Commonwealth of Pennsylvania
Environmental Resources
April 7, 1992

Subject: Source Test Review

To: Data File
Valley Landfill
Penn Township, Westmoreland County

From: Richard St. Louis, Chief
Source Testing Unit
Division of Technical Services and Monitoring
Bureau of Air Quality Control

Through: Chief, Source Testing and Monitoring Section

The Valley Landfill operates an enclosed McGill flare system at its Irwin, Westmoreland County facility. International Technology Corporation conducted efficiency testing for non-methane volatile organic compounds (NMVOC) and for the specific organic compounds specified in Condition No. 9A of Plan Approval 65-322-001A on November 26, 1991. In addition, outlet NO_x samples were also extracted. The NMVOC samples were extracted using a modified Method 25C while Method 7A was used to collect the NO_x samples. The tests were conducted in accordance with a preapproved test protocol and with the modifications to utilize Method 2B for determining the outlet flow rate by carbon balance. The test results are acceptable to the Department.

The test report indicate NMO removal efficiencies of 98.7, 98.3 and 98.7% versus an allowable of 98.0%. Outlet NO_x emission results were all less than 1.3 lb/hr. Summaries of the specific organic compound emissions detected are listed below:

		Run No. 1		Run No. 2		Run No. 3		Average	
Pollutant	Sampling Location	Conc. ppb	Rate lb/hr	Conc. ppb	Rate lb/hr	Conc. ppb	Rate lb/hr	Conc. ppb	Rate lb/hr
Benzene	Inlet	650	0.017	650	0.017	630	0.016	640	0.016
	Outlet	<7.8	<0.002	<6.0	<0.001	<15	<0.003	<9.6	<0.002
Methylene Chloride	Inlet	3200	0.089	3200	0.090	3200	0.088	3200	0.089
	Outlet	97	0.020	50	0.009	64	0.012	70	0.013
Perchloro ethylene	Inlet	4500	0.24	4500	0.25	4300	0.23	4400	0.24
	Outlet	<7.8	<0.004	<6.0	<0.002	<15	<0.006	<9.6	<0.004
Trichloro-ethylene	Inlet	1300	0.056	1300	0.056	1200	0.051	1300	0.054
	Outlet	<7.8	<0.003	<6.0	<0.002	<15	<0.005	<9.6	<0.003
Vinyl Chloride	Inlet	3500	0.071	3500	0.072	3600	0.072	3500	0.072
	Outlet	<7.8	<0.002	<6.0	<0.0008	<15	<0.003	<9.6	<0.002

ccs: Joseph Pezze - Southwest Regional Office
65-322-001A
EPA/RSL
ASC
Reading File - Source Testing

RSLabam

Valley Landfill

R.D. #2 - Box 262A
Pleasant Valley Road
Irwin, Pennsylvania 15642
(412) 744-7446
FAX (412) 744-4234

January 30, 1992

Mr. Richard St. Louis
Chief, Source Testing Unit
Division of Technical Services and Monitoring
Commonwealth of Pennsylvania
Department of Environmental Resources
P. O. Box 2357
Harrisburg, PA 17105-2357

RE: Emissions Test Report
Valley Landfill
Penn Township, Westmoreland County, Pennsylvania

Dear Mr. St. Louis:

Transmitted herein is a copy of the emissions test report entitled "Emission Test Report - Performance Evaluation - Enclosed Landfill Gas Flare," dated November, 1991, as prepared by International Technology Corporation.

The report indicates that the required testing criteria has been met and the destructive efficiency of 98% (by weight) has been achieved, with an average of 98.6%.

Please be advised that three copies of the report has also been forwarded to Mr. Joseph Pezze.

Should there by any questions or need of clarification on the information presented in the report, please feel free to contact this office.

Respectfully submitted,

Gregory J. Grudovich
Regional Environmental Director

GJG/dms
Enclosure
cc: Patricia Campolongo
Joseph Pasulo
Denny Marchetti
Jay Roberts

INTERNATIONAL TECHNOLOGY CORPORATION

EMISSION TEST REPORT

PERFORMANCE EVALUATION ENCLOSED LANDFILL GAS FLARE VALLEY LANDFILL IRWIN, PENNSYLVANIA

November 1991

Prepared by: David R. Osterhout

JTN: 382133

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SECTION 1

INTRODUCTION

On November 26, 1991, IT Air Quality Services (ITAQS) personnel conducted an atmospheric emission test program on the McGill enclosed flare system at Valley Landfill in Irwin, Pennsylvania. The purpose of the test program was to satisfy the requirements of the Commonwealth of Pennsylvania. Samples were collected simultaneously at the inlet and outlet of the flare and analyzed for nonmethane volatile organic compounds (NMVOC) and specific organic compounds (benzene, chloroform, 1,2-dichloroethane, methyl chloride, methylene chloride, perchloroethylene, trichloroethylene, carbon tetrachloride, vinylidene chloride, and vinyl chloride). Inlet samples were also analyzed for methane (CH_4), nitrogen (N_2), carbon dioxide (CO_2), carbon monoxide (CO), and oxygen (O_2). Testing was also conducted to determine the presence of nitrogen oxide (NO_x) at the flare outlet.

Mr. Bill Meyer of Waste Energy Technology and Mr. John Pastelock of Valley Landfill coordinated on-site activities. Mr. Keith Gratzmiller of the Commonwealth of Pennsylvania observed the test program.

SECTION 2

SUMMARY OF RESULTS

Table 2-1 summarizes the inlet and outlet gas conditions observed during the test program. U.S. Environmental Protection Agency (EPA) Method 2C* was used to collect flow rate data at the inlet; EPA Method 2* was used at the outlet. The velocity at the outlet stack, however, was very low. The pressure drop measured across the S-type pitot tube was near the level of detection on a 0- to 0.25-in. manometer, thereby increasing potential error in the methodology. Appropriate data were obtained during the sampling program to allow the use of an alternative method for low-flow determination. In addition to U.S. EPA Method 2 procedures, procedures similar to those described in Method 2B* were used to determine the flare stack flow rate. Method 2B uses a carbon balance method to calculate the flow rate downstream of a combustion source. Appendix A presents the calculations for this determination.

Flare inlet flow rates averaged 2000 dry standard cubic feet per minute (dscfm) [2250 actual cubic feet per minute (acfm)]. Temperatures averaged 91°F; moisture content averaged 2.9 percent; and CO_2, O_2, and CH_4 contents averaged 26.3, 6.1, and 21.2 percent, respectively.

Flare outlet flow rates measured by Method 2 averaged 5380 dscfm (23,200 acfm) compared with 14,000 dscfm determined by carbon balance. Temperatures averaged 1634°F, moisture content averaged 6.3 percent, and CO_2 and O_2 contents averaged 7.2 and 10.2 percent, respectively. The outlet stack emission rates were calculated on the basis of the carbon balance flow-rate value.

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* 40 CFR 60, Appendix A.

TABLE 2-1. SUMMARY OF GAS CONDITIONS

Run No.	Sampling location	Gas flow rate		Temperature, °F	Moisture, %	Composition, % by volume, dry basis				
		acfm[a]	dscfm[b]			CO_2	O_2	CH_4	N_2	CO
VI-1	Inlet	2,250	2,100	90	2.9	27.0	6.3	21.5	45.5	<0.002
VO-1	Outlet	22,400	5,150	1621	7.5	6.7	10.6	NA[d]	82.7	NA
			(15,300)[c]							
VI-2	Inlet	2,270	2,110	91	2.9	25.0	6.0	20.0	48.0	<0.001
VO-2	Outlet	24,800	5,780	1640	5.7	7.4	9.4	NA	83.2	NA
			(12,900)							
VI-3	Inlet	2,220	2,070	91	2.9	27.0	6.0	22.0	46.0	<0.001
VO-3	Outlet	22,300	5,200	1640	5.6	7.4	10.6	NA	82.0	NA
			(13,700)							
Average		2,250	2,090	91	2.9	26.3	6.1	21.2	46.5	<0.001
		23,200	5,380	1634	6.3	7.2	10.2		82.6	
			(14,000)							

[a] acfm = Actual cubic feet per minute.

[b] dscfm = Dry standard cubic feet per minute at 68°F and 29.92 in.Hg.

[c] Values in parentheses are flow rates calculated by carbon balance.

[d] NA = Not analyzed.

Nonmethane organics (NMO) emissions and removal efficiencies are summarized in Table 2-2. Concentrations are presented in parts per million (ppm) by volume and milligrams per dry normal cubic meter (mg/dNm^3) as carbon, and emission rates are presented in pounds per hour (lb/h). Inlet concentrations averaged 430 ppm, which corresponds to an emission rate of 1.69 lb/h. Outlet concentrations averaged 0.94 ppm, with a corresponding average emission rate of 0.024 lb/h based on the flow rates calculated from the carbon balance. NMO removal efficiencies averaged 98.6 percent. The target efficiency was 98 percent.

TABLE 2-2. SUMMARY OF NMO EMISSIONS AND REMOVAL EFFICIENCY (November 26, 1991)

Run No.	Location	Time (24-h)	Concentration, ppm[a]	Concentration, mg/dNm^3[b]	Emission rate, lb/h[c]	Removal efficiency, %[d]
1	Inlet	1159-1259	420	210	1.65	96.7
	Outlet		0.77	0.38	0.022	
2	Inlet	1408-1508	430	215	1.70	98.3
	Outlet		1.2	0.60	0.029	
3	Inlet	1533-1633	450	225	1.74	98.7
	Outlet		0.86	0.43	0.022	
Average	Inlet		430	216	1.69	98.6
	Outlet		0.94	0.47	0.024	

[a] ppm = Parts per million by volume as carbon.

[b] mg/dNm^3 = Milligrams per dry normal cubic meter.

[c] lb/h = Pounds per hour.

[d] Efficiency = $\frac{\text{lb/h in} - \text{lb/h out}}{\text{lb/h in}}$

Table 2-3 summarizes the emission data for the specific volatile organic compounds (VOC) that were detected in the samples. At the inlet, benzene, methylene chloride, perchloroethylene, trichloroethylene, and vinyl chloride were found. At the outlet, only methylene chloride was detected. Methylene chloride is a common laboratory solvent and methylene chloride contamination is not unusual. Although methylene chloride was not detected in the blank, it is possible that the sample values are biased high.

TABLE 2-3. SUMMARY OF VOC EMISSIONS

Pollutant	Sampling location	Run No. 1 Concentration ppb[a]	Run No. 1 Concentration µg/dNm³[b]	Run No. 1 Emission rate, lb/h[c]	Run No. 2 Concentration ppb	Run No. 2 Concentration µg/dNm³	Run No. 2 Emission rate, lb/h	Run No. 3 Concentration ppb	Run No. 3 Concentration µg/dNm³	Run No. 3 Emission rate, lb/h	Average Concentration ppb	Average Concentration µg/dNm³	Average Emission rate, lb/h
Benzene	Inlet	650	2,100	0.017	650	2,100	0.017	930	3,000	0.018	740	2,100	0.015
	Outlet	<7.8	<25	<0.002	<6.8	<20	<0.001	<15	<48	<0.003	<9.8	<32	<0.007
Methylene chloride	Inlet	3200	11,000	0.080	3200	11,000	0.080	3200	11,000	0.088	3200	11,000	0.083
	Outlet	97	340	0.020	50	180	0.009	64	230	0.012	70	250	0.013
Perchloro-ethylene	Inlet	4500	31,000	0.24	4500	31,000	0.25	4300	30,000	0.23	4400	31,000	0.24
	Outlet	<7.8	<54	<0.004	<6.0	<42	<0.002	<15	<110	<0.008	<9.8	<67	<0.004
Trichloro-ethylene	Inlet	1300	7,100	0.058	1300	7,100	0.058	1200	6,500	0.051	1300	6,900	0.054
	Outlet	<7.8	<43	<0.003	<6.0	<33	<0.002	<15	<82	<0.005	<9.8	<53	<0.003
Vinyl chloride	Inlet	3500	9,100	0.071	3500	9,100	0.072	3600	9,400	0.072	3500	9,200	0.072
	Outlet	<7.8	<21	<0.002	<6.0	<15	<0.0008	<15	<38	<0.003	<9.8	<25	<0.002

[a] ppb = Parts per billion by volume.

[b] µg/dNm³ = Microgram per dry normal cubic meter.

[c] lb/h = Pounds per hour.

Table 2-4 presents NO_x emission data. NO_x levels were below the detection limit for all samples.

TABLE 2-4. SUMMARY OF NO_x EMISSIONS DATA
(November 26, 1991)

Run No.	Time (24-h)	Concentration, ppm	Emission rate, lb/h
VN-1	1750	<13	<1.3
VN-2	1805	<13	<1.3
VN-3	1820	<14	<1.4
VN-4	1835	<14	<1.4
Average		<13	<1.3
VN-5	1850	<13	<1.3
VN-6	1905	<13	<1.3
VN-7	1920	<13	<1.3
VN-8	1935	<13	<1.3
Average		<13	<1.3
VN-9	1950	<13	<1.3
VN-10	2005	<14	<1.4
VN-11	2020	<13	<1.3
VN-12	2035	<14	<1.4
Average		<13	<1.3
Overall average		<13	<1.3

Calculations can be found in Appendix A, field data are in Appendix B, and laboratory data are in Appendix C.

SECTION 3

QUALITY ASSURANCE

This section outlines the steps ITACS takes to ensure that quality data are obtained from our testing procedures.

Routine standard reference method quality control (QC) procedures were followed throughout this test series. These included, but were not limited to, the following:

- Calibration of field sampling equipment. Sampling equipment was calibrated in accordance with the procedures of the "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III," EPA 600/4-72-027B, August 1977. The calibration data are summarized in Table 3-1. Calibration guidelines are described in more detail in Appendix E.

- Onsite dry gas meter and thermocouple digital indicator calibration checks (see Appendix B).

- Train configuration and calculation checks.

- Onsite quality assurance (QA) checks such as sampling train and pitot tube leak checks.

- Use of designated analytical equipment and sampling reagents.

- Laboratory analytical procedure QA checks.

Sampling equipment, reagents, and analytical procedures for this test series followed and met all necessary guidelines set forth for accurate test results. All sampling equipment was calibrated within the limits described in U.S. EPA Method 5.*

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* 40 CFR 60, Appendix A, July 1991.

TABLE 3-1. FIELD EQUIPMENT CALIBRATION

Equipment	ID. No.	Calibrated against	Allowable error	Actual error	Comments
Meter box	FT-4	Wet test meter	Y ±0.02	0.004	Pretest (maximum deviation)
			ΔH@ ±0.15	0.07	Pretest (maximum deviation)
			(Y ±0.05 Y posttest)	0.008	Pre- versus posttest
		Critical orifice	Y ±0.02	0.022	Checked on site prior to testing
			ΔH@ ±0.15	0.11	Checked on site prior to testing
Pitot tube	T002	Geometric specifications	a	a	Visually inspected on site
Digital indicator	FT-4	Millivolt signals	±0.5%	0.5%	Pretest (maximum deviation)
				0.4%	Checked on site prior to testing
Stack thermocouple	121	ASTM-3F	1.5%	0.5%	Pretest (maximum deviation)
	128			0.4%	Pretest (maximum deviation)
Orsat analyzer	142	Calibration gas	±0.5%, by volume	0.0%	CO_2
				0.0%	O_2
Impinger thermocouple	I-28	ASTM-3F	±2°F	1°F	Pretest (maximum deviation)
Balance	421	Type-S weights	±0.5 g	0.1 g	Pretest (maximum deviation)
Barometer	412	NBS-traceable barometer	±0.10 in.Hg	0.00 in.Hg	Pretest
			(±0.20 in.Hg, posttest)	0.00 in.Hg	Posttest
Dry gas thermocouple	FT-4	ASTM-3F	±5°F	3°F	Inlet (pretest, maximum deviation)
				4°F	Outlet (pretest, maximum deviation)

@ See Appendix E.

The QC procedures followed in the sample analyses in this test program included, but were not limited to, the following:

- Use of designated analytical equipment and experienced laboratory personnel.
- Internal and external audits to ensure accuracy in sampling and analysis.
- Reagent and field blanks to determine blank levels.

Nonmethane Organics

The NMO method spike recovery was 104 percent. NMOs were not detected in the field or laboratory blanks.

Specific VOCs

Tables 3-2 and 3-3 present surrogate and method spike recovery data for the VOC analyses.

Permanent Gases

All CH_4, CO_2, CO, N_2, and O_2 analyses were performed in duplicate. The field and laboratory blanks were 100 percent N_2. Table 3-4 summarizes the method spike recoveries for the permanent gas analyses.

Nitrogen Oxides

A standard reference solution was analyzed for NO_x. A recovery of 111 percent was achieved. NO_x was not detected in the reagent blank.

TABLE 3-2. CANISTER SAMPLE SURROGATE RECOVERY[a]

(percent)

Run No.	Compound		
	Octafluoro-toluene	4-Bromofluoro-benzene	1,2-Dichloro-benzene-d4
VE-1	101	111	105
VE-2	101	111	105
VE-3	100	111	100
VO-1	103	96	104
VO-2	104	95	96
VO-3	104	98	106
Field blank	105	98	96
Laboratory blank	105	100	99
Method spike	109	95	108

[a] Allowable limit is 70 to 130 percent.

TABLE 3-3. VOC SPIKE RECOVERIES

Compound	Recovery, percent
Benzene	111
Chloroform	118
1,2-Dichloroethane	112
Methyl chloride	107
Methylene chloride	98
Perchloroethylene	124
Trichloroethylene	126
Carbon tetrachloride	122
Vinylidene chloride	106
Vinyl chloride	109

TABLE 3-4. PERMANENT GAS SPIKE RECOVERIES

Compound	Recovery, percent
Oxygen	100
Nitrogen	100
Carbon monoxide	101
Methane	102
Carbon dioxide	101

SECTION 4

PROCESS DESCRIPTION

Valley Landfill operates an enclosed ground flare to control emissions of CH_4 and NMOC contained in the landfill gas collected at their disposal site in Irwin, Pennsylvania. Landfill gas is combusted through a burner system equipped with a flame arrestor to prevent flashback in the event the gas flow is lost. Combustion air is controlled by two sets of dampers located near the bottom of the flare assembly. One set is manually controlled; the other set is automatically adjusted based on flare temperature.

SECTION 5

SAMPLING LOCATIONS AND TEST METHODS

Sampling Locations

Sampling was conducted at the flare inlet and outlet as shown in Figure 5-1. At the inlet, two sampling ports were located approximately 7.1 duct diameters downstream and 2.8 duct diameters upstream from the nearest flow disturbances in the 119.6-in. inside-diameter (i.d.) duct. Twelve points were used to traverse the duct for velocity measurements. At the outlet, two sampling ports were located approximately 3.1 stack diameters downstream and 0.5 stack diameter upstream from the nearest flow disturbances in the 9-ft 6¼-in-i.d. stack. Because one of the ports could not be opened, velocity traverses were made with eight points in one port.

Test Methods

Canister Samples

Canister samples were collected simultaneously at the inlet and outlet. Each sample was collected in a passivated canister in accordance with procedures described in Draft U.S. EPA Method 25C.* These samples were analyzed for specific VOCs** by modified procedures of U.S. EPA Method TO-14. The modification is the replacement of the cryogenic trap with a sorbent media trap to prevent freeze-out of CO_2 in the trap, which would raise the detection limits. The samples were

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* Benzene, chloroform, 1,2-dichloroethane, methyl chloride, methylene chloride, perchloroethylene, trichloroethylene, carbon tetrachloride, vinylidene chloride, vinyl chloride.

** 40 CFR 60, Appendix A.

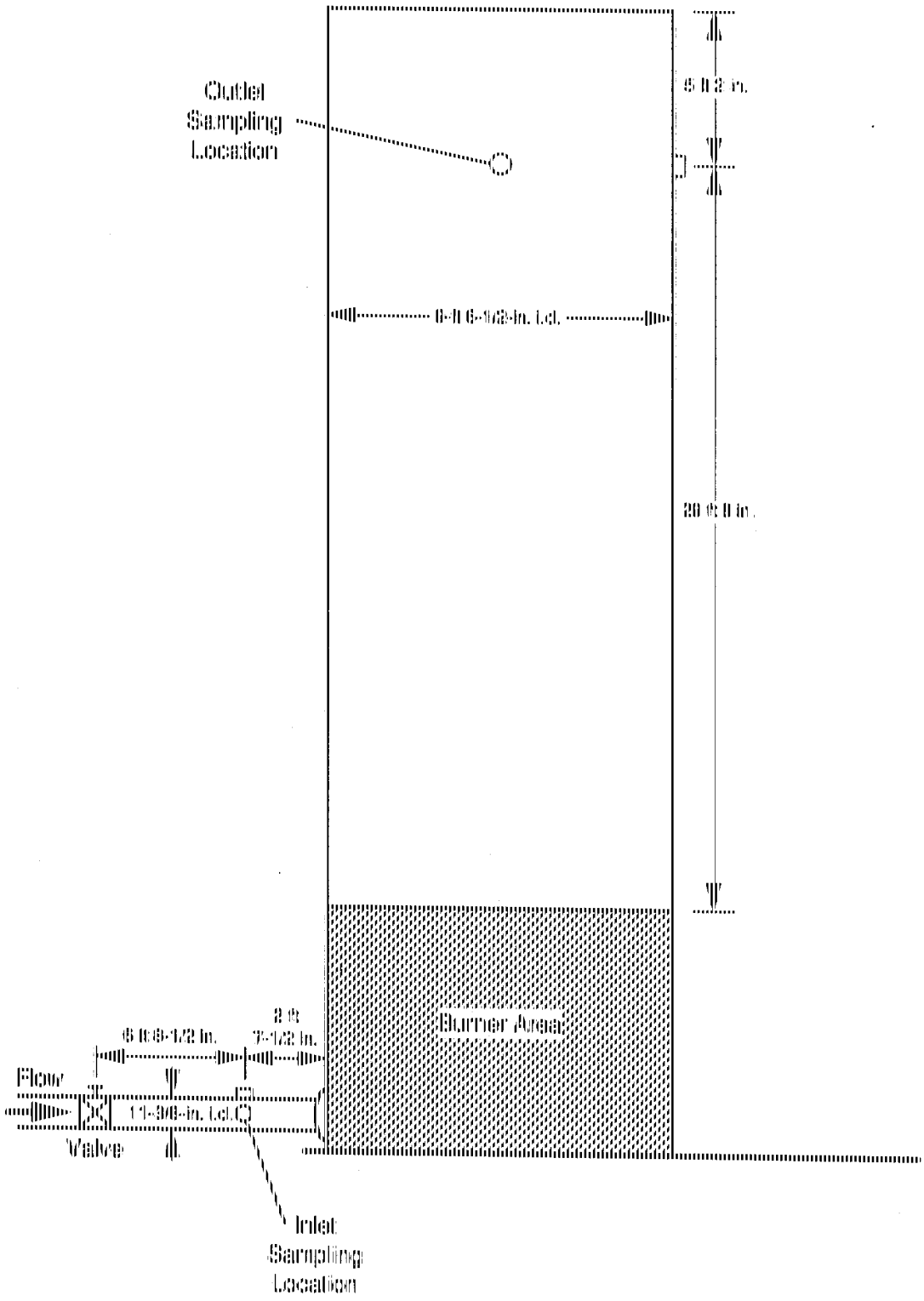

Figure 5-1.

Sampling locations.

then analyzed for total NMVOC in accordance with procedures described in U.S. EPA Method 25C. The samples were also analyzed for CH_4, N_2, O_2, CO_2, and CO by gas chromatograph with a thermal conductivity detector (GC/TCD).

Nitrogen Oxides

NO_x sampling was conducted at the outlet in accordance with U.S. EPA Method 7A.* Three tests were conducted, each consisting of four grab samples. The samples were collected in evacuated flasks containing a dilute sulfuric acid-hydrogen peroxide absorbing solution. The NO_x was measured by ion chromatography.

Velocity, Gas Temperature, Molecular Weight, and Moisture

At the inlet, flow rate and temperature measurements were obtained in accordance with U.S. EPA Method 2C** by use of a standard pitot tube, an inclined manometer, and a thermocouple and digital readout. Gas composition and molecular weight were determined by ASTM Method D1946.*** The canister sample analyses described earlier (CH_4, N_2, O_2, CO_2, and CO by GC/TCD) were used to calculate molecular weight. Moisture determinations were made by use of a wet bulb/dry bulb thermometer and psychrometric chart.

At the outlet, velocity and temperature measurements were obtained in accordance with U.S. EPA Method 2* (except that only one sampling port was used) by use of a Type-S pitot tube, an inclined manometer, and a thermocouple and digital readout. During the sampling program, pressure drops across the pitot tube were extremely low (<0.01 in.H_2O). Such low pressure drops greatly decreased the accuracy of the method. Therefore, an alternative method was used to represent the flow data

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* 40 CFR 60, Appendix A.

** Benzene, chloroform, 1,2-dichloroethane, methyl chloride, methylene chloride, perchloroethylene, trichloroethylene, carbon tetrachloride, vinylidene chloride, vinyl chloride.

*** Annual Book of ASTM Standards, Section 5, Volume 05.05.

in addition to the data collected by Method 2 procedures. The outlet flow rate was determined by carbon balance in accordance with U.S. EPA Method 2B.*

CO_2 and O_2 were measured in accordance with U.S. EPA Method 3,* and stack gas moisture was measured in accordance with U.S. EPA Method 4.*

Appendix D contains more detailed descriptions of the sampling and analytical procedures used during stack gas testing.

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* 40 CFR 60, Appendix A.

APPENDIX A

CALCULATIONS

VOCH

PLANT: Valley Landfill

SOURCE LOCATION: Flare Inlet

DATE: 11/26/91

	VI-1	VI-2	VI-3
Volumetric Flow, dscfm :	2096	2113	2066

		Concentration, ppb				Concentration, µg/m3 †				Emission Rate, lb/h ††			
		RUNS				RUNS				RUNS			
COMPOUND	MW	VI-1	VI-2	VI-3	Average	VI-1	VI-2	VI-3	Average	VI-1	VI-2	VI-3	Average
NMVOC	12.00	420000	430000	450000	433333	209650.58	214642.26	224625.62	216306.15	1.65E+00	1.70E+00	1.74E+00	1.69E+00
Benzene	78.11	650	650	630	643	2111.96	2111.96	2046.96	2090.30	1.66E-02	1.67E-02	1.58E-02	1.64E-02
Chloroform	119.39	<27	<28	<28	<26	<194.09	<114.28	<139.06	<129.12	<1.05E-03	<9.04E-04	<1.08E-03	<1.01E-03
1,2 - Dichloroethane	98.97	<27	<28	<28	<26	<111.16	<94.60	<115.27	<107.04	<8.73E-04	<7.50E-04	<8.92E-04	<8.38E-04
Methyl Chloride	50.49	<27	<28	<28	<26	<56.71	<48.31	<58.81	<54.61	<4.45E-04	<3.82E-04	<4.55E-04	<4.28E-04
Methylene Chloride	84.94	3200	3200	3200	3200	11306.49	11306.49	11306.49	11306.49	8.88E-02	8.95E-02	8.75E-02	8.86E-02
Perchloroethylene	165.85	4500	4500	4300	4433	31045.13	31045.13	29665.35	30585.21	2.44E-01	2.46E-01	2.30E-01	2.40E-01
Trichloroethylene	131.40	1300	1300	1200	1267	7105.66	7105.66	6559.07	6923.46	5.58E-02	5.62E-02	5.08E-02	5.43E-02
Carbon Tetrachloride	153.84	<27	<28	<28	<26	<172.78	<147.18	<178.18	<166.06	<1.36E-03	<1.17E-03	<1.39E-03	<1.30E-03
Vinylidene Chloride	96.95	<27	<28	<28	<26	<108.89	<92.76	<112.92	<104.85	<8.55E-04	<7.34E-04	<8.74E-04	<8.21E-04
Vinyl Chloride	62.50	9500	9500	9000	9333	9899.42	9899.42	9378.40	9725.75	7.77E-02	7.83E-02	7.26E-02	7.62E-02

† Concentration, µg/m3 = ppb * molecular weight / 24.04

†† Emission Rate, lb/hr = µg/m3 / 1000 * dscfm * 60 / .03531 / 1000000 / 453.6

VOC-3

PLANT: Valley Landfill

SOURCE LOCATION: Flare Outlet

DATE: 11/26/01

	VC-1	VC-2	VC-3
Volumetric Flow, dscfm :	15254	12814	13749

		Concentration, ppb				Concentration, µg/m3 †				Emission Rate, lb/h ††			
		RUNS				RUNS				RUNS			
COMPOUND	MW	VC-1	VC-2	VC-3	Average	VC-1	VC-2	VC-3	Average	VC-1	VC-2	VC-3	Average
NMVOC	12.00	770	1200	860	943	994.36	999.00	428.28	470.88	2.20E-02	2.90E-02	2.21E-02	2.44E-02
Benzene	78.11	<7.8	<8.0	<15	<9.6	<25.34	<19.50	<48.74	<31.19	<1.45E-03	<9.43E-04	<2.51E-03	<1.63E-03
Chloroform	119.39	<7.8	<8.0	<15	<9.6	<38.74	<29.80	<74.49	<47.68	<2.21E-03	<1.44E-03	<3.84E-03	<2.50E-03
1,2 - Dichloroethane	98.97	<7.8	<8.0	<15	<9.6	<32.11	<24.70	<61.75	<39.52	<1.83E-03	<1.19E-03	<3.18E-03	<2.07E-03
Methyl Chloride	50.49	<7.8	<8.0	<15	<9.6	<16.38	<12.60	<31.50	<20.16	<9.36E-04	<6.10E-04	<1.62E-03	<1.06E-03
Methylene Chloride	84.94	97	50	84	70	342.73	176.88	296.13	248.51	1.96E-02	8.55E-03	1.16E-02	1.33E-02
Perchloroethylene	165.85	<7.8	<8.0	<15	<9.6	<53.81	<41.39	<103.48	<66.23	<3.07E-03	<2.00E-03	<5.33E-03	<3.47E-03
Trichloroethylene	131.40	<7.8	<8.0	<15	<9.6	<42.63	<32.80	<81.99	<52.47	<2.44E-03	<1.59E-03	<4.22E-03	<2.75E-03
Carbon Tetrachloride	153.84	<7.8	<8.0	<15	<9.6	<49.91	<38.40	<95.99	<61.43	<2.85E-03	<1.86E-03	<4.94E-03	<3.22E-03
Vinylidene Chloride	96.95	<7.8	<8.0	<15	<9.6	<31.46	<24.20	<60.49	<38.72	<1.80E-03	<1.17E-03	<3.12E-03	<2.03E-03
Vinyl Chloride	62.50	<7.8	<8.0	<15	<9.6	<20.28	<15.60	<39.00	<24.96	<1.16E-03	<7.55E-04	<2.01E-03	<1.31E-03

† Concentration, µg/m3 = ppb * molecular weight / 24.04

†† Emission Rate, lb/hr = µg/m3 / 1000 * dscfm * 60 / .03531 / 1000000 / 453.6

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INTERNATIONAL TECHNOLOGY CORPORATION

By DLP Date 7/6/92 Subject Molecular Weight-Inlet Sheet No. 1 of 1

Chkd. By ____ Date ____ Proj. No. 32153

Molecular Weight, lb/lb-mole

$$M_d = \left(\%CH_4 \times \frac{MW_{CH_4}}{100}\right) + \left(\%N_2 \times \frac{MW_{N_2}}{100}\right) + \left(\%O_2 \times \frac{MW_{O_2}}{100}\right) + \left(\%CO_2 \times \frac{MW_{CO_2}}{100}\right)$$

where:

M_d = Dry molecular weight of flue gas, lb/lb-mole

MW_{CH_4} = Average molecular weight of methane, 16 lb/lb-mole*

MW_{N_2} = Average molecular weight of nitrogen, 28 lb/lb-mole*

MW_{O_2} = Average molecular weight of oxygen, 32 lb/lb-mole*

MW_{CO_2} = Average molecular weight of carbon dioxide, 44 lb/lb-mole*

*results from flue gas analysis of inlet landfill gas by ASTM Method D 1945.

RESULTS:

Run No. VE-1 $M_d = \left(21.5 \times \frac{16}{100}\right) + \left(65.5 \times \frac{28}{100}\right) + \left(6.3 \times \frac{32}{100}\right) + \left(27.0 \times \frac{44}{100}\right) = 30.06$ lb/lb-mole

Run No. VE-2 $M_d = \left(20.0 \times \frac{16}{100}\right) + \left(48.0 \times \frac{28}{100}\right) + \left(6.5 \times \frac{32}{100}\right) + \left(25.0 \times \frac{44}{100}\right) = 29.56$ lb/lb-mole

Run No. VE-3 $M_d = \left(22.0 \times \frac{16}{100}\right) + \left(46.0 \times \frac{28}{100}\right) + \left(6.0 \times \frac{32}{100}\right) + \left(27.0 \times \frac{44}{100}\right) = 30.20$ lb/lb-mole

Average = 29.95 lb/lb-mole

gr 7-13-92

100-10-01

Fore Flow Rate by Carbon Balance

$$Q_{std_{out}} = Q_{std_{in}} \frac{CH_{4_{in}} + CO_{2_{in}} + CO_{in}}{CH_{4_{out}} + CO_{2_{out}} + CO_{out} - 300}$$

where: $Q_{std_{out}}$ = volumetric flow rate of stack gas, dscfm

$Q_{std_{in}}$ = volumetric flow rate of inlet gas measured by EPA Method 2C, scfm

$CH_{4_{in}}$ = concentration of methane in inlet gas, ppm (CH4 MW=16)

$CO_{2_{in}}$ = concentration of carbon dioxide in inlet gas, ppm

CO_{in} = concentration of carbon monoxide in inlet gas, ppm

$CH_{4_{out}}$ = concentration of methane in stack gas, ppm

$CO_{2_{out}}$ = concentration of carbon dioxide in stack gas, ppm

CO_{out} = concentration of carbon monoxide in stack gas, ppm

300 = estimated concentration of carbon dioxide in ambient air, ppm

Run No. VE-1

$$Q_{std_{out}} = (2004)\ \frac{215{,}920 + 270{,}000 + 0}{0 + 27{,}000 + 0 - 300} = 15{,}254\ dscfm$$

Run No. VE-2

$$Q_{std_{out}} = (2113)\ \frac{200{,}930 + 250{,}000 + 0}{0 + 24{,}000 + 0 - 300} = 12{,}996\ dscfm \qquad Avg = 13{,}972\ dscfm$$

Run No. VE-3

$$Q_{std_{out}} = (2064)\ \frac{220{,}950 + 270{,}000 + 0}{0 + 27{,}000 + 0 - 300} = 13{,}749\ dscfm$$

Example Calculations for Gas Flow Rates

1. Dry molecular weight of stack gas, lb/lb-mole.

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

2. Molecular weight of stack gas, lb/lb-mole.

$$Ms = Md(1 - Bws) + 18Bws$$

3. Stack velocity at stack conditions, fps.

$$Vs = (85.49)(Cp)(avg\sqrt{\Delta P})\sqrt{\frac{Ts}{(Ps)(Ms)}}$$

4. Stack gas volumetric flow rate at stack conditions, cfm.

$$Qs = 60 \times Vs \times As$$

5. Dry stack gas volumetric flow rate at standard conditions, cfm.

$$Qsstd = (17.647)(Qs)\left(\frac{Ps}{Ts}\right)(1 - Bws)$$

A_s = Cross-sectional area of stack, ft^2

B_{ws} = Proportion by volume of water vapor in the gas stream, dimensionless

C_p = Pitot tube coefficient, dimensionless

%CO = Percent of carbon monoxide by volume, dry basis

$\%CO_2$ = Percent of carbon dioxide by volume, dry basis

M_d = Molecular weight of stack gas (dry basis), lb/lb-mole

M_s = Molecular weight of stack gas (wet basis), lb/lb-mole

$\%N_2$ = Percent of nitrogen by volume, dry basis

$\%O_2$ = Percent of oxygen by volume, dry basis

ΔP = Velocity pressure head of stack gas, in.H_2O

P_{bar} = Barometric pressure, in.Hg

P_s = Absolute stack gas pressure, in.Hg

Q_s = Volumetric flow rate - wet basis at stack conditions - actual cubic feet per minute, acfm

Q_{std} = Volumetric flow rate - dry basis at standard conditions - dry standard cubic feet per minute, dscfm

T_s = Average temperature of stack gas, °R

V_s = Average stack gas velocity at stack conditions - feet per second, ft/s

PT ARIEL QUALITY SERVICES
VELOCITY DETERMINATION

PLANT : Valley Landfill
SAMPLE LOCATION : Flare Inlet
RUN NUMBER : VI-1

DATE : 11/26/91
TIME(24-HR) : 1345
OPERATOR(S) : DC, PF
PRELIMINARY MOISTURE : 2.0
STACK AREA, SQ. IN. : 101.62
NO. OF TRAVERSE PTS. : 12

BAROMETRIC PRESS., in. Hg : 29.35
STATIC PRESS., in. H2O : 7.6

PITOT TUBE, Cp : 1

TRAVERSE PT. NO.	VELOCITY HEAD, in. H2O	STACK TEMP., deg. F
1	0.63	82
2	0.68	86
3	0.73	91
4	0.71	93
5	0.64	94
6	0.54	95
7	0.60	91
8	0.67	89
9	0.76	92
10	0.63	94
11	0.54	95
12	0.42	96
	0.63	90

ET AER QUALITY SERVICES
VELOCITY DETERMINATION

wbdata1.wb3

PLANT :	Valley Landfill
SAMPLE LOCATION :	Flare Inlet
RUN NUMBER :	VT-3

DATE :	11/26/01	BAROMETRIC PRESS., in. Hg :	29.36
TIME(24-HR) :	1620	STATIC PRESS., in. H2O :	7.7
OPERATOR(S) :	DO, PF		
PERCENT MOISTURE :	2.9	PITOT TUBE, Cp :	1.
STACK AREA, sq. ft. :	101.62		
NO. OF TRAVERSE PTS. :	12		

TRAVERSE PT. NO.	VELOCITY HEAD, in. H2O	STACK TEMP., deg. F
1	0.83	91
2	0.69	93
3	0.73	93
4	0.70	94
5	0.61	96
6	0.50	96
7	0.65	92
8	0.72	90
9	0.76	92
10	0.64	94
11	0.51	95
12	0.42	95
	0.68	94

EF AIR QUALITY SERVICES
VELOCITY DETERMINATION

PLANT :	Valley Landfill
SAMPLE LOCATION :	Flare Inlet
RUN NUMBER :	VI-3

DATE :	11/26/01	BAROMETRIC PRESS., in. Hg :	29.42
TIME(24-HR) :	1726	STATIC PRESS., in. H2O :	7.7
OPERATOR(S) :	DO, PF		
PERCENT MOISTURE :	2.9	PITOT TUBE, Cp :	1
STACK AREA, SQ. IN. :	1051.62		
NO. OF TRAVERSE PTS. :	12		

TRAVERSE PT. NO.	VELOCITY HEAD, in. H2O	STACK TEMP, deg. F
1	0.49	85
2	0.67	81
3	0.73	83
4	0.70	84
5	0.60	94
6	0.44	94
7	0.64	83
8	0.70	86
9	0.77	92
10	0.62	93
11	0.59	94
12	0.41	94
	0.61	91

TP AIR QUALITY SERVICES
VELOCITY DETERMINATION

mlddead 1.0/90

PLANT : Valley Landfill
SAMPLE LOCATION : Flare Inlet

Run No:	VI-1	VI-2	VI-3
STACK PRESSURE, in. Hg :	29.91	29.93	29.99
STACK TEMP., deg. F :	90	91	91
MOLECULAR WEIGHT, DRY :	30.37	29.57	30.20
MOLECULAR WEIGHT, STACK :	28.73	27.22	28.05
AVG. SQRT. VELOCITY HEAD :	0.79	0.79	0.78
VELOCITY, fps :	53.12	53.67	52.84
ACTUAL CUBIC FEET/ MINUTE :	2309	2270	2245
DRY STANDARD CUBIC FEET/ MINUTE :	2096	2113	2044

Moisture and Vented Calculations

Plant: Valley Landfill - Flare Outlet Date: 11/26/91

Run No.	Vm scf	Y	Pbar in. Hg	ΔH in. H2O	Tm °F	Vlc ml	Vented scf	Moisture %
MO-1	21.305	0.972	29.40	2.01	47	37.6	21.306	7.54
MO-2	22.266	0.972	29.40	2.01	46	28.9	22.325	5.74
MO-3	22.454	0.972	29.35	2.01	46	27.9	22.351	5.55
							22.161	6.28

TP AIR QUALITY SERVICES
VELOCITY DETERMINATION

PLANT :	Valley Landfill
SAMPLE LOCATION :	Outlet
RUN NUMBER :	VO-1

DATE :	11/26/91	BAROMETRIC PRESS., in. Hg :	29.37
TIME(24-HR) :	1320	STATIC PRESS., in. H2O :	-0.001
OPERATOR(S) :	DC/PP		
PERCENT MOISTURE :	2.5	PITOT TUBE, Cp :	0.84
STACK AREA, sq. ft. :	1.03296.77	PERCENT CO2 :	8.7
NO. OF TRAVERSE PTS. :	8	PERCENT O2 :	10.6

TRAVERSE PT. NO.	VELOCITY HEAD, in. H2O	STACK TEMP., deg. F
1	0.007	1585
2	0.009	1650
3	0.002	1743
4	0.005	1680
5	0.007	1462
6	0.005	1595
7	0.003	1793
8	0.002	1619
	0.005	1681

PT ATL QUALITY SERVICES
VELOCITY DETERMINATION

PLANT : Valley Landfill
SAMPLE LOCATION : Outlet
RUN NUMBER : VO-2

DATE :	11/26/91	BAROMETRIC PRESS., in. Hg :	29.96
TIME(24-HR) :	1510	STATIC PRESS., in. H2O :	-0.001
OPERATOR(S) :	DC/FP		
PERCENT MOISTURE :	6.7	PITOT TUBE, Cp :	0.84
STACK AREA, SQ. IN. :	10296.77	PERCENT CO2 :	7.4
NO. OF TRAVERSE PTS. :	8	PERCENT O2 :	9.4

TRAVERSE PT. NO.	VELOCITY HEAD, in. H2O	STACK TEMP., deg. F
1	0.005	1632
2	0.001	1715
3	0.002	1619
4	0.0025	1506
5	0.006	1651
6	0.0026	1722
7	0.0004	1681
8	0.002	1603
	0.0063	1640

(52.9)

EF AIR QUALITY SERVICES
VELOCITY DETERMINATION

Validated 10/00

PLANT : Valley Landfill
SAMPLE LOCATION : Outlet
RUN NUMBER : VO-1

DATE :	11/26/01	BAROMETRIC PRESS., in. Hg :	29.42
TIME(24-HR) :	1710	STATIC PRESS., in. H2O :	-0.001
OPERATOR(S) :	EC/PF		
PERCENT MOISTURE :	5.6	PITOT TUBE, Cp :	0.84
STACK AREA, SQ. IN. :	102936.77	PERCENT CO2 :	7.4
NO. OF TRAVERSE PTS. :	8	PERCENT O2 :	10.6

TRAVERSE PT. NO.	VELOCITY HEAD, in. H2O	STACK TEMP., deg. F
1	0.002	1736
2	0.000	1612
3	0.002	1516
4	0.004	1631
5	0.003	1730
6	0.004	1672
7	0.003	1596
8	0.001	1620
	0.003	1640

ET AIR QUALITY SERVICES
VELOCITY DETERMINATION

PLANT :	Valley Landfill			
SAMPLE LOCATION :	Outlet			
	Run No:	VO-1	VO-2	VO-3
STACK PRESSURE, in Hg :		29.37	29.36	29.42
STACK TEMP., deg. F :		1621	1640	1640
MOLECULAR WEIGHT, DRY :		29.50	29.56	29.61
MOLECULAR WEIGHT, STACK :		28.63	28.90	28.96
AVG. SQRT. VELOCITY HEAD :		0.05	0.05	0.05
VELOCITY, fps :		5.22	5.79	5.19
ACTUAL CUBIC FEET/MINUTE :		223.75	24839	222.83
DRY STANDARD CUBIC FEET/MINUTE :		5152	5776	5204

NO_x CALCULATIONS

$$\text{Equation 1:}\quad V_s = 17.647 \times (V_f - 25) \times \left[\left(\frac{P_b - P}{T + 460} \right)_f - \left(\frac{P_b - P}{T + 460} \right)_i \right]$$

Where:

V_s = Sample volume, ml

V_f = Flask volume, ml

P_b = Barometric pressure, in.Hg

P = Flask pressure, in.Hg

T = Flask temperature, °F

Note: Subscripts f and i indicate final and initial, respectively.

$$\text{Equation 2:}\quad C_{NO_x} = \frac{522.5 \times P_{NO_x}}{V_s}$$

Where:

C_{NO_x} = NO_x concentration, ppm

P_{NO_x} = micrograms NO_x, µg

$$\text{Equation 3:} \quad C'_{NO_x} = \frac{6.243 \times 10^{-5} \times P_{NO_x}}{V_s}$$

Where:

C'_{NO_x} = NO_x concentration, lb/dscf

$$\text{Equation 4:} \quad E_{NO_x} = C'_{NO_x} \times Q_{s_{std}} \times 60$$

Where:

E_{NO_x} = NO_x emission rate, lb/h

$Q_{s_{std}}$ = Volumetric flow rate, dscfm

NOx Emissions Calculations

PLANT : Valley Landfill
LOCATION : Flare Outlet
DATE : 11/26/91

	Final	Initial
Barometric Pressure(in. Hg):	29.68	29.42

Run No.	Test Time (24-hr)	Flask Volume ml	Final Pressure in. Hg	Final Temp. °F	Initial Pressure in. Hg	Initial Temp. °F	Sample Volume ml	PNOx µg	CPPM ppm	Qstd dscfm	NOx Emissions lb/dscf	NOx Emissions lb/h
VN-1	1750	2062.0	4.3	54	27.00	32	1600.9	< 39	< 13 12.7	13972	< 1.52E-06	< 1.27
VN-2	1805	1990.4	3.3	53	26.50	32	1577.0	< 39	< 13 12.9	13972	< 1.54E-06	< 1.29
VN-3	1820	2027.4	3.6	52	25.80	32	1542.7	< 39	< 13.2	13972	< 1.58E-06	< 1.32
VN-4	1835	2009.5	4.2	51	26.70	32	1555.3	< 39	< 13.1	13972	< 1.57E-06	< 1.32
Average									< 13.0		< 1.55E-06	< 1.30
VN-5	1850	2038.0	3.5	56	26.40	31	1586.8	< 39	< 13 12.8	13972	< 1.53E-06	< 1.28
VN-6	1905	2012.8	3.8	52	26.80	32	1599.3	< 39	< 13 12.7	13972	< 1.52E-06	< 1.27
VN-7	1920	2047.0	3.7	53	26.60	31	1601.4	< 39	< 13 12.7	13972	< 1.52E-06	< 1.27
VN-8	1935	2018.5	3.4	56	26.40	31	1578.0	< 39	< 13 12.9	13972	< 1.54E-06	< 1.29
Average									< 13 12.8		< 1.53E-06	< 1.28
VN-9	1950	2073.3	3.9	55	26.50	31	1597.2	< 39	< 13 12.8	13972	< 1.53E-06	< 1.27
VN-10	2005	2040.1	4.1	55	26.40	31	1550.3	< 39	< 13.1	13972	< 1.57E-06	< 1.32
VN-11	2020	2085.9	3.7	55	26.30	31	1610.6	< 39	< 13 12.7	13972	< 1.51E-06	< 1.27
VN-12	2035	1979.3	4.0	55	26.60	31	1520.9	< 39	< 13.4	13972	< 1.60E-06	< 1.34
Average									< 13.0		< 1.55E-06	< 1.30
Overall Average									< 13 12.9		< 1.54E-06	< [illegible]

[illegible] 1-14-92

APPENDIX B

FIELD DATA

FIELD AUDIT REPORT: DRY GAS METER BY CRITICAL ORIFICE

DATE: 11-25-91

CLIENT: [illegible]

BAROMETRIC PRESSURE (P_{bar}): 29.30 in.Hg

METER BOX NO. [illegible]

ORIFICE NO. 7

PRETEST Y: .972 ΔH@ 2.01 in.H_2O

ORIFICE K FACTOR: 4.886 x 10⁻⁴

AUDITOR: PJ

Orifice manometer reading ΔH, in.H_2O	Dry gas meter reading V_i/V_f, ft³	Temperatures: Ambient T_{ai}/T_{af}, °F	Ambient Average T_a, °F	Dry gas meter Inlet T_{ii}/T_{if}, °F	Dry gas meter Outlet T_{oi}/T_{of}, °F	Dry gas meter Average T_m, °F	Duration of run Ø min.
2.15	900.4	52	53	90	90	91.75	14.91
	912.0	54		94	93		

Dry gas meter V_m, ft³	$V_{m_{std}}$, ft³	$V_{m_{act}}$, ft³	Audit, Y	Y deviation, %	Audit ΔH@, in.H_2O	ΔH@ Deviation, in.H_2O
11.6	11.9	11.3	.950	-2.3%	2.12	+.11

$$V_{m_{std}} = \frac{17.647(V_m)(P_{bar} + \Delta H/13.6)}{(T_m + 460)} = 11.9 \text{ ft}^3$$

$$V_{m_{act}} = \frac{1203(\,Ø\,)(\,K\,)(P_{bar})}{\sqrt{(T_a + 460)}} = 11.3 \text{ ft}^3$$

$$\text{Audit } Y = \frac{V_{m_{act}}}{V_{m_{std}}} = .950 \qquad Y \text{ deviation} = \frac{\text{Audit } Y - \text{Pretest } Y}{\text{Pretest } Y} \times 100 = -2.3$$

$$\text{Audit } \Delta H@ = (0.0317)(\Delta H)(P_{bar})(T_m + 460)\left[\frac{Ø}{Y(V_m)(P_{bar} + \Delta H/13.6)}\right]^2 = 2.12 \text{ in.}H_2O$$

Audit Y must be in the range, pretest Y ±0.05 Y.
Audit ΔH@ must be in the range pretest ΔH@ ±0.15 inches H_2O.

THERMOCOUPLE DIGITAL INDICATOR
AUDIT DATA SHEET

Date 11-25-97 Indicator No. FT-1 Operator PS

Test Point No.	Millivolt signal*	Equivalent temperature, °F*	Digital indicator temperature reading, °F	Difference, %
1		0	-2	.43
2		600	597	.3
3		1200	1193	.42
4		1800	1792	.4

Percent difference must be less than or equal to 0.5%.

Percent difference:

$$\frac{\text{(Equivalent temperature °R - Digital indicator temperature reading °R)}(100\%)}{\text{(Equivalent temperature °R)}}$$

Where °R = °F + 460°F

* These values are to be obtained from the calibration data sheet for the calibration device.

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Plant [illegible]

Date [illegible]

Sampling location [illegible]

Inside of far wall to outside of nipple 14 3/4

Inside of near wall to outside of nipple (nipple length): 3

Stack inside diameter, inches 11 3/4

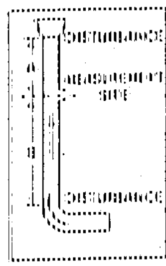
Distance downstream from flow disturbance (Distance B):

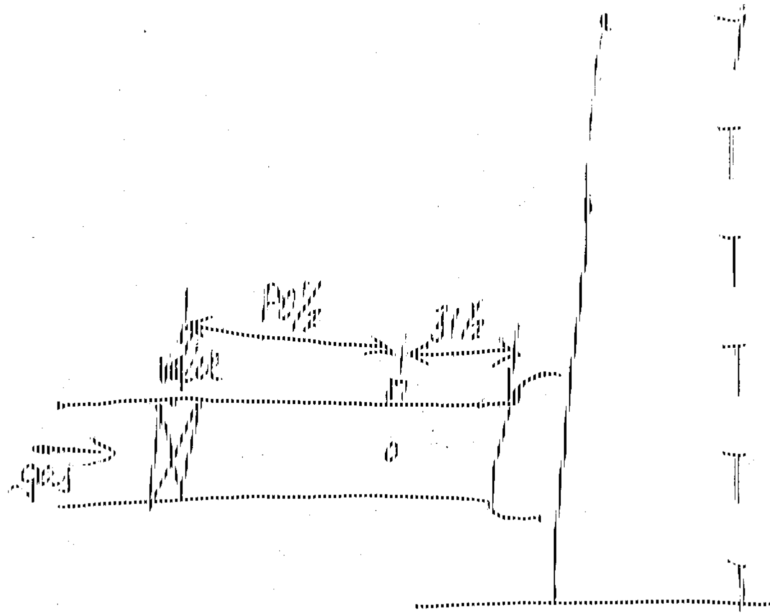
______ inches / diameter = 7.1 dd

Distance upstream from flow disturbance (Distance A):

______ inches / diameter = 2.5 dd

Calculated by [illegible]





SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	NIPPLE LENGTH	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	.044	11 3/4		3	3 1/2
2	.146				4 5/8
3	.296				6 1/2
4	.704				11
5	.854				12 3/4
6	.956				13 3/4

Method 25 Field Data

Plant [illegible] City [illegible] Date 11-20-97

Run No. 25-1 Sample Location [illegible]

Operator [illegible]

Tank No. [illegible] Tank Volume, Liters 4

Trap No. [illegible] Cylinder No. 97

Sampling Rate 200 cc/min. Filter Type [illegible] in stack

[illegible] out of stack

Sample Train Data

	Barometric Pressure, mm Hg	Ambient Temperature, °F °C	Sample Tank Gauge Vacuum, mm Hg
Pre-Test:	27.37	21. °	209.
Post-Test:	29.54	2F. °	27.

Front-Half - Leak Check Data

Time	Initial Vacuum, mm Hg	Time	Final Vacuum, mm Hg	ΔP, mm Hg	Leak Rate,* cc/min

Sampling Data

Time		Gauge Vacuum, mm Hg	Temperatures, °F	
Clock	Sampling, min		Probe	Filter Box
1157	0	209.	—	—
1209	20	225		
1215	26	36	104	
1229	30	237		
1239	40	1342		
1249	50	75		
1259	60	27		

* Leak Rate, cc/min = $\frac{\Delta P, \text{mm} \times \text{Volume, cm}^3}{Pb, \text{mm} \times \text{Time, min}}$

Leak rate must be <0.01 x sampling rate
(0.8 cc/min leak rate at sampling rate of 80 cc/min)
(volume = 100 cm³ for less than 4 ft probe)

[illegible] - 20 °F

[illegible] - 25 °F

Method 25 Field Data

Plant [illegible] City [illegible] Date 7-24-91

Run No. [illegible] Sample Location [illegible]

Operator [illegible]

Tank No. [illegible] Tank Volume, Liters [illegible]

Trap No: [illegible] Calibrated By No. [illegible]

Sampling Rate [illegible] cc/min. Filter Type [illegible] in stack

[illegible] out of stack

Sample Train Data

	Barometric Pressure, mm Hg	Ambient Temperature, °F °C	Sample Tank Gauge Vacuum, mm Hg
Pre-Test	[illegible]	[illegible]	[illegible]
Post-Test	[illegible]	[illegible]	[illegible]

Front-Half - Leak Check Data

Time	Initial Vacuum, mm Hg	Time	Final Vacuum, mm Hg	ΔP, mm Hg	Leak Rate,* cc/min
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Sampling Data

Time		Gauge Vacuum, mm Hg	Temperatures, °F	
Clock	Sampling, min		Probe	Filter Box
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		

* Leak Rate, cc/min = $\frac{\Delta P, \text{mm} \times \text{Volume, cm}^3}{Pb, \text{mm} \times \text{Time, min}}$

Leak rate must be <0.01 x sampling rate
(0.8 cc/min leak rate at sampling rate of 80 cc/min)
(volume = 100 cm³ for less than 4 ft probe)

Method 25 Field Data

Plant [illegible] City [illegible] Date 10-26-97

Run No. 1-3 Sample Location [illegible]

Operator [illegible]

Tank No. [illegible] Tank Volume, Liters 4

Trap No. [illegible] Flowmeter No. [illegible]

Sampling Rate 90 cc/min. Filter Type _____ in stack

_____ out of stack

Sample Train Data

	Barometric Pressure, mm Hg	Ambient Temperature, °F °C	Sample Tank Gauge Vacuum, mm Hg
Pre-Test	29.46	35 "	760
Post-Test	29.40	35 "	40

Front-Half - Leak Check Data

Time	Initial Vacuum, mm Hg	Time	Final Vacuum, mm Hg	ΔP, mm Hg	Leak Rate,* cc/min

Sampling Data

Time		Gauge Vacuum, mm Hg	Temperatures, °F	
Clock	Sampling, min		Probe	Filter Box
1533	0	760		
	10	550		
	20	395		
	30	284	114	
	40	163		
	50	100		
1633	60	60		

* Leak Rate, cc/min = $\frac{\Delta P, \text{mm} \times \text{Volume}, \text{cm}^3}{Pb, \text{mm} \times \text{Time}, \text{min}}$

Leak rate must be <0.01 x sampling rate
(0.9 cc/min leak rate at sampling rate of 90 cc/min)
(volume = 100 cm^3 for less than 4 ft probe)

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant and City Valley Lee, OH Date 11/24/91

Sampling Location Stack Clock Time 1345

Run No. VT-1 Operator DLB/PF

Barometric Pressure, in.Hg 29.35 Static Pressure, in.H_2O -0.20

Moisture, % 2.9 Molecular wt., Dry ____ Pitot Tube, Cp 1.00

Stack Dimension, in. Diameter or Side 1 17.5 Side 2 ____

FIELD DATA

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp, in.H_2O)	STACK TEMP., °F
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

CALCULATIONS

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

$$M_s = \left(\quad\right) \times \left(1 - \frac{\quad}{100}\right) + 18 \left(\frac{\quad}{100}\right)$$

M_s =

T_s = °F + 460 = °R

$P_s = P_g + \frac{\Delta p}{13.6} = \left(\quad\right) + \frac{\quad}{13.6}$

P_s = in.Hg

$\sqrt{\Delta p}$ =

$V_s = 85.49 \times Cp \times \sqrt{\Delta p} \times \sqrt{\frac{T_s}{P_s \times M_s}}$

$V_s = 85.49 \times \left(\quad\right) \times \left(\quad\right) \times \sqrt{\frac{\quad}{\quad}}$

V_s = ft/s

A_s = ft²

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

Q_s = × × 60

Q_s = acfm

$Q_{std} = C_s \times 17.647 \times P_s \times \left(1 - \frac{\%H_2O}{100}\right)$

Q_{std} = × 17.647 × × $\left(1 - \frac{\quad}{100}\right)$

Q_{std} = dscfm

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant and City Valley Landfill — Date 11/26/91

Sampling Location Inlet — Clock Time 1520

Run No. V12 — Operator [illegible]

Barometric Pressure, in.Hg 29.34 — Static Pressure, in.H_2O -4.7

Moisture, % 2.9 — Molecular wt., Dry _____ — Pitot Tube, Cp _____

Stack Dimension, in. Diameter or Side 1 [illegible] — Side 2 _____

FIELD DATA

TRAVERSE POINT NUMBER	VELOCITY HEAD (ΔP_s), in.H_2O	STACK TEMP., °F
[illegible]		

CALCULATIONS

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

M_s = ( ) × (1 −) + 18 ( )

M_s =

T_s = °F = °R = (°F + 460)

$P_s = P_b + \frac{S.P.}{13.6}$ = ( ) = in.Hg

P_s = in.Hg

$\sqrt{\Delta P}$ =

$V_s = 85.49 \times Cp \times \sqrt{\Delta P} \times \sqrt{\frac{T_s}{P_s \times M_s}}$

V_s = 85.49 × ( ) × ( ) × $\sqrt{\quad}$

V_s = ft/s

A_s = ft²

$Q_s = V_s \times A_s \times \frac{60 s}{ft}$

Q_s = × ×60

Q_s = acfm

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

Q_{std} = × 17.647 × × (1 −)

Q_{std} = dscfm

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant and City [illegible] Date [illegible]

Sampling Location [illegible] Stack Time 1725 (uncertain)

Run No. VI-3 (uncertain) Operator [illegible]

Barometric Pressure, in.Hg 29.42 (uncertain) Static Pressure, in.H_2O -.77 (uncertain)

Moisture, % 2.9 (uncertain) Molecular wt., Dry [illegible] Pitot Tube, Cp .800 (uncertain)

Stack Dimension, in. Diameter or Side 1 110 (uncertain) Side 2

FIELD DATA

TRAVERSE POINT NUMBER	VELOCITY HEAD (ΔP_s), in.H_2O	STACK TEMP., °F
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

CALCULATIONS

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

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

$M_s =$

$T_s = \quad °F + \quad °R = (°F + 460)$

$P_s = P_b + \frac{SP}{13.6} = (\quad) + \frac{\quad}{13.6}$

$P_s =$ in.Hg

$\sqrt{\Delta P} =$

$V_s = 85.49 \times Cp \times \sqrt{\Delta P} \times \sqrt{\frac{T_s}{P_s \times M_s}}$

$V_s = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{\quad \times \quad}}$

$V_s =$ ft/s

$A_s =$ ft²

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

$Q_s = \quad \times \quad \times 60$

$Q_s =$ acfm

$Q_{s_{std}} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times (1 - \frac{H_2O}{100})$

$Q_{s_{std}} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Q_{s_{std}} =$ dscfm

INTERNATIONAL TECHNOLOGY CORPORATION

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Valley Power AFB

DATE 11/20/91 TEST NO. VT-1

SAMPLING TIME (24-hr CLOCK) 1137-1259

SAMPLING LOCATION Prim. Duct

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Int Bag

ANALYTICAL METHOD Orsat

AMBIENT TEMPERATURE 70

OPERATOR TDW

ORSAT LEAK CHECKED ✓

COMMENTS: #142

GAS \ RUN	1 ACTUAL READING	1 NET	2 ACTUAL READING	2 NET	3 ACTUAL READING	3 NET	AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
CO_2	26.4	26.4	26.4	26.4		#	26.4	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	21.6	5.2	21.5	4.9			5.0	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)							68.4	28/100	
								TOTAL	

Pg 1 of 1

INTERNATIONAL TECHNOLOGY CORPORATION

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Wabash Lb-ASH

DATE 11/26/97 TEST NO. VE-2

SAMPLING TIME (24 H CLOCK) 1101-1108

SAMPLING LOCATION Sweet

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) INT Bag

ANALYTICAL METHOD Orsat

AMBIENT TEMPERATURE 70

OPERATOR [illegible]

ORSAT LEAK CHECKED ✓

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	25.4	25.4	25.3	25.3			25.4	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	30.9	5.4	30.5	5.2			5.3	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)							69.3	28/100	
								TOTAL	

INTERNATIONAL TECHNOLOGY CORPORATION

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Valley Landfill

DATE 4/24/95 TEST NO VC-3

SAMPLING TIME (24h CLOCK) 1533-1633

SAMPLING LOCATION Inlet

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Bag

ANALYTICAL METHOD ORSAT

AMBIENT TEMPERATURE 80

OPERATOR CAB

ORSAT LEAK CHECKED ✓

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	24.7	24.7	24.7	24.7			24.7	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	30.2	5.5	30.2	5.5			5.5	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)							69	%/100	
								TOTAL	

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Plant [illegible]

Date [illegible]

Sampling location [illegible]

Inside of far wall to outside of nipple [illegible]

Inside of near wall to outside of nipple (nipple length):

7"

Stack inside diameter, inches [illegible]

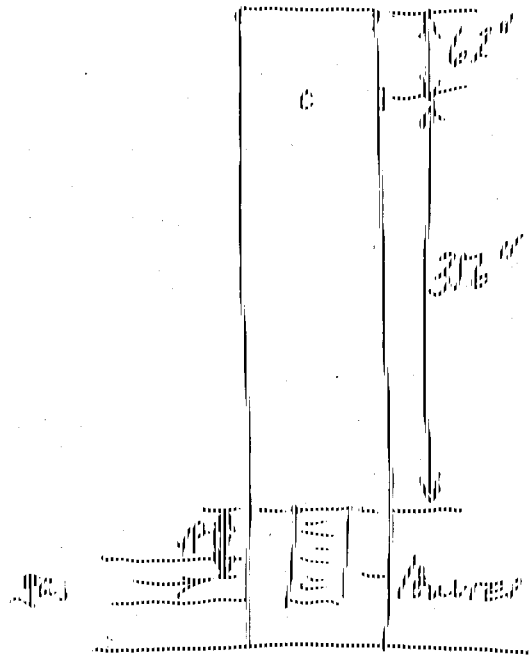
Distance downstream from flow disturbance (Distance B):

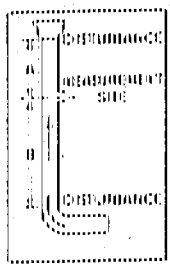
[illegible] inches / diameter = [illegible] dd

Distance upstream from flow disturbance (Distance A):

[illegible] inches / diameter = [illegible] dd

Calculated by [illegible]





SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/4 INCH)	NIPPLE LENGTH	TRAVERSE POINT LOCATION (FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.32	11.75		7	10.7
2	1.01				18.9
3	1.84				28.6
4	3.23				44.9
5	4.77				63.7
6	6.80				86.9
7	9.67				120.3
8	11.75				142.5
9					
10					
11					
12					

Method 25 Field Data

Plant [illegible] City [illegible] Date [illegible]

Run No. [illegible] Sample Location [illegible]

Operator [illegible]

Tank No. [illegible] Tank Volume, liters 6.

Trap No. ________ [illegible] No. [illegible]

Sampling Rate 90 cc/min. Filter Type ________ in stack

[illegible] out of stack

Sample Train Data

	Barometric Pressure, mm Hg	Ambient Temperature, °F °C	Sample Tank Gauge Vacuum, mm Hg
Pre-Test	29.40	45	722
Post-Test	29.40	43	81

Front-Half - Leak Check Data

Time	Initial Vacuum, mm Hg	Time	Final Vacuum, mm Hg	ΔP, mm Hg	Leak Rate,* cc/min

Sampling Data

Time: Clock	Time: Sampling, min	Gauge Vacuum, mm Hg	Temperatures, °F: Probe	Temperatures, °F: Filter Box
1159	0	722		
	10	593		
	20	469	NA	
	30	355		
	40	231		
	50	152		
1259	60	81		

$$\text{* Leak Rate, cc/min} = \frac{\Delta P\text{, mm} \times \text{Volume, cm}^3}{\text{Pb, mm} \times \text{Time, min}}$$

Leak rate must be ≤0.01 x sampling rate
(0.8 cc/min leak rate at sampling rate of 80 cc/min)
(volume = 100 cm³ for less than 4 ft probe)

Method 25 Field Data

Plant [illegible] City [illegible] Date [illegible]

Run No. VO-2 Sample Location [illegible]

Operator [illegible]

Tank No. [illegible] Tank Volume, Liters 6

Trap No. Rotameter No. 36

Sampling Rate 90 cc/min. Filter Type ______ in stack

[illegible] out of stack

Sample Train Data

	Barometric Pressure, mm Hg	Ambient Temperature, °F °C	Sample Tank Gauge Vacuum, mm Hg
Pre-Test	2935	55	662
Post-Test	2935	50	98

Front-Half - Leak Check Data

Time	Initial Vacuum, mm Hg	Time	Final Vacuum, mm Hg	ΔP, mm Hg	Leak Rate,* cc/min

Sampling Data

Time: Clock	Time: Sampling, min	Gauge Vacuum, mm Hg	Temperatures, °F: Probe	Temperatures, °F: Filter Box
1408	0	662		
	10	574		
	20	355	104	
	30	296		
	40	193		
	50	133		
1508	60	98		

$$\text{* Leak Rate, cc/min} = \frac{\Delta P\text{, mm} \times \text{Volume, cm}^3}{\text{Pb, mm} \times \text{Time, min}}$$

Leak rate must be <0.01 x sampling rate
(0.8 cc/min leak rate at sampling rate of 80 cc/min)
(volume = 100 cm³ for less than 4 ft probe)

Method 25 Field Data

Plant [illegible] City [illegible] Date 11-26-97

Run No. 25-3 Sample Location [illegible]

Operator [illegible]

Tank No. 0972-1 Tank Volume, Liters 4

Trap No. [illegible] Rotameter No. 34

Sampling Rate 90. cc/min. Filter Type [illegible] in stack

[illegible] out of stack

Sample Train Data

	Barometric Pressure, mm Hg	Ambient Temperature, °F	°C	Sample Tank Gauge Vacuum, mm Hg
Pre-Test	29.35	47.		712
Post-Test	29.35	43.		72

Front-Half - Leak Check Data

Time	Initial Vacuum, mm Hg	Time	Final Vacuum, mm Hg	ΔP, mm Hg	Leak Rate,* cc/min

Sampling Data

Time		Gauge Vacuum, mm Hg	Temperatures, °F	
Clock	Sampling, min		Probe	Filter Box
1023	0	712		
	5	583		
	10	444	274	
	15	344		
	20	233		
	25	127		
1053	30	87		

* Leak Rate, cc/min = $\frac{\Delta P, \text{mm} \times \text{Volume, cm}^3}{Pb, \text{mm} \times \text{Time, min}}$

Leak rate must be <0.01 x sampling rate
(0.8 cc/min leak rate at sampling rate of 80 cc/min)
(volume = 100 cm³ for less than 4 ft probe)

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant and City [illegible] Date 11/26/91

Sampling Location [illegible] Clock Time 1320

Run No. VO-1 Operator [illegible]

Barometric Pressure, in.Hg 29.37 Static Pressure, in.H_2O -.001

Moisture, % ______ Molecular wt., Dry ______ Pitot Tube, Cp .84

Stack Dimension, in. Diameter or Side 1 119¼ Side 2 ______

FIELD DATA

TRAVERSE POINT NUMBER	VELOCITY HEAD (ΔP_s), in.H_2O	STACK TEMP., °F
1	.003	153
2	.003	163
3	.002	163
4	.003	150
5	.007	[illegible]
6	.003	[illegible]
7	.003	[illegible]
8	.002	161

CALCULATIONS

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

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

$M_s =$

$T_s =$ °F = °R (°F + 460)

$P_s = P_b + \frac{S.P.}{13.6} = ($ $) + \frac{\quad}{13.6}$

$P_s =$ in.Hg

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

$v_s = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s}{P_s \times M_s}}$

$v_s = 85.49 \times ($ $) \times ($ $) \times \sqrt{\frac{\quad}{\quad}}$

$v_s =$ ft/s

$A_s =$ ft²

$Q_s = v_s \times A_s \times \frac{60 s}{m}$

$Q_s =$ $\times$ $\times 60$

$Q_s =$ acfm

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

$Q_{s_{std}} =$ $\times 17.647 \times$ $\times (1 - \frac{\quad}{100})$

$Q_{s_{std}} =$ dscfm

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant and City [illegible] Date 11/26/91

Sampling Location Outlet Clock Time 1520

Run No. VO-2 Operator DW/TF

Barometric Pressure, in.Hg 29.36 Static Pressure, in.H_2O -.001

Moisture, % ______ Molecular wt., Dry ______ Pitot Tube, Cp .84

Stack Dimension, in. Diameter or Side 1 17 7/8 Side 2 ______

FIELD DATA

TRAVERSE POINT NUMBER	VELOCITY HEAD (ΔP_s), in.H_2O	STACK TEMP., °F
1	.006	162
2	.003	175
3	.002	161
4	.005	170
5	.006	157
6	.006	164
7	.004	165
8	.002	163

CALCULATIONS

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

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

$M_s =$

$T_s =$ °F + °R = (°F + 460)

$P_s = P_b + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$P_s =$ in.Hg

$\sqrt{\Delta P} =$

$V_s = 85.49 \times Cp \times \sqrt{\Delta P} \times \sqrt{\frac{T_s}{P_s \times M_s}}$

$V_s = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{\quad}}$

$V_s =$ ft/s

$A_s =$ ft²

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

$Q_s = \quad \times \quad \times 60$

$Q_s =$ acfm

$Q_{s_{std}} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times (1 - \frac{H_2O}{100})$

$Q_{s_{std}} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Q_{s_{std}} =$ dscfm

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant and City Valley La... OSU Date 11/26/91

Sampling Location OSU Clock Time 1210

Run No. VO-3 Operator DSPE

Barometric Pressure, in.Hg 29.42 Static Pressure, in.H_2O -.001

Moisture, % ______ Molecular wt., Dry ______ Pitot Tube, Cp .84

Stack Dimension, in. Diameter or Side 1 11 1/4 Side 2 ______

FIELD DATA

TRAVERSE POINT NUMBER	VELOCITY HEAD (ΔP_s), in.H_2O	STACK TEMP., °F
1	.000	173
2	.002	168
3	.002	168
4	.003	168
5	.003	165
6	.004	168
7	.005	168
8	.002	170

CALCULATIONS

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

M_s = (   ) x (1 - ——/100) + 18 (——/100)

M_s =

T_s =   °F =   °R = (°F + 460)

$P_s = P_b + \frac{S.P.}{13.6}$ = (   ) + ——/13.6

P_s =   in.Hg

$\sqrt{\Delta P}$ =

$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{T_s}{P_s \times M_s}}$

V_s = 85.49 x (   ) x (   ) x $\sqrt{\quad}$

V_s =   ft/s

A_s =   ft²

$Q_s = V_s \times A_s \times 60$

Q_s =   x   x 60

Q_s =   acfm

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

$Q_{s_{std}}$ =   x 17.647 x —— x (1 - ——/100)

$Q_{s_{std}}$ =   dscfm

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Valley La. KY	11/14/91	Flue outlet	Mo/Mn	MO-1

OPERATOR(S)	BAR. PRESS. (in. Hg)	STATIC PRESS. (in. H_2O)	AMB. TEMP. (°F)	FILTER NUMBER(S)	STACK INSIDE DIA. (in.)		PITOT TUBE Cp	PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NUMBER
DW	29.40		21				.84	4' glass	N/A	

MOISTURE (%)	METER BOX NO.	METER ΔH@	METER CAL FACTOR (Y)	THERM. NO.	PITOT NO.	IMP. THERM. NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR	PROBE HEAT (°F)	BOX HEAT (°F)	PITOT LEAK CHECK INIT.	PITOT LEAK CHECK FINAL
	FF-4	2.01	.992			I-7F		10	.005	6	.002	-	250			

TRAVERSE POINT NUMBER	SAMPLING TIME, min.	CLOCK TIME (24-hr CLOCK)	GAS METER READING (Vm), ft³	VELOCITY HEAD (ΔP), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMP. (Ts), °F	DRY GAS METER TEMPERATURE INLET (T_m in), °F	DRY GAS METER TEMPERATURE OUTLET (T_m out), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMP., °F	IMPINGER TEMP., °F
	0	1205	914.259									
	10	1215	920.38		2.01	2.01		46	47	5.2		52
	20	1225	933.69		2.01	2.01		46	48	6.6		62
	30	1235	941.004		2.01	2.01		48	49	6.0		69
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MOISTURE
SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Valley Asphalt
Sample location Baghouse
Run number M5-1
Sample date 4/26/94
Recovery date 4/26/94
Recovered by DJB

MOISTURE

	1st, 2nd, and 3rd		4th silica gel
Impingers			
Final volume	229 ml	Final weight	2466.4 g
Initial volume	200 ml	Initial weight	2029.5 g
Net Gain	29 ml	Net gain	9.5 g

Total moisture 37.5 g

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
VALLEY LANDFILL	11/26/91	FLARE OUTLET	MOISTURE	NO. 2

OPERATOR(S)	BAR. PRESS. (in. Hg)	STATIC PRESS. (in. H_2O)	AMB. TEMP. (°F)	FILTER NUMBER(S)	STACK INSIDE DIA. (in.)	PITOT TUBE Cp	PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NUMBER
PT/BD	29.4		28		114/4	.84 .84	4' GLASS	A8	

MOISTURE (%)	METER BOX NO.	METER ΔH@	METER CAL FACTOR (Y)	THERM. NO.	PITOT NO.	IMP. THERM. NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR	PROBE HEAT (°F)	BOX HEAT (°F)	PITOT LEAK CHECK INIT.	PITOT LEAK CHECK FINAL
	FT-4	1.71	.972			I-19		10	.002	4	.001		250			

TRAVERSE POINT NUMBER	SAMPLING TIME, min.	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (ΔP), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL ACTUAL	STACK TEMP. (T_s), °F	DRY GAS METER TEMPERATURE INLET (T_m in), °F	DRY GAS METER TEMPERATURE OUTLET (T_m out), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMP., °F	IMPINGER TEMP., °F
	0	1418	941.224									
	10	1428	948.56		2.01	2.01		46	44	2.0		63
	20	1438	956.00		2.01	2.01		47	44	2.0		64
	30	1448	963.572		2.01	2.01		50	45	2.0		66
									46			

MOISTURE
SAMPLE RECOVERY AND INTEGRITY SHEET

Plant [illegible]

Sample location [illegible]

Run number [illegible]

Sample date [illegible]

Recovery date [illegible]

Recovered by [illegible]

MOISTURE

Impingers	1st, 2nd, and 3rd		4th silica gel	
Final volume	219 ml	Final weight	625.2 g	
Initial volume	200 ml	Initial weight	615.3 g	
Net Gain	19 ml	Net gain	9.9 g	

Total moisture 28.9 g

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Valley Landfill	11/26/91	Outlet	[illegible]	M0-3

OPERATOR(S)	BAR. PRESS. (in. Hg)	STATIC PRESS. (in. H_2O)	AMB. TEMP. (°F)	FILTER NUMBER(S)	STACK INSIDE DIA. (in.)	PITOT TUBE Cp	PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NUMBER
DC/RF	29.35		35		11 1/4	.84	4' Glass		

MOISTURE (%)	METER BOX NO.	METER ΔH@	METER CAL FACTOR (Y)	THERM. NO.	PITOT NO.	IMP. THERM. NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR	PROBE HEAT (°F)	BOX HEAT (°F)	PITOT LEAK CHECK INIT.	PITOT LEAK CHECK FINAL
	FT-4	2.01	.992			I-2H		10	.003	2	.001		250			

TRAVERSE POINT NUMBER	SAMPLING TIME, min.	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (ΔP), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMP. (T_s), °F	DRY GAS METER TEMPERATURE INLET (T_m in), °F	OUTLET (T_m out), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMP., °F	IMPINGER TEMP., °F
	0	1536	963.748									
	10	1546	971.30		2.01	2.01		47	48	2.0		38
	20	1556	978.9		2.01	2.01		50	48	2.0		47
	30	1606	986.202		2.01	2.01		51	49	2.0		54
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MOISTURE
SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Valley Energy
Sample location Duct
Run number 123

Sample date 4/26/91
Recovery date 4/26/91
Recovered by DG

MOISTURE

	1st, 2nd, and 3rd		4th silica gel	
Impingers		Final weight	2126.6	g
Final volume	220 ml	Initial weight	2082.1	g
Initial volume	200 ml	Net gain	44.5	g
Net Gain	20 ml			

Total moisture 64.5 g

INTERNATIONAL TECHNOLOGY CORPORATION

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Valley LandFill

DATE 11/24/PM TEST NO VO-1

SAMPLING TIME (24hr CLOCK) 1157-1759

SAMPLING LOCATION Flare Outlet

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Bag

ANALYTICAL METHOD Orsat

AMBIENT TEMPERATURE 70

OPERATOR BW

ORSAT LEAK CHECKED ✓

COMMENTS:

GAS \ RUN	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	6.7	6.7	6.7	6.7			6.7	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	17.4	10.7	17.2	10.5			10.6	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)							92.7	28/100	
								TOTAL	

INTERNATIONAL TECHNOLOGY CORPORATION

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Valley LandFill

DATE 11/26/91 TEST NO VO-2

SAMPLING TIME (24-hr CLOCK) 1407-1507

SAMPLING LOCATION Outlet

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Int. Bag

ANALYTICAL METHOD Orsat

AMBIENT TEMPERATURE 70

OPERATOR RW

ORSAT LEAK CHECKED ✓

COMMENTS:

GAS \ RUN	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	7.3	7.3	7.5	7.5			7.4	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	16.8	9.5	16.9	9.4			9.4	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)							83.2	28/100	
								TOTAL	

INTERNATIONAL TECHNOLOGY CORPORATION

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Volvo LaGrange

DATE 11/24/97 TEST NO. VO-3

SAMPLING TIME (24hr CLOCK) 1533-1635

SAMPLING LOCATION Stack

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Int Bag

ANALYTICAL METHOD Orsat

AMBIENT TEMPERATURE 70

OPERATOR (illegible)

ORSAT LEAK CHECKED ✓

COMMENTS:

RUN / GAS	1 ACTUAL READING	1 NET	2 ACTUAL READING	2 NET	3 ACTUAL READING	3 NET	AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb mole
CO_2	7.4	7.4	7.3	7.3			7.4	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.0	10.6	18.0	10.7			10.6	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)							82.0	28/100	
								TOTAL	

NITROGEN OXIDE FIELD DATA SHEET

PLANT: VALLEY LANDFILL

SAMPLE LOCATION: STACK OUTLET

OPERATOR: [illegible]

REAGENT VOLUME: 25 ML

CITY: [illegible] PA

DATE: 11-26-91

INITIAL BAROMETRIC PRESSURE: 29.43 in. Hg

FINAL BAROMETRIC PRESSURE: 29.68 in. Hg

RUN NO.	SAMPLE TIME (24 hr.)	FLASK AND VALVE NO's	VOLUME OF FLASK AND VALVE, ml	FLASK TEMP. (INITIAL), °F	INITIAL FLASK PRESSURE LEG 1 in. Hg	INITIAL FLASK PRESSURE LEG 2 in. Hg	FLASK TEMP. (FINAL) °F	FINAL FLASK PRESSURE LEG 1 in. Hg	FINAL FLASK PRESSURE LEG 2 in. Hg
VN-1	1750	LL	2063.0	32	13.5	13.5	54	1.70	2.55
VN-2	1805	SAA	1990.4	32	13.3	13.2	53	1.25	2.05
VN-3	1820	SQ	2027.4	32	12.9	12.9	52	1.35	2.20
VN-4	1835	KP	2009.5	32	13.3	13.4	51	1.65	2.50
VN-5	1850	WW	2038.0	31	13.2	13.2	56	1.30	2.15
VN-6	1905	9F	2012.8	32	13.4	13.4	52	1.40	2.20
VN-7	1920	KK	2047.0	31	13.3	13.3	53	1.45	2.25
VN-8	1935	IHA	2016.5	31	13.2	13.2	56	1.25	2.10
VN-9	1950	FL	2075.3	31	13.3	13.2	55	1.50	2.35
VN-10	2005	WF	2040.05	31	13.2	13.2	55	1.60	2.45
VN-11	2020	EE	2095.9	31	13.2	~~13.1~~ (B)	55	1.45	2.25
VN-12	2035	WKB	1979.5	31	13.3	13.3	55	1.60	2.40

APPENDIX C

LABORATORY DATA

9112026-T

AIR TOXICS LTD.

Modified US EPA Method 25C

(NMVOC)

Cryofocussed GC/FID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	MDL (ppmv)	Amount (ppmv)	
XI-11-149-01A	9112026-01A	6122005	11/26/91	NMVOC	160	1.6	420	VI-1
XI-11-149-02A	9112026-02A	6122004	11/26/91	NMVOC	67	0.67	430	VI-2
XI-11-149-03A	9112026-03A	6122006	11/26/91	NMVOC	70	0.70	450	VI-3
XI-11-149-04A	9112026-04A	6122009	11/26/91	NMVOC	7.8	0.078	0.77	VO-1
XI-11-149-05A	9112026-05A	6122007	11/26/91	NMVOC	7.4	0.074	1.2	VO-2
XI-11-149-06A	9112026-06A	61220012	11/26/91	NMVOC	7.4	0.074	0.85	VO-3
XI-11-149-07A	9112026-07A	6122011	11/26/91	NMVOC	6.0	0.060	Not Detected	VFB
Lab Blank	9112026-08A	6122002	NA	NMVOC	1.0	0.010	Not Detected	
							% Recovery	
Method Spike	9122026-08B	6122001	1/1/04	NMVOC	1.0	0.010	104	

Analysis Date: 12/20/91

COMMENTS: NA-Not Applicable

Response factor referenced to heptane (MW = 100)

AIR TOXICS LTD.

SAMPLE NAME: XX-11-149-01A VIC-1

ID#: 9112025-01A

Summa CANISTER EPA METHOD TO-14 GC/MS PaK Scan

[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

Compound	MDL (ppbv)	Amount (ppbv)
Benzene	27	650
Chloroform	27	Not Detected
1,2-Dichloroethane	27	Not Detected
Methyl Chloride	27	Not Detected
Methylene Chloride	27	3200
Perchloroethylene	27	4500
Trichloroethylene	27	1300
Carbon Tetrachloride	27	Not Detected
Vinylidene Chloride	27	Not Detected
Vinyl Chloride	27	3500

Container Type: 6 Liter SUMMA Canister

[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

AIR TOXICS LTD.

SAMPLE NAME: 25-11-149-02A VT-2

ID#: 9112025-02A

Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

[redacted]

Compound	MDL (ppbv)	Amount (ppbv)
Benzene	23	650
Chloroform	23	Not Detected
1,2-Dichloroethane	23	Not Detected
Methyl Chloride	23	Not Detected
Methylene Chloride	23	3200
Perchloroethylene	23	4500
Trichloroethylene	23	1300
Carbon Tetrachloride	23	Not Detected
Vinylidene Chloride	23	Not Detected
Vinyl Chloride	23	3500

Container Type: 6 Liter SUMMA Canister

[redacted]

AIR TOXICS LTD.

SAMPLE NAME: K-11-149-03A VL-3

ID#: 911202S-03A

Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

File Name:	11202S	Date of Collection:	11/20/91
Dil. Fact.:	66	Date of Analysis:	12/2/91

Compound	MDL (ppbv)	Amount (ppbv)
Benzene	29	630
Chloroform	29	Not Detected
1,2-Dichloroethane	29	Not Detected
Methyl Chloride	29	Not Detected
Methylene Chloride	29	3200
Perchloroethylene	29	4300
Trichloroethylene	29	1200
Carbon Tetrachloride	29	Not Detected
Vinylidene Chloride	29	Not Detected
Vinyl Chloride	29	3600

Container Type: 6 Liter SUMMA Canister

Surrogates	%Recovery	Method Limits
Bromochloromethane	100	70-130
1,4-Difluorobenzene	113	70-130
1,2-Dichlorobenzene-d4	120	70-130

9112025 IT

AIR TOXICS LTD.

SAMPLE NAME: KI-11-149-04A. V0-1

ID#: 9112025-04A

Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

[illegible]	[illegible]	[illegible]
[illegible]	10	[illegible]

Compound	MDL (ppbv)	Amount (ppbv)
Benzene	7.8	Not Detected
Chloroform	7.8	Not Detected
1,2-Dichloroethane	7.8	Not Detected
Methyl Chloride	7.8	Not Detected
Methylene Chloride	7.8	87
Perchloroethylene	7.8	Not Detected
Trichloroethylene	7.8	Not Detected
Carbon Tetrachloride	7.8	Not Detected
Vinylidene Chloride	7.8	Not Detected
Vinyl Chloride	7.8	Not Detected

Container Type : 6 Liter SUMMA Canister

[illegible]	% Recovery	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

AIR TOXICS LTD.

SAMPLE NAME: KI-11-149-05A VO-2

ID#: 9112025-05A

Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

[illegible]	DETECT	[illegible]	[illegible]
[illegible]	IT	[illegible]	[illegible]

Compound	MDL (ppbv)	Amount (ppbv)
Benzene	6.0	Not Detected
Chloroform	6.0	Not Detected
1,2-Dichloroethane	6.0	Not Detected
Methyl Chloride	6.0	Not Detected
Methylene Chloride	6.0	50
Perchloroethylene	6.0	Not Detected
Trichloroethylene	6.0	Not Detected
Carbon Tetrachloride	6.0	Not Detected
Vinylidene Chloride	6.0	Not Detected
Vinyl Chloride	6.0	Not Detected

Container Type: 6 Liter SUMMA Canister

[illegible]	% Recovery	Method Limit
Dichlorodifluoromethane	104	70-130
1,2-Dichlorotetrafluoroethane	95	70-130
1,3-Dichlorobenzene-d4	88	70-130

AIR TOXICS LTD.

SAMPLE NAME: XI-11-149-06A V0-3

ID#: 9112025-06A

Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Compound	MDL (ppbv)	Amount (ppbv)
Benzene	15	Not Detected
Chloroform	15	Not Detected
1,2-Dichloroethane	15	Not Detected
Methyl Chloride	15	Not Detected
Methylene Chloride	15	64
Perchloroethylene	15	Not Detected
Trichloroethylene	15	Not Detected
Carbon Tetrachloride	15	Not Detected
Vinylidene Chloride	15	Not Detected
Vinyl Chloride	15	Not Detected

Container Type: 6 Liter SUMMA Canister

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

9112025 TT

AIR TOXICS LTD.

SAMPLE NAME: XI-11-149-07A

ID#: 9112025-07A

Bruceman CANISTER EPA METHOD TO-14 GC/MS Full Scan

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Compound	MDL (ppbv)	Amount (ppbv)
Benzene	0.5	Not Detected
Chloroform	0.5	Not Detected
1,2-Dichloroethane	0.5	Not Detected
Methyl Chloride	0.5	Not Detected
Methylene Chloride	0.5	Not Detected
Perchloroethylene	0.5	Not Detected
Trichloroethylene	0.5	Not Detected
Carbon Tetrachloride	0.5	Not Detected
Vinylidene Chloride	0.5	Not Detected
Vinyl Chloride	0.5	Not Detected

Container Type: 6 Liter SUMMA Canister

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9112025-08A

Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

[illegible]	Arizona	[illegible]	[illegible]
[illegible]	1	[illegible]	[illegible]

Compound	MDL (ppbv)	Amount (ppbv)
Benzene	0.5	Not Detected
Chloroform	0.5	Not Detected
1,2-Dichloroethane	0.5	Not Detected
Methyl Chloride	0.5	Not Detected
Methylene Chloride	0.5	Not Detected
Perchloroethylene	0.5	Not Detected
Trichloroethylene	0.5	Not Detected
Carbon Tetrachloride	0.5	Not Detected
Vinylidene Chloride	0.5	Not Detected
Vinyl Chloride	0.5	Not Detected

Container Type: 6 Liter SUMMA Canister

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 9112025-08B

Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

File Name:	080424A	Date of Calibration:	N/A
Dil. Factor:	1	Date of Analysis:	8/29/24

Compound	MDL (ppbv)	% Recovery
Benzene	0.5	111
Chloroform	0.5	116
1,2-Dichloroethane	0.5	112
Methyl Chloride	0.5	107
Methylene Chloride	0.5	86
Perchloroethylene	0.5	124
Trichloroethylene	0.5	126
Carbon Tetrachloride	0.5	122
Vinylidene Chloride	0.5	106
Vinyl Chloride	0.5	109

Container Type: 6 Liter SUMMA Canister

Surrogates	% Recovery	Method Limits
Dibromofluoromethane	100	70-130
1,2-Dichlorobenzene-d4	98	70-130
4-Bromofluorobenzene	100	70-130

AIR TOXICS LTD.

SAMPLE NAME: 91-11-149-01A

ID#: 9112027-01A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	9112027	Date of Calibration:	12/10/91
Dil. Factor:	1.0	Date of Analysis:	12/20/91

Compound	MDL (%)	Amount (%)
Oxygen	0.001	6.3
Nitrogen	0.001	46
Carbon Monoxide	0.001	Not Detected
Methane	0.001	22
Carbon Dioxide	0.001	27

Comments:

AIR TOXICS LTD.

SAMPLE NAME: 3X-11-149-01A DUP VT-1

ID#: 9112027-01B

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

Operator:	Ontario
Lot Code:	03
Date of Calibration:	[illegible]
Date of Analysis:	[illegible]

Compound	MDL (%)	Amount (%)
Oxygen	0.003	6.3
Nitrogen	0.003	46
Carbon Monoxide	0.003	Not Detected
Methane	0.003	21
Carbon Dioxide	0.003	27

Comments:

AIR TOXICS LTD.

SAMPLE NAME: XI-11-149-02A VI-2
ID#: 9112027-02A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	[illegible]	Date of Collection: [illegible]
Dil. Factor:	[illegible]	Date of Analysis: [illegible]

Compound	MDL (%)	Amount (%)
Oxygen	0.001	6.0
Nitrogen	0.001	48
Carbon Monoxide	0.001	Not Detected
Methane	0.001	20
Carbon Dioxide	0.001	25

Comments:

AIR TOXICS LTD.

SAMPLE NAME: 91-11-149-02A DUP V5-2

ID#: 9112027-02B

Atmosphere Gases by Modified ASTM D-1946
GC/TCD/FID

[redacted]		[redacted]	
[redacted]		[redacted]	

Compound	MDL (%)	Amount (%)
Oxygen	0.001	6.0
Nitrogen	0.001	48
Carbon Monoxide	0.001	Not Detected
Methane	0.001	20
Carbon Dioxide	0.001	26

Comments:

AIR TOXICS LTD.

SAMPLE NAME: 91-11-149-03A VT-3

ID#: 9112027-03A

Atmosphere Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	9112031	Date of Collection:	[illegible]
Dil. Factor:	1.0	Date of Analysis:	12/20/91

Compound	MDL (%)	Amount (%)
Oxygen	0.001	6.0
Nitrogen	0.001	66.4
Carbon Monoxide	0.001	Not Detected
Methane	0.001	22
Carbon Dioxide	0.001	27

Comments:

AIR TOXICS LTD.

SAMPLE NAME: K-11-149-03A DUP V3-3

ID#: 9112027-03B

Atmosphere Gases by Modified ASTM D-3416
GC/TCD/FID

[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

Compound	MDL (%)	Amount (%)
Oxygen	0.001	6.0
Nitrogen	0.001	46
Carbon Monoxide	0.001	Not Detected
Methane	0.001	22
Carbon Dioxide	0.001	27

Comments:

AIR TOXICS LTD.

SAMPLE NAME: XI-11-149-07A   V-FB

ID#: 9112027-07A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	[illegible]	Date of Collection: [illegible]
Dil. Factor:	1	Date of Analysis: [illegible]

Compound	MDL (%)	Amount (%)
Oxygen	0.001	Not Detected
Nitrogen	0.001	100
Carbon Monoxide	0.001	Not Detected
Methane	0.001	Not Detected
Carbon Dioxide	0.001	Not Detected

Comments:

AIR TOXICS LTD.

SAMPLE NAME: XH-11-149-07A DUP V- P5

ID#: 911202?-07B

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

Sub Number:	911202?-07B	Date of Collection:	11/20/91
Dil Factor:	1	Date of Analysis:	11/26/91

Compound	MDL (%)	Amount (%)
Oxygen	0.001	Not Detected
Nitrogen	0.001	100
Carbon Monoxide	0.001	Not Detected
Methane	0.001	Not Detected
Carbon Dioxide	0.001	Not Detected

Comments:

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 911027-06A

Atmospheric Gases by Modified ASTM D-3416

GC/TCD/FID

[redacted]

Compound	MDL (%)	Amount (%)
Oxygen	0.001	Not Detected
Nitrogen	0.001	100
Carbon Monoxide	0.001	Not Detected
Methane	0.001	Not Detected
Carbon Dioxide	0.001	Not Detected

Comments:

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9112027-08B

Atmospheric Gases by Modified ASTM D-3416

GC/TCD/FID

[redacted]

Compound	MDL (%)	Amount (%)
Oxygen	0.001	Not Detected
Nitrogen	0.001	100
Carbon Monoxide	0.001	Not Detected
Methane	0.001	Not Detected
Carbon Dioxide	0.001	Not Detected

Comments:

AIR TOXICS LTD.

SAMPLE NAME: Method Spike
ID#: 911202?-08C

Atmospheric Gases by Modified ASTM D-9416
GC/TCD/FID

File Name:	112804	Date of Collection: NA	
Dil. Factor:	1	Date of Analysis: 12/28/01	

Compound	MDL (%)	% Recovery
Oxygen	0.001	100
Nitrogen	0.001	100
Carbon Monoxide	0.001	101
Methane	0.001	102
Carbon Dioxide	0.001	101

Comments:

IT INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

IT Corporation — Date: December 13, 1991

Attn: Dave Ostenhout

Project Number 21594

This is the Certificate of Analysis for the following samples:

Client Project ID:	Valley Landfill
Date Received:	November 27, 1991
Work Orders:	KK-11-150
Number of Samples:	13
Sample Type:	Air

I. Introduction

Thirteen air samples arrived at ITAS Cincinnati on November 27, 1991. The samples were collected on November 26, 1991 and were labeled as follows:

Flask # VN-1	Flask # VN-7	Liquid # NOx Reagent Blank
Flask # VN-2	Flask # VN-8	
Flask # VN-3	Flask # VN-9	
Flask # VN-4	Flask # VN-10	
Flask # VN-5	Flask # VN-11	
Flask # VN-6	Flask # VN-12	

II. Analytical Results/Methodology

The analytical results for this report are presented by analytical test. The data will include sample identification information, the analytical results, and the appropriate detection limits.

The analysis requested was NOX by EPA Method 7A.

Reviewed and Approved by:

Laurel Tomanovich
Project Manager
KK1150

AIR TOXICS LTD.

SAMPLE NAME: Method Spike
ID#: 9112027-08C

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	112804	Date of Collection:	NA
Dil. Factor:	1	Date of Analysis:	12/8/01

Compound	MDL (%)	% Recovery
Oxygen	0.001	100
Nitrogen	0.001	100
Carbon Monoxide	0.001	101
Methane	0.001	102
Carbon Dioxide	0.001	101

Comments:

Client: Valley Landfill
Work Order: 11-11-150
1111503

IT ANALYTICAL SERVICES
CINCINNATI, OH

Analytical Results, Total ug

Client Sample ID	Lab No.	NOx
Flask # VM-1	01	ND
Flask # VM-2	02	ND
Flask # VM-3	03	ND
Flask # VM-4	04	ND
Flask # VM-5	05	ND
Flask # VM-6	06	ND
Flask # VM-7	07	ND
Flask # VM-8	08	ND
Flask # VM-9	09	ND
Flask # VM-10	10	ND
Flask # VM-11	11	ND
Flask # VM-12	12	ND
Liquid # NOx Reagent Blank	13	ND
Detection Limit		39

Quality Assurance Data

Quality Control
Standard Reference Solution

Analyte	Theoretical Value	Percent Recovery
NOx	350	111

III. Quality Control

Immediately following the analytical data for the samples can be found the QA/QC information that pertains to these samples. The purpose of this information is to demonstrate that the data enclosed is scientifically valid and defensible. This QA/QC data is used to assess the laboratory's performance during the analysis of the samples it accompanies. All quantitations were performed within the calibrated range of the analytical instrument.

IV. Comments

Due to interferences present in the matrix, adequate resolution of the BCs was difficult to obtain. Because of this problem, the detection limits were raised.

APPENDIX D

SAMPLING AND ANALYTICAL PROCEDURES

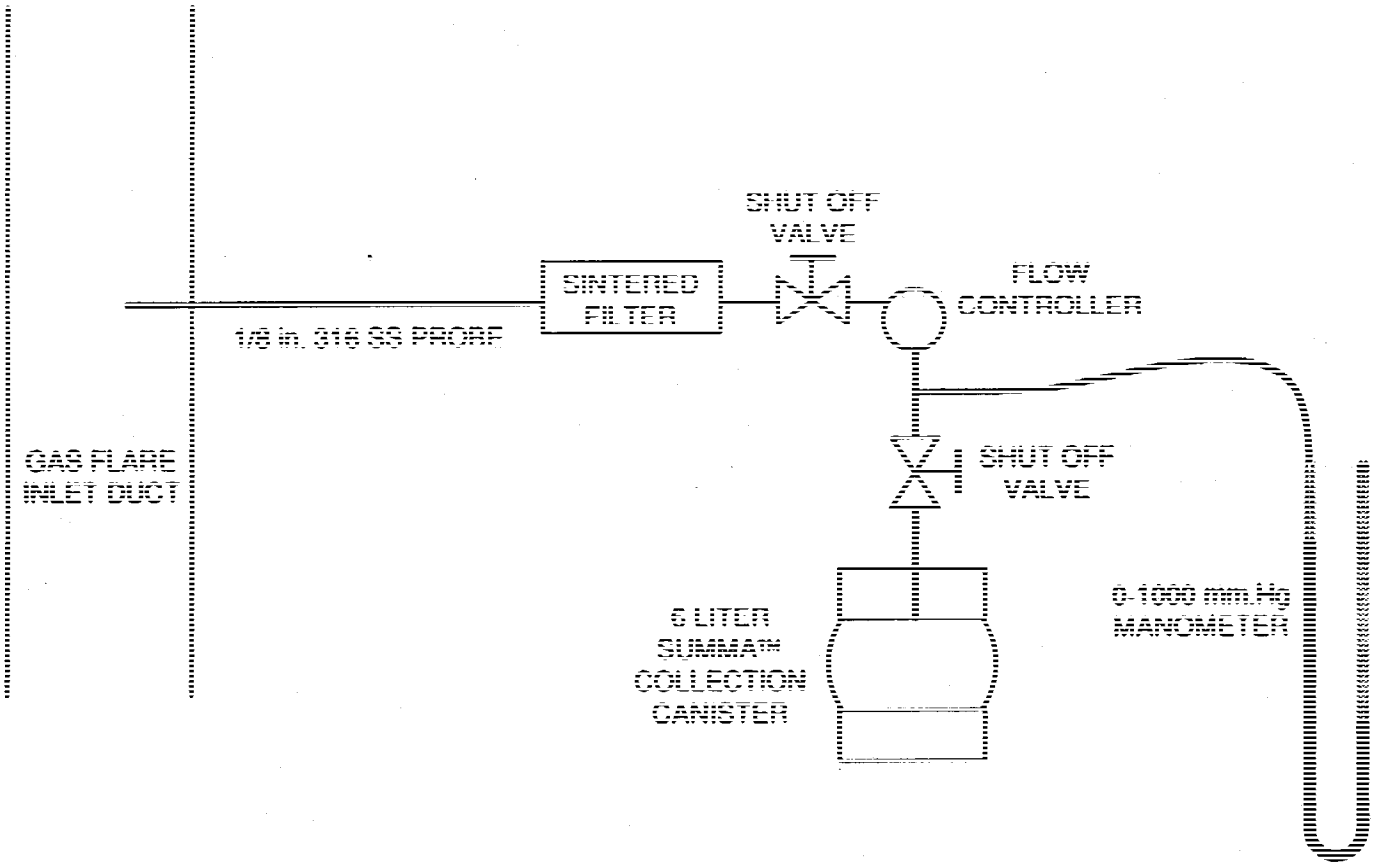

Figure D-1. VOC/NMO sampling train - flare inlet.

DETERMINATION OF SELECTED VOLATILE ORGANIC COMPOUNDS AND TOTAL GASEOUS NONMETHANE ORGANIC EMISSIONS

Sampling and analysis for selected volatile organic compounds (VOC) and total gaseous nonmethane organic compounds (NMO) are conducted in accordance with sampling procedures described in U.S. Environmental Protection Agency (EPA) Method TO14* and proposed U.S. EPA Method 25C.** Since both methodologies required evacuated canisters as the collection media, one sample is obtained and analyzed by the respective procedures of each method for the required pollutants.

Sampling Apparatus

A schematic of the sampling apparatus used at the landfill gas flare inlet is shown in Figure D-1. Figure D-2 depicts the sampling apparatus used at the landfill gas flare outlet. The outlet sampling train differs from the inlet by the addition of a moisture knock-out jar, which is used to remove possible condensation produced by cooling the exhaust gases from the exit of the landfill gas flare. The sampling trains used in these tests meet design specifications established by the U.S. EPA. Assembled by IT personnel, the train consists of the following:

Gas Collection Tank: - 316 stainless steel tank with premeasured volume of approximately 6.0 liters. Tank is fitted with a valve and the interior surfaces are SUMMA™ passivated.

Sampling Regulator System - A mercury manometer to monitor changes in tank pressure during sampling, stainless steel flow shutoff valve to start and stop sample flow, 2-µm sintered stainless steel in-line filter, and calibrated preset stainless steel flow meter to maintain constant flow rate.

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* Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. EPA-600/4-84-041. April 1984.

** 56 FR 24468, May 30, 1991.

Pressure Gauge - U-tube mercury manometer with a range of 0 to 1000 millimeters of mercury (mmHg) to measure tank pressure to the nearest 1 mmHg.

Vacuum Pump - Single-stage vacuum pump to evacuate sample tanks to an absolute pressure of 10 mmHg.

Sampling Procedures

Prior to sampling, the collection tank is evacuated to 10 mmHg absolute pressure and the sampling train is allowed to sit for a predetermined period of time. An acceptable leak check is considered to be no change in pressure during this period. This procedure is conducted in the laboratory before transport to the sampling site. At the sampling site (prior to sampling) the internal pressure is checked and recorded to verify no leakage occurs during transport. Sampling proceeds if the tank pressure is within 10 mmHg of absolute pressure. If the canister fails this check, it is either discarded or reevacuated and observed to determine the movement within a predetermined period time. If at this time no change is observed, the canister is considered acceptable for use. The sampling trains are assembled as shown in Figures D-1 and D-2. The outlet sampling train is leak-checked from the probe inlet to the shutoff valve on the collection tank. This is conducted following procedures described in U.S. EPA Method 25.* The ambient temperature and barometric pressure are recorded.

After the leak check, the probe is inserted into the gas stream, the valve connected to the collection tank is closed, and the sampling train is purged with sample gas using the vacuum pump. At least two sample probe volumes are evacuated from the system at a flow rate similar to that of sampling. Once the purge is complete, sampling is begun by closing the vacuum pump valve and opening the collection tank valve. The flow is maintained at a constant rate by the preset flow controller. Manometer readings are recorded at 10-minute intervals throughout the sampling period.

After completion of the test, the collection tank pressure and temperature are measured and the train is disassembled and transported to the laboratory for the appropriate analyses.

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* 40 CFR 60, Appendix A, July 1991.

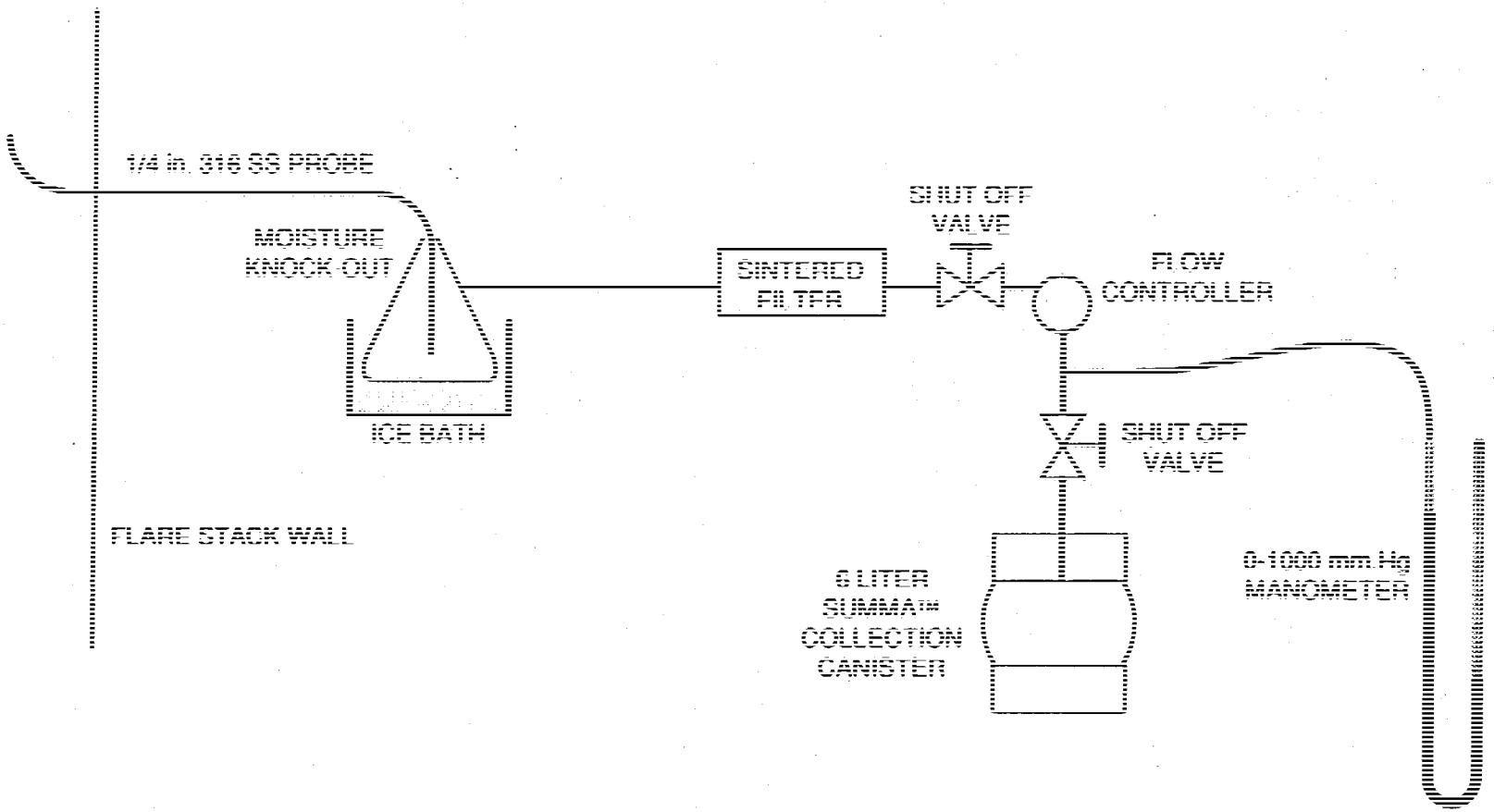


Figure D-2. VOC/NMO sampling train - flare outlet.

Sample identities are confirmed by Triple Plot mass spectra, which simultaneously display the enhanced target compound spectra, the unenhanced target compound spectra, and the library spectra of the target compound.

Analytical Procedures for Permanent Gases

Prior to analysis, the gas chromatograph/thermal conductivity detector (GC/TCD) is calibrated with at least three concentrations in the expected range of each compound of interest and the linearity of the detector is verified. An aliquot of the sample is extracted from the canister and injected into the GC. Each sample is analyzed in duplicate.

Analytical Procedures for NMOG (Inlet)

The following subsections describe the calibration criteria and quality assurance procedures specified for the method.

Flame Ionization Detector (FID) Calibration and Linearity Check

Prior to analysis of each set of samples, the linearity of the NMO analyzer FID is checked by calibration with gas standards of propane in air, at concentrations ranging from 19 to 3000 ppm. The FID linearity is considered acceptable if the response for each propane standard is within ±5 percent of the mean response from all four standards.

Oxidation and Reduction Catalyst Efficiency Check

The performance of the oxidation and reduction catalysts is checked prior to the analysis of each set of samples. Before the catalyst checks are performed, triplicate injections of 10,000 ppm methane are made with both the oxidizer and methanizer bypassed to establish a baseline methane response. For a check of the oxidizer performance, triplicate injections of 10,000 ppm methane are made with the carrier gas passing through the oxidizer and bypassing the methanizer. Complete conversion of the methane of carbon dioxide is confirmed by the fact that no methane response is obtained at the FID. Once the oxidizer is operating at near 100 percent efficiency (no FID response), the reduction catalyst is checked. Triplicate injections of 10,000 ppm

Analytical Procedure for Selected VOCs

Because the collection tanks are sampled down to near ambient pressures, the tanks are pressurized with humidified helium in the laboratory to facilitate sample travel from the canister as a result of positive pressure release. A dilution factor is calculated for each canister and is reported on the analytical data sheets presented in Appendix B. Analyses are performed for the pollutants listed in Table D-1 by extracting an aliquot from the collection tank and injecting it onto a Tenax sorbent tube. The Tenax sorbent tube is subsequently thermally desorbed onto a sorbent trap and then routed to the detector. Sample components are separated by gas chromatography (GC) utilizing fused silica capillary columns. Mass analysis is performed on each peak and ion counts are recorded for quantitation by gas chromatography/mass spectroscopy (GC/MS) full scan.

TABLE D-1. VOC COMPOUNDS

Benzene	Perchloroethylene
Chloroform	Trichloroethylene
1,2-Dichloroethane	Carbon tetrachloride
Methyl chloride	Vinylidene chloride
Methylene chloride	Vinyl chloride

Each SUMMA™ polished collection is cleaned and batch blank-checked before sampling. The cleaning cycle consists of placing the tanks on a manifold system within a 150°C heated oven, then evacuating and pressurizing the tanks. The evacuation/pressurization cycles are conducted 25 times and then the canisters are removed under vacuum. One tank from each batch is blank-checked and the batch is considered clean if all target compounds are less than 0.2 ppb and there are no unknown peaks not already present in the direct analysis of the ultrapure air.

The analytical system is tuned daily with 4-bromofluorobenzene to meet the key ion and ion abundance criteria of TO14.

An initial minimum three-point calibration is conducted; check standards are run every 12 hours.

Title: 7A
Date: 2/28/91

DETERMINATION OF NITROGEN OXIDE EMISSIONS

This test program follows the sampling procedures described in EPA Method 7A.*

Sampling Apparatus

The nitrogen oxide (NO_x) sampling train used in these tests meets design specifications established by the Federal EPA. Assembled by TRACS personnel, it consists of the following:

Probe - Borosilicate glass tubing with a heating system capable of maintaining a gas temperature of approximately 250°F at the exit end to prevent water condensation. A glass-wool plug is placed in the end of the probe to remove particulate matter, as shown in Figure 7A-1.

Collection Flask - Two-liter borosilicate, round-bottom flask, with short neck and 24/40 standard taper opening, protected against implosion or breakage.

Flask Valve - Two-way stopcock connected to a 24/10 standard taper joint.

Manifold - Two- and three-way Teflon stopcock and connected 24/10 standard taper joints.

Temperature Gauge - Dial-type thermometer capable of measuring 2°F intervals from 25° to 125°F.

Vacuum Line - Tubing capable of withstanding a vacuum of 3 in.Hg absolute pressure, with "T" connection and T-bore stopcock.

Vacuum Gauge - U-tube manometer, 36 in.Hg with 0.1-in. divisions.

Pump - Capable of evacuating the collection flask to a pressure equal to or less than 3 in.Hg absolute.

Barometer - Aneroid type to measure atmospheric pressures to ±0.1 in.Hg.

---

* 40 CFR60, Appendix A, July 1990.

are made with both the oxidizer and methanizer in line. The reduction catalyst performance is acceptable if the response for methane is within ±5 percent of what it was with the oxidizer and methanizer bypassed.

System Operation Check and Daily Response Factors

Prior to and at the conclusion of daily sample analysis, FID response factors are determined and the system operation is checked by making triplicate injections of four component gas mixtures through both the oxidation and reduction catalysts. The four component mixtures consist of 50 ppm carbon monoxide, 2 percent carbon dioxide, 500 ppm methane, and propane. The propane concentrations of these standards are about 20, 100, or 1000 ppm.

NMOC Analyzer Blank

The blank value for the NMOC analyzer is checked between each analysis of calibration gas or sample tanks by purging the sample loop with dry, clean nitrogen and injecting the nitrogen as a sample. An acceptable blank level is less than 10 ppm carbon.

Sampling Procedure

Following the selection of the sampling site and minimum number of traverse points, the stack pressure, temperature, moisture, and range of velocity head are measured according to procedures described in EPA Methods 1 through 4.*

One sampling point, representing the average flow rate, is chosen. The sampling flask is charged with 25 mL of absorbing solution (made by mixing 1 liter of distilled water, 2.8 mL of concentrated H_2SO_4, and 6 mL of 3 percent H_2O_2). A portion of the reagent is retained for use in preparing the calibration standards.

With the sample valve closed, the flask valve open, and the pump/manometer valve open to pump, the flask is evacuated to less than 3 in.Hg absolute pressure. Flask vacuum is determined by moving the pump/manometer valve to manometer. Leakage is checked by observing the manometer for pressure fluctuation. Any variation greater than 0.4 in.Hg over a 1-minute period is corrected before sampling.

With the flask closed, the sample valve open, and the pump/manometer valve turned to pump, the sampling apparatus is purged for 5 minutes. The probe heater setting is adjusted to prevent any visible condensation. With the sample valve closed and the pump/manometer valve open to manometer, an initial flask vacuum is determined by opening the flask valve. The sample valve is then slowly opened, allowing stack gas to enter the flask. The vacuum is allowed to drop to 3 in.Hg (approximately 15 seconds), and then the sample flask valves are closed. The flask is shaken for 5 minutes to ensure contact between the sample and absorbing solution.

Sample Recovery Procedure

The collection flasks are transported to the laboratory for sample recovery. The flasks are set aside for a minimum of 16 hours. At the end of the period, the flasks are shaken for 2 minutes and the final flask pressure and temperatures are measured. All pertinent data are recorded on the recovery data sheets.

---

* 40 CFR 60, Appendix A, July 1990.

Figure 7A-1. NO_2 sampling train.

APPENDIX E

CALIBRATION PROCEDURES AND RESULTS

The contents of the flask are measured volumetrically and transferred to a polyethylene container. The flask is then rinsed with two separate 5-mL portions of deionized, distilled water, and the solution is added to the same container.

Analytical Procedure

The volume of absorbing solution is recorded and diluted to 50 mL with deionized, distilled water. A 5-mL aliquot of this solution is pipetted to a volumetric flask and diluted to 50 mL with deionized water. The samples from the second dilution are analyzed by ion chromatography. A calibration curve of $\mu g\ NO_3^-$ versus peak area response is prepared using standards of known concentration.

Pitot Tube Calibration

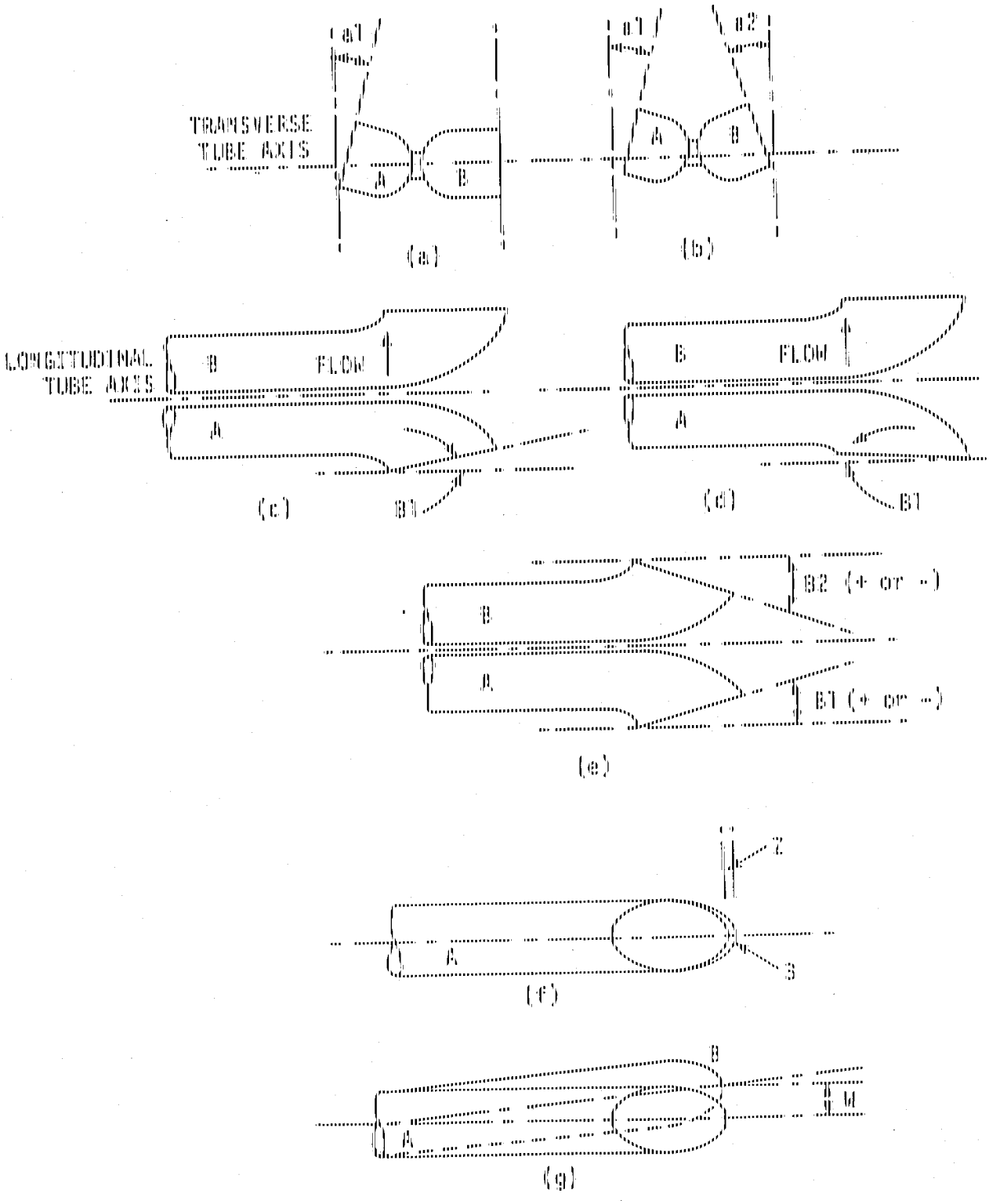
Each pitot tube used in sampling is constructed by ITACS and meets all requirements of EPA Method 2, Section 4.1.[*] Therefore, a baseline coefficient of 0.84 is assigned to each pitot tube. The following pages show the alignment requirements of Method 2 and the Pitot Tube Inspection Data Sheet(s) for each pitot tube used during the test program.

[*]40 CFR 60, Appendix A, July 1989.

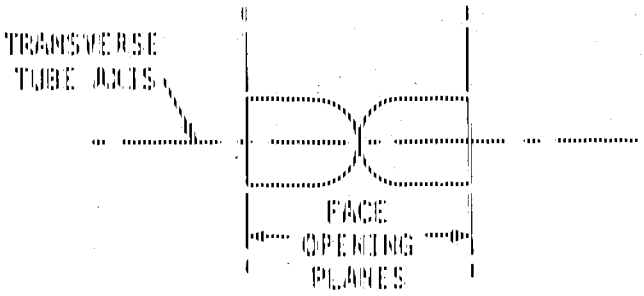
CALIBRATION PROCEDURES AND RESULTS

All of the equipment used is calibrated in accordance with the procedures outlined in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II.* The following pages describe these procedures and include the data sheets.

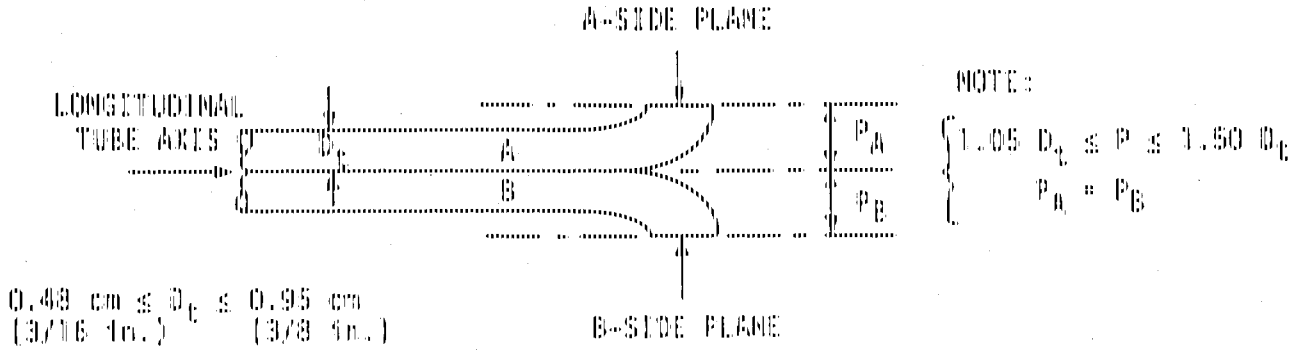
*EPA 600/4-77-027b.



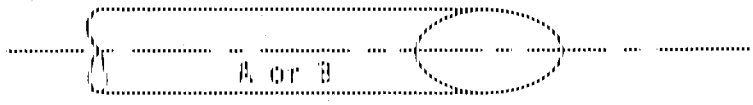
Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect Cp as long as a_1 and a_2 are <10°, B_1 and B_2 are <5°, z is <0.32 (1/8 in.), and w is <0.08 cm (1/32 in.).



(a) END VIEW



(b)



(c)

Properly constructed Type S pitot tubes shown in: (a) end view, face opening planes perpendicular to transverse axis; (b) top view, face opening planes parallel to longitudinal axis; (c) side view, both legs of equal length and centerlines coincident when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.

Dry Gas Meter and Orifice Meter

The following page shows the Calibration Setup used for the initial and post-test calibration. A wet-test meter with a 2-cubic-feet-per-minute capacity and ±1 percent accuracy is used. The pump is run for approximately 15 minutes at an orifice manometer setting of 0.5 in.H_2O to heat up the pump and wet the interior surface of the wet-test meter. The information in the following example Calibration Data Sheet is gathered for the initial calibration; the ratio of accuracy of the wet-test meter to the dry-test meter and the $\Delta H@$ are then calculated.

Post-Test Meter Calibration Check

A post-test meter calibration check is made on each meter box used during the test to check its accuracy against the last calibration check. This post-test calibration must be within ±5 percent of the initial calibration. The initial calibration is performed as described in APTD-0576. The post-test calibration is performed by the same method. Three calibration runs are made by using the average orifice setting obtained during each test run and setting the vacuum at the maximum value obtained during each test run. The post-test calibration check indicated that all three runs for each meter box were within the ± 5 percent range allowed by EPA Method 5.[1]

The Particulate Sampling Meter Box Initial Calibration and Post-Test Calibration data sheets are included in the following pages.

[1] 40 CFR 60, Appendix A, July 1990.

INTERNATIONAL TECHNOLOGY CORPORATION

PITOT TUBE INSPECTION DATA SHEET

Pitot Tube No. P02-11 Date 12-20-90 Inspector [illegible]

α_1 degrees	α_2 degrees	β_1 degrees	β_2 degrees
0	2	2	1
<1.0°	<1.0°	<5°	<5°

D_t inches	P inches	1.05 D_t inches	1.50 D_t inches
.375	1.050	.394	.563
0.165 ≤ P_t ≤0.380	"	"	"

γ degrees	φ degrees	$P_{sin(\gamma)}$ inches	$P_{sin(\varphi)}$ inches
2	1	.057	.019
"	"	≤0.125	≤0.03125

P_1 inches	P_2 inches	$\lvert P_1 - P_2 \rvert$ inches	Meet specifications
.524	.526	.002	✓
1.05 D_t ≤P_1 ≤1.50 D_t	1.05 D_t ≤P_2 ≤1.50 D_t	≤0.010	

Lower line in each table is limits for meeting specifications.

Checked by [signature] Date 12/28/90

INTERNATIONAL TECHNOLOGY CORPORATION

METER BOX INITIAL CALIBRATION

Date: 11/18/91 | Meter Box No.: PT-4

Barometric Pressure, (Pbar): 29.43 | Calibrator: Graves

Run No.	Orifice manometer setting* ΔH in. H2O	Wet test meter volume Vw ft3	Dry gas meter volume Vd ft3	Temperatures: Wet test meter Tw °F	Dry gas meter: Inlet Tdi °F	Dry gas meter: Outlet Tdo °F	Dry gas meter: Average Td °F	Vacuum setting** in. Hg	Duration of run, Θ min.	Duration of run, Θ sec
			823.094	71	76	75				
1	0.50	5.000	828.299	71	77	77	76.5	10	13	5
			828.681	71	77	77				
2	1.00	10.000	839.049	71	78	78	77.5	10	18	47
			839.452	71	78	78				
3	1.50	10.000	849.886	71	80	79	78.5	10	15	30
			850.364	71	80	79				
4	2.00	11.000	861.820	71	81	80	80.0	10	14	38
			862.378	71	81	80				
5	3.00	10.000	872.805	71	82	81	81.0	10	11	5
			873.652	71	82	81				
6	4.00	10.000	884.077	71	83	81	81.5	10	9	34

$$Y = \frac{(Vw)(Pbar)(Td+460)}{(Vd)(Pbar+\Delta H/13.6)(Tw+460)}$$

$$\Delta H@ = \frac{(0.0317)(\Delta H)}{(Pbar)(Td+460)} \left[\frac{(Tw+460)(\Theta)}{Vw} \right]^2$$

Run No.	Y	ΔH@
1	0.976	1.94
2	0.974	1.99
3	0.972	2.03
4	0.972	1.99
5	0.970	2.07
6	0.969	2.05
Pretest average	0.972	2.01
Difference*=	0.004	0.05 0.07

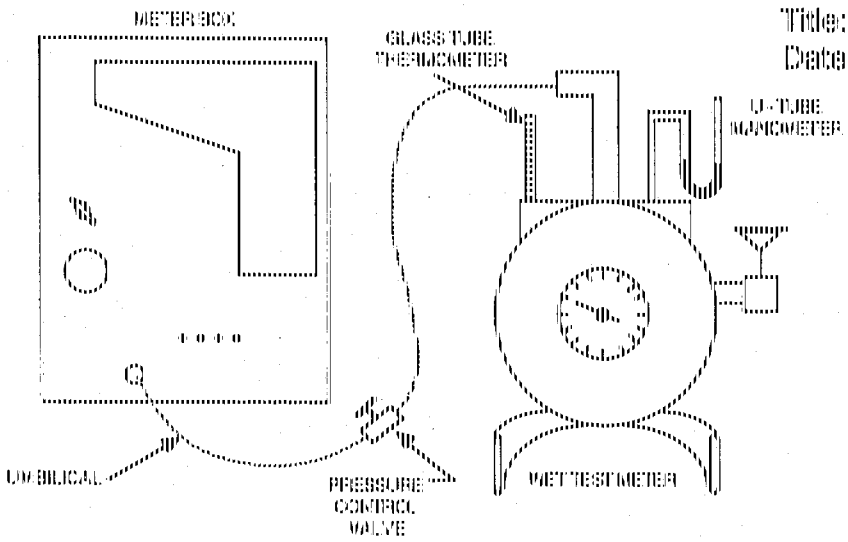
Data checked by: _____

Date: 11-19-91

* Y must not deviate by more than ±0.02Y.

ΔH@ must not deviate by more than ±0.15 ΔH avg.

Title: E-2
Date: 10/15/91



Calibration setup.

DATE _____ METER BOX NO. _____

BAROMETRIC PRESSURE P_b = _____ in. Hg. DRY GAS METER NO. _____

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	WET TEST METER T_w, °F	DRY GAS METER			TIME (θ), min.	Y	$\Delta H@$
				INLET t_{di}, °F	OUTLET t_{do}, °F	AVERAGE t_d, °F			
0.5	5								
1.0	5								
1.5	10								
2.0	10								
3.0	10								
4.0	10								

AVERAGE _____

ΔH	$\frac{\Delta H}{13.6}$	Y: $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	$\Delta H@$: $\frac{0.0317\,\Delta H}{P_b(t_d + 460)}$	$\left[\frac{(t_w + 460)\theta}{V_w}\right]^2$
0.5	0.0368			
1.0	0.0737			
1.5	0.110			
2.0	0.147			
3.0	0.221			
4.0	0.294			

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

$\Delta H@$ = Orifice pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in. H_g. Tolerance = ±0.15.

Calibration data sheet.

E-8

Stack Thermocouples

Each thermocouple is calibrated by comparing it with an ASTM-3F thermometer at approximately 32°F, ambient temperature, 100°F, and 500°F. The thermocouple read within 1.5 percent of the reference thermometer throughout the entire range when expressed in degrees Rankine. If the stack gas is saturated with moisture, the thermocouple is calibrated at 10° intervals between 70° and 180°F using a water bath. The thermocouple agreed within ±2°F of the reference thermometer over the entire range. The thermocouples may be checked at ambient temperature at the test site to verify the calibration. Calibration data are included in the following Thermocouple Calibration Data Sheet(s).

METER BOX POST-TEST CALIBRATION

Date: 12/9/91
Barometric Pressure, (Pbar): 29.44
Plant: WET
Project Manager: OSTERHOUT

Meter Box No.: PT-4
Initial Y: 0.972 ΔH@: 2.01
Project No.: 002133
Calibrator: B.J.G

Run No.	Orifice manometer setting* ΔH in. H2O	Wet test meter volume Vw ft3	Dry gas meter volume Vd ft3	Wet test meter Tw °F	Temperatures Dry gas meter Inlet Tdi °F	Dry gas meter Outlet Tdo °F	Average Td °F	Vacuum setting** in.Hg	Duration of run, θ min.	sec.
			97.811	73	77	77				
1	2.01	10.000	106.949	74	81	79	78.3	5	13	12
			106.949	74	81	78				
2	2.01	10.000	118.318	74	83	79	80.3	5	13	13
			118.318	74	83	79				
3	2.01	10.000	128.692	74	85	80	81.8	5	13	14

Run No.	Y	ΔH@
1	0.981	1.99
2	0.988	2.00
3	0.979	1.99
Post-test average***	0.980	1.99
Difference from Pretest ***=	0.008	-0.02

$$Y = \frac{(Vw)(Pbar+\frac{\Delta H}{13.6})(Td+460)}{(Vd)(Pbar+\Delta H/13.6)(Tw+460)}$$

$$\Delta H@ = \frac{(0.0317)(\Delta H)(Pbar+\frac{\Delta H}{13.6})}{(Pbar)(Td+460)}\left[\frac{(Tw+460)}{Vw}\right]^2$$

* To be the average ΔH used during the test series.
** To be the highest vacuum used during the test series.
*** Post-test Y must be within ±0.05 initial Y.
ΔY = [Post-test Y - Initial Y] / Initial Y
Post-test ΔH@ must be within ±0.15 in.H2O of the initial ΔH@.
ΔH@ difference = Post-test ΔH@ - Initial ΔH@

Data checked by: _____
Date: 12/9/91

INTERNATIONAL TECHNOLOGY CORPORATION

THERMOCOUPLE CALIBRATION DATA SHEET

Date: 12/20/90 Thermocouple No: 12E

Calibrator: BJS Reference: 85772-31E

Range: 5"

Reference point no.	Source*	Reference thermometer temperature °F	Thermocouple temperature °F	Difference %**
1	2	68	67	1.5
2	1	34	34	0
3	3	210	213	1.5
4	4	452	453	.33

* Source: 1) Ice bath
2) Ambient
3) Water bath
4) Oil bath

** Percent difference.

$$\frac{\text{Reference temp. °R} - \text{thermocouple temp. °R}}{\text{(Reference temp. °R)}} \times 100\%$$

where °R = °F + 460

Each percent difference must be less than or equal to 1.5%.

Checked by [signature] Date 12/26/90

THERMOCOUPLE CALIBRATION DATA SHEET

Date: 12/6/90 Thermocouple No: 121

Calibrator: B. S Reference: 4507-3F

Range: 121

Reference point no.	Source*	Reference thermometer temperature °F	Thermocouple temperature °F	Difference %**
1	2	65	67	.15
2	1	34	35	.20
3	3	212	212	.30
4	4	436	437	.30

* Source: 1) Ice bath
2) Ambient
3) Water bath
4) Oil bath

** Percent difference.

$$\frac{\text{Reference temp. °R} - \text{thermocouple temp. °R}}{\text{(Reference temp. °R)}} \times 100\%$$

where °R = °F + 460

Each percent difference must be less than or equal to 1.5%.

Checked by [signature] Date 12/6/90

DI INTERNATIONAL CORPORATION

DIGITAL INDICATOR CALIBRATION DATA SHEET

DATE: 11/19/91 INDICATOR: ET-4

OPERATOR: R. T. Cravens

Test Point Number	Equivalent Temperature, °F T_e	Digital Indicator Temperature, °F T_{di}	Difference,* %
1	0	0	0
2	100	100	0
3	200	201	.15%
4	300	299	.13%
5	400	399	.25%
6	500	499	.21%
7	1000	997	.21%
8	1300	1294	.34%
9	1600	1593	.34%
10	1900	1889	.47%

*PERCENT DIFFERENCE MUST BE LESS THAN OR EQUAL TO 0.5%

$$\%\text{DIFFERENCE} = \frac{(T_e\,°R - T_{di}\,°R)(100)}{T_e\,°R}$$

Where, °R = °F + 460

Checked By: [signature] Date 11-19-91

Digital Indicators for Thermocouple Readout

A digital indicator is calibrated by feeding a series of millivolt signals to the input and comparing the indicator reading with the reading the signal should have generated. Error did not exceed 0.5 percent when the temperatures were expressed in degrees Rankine. Calibration data are included in the following Thermocouple Digital Indicator Calibration Data Sheet(s).

INTERNATIONAL DISTILLATE CORPORATION

DRY GAS THERMOCOUPLE CALIBRATION DATA SHEET

Date: 11-19-91 Thermocouple No: ST-4

Calibrator: B. Groves Reference: ASTM-3F

Inlet

Reference point no.	Source*	Reference thermometer temperature °F	Thermocouple temperature °F	Difference °F**
1	1	73	74	1
2	2	38	41	3
3	3	147	146	1

Outlet

Reference point no.	Source*	Reference thermometer temperature °F	Thermocouple temperature °F	Difference °F**
1	1	73	74	1
2	2	38	42	4
3	3	147	146	1

* Source: 1) Ambient
2) Ice bath
3) Water bath

** Difference must be less than 5°F at both points.

Checked by: GM Date: 11/3/91

Dry Gas Thermocouples and Impinger Thermocouples

The dry gas thermocouples are calibrated by comparing them with an ASTM-3F thermometer at approximately 32°F, ambient temperature, and a higher temperature between approximately 100° and 200°F. The thermocouples agreed within 5°F of the reference thermometer. The impinger thermocouples are checked in a similar manner at approximately 32°F and ambient temperature, and they agreed within 2°F. The thermocouples may be checked at ambient temperature prior to the test series to verify calibration. Calibration data are included in the following Dry Gas Thermometer and Impinger Thermocouple Calibration Data Sheet(s).

Trip Balance

The trip balance is calibrated by comparing it with Class-S standard weights, and it agreed within 0.5 g. Calibration data are shown in the following Trip Balance Calibration Data Sheet(s).

INTERNATIONAL TECHNOLOGY CORPORATION

IMPINGER THERMOCOUPLE CALIBRATION DATA SHEET

Date: 12-14-90 Thermocouple No: T-32

Calibrator: T. Gardenhire Reference: ASTM-3F

Reference point no.	Source*	Reference thermometer temperature °F	Thermocouple temperature °F	Difference °F**
1	1	70	71	1
2	2	34	34	0

* Source: 1) Ambient
2) Ice bath

** Difference must be less than 2°F at both points.

Checked by QA Date 12/14/90

Barometer

The field barometer is calibrated to within 0.1 in.Hg of an NBS-traceable mercury-in-glass barometer before the test series. It is checked against the reference barometer after each test series to determine if it reads within 0.2 in.Hg. The barometer read within the allowable limits each time. Calibration data are included in the following Barometer Calibration Log(s).

TRIP BALANCE CALIBRATION DATA SHEET

Balance No.	Date	Calibrator	Mass determined for					
			5 g	Error	50 g	Error	100 g	Error
419	12/19/96	BJ Graves	5.3	0.3	50.3	0.3	100.2	0.2
420	12/19/96	BJ Graves	5.0	0.0	50.0	0.0	100.1	0.1
421	12/19/96	BJ Graves	5.1	0.1	50.1	0.1	100.1	0.1
422	12/19/96	BJ Graves	5.1	0.1	50.1	0.1	100.1	0.1
415	12/19/96	BJ Graves	5.0	0.0	50.1	0.1	100.0	0.0
199	12/19/96	BJ Graves	5.0	0.0	50.0	0.0	100.0	0.0
Mettler	12/19/96	BJ Graves	5.0	0.0	50.0	0.0	100.0	0.0

Error must not exceed 0.5 grams at each point.

Checked by BJG Date 12/19/96

Orsat Analyzer

The Orsat analyzer is calibrated before the test series by determining the percentages of carbon dioxide and oxygen in a calibration gas containing known percentages of each. The analyzer read within 0.5 percent of the known values. Calibration data are shown in the following Orsat Calibration Data Sheets.

BAROMETER CALIBRATION LOG

	BAROMETER NO.	410	460	408	412	411	412	420
	Client	ZACK	Ausimont	[illegible]	WET	FORD	DuPont	[illegible]
	Project No.	332093			332133	332144		332154
PRETEST	BAROMETER READING	29.20	29.64	29.45	29.56	29.45	29.60	29.57
	REFERENCE BAROMETER READING	29.20	29.63	29.45	29.56	29.46	29.63	29.57
	DIFFERENCE*	.00	0.01	.00	.00	.01	0.03	0.00
	DATE	[illegible]	[illegible]	[illegible]	[illegible]	12/2/91	12/4/91	12/4/91
	CALIBRATOR	[illegible]	[illegible]	[illegible]	M. [illegible]	[illegible]	[illegible]	[illegible]

POST-TEST	BAROMETER READING	29.34			29.60			
	REFERENCE BAROMETER READING	29.26			29.63			
	DIFFERENCE**	0.08			0.03			
	DATE	[illegible]			[illegible]			
	CALIBRATOR	[illegible]			[illegible]			

*Barometer is adjusted so that difference does not exceed 0.05 in. Hg.
**Barometer is not adjusted. If difference exceed 0.10 in. Hg, inform project manager immediately.

Reference Gas: Matheson Gas Products, Inc.
Cylinder No. 4
Control No.
Analysis: CO_2 - 5.0
O_2 - 10.0
CO - 2.0

ORSAT CALIBRATION DATA SHEET

Orsat No.: 142 Gas: O_2

Calibrator	Date	PN	Value determined
J. Neese	3/22/91	332076	10.0
[illegible]	5/18/91	33239 36	10.0
[illegible]	5/1/91	332059	10.0
[illegible]	[illegible]	332[illegible]	10.0
[illegible]	[illegible]	[illegible]	10.0
[illegible]	[illegible]	[illegible]	10.0
[illegible]	[illegible]	33[illegible]	10.0
[illegible]	[illegible]	[illegible]	10.0
R.S. [illegible]	10/[illegible]/91	[illegible]	10.0
[illegible]	[illegible]	[illegible]	10.0
[illegible]	[illegible]	[illegible]	10.0

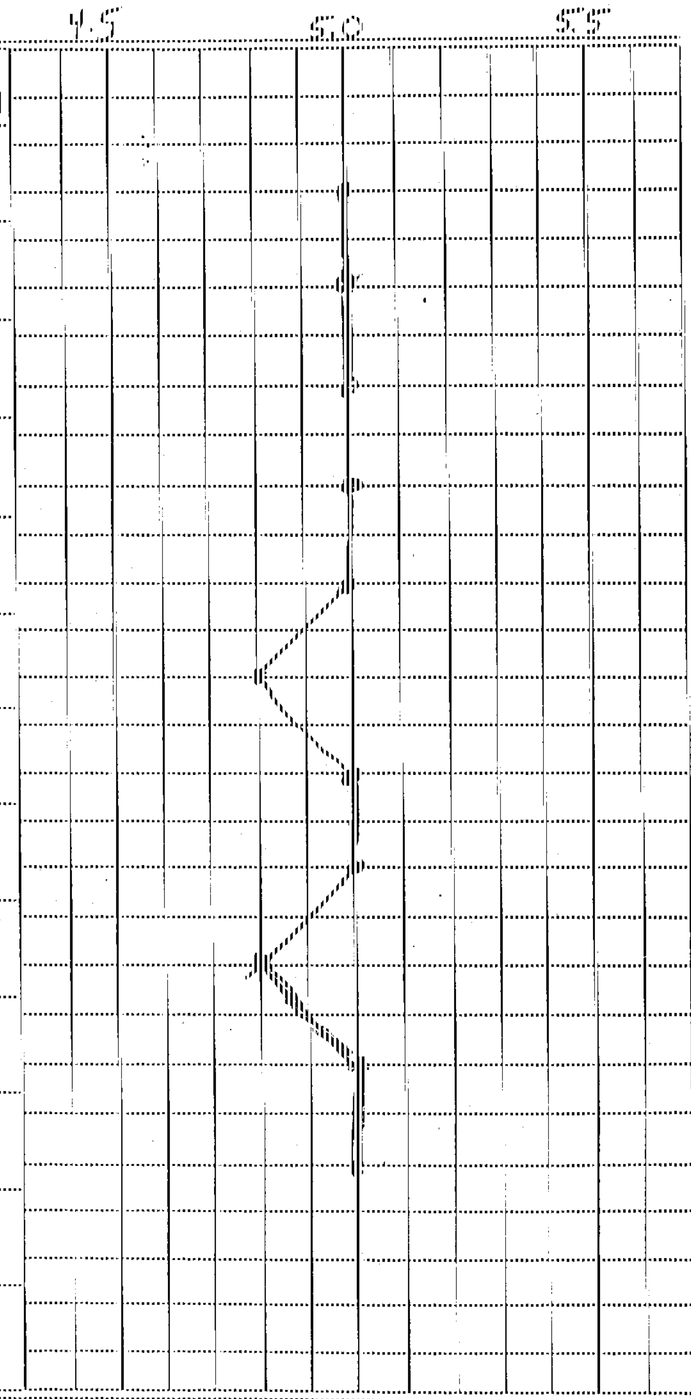
9.5 10.0 10.5

Reference Gas: Matheson Gas Products, Inc.
Cylinder No. 4
Control No.
Analysis: CO_2 - 5.0
O_2 - 10.0
CO - 2.0

ORSAT CALIBRATION DATA SHEET

Orsat No.: 142 Gas: CO_2

Calibrator	Date	PN	Value determined
J. Neese	3/22/[illegible]	[illegible]	5.0
[illegible]	[illegible]	[illegible]	5.0
M. Kettle	[illegible]	[illegible]	5.0
[illegible]	[illegible]	[illegible]	5.0
[illegible]	[illegible]	[illegible]	5.0
[illegible]	[illegible]	[illegible]	4.8
[illegible]	[illegible]	[illegible]	5.0
[illegible]	[illegible]	[illegible]	5.0
[illegible]	10/[illegible]	[illegible]	4.8
[illegible]	[illegible]	[illegible]	5.0
M. Kettle	[illegible]	[illegible]	5.0



AIR TOXICS LTD.

SAMPLE NAME: 25-11-149-02A VT-2

ID#: 9112025-02A

Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

[redacted]

Compound	MDL (ppbv)	Amount (ppbv)
Benzene	23	650
Chloroform	23	Not Detected
1,2-Dichloroethane	23	Not Detected
Methyl Chloride	23	Not Detected
Methylene Chloride	23	3200
Perchloroethylene	23	4500
Trichloroethylene	23	1300
Carbon Tetrachloride	23	Not Detected
Vinylidene Chloride	23	Not Detected
Vinyl Chloride	23	3500

Container Type: 6 Liter SUMMA Canister

[redacted]

NO_x COLLECTION FLASK CALIBRATION

Date	Calibrator	Water temp, °F	Flask tare weight	1st vol, ml*	2nd vol, ml*	3rd** vol, ml*	Volume dev, ml***	Flask number	Mean vol ml
12/[illegible]/88	D CAHILL	71	659.1	2057.3	2057.9		0.6	AA	2057.6
12/[illegible]/88	D CAHILL	71	610.5	2048.9	2049.0		0.1	FF	2049.0
12/[illegible]/88	D CAHILL	71	951.6	2012.9	2012.7		0.2	9F	2012.8
12/[illegible]/88	D CAHILL	71	749.3	2066.3	2066.0		0.3	QQ	2066.2
12/[illegible]/88	D CAHILL	72	676.2	2022.9	2023.5		0.6	7D	2023.2
12/[illegible]/88	D CAHILL	72	734.9	2008.3	2010.6		2.3	KP	2009.5
12/[illegible]/88	D CAHILL	72	595.7	2075.2	2075.1		0.1	OL	2075.2
12/[illegible]/88	D CAHILL	72	736.9	1997.1	1998.8		1.7	15L	1998.0
12/[illegible]/88	D CAHILL	71	881.2	2040.5	2041.6		1.1	11H	2041.1
12/[illegible]/88	D CAHILL	71	908.1	1953.9	1957.4		3.5	3KB	1955.7
12/[illegible]/88	D CAHILL	71	607.0	2058.2	2057.8		0.4	NN	2058.0
12/[illegible]/88	D CAHILL	71	652.7	2062.2	2061.8		0.4	LL	2062.0
12/[illegible]/88	D CAHILL	71	939.6	1959.3	1959.8		0.5	5KR	1959.6
12/[illegible]/88	D CAHILL	71	618.7	2058.6	2059.2		0.6	CC	2058.9
12/[illegible]/88	D CAHILL	71	756.5	1991.3	1990.8		0.5	5B	1991.1
12/[illegible]/88	D CAHILL	71	1036.6	2076.0	2076.0		0.0	YB	2076.0
12/[illegible]/88	D CAHILL	71	743.2	2064.2	2064.2		0.0	ZZ	2064.2
12/[illegible]/88	D CAHILL	71	661.9	2048.4	2047.5		0.9	VV	2048.0
12/[illegible]/88	D CAHILL	71	826.1	2049.4	2050.3		0.9	SS	2049.9

*Determined by (gross-tare)/p where p is density of water at given temperature.
**Third determination is performed if first two do not agree within 10 ml.
***Must not exceed 10 ml.

PEDCo ENVIRONMENTAL METHOD CONTROL

Instrument __________ Model __________

Use Approved By [illegible] Date [illegible]

Termination Approved By __________ Date __________

NO_x COLLECTION FLASK CALIBRATION

Date	Calibrator	Water temp, °F	Flask tare weight	1st vol, ml*	2nd vol, ml*	3rd** vol, ml*	Volume dev, ml***	Flask number	Mean vol ml
12/20/89	D CAHILL	71	1049.7	2095.3	2094.8		1.1	7A	2094.9
1/11/89	D CAHILL	70	632.2	2038.0	2038.0		0.0	WW	2038.0
1/10/89	D CAHILL	70	928.0	1961.2	1961.1		0.1	AZ	1961.2
1/10/89		70	738.6	2050.9	2051.1		0.2	MM	2051.0
1/10/89		71	824.7	2016.2	2016.4		0.2	KB	2016.3
1/10/89		71	698.2	2031.5	2030.7		0.8	HS	2031.1
1/10/89		71	981.2	1991.6	1992.0		0.4	ZK	1991.8
1/10/89		71	696.2	2073.0	2073.6		0.6	FD	2073.3
1/10/89		71	569.9	2049.9	2049.8		0.1	XX	2049.9
1/11/89	D CAHILL	71	648.3	2050.9	2047.5		3.4	HH	2049.2
1/11/89		71	602.7	2046.9	2047.0		0.1	KK	2047.0
1/11/89		71	861.5	2037.0	2037.1		0.1	13J	2037.1
1/11/89		71	718.2	2031.1	2031.1		0.6	PP	2031.1
/		71	603.8	BROKE IN				MM	/
1/11/89		71	909.3	1946.1	1946.3		0.2	SMB	1946.2
1/11/89		71	950.3	2019.3	2019.5		0.2	3HB	2019.4
1/11/89		71	716.7	2016.3	2013.4		2.9	GG	2014.9
1/11/89		71	917.4	1967.8	1967.9		0.1	TT	1967.9
1/11/89		71	1062.8	2071.6	2071.6		0.0	XC	2071.6
1/11/89		71	617.2	2064.4	2064.7		0.3	UU	2064.6

*Determined by (gross-tare)/p where p is density of water at given temperature.
**Third determination is performed if first two do not agree within 10 ml.
***Must not exceed 10 ml.

NO_x COLLECTION FLASK CALIBRATION

Date	Calibrator	Water temp, °F	Flask tare weight	1st vol, ml*	2nd vol, ml*	3rd** vol, ml*	Volume dev, ml***	Flask number	Mean vol ml
1/11/89	D CAHILL	71	620.9	2059.7	2059.3		0.4	EV	2059.5
1/11/89	D CAHILL	71	898.1	2029.2	2028.5		0.3	2HD	2028.4
1/11/89	D CAHILL	71	746.3	2058.4	2054.3		4.1	AUM	2056.4
1/11/89	D CAHILL	71	1011.4	2058.2	2056.2		0.0	2A	2056.2
1/11/89	D CAHILL	71	815.1	2095.6	2096.1		0.5	EE	2095.9
1/11/89	D CAHILL	71	995.3	2078.2	2078.7		0.5	TG	2078.5
1/11/89	D CAHILL	71	665.7	2039.8	2039.3		0.5	JJ	2039.6
1/11/89	D CAHILL	71	917.2	2017.4	2016.5		0.1	1W0	2016.5
1/12/89	D CAHILL	71	708.9	2038.7	2038.1		0.6	00	2038.4
1/12/89	D CAHILL	71	676.0	2020.4	2020.5		0.1	8E	2020.5
1/12/89	D CAHILL	71	699.9	2070.1	2069.5		0.6	YY	2069.8
1/12/89	D CAHILL	71	846.3	1985.8	1984.3		0.5	3A	1984.1
1/12/89	D CAHILL	71	1019.1	1930.2	1930.6		0.4	9KB	1930.4
1/12/89	D CAHILL	71	882.4	1975.4	1975.6		0.2	4KB	1975.5
1/12/89	D CAHILL	71	637.3	2026.6	2027.4		0.8	JD	2027.4
1/12/89	D CAHILL	71	612.9	2053.1	2052.9		0.2	IR	2053.0
1/12/89	D CAHILL	71	650.3	2064.8	2064.3		0.5	00	2064.6
1/12/89	D CAHILL	71	1002.0	1933.3	1933.7		0.4	2KB	1933.5
1/12/89	D CAHILL	71	972.0	1990.3	1990.5		0.2	5W0	1990.4
1/12/89	D CAHILL	71	1013.7	2085.6	2086.0		0.4	WD	2086.8

*Determined by (gross-tare)/p where p is density of water at given temperature.
**Third determination is performed if first two do not agree within 10 ml.
***Must not exceed 10 ml.

NO_x COLLECTION FLASK CALIBRATION

Date	Calibrator	Water temp, °F	Flask tare weight	1st vol, ml*	2nd vol, ml*	3rd** vol, ml*	Volume dev, ml***	Flask number	Mean vol ml
3/9/79	B Gonka	68°	1006.2	2050.7	2050.4		0.3	16 M	2050.55
		68°	936.7	2039.9	2040.2		0.3	UF	2040.05
		68°	901.5	1958.7	1959.2		0.5	AR	1958.95
		68°	728.3	1989.5	1989.3		0.2	4A	1989.4
		68°	698.3	2018.1	2018.1		0.0	DW	2018.1
		68°	881.5					6KB	
		68°	949.9	1999.6	1999.6		0.0	BG	1999.6
		68°	1000.6	1966.2	1966.4		0.2	MM	1966.3
2/10/81	R Thomas	68°	951.6	2002.7	2002.1		0.6	GE	2002.4
[illegible]	R Thomas	68°	750.1	2008.4	2008.3		0.1	CK	2008.4
[illegible]	R Thomas	64	963.7	1951.7	1951.4		0.3	10KB	1951.6

*Determined by (gross-tare)/p where p is density of water at given temperature.
**Third determination is performed if first two do not agree within 10 ml.
***Must not exceed 10 ml.

PEDCo ENVIRONMENTAL METHOD CONTROL

Parameter ______ Method ______

Use Approved By BA Date 1/2/82

Termination Approved By ______ Date ______