 mm Hg Ptk(f test) 732 mm Hg

TRAP DATA 17425 TANK DATA 30

Pb(tp lab) 742 mm Hg Pb(tk lab) 748 mm Hg

T(tp lab) 21 oC T(tk lab) 24 oC

ICV Number 39

Vicv(cal) 4.805 Liter

Picv(f lab) 424 mm Hg Ptk(f lab) 422 mm Hg

Ctp(m1) 2	ppm C1	Ctk(m1) 13	ppm C1
Ctp(m1) 2	ppm C1	Ctk(m1) 12	ppm C1
Ctp(m1) 2	ppm C1	Ctk(m1) 16	ppm C1
Ctp(m)2 2 ✓	ppm C1	Ctk(m)2 14 ✓	ppm C1

Analyst: [illegible] /26

Comments:

Pb(tp lab) = Lab barometric pressure during sample recovery
T(tp lab) = Lab temperature during recovery
ICV = Intermediate Collection Vessel
Vicv(cal) = Volumn of Intermediate Collection Vessel
Picv(f lab) = Final pressure of ICV
Ctp(m1) = GC analyzed and reported concentration of VOC in ICV
Ctp(m)2 = Average concentration of VOC in trap sample
tk = Subscript used vice "tp" for tank related data

TGNMO FIELD DATA

APEX Environmental Inc.

Client: Valley Landfill
Facility:
City: Turlock
Sample Location: Stack
Process:
Regulator No.: Reg 3
Tank Number(s): 20

PN:
Run Number: 2-A
Date: 1-23-20
Operator: MC
Regulator Setting: 2.5 cc/min
Stack Temperature: °F
Trap Number(s): 1425

		Pre-Test	Post-Test
Barometric Press.,	in Hg	28.93	28.93
Tank Vacuum	mm Hg	32	10
Gauge Vacuum	" Hg	29	8
Leak Check	cm/10 min.	0	0
Ambient Temperature	°F	20	20

Tank Vol = 620

SAMPLE TIME 24 hr clock/ minutes	GAUGE VACUUM inches Hg	COMMENTS
15:05	29	
15:10	27	
15:15	26	
15:20	24	
15:25	23	
15:30	21	
15:35	19.5	
15:40	18	
15:45	16	
15:50	14	
15:55	12	
16:00	10	
16:05	7	

TGNMO EMISSION RATE SUMMARY DATA

COMPANY: JACOBY LANDFILL

TEST LOCATION: STACK

TRAP NO.:

TANK NO.:

RUN NO.: 3

TEST DATE: 1-23-91

Sample Volume

$$V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$$

0.905263 DSCM

Sample tank noncondensible organics concentration

$$C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}} \right] \left[\frac{1}{r} \sum_{j=1}^{r} C_{tmj} - B_a \right]$$

35 ppm C_1

Condensate trap condensible organics concentration

$$C_c = 0.386\ \frac{V_v}{V_s}\ \frac{P_f}{T_f} \left[\frac{1}{q} \sum_{k=1}^{q} C_{cm_k} - B_t \right]$$

11 ppm C_1

TGNMO concentration

$C = C_t + C_c$

46 ppm C_1

TGNMO mass concentration

M_c (metric) = 0.498C

mgC_1/DSCM

$M_c = 3.11 \times 10^{-8} C$

0.1430×10^{-6} lbC_1/DSCF

TGNMO mass emission rate

$M_e = M_c \times Q_s$

1.017 lbC_1/hr

with Q_s = 711.258 DSCFH

METHOD 25 LABORATORY DATA

Client: ARI EEG Sample #: 910422 Date: 1/29/91

Source: Stack Site: Valley Landfill Run: 3B

Recovery Date: 1/29/91 Analysis Date: 1/31/91

FIELD DATA

Vtk(cal): 6.21 Liters

Pb(i test)	730.3	mm Hg	Pb(f test)	730.3	mm Hg
T(i test)	-9.4	oC	T(f test)	-8.9	oC
Ptk(i test)	723	mm Hg	Ptk(f test)	149	mm Hg

TRAP DATA #1			TANK DATA #5		
Pb(tp lab)	742	mm Hg	Pb(tk lab)	746	mm Hg
T(tp lab)	24	oC	T(tk lab)	26	oC
Icv Number	91				
Vicv(cal)	1.761	Liter			
Picv(f lab)	409	mm Hg	Ptk(f lab)	553	mm Hg

Ctp(ml)	8	ppm C1	Ctk(ml)	19	ppm C1
Ctp(ml)	8	ppm C1	Ctk(ml)	12	ppm C1
Ctp(ml)	8	ppm C1	Ctk(ml)	12	ppm C1
Ctp(m)2	8	ppm C1	Ctk(m)2	18	ppm C1

Analyst: [signature]

Comments:

Pb(tp lab) = lab barometric pressure during sample recovery
T(tp lab) = lab temperature during recovery
Icv = Intermediate Collection Vessel
Vicv(cal) = Volumn of Intermediate Collection Vessel
Picv(f lab) = Final pressure of Icv
Ctp(ml) = GC analyzed and reported concentration of VOC in Icv
Ctp(m)2 = Average concentration of VOC in trap sample
tk = Subscript used vice "tp" for tank related data

METHOD 18 ANALYSIS CALCULATIONS

Client: ARI PN: Task: 91030152

Source: Stack Site: Valley Landfill Run: 3A

REG Sample Number: 910473 Analyst: rh

Recovery Date: 3/20/91 Analysis Date: 3/21/91

Sample Volume

$$Dfc = ((Pb(f\ test) - Pck(f\ test))/(T(f\ test)+273.2)) - ((Pb(i\ test) - Pck(i\ test))/(T(i\ test)+273.2)) = 2.2057744$$

$$Vs = 0.3857 * Vck(cal) * Dfc = 5.2832642$$

Trap Concentration

$$dK(ctp) = (Vlcv(cal)/Vs) * ((Pb(tp\ lab)+Plcv(f\ lab))/T(tp\ lab)+273.2))$$

$$dK(ctp) = 1.496332$$

$$Ctp = 0.3857 * (Ctp(m)2) * (dK(ctp)) = 10.788282$$

Tank Concentration

$$dK(ctk) = ((Pb(tk\ lab)+Pck(f\ lab))/(T(tk\ lab)+273.2))/Dfc$$

$$dK(ctk) = 1.9668281$$

$$Ctk = (Ctk(m)2) * (dK(ctk)) = 35.4290058$$

Source Concentration, Converted to Mass Basis

$$Cvoc1 = Ctp+Ctk = 46.2172024$$

$$Cvoc2 = (Ctp+Ctk) * ((12.011)/(24.055*100)) = 0.0231096$$

TOTAL CONCENTRATION	= 46	ppm C1	
	= 0.023	mg/L	Today's Date 3/20/91
TANK CONCENTRATION	= 35	ppm C1	Verified [illegible]
TRAP CONCENTRATION	= 11	ppm C1	
SAMPLE VOLUME	= 5.283	Liters	

Dfc = Value determined using difference of pre- and post- test data from the field data sheet
Vs = Volume of sample collected in liters
dK(ctp)/dK(ctk) = Dilution factor of the sample trap or tank respectively
Ctp/Ctk = Concentration of VOC (ppm C1) in either trap or tank
Cvoc1 = Total corrected concentration of VOC, ppm C1
Cvoc2 = Total corrected concentration of VOC, mg/L

TGNMO FIELD DATA

Client: Valley Landfill
Facility: "
City:
Sample Location: Stack
Process:
Regulator No.: RT 3
Tank Number(s): 25

PN:
Run Number: 3-1
Date: 1-23-97
Operator: DC
Regulator Setting: 26 cc/min
Stack Temperature: °F
Trap Number(s): 21

		Pre-Test	Post-Test
Barometric Press.,	mm Hg	28.25	28.25
Tank Vacuum	mm Hg	223	140
Gauge Vacuum	" Hg	29.0	7.0
Leak Check	cm/10 min.	0	0
Ambient Temperature	°C	15	16

Tank Vol = 6210 mL

SAMPLE TIME 24 hr clock/ minutes	GAUGE VACUUM inches Hg	COMMENTS
7:55	29	Start
8:00	27	
8:05	25	
8:10	23.5	
8:15	21	
8:20	19	
8:25	18.5	
8:30	16	
8:35	14.5	
8:40	13.0	
8:45	11	
8:50	9.5	
8:55	7.0	Stop

EMISSION TEST PROGRAM
McGILL ENCLOSED FLARE SYSTEM
VALLEY LANDFILL
IRWIN, PENNSYLVANIA

APPENDIX C

Stack VOC Calculation Summary and Data

VOC CALCULATION SUMMARY

COMPANY: VALLEY LANDFILL
SOURCE: STACK
REPETITION NO.: 1
TEST DATE: 1-22-91
VOC COMPOUND: 1,2 DICHLOROETHANE

English Units
(29.92 in. Hg 68° F)

Volume of sample at standard conditions on dry basis

$$V_{mstd} = V_m \frac{T_{std} \cdot P_m}{T_m \cdot P_{std}}$$ = _____ dry std liters

$$V_{mstd} = \frac{\text{Liters dry std}}{28.316}$$ = 4.735 ✓ dscf

VOC concentrations in stack gas on dry basis

$$C's = 2.205 \times 10^{-6} \frac{M_n}{V_{mstd}}$$ = 1.071 ✓ $\times 10^{-6}$ lb/dscf

M_n = 230 mg

ppm by vol (dry basis) $= C's \times \frac{385.26 \times 10^6}{\text{mol. wt.}}$ = 2.042 ✓ ppm by vol db
41.7 ✓ ppb

M.W. = 98.96

Stack gas volume flow rate on dry basis

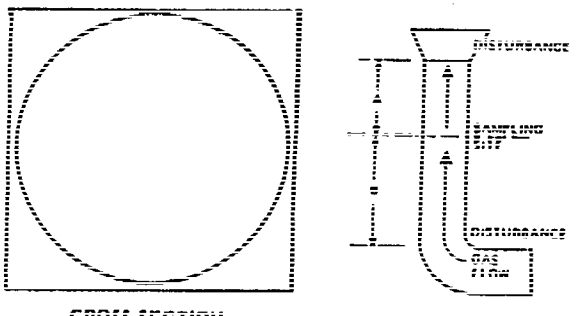
$$Q_s = 3600\ (1-B_{ws})V_s A_s \frac{T_{std} \cdot P_s}{(T_s)av. \cdot P_{std}}$$ = 118,093.8 ✓ dscf/hr

Stack emission rate

$Q_s C's$ = 0.20769 ✓ lb/hr

PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION

PLANT Valley Landfill
DATE
LOCATION Stack
OPERATOR DC
STACK NO. Stack
RUN NO. 1 - VOC
SAMPLE BOX NO.
METER BOX NO.

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 28.75
ASSUMED MOISTURE, %
PROBE LENGTH, in.
NOZZLE DIAMETER, in.
STACK DIAMETER, in.
PROBE HEATER SETTING
HEATER BOX SETTING

METER $\Delta H_@$
C FACTOR
PROCESS WEIGHT RATE

WEIGHT OF PARTICULATE COLLECTED, mg

SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		

Filter # TOTAL

20 PM 10

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s) ($\sqrt{\Delta P}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER: INLET ($T_{m_{in}}$), °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER: OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	13:00				0.02		661.35	14	16				
	13:05						664.7	24	19				
	13:10						668.21	28	19				
	13:15						671.24	31	20				
	13:20						674.24	32	21				
	13:25						677.49	34	23				
	13:30			1			680.34	35	26				
	13:35						683.91	35	26				
	13:40						687.5	35	27				
	13:45						691.24	35	27				
	13:50						694.52	36	28				
	13:55						698.2	36	28				
	14:00						701.5						
TOTAL													
AVERAGE							4,519	273					

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

LEAK CHECK
COMMENTS: Pre 1:02 PM AT 15" Hg
Post 1:04 PM AT 15" Hg

PITOTS
Pre
Post

VOC CALCULATION SUMMARY

COMPANY: VALLEY LANDFILL
SOURCE: STACK
REPETITION NO.: 2
TEST DATE: 1-22-91
VOC COMPOUND: 1,2 DICHLOROETHANE

English Units
(29.92 in. Hg 68°F)

Volume of sample at standard conditions on dry basis

$$V_{mstd} = V_m \frac{T_{std} \cdot P_m}{\bar{T}_m \cdot P_{std}}$$ = _____ dry std liters

V_{mstd} = Liters dry std / 28.316 = 4.467 dscf

VOC concentrations in stack gas on dry basis

$$C's = 2.205 \times 10^{-6} \frac{M_n}{V_{mstd}}$$ = 8.638 x 10^{-9} lb/dscf

M_n = 175 #gs

ppm by vol (dry basis) = $C's \times \frac{385.26 \times 10^6}{\text{mol. wt.}}$ = 0.034 / 33.6 ppb

M.W. = 99.96

Stack gas volume flow rate on dry basis

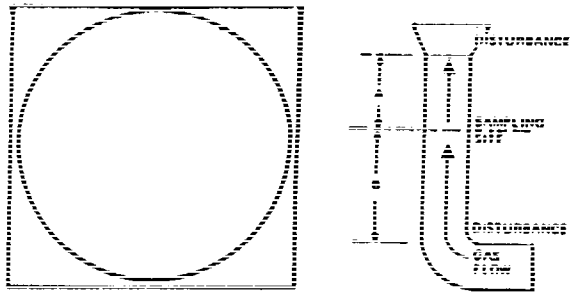
$$Q_s = 3600\ (1-B_{ws})V_s A_s \frac{T_{std} \cdot P_s}{(\bar{T}_s)av. \cdot P_{std}}$$ = 19,324 dscf/hr

Stack emission rate

$Q_s C's$ = 0.00621 lb/hr

PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION

PLANT Valley Landfill

DATE

LOCATION

OPERATOR DC

STACK NO. Flare

RUN NO. 2 - VOC

SAMPLE BOX NO.

METER BOX NO.

AMBIENT TEMPERATURE

BAROMETRIC PRESSURE

ASSUMED MOISTURE, %

PROBE LENGTH, in.

NOZZLE DIAMETER, in.

STACK DIAMETER, in.

PROBE HEATER SETTING

HEATER BOX SETTING

METER $\Delta H_@$

C FACTOR

PROCESS WEIGHT RATE

WEIGHT OF PARTICULATE COLLECTED, mg

SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		

TOTAL

Filter #

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	$\sqrt{\Delta P_s}$	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH), in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft^3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY in.
	15:00							666.20	27	26				
	15:05							666.55	29	26				
	15:10							666.9	30	26				
	15:15							667.3	32	26				
	15:20							667.76	34	26				
	15:25							668.19	33	29				
	15:30							668.63	34	29				
	15:35							669.0	35	29				
	15:40							669.4	35	28				
	15:45							669.8	36	29				
	15:50							670.2	36	29				
	15:55							670.6	37	29				
	16:00							670.93						
TOTAL								4.27						
AVERAGE														

30.7

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

LEAK CHECK

COMMENTS: Pre ___ cfm AT ___ in Hg

Post ___ cfm AT ___ in Hg

PITOTS

Pre

Post

VOC CALCULATION SUMMARY

COMPANY: Jacuzzi Luxury Inc.
SOURCE: Spa
REPETITION NO.: 3
TEST DATE: 1-22-91
VOC COMPOUND: 1,2 Dichloroethane

English Units
(29.92 in. Hg 68°F)

Volume of sample at standard conditions on dry basis

$$V_{mstd} = V_m \frac{T_{std} \cdot P_m}{T_m \cdot P_{std}} = \_\_\_\_\_ \text{ dry std liters}$$

$$V_{mstd} = \frac{\text{Liters dry std}}{28.316} = 4.477_a \text{ dscf}$$

VOC concentrations in stack gas on dry basis

$$C's = 2.205 \times 10^{-6} \frac{M_n}{V_{mstd}} = 9.512 \times 10^{-4} \text{ lb/dscf}$$

M_n = 26.71 mg

$$\text{ppm by vol (dry basis)} = C's \times \frac{385.26 \times 10^6}{\text{mol. wt.}} = \frac{2.037}{37.5} \text{ ppm by vol db} \quad \text{ppb}$$

M.W. = 97.96

Stack gas volume flow rate on dry basis

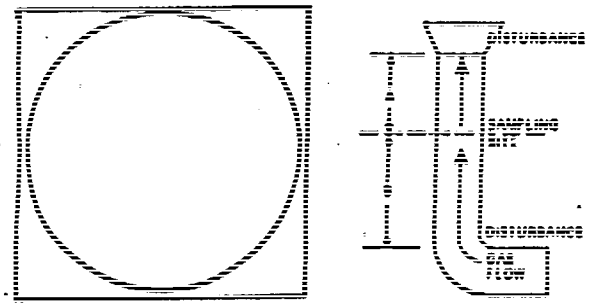
$$Q_s = 3600\ (1-B_{ws})V_s A_s \frac{T_{std} \cdot P_s}{(T_s)av. \cdot P_{std}} = 711,258 \text{ dscf/hr}$$

Stack emission rate

$$Q_s C's = 0.6767_a \text{ lb/hr}$$

PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION

PLANT Valley Landfill AMBIENT TEMPERATURE 15

DATE 1-23-91 BAROMETRIC PRESSURE 28.75

LOCATION Irwin, Pa ASSUMED MOISTURE, % _____

OPERATOR DC PROBE LENGTH, in. _____

STACK NO. Stack NOZZLE DIAMETER, in. _____

RUN NO. 3 - VOC STACK DIAMETER, in. _____

SAMPLE BOX NO. _____ PROBE HEATER SETTING _____

METER BOX NO. _____ HEATER BOX SETTING _____

METER $\Delta H_@$ _____

C FACTOR _____

PROCESS WEIGHT RATE _____

WEIGHT OF PARTICULATE COLLECTED, mg		
SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F (2 L/min)	VELOCITY HEAD (ΔP_s) ($\sqrt{\Delta P}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH), in. H_2O ACTUAL	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH), in. H_2O DESIRED	GAS SAMPLE VOLUME (V_m), ft³ (Y = 1.000)	GAS SAMPLE TEMPERATURE AT DRY GAS METER: INLET ($T_{m_{in}}$), °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER: OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY Δp_s
1	9:55						671.641	16	16				
	9:00						672.0	18	18				4
	9:05						672.3	20	20				
	9:10						672.7	22	22				
	9:15						673.0	24	23				
	9:20						673.4	26	25				
	9:25						673.7	27	25				
	9:30						674.1	29	26				
	9:35						674.5	31	26				
	9:40						674.8	33	26				
	9:45						675.1	34	26				
	9:50						675.5	36	26				
	9:55						675.891						
TOTAL													
AVERAGE				X			4.250		(24.9)				

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME, ml: 1	2	3	4	SILICA GEL WEIGHT, g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

COMMENTS: Leak check

SYSTEM

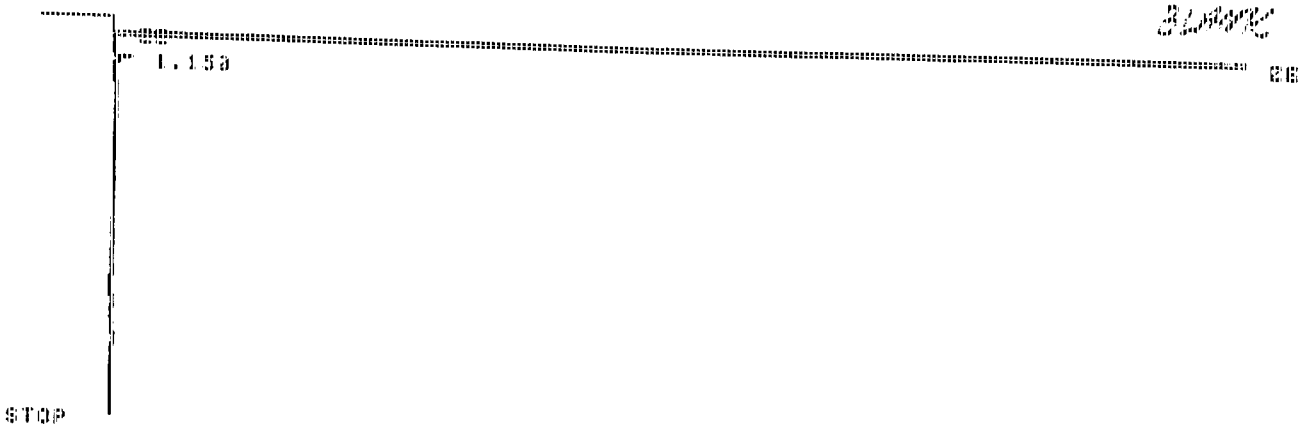
Pre : ___ cfm at 15" Hg

Post : ___ cfm at 15" Hg.

Pitots

Pre 1

* RUN # 66 MAR 6, 1991 16:46:00
START



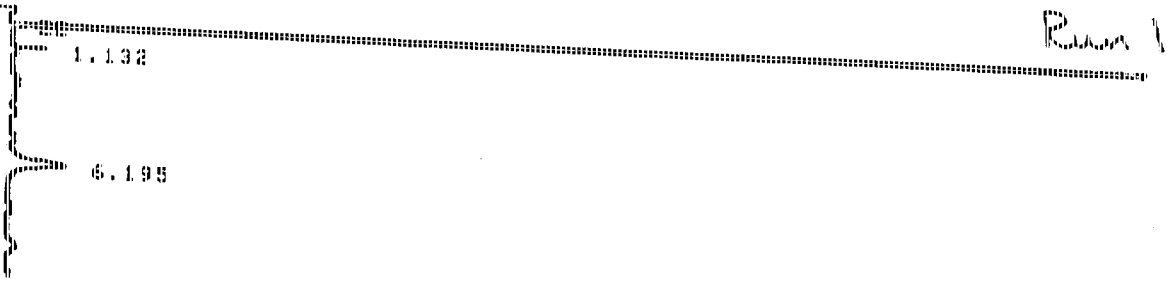
RUN# 66 MAR 6, 1991 16:46:00

AREA%

RT	AREA	TYPE	WIDTH	AREA%
1.150	5635	PB	.054	100.00000

TOTAL AREA= 5635
MUL FACTOR=1.00000E+00

```
* RUN 6    77          MAR  6, 1991   14:16:03
START
```



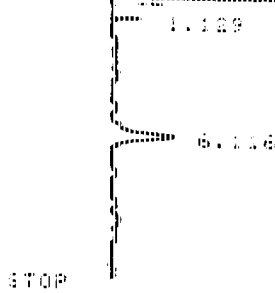
Run 1 Cube 1

26

```
RUN6     77                  MAR  6, 1991   14:16:03

AREAS:
        RT          AREA  TYPE    WIDTH          AREA%
     1.132          6169    PB     .027       4.338972
     6.195        135983    VV     .343      95.660829

TOTAL AREA=  142152
MDL FACTOR=1.000005+00
```

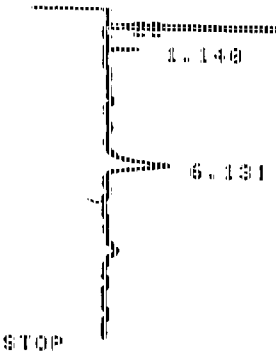
```
*  RUN #    78       MAR  6, 1991   14:28:08
START
```

Run Table 25



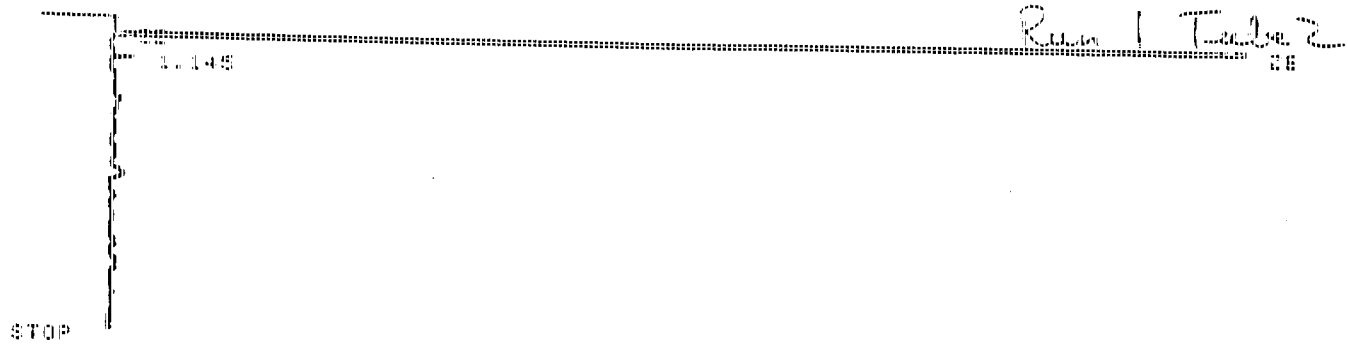

```
STOP


RUN#     78            MAR  6, 1991   14:28:08

AREA%
        RT        AREA TYPE   WIDTH        AREA%
    1.129        5797   PB    .025   100.000000

TOTAL AREA=    5797
MUL FACTOR=1.0000E+00


*  RUN #    79       MAR  6, 1991   14:40:32
START
```

Run Table 26

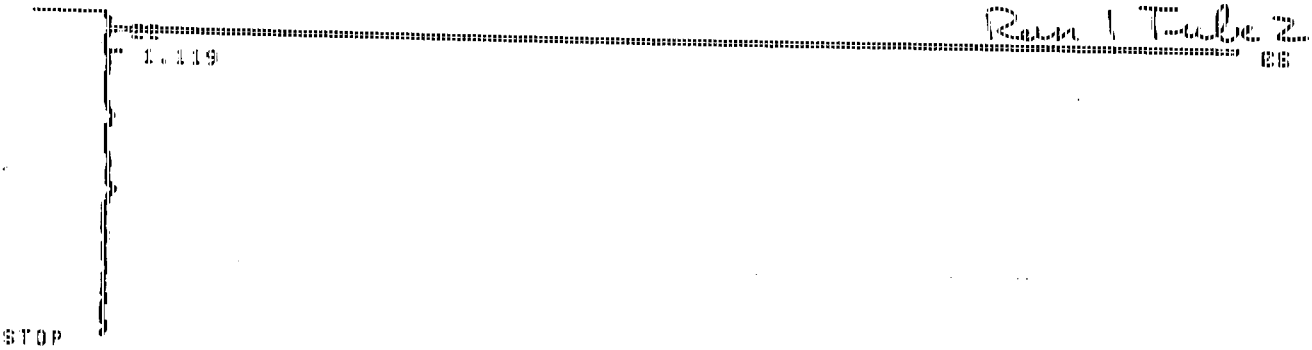



```
STOP


RUN#     79            MAR  6, 1991   14:40:32

AREA%
        RT        AREA TYPE   WIDTH        AREA%
    1.140        5369   PB    .021     3.42275
    6.131      151493   VV    .350    96.57725

TOTAL AREA=  156862
MUL FACTOR=1.0000E+00
```

```
*  RUN #    74       MAR  6, 1991   13:32:50
START
```

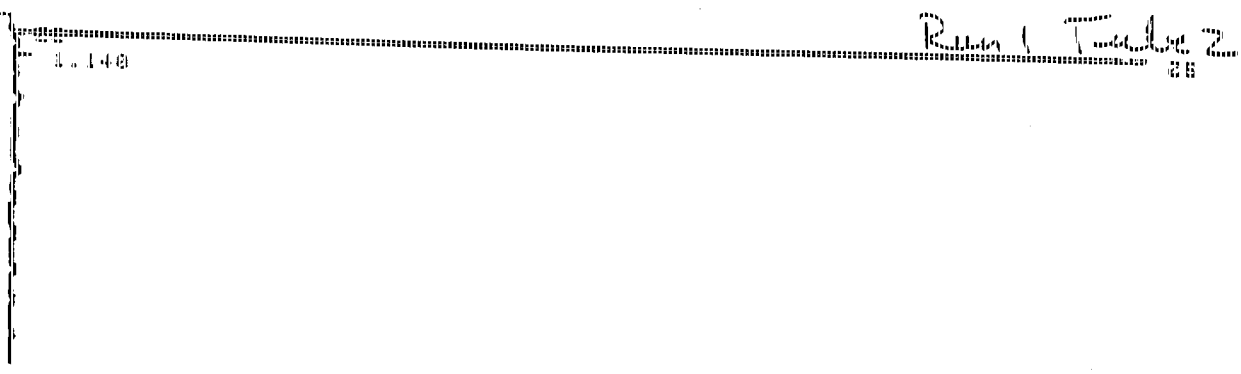



```
STOP


RUN#     74             MAR  6, 1991   13:32:50

AREA%

       RT        AREA TYPE   WIDTH        AREA%
    1.145        5173   PB    .032   100.00000

TOTAL AREA=    5173
NUL FACTOR=1.00000E+00


*  RUN #    75       MAR  6, 1991   13:46:32
START
```




```
STOP


RUN#     75             MAR  6, 1991   13:46:32

AREA%

       RT        AREA TYPE   WIDTH        AREA%
    1.119        5104   PP    .035   100.00000

TOTAL AREA=    5104
NUL FACTOR=1.00000E+00
```

```
*  RUN #    76        MAR   6,  1991   14:00:06
START
```




```
STOP


RUN#      76                MAR   6,  1991   14:00:06

AREA:
        RT          AREA  TYPE   WIDTH        AREA%
     1.140          3723    PB    .027   100.00000

TOTAL AREA=     3723
MUL FACTOR=1.666666E-03
```

```
*  RUN #    65       MAR  6, 1991   11:50:15
START
```

Run 2 Tube 1
26


```
STOP


RUN0      65              MAR   6, 1991   11:50:54

AREA%
        RT        AREA  TYPE   WIDTH        AREA%
    1.135        6670    PB    .035      5.17889
    6.153      122122    VP    .362     94.82112

TOTAL AREA= 128792
NUL FACTOR=1.00000E+00



*  RUN #    67       MAR  6, 1991   11:58:32
START
```

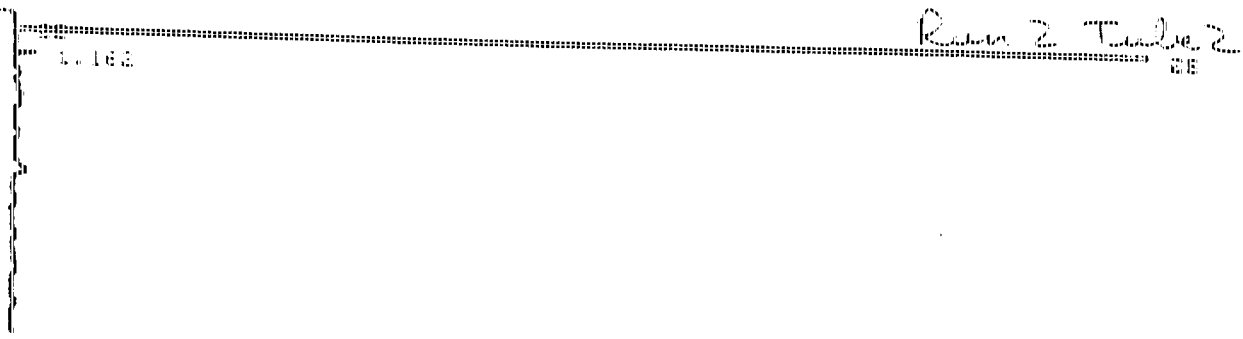
Run 2 Tube 1
26


```
STOP


RUN0      67              MAR   6, 1991   11:58:32

AREA%
        RT        AREA  TYPE   WIDTH        AREA%
    1.142        6225    PB    .023      5.10569
    6.146      115693    VP    .331     94.89411

TOTAL AREA= 121918
NUL FACTOR=1.00000E+00
```

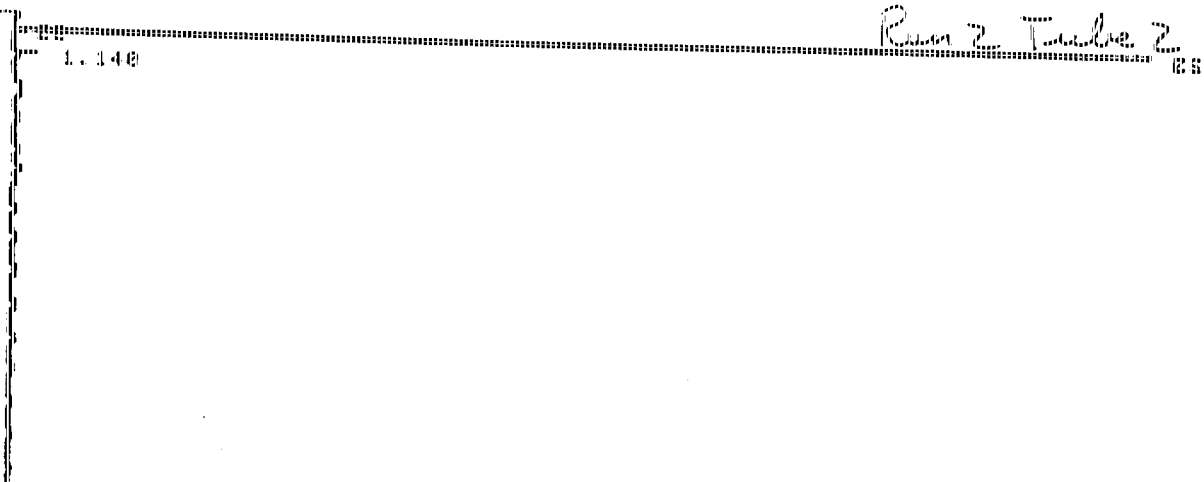
```
*  RUN 0    68       MAR  6, 1991   12:17:15
START
STOP                                                                                                    05


RUN0      68             MAR  6, 1991   12:17:15

NO RUN PEAKS STORED


*  RUN 0    69       MAR  6, 1991   12:23:26
START
                                                                                                        26
        1.131
        6.124
STOP


RUN0      69             MAR  6, 1991   12:23:26

AREA%
        RT        AREA  TYPE   WIDTH       AREA%
    1.131        5700    PB    .024     5.78164
    6.124       92868  1 BB    .273    94.21837

TOTAL AREA=  98568
MUL FACTOR=1.00000E+00
```

Run 2 Tedlar

```
*  RUN #    80        MAR   6, 1991   14:56:44
START
```

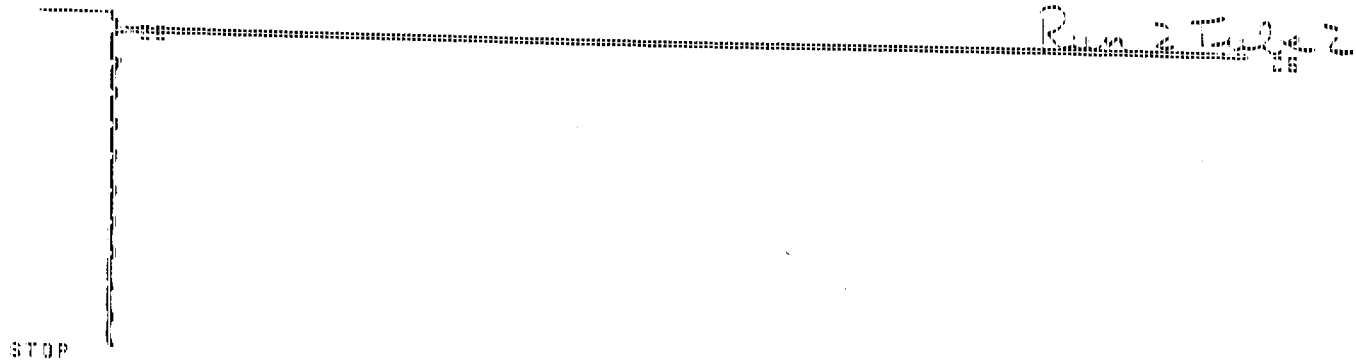



```
STOP


RUN#      80                MAR   6, 1991   14:56:46

AREAS:
          RT        AREA TYPE   WIDTH          AREAS
     1.162          5693    PB     .033   100.00000

TOTAL AREA=    5693
MUL FACTOR=1.00000E+00



*  RUN #    81        MAR   6, 1991   15:10:17
START
```




```
TIMETABLE STOP


RUN#      81                MAR   6, 1991   15:10:17

AREAS:
          RT        AREA TYPE   WIDTH          AREAS
     1.140          9589    PB     .054   100.00000

TOTAL AREA=    9589
MUL FACTOR=1.00000E+00
```

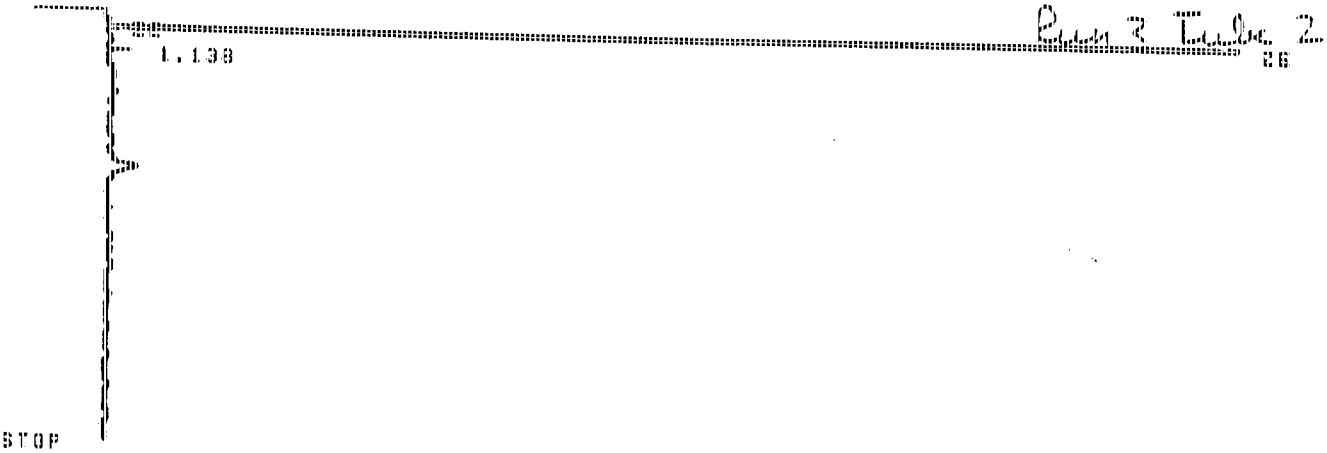
* RUN # 82 MAR 6, 1991 15:34:47
START



RUNO 82 MAR 6, 1991 15:34:47

NO RUN PEAKS STORED

* RUN # 83 MAR 6, 1991 15:56:34
START



RUNO 83 MAR 6, 1991 15:56:34

AREAS:

RT	AREA TYPE	WIDTH	AREA%
1.138	6030 PB	.033	100.000000

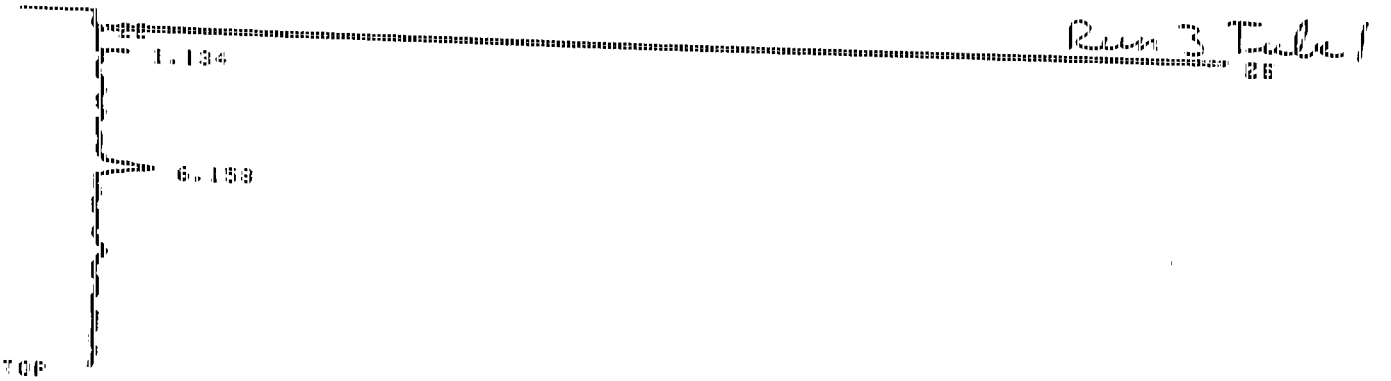
TOTAL AREA= 6030
MUL FACTOR=1.0000E+00

```
*  RUN 1    P1        MAR   6, 1991   12:43:26
START
```

Run 1 Table 1

```
RUN0      P1                MAR   6, 1991   12:43:26

AREA%

        RT        AREA  TYPE   WIDTH        AREA%
     1.143        5585    PB    .022      4.736288
     6.129      112484    PV    .320     95.263712

TOTAL AREA= 118069
MUL FACTOR=1.000000E-00
```

```
*  RUN 0    P2        MAR   6, 1991   12:55:48
START
```

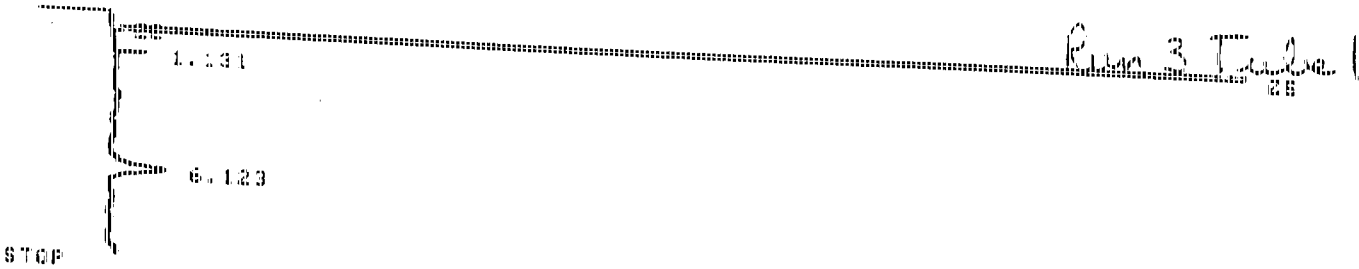


Run 3 Table 1

```
RUN0      P2                MAR   6, 1991   12:55:48

AREA%

        RT        AREA  TYPE   WIDTH        AREA%
     1.134        5513    PB    .025      3.946622
     6.156      134166    VP    .230     96.053378
```

TOTAL AREA= 139678
MUL FACTOR=1.0000E+00

* RUN # 73 MAR 6, 1991 13:11:43
START



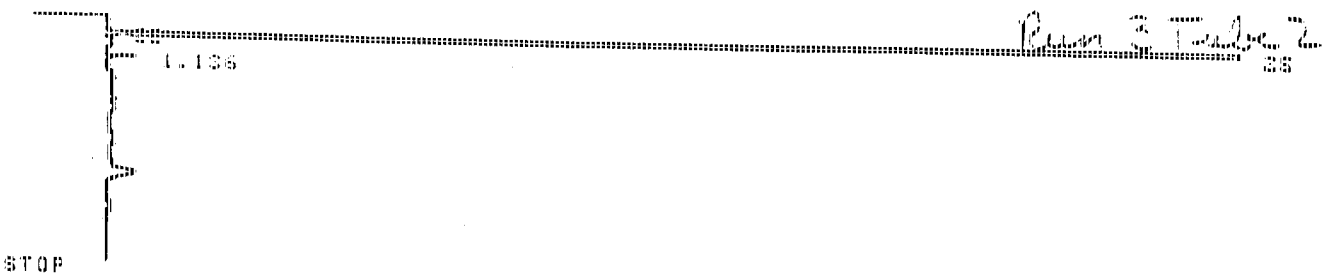
RUN# 73 MAR 6, 1991 13:11:43

AREAS

RT	AREA	TYPE	WIDTH	AREA%
1.131	4432	PB	.026	3.00915
6.123	142852	VB	.363	96.99085

TOTAL AREA= 147284
MUL FACTOR=1.00000E-00

* RUN * 84 MAR 6, 1991 16:17:08
START



STOP

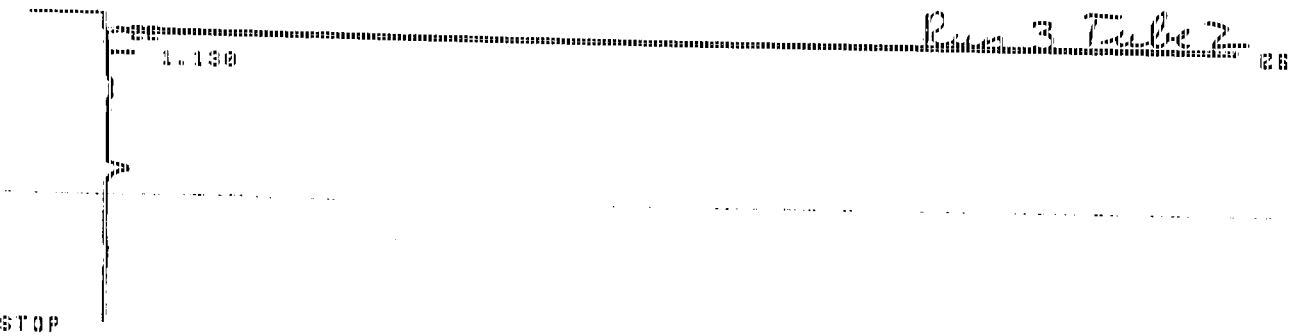
RUN# 84 MAR 6, 1991 16:17:08

AREAS:

RT	AREA TYPE	WIDTH	AREAS
1.136	6036 6B	.028	100.00000

TOTAL AREA= 6036
MUL FACTOR=1.00000E+00

* RUN # 85 MAR 6, 1991 16:28:05
START



STOP

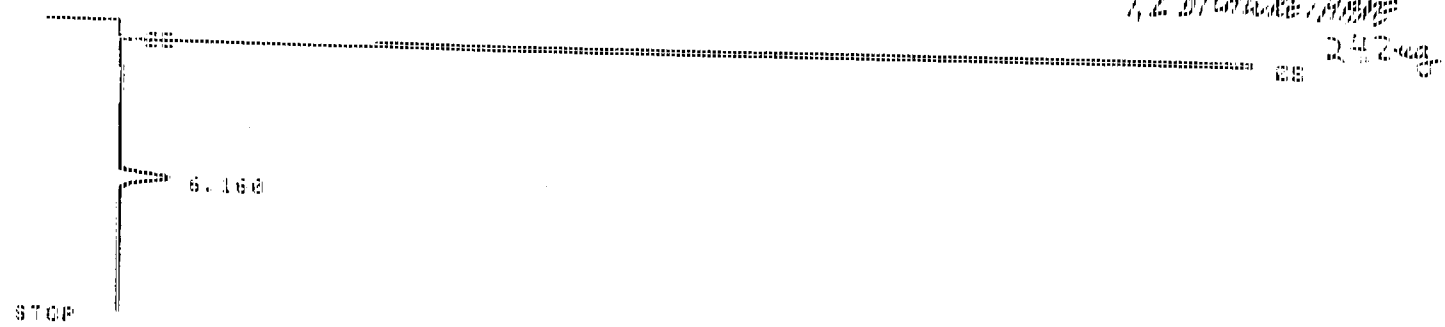
RUN# 85 MAR 6, 1991 16:28:05

AREAS:

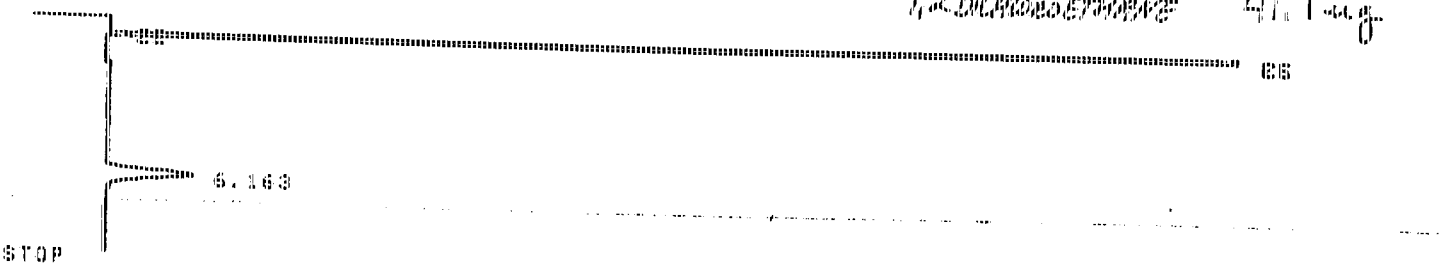
RT	AREA TYPE	WIDTH	AREAS
1.130	14150 PB	.066	100.00000

TOTAL AREA= 14150
MUL FACTOR=1.00000E+00

```
*  RUN 4     12        MAR 11, 1991   16:25:44
START
```

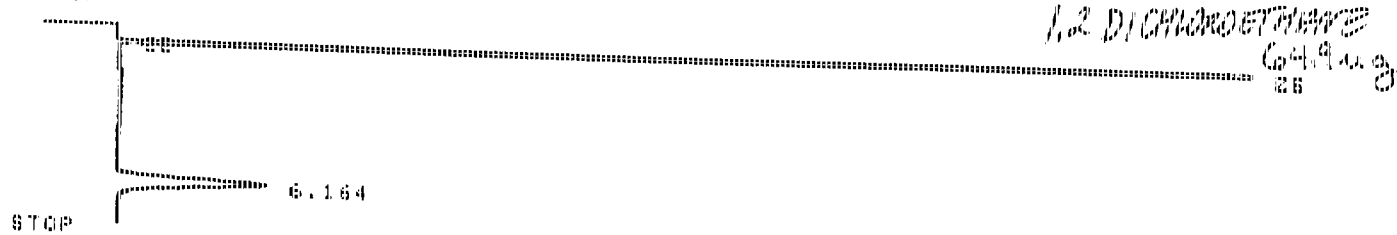



```
STOP


RUNO      12              MAR 11, 1991   16:25:44

AREAS

        RT        AREA TYPE   WIDTH        AREA%
     6.160      147020    PB     .416   100.00000

TOTAL AREA= 147020
MUL FACTOR=1.0000E+00


*  RUN 0     13        MAR 11, 1991   16:42:48
START
```



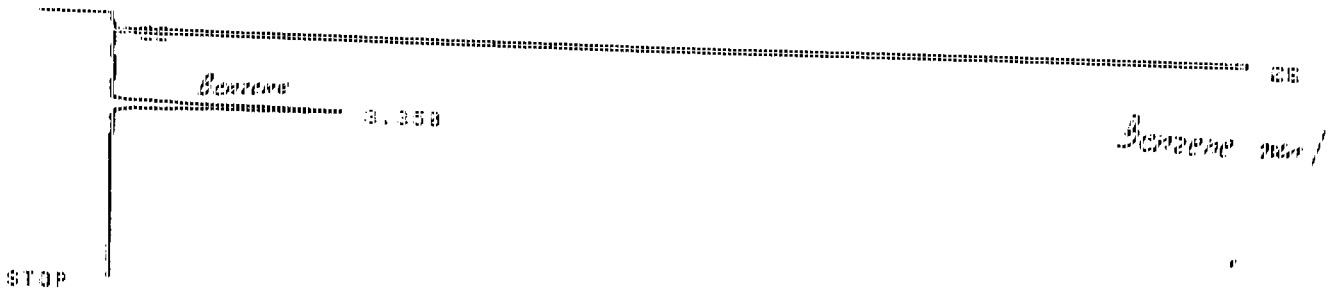

```
STOP


RUNO      13              MAR 11, 1991   16:42:48

AREAS

        RT        AREA TYPE   WIDTH        AREA%
     6.163      248659    PV     .416   100.00000

TOTAL AREA= 248659
MUL FACTOR=1.0000E+00
```

```
*  RUN #    14        MAR 11, 1991   16:59:13
START
```




```
RUN#      14              MAR 11, 1991   16:59:13

AREAS

        RT        AREA  TYPE    WIDTH        AREA%
     6.164      421591    PB     .414    100.00000

TOTAL AREA= 421591
NUL FACTOR=1.00000E+00
```

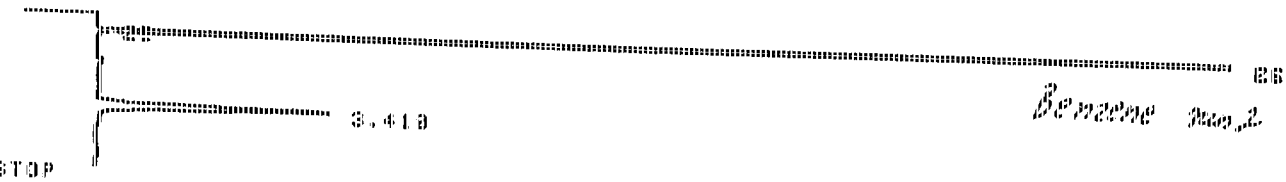
```
*  RUN #    14        MAR  5, 1991   11:09:56
START
```




```
STOP
```

```
RUN#     14              MAR  5, 1991   11:09:56

AREAS

       RT        AREA  TYPE   WIDTH        AREA%
    3.350      323841    VB    .209   100.00000

TOTAL AREA= 323841
MUL FACTOR=1.0000E+00
```

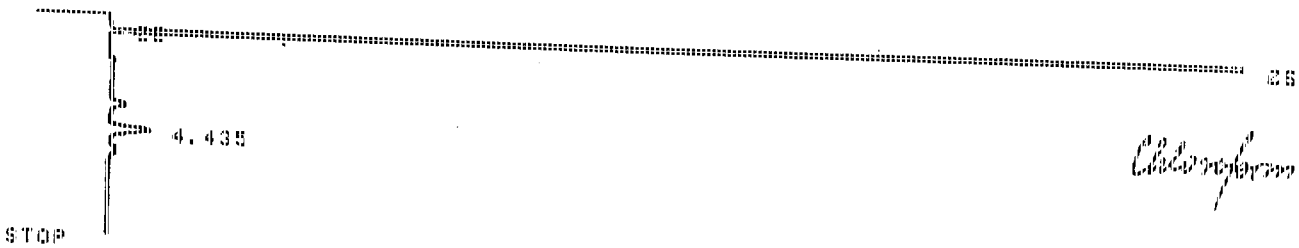
```
*  RUN #    15        MAR  5, 1991   11:21:16
START
```




```
STOP
```

```
RUN#     15              MAR  5, 1991   11:21:16

AREAS

       RT        AREA  TYPE   WIDTH        AREA%
    3.410      339714    PB    .215   100.00000

TOTAL AREA= 339714
MUL FACTOR=1.0000E+00
```

* RUN # 90 MAR 8, 1991 13:08:56
START



Catchment No. 1

STOP

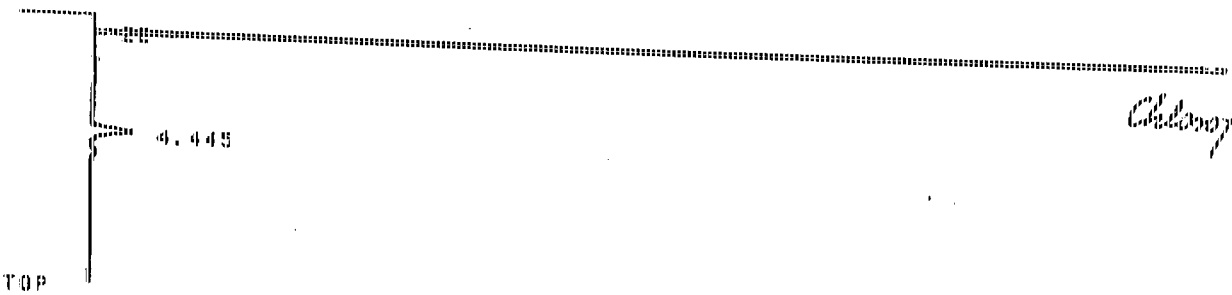
RUN# 90 MAR 8, 1991 13:08:56

AREA%

RT	AREA	TYPE	WIDTH	AREA%
4.435	82579	BB	.294	100.00000

TOTAL AREA= 82579
MUL FACTOR=1.00000E+00

* RUN # 91 MAR 8, 1991 13:10:15
START



Catchment No. 2

STOP

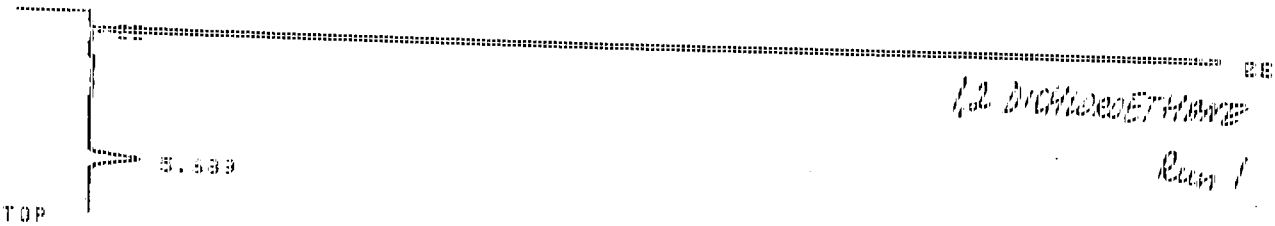
RUN# 91 MAR 8, 1991 13:10:15

AREA%

RT	AREA	TYPE	WIDTH	AREA%
4.445	84273	PV	.293	100.00000

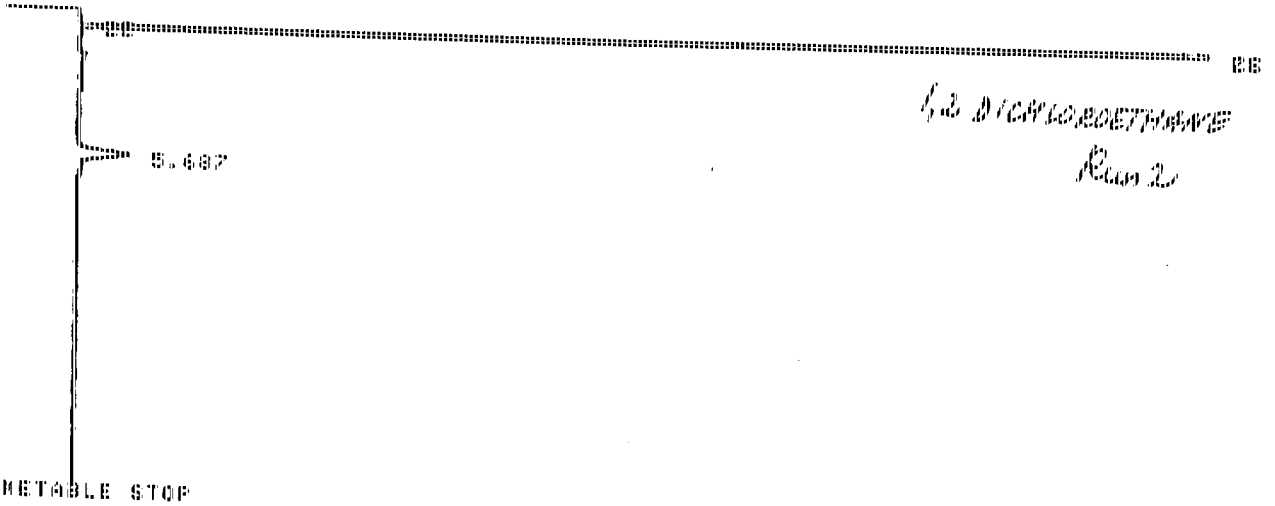
TOTAL AREA= 84273
MUL FACTOR=1.00000E+00

```
*  RUN #    19       MAR  5, 1991   12:04:33
START
```



Run 1

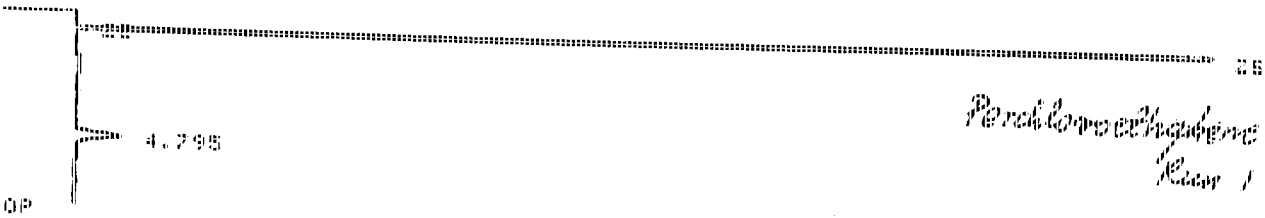
```
STOP


RUN#     19            MAR  5, 1991   12:04:33

AREAS:
        RT        AREA TYPE   WIDTH        AREA%
     5.689      121270   PP    .351   100.00000

TOTAL AREA= 121270
MUL FACTOR=1.0000E+00


*  RUN #    20       MAR  5, 1991   12:13:28
START
```



Run 2

```
TIMETABLE STOP


RUN#     20            MAR  5, 1991   12:13:28

AREAS:
        RT        AREA TYPE   WIDTH        AREA%
     5.687      119840   PP    .349   100.00000

TOTAL AREA= 119840
MUL FACTOR=1.0000E+00
```

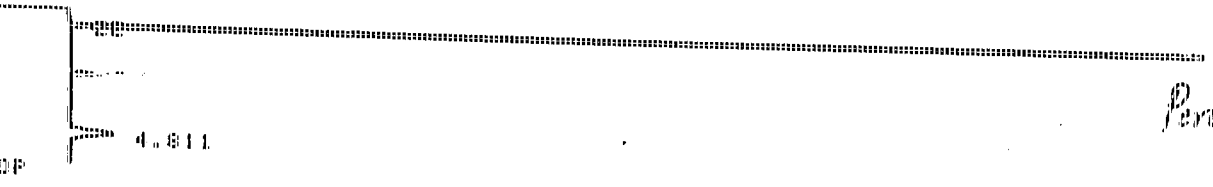
```
*  RUN #    22        MAR   5, 1991   12:49:12
START
```



Parallelogram Area 1

```
STOP


RUN#      22              MAR   5, 1991   12:49:12

AREAS:
        RT        AREA TYPE   WIDTH        AREA%
     4.795       81136    PP    .264   100.00000

TOTAL AREA=   81136
MUL FACTOR=1.000000E+00
```

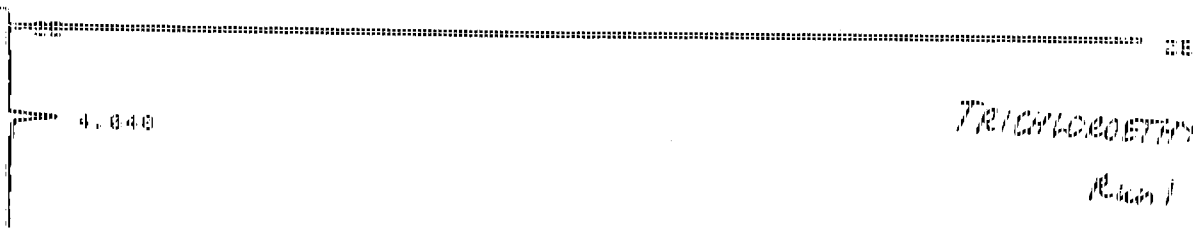
```
*  RUN #    23        MAR   5, 1991   12:57:39
START
```



Parallelogram Area 2

```
STOP


RUN#      23              MAR   5, 1991   12:57:39

AREAS:
        RT        AREA TYPE   WIDTH        AREA%
     4.811       66899    PP    .278   100.00000

TOTAL AREA=   66899
MUL FACTOR=1.000000E+00
```

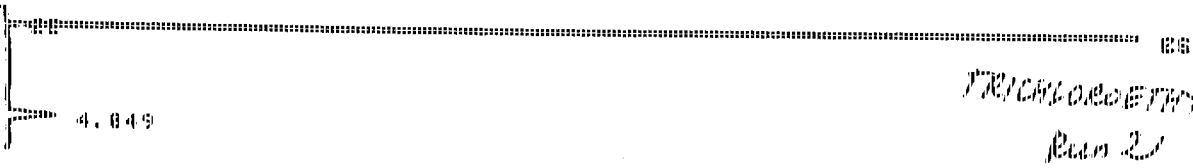
```
*  RUN #    25       MAR  5, 1991   13:13:29
START
```



Rectangle
Run 1

```
STOP


RUN#      25              MAR  5, 1991   13:13:29

AREAX
      RT        AREA  TYPE   WIDTH        AREAX
   4.040       76156    PB    .240   100.00000

TOTAL AREA=  76156
NUL FACTOR=1.00000E+00


*
```

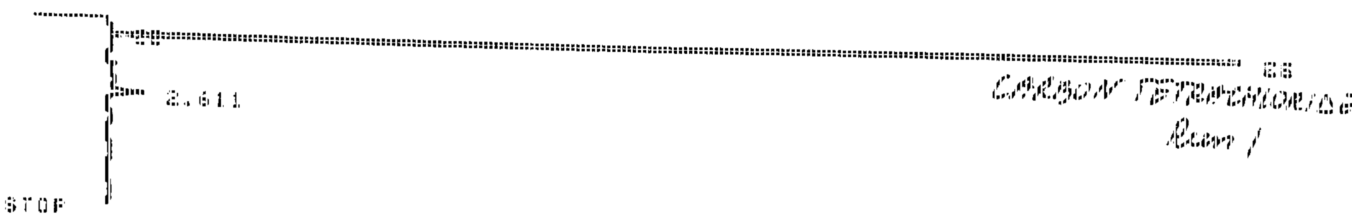
```
*  RUN #    26       MAR  5, 1991   13:24:45
START
```



Rectangle
Run 2

```
STOP


RUN#      26              MAR  5, 1991   13:24:45

AREAX
      RT        AREA  TYPE   WIDTH        AREAX
   4.049       77763    EB    .241   100.00000

TOTAL AREA=  77763
NUL FACTOR=1.00000E+00
```

* RUN # 31 MAR 5, 1991 14:07:54



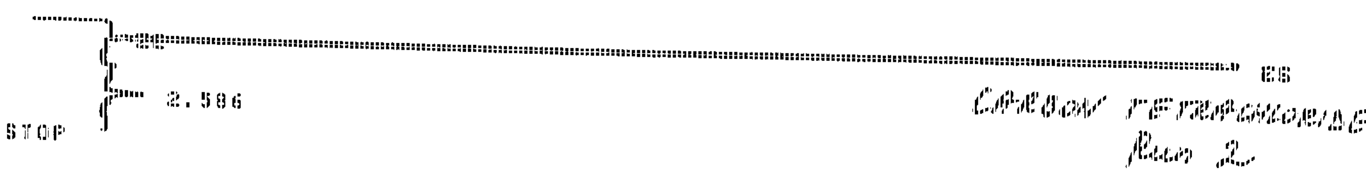
RUN# 31 MAR 5, 1991 14:07:54

AREA%

RT	AREA	TYPE	WIDTH	AREA%
2.611	42949	VP	.176	100.00000

TOTAL AREA= 42949
MUL FACTOR=1.0000E+00

* RUN # 32 MAR 5, 1991 14:15:43



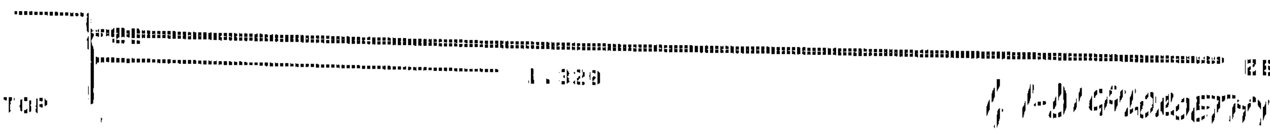
RUN# 32 MAR 5, 1991 14:15:43

AREA%

RT	AREA	TYPE	WIDTH	AREA%
2.586	51695	PV	.183	100.00000

TOTAL AREA= 51895
MUL FACTOR=1.0000E+00

* RUN # 36 MAR 5, 1991 14:33:44
START



STOP

1,1-DICHLOROETHYLENE
Run 1

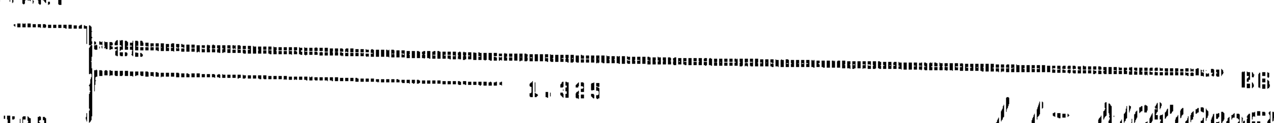
RUN# 36 MAR 5, 1991 14:33:44

AREA%

RT	AREA	TYPE	WIDTH	AREA%
1.320	33637	BB	.012	100.00000

TOTAL AREA= 33637
MUL FACTOR=1.0000E+00

* RUN # 37 MAR 5, 1991 14:37:01
START



STOP

1,1- DICHLOROETHYLENE
Run 2

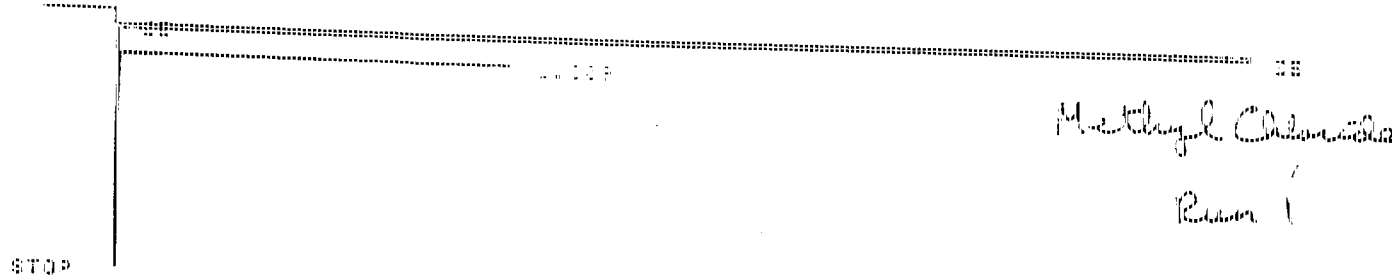
RUN# 37 MAR 5, 1991 14:37:01

AREA%

RT	AREA	TYPE	WIDTH	AREA%
1.325	31697	PB	.012	100.00000

TOTAL AREA= 31697
MUL FACTOR=1.0000E+00

* RUN # 103 MAR 8, 1991 11:34:09
START



STOP

Methyl Chloride
Run 1

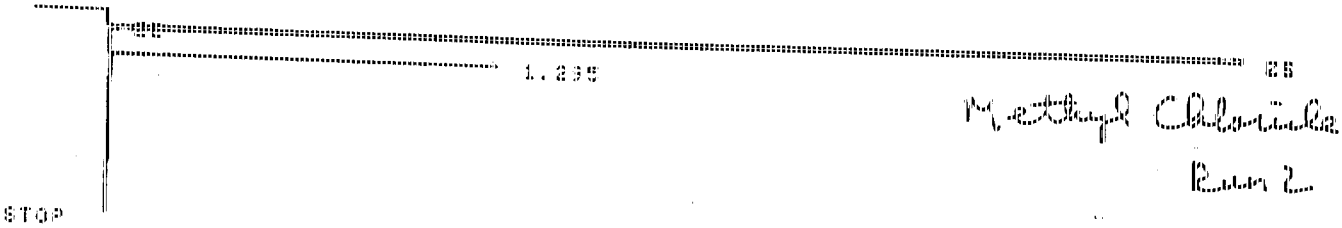
RUN# 103 MAR 8, 1991 11:34:09

AREA%

RT	AREA	TYPE	WIDTH	AREA%
1.309	30849	BB	.012	100.00000

TOTAL AREA= 30849
MUL FACTOR=1.00000E-06

* RUN # 104 MAR 8, 1991 16:44:56
START



STOP

Methyl Chloride
Run 2

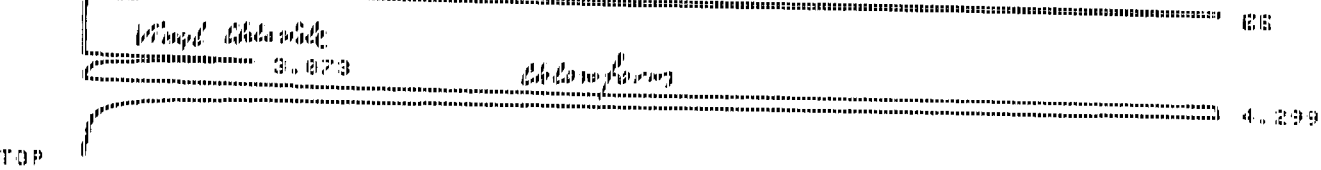
RUN# 104 MAR 8, 1991 16:44:56

AREA%

RT	AREA	TYPE	WIDTH	AREA%
1.295	29562	PB	.011	100.00000

TOTAL AREA= 29562
MUL FACTOR=1.00000E-06

* RUN # 42 MAR 5, 1991 15:10:48
START



STOP

Vinyl Chloride
Run 1

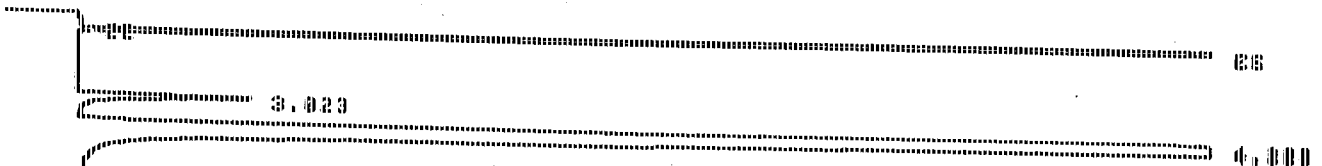
RUN# 42 MAR 5, 1991 15:10:48

AREA%

RT	AREA	TYPE	WIDTH	AREA%
3.873	236663	PB	.204	18.66873
4.299	1031122	PV	.109	81.33126

TOTAL AREA=1267785
MUL FACTOR=1.00000E+00

* RUN # 43 MAR 5, 1991 15:22:44
START



STOP

Vinyl Chloride
Run 2

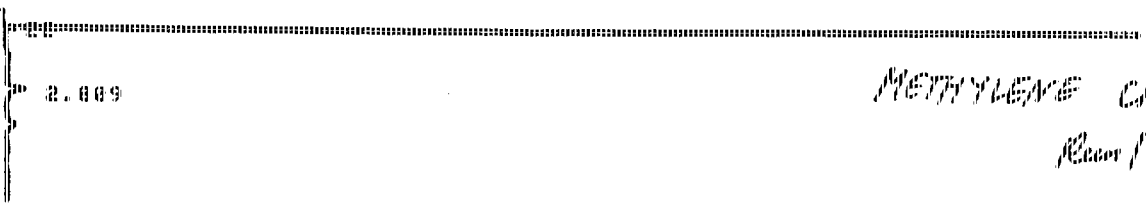
RUN# 43 MAR 5, 1991 15:22:44

AREA%

RT	AREA	TYPE	WIDTH	AREA%
3.823	239206	BB	.203	2.35068
4.198	2943341	PV	.105	28.92670
4.241	1265221	VV	.045	12.43440
4.360	5727485	VB	.205	56.29803

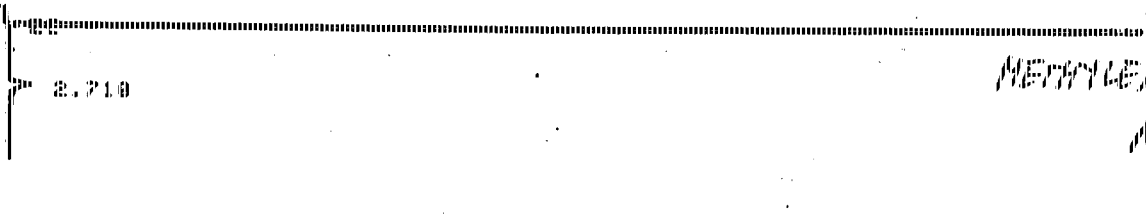
TOTAL AREA=1.01752E+07
MUL FACTOR=1.00000E+00

```
*  RUN 0    44       MAR  5, 1991   15:32:55
START
```



NEW YEAR CROSSING
Rev 1

```
STOP


RUN0     44            MAR  5, 1991   15:32:55

AREAX
       RT        AREA TYPE   WIDTH        AREAX
    2.809       34200    BB    .243 -  100.00000

TOTAL AREA=  34200
MUL FACTOR=1.00000E+00



*  RUN 0    45       MAR  5, 1991   15:41:37
START
```



NEW YEAR CROSSING
Rev 2

```
STOP


RUN0     45            MAR  5, 1991   15:41:37

AREAX
       RT        AREA TYPE   WIDTH        AREAX
    2.710       35960    BV    .230   100.00000

TOTAL AREA=  35960
MUL FACTOR=1.00000E+00
```

12 DICHLOROETHANE (ETHYLENE DICHLORIDE) STANDARD CURVE
40
30
20
10
0
50 000
100 000
150 000
200 000
250 000
300 000
350 000
400 000

McGILL ENCLOSED FLARE SYSTEM
VALLEY LANDFILL
IRWIN, PENNSYLVANIA

APPENDIX D

Stack Sulfur Dioxide Calculation
Summary and Data

SULFUR DIOXIDE CALCULATION FORM
(English Units)

DATE: 1-22-91

COMPANY: Valley Landfill

SOURCE: STACK

RUN NO.: 1

SAMPLE VOLUME

V_m = 24.151 ft^3

T_m = 538.6 °R

P_{bar} = 29.93 in. Hg

Y = 0.986

$$V_{m(std)} = 17.64 \frac{°R}{\text{in. Hg}} \times \frac{Y\, V_m \left[P_{bar} + \frac{\Delta H}{13.6}\right]}{T_m} = 25.645\ ft^3$$ Equation 6-1

SO_2 ANALYSIS DATA

N = 0.0104 (g-eq) /ml

V_t = 2.10 ml

V_{tb} = 0.05 ml

V_{soln} = 500 ml

V_a = 10 ml

SO_3 ANALYSIS DATA

N = _____ (g-eq) /ml

V_t = _____ ml

V_{tb} = _____ ml

V_{soln} = _____ ml

V_a = _____ ml

SO_2 CONCENTRATION IN STACK GAS

$$C_{SO_2} = 7.061 \times 10^{-5} \frac{N\,(V_t - V_{tb})\,(V_{soln}/V_a)}{V_{m\,(std)}} = 0.2491 \times 10^{-5}\ \text{lb/dscf}$$

C_{SO_2} ppm = C_{SO_2} (lb/dscf) $\times \frac{385.26}{64} \times 10^6$ = 18.0 ppm by Volume Dry Basis

SO_2 EMISSION RATE

$C_{SO_2} \times Q_s$ = 2.149 lb/hr

Q_s = 116,093.8 DSCFH

SO_3 CONCENTRATION IN STACK GAS

$$C_{SO_3} = 8.826 \times 10^{-5} \frac{N\,(V_t - V_{tb})\,(V_{soln}/V_a)}{V_{m(std)}} = \_\_\_\_ \times 10^{-5}\ \text{lb/dscf}$$

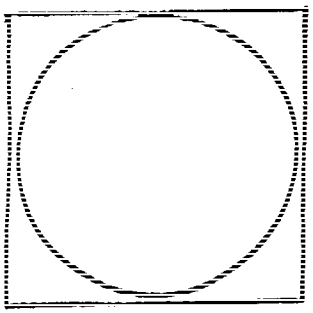
C_{SO_3} ppm = C_{SO_3} (lb/dscf) $\times \frac{385.26}{80} \times 10^6$ = _____ ppm By Volume Dry Basis

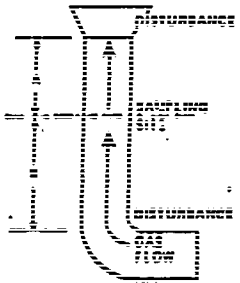
SO_3 EMISSION RATE

$C_{SO_3} \times Q_s$ = _____ lbs/hr

Q_s = _____ DSCFH

SCHEMATIC OF STACK





CROSS SECTION
Stack (3:00

PLANT Valley Lamech
DATE 1/22/91
LOCATION Irwin, PA
OPERATOR DB/DC
STACK NO. Stack - R1
RUN NO. SO2/Moisture
SAMPLE BOX NO.
METER BOX NO. 2390

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 28.93
ASSUMED MOISTURE, %
PROBE LENGTH, in. 6 ft
NOZZLE DIAMETER, in.
STACK DIAMETER, in.
PROBE HEATER SETTING 250
HEATER BOX SETTING 250

METER $\Delta H_@$
C FACTOR
PROCESS WEIGHT RATE

WEIGHT OF PARTICULATE COLLECTED, mg		
SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (P_s), in. H_2O	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH), in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³ Y = 0.986	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. H_g	VELOCITY (Δp_s)
1	5					2.4		166.60	18	18	260	17	4	
2	5					2.4		170.8	30	20	262	19	4	
3	5					2.4		176.9	34	22	265	00	4	
4	5					2.4		181.2	38	26	266	20	4	
5	5					2.4		185.2	41	27	264	20	4	
6	5					2.4		189.3	40	29	260	20	4	
								193.357						
TOTAL														
AVERAGE				X				24.751	28.0					

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL	103	107	101		250
INITIAL	100	100	100	56	200
LIQUID COLLECTED	3	7	1		0

ORSAT MEASUREMENT

TIME	CO_2	O_2	CO	N_2
	4.3	19.5	=	

COMMENTS: Leak check system
Pre: 0 @ 15" H_g
Post: 0 @ 15" H_g
Orsats
Pre 1

SULFUR DIOXIDE CALCULATION FORM
(English Units)

DATE: Wesley Landfill

COMPANY: C-22-81

SOURCE: Stack

RUN NO.: 2

SAMPLE VOLUME

V_m = 24.284 ft^3

T_m = 24.4 °F

P_{bar} = 28.93 in. Hg

Y = .9946

$$V_{m(std)} = 17.64 \frac{°R}{in.\ Hg} \times \frac{Y\ V_m \left[P_{bar} + \frac{\Delta H}{13.6}\right]}{T_m} = 25.6884\ ft^3$$ Equation 6-1

SO_2 ANALYSIS DATA

N = 0.01106 (g-eq) /ml.

V_t = 8.15 ml.

V_{tb} = 8.05 ml.

V_{soln} = 500 ml.

V_a = 10 ml.

SO_3 ANALYSIS DATA

N = _____ (g-eq) /ml.

V_t = _____ ml.

V_{tb} = _____ ml.

V_{soln} = _____ ml.

V_a = _____ ml.

SO_2 CONCENTRATION IN STACK GAS

$$C_{SO_2} = 7.061 \times 10^{-5} \frac{N\ (V_t - V_{tb})\ (V_{soln}/V_a)}{V_{m\ (std)}} = 0.3167 \times 10^{-5}\ lb/dscf$$

C_{SO_2} ppm = C_{SO_2} (lb/dscf) x $\frac{385.26}{64} \times 10^6$ = 49.0 ppm by Volume Dry Basis

SO_2 EMISSION RATE

$C_{SO_2} \times Q_s$ = 2.375 lb/hr

Q_s = 748,318.4 DSCFH

SO_3 CONCENTRATION IN STACK GAS

$$C_{SO_3} = 8.826 \times 10^{5} \frac{N\ (V_t - V_{tb})\ (V_{soln}/V_a)}{V_{m\ (std)}} = \_\_\_\_\_ \times 10^{-5}\ lb/dscf$$

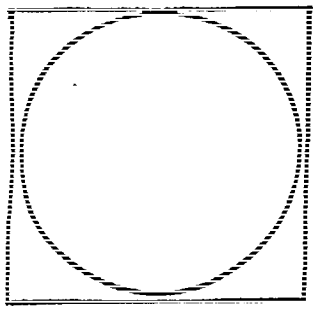
C_{SO_3} ppm = C_{SO_3} (lb/dscf) x $\frac{385.26}{80} \times 10^6$ = _____ ppm By Volume Dry Basis

SO_3 EMISSION RATE

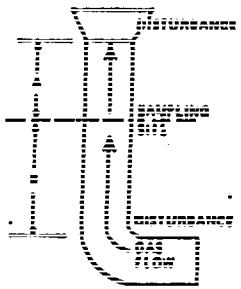
$C_{SO_3} \times Q_s$ = _____ lbs/hr

Q_s = _____ DSCFH

SCHEMATIC OF STACK



CROSS SECTION



PLANT VALLEY LANDFILL
DATE 4/22/91
LOCATION IRWIN, PA.
OPERATOR DR/DC
STACK NO. STACK #2
RUN NO. SO2 / MOISTURE
SAMPLE BOX NO. _____
METER BOX NO. 2390

AMBIENT TEMPERATURE _____
BAROMETRIC PRESSURE 28.93
ASSUMED MOISTURE, % _____
PROBE LENGTH, in. 6'
NOZZLE DIAMETER, in. _____
STACK DIAMETER, in. _____
PROBE HEATER SETTING 250
HEATER BOX SETTING 250

METER $\Delta H_@$ _____
C FACTOR _____
PROCESS WEIGHT RATE _____

WEIGHT OF PARTICULATE COLLECTED, mg

SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		

TOTAL _____

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s) ($\sqrt{\Delta P}$)		PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	Y=0.984 GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m(in)}$), °F	OUTLET ($T_{m(out)}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. H_g gauge	VELOCITY l_{ps}
1						2.4		194.150	24	22	260	15	4	
2						2.4		198.2	30	23	259	16	4	
3						2.4		202.3	32	24	256	18	4	
4						2.4		206.3	36	25	258	19	4	
5						2.4		210.3	37	25	255	19	4	
6						2.4		214.4	38	25	255	20	4	
								218.431						
TOTAL								24.281						
AVERAGE														

24.4

VOLUME OF LIQUID WATER COLLECTED

	1	2	3	4	SILICA GEL WEIGHT, g
FINAL	104	100	102		50
INITIAL	100	100	100	56	200
LIQUID COLLECTED	4	0	2		1
TOTAL VOLUME COLLECTED			6		

IMPINGER VOLUME ml

ORSAT MEASUREMENT

	TIME	CO_2	O_2	CO	N_2
1		4.4	19.9		
2					
3					
4					

COMMENTS: LEAK check
SYSTEM
PRE: 0 cfm at 15" H_g
POST: 0 cfm at 15" H_g
Audit
Pre 1

SULFUR DIOXIDE CALCULATION FORM
(English Units)

DATE: 1-23-91

COMPANY: Waste Management

SOURCE: Stack

RUN NO.: 3

SAMPLE VOLUME

V_m = 24.827 ft^3

T_m = 523 °R

P_{bar} = 28.76 in. Hg

Y = 0.986

$V_{m(std)} = 17.64 \frac{°R}{in.\ Hg} \times \frac{Y\ V_m \left[P_{bar} + \frac{\Delta H}{13.6}\right]}{T_m} = 25.7386\ ft^3$ Equation 6-1

SO_2 ANALYSIS DATA

N = 0.0100 (g-eq) /ml.

V_t = 19.5 ml.

V_{tb} = 0.05 ml.

V_{soln} = 500 ml.

V_a = 10 ml.

SO_3 ANALYSIS DATA

N = _____ (g-eq) /ml.

V_t = _____ ml.

V_{tb} = _____ ml.

V_{soln} = _____ ml.

V_a = _____ ml.

SO_2 CONCENTRATION IN STACK GAS

$C_{SO_2} = 7.061 \times 10^{-5} \frac{N\ (V_t - V_{tb})\ (V_{soln}/V_a)}{V_{m\ (std)}} = 0.2742 \times 10^{-5}$ lb/dscf

C_{SO_2} ppm = C_{SO_2} (lb/dscf) $\times \frac{385.26}{64} \times 10^6$ = 14.6 ppm by Volume Dry Basis

SO_2 EMISSION RATE

$C_{SO_2} \times Q_s$ = 1945 lb/hr

Q_s = 711,258 DSCFH

SO_3 CONCENTRATION IN STACK GAS

$C_{SO_3} = 8.826 \times 10^{-5} \frac{N\ (V_t - V_{tb})\ (V_{soln}/V_a)}{V_{m(std)}}$ = _____ $\times 10^{-5}$ lb/dscf

C_{SO_3} ppm = C_{SO_3} (lb/dscf) $\times \frac{385.26}{80} \times 10^6$ = _____ ppm By Volume Dry Basis

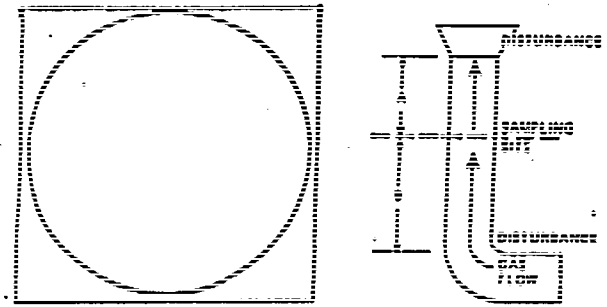
SO_3 EMISSION RATE

$C_{SO_3} \times Q_s$ = _____ lbs/hr

Q_s = _____ DSCFH

PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION

PLANT Valley Landfill
DATE 11/23/94
LOCATION Irwin, PA
OPERATOR DC/DD
STACK NO. STACK -3
RUN NO. SO_2 / MOISTURE
SAMPLE BOX NO. _____
METER BOX NO. 3390

AMBIENT TEMPERATURE _____
BAROMETRIC PRESSURE 29.75
ASSUMED MOISTURE, % _____
PROBE LENGTH, in. 6'
NOZZLE DIAMETER, in. _____
STACK DIAMETER, in. _____
PROBE HEATER SETTING 250
HEATER BOX SETTING 250

METER $\Delta H_@$ _____
'C' FACTOR _____
PROCESS WEIGHT RATE _____

WEIGHT OF PARTICULATE COLLECTED, mg

SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		

TOTAL _____

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s) ($\sqrt{\Delta P}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER: INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. H_g	VELOCITY Δp_s
							V=0.986						
1	5				2.4		218.604	16	15	255	15	4	
2	5				2.4		223.7	20	17	255	16	4	
3	5				2.4		226.8	31	20	257	16	4	
4	5				2.4		230.96	37	22	257	16	4	
5	5				2.4		235.0	38	24	257	18	4	
6	5				2.4		239.25	38	25	258	18	4	
							243.436						
TOTAL							(24.927)						
AVERAGE				X									

(25.3)

VOLUME OF LIQUID WATER COLLECTED	H_2O in grams	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL	103	102	103			256
INITIAL	100	100	100	56		200
LIQUID COLLECTED	3	2	3			0

ORSAT MEASUREMENT

	TIME	CO_2	O_2	CO	N_2
Sample		4.0	20.0		
O_2					

COMMENTS: LEAK check
SYSTEM
Pre: 0.0 cfm at 15" H_g
Post: 0.0 cfm at 15" H_g.
Orsats
Pre ✓

EMISSION TEST PROGRAM
McGILL ENCLOSED FLARE SYSTEM
VALLEY LANDFILL
ERWIN, PENNSYLVANIA

APPENDIX E

Inlet Hydrogen Sulfide Calculation Summary and Data

HYDROGEN SULFIDE
METHOD 11 CALCULATION SHEET

TEST DATE: 1-22-91 TEST LOCATION: [illegible]

TEST NO: 1-A COMPANY: [illegible]

Sample Volume

$$V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m} \frac{P_{bar}}{P_{std}}\right) = \underline{\quad 0.4476 \quad} \text{ ft}^3$$

$$V_{m(std)} \text{ liters} = V_{m(std)} \text{ ft}^3 \times 28.32 = \underline{\quad 12.681 \quad} \text{ liters}$$

H_2S Concentration

$$C_{H_2S} = \frac{K \left(V_{IT} N_I - V_{TT} N_T\right)_S - \left(V_{IT} N_I - V_{TT} N_T\right)_{bl}}{V_{m(std)} \text{ liters}}$$

$$= \frac{17.04 \times 10^3 \left(\underline{50.0} \ 0.0\underline{0}1 - \underline{4.1} \ 0.00\underline{2}0 \right)_S - \left(\underline{50} \ 0.00\underline{8}8 - \underline{47.5} \ 0.00\underline{9}4 \right)_{bl}}{\underline{12.681}}$$

$$= \underline{\quad 5402.7 \quad} \text{ mg/dscm}$$

CH_2S lb/dscf = CH_2S mg/dscm $\times 6.242 \times 10^{-8}$

$$= \underline{\qquad} \times 6.242 \times 10^{-8} = \underline{\quad 33.711 \quad} \times 10^{-6} \text{ lb/dscf}$$

$$CH_2S \text{ ppm by vol} = CH_2S \text{ lb/dscf} \times \frac{385.86}{34} \times 10^6$$

$$= \underline{\qquad} \times 1.134 \times 10^7 = \underline{\quad 382.3 \quad} \text{ ppm by vol}$$

1.540 LB/HR

HYDROGEN SULFIDE
METHOD 11 CALCULATION SHEET

APT Environmental Inc.

TEST DATE: 1-22-91 TEST LOCATION: Inlet

TEST NO: 1-3 COMPANY: Valley Landfill

Sample Volume

$$V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m}\right)\left(\frac{P_{bar}}{P_{std}}\right) = \underline{0.457} \text{ ft}^3$$

$$V_{m(std)} \text{ liters} = V_{m(std)\,ft^3} \times 28.32 = \underline{12.942} \text{ liters}$$

H_2S Concentration

$$C_{H_2S} = \frac{K\,(V_{IT}\,N_I - V_{Tm}\,N_T)_S - (V_{IT}\,N_I - V_{TT}\,N_T)_{bl}}{V_{m(std)} \text{ liters}}$$

$$= \frac{17.04 \times 10^3\,(\underline{(50.0\ 0.0096} - \underline{4.2\ 0.0096})_S - (\underline{50.0\ 0.0096} - \underline{47.8\ 0.0096})_{bl}}{\underline{12.942}}$$

$$= \underline{5250} \text{ mg/dscm}$$

$$CH_2S \text{ lb/dscf} = CH_2S \text{ mg/dscm} \times 6.242 \times 10^{-8}$$

$$= \underline{\quad} \times 6.242 \times 10^{-8} = \underline{3.29207} \times 10^{-6} \text{ lb/dscf}$$

$$CH_2S \text{ ppm by vol} = CH_2S \text{ lb/dscf} \times \frac{385.86}{34} \times 10^6$$

$$= \underline{\quad} \times 1.134 \times 10^7 = \underline{372.8} \text{ ppm by vol}$$

1.499 lb/hr

HYDROGEN SULFIDE
METHOD 11 CALCULATION SHEET

ARB Environmental Inc.

TEST DATE: 1-22-91 TEST LOCATION: Inlet

TEST NO: 2-A COMPANY: Valley Landfill

Sample Volume

$$V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m}\right)\left(\frac{P_{bar}}{P_{std}}\right) = \underline{\quad 0.459 \quad} ft^3$$

$$V_{m(std)\ liters} = V_{m(std)\ ft^3} \times 28.32 = \underline{\quad 12.999 \quad} liters$$

H_2S Concentration

$$C_{H_2S} = \frac{K\,(V_{IT}\,N_I - V_{IT}\,N_T)_S - (V_{IT}\,N_I - V_{IT}\,N_T)_{bl}}{V_{m(std)\ liters}}$$

$$= \frac{17.04 \times 10^3\ (\underline{\quad .520 \quad 0.096} - \underline{\quad .5 \quad 0.096})_S - (\underline{\quad .520 \quad 0.096} - \underline{\quad .498 \quad 0.096})_{bl}}{\underline{\quad 12.999 \quad}}$$

$$= \underline{\quad 529.8 \quad} mg/dscm$$

$$CH_2S\ lb/dscf = CH_2S\ mg/dscm \times 6.242 \times 10^{-8}$$

$$= \underline{\qquad} \times 6.242 \times 10^{-8} = \underline{\quad 33.0705 \quad} \times 10^{-6}\ lb/dscf$$

$$CH_2S\ ppm\ by\ vol = CH_2S\ lb/dscf \times \frac{385.86}{34} \times 10^6$$

$$= \underline{\qquad} \times 1.134 \times 10^7 = \underline{\quad 3750 \quad} ppm\ by\ vol$$

1.502 lb/hr

HYDROGEN SULFIDE
METHOD 11 CALCULATION SHEET

ARI Environmental Inc.

TEST DATE: 1-22-91 TEST LOCATION: Inlet

TEST NO: 2B COMPANY: Valley Landfill

Sample Volume

$$V_{m(std)} = V_m Y \left[\frac{T_{std}}{T_m} \frac{P_{bar}}{P_{std}}\right] = \underline{\quad 0.446 \quad} ft^3$$

$V_{m(std)}$ liters $= V_{m(std)}\ ft^3 \times 28.32 =$ _____ liters

H_2S Concentration

$$C_{H_2S} = \frac{K\ (V_{IT}\ N_I - V_{TT}\ N_T)_S - (V_{IT}\ N_I - V_{TT}\ N_T)_{bl}}{V_{m(std)}\ liters}$$

$$= \frac{17.04 \times 10^3\ (\underline{\quad 50.0 \quad 0.0\%} - \underline{\quad 5.0 \quad 0.0\%})_S - (\underline{\quad 50.0 \quad 0.0\%} - \underline{\quad 47.5 \quad 0.0\%})_{bl}}{\underline{\quad\quad\quad}}$$

$$= \underline{\quad 5262.5 \quad} mg/dscm$$

CH_2S lb/dscf $= CH_2S$ mg/dscm $\times\ 6.242 \times 10^{-8}$

$= \underline{\quad\quad} \times 6.242 \times 10^{-8} = \underline{\quad 3.29488 \quad} \times 10^{-6}$ lb/dscf

CH_2S ppm by vol $= CH_2S$ lb/dscf $\times \frac{385.86}{34} \times 10^6$

$= \underline{\quad\quad} \times 1.134 \times 10^7 = \underline{\quad 373.5 \quad}$ ppm by vol

1,492 16/42

HYDROGEN SULFIDE
METHOD 11 CALCULATION SHEET

TEST DATE: 1-23-91 TEST LOCATION: OUTLET

TEST NO: 3A COMPANY: VALLEY ENDOFILL

Sample Volume

$$V_{m(std)} = V_m Y \left[\frac{T_{std}}{T_m} \frac{P_{bar}}{P_{std}}\right] = \underline{\quad 0.5464 \quad} ft^3$$

$$V_{m(std)\ liters} = V_{m(std)\ ft^3} \times 28.32 = \underline{\quad 13.197 \quad} liters$$

H_2S Concentration

$$C_{H_2S} = \frac{K\,(V_{IT}\,N_I - V_{TT}\,N_T)_S - (V_{IT}\,N_I - V_{TT}\,N_T)_{bl}}{V_{m(std)\ liters}}$$

$$= \frac{17.04 \times 10^3\ [(\underline{\quad 50.0 \quad} \underline{0.0096} - \underline{\quad 34 \quad} \underline{0.0096})_S - (\underline{\quad 50.0 \quad} \underline{0.0096} - \underline{\quad 50.0 \quad} \underline{0.0096})_{bl}]}{\underline{\quad 13.197 \quad}}$$

$$= \underline{\quad\quad} mg/dscm$$

$$CH_2S\ lb/dscf = CH_2S\ mg/dscm \times 6.242 \times 10^{-8}$$

$$= \underline{\quad\quad} \times 6.242 \times 10^{-8} = \underline{\quad 30.4847 \quad} \times 10^{-6}\ lb/dscf$$

$$CH_2S\ ppm\ by\ vol = CH_2S\ lb/dscf \times \frac{385.86}{34} \times 10^6$$

$$= \underline{\quad\quad} \times 1.134 \times 10^7 = \underline{\quad 345.7 \quad} ppm\ by\ vol$$

1.371 lb/hr

HYDROGEN SULFIDE
METHOD 11 CALCULATION SHEET

API Environmental Inc.

TEST DATE: 1-23-91 TEST LOCATION: Inlet

TEST NO: 3B COMPANY: Valley Landfill

Sample Volume

$$V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m}\ \frac{P_{bar}}{P_{std}}\right) = \underline{\quad 0.467 \quad} ft^3$$

$$V_{m(std)}\ liters = V_{m(std)}\, ft^3 \times 28.32 = \underline{\quad 13.225 \quad} liters$$

H_2S Concentration

$$C_{H_2S} = \frac{K\ (V_{IT}\ N_I - V_{TT}\ N_T)_S - (V_{IT}\ N_I - V_{TT}\ N_T)_{bl}}{V_{m(std)}\ liters}$$

$$= \frac{17.04 \times 10^3\ (\ (50.0\ \ 0.0086 - 8.8\ \ 0.0098)_S - (50.0\ \ 0.0086 - 49.8\ \ 0.0086)_{bl}}{13.225}$$

= ______________ mg/dscm

C_{H_2S} lb/dscf = C_{H_2S} mg/dscm x 6.242×10^{-8}

= ______________ x 6.242×10^{-8} = 30.1106 x 10^{-6} lb/dscf

C_{H_2S} ppm by vol = C_{H_2S} lb/dscf x $\frac{385.26}{34}$ x 10^6

= ______________ x 1.134×10^7 = 341.5 ppm by vol

1.354 lb/HR

FIELD DATA SHEET FOR HYDROGEN SULFIDE - (Method 11)

COMPANY Valley CONSOLE NO. ______

LOCATION Plant DGMCF .992 SOURCE ______

ITEMS TO RECORD	TEST 1 2893 DATE			TEST 2 2893 DATE			TEST 3 2875 DATE		
SAMPLE NUMBER	1a	1b		2a	2b		3a	3b	
Purge between valve & imp. (Y/N)*	✓	✓		✓	✓		✓	✓	
Leak check ("H_2O/min @12" H_2O)	✓	✓		✓	✓		✓	✓	
Time start	1308	1338		1500	1530		0755	8:30	
Time stop	1318	1348		1510	1540		0805	8:40	
DGM final	356.800	357.240		364.470	365.665		377.370	378.661	
DGM initial	355.570	356.800		364.030	365.220		376.930	378.220	
Vol. sampled (ft^3)	0.470	0.440		0.440	0.443		0.440	0.441	
Meter Temp. In (int/final) °F	28/71	28/28	/	26/26	26/26	/	19/19	19/19	/
Meter temp. Out (int/final) °F	28/28	29/28	/	26/26	26/26	/	19/19	19/19	/
Flow rate (LPM)									
Purge samples (15 min) (Y/N)	Y	Y		Y			Y		
Ice in imp. (Y/N)									
Operator									

COMMENTS:

*Yes; No

EMISSION TEST PROGRAM
McGILL ENCLOSED FLARE SYSTEM
VALLEY LANDFILL
IRWIN, PENNSYLVANIA

APPENDIX F

Inlet and Stack Nitrogen Oxide Calculation Summary and Data

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: VALLEY LANDFILL

LOCATION:

SOURCE: INLET

DATE: 1-22-91

RUN NO. 1-1

Sample Volume

V_f = 2013 ml, P_f = 29.13 in. Hg, T_f = 516 °R

P_i = 0.47 in. Hg, T_i = 504 °R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1935.8 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 49.44 A = 0.000 OD, F = 1

m = $2K_c$ AF = 0 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{q_5} \times 10^6 = 0 \text{ ppm}$$

Stack Gas Emission Rate

E = lb/dscf x Q_s = _____ lb/hr

Q_s = 45,480 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: VALLEY LANDFILL

LOCATION:

SOURCE: INLET

DATE: 1-22-91

RUN NO. 1-2

Sample Volume

V_f = 2067 ml, P_f = 28.01 in. Hg, T_f = 514 °R

P_i = 0.39 in. Hg, T_i = 498 °R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1927.1 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 49464 A = 0.000 OD, F = 1

$m = 2K_c\ AF$ = 0 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^6 = 0 \text{ ppm}$$

Stack Gas Emission Rate

E = lb/dscf x Q_s = _____ lb/hr

Q_s = 45,080 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: VALLEY FORGE

LOCATION:

SOURCE: INLET

DATE: 1-22-91

RUN NO. 1-3

Sample Volume

V_f = 2072 ml, P_f = 29.39 in. Hg, T_f = 516 $^{\circ}R$

P_i = 0.54 in. Hg, T_i = 497 $^{\circ}R$

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 2016.8 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 4944.1 A = 0.000 OD, F = 1

$m = 2K_c\ AF$ = 0 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^6 = 0 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = _____ lb/hr

Q_s = 45,690 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: VALLEY LANDFILL

LOCATION:

SOURCE: INLET

DATE: 1-22-91

RUN NO. 1-4

Sample Volume

V_f = 3068 ml, P_f = 29.31 in. Hg, T_f = 516 $^{\circ}R$

P_i = 0.39 in. Hg, T_i = 497 $^{\circ}R$

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 2018.8 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 49446 A = 0.000 OD, F = 1

$m = 2K_c\ AF$ = 0 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^6 = 0 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = _____ lb/hr

Q_s = 45,690 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: VALLEY LANDFILL

LOCATION:

SOURCE: INLET

DATE: 1-22-91

RUN NO. 2-1

Sample Volume

V_f = 2061 ml, P_f = 28.09 in. Hg, T_f = 516 ^{o}R

P_i = 0.59 in. Hg, T_i = 495 ^{o}R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1912.5 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 49464 A = 0.000 OD, F = 1

$m = 2K_c\ AF$ = 0 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^{6} = 0 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = _____ lb/hr

Q_s = 45444 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: VALLEY LANDFILL

LOCATION:

SOURCE: INLET

DATE: 1-22-91

RUN NO. 1-2

Sample Volume

V_f = 2013 ml, P_f = 28.28 in. Hg, T_f = 516 ^{o}R

P_i = 0.50 in. Hg, T_i = 495 ^{o}R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1943.3 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 49444 A = 0.000 OD, F = 1

$m = 2K_c\ AF$ = 0 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^{6} = 0 \text{ ppm}$$

Stack Gas Emission Rate

E = lb/dscf x Q_s = _____ lb/hr

Q_s = 45444 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: VALLEY LANDFILL

LOCATION:

SOURCE: INLET

DATE: 1-22-91

RUN NO. 2-3

Sample Volume

V_f = 2012 ml, P_f = 28.48 in. Hg, T_f = 516 $^{\circ}R$

P_i = 0.43 in. Hg, T_i = 495 $^{\circ}R$

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1961.9 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 49461 A = 0.000 OD, F = 1

$m = 2K_c AF$ = 0 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^6 = 0 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = _____ lb/hr

Q_s = 45,414 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: Valley Landfill

LOCATION:

SOURCE: Inlet

DATE: 1-22-91

RUN NO. 1-4

Sample Volume

V_f = 2015 ml, P_f = 29.46 in. Hg, T_f = 524 °R

P_i = 0.47 in. Hg, T_i = 494 °R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 2030.8 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 49464 A = 0.000 OD, F = 1

$m = 2K_c\ AF$ = 0 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^6 = 0 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = _____ lb/hr

Q_s = 45,949 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: VALLEY LANDFILL

LOCATION:

SOURCE: INLET

DATE: 1-23-91

RUN NO. 3-1

Sample Volume

V_f = 2032 ml, P_f = 27.77 in. Hg, T_f = 516 ^{o}R

P_i = 0.43 in. Hg, T_i = 492 ^{o}R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1874.7 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 49444 A = 0.000 OD, F = 1

$m = 2K_c\ AP$ = 0 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^{6} = 0 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = _____ lb/hr

Q_s = 44944 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: VALLEY LANDFILL

LOCATION:

SOURCE: INLET

DATE: 1-23-91

RUN NO. 3-2

Sample Volume

V_f = 2014 ml, P_f = 29.54 in. Hg, T_f = 516 ^{o}R

P_i = 0.43 in. Hg, T_i = 490 ^{o}R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 2038.1 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 49446 A = 0.000 OD, F = 1

$m = 2K_c\ AF$ = 0 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^{6} = 0 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = _____ lb/hr

Q_s = 44946 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: Valley Landfill

LOCATION:

SOURCE: Inlet

DATE: 1-23-91

RUN NO. 3-3

Sample Volume

V_f = 201 ml, P_f = 28.09 in. Hg, T_f = 516 °R

P_i = 0.54 in. Hg, T_i = 492 °R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1924.5 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 49464 A = 0.005 OD, F = 1

$m = 2K_c\ AF$ = 0 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^6 = 0 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = _____ lb/hr

Q_s = 44,964 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: Valley Landfill

LOCATION:

SOURCE: Inlet

DATE: 1-23-91

RUN NO. 3-4

Sample Volume

V_f = 2058 ml, P_f = 28.36 in. Hg, T_f = 576 °R

P_i = 0.58 in. Hg, T_i = 492 °R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1928.4 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 494.621 A = 0.000 OD, F = 1

$m = 2K_c\ AF$ = 0 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^6 = 0 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = _____ lb/hr

Q_s = 44,964 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: Valley Landfill

LOCATION: Stack

SOURCE:

DATE: 1-22-91

RUN NO. 1-1

Sample Volume

V_f = 2065 ml, P_f = 29.24 in. Hg, T_f = 516 ^{o}R

P_i = 29.62 in. Hg, T_i = 504 ^{o}R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1952 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 4944.6 A = 0.030 OD, F = 1

$m = 2K_c\ AF$ = 29.677 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0.0962 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^{6} = 8.1 \text{ ppm}$$

Stack Gas Emission Rate

E = lb/dscf x Q_s = 0.691 lb/hr

Q_s = 7180.94 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: Puget Load Fac

LOCATION:

SOURCE: STACK

DATE: 1-22-91

RUN NO. 1-2

Sample Volume

V_f = 2072 ml, P_f = 29.42 in. Hg, T_f = 516 ^{o}R

P_i = 1.05 in. Hg, T_i = 498 ^{o}R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1925 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 4954.6 A = 0.030 OD, F = 1

$m = 2K_c\ AF$ = 297.27 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0.0935 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^{6} = 7.8 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = 0.671 lb/hr

Q_s = 115,094 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: Valley Landfill

LOCATION:

SOURCE: STACK

DATE: 1-22-91

RUN NO. 1-3

Sample Volume

V_f = 2970 ml, P_f = 28.13 in. Hg, T_f = 516 °R

P_i = 0.5 in. Hg, T_i = 498 °R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1929.7 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 44441 A = 0.035 OD, F = 1

$m = 2K_c AF$ = 3123 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0.1120 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^6 = 244 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = 0.201 lb/hr

Q_s = 18,094 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: Valley Landfill

LOCATION:

SOURCE: STACK

DATE: 1-22-90

RUN NO. 1-4

Sample Volume

V_f = 2014 ml, P_f = 28.05 in. Hg, T_f = 516 ^{o}R

P_i = 0.39 in. Hg, T_i = 498 ^{o}R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1936.5 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 494.6 A = 0.030 OD, F = 1

$m = 2K_c AF$ = 29.677 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0.0957 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^{6} = 8.0 \text{ ppm}$$

Stack Gas Emission Rate

E = lb/dscf x Q_s = 0.6911 lb/hr

Q_s = 7198.099 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: VALLEY LANDFILL

LOCATION:

SOURCE: STACK

DATE: 1-22-91

RUN NO. 2-1

Sample Volume

V_f = 2014 ml, P_f = 24.46 in. Hg, T_f = 516 ^{o}R

P_i = 0.50 in. Hg, T_i = 498 ^{o}R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 2037.2 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 49461 A = 0.030 OD, F = 1

$m = 2K_c\ AF$ = 2961 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0.0914 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^{6} = 1.7 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = 0.660 lb/hr

Q_s = 7218 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: Vecchy Landfill

LOCATION:

SOURCE: Stack

DATE: 1-22-91

RUN NO. 2-2

Sample Volume

V_f = 2064 ml, P_f = 28.60 in. Hg, T_f = 516 $^{\circ}R$

P_i = 0.58 in. Hg, T_i = 496 $^{\circ}R$

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1951.1 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 49961 A = 0.025 OD, F = 1

$m = 2K_c\ AF$ = 2769.8 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0.0886 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^6 = 74 \text{ ppm}$$

Stack Gas Emission Rate

E = lb/dscf x Q_s = 0.641 lb/hr

Q_s = 7238 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: Valley Landfill

LOCATION:

SOURCE: STACK

DATE: 1-22-91

RUN NO. 2-3

Sample Volume

V_f = 2070 ml, P_f = 27.97 in. Hg, T_f = 516 $^{\circ}R$

P_i = 0.35 in. Hg, T_i = 496 $^{\circ}R$

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1930.0 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 494461 A = 0.0220 OD, F = 1

$m = 2K_c AF$ = 19.785 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0.0640 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^6 = 5.4 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = 0.461 lb/hr

Q_s = 7198.5 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: Valley Landfill

LOCATION:

SOURCE: Stack

DATE: 1-22-91

RUN NO. 2-4

Sample Volume

V_f = 2012 ml, P_f = 28.83 in. Hg, T_f = 536 °R

P_i = 0.43 in. Hg, T_i = 496 °R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 1987.7 \text{ ml}$$

Total μg NO_2 in Sample

K_c = 49.61 A = 0.03 OD, F = 1

$m = 2K_c\ AF$ = 2.972 μg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0.0933 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^6 = 1.8 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = 0.671 lb/hr

Q_s = 19,315 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: VALLEY LANDFILL

LOCATION:

SOURCE: STACK

DATE: 1-23-91

RUN NO. 3-1

Sample Volume

V_f = 2070 ml, P_f = 29.54 in. Hg, T_f = 516 °R

P_i = 0.05 in. Hg, T_i = 492 °R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 2067 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 49444 A = 0.040 OD, F = 1

$m = 2K_c\ AF$ = 3956 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0.1912 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^6 = 10.0 \text{ ppm}$$

Stack Gas Emission Rate

E = lb/dscf x Q_s = 0.851 lb/hr

Q_s = 7111.26 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: VALLEY LANDFILL

LOCATION:

SOURCE: STACK

DATE: 1-23-91

RUN NO. 3-2

Sample Volume

V_f = 2075 ml, P_f = 29.51 in. Hg, T_f = 516 °R

P_i = 0.25 in. Hg, T_i = 492 °R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 2052.3 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 4954.61 A = 0.04 OD, F = 1

$m = 2K_c\ AF$ = 396.9 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0.1204 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^6 = 10.1 \text{ ppm}$$

Stack Gas Emission Rate

E = lb/dscf x Q_s = 0.861 lb/hr

Q_s = 7142 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: VALLEY LANDFILL

LOCATION:

SOURCE: STACK

DATE: 1-23-91

RUN NO. 3-3

Sample Volume

V_f = 2068 ml, P_f = 29.15 in. Hg, T_f = 516 ^{o}R

P_i = 0.25 in. Hg, T_i = 492 ^{o}R

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 2017.8 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 594.41 A = 0.040 OD, F = 1

$m = 2K_c\ AF$ = 39.549 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0.1229 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^{6} = 103 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = 0.871 lb/hr

Q_s = 7112.6 dscf/hr

NITROGEN OXIDES CALCULATION FORM
(English Units)

COMPANY: VALLEY LANDFILL

LOCATION:

SOURCE: Stack

DATE: 1-23-97

RUN NO. 3-4

Sample Volume

V_f = 2063 ml, P_f = 29.23 in. Hg, T_f = 544 $^{\circ}R$

P_i = 0.49 in. Hg, T_i = 492 $^{\circ}R$

$$V_{sc} = 17.64\ (V_f - 25)\left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right] = 2001.1 \text{ ml}$$

Total µg NO_2 in Sample

K_c = 49441 A = 0.038 OD, F = 1

$m = 2K_c\ AF$ = 3759.1 µg of NO_2

Stack Gas Concentration

$$C = 6.243 \times 10^{-5}\left[\frac{m}{V_{sc}}\right] = 0.113 \times 10^{-5} \text{ lb/dscf}$$

$$C = \text{lb/dscf} \times \frac{385.26}{46} \times 10^6 = 9.8 \text{ ppm}$$

Stack Gas Emission Rate

$E = \text{lb/dscf} \times Q_s$ = 0.831 lb/hr

Q_s = 7112.4 dscf/hr

OPTIMUM WAVELENGTH DETERMINATION DATA FORM

SPECTROPHOTOMETER NUMBER: B AND L DATE: 2/15/1991

CALIBRATED BY: J.M. WHITAKER REVIEWED BY: D. CHAPMAN

Spectrophotometer setting, nm	Absorbance of standard ODa	Absorbance of blank ODb	Actual absorbance of ODc
399			.312
400			.312
401			.312
402			.312
403			.312
404			.312
405			.312
406			.312
407			.312
408			.312
409			.310
410			.310
411			.310
412			.307
413			.302
414			.300
415			.300
416			.298

SPECTROPHOTOMETER SETTING FOR MAXIMUM ABSORBANCE OF STANDARD

408 nm

a Absorbance of the 200 ug NO2 standard in a single beam spectrophtometer

b Absorbance of the blank in a single beam spectrophotometer

c For a single beam spectrophotmeter, absorbance of the standard minus absorbance of the blank. For a double beam spectrophotmeter, absorbance of the 200 ug NO2 standard with the blank in the reference cell.

ANALYST J.M. WHITAKER OPTIMUM WAVELENGTH 408

BLANK USED AS REFERENCE YES

Standard Number	Standard, ug	Measured Absorbance A
1	100	.200
2	200	.420
3	300	.580
4	400	.820

$$Kc = 100 \times \frac{A_1 + 2A_2 + 3A_3 + 4A_4}{2^2 + 2^2 + 2^2 + 2^2} = 494.613$$

$$A_1 + A_2 + A_3 + A_4$$

QUALITY CONTROL

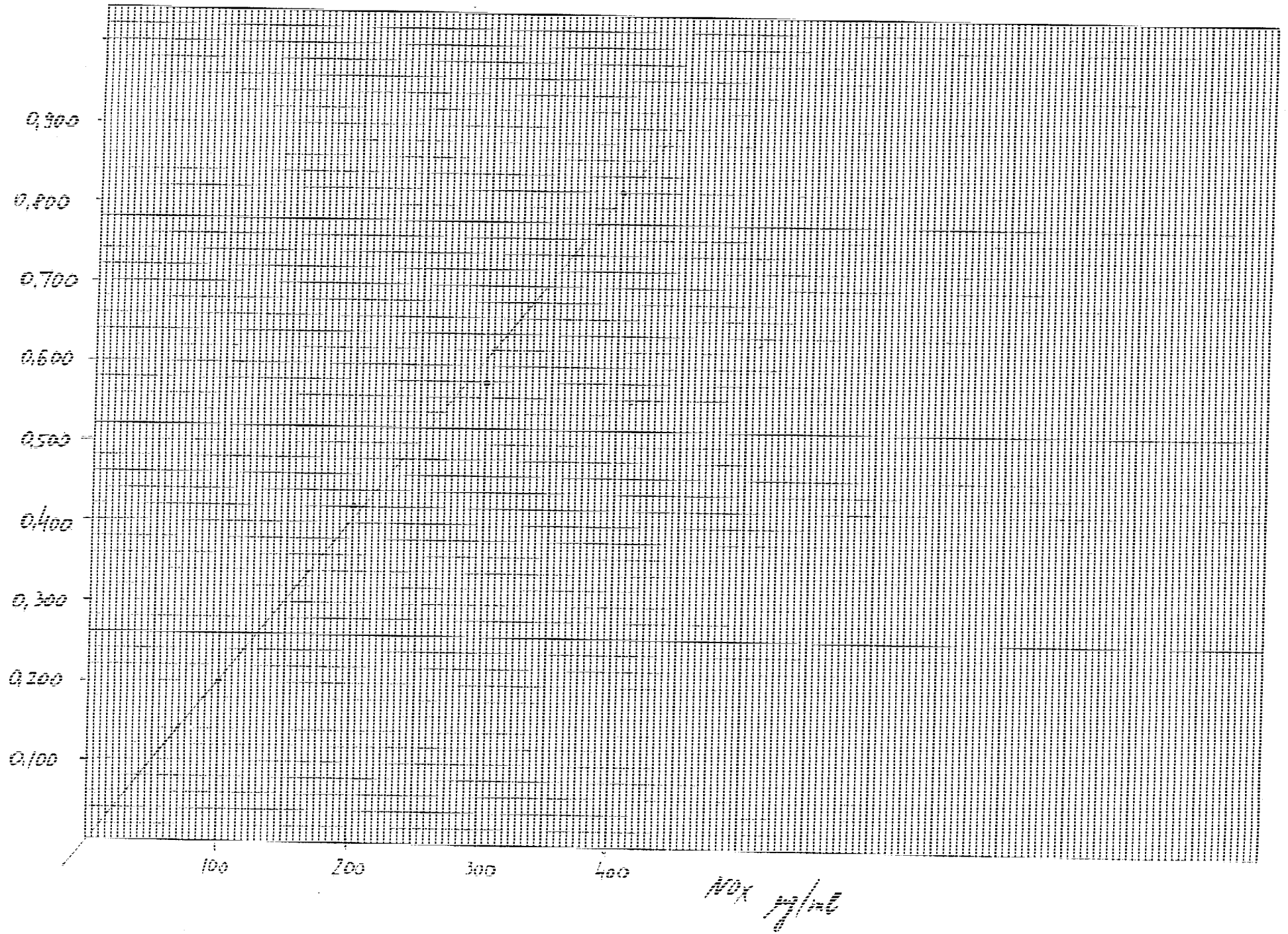
Actual Standard ug	Absorbance x Kc	=	Calculated Standard ug	Difference ug	%	Allowable %
100	.156 X 653.602		98.9226	1.0774	1.0774	7%
200	.319 X 653.602		207.7375	-7.7375	-3.8688	7%
300	.470 X 653.602		286.8756	13.1244	4.3748	7%
400	.595 X 653.602		405.5828	-5.5828	-1.3957	7%

Three out of the four calculated standards must be within 7%.

46 3013

NOx STANDARD CURVE

ABS at 410nm



COMPANY _____ DATE 1-22-91

LOCATION Valleyland SW TEST TEAM JW-16-CL-DC

SOURCE Stack 1-23-91

Barometric Pressure in Hg: Sample 1 28.83 / 2 28.83 / 3 28.75

EPA METHOD 7 - NO_x Sample Recovery: 1 29.70 / 2 29.70 / 3 29.70

Sample #	Time	Flask #	Flask Vol. (ml)	Solution Vol. (ml)	Leak Rate in Hg/min	Initial Manometer Reading mm Hg	T_i °F	ORSAT	Final Manometer Reading mm Hg	T_f °F	Shipping Container #	COMMENTS
			FIELD DATA						SAMPLE RECOVERY			
1-1		#12	2065	25	0.0	719	44	CO_2 ___	-37	56		1119
1-2		#13	2072	/	0.0	708	38	O_2 ___	-7.0	56		1120
1-3		13	2070	/	0.0	722	38	CO ___	-40.0	56		1121
1-4		26	2074	/	0.0	725	38	N_2 ___	-42	56		1122
								Time:				
2-1		#14	2074	25	0.0	722	36	CO_2 ___	-6	56		1123
2-2		8	2064	/	0.0	720	36	O_2 ___	-28	56		1124
2-3		#10	2070	/	0.0	726	36	CO ___	-44	56		1125
2-4		24	2072		0.0	724	36	N_2 ___	-22	56		1126
								Time:				
3-1		#15	2010	25	0.0	729	36	CO_2 ___	-4	56		1127
3-2		#6	2015	/	0.0	724	36	O_2 ___	-4	56		1128
3-3		#14	2005	/	0.0	724	36	CO ___	-14	56		1129
3-4		#62	2063	/	0.0	719	36	N_2 ___	-12	56		1130
								Time:				

COMPANY Valley Landfill

LOCATION

SOURCE Inlet

DATE 1-22-91

TEST TEAM SW-LG-DB-DC

1-23-91

Barometric Pressure in Hg: Sample 1 28.67 / 2 29.70 / 3 28.75

EPA METHOD 7 - NO_x Sample Recovery: 1 29.70 / 2 29.70 / 3 29.70

FIELD DATA									SAMPLE RECOVERY			
Sample #	Time	Flask #	Flask Vol. (ml)	Solution Vol. (ml)	Leak Rate in Hg/min	Initial Manometer Reading mm Hg	T_i °F	ORSAT	Final Manometer Reading mm Hg	T_f °F	Shipping Container #	COMMENTS log #
-1		1115	2073	25	0.0	723	44	CO_2 ___	-40	56		1107
-2		3	2067	/	0.0	725	38	O_2 ___	-43	56		1108
-3		1	2072	/	0.0	721	37	CO ___	-8	56		1109
-4		1112	2068	/	0.0	725	37	N_2 ___	-10	56		1110
								Time:				
-1		5	2061	25	0.0	720	35	CO_2 ___	-41	56		1111
-2		7.5	2073	/	0.0	722	35	O_2 ___	-36	56		1112
-3		1119	2072	/	0.0	724	35	CO ___	-31	56		1113
-4		11-8	2075	/	0.0	723	34	N_2 ___	-6	56		1114
								Time:				
-1		02	2032	25	0.0	724	32	CO_2 ___	-49	56		1115
-2		1191	2074	/	0.0	724	32	O_2 ___	-4	56		1116
-3		12	2071	/	0.0	721	32	CO ___	-41	56		1117
-4		05	2058	/	0.0	720	32	N_2 ___	-34	56		1118
								Time:				

EMISSION TEST PROGRAM
McGILL ENCLOSED FLARE SYSTEM
VALLEY LANDFILL
IRWIN, PENNSYLVANIA

APPENDIX G

Test Calibration Data

PITOT TUBE CALIBRATION DATA

Calibration pitot tube: type Std size (OD) 3/4 ID number 7

Type S pitot tube ID number 12' $C_{p(std)}$ = 0.99

Calibration: date 1-16-91 performed by [illegible]

A-Side Calibration

Δp_{std}, cm (in.) H_2O	Δp_s, cm (in.) H_2O	$C_{p(s)}$ [a]	DEV. [b]
0.14	0.25	0.840	0.000
0.56	0.75	0.839	0.001
0.88	1.32	0.841	-0.001
	Average		

B-Side Calibration

Δp_{std}, cm (in.) H_2O	Δp_s, cm (in.) H_2O	$C_{p(s)}$ [a]	DEV. [b]
0.14	0.25	0.840	0.000
0.56	0.78	0.839	0.001
0.88	1.32	0.841	-0.001
	Average		

[a] $C_{p(s)} = C_{p(std)} \sqrt{\frac{\Delta p_{std}}{\Delta p_s}}$ = 0.84

[b] DEV = $C_{p(s)} - \bar{C}_{p'}$ (must be ≤ 0.01)

$\bar{C}_{p(A)} - \bar{C}_{p(B)}$ = 0 (must be ≤ 0.01).

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Data 1-16-91 Thermocouple number 17407

Ambient temperature 72 °F Barometric pressure 29.92 in. Hg

Calibrator D Reference: mercury-in-glass ✓

other

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[c] %
1	Ice Bath	33.5	34	0.10
2	Boiling H_2O	210.2	210	0.03
3	Hot Oil	353.6	353	0.07

[b] Type of calibration system used.

[c] $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermocouple temp, °F} + 460)}{\text{ref temp, °F} + 460}\right] 100 \leq 1.5\%$.

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 1/16/81 Thermocouple number 6097

Ambient temperature 72 °F Barometric pressure 29.92 in. Hg

Calibrator AE Reference: mercury-in-glass ✓

other

Reference point number[a]		Source[b] (specify)	Reference barometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[c] %
110	1	ice water	33	35	0.11
	2	Boiling water	210	214	0.60
047	1	ice water	33	36	0.61
	2	Boiling water	210	215	0.72

[b] Type of calibration system used.

[c] $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermon temp, °F} + 460)}{\text{ref temp, °F} + 460}\right] 100 \leq 1.5\%.$

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 1-16-91 Meter box number 2805

Barometric pressure, P_b = 29.50 in. Hg Calibrated by DC

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperatures: Wet test meter (t_w), °F	Temperatures: Dry gas meter: Inlet (t_{d_i}), °F	Temperatures: Dry gas meter: Outlet (t_{d_o}), °F	Temperatures: Dry gas meter: Avg[a] (t_d), °F	Time (θ), min	Y_i	$\Delta H@_i$ in. H_2O
0.5	4.495	5.026	76 / 80	90 / 97	76 / 82		12:09	1.004	
1.0	49.172	9.417	63 / 76	63 / 96	63 / 78			0.984	
1.5	13.982	14.550	80 / 85	97 / 103	82 / 89			0.980	
2.0	18.896	19.467	85 / 86	103 / 107	89 / 92			0.982	
2.5	10.169	10.623	93 / 93	107 / 107	92 / 92			0.981	
3.0	10.420	10.892	83 / 84	107 / 114	92 / 96			0.983	
							Avg	0.986	

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H@_i = \frac{0.0317\ \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\ \theta}{V_w} \right]^2$
0.5	0.0368	1.004	1.68
1.0	0.0737	0.984	1.80
1.5	0.110	0.980	1.79
2.0	0.147	0.982	1.84
2.5	0.183	0.981	1.81
3.0	0.221	0.983	1.92

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date _____ Meter box number _____

Barometric pressure, P_b = _____ in. Hg Calibrated by _____

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperatures: Wet test meter (t_w), °F	Temperatures: Dry gas meter: Inlet (t_{d_i}), °F	Temperatures: Dry gas meter: Outlet (t_{d_o}), °F	Temperatures: Dry gas meter: Avg (t_d), °F	Time (θ), min	Y_i	$\Delta H@_i$, in. H_2O
0.5									
1.0									
1.5									
2.0									
3.0									
4.0									
							Avg		

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H@_i = \frac{0.0317\ \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\ \theta}{V_w} \right]^2$
0.5	0.0368		
1.0	0.0737		
1.5	0.110		
2.0	0.147		
3.0	0.221		
4.0	0.294		

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 1-13-9[illegible] Meter box number 2 3 0

Barometric pressure, P_b = 28.65 in. Hg Calibrated by [illegible]

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperatures: Wet test meter (t_w), °F	Temperatures: Dry gas meter: Inlet (t_{d_i}), °F	Temperatures: Dry gas meter: Outlet (t_{d_o}), °F	Temperatures: Dry gas meter: Avg[a] (t_d), °F	Time (θ), min	Y_i	$\Delta H@_i$, in. H_2O
0.5	5.085	5.[illegible]2	64	90	80	85	12.0	0.9814	1.773
1.0	5.[illegible]2	5.551	65.5	8[illegible]	[illegible]9	84	9[illegible]	0.9803	1.825
1.5	10.0[illegible]	10.45[illegible]	66	93	8[illegible]	86.5	15.[illegible]	0.9817	1.954
2.0	10.116	10.547	66.5	97	82	89.5	13.0	0.9959	1.844
3.0	10.202	10.614	66.5	98	82	90	11.0	0.9964	1.945
4.0	10.272	10.040	67	102	84	93	9.5	1.0027	1.901
							Avg	0.9916	1.874

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H@_i = \frac{0.0317\ \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\ \theta}{V_w} \right]^2$
0.5	0.0368		
1.0	0.0737		
1.5	0.110		
2.0	0.147		
3.0	0.221		
4.0	0.294		

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 1-12-91 Meter box number 7 & 11

Barometric pressure, P_b = 25.6 in. Hg Calibrated by JAC

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperatures: Wet test meter (t_w), °F	Temperatures: Dry gas meter: Inlet (t_{d_i}), °F	Temperatures: Dry gas meter: Outlet (t_{d_o}), °F	Temperatures: Dry gas meter: Avg[a] (t_d), °F	Time (θ), min	Y_i	$\Delta H@_i$, in. H_2O
0.5	5.055	5.220	65	91	82	86.5		1.007	
1.0	5.320	5.491	66	89	74	81.5		1.006	
1.5	10.015	10.260	66	94	80	87.0		1.011	
2.0	10.287	10.502	66	95	82	90.0		1.011	
3.0	10.215	10.505	66	99	84	91.5		1.012	
4.0	10.284	10.546	66	102	86			1.009	
							Avg	1.009	

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H@_i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\theta}{V_w} \right]^2$
0.5	0.0368		
1.0	0.0737		
1.5	0.110		
2.0	0.147		
3.0	0.221		
4.0	0.294		

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test numbers ______ Date 1-31-91 Meter box number ______ Plant [illegible]

Barometric pressure, P_b = 29.62 in. Hg Dry gas meter number 2805 Pretest Y 0.986

Orifice manometer setting, (ΔH), in. H_2O	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_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average (t_d),[a] °F	Time (Θ), min	Vacuum setting, in. Hg	Y_i	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
2.5	10.164	10.250	69	78	70	74.0		4.0	0.989	
2.5	10.233	16.471	69	84	73	78.5		4.0	0.987	
2.5	10.019	10.35	69	92	75	83.5		4.0	0.988	
									Y = 0.989	

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y $\pm 0.05Y$

P_b = Barometric pressure, in. Hg.

Θ = Time of calibration run, min.

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test numbers ______ Date 1-31-91 Meter box number ______ Plant Valley Landfill

Barometric pressure, P_b = 29.62 in. Hg Dry gas meter number 425598 Pretest Y 1.800

Orifice manometer setting, (ΔH), in. H_2O	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_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (Θ), min	Vacuum setting, in. Hg	Y_i	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
0.2	10.008	10.055	68	72	70	71.0		1.0	1.000	
0.2	10.000	10.065	69	74	72	73.0		1.0	1.001	
0.2	10.019	10.140	69	79	72	75.5		1.0	1.000	
									Y = 1.000	

a If there is only one thermometer on the dry gas meter, record the temperature under t_d.

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y $\pm 0.05Y$

P_b = Barometric pressure, in. Hg.

Θ = Time of calibration run, min.

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test numbers _____ Date 1-31-91 Meter box number 2390 Plant Vaudreuil-Québec

Barometric pressure, P_b = 29.62 in. Hg Dry gas meter number _____ Pretest Y 0.992

Orifice manometer setting, (ΔH), in. H_2O	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_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$\frac{V_w P_b (t_d + 460)}{V_d P_b + \frac{\Delta H}{13.6}(t_w + 460)}$
0.2	10.055	10.302	69	92	77	77.0		1.0	0.992	
0.2	10.013	10.399	68	89	78	83.5		1.0	0.991	
0.2	10.001	10.455	68	96	80			1.0	0.992	
									Y = 0.992	

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ±0.05Y

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test numbers _____ Date 1-31-91 Meter box number 74511 Plant Wa0a4 La0f0

Barometric pressure, P_b = 29.62 in. Hg Dry gas meter number _____ Pretest Y 1.009

Orifice manometer setting, (ΔH), in. H_2O	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_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$\frac{V_w P_b (t_d + 460)}{V_d P_b + \frac{\Delta H}{13.6}(t_w + 460)}$
2.4	10,095	10,091	68	80	70	75.0		2.0	1.008	
2.4	10,096	10,101	68	85	76	80.5		2.0	1.008	
2.4	10,101	10,125	68	90	79	84.5		2.0	1.010	
									Y = 1.009	

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ±0.05Y

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.