Arizona St.
LFG EFD AP42

Arizona St (Balboa Park) Landfill
Surelite Flare

Data Qual = A.

November 25, 1992

TO: Michael R. Lake, Chief
Engineering Division

FROM: Dave Byrnes, Associate Toxics Engineer
Archi dela Cruz, Junior Toxics Engineer

EMISSION FACTORS FOR LANDFILL GAS FLARES

The San Diego Air Pollution Control District (District) contracted the South Coast Environmental Company (SCEC) to source test the Arizona Street and Bell Junior High School landfill gas flares. The sites were source tested for SOx, NOx, CO, TOG/ROG, particulates, and speciated toxic organic gases between March 30 and April 7, 1992.

The source test results of SCEC have been reviewed and approved by the District Monitoring and Technical Services Section (M&TS). District Toxics Engineering Section has generated the following emission factors for landfill gas flares using the M&TS approved source test reports. The emission factors are presented below in units of lbs of contaminant per million BTU.

Emission Factors for Landfill Gas Flares (lbs contaminant/mm BTU).

Contaminant	Arizona	Bell	Average	Recommended*	SCAQMD
SOx	0.0077	0.0105	0.0091	0.01	0.001
NOx	0.0825	0.0562	0.0694	0.10	0.05
CO	<0.0170	<0.0181	<0.0176	0.02	0.19
Particulates	0.0106	0.0207	0.0157	0.02	0.07
ROG**				0.06	0.42

* Recommended for permit processing.
** Inlet concentrations of 0.2 and a conservative destruction efficiency of 70% will be used for the purposes of permit processing.

S2

ENGINEERING'S METHODOLOGY.

Both energy and mass balance were performed to verify the source test report information approved by M&TS. A carbon balance was used to determine the landfill gas flow at the inlet. A hydrogen balance was used to verify the methane content of the inlet landfill gas. Data from Arizona Run #3 and Bell Run #1 were determined to be acceptable after adjustment of the outlet stack temperatures, landfill gas inlet flow rates, and inlet methane concentrations.

An Excel spreadsheet was developed to calculate the energy at the inlet and at the outlet of the flare, the heat of combustion of the landfill gas, and the heat loss by the flare. Test results were adjusted to develop more accurate operating parameters. These operating parameters were verified by inspecting the heat loss as a percent of the total heat output.

Table 1 lists the key operating parameters that were used to produce reasonable energy balances and to determine the landfill emission factors.

Table 1. Flare Operating Parameters.

PARAMETERS	ARIZONA	BELL
Stack Temperature	2110°R	2010°R
Inlet Flow of Landfill Gas	242 cfm	316 cfm
Methane Content at Inlet	60%	55%

STACK TEMPERATURE CORRECTIONS.

It was discovered that SCEC's temperature readings may have been taken improperly and the temperature probe may have been calibrated incorrectly. At Arizona Street, M&TS noticed the SCEC did not allow the temperature probe to reach equilibrium after reinserting the probe into the next port or sampling location. M&TS corrected for this incorrect measurement technique and approved a temperature value of 1903°R. No correction was made by M&TS for the possible calibration error. The thermocouple installed in the site flare displayed an average temperature of 2110°R. A difference of 207° is observed between the two temperature probes.

Temperature readings were apparently performed properly at Bell. SCEC measured an average temperature of 1776°R. The thermocouple installed in the site flare displayed an average temperature of 2010°R. A difference of 234° is observed between the two temperature probes.

It is believed that the temperature readings from the installed thermocouples in both site flares represent the actual stack temperature. The differences between SCEC's temperature measurements and the temperature displayed by the installed thermocouples at both sites are very similar. SCEC's temperature measurements are ~200° lower than both of the thermocouples installed in each

site flare. It is believed that SCEC's temperature probe is reading ~200° less than the actual stack temperature due to a calibration error.

Engineering used the temperature readings measured by the installed thermocouples at each site in an energy balance of each system and for emission factor calculations.

LANDFILL GAS INLET FLOW RATE CORRECTIONS.

The landfill gas inlet flow meters at both sites were inaccurate. Correct landfill gas inlet flow rates were determined by performing a carbon balance using a temperature corrected exhaust flow rate and the %CO2 outlet value approved by M&TS. Arizona's flow meter read 345 cfm during the source test. The calculated flow rate was 242 cfm (the site's flow meter reads 43% higher). Bell's flow meter read 195 cfm while the calculated flow rate was 316 cfm (the site's flow meter reads 38% lower).

Engineering used the corrected inlet flow rates in an energy balance of each systems and for emission factors calculations.

LANDFILL GAS METHANE CONCENTRATION CORRECTIONS.

Arizona Street Landfill Gas Flare Source Test Report.

Run #3 of the particulates testing was the only run that was used for energy balance and emission factors calculations. Runs #1 and #2 were eliminated from the average by M&TS.

An average inlet methane content of ~~390,000~~ ppm was approved by M&TS for Arizona. This average included an unrealistic methane content of 120,000 ppm. This approved methane concentration is incorrect as demonstrated by an energy balance of the system. See spreadsheet #1. An inlet methane content of 600,000 ppm is more accurate based on both a hydrogen and energy balance of the system. See spreadsheet #2. Past inlet sampling conducted by the site supports this value. Therefore, a methane content of 600,000 ppm was used by Engineering to calculate the emission factors for Arizona Street.

60%

Bell Junior High School Landfill Flare Source Test Report.

Run #1 of the particulates testing is believed to be the best data obtained for the energy balance and emission factor calculations. Run #2 was eliminated from the average by M&TS. Run #3 is ignored by Engineering because the percent H2O at the outlet is too high relative to the percent CO2 at the outlet. The percent of H2O at the outlet should equal the percent of CO2 at the outlet for an inlet methane content of 50%.

An average inlet methane content of 253,333 ppm was approved by M&TS for Bell. The average included an unrealistic methane content of 160,000 ppm. This approved methane concentration is incorrect as demonstrated by an energy balance on the system. See spreadsheet #3. An inlet methane content of 550,000 ppm is more accurate based on both a hydrogen and energy balance of the system. See spreadsheet #4. Therefore, a methane content of 550,000 ppm was used by Engineering to calculate the emission factors for Bell.

TOXIC AIR CONTAMINANTS.

The GC analyses of toxic air contaminants (TAC's) as approved by M&TS shows that both sites have similar compositions of TAC's. Table 2 and 3 presents the TAC's destruction efficiencies for both sites. Inlet and outlet detection limits were used when non-detectable concentrations were reported.

Table 2. Destruction Efficiency of TAC's at Arizona Street Flare.

Contaminant	Inflow Conc., lbm/hr	Outflow Conc., lbm/hr	Destruction Efficiency, %
Vinyl Chloride	0.0024	<0.00044 (ND)	>81.7
Methylene Chloride	0.0010	0.00008	91.8
Chloroform	<0.0005 (ND)	<0.00044 (ND)	>12
1,2-Dichloroethane	<0.0005 (ND)	<0.00044 (ND)	>12
1,1,1-Trichloroethane	0.0025	<0.00044 (ND)	>82.4
Benzene	0.00056	0.0003	38.2
Carbon Tetrachloride	<0.0005 (ND)	<0.00044 (ND)	>12
Trichloroethene	0.0038	<0.00044 (ND)	>88.4
1,2-Dibromoethane	<0.0005 (ND)	<0.00044 (ND)	>12
Tetrachloroethene	0.0079	<0.00044 (ND)	>94.4

Table 3. Destruction Efficiency of TAC's at Bell Jr. High Flare.

Contaminant	Inflow Conc., lbm/hr	Outflow Conc., lbm/hr	Destruction Efficiency, %
Vinyl Chloride	0.0012	<0.00028 (ND)	>76.7
Methylene Chloride	0.0029	<0.00028 (ND)	>90.5
Chloroform	<0.0004 (ND)	<0.00029 (ND)	>29.3
1,2-Dichloroethane	<0.0004 (ND)	<0.00028 (ND)	>30.0
1,1,1-Trichloroethane	0.0014	<0.00028 (ND)	> 79.7
Benzene	0.0027	0.00038	85.9
Carbon Tetrachloride	<0.0004 (ND)	<0.00027 (ND)	>32.5
Trichloroethene	0.011	<0.00027 (ND)	>97.5
1,2-Dibromoethane	<0.0004 (ND)	<0.00028 (ND)	>30.0
Tetrachloroethene	0.017	<0.00027 (ND)	>98.4

LANDFILL GAS FLARE EMISSION FACTORS.

Emission factors for SOx, NOx, CO, and particulates were calculated using M&TS approved emissions, the corrected flow rate out the stack (using installed thermocouple readings), the corrected landfill gas flow rate at the inlet (using carbon balance), and the adjusted methane content at the inlet (using energy and hydrogen balance).

M&TS reported undetectable CO in the exhaust of both stacks but did not specify a detection limit. A detection limit of 10 ppm was assumed by Engineering and was used to calculate the CO emission factors.

The approved M&TS source test report showed that all non-methane hydrocarbons (ROG) were non-detectable (ppm range) at both the inlet and the outlet sampling locations for each site. It is recommended that an inlet concentration of 0.2 lbs ROG/mm BTU based on detection limits be used to estimate the landfill ROG generation rate. Using a conservative destruction efficiency of 70%, a 0.06 lbs ROG/mm BTU emission factor is recommended for permit processing.

SUMMARY AND DISCUSSION OF RESULTS.

The recommended emission factor of NOx is relatively similar to the SCAQMD emission factor. SCAQMD emission factor for SOx is one order of magnitude less than the recommended emission factor. This is probably due to differing of sulfur content in the landfill gas or differing sampling methodology. The recommended emission factors for CO and particulates indicate more efficient combustion than the SCAQMD emission factors.

SCAQMD's emission factor for ROG is too high. With SCAQMD 's ROG emission factor, the outlet concentration of ROG would equal ~69 ppm. This value is higher than the measured ROG concentration in any of the sampled landfill gas inlets in San Diego. SCAQMD's emission factor for ROG is questionable . The recommended value based on non-detectable concentrations will be used by Engineering.

RECOMMENDATIONS.

It is recommended that these emission factors be used to calculate emissions for landfill gas flares and be used to determine a cut-off point for source testing landfill gas flares. With the recommended emission factors, landfill gas flare emissions can be estimated. Table 4 presents these estimated emissions.

Table 4. Estimated Emissions from Landfill Gas Flares.

Landfill Size, tons	Gas Gen. Rate, mm cu ft/yr	Estimated Emissions, tons/yr*				
		NOx	ROG	CO	Particulates	SOx
1,000,000	85.6	2.0	1.2	0.4	0.4	0.2
2,000,000	171.4	4.0	2.4	0.8	0.8	0.4
4,000,000	343	8.0	4.8	1.6	1.6	0.8
6,000,000	514	12.0	7.2	2.4	2.4	1.2
10,000,000	857	20.0	12.0	4.0	4.0	2.0

* Assumes an inlet methane content of 50%.

A landfill with a size of 9,000,000 tons and a continuous operating flare triggers Rule 20.2. A landfill with a size of 5,000,000 tons would require offsets per the proposed New Source Review. It is recommended that the presented emission factors be used to estimate emissions from landfills with a size of <5,000,000 tons. Source testing is recommended for landfills with a size of ≥5,000,000 tons.

TEST SUMMARY OF LANDFILL GAS THERMAL OXIDIZER

AT BALBOA PARK IN SAN DIEGO

1. Narrative Summary
2. Test Summary
3. Engineering Report
4. SOx Average
   - Run #1
   - Run #2
   - Run #3
5. NOx and CO Analysis
6. Runs #1 - #3 GC Analysis
7. Particulates
8. Test Witness
   - Run #1
   - Run #2
   - Run #3

Purpose: The SDAPCD engineering division requested testing of emissions from a landfill gas thermal oxidizer located at the Arizona Street landfill. Data regarding emissions from this type of operation were needed for regulatory decision making. The objective of these tests was to quantify emissions of speciated organic gases, oxides of nitrogen, carbon monoxide, oxides of sulfur and particulates. An additional objective was to assess the efficiency of the thermal oxidizer in destroying incoming toxic organic compounds.

Methods: Organic gases were collected in summa polished stainless steel canisters and analyzed using gas chromatography as detailed in the attached appendix. Particulate matter and oxides of sulfur were collected and determined according to modified EPA Methods 5 and 8. Oxides of nitrogen and carbon monoxide were determined using SDAPCD Method 20. A copy of the protocol and referenced methods are contained in an appendix to this report. In general, testing was accomplished in accordance with agreed upon methodology. Individual sample runs which were determined to be substantively in error were deleted from data used in the attached summary table.

Process Description: Gases are generated from the decomposition or volatization of previously deposited waste at the landfill. A gas collection system has been installed at this site to gather these gases for processing. The collected landfill gases are oxidized in an enclosed flare. Emissions associated with this incineration are quantified in the test program discussed in this report.

Conclusions: As indicated in the attached table of summarized results, emissions of oxides of sulfur, carbon monoxide and particulate matter are quite low. Emissions of oxides of nitrogen are also fairly low as would be expected from a low heating value fuel. Emissions of hydrocarbons, including various halogenated toxic species, are also quite low.

Test Summary of Landfill Gas Thermal Oxidizer

SOURCE TEST OF VARIOUS POLLUTANTS EMITTED TO THE ATMOSPHERE

TEST WITNESS - SUMMARY

SITE: Balboa Park Landfill Gas Thermal Oxidizer
2850 Pershing Dr.
San Diego, CA

TEST#: 92090 P.O.#: none TEST DATE: 3/30/92

UNIT TESTED: INCINERATOR

EQUIPMENT: LANDFILL GAS THERMAL OXIDIZER

TESTED BY: Russ Logan & Ted Jackman of SCEC DATE: 3/30/92

SITE PERSONNEL: Ray Purtee DATE: 3/30/92

APCD ENGINEER: Archi de la Cruz DATE: 3/30/92

LAB ANALYSIS BY: SCEC DATE: 4/21/92

REPORT BY: SCEC (Russ Logan) DATE: 5/14/92

REVIEWED BY: David N. Shina DATE: 8/5/92

APPROVED BY: Judith Lake DATE: 8/11/92

JUDITH LAKE, CHIEF OF MONITORING

This report has been reviewed and found to be representative of the testing that was performed.

SOx TEST RESULTS SUMMARY:

		SO3			SO2			Total SOx		
ITEM	I	Cs	Cs(12%)	E	Cs	Cs(12%)	E	Cs	Cs(12%)	E
UNITS	%	gr/dscf	gr/dscf	lbs/hr	gr/dscf	gr/dscf	lbs/hr	gr/dscf	gr/dscf	lbs/hr
VALUE	106	0.001400	0.002138	0.0388	0.000915	0.001397	0.0254*	0.002315	0.003535	0.0642

NOx TEST RESULTS SUMMARY:

GAS	TEST (PPM)	LIMITS (PPM)	PERFORMANCE EXCEEDANCE/NON-EXCEEDANCE
NOx	29.49	N/A	N/A
CO	0.00	N/A	N/A

PARTICULATE TEST RESULTS SUMMARY

ITEM	ts	Bws	%O2	%CO2	vs	Qstd	Cs(total)	Cs(12%,total)	E(total)	%I
UNITS	°F	%	%	%	ft/sec	dscfm	gr/hr	gr/hr	lbs/hr	%
VALUE	1437	8.67	11.70	7.81	17.419	3246	0.0316	0.0050	0.09	108

G.C. TEST RESULTS SUMMARY:

	AVERAGE INLET		AVERAGE OUTLET			AVERAGE INLET		AVERAGE OUTLET	
	RESULT (PPM)	DET. LIMIT (PPM)	RESULT (PPM)	DET. LIMIT (PPM)		RESULT (PPB)	DET. LIMIT (PPB)	RESULT (PPB)	DET. LIMIT (PPB)
C1 as Methane	390000	118	25	3.7	Vinyl Chloride	970	186	ND	14.6
C2 as Ethane	ND	118	ND	3.7	Methylene Chloride	303	133	2	10.8
C3 as n-Propane	ND	93	ND	2.9	Chloroform	ND	97	ND	7.6
C4 as n-Butane	ND	72	ND	2.3	1,2-Dichloroethane	ND	115	ND	9.1
C5 as Pentane	ND	47	ND	1.5	1,1,1-Trichloroethane	464	86	ND	6.8
C6 as n-Hexane	ND	47	ND	1.5	Benzene	180	147	5	11.6
C7 as n-Heptane	ND	47	ND	1.5	Carbon Tetrachloride	ND	74	ND	5.9
C8 as n-Octane	ND	47	ND	1.5	Trichloroethene	733	88	ND	6.9
C9 as n-Nonane	ND	47	ND	1.5	1,2-Dibromoethane	ND	61	ND	4.8
> C9 as n-Nonane	ND	47	ND	1.5	Tetrachloroethene	1203	68	ND	5.5

ENGINEERING SOURCE TEST REPORT
ARIZONA STREET LANDFILL GAS FLARE

DATE:	April 10, 1992
SOURCE:	Arizona Street Landfill
EQUIPMENT:	Arizona Street Landfill Gas Flare
ENGINEER:	Archi dela Cruz

TEST PURPOSE

The purpose of this source test is to more accurately assess PM, CO, NOx, SO2, and TOG/ROG emissions which are generated at this type of source. Also, there will be an analysis of toxic emissions generated at the inlet and outlet of the landfill gas flare system. The results of this source test will be used to generate emission factors for this type of source.

BACKGROUND INFORMATION

SDAPCD M&TS personnel:	Dave Shina and Janet Cawyer
Contracted source testing company:	Russ Logan South Coast Environmental Company
Operator of flare:	Ray Purtee, City of San Diego

OPERATING PARAMETERS DURING TESTING

The flare was in operation upon arrival. Scaffolding and newly positioned sampling ports were provided. The following parameters were observed during the source test.

Sampling date:	March 30, 1992
Starting time of sampling:	11:25 am
Ending time of sampling:	5:15 pm
Average landfill gas flowrate:	345 cfm
Natural gas usage:	0 cfm
Average flare temperature:	1650 F
Average landfill O_2 content:	0.022%
Methane content of landfill gas	48% (as reported by Ray Purtee)

DISCUSSION AND CONCLUSION.

One event that occurred during the source test was that the flowmeter was recalibrated. While I was recording the O_2 content and observing the stack, I noticed Ray Purtee and Greg Montgomery (Klienfelder) in front of the flowmeter. I approached them. They indicated that they were clearing the vent valves from condensation. It appeared that clearing the vent valves would have little effect on the operating system (vent pipes are approximately 1/8" in diameter). The vent valves were opened for about only a minute each. The flowrate through the vent valves was assumed to be negligible.

Later, I noticed that the flowrate readings decreased from 360 cfm to 160 cfm. I called Ray Purtee (he had left the site), and asked him about this occurrence. Ray Purtee returned to the site and realized that Greg Montgomery had recalibrated the flowmeter. Purtee explained that Montgomery reset the flowmeter to zero while clearing the vent valves.

I question the validity of the flowmeter readings which I recorded. Two average landfill gas flowrates were calculated. The first average flowrate calculated (345 cfm) represents the average flowrate prior to the flowmeter recalibration by Montgomery. A second average flowrate was calculated (250 cfm) represents the average flowrate after the flowmeter recalibration. I believe that the more representative average flowrate value would be 345 cfm.

The landfill gas flare system appeared to be operating under typical conditions during testing. No noticeable operating changes were observed throughout the testing. The system appeared to be in good operating condition. No visible emissions were observed during the testing. Slight landfill gas odors were observed in the vicinity of the blower but at non-detectable levels from the explosimeter (ID#168241, calibrated for propane).

The source was not operating under S/A conditions. The source was not controlling off-site migration from the landfill. This implies the there is an abundance of landfill gas and does not effect the source test results.

Landfill Flare Source Test Data
Arizona Street Landfill

warm-up time to reach operating temperature - none required

~~FLARE~~ no visible emission, ~~0.025%~~

TEMP. = 1652°F , O_2 % ~~0.025%~~ , 340 ~~360~~ cfm

SCEC arrived at 8:30 slight odor but no reading on explosimeter

1st run of PM? low pressure differential in stack = ~0.05" H_2O

SOURCE TESTING RUN # 1

TIME, min	LANDFILL GAS BURNED (inlet), ft³/min	NATURAL GAS USAGE, ft³/min	TEMP, °F	O_2 CONTENT
(1:25) start PM 5	~~340~~ 340	0	1653	0.025%
10	~~320~~ 320		1650	0.023%
15	~~360~~ 360		1655	0.023%
20	~~340~~ 340		1652	0.023%
25	~~340~~ 340		1650	0.022%
30	~~340~~ 340		1650	0.022%
35	~~340~~ 340		1649	0.022%
40	~~320~~ 320		1648	0.022%
90 ran out of ice	~~340~~ 340		1651	0.022%
5	~~360~~ 360		1649	0.022%
10	~~360~~ 360		1653	0.022%
	~~360~~ 360		1653	0.022%
10	~~360~~ 360		1647	0.022
20	340		1654	0.022
30	360		1649	"
40	300		1650	"
50 was 0	160		1650	"
60	200		1657	"

Landfill Flare Source Test Data
Arizona

TIME	MIN. PASSED	LAND FILL GAS INLET, cfm	NAT'L GAS INLET, cfm	TEMP., °F	O_2 CONTE
:30 phone	95	200	0	1651	0.022%
20	135	280	0	1650	0.02
:20		280	0	1652	0.022

Ray Purtee cleaned valves of flowmeter. ~~Stated~~ Purtee stated clearing valves will have few drops of condensate came out. little effects of system.

Ray Purtee stated Greg Montgomery (Kleinfelder) "recalibrated" flowmeter in the middle of source testing. Montgomery turned bottom screw to zero the flowmeter w/ his thumbnail. Purtee has scaffolding until Apr. 13.

:5	260	0	1652	0.022%
5:5	280	0 ~~1647~~	1647	0.022%
1:00	280	0	1655	0.022%
:10	260	↓	1651	0.022%
:20	260		1652	0.022%
:30	260		1650	"
:40	260	↓	1652	"
:50	260		1653	"
00	260		1648	"

SOURCE TEST OF OXIDES OF SULFUR EMISSIONS TO THE ATMOSPHERE

Test Witness - Average (SOx)

TEST RESULTS SUMMARY:

		SO3			SO2			Total SOx		
ITEM	I	Cs	Cs(12%)	E	Cs	Cs(12%)	E	Cs	Cs(12%)	E
UNITS	%	gr/dscf	gr/dscf	lbs/hr	gr/dscf	gr/dscf	lbs/hr	gr/dscf	gr/dscf	lbs/hr
VALUE	106	0.001400	0.002138	0.0388	0.000915	0.001397	0.0254	0.002315	0.003535	0.0642

TEST PARAMETERS:

PROCEDURES:

The procedures and equipment utilized in these tests are based on EPA NSPS guidelines and from the EPA CFR 40, Standards Method 8. The sampling utilized a front-end filter (fig. 1).

CALCULATIONS:

All calculations are based on the EPA CFR 40, July 1, 1991, Parts 53-60, Appendix A, Method 8.

SAMPLING:

The test consisted of sampling at 16 traverse points, 4 from each of 4 sample ports (fig.2), collected from 84 inches below the stack (fig.3). All field data were transferred to the computer printout. All calculations were done by the computer.

ANALYSES:

Gas: A CEM analysis was performed by SCEC.

SOx: All procedures follow EPA guidelines, except where noted in this report.

EQUIPMENT:

All testing and analysis equipment was calibrated according to EPA guidelines and performed by SCEC.

OVERVIEW OF THE TEST:

	RUN #1	RUN #2	RUN #3
SAMPLING:	Failed	Passed	Passed
LABORATORY:	Passed	Passed	Passed

#1 was eliminated from the overall test average because QA criteria were not met. (See the laboratory sheet of the particulate report for an in depth explanation.)

Concentration(H2SO4) = [K*Normality*V-titrant*(V-solution/V-aliquot)]/Vm-(std)

Concentration(SO2) = [K*Normality*V-titrant*(V-solution/V-aliquot)]/Vm-(std)

K=MW/#equiv/mole

CALCULATIONS:

	SDAPCD RUN1	SDAPCD RUN 2	SDAPCD RUN 3	SDAPCD **AVG	
TOTAL SO3					
Conc(H2SO4,total) = ΣConc(H2SO4,location) =	0.0000674	0.0000826	0.0000989	0.0000830	grams/dscf
Cs(H2SO4,total) = ΣCs(H2SO4,location) =	**0.0010403**	**0.0012752**	**0.0015257**	**0.0012804**	**grains/dscf**
Cs(H2SO4,12%,total) =ΣCs(H2SO4,12%,location) =	0.0015546	0.0019321	0.0023442	0.0019436	grains/dscf
E (H2SO4,total) = ΣE(H2SO4,location) =	**0.0245**	**0.0352**	**0.0424**	**0.0340**	**lbs/hr**
TOTAL SO2					
Conc(SO2,total) = ΣConc(SO2,location) =	0.0000440	0.0000540	0.0000646	0.0000542	grams/dscf
Cs(SO2,total) = ΣCs(SO2,location) =	**0.0006795**	**0.0008329**	**0.0009965**	**0.0008363**	**grains/dscf**
Cs(SO2,12%,total) =ΣCs(SO2,12%,location) =	0.0010154	0.0012620	0.0015311	0.0012695	grains/dscf
E (SO2,total) = ΣE(SO2,location) =	**0.0160**	**0.0230**	**0.0277**	**0.0222**	**lbs/hr**
TOTAL SOx					
Conc(SOx,total) = Conc(H2SO4,total)+Conc(SO2,total) =	0.0001115	0.0001366	0.0001635	0.0001372	grams/dscf
Cs(SOx,total) = Cs(H2SO4,total)+Cs(SO2,total) =	**0.0017198**	**0.0021081**	**0.0025222**	**0.0021167**	**grains/dscf**
SO2,12%,total) = Cs(H2SO4,12%,total)+Cs(SO2,12%,total) =	0.0025700	0.0031941	0.0038753	0.0032131	grains/dscf
E(SOx,total) = E(H2SO4,total)+E(SO2,total) =	**0.0405**	**0.0582**	**0.0702**	**0.0562**	**lbs/hr**

** Run #1 is eliminated from the overall test average

SOURCE TEST OF OXIDES OF SULFUR EMISSIONS TO THE ATMOSPHERE

Test Witness - Average (SOx)

TEST RESULTS SUMMARY:

		SO3			SO2			Total SOx		
ITEM	I	Cs	Cs(12%)	E	Cs	Cs(12%)	E	Cs	Cs(12%)	E
UNITS	%	gr/dscf	gr/dscf	lbs/hr	gr/dscf	gr/dscf	lbs/hr	gr/dscf	gr/dscf	lbs/hr
VALUE	106	0.001400	0.002138	0.0388	0.000915	0.001397	0.0254	0.002315	0.003535	0.0642

TEST PARAMETERS:

PROCEDURES:

The procedures and equipment utilized in these tests are based on EPA NSPS guidelines and from the EPA CFR 40, Standards Method 8. The sampling utilized a front-end filter (fig. 1).

CALCULATIONS:

All calculations are based on the EPA CFR 40, July 1, 1991, Parts 53-60, Appendix A, Method 8.

SAMPLING:

The test consisted of sampling at 16 traverse points, 4 from each of 4 sample ports (fig.2), collected from 84 inches below the stack (fig.3). All field data were transferred to the computer printout. All calculations were done by the computer.

ANALYSES:

Gas: A CEM analysis was performed by SCEC.

SOx: All procedures follow EPA guidelines, except where noted in this report.

EQUIPMENT:

All testing and analysis equipment was calibrated according to EPA guidelines and performed by SCEC.

OVERVIEW OF THE TEST:

	RUN #1	RUN #2	RUN #3
SAMPLING:	Failed	Passed	Passed
LABORATORY:	Passed	Passed	Passed

#1 was eliminated from the overall test average because QA criteria were not met. (See the laboratory sheet of the particulate report for depth explanation.)

Concentration(H2SO4) = [K*Normality*V-titrant*(V-solution/V-aliquot)]/Vm-(std)

Concentration(SO2) = [K*Normality*V-titrant*(V-solution/V-aliquot)]/Vm-(std)

K=MW/#equiv/mole

CALCULATIONS:

	SDAPCD RUN1	SDAPCD RUN 2	SDAPCD RUN 3	SDAPCD **AVG	
TOTAL SO3					
Conc(H2SO4,total) = ΣConc(H2SO4,location) =	0.0000674	0.0000826	0.0000989	0.0000908	grams/dscf
Cs(H2SO4,total) = ΣCs(H2SO4,location) =	**0.0010403**	**0.0012752**	**0.0015257**	**0.0014005**	**grains/dscf**
Cs(H2SO4,12%,total) =ΣCs(H2SO4,12%,location) =	0.0015546	0.0019321	0.0023442	0.0021382	grains/dscf
E (H2SO4,total) = ΣE(H2SO4,location) =	**0.0245**	**0.0352**	**0.0424**	**0.0388**	**lbs/hr**
TOTAL SO2					
Conc(SO2,total) = ΣConc(SO2,location) =	0.0000440	0.0000540	0.0000646	0.0000593	grams/dscf
Cs(SO2,total) = ΣCs(SO2,location) =	**0.0006795**	**0.0008329**	**0.0009965**	**0.0009147**	**grains/dscf**
Cs(SO2,12%,total) =ΣCs(SO2,12%,location) =	0.0010154	0.0012620	0.0015311	0.0013965	grains/dscf
E (SO2,total) = ΣE(SO2,location) =	**0.0160**	**0.0230**	**0.0277**	**0.0254**	**lbs/hr**
TOTAL SOx					
Conc(SOx,total) = Conc(H2SO4,total)+Conc(SO2,total) =	0.0001115	0.0001366	0.0001635	0.0001500	grams/dscf
Cs(SOx,total) = Cs(H2SO4,total)+Cs(SO2,total) =	**0.0017198**	**0.0021081**	**0.0025222**	**0.0023151**	**grains/dscf**
SO2,12%,total) = Cs(H2SO4,12%,total)+Cs(SO2,12%,total) =	0.0025700	0.0031941	0.0038753	0.0035347	grains/dscf
E(SOx,total) = E(H2SO4,total)+E(SO2,total) =	**0.0405**	**0.0582**	**0.0702**	**0.0642**	**lbs/hr**

** Run #1 is eliminated from the overall test average

Test Witness - Run #1 (SOx)

TEST RESULTS SUMMARY:

		SO3			SO2		
ITEM	I	Cs	Cs(12%)	E	Cs	Cs(12%)	E
UNITS	%	gr/dscf	gr/dscf	lbs/hr	gr/dscf	gr/dscf	lbs/hr
VALUE	106	0.001040	0.001555	0.0245	0.000679	0.001015	0.0160

Total SOx		
Cs	Cs(12%)	E
gr/dscf	gr/dscf	lbs/hr
0.001720	**0.002570**	**0.0405**

TEST PARAMETERS:

OVERVIEW OF THE TEST

SAMPLING: Failed

LABORATORY: Passed

The data from this test is unacceptable and will not be used in the overall test average (see the particulate laboratory report-Run #1 for an in depth explanation).

Concentration(H2SO4) = [K*Normality*V-titrant*(V-solution/V-aliquot)]/Vm-(std)

CALCULATIONS:

	SDAPCD	SCEC	
MISCELLANEOUS DATA			
N = Normality =	0.00971	0.00971	equiv/liter
Vmstd =	30.794	30.79	dscf
Qstd =	2749	2727	dscfm
%CO2 =	8.03	8.03	%
15.43 grains = 1 gram	15.43	15.4	grains/gram
7000grains=1lb, 60min=1hr; 60min/hr/7000grains/lb=	0.00857	0.00857	lbs-min/grs-hr
SO3 as H2SO4:			
MW =	98.08	** 97	g/mole
# equiv/mole vs. BaCl2 =	2	2	equiv/mole
K =	49.04	48.5	grams/equiv
FRONT HALF			
Volume of the titrant = Vt	0	0	ml
Volume of the solution = Vsoln =	545	545	ml
Volume of the aliquot = Valiquot =	10	10	ml
Conc(H2SO4,front) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000000	0.0000000	grams/dscf
Cs(H2SO4,front) = 15.43*Conc(H2SO4,front) =	0.0000000	0.0000000	grains/dscf
Cs(H2SO4,12%,front) = Cs(front)*(12/%CO2) =	0.0000000	0.0000000	grains/dscf
E (H2SO4,front) = 0.00857*Qstd*Cs(H2SO4,front) =	0.0000	0.0000	lbs/hr
FILTER			
Volume of the titrant = Vt	0	0	ml
Volume of the solution = Vsoln =	100	100	ml
Volume of the aliquot = Valiquot =	10	10	ml
Conc(H2SO4,filter) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std	0.0000000	0.0000000	grams/dscf
Cs(H2SO4,filter) = 15.43*Conc(H2SO4,filter) =	0.0000000	0.0000000	grains/dscf
Cs(H2SO4,12%,filter) = Cs(filter)*(12/%CO2) =	0.0000000	0.0000000	grains/dscf
E (H2SO4,filter) = 0.00857*Qstd*Cs(H2SO4,filter) =	0.0000	0.0000	lbs/hr
BACK HALF			
Volume of the titrant = Vt	0.08	0.08	ml
Volume of the solution = Vsoln =	545	545	ml
Volume of the aliquot = Valiquot =	10	10	ml
Conc(H2SO4,back) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000674	0.0000667	grams/dscf
Cs(H2SO4,back) = 15.43*Conc(H2SO4,back) =	0.0010403	0.0010270	grains/dscf
Cs(H2SO4,12%,back) = Cs(H2SO4,back)*(12/%CO2) =	0.0015546	0.0015347	grains/dscf
E (H2SO4,back) = 0.00857*Qstd*Cs(H2SO4,back) =	0.0245	0.0242	lbs/hr
TOTAL SO3			
Conc(H2SO4,total) = ΣConc(H2SO4,location)	0.0000674	0.0000667	grains/dscf
Cs(H2SO4,total) = ΣCs(H2SO4,location) =	0.0010403	0.0010270	grains/dscf
Cs(H2SO4,12%,total) =ΣCs(H2SO4,12%,location) =	0.0015546	0.0015347	grains/dscf
E (H2SO4,total) = ΣE(H2SO4,location) =	0.0245	0.0242	lbs/hr

COMMENTS:

** SCEC used an incorrect molecular weight for H2SO4, and this gave incorrect values for all the subsequent numbers that SCEC generated in its final report.

The District will use the numbers generated by the District's spreadsheet, because these values are correct.

Concentration(SO2) = [K*Normality*V-titrant*(V-solution/V-aliquot)]/Vm-(std)

CALCULATIONS:

SCELLANEOUS DATA

	SDAPCD	SCEC	
N = Normality =	0.00971	0.00971	equiv/liter
Vmstd =	30.794	30.79	dscf
Qstd =	2749	2727	dscfm
%CO2 =	8.03	8.03	%
15.43 grains = 1 gram	15.43	15.4	grains/gram
7000grains=1lb, 60min=1hr; 60min/hr/7000grains/lb=	0.00857	0.00857	lbs-min/grs-hr

SO2:

MW =	64.06	not done	g/mole
# equiv/mole vs. BaCl2 =	2	not done	equiv/mole
K =	32.03	not done	grams/equiv

FRONT HALF

Volume of the titrant = Vt	0	not done	ml
Volume of the solution = Vsoln =	545	not done	ml
Volume of the aliquot = Valiquot =	10	not done	ml
Conc(SO2,front) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000000	not done	grams/dscf
Cs(SO2,front) = 15.43*Conc(SO2,front) =	0.0000000	not done	grains/dscf
Cs(SO2,12%,front) = Cs(SO2,front)*(12/%CO2) =	0.0000000	not done	grains/dscf
E (SO2,front) = 0.00857*Qstd*Cs(SO2,front) =	0.0000	not done	lbs/hr

FILTER

Volume of the titrant = Vt	0	not done	ml
Volume of the solution = Vsoln =	100	not done	ml
Volume of the aliquot = Valiquot =	10	not done	ml
Conc(SO2,filter) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000000	not done	grams/dscf
Cs(SO2,filter) = 15.43*Conc(SO2,filter) =	0.0000000	not done	grains/dscf
Cs(SO2,12%,filter) = Cs(SO2,filter)*(12/%CO2) =	0.0000000	not done	grains/dscf
E (SO2,filter) = 0.00857*Qstd*Cs(SO2,filter) =	0.0000	not done	lbs/hr

BACK HALF

Volume of the titrant = Vt	0.08	not done	ml
Volume of the solution = Vsoln =	545	not done	ml
Volume of the aliquot = Valiquot =	10	not done	ml
Conc(SO2,back) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000440	not done	grams/dscf
Cs(SO2,back) = 15.43*Conc(SO2,back) =	0.0006795	not done	grains/dscf
Cs(SO2,12%,back) = Cs(SO2,back)*(12/%CO2) =	0.0010154	not done	grains/dscf
E (SO2,back) = 0.00857*Qstd*Cs(SO2,back) =	0.0160	not done	lbs/hr

TOTAL SO2

Conc(SO2,total) = ΣConc(SO2,location)	0.0000440	not done	grams/dscf
Cs(SO2,total) = ΣCs(SO2,location) =	0.0006795	not done	grains/dscf
Cs(SO2,12%,total) = ΣCs(SO2,12%,location) =	0.0010154	not done	grains/dscf
E (SO2,total) = ΣE(SO2,location) =	0.0160	not done	lbs/hr

COMMENTS:

SCEC did not calculate the contribution due to SO2; so, the District will use the values generated by the District's spreadsheet.

COMPANY: ARIZONA STREET
DATE: 3/30/92
UNIT: FLARE
REPORT #:T1482-1

RUN #1
@ 68'F
EPA METHOD 5/8

PARTICULATE RESULTS:	net mg	gr/dscf	gr/scf	gr/dscf @ 12% CO2	lbs/hr
Probe & Nozzle:	0	0	0	0	0
Filter:	0	0	0	0	0
Condensables:	16.895	0.008450	0.007713	0.012628	0.2
Total:	16.895	0.008450	0.007713	0.012628	0.2

N BaCl = 0.00971

SULFATE RESULTS:	Vol aliq	Vt	gr/dscf	gr/scf	gr/dscf @ 12% CO2	lbs/hr
Probe & Nozzle:	54.5	0	0	0	0	0
Filter:	10	0	0	0	0	0
Condensables:	54.5	0.08	0.001026	0.000937	0.001534	0.02
Total:			0.001026	0.000937	0.001534	0.02

ADDITIONAL DATA:

TIME start	TIME finish	%O2	%CO2	%H2O	Vm(std)	SDCFM
1125	1309	11.55	8.03	8.72	30.79	2727

only Run # 3 were used for calc. of emissions.

Test Witness - Run #2 (SOx)

TEST RESULTS SUMMARY:

		SO3			SO2		
ITEM	I	Cs	Cs(12%)	E	Cs	Cs(12%)	E
UNITS	%	gr/dscf	gr/dscf	lbs/hr	gr/dscf	gr/dscf	lbs/hr
VALUE	103	0.001275	0.001932	0.0352	0.000833	0.001262	0.0230

Total SOx		
Cs	Cs(12%)	E
gr/dscf	gr/dscf	lbs/hr
0.002108	**0.003194**	**0.0582**

TEST PARAMETERS:

OVERVIEW OF THE TEST

SAMPLING: Passed

LABORATORY: Passed

The data from this test is acceptable and will be used in the overall test average.

Concentration(H2SO4) = [K*Normality*V-titrant*(V-solution/V-aliquot)]/Vm-(std)

CALCULATIONS:

	SDAPCD	SCEC	
MISCELLANEOUS DATA			
N = Normality =	0.00971	0.00971	equiv/liter
Vmstd =	35.262	35.25	dscf
Qstd =	3223	3402	dscfm
%CO2 =	7.92	7.92	%
15.43 grains = 1 gram	15.43	15.4	grains/gram
7000grains=1lb, 60min=1hr; 60min/hr/7000grains/lb=	0.00857	0.00857	lbs-min/grs-hr
SO3 as H2SO4:			
MW =	98.08	** 97	g/mole
# equiv/mole vs. BaCl2 =	2	2	equiv/mole
K =	49.04	48.5	grams/equiv
FRONT HALF			
Volume of the titrant = Vt	0	0	ml
Volume of the solution = Vsoln =	70	70	ml
Volume of the aliquot = Valiquot =	10	10	ml
Conc(H2SO4,front) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000000	0.0000000	grams/dscf
Cs(H2SO4,front) = 15.43*Conc(H2SO4,front) =	0.0000000	0.0000000	grains/dscf
Cs(H2SO4,12%,front) = Cs(front)*(12/%CO2) =	0.0000000	0.0000000	grains/dscf
E (H2SO4,front) = 0.00857*Qstd*Cs(H2SO4,front) =	0.0000	0.0000	lbs/hr
FILTER			
Volume of the titrant = Vt	0	0	ml
Volume of the solution = Vsoln =	100	100	ml
Volume of the aliquot = Valiquot =	10	10	ml
Conc(H2SO4,filter) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std	0.0000000	0.0000000	grams/dscf
Cs(H2SO4,filter) = 15.43*Conc(H2SO4,filter) =	0.0000000	0.0000000	grains/dscf
Cs(H2SO4,12%,filter) = Cs(filter)*(12/%CO2) =	0.0000000	0.0000000	grains/dscf
E (H2SO4,filter) = 0.00857*Qstd*Cs(H2SO4,filter) =	0.0000	0.0000	lbs/hr
BACK HALF			
Volume of the titrant = Vt	0.18	0.18	ml
Volume of the solution = Vsoln =	340	340	ml
Volume of the aliquot = Valiquot =	10	10	ml
Conc(H2SO4,back) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000826	0.0000818	grams/dscf
Cs(H2SO4,back) = 15.43*Conc(H2SO4,back) =	0.0012752	0.0012591	grains/dscf
Cs(H2SO4,12%,back) = Cs(H2SO4,back)*(12/%CO2) =	0.0019321	0.0019078	grains/dscf
E (H2SO4,back) = 0.00857*Qstd*Cs(H2SO4,back) =	0.0352	0.0348	lbs/hr
TOTAL SO3			
Conc(H2SO4,total) = ΣConc(H2SO4,location)	0.0000826	0.0000818	grams/dscf
Cs(H2SO4,total) = ΣCs(H2SO4,location) =	0.0012752	0.0012591	grains/dscf
Cs(H2SO4,12%,total) = ΣCs(H2SO4,12%,location) =	0.0019321	0.0019078	grains/dscf
E (H2SO4,total) = ΣE(H2SO4,location) =	0.0352	0.0348	lbs/hr

COMMENTS:

** SCEC used an incorrect molecular weight for H2SO4, and this gave incorrect values for all the subsequent numbers that SCEC generated in its final report.

The District will use the numbers generated by the District's spreadsheet, because these values are correct.

Concentration(SO2) = [K*Normality*V-titrant*(V-solution/V-aliquot)]/Vm-(std)

CALCULATIONS:

SCELLANEOUS DATA

	SDAPCD	SCEC	
N = Normality =	0.00971	0.00971	equiv/liter
Vmstd =	35.262	35.25	dscf
Qstd =	3223	3402	dscfm
%CO2 =	7.92	7.92	%
15.43 grains = 1 gram	15.43	15.4	grains/gram
7000grains=1lb, 60min=1hr; 60min/hr/7000grains/lb=	0.00857	0.00857	lbs-min/grs-hr

SO2:

MW =	64.06	not done	g/mole
# equiv/mole vs. BaCl2 =	2	not done	equiv/mole
K =	32.03	not done	grams/equiv

FRONT HALF

Volume of the titrant = Vt	0	not done	ml
Volume of the solution = Vsoln =	70	not done	ml
Volume of the aliquot = Valiquot =	10	not done	ml
Conc(SO2,front) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000000	not done	grams/dscf
Cs(SO2,front) = 15.43*Conc(SO2,front) =	0.0000000	not done	grains/dscf
Cs(SO2,12%,front) = Cs(SO2,front)*(12/%CO2) =	0.0000000	not done	grains/dscf
E (SO2,front) = 0.00857*Qstd*Cs(SO2,front) =	0.0000	not done	lbs/hr

FILTER

Volume of the titrant = Vt	0	not done	ml
Volume of the solution = Vsoln =	100	not done	ml
Volume of the aliquot = Valiquot =	10	not done	ml
Conc(SO2,filter) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000000	not done	grams/dscf
Cs(SO2,filter) = 15.43*Conc(SO2,filter) =	0.0000000	not done	grains/dscf
Cs(SO2,12%,filter) = Cs(SO2,filter)*(12/%CO2) =	0.0000000	not done	grains/dscf
E (SO2,filter) = 0.00857*Qstd*Cs(SO2,filter) =	0.0000	not done	lbs/hr

BACK HALF

Volume of the titrant = Vt	0.18	not done	ml
Volume of the solution = Vsoln =	340	not done	ml
Volume of the aliquot = Valiquot =	10	not done	ml
Conc(SO2,back) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000540	not done	grams/dscf
Cs(SO2,back) = 15.43*Conc(SO2,back) =	0.0008329	not done	grains/dscf
Cs(SO2,12%,back) = Cs(SO2,back)*(12/%CO2) =	0.0012620	not done	grains/dscf
E (SO2,back) = 0.00857*Qstd*Cs(SO2,back) =	0.0230	not done	lbs/hr

TOTAL SO2

Conc(SO2,total) = ∑Conc(SO2,location)	0.0000540	not done	grams/dscf
Cs(SO2,total) = ∑Cs(SO2,location) =	0.0008329	not done	grains/dscf
Cs(SO2,12%,total) =∑Cs(SO2,12%,location) =	0.0012620	not done	grains/dscf
E (SO2,total) = ∑E(SO2,location) =	0.0230	not done	lbs/hr

COMMENTS:

SCEC did not calculate the contribution due to SO2; so, the District will use the values generated by the District's spreadsheet.

COMPANY: ARIZONA STREET
DATE: 3/30/92
UNIT: FLARE
REPORT #:T1482-1

RUN #2
@ 68'F
EPA METHOD 5/8

PARTICULATE RESULTS:	net mg	gr/dscf	gr/scf	gr/dscf @ 12% CO2	lbs/hr
Probe & Nozzle:	4.9	0.002140	0.001932	0.003243	0.06
Filter:	0.7	0.000305	0.000276	0.000463	0.01
Condensables:	8.33	0.003639	0.003284	0.005513	0.11
Total:	13.93	0.006085	0.005492	0.009220	0.18

N BaCl = 0.00971

SULFATE RESULTS:	Vol aliq	Vt	gr/dscf	gr/scf	gr/dscf @ 12% CO2	lbs/hr
Probe & Nozzle:	7	0	0	0	0	0
Filter:	10	0	0	0	0	0
Condensables:	34	0.18	0.001259	0.001136	0.001907	0.04
Total:			0.001259	0.001136	0.001907	0.04

ADDITIONAL DATA:

TIME start	TIME finish	%O2	%CO2	%H2O	Vm(std)	SDCFM
1403	1508	11.69	7.92	9.74	35.25	3402

Test Witness - Run #3 (SOx)

TEST RESULTS SUMMARY:

		SO3			SO2		
ITEM	I	Cs	Cs(12%)	E	Cs	Cs(12%)	E
UNITS	%	gr/dscf	gr/dscf	lbs/hr	gr/dscf	gr/dscf	lbs/hr
VALUE	108	0.001526	0.002344	0.0424	0.000996	0.001531	0.0277

Total SOx		
Cs	Cs(12%)	E
gr/dscf	gr/dscf	lbs/hr
0.002522	0.003875	0.0702

TEST PARAMETERS:

PROCEDURES:

The procedures and equipment utilized in these tests are based on EPA NSPS guidelines and from the EPA CFR 40, Standards Method 8. The sampling utilized a front-end filter (fig. 1).

CALCULATIONS:

All calculations are based on the EPA CFR 40, July 1, 1991, Parts 53-60, Appendix A, Method 8.

SAMPLING:

The test consisted of sampling at 16 traverse points, 4 from each of 4 sample ports (fig.2), collected from 84 inches below the stack (fig.3). All field data was transferred to the computer printout. All calculations were done by the computer.

ANALYSES:

Gas: A CEM analysis was performed by SCEC.

SOx: All procedures follow EPA guidelines, except where noted in this report.

EQUIPMENT:

All testing and analysis equipment was calibrated according to EPA guidelines and performed by SCEC.

OVERVIEW OF THE TEST

SAMPLING: Passed

LABORATORY: Passed

The data from this test is acceptable and will be used in the overall test average.

Run #3

Concentration(H2SO4) = [K*Normality*V-titrant*(V-solution/V-aliquot)]/Vm-(std)

CALCULATIONS:

	SDAPCD	SCEC	
MISCELLANEOUS DATA			
N = Normality =	0.00971	0.00971	equiv/liter
Vmstd =	32.362	32.36	dscf
Qstd =	3246	3267	dscfm
%CO2 =	7.81	7.81	%
15.43 grains = 1 gram	15.43	15.4	grains/gram
7000grains=1lb, 60min=1hr; 60min/hr/7000grains/lb=	0.00857	0.00857	lbs-min/grs-hr
SO3 as H2SO4:			
MW =	98.08	** 97	g/mole
# equiv/mole vs. BaCl2 =	2	2	equiv/mole
K =	49.04	48.5	grams/equiv
FRONT HALF			
Volume of the titrant = Vt	0	0	ml
Volume of the solution = Vsoln =	150	150	ml
Volume of the aliquot = Valiquot =	10	10	ml
Conc(H2SO4,front) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000000	0.0000000	grams/dscf
Cs(H2SO4,front) = 15.43*Conc(H2SO4,front) =	0.0000000	0.0000000	grains/dscf
Cs(H2SO4,12%,front) = Cs(front)*(12/%CO2) =	0.0000000	0.0000000	grains/dscf
E (H2SO4,front) = 0.00857*Qstd*Cs(H2SO4,front) =	0.0000	0.0000	lbs/hr
FILTER			
Volume of the titrant = Vt	0	0	ml
Volume of the solution = Vsoln =	100	100	ml
Volume of the aliquot = Valiquot =	10	10	ml
Conc(H2SO4,filter) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std	0.0000000	0.0000000	grams/dscf
Cs(H2SO4,filter) = 15.43*Conc(H2SO4,filter) =	0.0000000	0.0000000	grains/dscf
Cs(H2SO4,12%,filter) = Cs(filter)*(12/%CO2) =	0.0000000	0.0000000	grains/dscf
E (H2SO4,filter) = 0.00857*Qstd*Cs(H2SO4,filter) =	0.0000	0.0000	lbs/hr
BACK HALF			
Volume of the titrant = Vt	0.24	0.24	ml
Volume of the solution = Vsoln =	280	280	ml
Volume of the aliquot = Valiquot =	10	10	ml
Conc(H2SO4,back) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000989	0.0000978	grams/dscf
Cs(H2SO4,back) = 15.43*Conc(H2SO4,back) =	0.0015257	0.0015061	grains/dscf
Cs(H2SO4,12%,back) = Cs(H2SO4,back)*(12/%CO2) =	0.0023442	0.0023140	grains/dscf
E (H2SO4,back) = 0.00857*Qstd*Cs(H2SO4,back) =	0.0424	0.0419	lbs/hr
TOTAL SO3			
Conc(H2SO4,total) = ∑Conc(H2SO4,location)	0.0000989	0.0000978	grams/dscf
Cs(H2SO4,total) = ∑Cs(H2SO4,location) =	0.0015257	0.0015061	grains/dscf
Cs(H2SO4,12%,total) =∑Cs(H2SO4,12%,location) =	0.0023442	0.0023140	grains/dscf
E (H2SO4,total) = ∑E(H2SO4,location) =	0.0424	0.0419	lbs/hr

COMMENTS:

** SCEC used an incorrect molecular weight for H2SO4, and this gave incorrect values for all the subsequent numbers that SCEC generated in its final report.

The District will use the numbers generated by the District's spreadsheet, because these values are correct.

Concentration(SO2) = [K*Normality*V-titrant*(V-solution/V-aliquot)]/Vm-(std)

CALCULATIONS:

SCELLANEOUS DATA

	SDAPCD	SCEC	
N = Normality =	0.00971	0.00971	equiv/liter
Vmstd =	32.362	32.36	dscf
Qstd =	3246	3267	dscfm
%CO2 =	7.81	7.81	%
15.43 grains = 1 gram	15.43	15.4	grains/gram
7000grains=1lb, 60min=1hr; 60min/hr/7000grains/lb=	0.00857	0.00857	lbs-min/grs-hr

SO2:

MW =	64.06	not done	g/mole
# equiv/mole vs. BaCl2 =	2	not done	equiv/mole
K =	32.03	not done	grams/equiv

FRONT HALF

Volume of the titrant = Vt	0	not done	ml
Volume of the solution = Vsoln =	150	not done	ml
Volume of the aliquot = Valiquot =	10	not done	ml
Conc(SO2,front) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000000	not done	grams/dscf
Cs(SO2,front) = 15.43*Conc(SO2,front) =	0.0000000	not done	grains/dscf
Cs(SO2,12%,front) = Cs(SO2,front)*(12/%CO2) =	0.0000000	not done	grains/dscf
E (SO2,front) = 0.00857*Qstd*Cs(SO2,front) =	0.0000	not done	lbs/hr

FILTER

Volume of the titrant = Vt	0	not done	ml
Volume of the solution = Vsoln =	100	not done	ml
Volume of the aliquot = Valiquot =	10	not done	ml
Conc(SO2,filter) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000000	not done	grams/dscf
Cs(SO2,filter) = 15.43*Conc(SO2,filter) =	0.0000000	not done	grains/dscf
Cs(SO2,12%,filter) = Cs(SO2,filter)*(12/%CO2) =	0.0000000	not done	grains/dscf
E (SO2,filter) = 0.00857*Qstd*Cs(SO2,filter) =	0.0000	not done	lbs/hr

BACK HALF

Volume of the titrant = Vt	0.24	not done	ml
Volume of the solution = Vsoln =	280	not done	ml
Volume of the aliquot = Valiquot =	10	not done	ml
Conc(SO2,back) = [K*N*Vt*(Vsoln/Valiquot)]/Vm(std) =	0.0000646	not done	grams/dscf
Cs(SO2,back) = 15.43*Conc(SO2,back) =	0.0009965	not done	grains/dscf
Cs(SO2,12%,back) = Cs(SO2,back)*(12/%CO2) =	0.0015311	not done	grains/dscf
E (SO2,back) = 0.00857*Qstd*Cs(SO2,back) =	0.0277	not done	lbs/hr

TOTAL SO2

Conc(SO2,total) = ΣConc(SO2,location)	0.0000646	not done	grams/dscf
Cs(SO2,total) = ΣCs(SO2,location) =	0.0009965	not done	grains/dscf
Cs(SO2,12%,total) = ΣCs(SO2,12%,location) =	0.0015311	not done	grains/dscf
E (SO2,total) = ΣE(SO2,location) =	0.0277	not done	lbs/hr

COMMENTS:

SCEC did not calculate the contribution due to SO2; so, the District will use the values generated by the District's spreadsheet.

COMPANY: ARIZONA STREET
DATE: 3/30/92
UNIT: FLARE
REPORT #:T1482-1

RUN #3
@ 68'F
EPA METHOD 5/8

PARTICULATE RESULTS:	net mg	gr/dscf	gr/scf	gr/dscf @ 12% CO2	lbs/hr
Probe & Nozzle:	5.3	0.002522	0.002304	0.003875	0.07
Filter:	2.6	0.001237	0.001130	0.001901	0.03
Condensables:	1.26	0.000599	0.000547	0.000921	0.02
Total:	9.16	0.004359	0.003982	0.006697	0.12

N BaCl = 0.00971

SULFATE RESULTS:	Vol aliq	Vt	gr/dscf	gr/scf	gr/dscf @ 12% CO2	lbs/hr
Probe & Nozzle:	15	0	0	0	0	0
Filter:	10	0	0	0	0	0
Condensables:	28	0.24	0.001506	0.001375	0.002314	0.04
Total:			0.001506	0.001375	0.002314	0.04

ADDITIONAL DATA:

TIME start	TIME finish	%O2	%CO2	%H2O	Vm(std)	SDCFM
1600	1700	11.7	7.81	8.65	32.36	3267

Client: [illegible] & ENG

Analyst: [illegible]

Report #: T-1482

Test Date: 3/30/92

TITRIMETRIC ANALYSIS

Sample I.D./Run #	Total Sample (mls)	Aliquot mls	Normality	Titrant mls
N =	—			
N = 2	70	10	0.009710	0
N = 2	150	10	0.009710	0
[illegible] =	545	10	0.009710	0.08
COND #2	340	10	0.009710	0.18
[illegible] = 3	280	10	0.009710	0.24
F. Hx. #1	100	10	0.009710	0
#2	100	10	0.009710	0
#3	100	10	0.009710	0

COMMENTS:

NOx and CO Analysis

OFFICIAL TEST RESULTS:

GAS	TEST (PPM)	LIMITS (PPM)	PERFORMANCE EXCEEDANCE/NON-EXCEEDANCE
NOx	29.49	N/A	N/A
CO	0.00	N/A	N/A

TEST PARAMETERS:

PROCEDURES & CALCULATIONS:

All the procedures, calculations and equipment utilized in these tests are based on EPA NSPS guidelines and from the EPA CFR 40, July 1, 1991, parts 53-60, Method 20, except where noted in the SDAPCD QA manual for Method 20 testing.

SAMPLING & EQUIPMENT:

SCEC provided all the sampling and analysis equipment, and they were responsible for all the calibrations according to EPA guidelines.

OVERVIEW OF THE TEST:

(1) SCEC did not perform the NO2 converter equation correctly. The District corrected for this.
(2) SCEC did not subtract [NO] from [NOx].
(3) SCEC's O2 calibrations are high (not within +/- 2% full scale).

RUN #1: *ACCEPTED* **RUN #2:** *ACCEPTED* **RUN #3:** *ACCEPTED*

SUMMARY OF ALL 3 TESTS:

	NOx		CO	
	SCEC	APCD	SCEC	APCD
RUN 1	30.46	30.54	0.00	0.00
RUN 2	28.38	28.42	0.00	0.00
RUN 3	29.40	29.50	0.00	0.00
AVERAGE	29.41	29.49	0.00	0.00

COMPANY: ARIZONA STREET
DATE: MARCH 30, 1992
UNIT: FLARE
REPORT #:T1482-1

NO2 - NOx ADJUSTMENTS

RUN #	NOX	NO ppm	NO2 ppm	% Recovery	NOx ADJUSTED VALUES	
					NO2 ppm	NOX ppm
#1	15.95	15.95	0	95.7	0.00	15.95
#2	14.58	13.75	0.83	95.7	0.87	14.62
#3	15.1	13.75	1.35	95.7	1.41	15.16
				AVERAGE	0.76	15.24

CONTRACTOR TEST REPORT

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
MONITORING AND TECHNICAL SERVICES
9150 CHESAPEAKE DRIVE
SAN DIEGO, CA 92123

NITROGEN OXIDES, CARBON MONOXIDE, PARTICULATE, AND SULFUR EMISSIONS SUMMARY REPORT

SITE: Arizona Street Flare

P/O NUMBER: 56896 and 59383 JOB NO: T1482-1

TEST DATE: 3/30/92

EQUIPMENT: Arizona Street Landfill Gas Collection and Incineration System

REPORT BY: R.P. Logan - SCEC DATE: 5/14/92

APCD PERSONNEL: Janet Cawver/David Shina 5/13/92

SITE PERSONNEL: Ray Purtee

APPROVED BY: DATE:

Table 1. Summary of Results - average NO_x and CO stack emissions corrected to 3% O_2

	TEST (ppm)	PERMIT LIMITS (ppm)	PERFORMANCE	HOURS OF TEST
NO_x	29.49	N/A	N/A	3.0
CO	0.00	N/A	N/A	3.0

* Particulate and sulfur results can be found on Page 4

TEST REFERENCE: This testing was performed in accordance with the San Diego Air Pollution Control District Method 20: "Test Procedures For The Determination of Nitrogen Oxides, Carbon Monoxide and Diluent Gases by Continuous Emission Monitoring"

P/O NUMBER: 56896 and 59383 DATE: 3/30/92

Table 2. Stack Emissions of NO_x, CO, and O_2

RUN	SCALE TIME	NO_x 0-250 PPM CHART (div)	NO_x UNCORR (ppm)	NO_x CORR 3%O_2 (ppm)	CO 0-500 PPM CHART (div)	CO UNCORR (ppm)	CO CORR 3% O_2 (ppm)	O_2 0-25% CHART (div)	O_2 %
R1 Avg.	12:30 13:30	6.38	15.95	30.54	0.0	0.0	0.0	46.2	11.55
PK1									
PK2									
R2 Avg.	13:40 14:40	5.85	14.62	28.42	0.0	0.0	0.0	46.8	11.69
PK1									
PK2									
R3 Avg.	14:50 16:00	6.06	15.16	29.50	0.0	0.0	0.0	46.8	11.70
PK1									
PK2									
Peak = Overall =		6.10	15.24	29.49	0.0	0.0	0.0	46.6	11.65

NO_x and CO:

- The value reported is the average concentration value at 3% O_2, when:
  The average pollutant concentration exceeds the permit limit, or the average value is within the permit limit and there are less than two excursions above the limit.

- The value reported is the highest excursion value at 3% O_2, when: There are two or more excursions above the permit limit during the three subtests.

- If it has been determined that stratification exists, the average concentration values of NO_x and CO, at 3% O_2, are then reported.

Table 3. Calibration Gases

	CYLINDER	MANUFACTURER	CONCENTRATION (ppm)
NO_x	CC7297	Scott Marrin	214.2
CO	CC67219	Scott Marrin	476
O_2	CC106786	Scott Marrin	8.40%
NO_2	CC648	Scott Marrin	176.0

P/O NUMBER: 56896 and 59383 DATE: 3/30/92

ANALYZER CHECK LIST

	YES	NO	COMMENTS
NO_x Analyzer			
analyzer calibrated	X		
analyzer set to zero	X		
zero drift < or = 2% of span	X		
reset zero	X		
span drift < or = 2%	X		
reset span	X		
response time within limits	X		
CO Analyzer			
analyzer calibrated	X		
analyzer set to zero	X		
zero drift < or = 2% of span	X		
reset zero	X		
span drift < or = 2%	X		
reset span	X		
O_2 Analyzer			
high calibration set to 20.95%	X		
low cal. set to exhaust gas		X	Set @ 8.4% Gas
zero drift < or = 2% of span	X		
reset zero	X		
span drift < or = 2%	X		
reset span	X		
System Integrity/Leak Check			
pre-testing: performed w/NO/NO_2	X		
post testing: performed w/NO/NO_2	X		
System Assembly			
probe installed	X		
moisture removal trap used	X		
particulate filter used	X		
sample manifold pressure set	X		
Data Recording			
annotated	X		
electronic zero set on each pen	X		
chart speed set	X		
convertor efficiency: NO_2 to NO	X		
certificates of cal. gases	X		

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (714) 653-6780 • FAX (714) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

SOCE01

TO:

KEITH SHANNON
SCEC
15882-1 NORTH BATAVIA
ORANGE, CA 92667-

DATE : 03/02/92

CUSTOMER ORDER NUMBER: 446

COMPONENT	CONCENTRATION (v/v)	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.: CC29002					
Carbon Dioxide	12.16 ± 0.12 %	GMIS Cylinder # CC58263 @ 17.61 @	Varian Model 1868 S/N None Thermal Conductivity Gas Chromatography Last Cal Date: 12/06/91	08/26/93	02/26/92 12.23 % 11.99 % 12.25 % Mean: 12.16 %
Ygen	4.02 ± 0.04 %	GMIS Cylinder # CC81219 @ 5.18 @	Varian Model 1868 S/N None Thermal Conductivity Gas Chromatography Last Cal Date: 12/30/91	08/25/93	02/25/92 4.09 % 4.08 % 4.08 % Mean: 4.08 %
Nitrogen Balance Cylinder Pressure: 2000 psig					
CYLINDER NO.: CC106786					
Oxygen	8.40 ± 0.08 %	GMIS Cylinder # CC52358 @ 7.37 @	Varian Model 1868 S/N None Thermal Conductivity Gas Chromatography Last Cal Date: 4/07/92	08/25/93	02/25/92 8.42 % 8.38 % 8.38 % Mean: 8.40 %
Carbon Dioxide	13.47 ± 0.13 %	GMIS Cylinder # CC58263 @ 17.61 @	Varian Model 1868 S/N None Thermal Conductivity Gas Chromatography Last Cal Date: 12/06/91	08/26/93	02/26/92 13.42 % 13.46 % 13.53 % Mean: 13.47 %
Nitrogen Balance Cylinder Pressure: 2000 psig					

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with EPA-1987 Traceability Protocol # 1, Section 3.0.4, Procedure G1.

Analyst: _____
M.S. Calhoun

Approved: _____
J.T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
2001 THIRD ST. • UNIT H • RIVERSIDE, CA 92507
TELEPHONE (714) 784-1240

RECEIVED

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

SOCE01

TO:

KEITH SHANNON
SOUTH COAST ENVIRONMENTAL CORP
1915 MCKINLEY AVE., ST. E
LA VERNE, CA 91750

DATE : 05/14/91

CUSTOMER ORDER NUMBER: 294

COMPONENT	CONCENTRATION (v/v)	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.:	CC7297				
Nitric Oxide	214.2 ± 2.1 ppm	GMIS Cylinder # CC7341 @ 247.6 ppm	Monitor Labs Model 8448 S/N 136 Continuous Chemiluminescence Last Cal Date: 05/01/91	11/14/92	05/06/91: 211.2 ppm, 214.9 ppm, 213.3 ppm, Mean: 211.8 ppm 05/14/91: 215.8 ppm, 214.4 ppm, 214.5 ppm, Mean: 214.6 ppm
Nitrogen, O2-Free Balance					
Cylinder Pressure: 2000 psig					

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with EPA-1987 Traceability Protocol # 1, Section 3.0.4, Procedure G1.

Analyst: B.E. Gross Approved: J.T. Marrin

SCOTT-MARRIN, INC.
2001 THIRD ST. • UNIT H • RIVERSIDE, CA 92507
TELEPHONE (714) 784-1240

RECEIVED SEP

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

SOCE01
TO: RUSS LOGAN
SOUTH COAST ENVIRONMENTAL CORP
1915 MCKINLEY AVE.
SUITE E
LAVERNE, CA 91750

DATE : 08/30/91

CUSTOMER ORDER NUMBER: 343

COMPONENT	CONCENTRATION (v/v)	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CC67219					
Carbon Monoxide	476 ± 5 ppm	GMIS Cylinder # CC28362 @ 496 ppm	Carle Instr Model 8000 S/N 8249 Methanation/FID Gas Chromatography Last Cal Date: 07/19/91	02/29/93	07/29/89	08/29/91
					475 ppm	475 ppm
Nitrogen	Balance				473 ppm	477 ppm
Cylinder Pressure: 2000 psig					473 ppm	481 ppm
				Mean:	474 ppm	478 ppm

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with EPA-1987 Traceability Protocol # 1, Section 3.0.4, Procedure G1.

Analyst: Mark Monson
M.J. Monson

Approved:
J.T. Marrin

STANDARD CALIBRATION GASES

SCOTT-MARRIN, INC.
2001 THIRD ST. • UNIT H • RIVERSIDE, CA 92507
TELEPHONE (714) 784-1240

REPORT OF ANALYSIS
NIST TRACEABLE GAS MIXTURES

SOCE01

TO:

LESLIE JOHNSON
SOUTH COAST ENVIRONMENTAL
1582-1 N. BATAVIA STREET
ORANGE, CA 92667-

DATE: 01/13/92

CUSTOMER ORDER NUMBER: 427

CYLINDER NUMBER	COMPONENT	CONCENTRATION (v/v)	NIST TRACEABLE REFERENCE STANDARD
CC648	Nitrogen Dioxide	176.8 ± 1.8 ppmv	SRM 2627
	Nitrogen	Balance	

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To Russ Logan	From Leslie
Co.	Co.
Dept.	Phone # (853 6780
Fax # (714) 352-8201	Fax #

ppm = umole/mole % = mole-%

The above analysis is traceable to the National Institute of Standards and Technology by intercomparison with the reference standard listed above.
Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance. NIST Report No. MMAP 232.09/202491.

Analyst: _____
R.E. Gross

Approved: _____
J.T. Marrin

KOKUSAI

CHART NO. B9627RY

YOKOGAWA

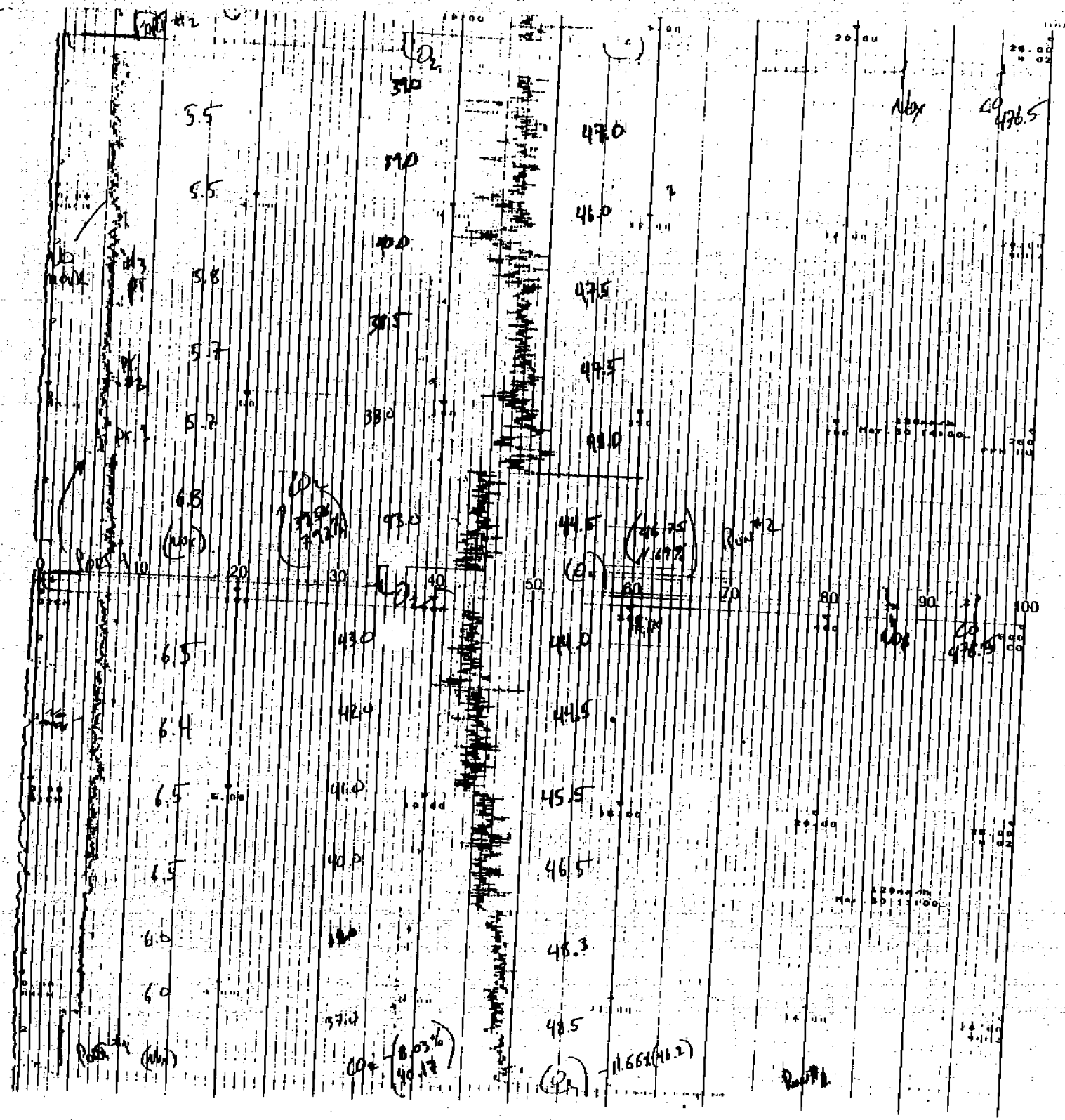
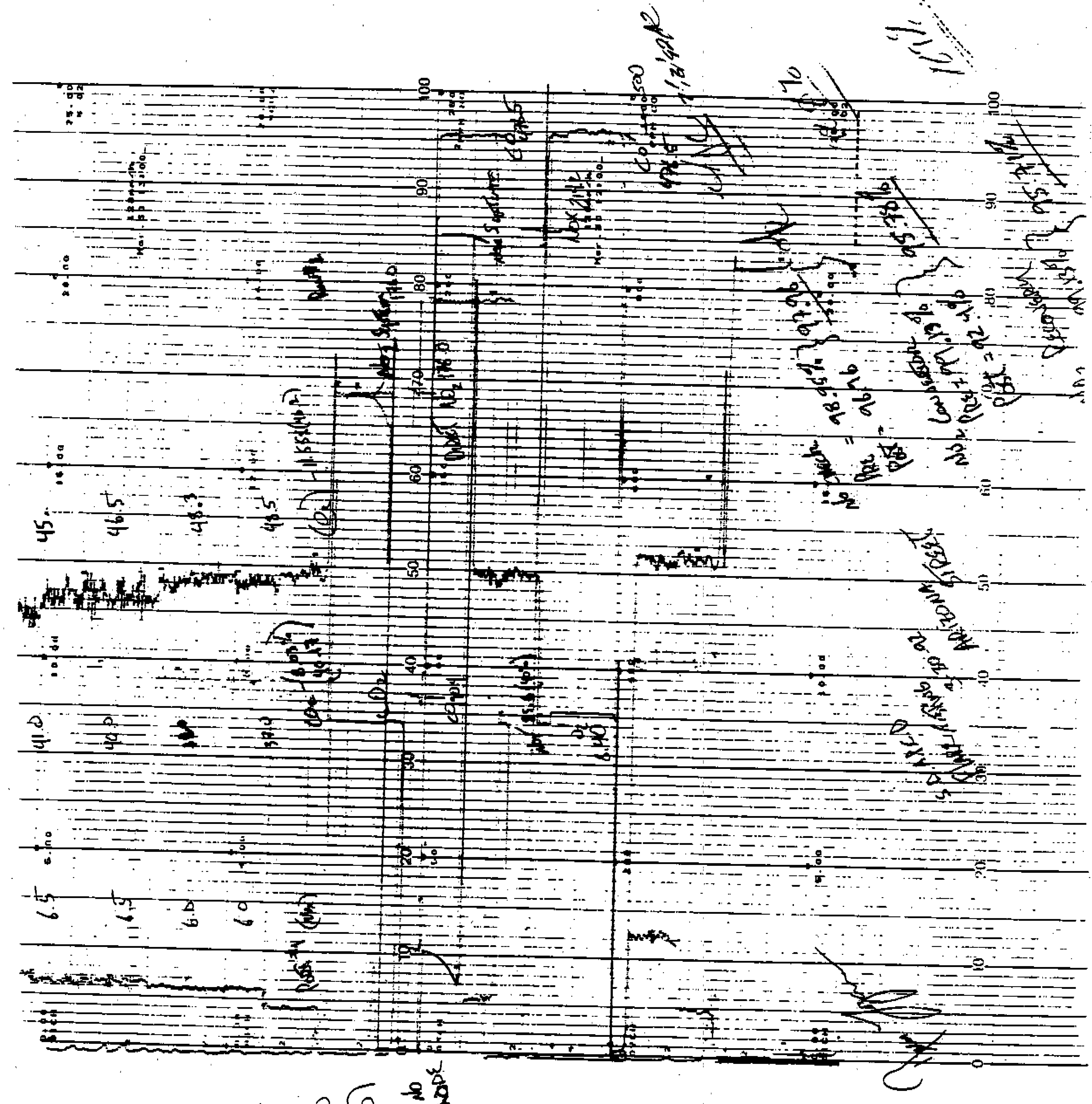


CHART NO. B962RY
YOKOGAWA

YOKOGAWA ◆ KOKUSAI CHART NO. B9627RY



DISTRICT QC

Arizona St : GLM20 J. Cayer 7/13/92

	VALUES	CALGAS:		
CO	0-500	476.5 ppm =	95.3 ch div	NO_2: 176.0 ppm
		190.0 ppm =	38.0 "	= 70.4 ch div
O_2	0-25 %	20.95 % =	83.8 "	
		8.40 % =	33.6 "	Limit = ±2% FS
NOx	0-250	214.2 ppm =	85.6 "	= ±2 ch div
		85.6 " =	34.2 "	

GAS	CAL	ACT	DIF	OK	ZERO	ACT	DIF	OK
CO	96.0	95.3	0.7	✓	-.5	0	-.5	✓
O_2	34.2	33.6	0.8	✓	0	0	0	✓
NOx	85.9	85.6	0.3	✓	-.5	0	-.5	✓
	34.1	34.2	0.1	✓	0	0	0	✓
O	37.0	38.0	1.0	✓	-.5	0	-.5	✓

CALS = OK

NO system = 85.0 ch div

85.0/85.9 = 99.0 %

NO_2 conversion: Nox mode 69.0

ACT = 70.4 No mode 0

69.0/70.4 = 98.0 % 69.0

O_2 RECOVERY: Nox mode: 68.0

No mode: 1.0 (No mode - not marked, appears ≈ 1 ch div)

67.0/69.0 = 97.1 % 67.0

SYSTEMS = OK

		ch div	=	ppm	= at 3% O_2	REPORT EC
NH1:	CO	0	=	0	= 0	0, 0, 0
	NOx	6.38	=	15.95	= 30.46	6.38, 15.95, 30.54 *
	O_2	46.2	=	11.55	CF = 1.910	46.2, 11.55

Arizona ST : QC 1120

RUN 1 cont
1:35 - 13:35

TIMES: NOx 30 min + - + NO mode 10 min
CO 30 min +, O2 30 min +

→ Sampled at port #4 → NO PEAKS
→ NO STRAT YET (WILL DO AT RUN #2) [NO2] = 0

GAS	CAL	ACT	DIF	OK	ZERO	ACT	DIF	OK
NO	86.0	85.6	0.4	✓	0	0	0	✓
CO	950	95.3	0.3	✓	-5	0	-.5	✓
O2	34.2	33.6	0.8	✓	.3	0	.3	✓

CALS = OK

RUN #2:
3:40 - 14:47

	ch div =	ppm =	@ 3% O2
CO =	0	= 0	= 0
NOx =	5.85	= 14.63	= 29.38
O2 =	46.8	→ 11.69	CF = 1.94
NO2 =	0		

SCEC REPORT

ch div =	ppm =	@ 3% O2
0	= 0	= 0
5.85	= 14.62	= 29.4
46.8	= 11.61	
0		

→ STRACT CK DONE. 4 points

O2 AVE = 46.8 5% of AVE = 2.34 ch div.
lowest O2 = 44.5 46.8 - 2.34 = 44.46 ∞ NO STRAT
#4 O2 level = 54.6 just within limits of STRATIFICATION

TIMES: NOx 30 min + NO mode = 10 min +
CO 30 min + O2 30 min +

PEAKS: NO [redacted]

GAS	CAL	ACT	DIF	OK	ZERO	ACT	DIF	OK
NO	85.4	85.6	0.6	✓	0	0	0	✓
CO	95.0	95.3	0.3	✓	-.5	0	-.5	✓
O2	34.2	33.6	0.8	✓	.5	0	.5	✓

CALS = OK

Arizona St. GC M28

SCEC REPORT

RUN #3
14.50 - 16.00

	ch div = ppm @ 3% O_2	ch div = ppm @ 3% O_2
NO_x:	5.06 × 18.15 = 29.40	5.06 × 18.15 = 29.58
CO	0 × 0 = 0	0 × 0 = 0
O_2:	46.8 = 11.70 CF = 1.94	46.8 = 11.70

TIMES / (NO_x, NO, CO, O_2) = OK

STRAT CK = DONE AVE O_2 = 46.8 5% = 2.34

46.8 - 2.34 = 44.46 lowest O_2 = 45.5

PEAKS: NONE ΣNO_2 = 0

GAS	CAL	ACT	DIF	OK	ZERO	ADJ	DIF	OK
NO	85.9	85.6	0.3	✓	-.1	0	-.1	✓
O_2	34.1	33.6	0.5	✓	.5	0	.5	✓
	95.0	95.3	0.3	✓	-.5	0	-.5	✓
O_2	81.0	83.8	2.8	*	.5	0	.5	✓

CALS = OK

* O_2 for 20.95 low by 0.8% FS. Questionable linearity on O_2.

O_2 Data = Cals at 8.49% O_2 - near emissions of ≥ 11% O_2. Therefore will accept data.

NO SYSTEM = 83.0 ch div

83.0 / 85.8 = 96.69%

NO_2 converter: NO_x mode 68.9

(DIRECT) NO mode: 0

68.9 / 70.4 = 97.9% 68.9

NO_2 Recovery: NO_x mode: 61.3

NO mode: 5.8

55.5

55.5 / 68.9 = 80.6%

Arizona St: QC 11266

SUMMARY:

SCEC

SYSTEMS: NO SYSTEM = ok AVE = $\frac{96.6+99.0}{2}$ = 97.8% 97.9

NO_2 converter = ok AVE = $\frac{97.9+98.01}{2}$ = 98.0% 95.78

NO_2 RECOVERY = ok AVE = $\frac{97.10+80.6\%}{2}$ = 88.9% 95.71

%SCEC past NO_2 converter (176 ppm NO_2 = 70.4 ch div = ACT,
NO_x = 68.9 ch div 68.9/70.4 = 97.9%
NO = 0 ch div SCEC ⇒ 92.4%. → calc incorrectly
NO_2] = 68.9 ch div

* SCEC = Does not subtract [NO] from [NO_x] in order to get [NO_2] through syst ∴ NO_2 recovery. ∴ SCEC NO_2 recovery is higher.

NO & CAL DRIFTS: NO DRIFTS – DATA CORRECTLY

pt CALS: ok for NO_x & CO
→ O_2 CAL (HIGH) NOT w/in 2% FS
However, CALS @ emission levels
Data is accepted.

TRAT CK: DONE, NO STRAT DETERMINED

O_2 & [NO_2] = 0 ∴ NO NO_2

Arizona St. GC M20

[NO2] = 2 all runs ∴

DATA SUMMARY

	NOx (lb/hr)	ppm @ 5% O2	CO	O2		CF
R#1 (GC)	6.38	15.95	30.46	Ø	46.2	11.55	1.9096
(SCEC)	6.38	15.95	(30.54)	Ø	46.2	11.55	(1.915)
R#2 (GC)	5.85	14.63	28.38	Ø	46.8	11.69	1.938
(SCEC)	5.85	14.62	(28.43)	Ø	46.8	11.69	(1.944)
R#3 (GC)	6.06	15.15	29.40	Ø	46.8	11.70	1.941
(SCEC)	6.06	15.16	(29.50)	Ø	46.8	11.70	(1.946)

CF = $\frac{20.95 - 3}{20.95 - O_2\%}$

COR NOx = NOx · CF → TO FIND

SCEC CF = $\frac{\text{COR NOx}}{\text{NOx}}$ OF SCEC USED

GC AVE NOx = 29.41 @ 3% O2

SCEC AVE NOx = 29.49 @ 3% O2

Diff could be due to round off error in determining O2 correction factors. The final ave b/w GC & SCEC is .08% ∴ will accept data.

Test Witness - Runs #1 - 3 GC Analysis

T PARAMETERS:

PROCEDURES:

The procedures and equipment utilized in these tests are based on EPA NSPS guidelines and from the EPA CFR 40, Method 18.

CALCULATIONS:

All calculations are based on the EPA CFR 40, July 1, 1991, Parts 53-60, Method 18.

GAS SAMPLING:

SCEC performed all the field testing. Their procedures are as follows:
A pressurized container was placed at the gas inlet BEFORE the flare. The container was opened after the flare reached a steady state. Once at a steady state, the container drew in the landfill gas for 25 minutes. After 25 minutes, the container was shut off, labeled and shipped to Performance Analytical Inc. The outlet monitoring was run concurrently and parallel to the particulate sampling (AFTER the flare). An EPA Method 20 probe with teflon tubing connecting the probe to the pressurized container was used. The pressurized container was opened and allowed to draw in the outlet gas for 25 minutes. The container was then shut off, labeled and shipped to Performance Analytical Inc.

ANALYSES:

All analyses were performed by Performance Analytical Inc.

EQUIPMENT:

All testing and analysis equipment was calibrated according to EPA guidelines and performed by Performance Analytical Inc..

OVERVIEW OF THE TEST:

RUN #1: *INLET:* Accepted
OUTLET: Accepted

RUN #2: *INLET:* Accepted
OUTLET: Accepted

RUN #3: *INLET:* Accepted
OUTLET: Accepted

	INLET #1		OUTLET #1		INLET #2		OUTLET #2		INLET #3		OUTLET #3	
	RESULT (PPM)	DET. LIMIT (PPM)	RESULT (PPM)	DET. LIMIT (PPM)	RESULT (PPM)	DET. LIMIT (PPM)	RESULT (PPM)	DET. LIMIT (PPM)	RESULT (PPM)	DET. LIMIT (PPM)	RESULT (PPM)	DET. LIMIT (PPM)
C1 as Methane	400000	150	76	2.5	120000	25	ND	4.0	650000	180	ND	4.5
C2 as Ethane	ND	150	ND	2.5	ND	25	ND	4.0	ND	180	ND	4.5
C3 as n-Propane	ND	120	ND	2.0	ND	20	ND	3.2	ND	140	ND	3.6
C4 as n-Butane	ND	90	ND	1.5	ND	15	ND	2.4	ND	110	ND	2.7
C5 as Pentane	ND	60	ND	1.0	ND	10	ND	1.6	ND	70	ND	1.8
C6 as n-Hexane	ND	60	ND	1.0	ND	10	ND	1.6	ND	70	ND	1.8
C7 as n-Heptane	ND	60	ND	1.0	ND	10	ND	1.6	ND	70	ND	1.8
C8 as n-Octane	ND	60	ND	1.0	ND	10	ND	1.6	ND	70	ND	1.8
C9 as n-Nonane	ND	60	ND	1.0	ND	10	ND	1.6	ND	70	ND	1.8
> C9 as n-Nonane	ND	60	ND	1.0	ND	10	ND	1.6	ND	70	ND	1.8
	RESULT (PPB)	DET. LIMIT (PPB)	RESULT (PPB)	DET. LIMIT (PPB)	RESULT (PPB)	DET. LIMIT (PPB)	RESULT (PPB)	DET. LIMIT (PPB)	RESULT (PPB)	DET. LIMIT (PPB)	RESULT (PPB)	DET. LIMIT (PPB)
Vinyl Chloride	890	240	ND	9.9	1110	39	ND	16.0	910	280	ND	18.0
Methylene Chloride	270	170	6.5 TR	7.3	170	29	ND	12.0	470	200	ND	13.0
Chloroform	ND	120	ND	5.2	ND	21	ND	8.3	ND	150	ND	9.3
1,2-Dichloroethane	ND	150	ND	6.2	ND	25	ND	10.0	ND	170	ND	11.0
1,1,1-Trichloroethane	450	110	ND	4.6	62	19	ND	7.4	880	130	ND	8.3
Benzene	180TR	190	1.6	7.8	200	31	ND	13.0	170 TR	220	ND	14.0
Carbon Tetrachloride	ND	97	ND	4.0	ND	16	ND	6.4	ND	110	ND	7.2
Trichloroethene	710	110	ND	4.7	750	19	ND	7.5	740	130	ND	8.5
1,2-Dibromoethane	ND	75	ND	3.3	ND	13	ND	5.2	ND	92	ND	5.9
Tetrachloroethene	1200	89	ND	3.7	810	15	ND	6.0	1600	100	ND	6.7

	AVERAGE INLET		AVERAGE OUTLET	
	RESULT (PPM)	DET. LIMIT (PPM)	RESULT (PPM)	DET. LIMIT (PPM)
C1 as Methane	390000	118	25	3.7
C2 as Ethane	ND	118	ND	3.7
C3 as n-Propane	ND	93	ND	2.9
C4 as n-Butane	ND	72	ND	2.3
C5 as Pentane	ND	47	ND	1.5
C6 as n-Hexane	ND	47	ND	1.5
C7 as n-Heptane	ND	47	ND	1.5
C8 as n-Octane	ND	47	ND	1.5
C9 as n-Nonane	ND	47	ND	1.5
> C9 as n-Nonane	ND	47	ND	1.5
	RESULT (PPB)	DET. LIMIT (PPB)	RESULT (PPB)	DET. LIMIT (PPB)
Vinyl Chloride	970	186	ND	14.6
Methylene Chloride	303	133	2	10.4
Chloroform	ND	97	ND	7.6
1,2-Dichloroethane	ND	115	ND	9.1
1,1,1-Trichloroethane	464	86	ND	6.8
Benzene	180	147	6	11.6
Carbon Tetrachloride	ND	74	ND	5.9
Trichloroethene	733	86	ND	6.9
1,2-Dibromoethane	ND	61	ND	4.8
Tetrachloroethene	1203	68	ND	5.5

LEGEND

ND= Not Detected

TR= Trace Level (below the indicated detection limit)

SAMPLE HISTORY

SAMPLES 1-3 INLET & OUTLET

Samples 1-3 INLET and OUTLET were
taken on 3/30/92.
received on 4/2/92.
analyzed on 4/10/92.

GAS CHROMATOGRAPHY RESULTS

Performance Analytical Inc.
Environmental Testing and Consulting

PERFORMANCE ANALYTICAL INC.

RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: Inlet #1 (03/30/92) (1:30)

PAI Sample ID: 9201463

Test Code: EPA 18
Analyst: Ku-Jih Chen
Instrument ID: HP5890/FID #4
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: 04/02/92
Date Analyzed: 04/10/92
Volume Analyzed: 0.050 ml
P_i = -11.4 P_f = +4.0 DF= 5.67

COMPOUND	RESULT (PPM)	DETECTION LIMIT (PPM)
C1 as Methane	400000	150
C2 as Ethane	ND	150
C3 as n-Propane	ND	120
C4 as n-Butane	ND	90
C5 as Pentane	ND	60
C6 as n-Hexane	ND	60
C7 as n-Heptane	ND	60
C8 as n-Octane	ND	60
C9 as n-Nonane	ND	60
> C9 as n-Nonane	ND	60

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

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RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: Outlet #1 (03/30/92) (4:00)

PAI Sample ID: 9201466

Test Code: EPA-18
Analyst: Ku-Jih Chen
Instrument ID: HP5890/FID #4
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: 04/02/92
Date Analyzed: 04/10/92
Volume Analyzed: 2.5 ml
P_i = -10.6 P_f = +4.0 DF= 4.56

COMPOUND	RESULT (PPM)	DETECTION LIMIT (PPM)
C1 as Methane	76	2.5
C2 as Ethane	ND	2.5
C3 as n-Propane	ND	2.0
C4 as n-Butane	ND	1.5
C5 as Pentane	ND	1.0
C6 as n-Hexane	ND	1.0
C7 as n-Heptane	ND	1.0
C8 as n-Octane	ND	1.0
C9 as n-Nonane	ND	1.0
> C9 as n-Nonane	ND	1.0

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

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RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: Inlet #1 (03/30/92) (1:30)

PAI Sample ID: 9201463

Test Code: GC/MS EPA TO-14
Analyst: Chris Parnell
Instrument ID: Finnigan 4500C/Tekmar 5010
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: 04/02/92
Date Analyzed: 04/08/92
Volume Analyzed: 0.050 Liter
P_i = -11.4 P_f = +4.0 DF= 5.67

CAS #	COMPOUND	RESULT (UG/M^3)	DETECTION LIMIT (UG/M^3)	RESULT (PPB)	DETECTION LIMIT (PPB)
75-01-4	VINYL CHLORIDE	2300	600	890	240
75-09-2	METHYLENE CHLORIDE	920	600	270	170
67-66-3	CHLOROFORM	ND	600	ND	120
107-06-2	1,2-DICHLOROETHANE	ND	600	ND	150
71-55-6	1,1,1-TRICHLOROETHANE	2400	600	450	110
71-43-2	BENZENE	570 TR	600	180 TR	190
56-23-5	CARBON TETRACHLORIDE	ND	600	ND	97
79-01-6	TRICHLOROETHENE	3800	600	710	110
106-93-4	1,2-DIBROMOETHANE	ND	600	ND	78
127-18-4	TETRACHLOROETHENE	7800	600	1200	89

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

450 - in
24.6 - out

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RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: Outlet #1 (03/30/92) (4:00)

PAI Sample ID: 9201466

Test Code: GC/MS EPA TO-14
Analyst: Kathleen Aguilera
Instrument ID: Finnigan 4500C/Tekmar 5010
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: 04/02/92
Date Analyzed: 04/07/92
Volume Analyzed: 1.00 Liter
P_i = -10.6 P_f = +4.0 DF= 4.56

CAS #	COMPOUND	RESULT (UG/M^3)	DETECTION LIMIT (UG/M^3)	RESULT (PPB)	DETECTION LIMIT (PPB)
75-01-4	VINYL CHLORIDE	ND	25	ND	9.9
75-09-2	METHYLENE CHLORIDE	22 TR	25	6.5 TR	7.3
67-66-3	CHLOROFORM	ND	25	ND	5.2
107-06-2	1,2-DICHLOROETHANE	ND	25	ND	6.2
71-55-6	1,1,1-TRICHLOROETHANE	ND	25	ND	4.6
71-43-2	BENZENE	ND	25	ND	7.8
56-23-5	CARBON TETRACHLORIDE	ND	25	ND	4.0
79-01-6	TRICHLOROETHENE	ND	25	ND	4.7
106-93-4	1,2-DIBROMOETHANE	ND	25	ND	3.3
127-18-4	TETRACHLOROETHENE	ND	25	ND	3.7

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

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RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: Inlet #2 (03/30/92) (2:15)

PAI Sample ID: 9201464

Test Code: EPA 18
Analyst: Ku-Jih Chen
Instrument ID: HP5890/FID #4
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: 04/02/92
Date Analyzed: 04/10/92
Volume Analyzed: 0.050 ml
P_i = -2.1 P_f = +4.0 DF= 1.48

COMPOUND	RESULT (PPM)	DETECTION LIMIT (PPM)
C1 as Methane	120000	25
C2 as Ethane	ND	25
C3 as n-Propane	ND	20
C4 as n-Butane	ND	15
C5 as Pentane	ND	10
C6 as n-Hexane	ND	10
C7 as n-Heptane	ND	10
C8 as n-Octane	ND	10
C9 as n-Nonane	ND	10
> C9 as n-Nonane	ND	10

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

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RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: Outlet #2 (03/30/92) (4:30)
PAI Sample ID: 9201467

Test Code: EPA 18
Analyst: Ku-Jih Chen
Instrument ID: HP5890/FID #4
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: 04/02/92
Date Analyzed: 04/10/92
Volume Analyzed: 2.5 ml
P_i = -12.3 P_f = +4.0 DF= 7.79

COMPOUND	RESULT. (PPM)	DETECTION LIMIT (PPM)
C1 as Methane	ND	4.0
C2 as Ethane	ND	4.0
C3 as n-Propane	ND	3.2
C4 as n-Butane	ND	2.4
C5 as Pentane	ND	1.6
C6 as n-Hexane	ND	1.6
C7 as n-Heptane	ND	1.6
C8 as n-Octane	ND	1.6
C9 as n-Nonane	ND	1.6
> C9 as n-Nonane	ND	1.6

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

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RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: Inlet #2 (03/30/92) (2:15)

PAI Sample ID: 9201464

Test Code: GC/MS EPA TO-14
Analyst: Chris Parnell
Instrument ID: Finnigan 4500C/Tekmar 5010
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: 04/02/92
Date Analyzed: 04/08/92
Volume Analyzed: 0.050 Liter
P_i = -2.1 P_f = +4.0 DF= 1.48

CAS #	COMPOUND	RESULT (UG/M^3)	DETECTION LIMIT (UG/M^3)	RESULT (PPB)	DETECTION LIMIT (PPB)
75-01-4	VINYL CHLORIDE	2900	100	1100	39
75-09-2	METHYLENE CHLORIDE	590	100	170	29
67-66-3	CHLOROFORM	ND	100	ND	21
107-06-2	1,2-DICHLOROETHANE	ND	100	ND	25
71-55-6	1,1,1-TRICHLOROETHANE	340	100	62	19
71-43-2	BENZENE	630	100	200	31
56-23-5	CARBON TETRACHLORIDE	ND	100	ND	16
79-01-6	TRICHLOROETHENE	4000	100	750	19
106-93-4	1,2-DIBROMOETHANE	ND	100	ND	13
127-18-4	TETRACHLOROETHENE	5500	100	810	15

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

In - $\frac{450+62}{2} = 256/1000 = .256$

out - $\frac{12+6+7.5}{2} = 6.1/2000 = .003$

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RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: Outlet #2 (03/30/92) (4:30)

PAI Sample ID: 9201467

Test Code: GC/MS EPA TO-14
Analyst: Kathleen Aguilera
Instrument ID: Finnigan 4500C/Tekmar 5010
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: 04/02/92
Date Analyzed: 04/07/92
Volume Analyzed: 1.00 Liter
P_i = -12.3 P_f = +4.0 DF= 7.79

CAS #	COMPOUND	RESULT (UG/M^3)	DETECTION LIMIT (UG/M^3)	RESULT (PPB)	DETECTION LIMIT (PPB)
75-01-4	VINYL CHLORIDE	ND	40	ND	16
75-09-2	METHYLENE CHLORIDE	ND	40	ND	12
67-66-3	CHLOROFORM	ND	40	ND	8.3
107-06-2	1,2-DICHLOROETHANE	ND	40	ND	10
71-55-6	1,1,1-TRICHLOROETHANE	ND	40	ND	7.4
71-43-2	BENZENE	ND	40	ND	13
56-23-5	CARBON TETRACHLORIDE	ND	40	ND	6.4
79-01-6	TRICHLOROETHENE	ND	40	ND	7.5
106-93-4	1,2-DIBROMOETHANE	ND	40	ND	5.2
127-18-4	TETRACHLOROETHENE	ND	40	ND	6.0

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

outlet
<13
3/30

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RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: Inlet #3 (03/30/92) (3:00)
PAI Sample ID: 9201465

Test Code: EPA-18
Analyst: Ku-Jih Chen
Instrument ID: HP5890/FID #4
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: 04/02/92
Date Analyzed: 04/10/92
Volume Analyzed: 0.050 ml
P_i = -12.2 P_f = +4.0 DF= 7.48

COMPOUND	RESULT (PPM)	DETECTION LIMIT (PPM)
C1 as Methane	650000	180
C2 as Ethane	ND	180
C3 as n-Propane	ND	140
C4 as n-Butane	ND	110
C5 as Pentane	ND	70
C6 as n-Hexane	ND	70
C7 as n-Heptane	ND	70
C8 as n-Octane	ND	70
C9 as n-Nonane	ND	70
> C9 as n-Nonane	ND	70

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

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RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: Outlet #3 (03/30/92) (5:00)

PAI Sample ID: 9201468

Test Code: EPA 18
Analyst: Ku-Jih Chen
Instrument ID: HP5890/FID #4
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: 04/02/92
Date Analyzed: 04/10/92
Volume Analyzed: 2.5 ml
P_i = -12.5 P_f = +4.0 DF= 8.50

COMPOUND	RESULT (PPM)	DETECTION LIMIT (PPM)
C1 as Methane	ND	4.5
C2 as Ethane	ND	4.5
C3 as n-Propane	ND	3.6
C4 as n-Butane	ND	2.7
C5 as Pentane	ND	1.8
C6 as n-Hexane	ND	1.8
C7 as n-Heptane	ND	1.8
C8 as n-Octane	ND	1.8
C9 as n-Nonane	ND	1.8
> C9 as n-Nonane	ND	1.8

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

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RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: Inlet #3 (03/30/92) (3:00)

PAI Sample ID: 9201465

Test Code: GC/MS EPA TO-14
Analyst: Chris Parnell
Instrument ID: Finnigan 4500C/Tekmar 5010
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: 04/02/92
Date Analyzed: 04/08/92
Volume Analyzed: 0.050 Liter
P_i = -12.2 P_f = +4.0 DF= 7.48

CAS #	COMPOUND	RESULT (UG/M^3)	DETECTION LIMIT (UG/M^3)	RESULT (PPB)	DETECTION LIMIT (PPB)
75-01-4	VINYL CHLORIDE	2300	700	910	280
75-09-2	METHYLENE CHLORIDE	1600	700	470	200
67-66-3	CHLOROFORM	ND	700	ND	150
107-06-2	1,2-DICHLOROETHANE	ND	700	ND	170
71-55-6	1,1,1-TRICHLOROETHANE	4700	700	880	130
71-43-2	BENZENE	550 TR	700	170 TR	220
56-23-5	CARBON TETRACHLORIDE	ND	700	ND	110
79-01-6	TRICHLOROETHENE	3900	700	740	130
106-93-4	1,2-DIBROMOETHANE	ND	700	ND	92
127-18-4	TETRACHLOROETHENE	11000	700	1600	100

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

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RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: Outlet #3 (03/30/92) (5:00)

PAI Sample ID: 9201468

Test Code: GC/MS EPA TO-14
Analyst: Kathleen Aguilera
Instrument ID: Finnigan 4500C/Tekmar 5010
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: 04/02/92
Date Analyzed: 04/07/92
Volume Analyzed: 1.00 Liter
P_i = -12.5 P_f = +4.0 DF= 8.50

CAS #	COMPOUND	RESULT (UG/M^3)	DETECTION LIMIT (UG/M^3)	RESULT (PPB)	DETECTION LIMIT (PPB)
75-01-4	VINYL CHLORIDE	ND	45	ND	18
75-09-2	METHYLENE CHLORIDE	ND	45	ND	13
67-66-3	CHLOROFORM	ND	45	ND	9.3
107-06-2	1,2-DICHLOROETHANE	ND	45	ND	11
71-55-6	1,1,1-TRICHLOROETHANE	ND	45	ND	8.3
71-43-2	BENZENE	ND	45	ND	14
56-23-5	CARBON TETRACHLORIDE	ND	45	ND	7.2
79-01-6	TRICHLOROETHENE	ND	45	ND	8.5
106-93-4	1,2-DIBROMOETHANE	ND	45	ND	5.9
127-18-4	TETRACHLOROETHENE	ND	45	ND	6.7

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

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Performance Analytical Inc.
Environmental Testing and Consulting

Bell

LABORATORY REPORT

Client:	SAN DIEGO AIR POLLUTION CONTROL DISTRICT	Date of Report:	04/21/92
Address:	9150 Chesapeake Drive	Date Received:	04/02/92
	San Diego, CA 92123	PAI Project No:	4060,4061
Contact:	Ms. Judy Lake	Purchase Order:	Verbal

Client Project: Arizona Street & Bell Jr. High School

Twelve (12) Stainless Steel "SUMMA" Polished Canisters labeled:

"Inlet #1 (03/30/92)"	"Inlet #2 (03/30/92)"	"Inlet #3 (03/30/92)"
"Outlet #1 (03/30/92)"	"Outlet #2 (03/30/92)"	"Outlet #3 (03/30/92)"
"Inlet #1 (03/31/92)"	"Inlet #2 (03/31/92)"	"Inlet #3 (03/31/92)"
"Outlet #1 (03/31/92)"	"Outlet #2 (03/31/92)"	"Outlet #3 (03/31/92)"

The samples were received at the laboratory under chain of custody on April 2, 1992. The samples were received intact. The dates of analysis are indicated on the data sheets.

Twelve (12) six-liter passivated canisters were sent directly to the field sampler along with variable-constant differential low volume flow controllers. At the request of the sampler the flow controllers were calibrated to take one-hour time integrated samples. The majority of the canisters received by the laboratory were significantly undersampled. Ten of twelve canisters submitted to the laboratory were received under a unusually high vacuum. Canisters are evacuated to -14.0 psig at the laboratory prior to being sent out into the field. After time integrated sampling is completed, canisters returned to the laboratory generally have vacuum readings ranging from -2.5 psig to -0.5 psig. The ten canisters had vacuum readings of -12.5 psig to -8.9 psig, corresponding to sample volumes of 0.9 to 2.4 liters in a 6-liter container. In order to draw aliquots out of the canisters, the samples had to be pressurized with Nitrogen prior to laboratory analysis. The dilution factor due to the Nitrogen pressurization ranged from 3.22 to 8.50, thereby resulting in detection limits that are significantly higher than would otherwise be detected.

Data Release Authorization:

Ku-jih Chen
Principal Chemist

Reviewed and Approved:

Michael Tuday
Laboratory Director

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C1 through >C9 Hydrocarbon Analysis

The samples were analyzed for C_1 through > C_9 Hydrocarbons by direct injection GC/FID. The analytical system consisted of a Hewlett-Packard model 5890A gas chromatograph equipped with a flame ionization detector. Separation was achieved using a Restek Rt_x-1 megabore column, 60 meters long by 0.53 mm I.D., with a 5.0 um film thickness.

A four point standard calibration was performed using a certified gas standard mix (Scott Speciality Gases) prior to analysis of the field samples.

Volatile Organic Compound Analysis

The samples were also analyzed by combined gas chromatography/mass spectrometry (GC/MS) for ten Volatile Organic Compounds. The analyses were performed according to the methodology outlined in EPA Method TO-14 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA 600/4-84-041, U.S. Environmental Protection Agency, Research Triangle Park, NC, April, 1984 and May, 1988. The analyses were performed by gas chromatography/ mass spectrometry, utilizing a direct cryogenic trapping technique. The analytical system used was comprised of a Finnigan Model 4500C GC/MS/DS interfaced to a Tekmar 5010 Automatic Desorber. A thick film (5 micron) crossbonded 100% Dimethyl polysiloxane megabore column (RT_x-1, Restek Corporation, Bellefonte, PA) was used to achieve chromatographic separation.

The results of the analyses are included on the attached data sheets.

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RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: N/A

PAI Sample ID: PAI Method Blank

Test Code: GC/MS EPA TO-14
Analyst: Chris Parnell
Instrument ID: Finnigan 4500C/Tekmar 5010
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: N/A
Date Analyzed: 04/08/92
Volume Analyzed: 1.00 Liter

CAS #	COMPOUND	RESULT (UG/M^3)	DETECTION LIMIT (UG/M^3)	RESULT (PPB)	DETECTION LIMIT (PPB)
75-01-4	VINYL CHLORIDE	ND	5.0	ND	2.0
75-09-2	METHYLENE CHLORIDE	ND	5.0	ND	1.5
67-66-3	CHLOROFORM	ND	5.0	ND	1.0
107-06-2	1,2-DICHLOROETHANE	ND	5.0	ND	1.2
71-55-6	1,1,1-TRICHLOROETHANE	ND	5.0	ND	0.93
71-43-2	BENZENE	ND	5.0	ND	1.6
56-23-5	CARBON TETRACHLORIDE	ND	5.0	ND	0.80
79-01-6	TRICHLOROETHENE	ND	5.0	ND	0.94
106-93-4	1,2-DIBROMOETHANE	ND	5.0	ND	0.65
127-18-4	TETRACHLOROETHENE	ND	5.0	ND	0.75

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

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Performance Analytical Inc.
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PERFORMANCE ANALYTICAL INC.

RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: N/A

PAI Sample ID: PAI Method Blank

Test Code: GC/MS EPA TO-14
Analyst: Kathleen Aguilera
Instrument ID: Finnigan 4500C/Tekmar 5010
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: N/A
Date Analyzed: 04/07/92
Volume Analyzed: 1.00 Liter

CAS #	COMPOUND	RESULT (UG/M^3)	DETECTION LIMIT (UG/M^3)	RESULT (PPB)	DETECTION LIMIT (PPB)
75-01-4	VINYL CHLORIDE	ND	5.0	ND	2.0
75-09-2	METHYLENE CHLORIDE	ND	5.0	ND	1.5
67-66-3	CHLOROFORM	ND	5.0	ND	1.0
107-06-2	1,2-DICHLOROETHANE	ND	5.0	ND	1.2
71-55-6	1,1,1-TRICHLOROETHANE	ND	5.0	ND	0.93
71-43-2	BENZENE	ND	5.0	ND	1.6
56-23-5	CARBON TETRACHLORIDE	ND	5.0	ND	0.80
79-01-6	TRICHLOROETHENE	ND	5.0	ND	0.94
106-93-4	1,2-DIBROMOETHANE	ND	5.0	ND	0.65
127-18-4	TETRACHLOROETHENE	ND	5.0	ND	0.75

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

Performance Analytical Inc.
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PERFORMANCE ANALYTICAL INC.

RESULTS OF ANALYSIS

Client: San Diego Air Pollution Control District

Client Sample ID: Inlet #3 (03/30/92) (3:00)

PAI Sample ID: 9201465 (Laboratory Duplicate)

Test Code: EPA-18
Analyst: Ku-Jih Chen
Instrument ID: HP5890/FID #4
Verified by: Michael Tuday

Matrix: Summa Canister
Date Received: 04/02/92
Date Analyzed: 04/10/92
Volume Analyzed: 0.050 ml
P_i = -12.2 P_f = +4.0 DF= 7.48

COMPOUND	RESULT (PPM)	DETECTION LIMIT (PPM)
C1 as Methane	650000	180
C2 as Ethane	ND	180
C3 as n-Propane	ND	140
C4 as n-Butane	ND	110
C5 as Pentane	ND	70
C6 as n-Hexane	ND	70
C7 as n-Heptane	ND	70
C8 as n-Octane	ND	70
C9 as n-Nonane	ND	70
> C9 as n-Nonane	ND	70

ND = Not Detected TR = Trace Level - Below Indicated Detection Limit

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Test Witness - Avg

SDAPCD RULES

TEST	LIMIT	MEASURED	PASS/FAIL
E 53b SPECIFIC CONT.	0.10 gr/dscf	0.005 gr/dscf	NON-EXCEEDANCE

TEST RESULTS SUMMARY:

ITEM	I	Cs(12%)	E
UNITS	%	gr/dscf	lbs/hr
VALUE	108	0.0049	0.09

ENGINEERING SUMMARY

Qstd	TYPE OF FUEL	LOAD	RATE
dscfm		Tons/Hr	Tons
3246			

TEST PARAMETERS:

PROCEDURES:

The procedures and equipment utilized in these tests are based on EPA NSPS guidelines and from the EPA CFR 40, Standards Method 5. The sampling utilized a front-end filter (fig. 1).

CALCULATIONS:

All calculations are based on the EPA CFR 40, Standards Method 5, July 1, 1991, Parts 53-60, Appendix A, Methods 1-5 inclusive.

PARTICULATE SAMPLING:

The test consisted of sampling at 16 traverse points, 4 from 4 sampling ports (fig.2) collected from 84 inches below the stack (fig.3). All field data, SCEC's as well as SDAPCD's, were transferred to the computer printout. All calculations were done by computer and the emissions were compared to SDAPCD rules.

ANALYSES:

Gas: A CEM analysis was performed by SCEC.

Particulate. All procedures follow EPA guidelines, except where noted in the SDAPCD QA manual.

EQUIPMENT:

All testing and analysis equipment was calibrated according to EPA guidelines and performed by SCEC.

OVERVIEW OF THE TEST:

RUN #1:

LAB: Eliminated from the average
PM: Eliminated from the average

RUN #2:

LAB: Eliminated from the average
PM: Pass, but eliminated from the average

RUN #3:

LAB: PASS
PM: PASS

Because of the disparity in numbers between the District and SCEC, it was decided to use the District's values. The District used the values from Run #3 only, because it produced the only reliable numbers. A complete critique of the performance of SCEC's testing procedures and calculations are on page 4 and a data summary of all 3 runs are on page 5.

FIELD DATA & DATA SUMMARY:

Trav. Pt	Vm (ft^3)	ΔP (in H2O)	ΔH (in H20)	Stack Temp (°F)	Box Temp (°F)	Imp Temp (°F)	t 1 (in) (°F)	t 2 (out) (°F)	velocity (ft/sec)

	Vm	ΔP	ΔH	ts	tbox	ti	t 1 (in)	t 2 (out)	vs
Average:	33.180	0.027	1.106	1437	not done	68	69.19	68.56	17.419

METER BOX PARAMETERS:

Box ID = NUTECH
ΔH@ =
Y = 0.9766

NOZZLE & PROBE:

Dn = 0.587 in
An = 0.2706 in^2
Cp = 0.840

MISCELLANEOUS:

Maximum vacuum = 5.0 in. Hg.
Circular stack (Y/N) = YES
Silica gel (Y/N) = YES

VOLUME:

tart leak rate = 0.000 cfm
Pass/Fail PASS
inal leak rate = 0.000 cfm
Pass/Fail PASS
Vm 33.180 ft^3

PRESSURES:

Pbar= 29.85 in Hg
Pg= 0.00 in H2O
Vpw @ ts= 29.9200 in Hg
Vpw @ ti= N/A in Hg

LABORATORY DATA:

mn(front) = 0.004675 g CO2 = 7.81 %
mn(back) = 0.001960 g O2 = 11.70 %
mn(total)= 0.00664 g CO = 0.00 %
Vlc 65.10 ml N2 = 80.49 %

STACK PARAMETERS:

Ds = 3.50 ft
Length = 3.50 ft
As = 12.25 ft^2

TIME:

ø = 60.0 min
tn = 16 points
ø = 3.8 min/pt

TEMPERATURES:

t1 = 69.19 °F ti= 68 °F
t2 = 68.56 °F tbox= not done °F
tm = 68.88 °F ts= 1437 °F

CALCULATIONS:

TEMPERATURES:

01)	ts = (Σ ts(n))/total n's	
02)	Ts = ts+460	1437 °F
03)	tm= (Σ [(t 1(n)+t 2(n))/2]/total n's=(t1+t2)/2	1897 °R
04)	Tm= (t1+t2)/2 + 460	69 °F
05)	ti= (Σ ti(n))/total n's	529 °R
06)	Tstd	68 °F

PRESSURES:

		528 °R
07)	Pbar= [(P @ S.L.)+[ft. above S.L.*(-0.1 in Hg/100ft)]]	29.85 in Hg
08)	Pg= read from pressure sensing device	0.00 in H2O
09)	Ps= Pbar + (Pg/13.6)	29.85 in Hg
10)	ΔH	1.106 in H2O
11)	Pm= Pbar+(ΔH/13.6)	29.93 in Hg
12)	Pstd	29.92 in Hg

VOLUME:

13)	Vm= Vm(end)-Vm(begin)	33.180 ft^3
14)	Y	0.9766
15)	Vm'= Vm*Y	32.404 ft^3
16)	Vpw @ ts = from appendix	N/A in Hg
17)	corr Vwm = [[(Vm'*Vpw@imp/Ps)*Pm*Tstd]/(Tm*Pstd)]	0.0000 ft^3
18)	Vm std = [[Vm'*(Tstd/Tm)*(Pm/Pstd)]-corr Vwm]	32.962 ft^3
19)	Vlc= (Σ Volume of impingers)	65.10 ml
20)	∂	0.00201 lb/ml
22)	MwH2O	18.00 g/g-mo
23)	Vw std = [[(Vlc*∂*R*Tstd)/(Pstd*MwH2O)]+corr Vwm]	3.0727 ft^3

MOISTURE:

24)	Bws(1) =(Vw std)/(Vw std+Vm std)100	8.67 %	
25)	Vpw @ ts = from appendix	29.92 in Hg	
26)	Bws(2) =[(Vpw @ ts)/Ps]*100	100.23 %	
27)	Bws = lower value of equation 24 or 26		8.67 %

MOLECULAR WEIGHT:

28)	%O2	11.70 %
29)	%CO2	7.81 %
30)	%N2+inerts+%CO	80.49 %
31)	Md=[0.440(%CO2)]+[0.320*(%O2)]+[0.280(%N2+inerts+%CO)]	29.72 g/g*mole
32)	Ms=Md*(1-Bws)+18.0*(Bws)	29.70 g/g*mole

FLOW:

33)	ΔP	0.0270 in H2O
34)	Cp	0.840
35)	vs= 85.49*Cp*[(Ts*ΔP)/(Ps*Ms)]^.5]	17.419 ft/sec
36)	As=3.14*[(Ds)^2/4]	12.250 ft^2
37)	Qs = (vs)*As*60	12803 acfm
38)	Qstd =17.64*Qs*(1-Bws)*Ps/Ts	3246 dscfm

EMISSIONS:

FRONT HALF

39)	mn (front)	0.00468 g
40)	Cs (front) =15.43*mn(front)/Vm std	0.00223 grains/dscf
41)	Cs(12%,front)=(12/%CO2)*Cs(front)	0.003 grains/dscf
42)	E (front) = [0.02857]*(Qstd)*Cs (front)	0.06 lbs/hr

BACK HALF

43)	mn (back)	0.00196 g
44)	Cs (back) =15.43*mn(back)/Vm std	0.00093 grains/dscf
45)	Cs(12%,back)=(12/%CO2)*Cs(back)	0.001 grains/dscf
46)	E (back) = [0.02857]*(Qstd)*Cs (back)	0.06 lbs/hr

TOTAL

47)	mn (total) = mn(front)+mn(back)	0.00664 g
48)	Cs (total) =15.43*mn(total)/Vm std	0.00316 grains/dscf
49)	Cs(12%,total)=(12/%CO2)*Cs(total)	0.005 grains/dscf
50)	E (total) = [0.02857]*(Qstd)*Cs (total)	0.09 lbs/hr
51)	E.A. =[(%O2-.5(%CO)*100]/[0.264(%N2)-(%O2)-0.5(%CO)]	122.52 %

ISOKINETICS:

52)	Dn=	0.587 in
53)	An=3.14*[(Dn)^2/4]	0.2706 in^2
54)	I=.09450(Ts*Vm std)/Ps*VsAn∂(1-Bws) 108.34 % =	108 %

LABORATORY:

RUN #1:

1) SCEC used only 50 mls of acetone for the FRONT half rinses. The water blank is 0 ppm. so there was no SOLV. WGT. value.
2) SCEC did not wash out the BACK half with acetone. so the SOLV. WGT. contribution was zero.
3) For the BACK HALF totals. SCEC did not allow the beakers to reach a constant weight and they took an incorrect average weight. The District had to correct for these errors.
4) As a result of the preceding items. SCEC's TOTAL of the particulate collected differed from the District's.

ISOKINETICS:

1) SCEC broke the probe/nozzle halfway through the test. As a consequence of this. they couldn't do the following:
   a. SCEC could not collect the SDAPCD minimum of 40 ft^3.
   b. SCEC could not do a front half recovery.
2) The District had to correct for illogical stack temp. measurements.

CONCLUSION:

This entire run was eliminated from the average. because the low amount of collected particulate would not be an accurate representative sample of the flare.

LABORATORY:

RUN #2:

1) For the FRONT HALF totals. SCEC did not allow the beakers to reach a constant weight and they took an incorrect average weight. The District had to correct for these errors.
2) SCEC used only 50 mls of acetone for the FRONT half rinses. The water blank is 0 ppm. so there was no SOLV. WGT. value.
3) SCEC did not allow the filter to come to a constant weight. so the District had to correct for this.
4) SCEC did not wash out the BACK half with acetone. so the SOLV. WGT. contribution was zero.
5) For the BACK HALF totals. SCEC took an incorrect average weight. The District had to correct for these errors.
6) As a result of the preceding items. SCEC's NET WGT of the particulate collected. differed from the District's.

ISOKINETICS:

1) SCEC did not collect the SDAPCD minimum amount of 40 ft^3.
2) The District had to correct for illogical stack temp. measurements.

CONCLUSION:

SCEC's isokinetic sampling data are acceptable. but there are too many gross errors in the laboratory weight analysis. after the District made the proper data corrections. to be able to make a confident decision on the accuracy of the collected data. Consequently. it was decided to eliminate all data from run #2 from the average.

LABORATORY:

RUN #3:

1) SCEC used only 50 mls of acetone for the FRONT half rinses. The water blank is 0 ppm. so there was no SOLV. WGT. value.
2) SCEC did not wash out the BACK half with acetone. so the SOLV. WGT. contribution was zero.
3) For the FRONT HALF totals. SCEC did not allow the beakers to reach a constant weight and they took an incorrect average weight. The District had to correct for these errors.
4) For the BACK HALF totals. SCEC took an incorrect average weight. The District had to correct for these errors.
5) As a result of the preceding items. SCEC's NET WGT of the particulate collected differed from the District's.

ISOKINETICS:

1) SCEC did not collect the SDAPCD minimum amount of 40 ft^3.
2) The District had to correct for illogical stack temp. measurements.

CONCLUSION:

The data from this run are acceptable. after the District has made the necessary corrections.

AVERAGE:

CONCLUSION:

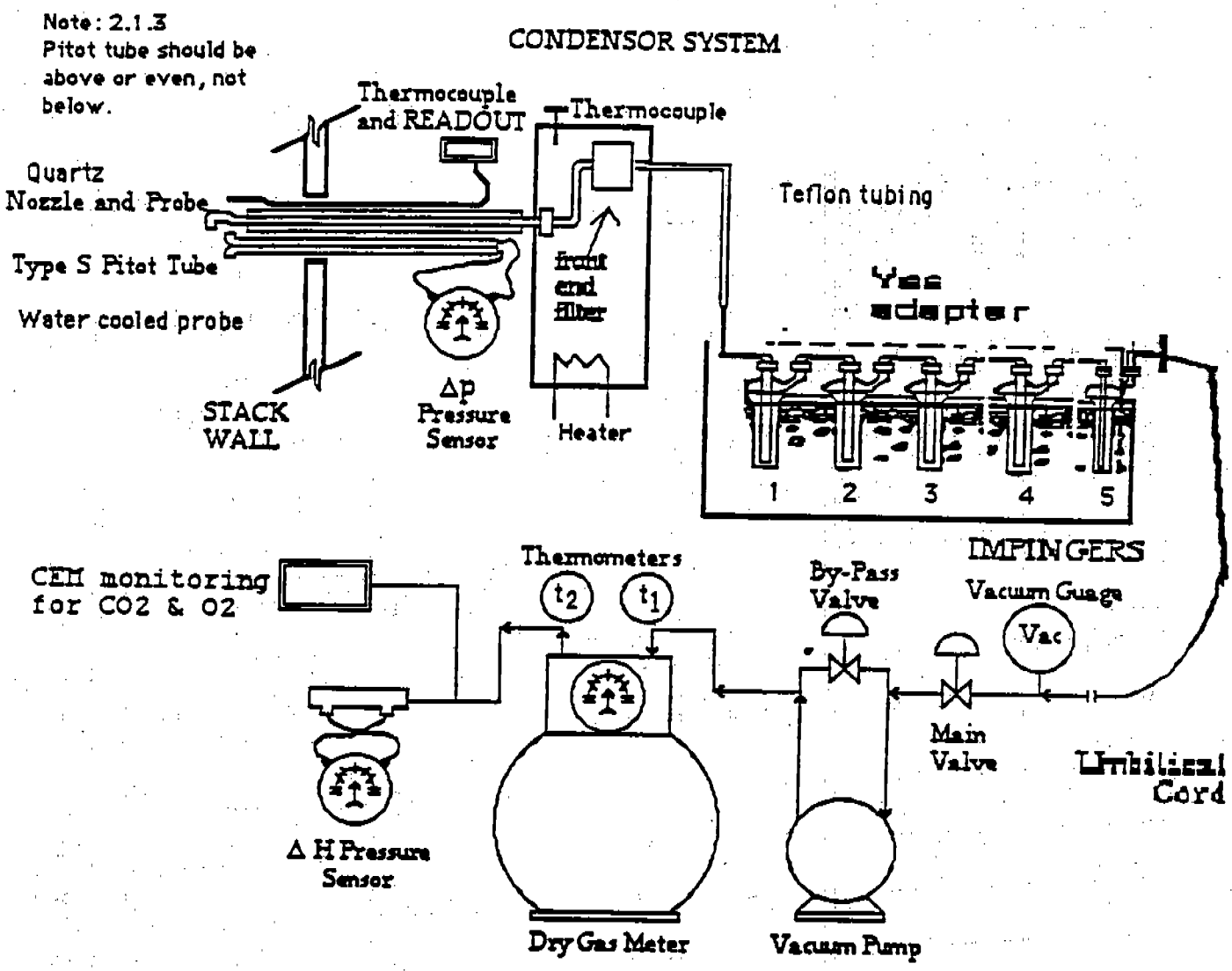
The District will use their numbers generated from SCEC's raw data. The District will use the values from only Run #3. as the Overall test average values. because Runs #2 & #3 are unacceptable. It is called the APCD average on the page 5. SCEC's average on page 5 consists only of the average of Runs #2 & #3.

		APCD RUN 1	SCEC RUN 1	APCD RUN 2	SCEC RUN 2	APCD RUN 3	SCEC RUN 3	APCD AVG	SCEC AVG
TEMPERATURES:									
01)	ts = (Σ ts(n))/total n's	1443	1246	1433	1256	1437	1437	1437	1346
02)	Ts = ts+460	1903	1715	1893	1715	1897	1897	1897	1806
	tm= (Σ [(t 1(n)+t 2t(n))/2]/total n's	71	71	71	71	69	69	69	70
	Tm= (t1+t2)/2 + 460	531	531	531	531	529	529	529	530
05)	ti= (Σ ti(n))/total n's	68	68	68	68	68	68	68	68
06)	Tstd	528	528	528	528	528	528	528	528
PRESSURES:									
07)	Pbar= [(P @ S.L.)+[ft. above S.L.*(-0.1 in Hg/100ft)]]	29.85	29.85	29.85	29.85	29.85	29.85	29.85	29.85
08)	Pg= read from pressure sensing device	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
09)	Ps= Pbar + (Pg/13.6)	29.85	29.85	29.85	29.85	29.85	29.85	29.85	29.85
10)	ΔH	0.885	0.885	1.117	1.117	1.106	1.105	1.106	1.111
11)	Pm= Pbar+(ΔH/13.6)	29.92	29.92	29.93	29.93	29.93	29.93	29.93	29.93
12)	Pstd	29.92	29.92	29.92	29.92	29.92	29.92	29.92	29.92
VOLUME:									
13)	Vm= Vm(end)-Vm(begin)	31.727	31.727	36.282	36.280	33.180	33.180	33.180	34.730
14)	Y	0.9766	0.9766	0.9766	0.9765	0.9766	0.9766	0.9766	0.9766
15)	Vm = Vm*Y	30.985	30.985	35.433	35.430	32.404	32.404	32.404	33.917
16)	Vpw @ ti = from appendix	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17)	corr Vwm = [[(Vm*Vpw@imp/Ps)*Pm*Tstd]/(Tm*Pstd]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18)	Vm std = [[Vm*(Tstd/Tm)*(Pm/Pstd)]-corr Vwm]	30.794	30.795	35.262	35.250	32.362	32.362	32.362	33.606
19)	Vlc= (Σ Volume of impingers)	62.50	62.50	80.80	80.80	65.10	65.10	65.10	72.95
20)	d	0.00201	0.00201	0.00201	0.00201	0.00201	0.00201	0.00201	0.00201
21)	R	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85
22)	MwH2O	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
23)	Vw std = [[(Vlc*d*R*Tstd)/(Pstd*MwH2O)]+corr Vwm]	2.9500	not done	3.8138	not done	3.0727	not done	3.0727	not done
CALCULATIONS:									
	MOISTURE								
24)	Bws(1) =(Vw std)/(Vw std+Vm std)100	8.74	8.72	9.76	9.74	8.67	8.65	8.67	9.20
25)	Vpw @ ts = from appendix	29.92	N/A	29.92	29.92	29.92	29.92	29.92	29.92
26)	Bws(2) =[(Vpw @ ts)/Ps]*100	100.23	N/A	100.23	N/A	100.23	100.23	100.23	N/A
27)	Bws = lower value of equation 24 or 26	8.74	8.72	9.76	9.74	8.67	8.65	8.67	9.20
	MOLECULAR WEIGHT								
28)	%O2	11.55	11.55	11.69	11.69	11.70	11.70	11.70	11.70
	%CO2	8.03	8.03	7.92	7.92	7.81	7.81	7.81	7.87
30)	%N2+inerts+%CO	80.42	80.42	80.39	80.39	80.49	80.49	80.49	80.44
31)	Md=[0.440(CO2)]+[0.320(O2)]+[0.280(N2+inerts+CO)]	29.75	29.75	29.73	29.73	29.72	29.72	29.72	29.72
32)	Ms=Md*(1-Bws)+18.0*(Bws)	28.72	28.73	28.59	28.59	28.70	28.71	28.70	28.85
	FLOW								
33)	ΔP	0.0192	0.019	0.0267	0.027	0.0266	0.027	0.0266	0.027
34)	Cp	0.840	0.840	0.840	0.840	0.840	0.840	0.840	0.840
35)	vs= 85.49*Cp*[[(Ts*ΔP)/(Ps*Ms)]^.5]	14.809	14.656	17.475	16.690	17.419	17.520	17.419	17.105
36)	As=3.14*[(Ds)^2/4]	12.250	12.250	12.250	12.250	12.250	12.250	12.250	12.250
37)	Qs = (vs)*As*60	10885	10815	12844	12257	12803	12877	12803	12572
38)	Qstd =17.64*Qs*(1-Bws)*Ps/Ts	2749	2727	3223	3402	3246	3267	3246	3335
	EMISSIONS								
	FRONT HALF								
39)	mn (front)	0.00000	0.00000	0.00322	0.00550	0.00468	0.00790	0.00468	0.00675
40)	Cs (front) =15.43*mn(front)/Vm std	0.00000	0.00000	0.00141	0.00250	0.00223	0.00378	0.00223	0.00313
41)	Cs(12%,front)=(12/%CO2)*Cs(front)	0.0000	0.0000	0.0021	0.0037	0.0034	0.0058	0.0034	0.0047
42)	E (front) = (0.00857)*(Qstd)*Cs (front)	0.00	0.00	0.04	0.07	0.06	0.10	0.06	0.09
	BACK HALF								
43)	mn (back)	0.01716	0.00189	0.00000	0.00830	0.00196	0.00126	0.00196	0.00476
44)	Cs (back) =15.43*mn(back)/Vm std	0.00860	0.00945	0.00000	0.00364	0.00093	0.00060	0.00093	0.00212
45)	Cs(12%,back)=(12/%CO2)*Cs(back)	0.0128	0.0126	0.0000	0.0055	0.0014	0.0009	0.0014	0.0032
46)	E (back) = (0.00857)*(Qstd)*Cs (back)	0.20	0.20	0.00	0.13	0.03	0.02	0.03	0.07
	TOTAL								
47)	mn (total)	0.01716	0.00189	0.00322	0.01393	0.00664	0.00916	0.00664	0.01155
48)	Cs (total) =15.43*mn(back)/Vm std	0.00860	0.00845	0.00141	0.00608	0.00316	0.00436	0.00316	0.00522
49)	Cs(12%,total)=(12/%CO2)*Cs(total)	0.0128	0.0126	0.0021	0.0092	0.0049	0.0070	0.0049	0.0081
50)	E (total) = (0.00857)*(Qstd)*Cs (total)	0.20	0.20	0.04	0.16	0.09	0.12	0.09	0.15
	#REF!	119.31	not done	122.63	not done	122.52	not done	122.52	not done
KINETICS:									
	Dn	0.63	0.63	0.63	0.63	0.59	0.59	0.59	0.61
53)	An=3.14*[(Dn)^2/4]	0.3117	0.3117	0.3117	0.3117	0.2706	0.2706	0.2706	0.2912
54)	I=.09450(Ts*Vm std)/Ps*vsAnØ(1-Bws)	106	107	103	98	108	103	108	100

SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT

FIGURE 1

CONDENSOR SYSTEM



LEGEND

No. 1 - IPs

No. 2 - K.O.

No. 3 - H2O2

No. 4 - K.O.

No. 5 - Silica Gel

FIELD DATA ABBREVIATIONS

PT = Point Number
T_s = Stack Temperature
Δp = Pitot Tube Pressure Differential, in H_2O
V_s = Stack Velocity, fps
ΔH = Orifice Meter Pressure Drop, in H_2O
t_1 = Meter Inlet Temperature, °F
t_2 = Meter Outlet Temperature, °F
Pm = Pump Vacuum, in Hg
ti = Impinger Temperature
P_{bar} = Barometric Pressure

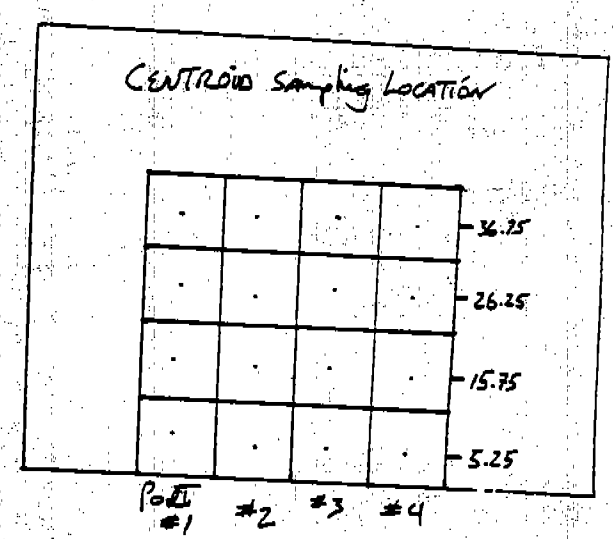
FIGURE 1 : PARTICULATE MATTER SAMPLING TRAIN

SCEC
1582-1 N. BATAVIA
ORANGE, CA 92667

FILE REF: ST12

SAMPLE POINT LOCATION DATA SHEET

FACILITY: ARIZONA STREET
PROJECT #: T-1482
DATE: 3/30/92
STACK DIMENSIONS: L= 42"
W= 42"
H=
UPSTREAM DIST./
EQUIVALENT DIAMETERS 5
DOWNSTREAM DIST./
EQUIVALENT DIAMETERS 2
NO. OF SAMPLING POINTS
SAMPLING PORT DIMENSIONS:
DIA.= 3"
PROTRUSION DIST.= 3"



SAMPLE POINT	% OF STACK DIAMETER	DISTANCE FROM STACK WALL (IN.)	DISTANCE FROM SAMPLE PORT (IN.)
EACH PORT			
#1		36.75	39.75
#2		26.25	29.25
#3		15.75	18.75
#4		5.25	8.25

1582-1 N. Batavia
Orange, CA 92667
714-282-8900
714-282-8911 (fax)

Figure

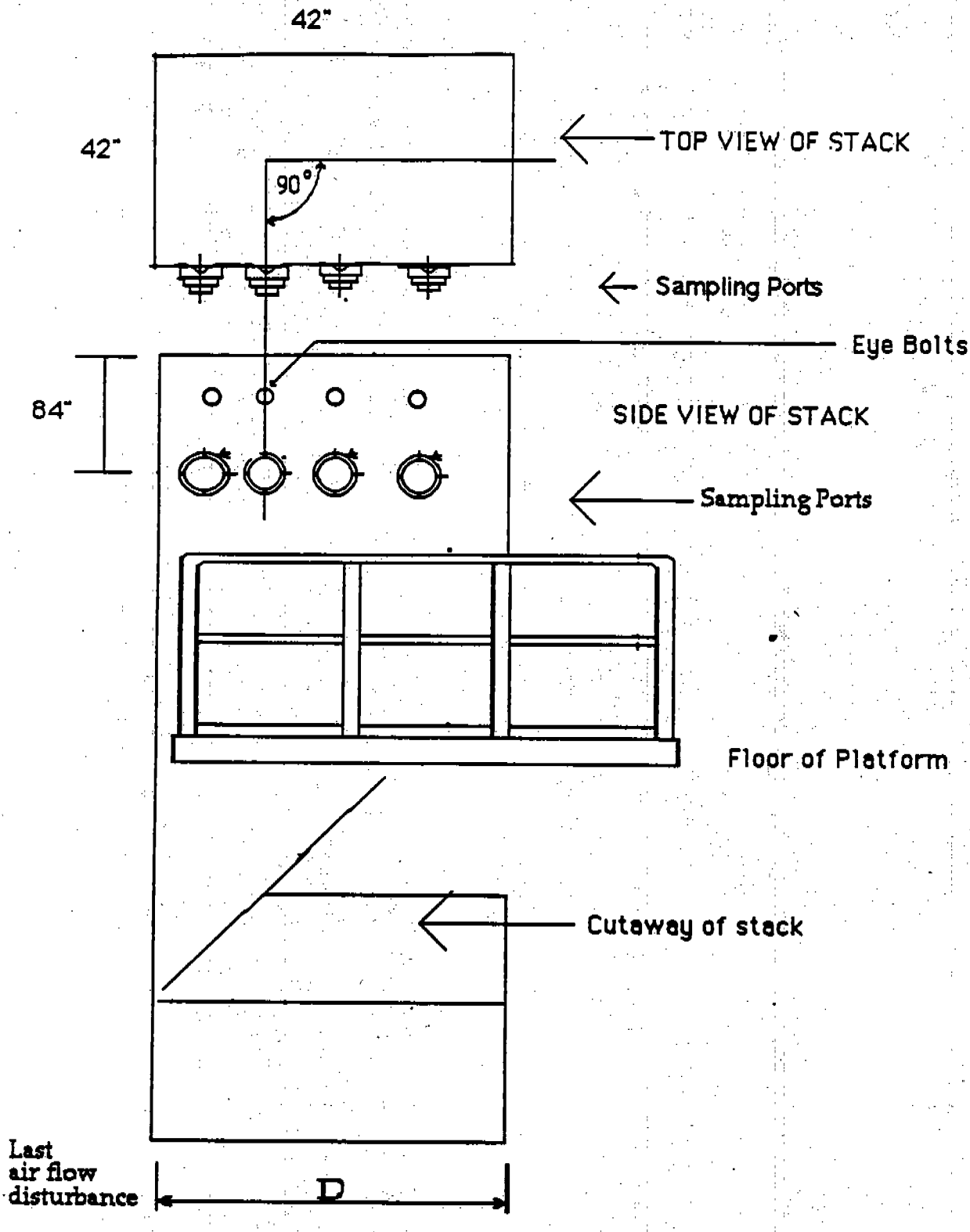


Figure 3

NOMENCLATURE

symbol	units	explanation	equation
	A		
An	in^2	nozzle area	π/4((Dn)^2)
As	ft^2	stack area	π/4((De)^2) or LxW
	B		
Bws(1)	%	fractional stack gas moisture-equ 1	((Vw std)/(Vw std+Vm std))100
Bws(2)	%	fractional stack gas moisture-equ 2	((Vpw @ ts)/Ps)100
Bws	%	water vapor in the gas stream	lower of Bws(1) and Bws(2)
	C		
CO	%	carbon monoxide	read from measuring device(0 for Asphalt plants)
CO2	%	carbon dioxide	read from measuring device
Corr Vwm	ft^3	correction for Vw w/o silica gel	((Vm*(Vpw@ti)/Ps)*Pm*Tstd)/ (Tm*Pstd)
Cp	none	pitot tube correction factor	see EPA method 2
Cs(front)	gr/dscf	concentration of particulate in stack gas, corrected to STP-for front	(15.43*mn(front))/(Vm std)
Cs(back)	gr/dscf	concentration of particulate in stack gas, corrected to STP-for back	(15.43*mn(back))/(Vm std)
Cs(total)	gr/dscf	concentration of particulate in stack gas, corrected to STP-for total	(15.43*mn(total))/(Vm std)
Cs12(front, back,total)		same as Cs(front,back,total) except- corrected for grain loading at 12% CO2	(12/%CO2)*(15.43*mn(fr, back,total))/(Vm std)
	D		
∂ (density)	lb/ml	density of water at STP	0.002201 (see CRC)
Ds	in or ft	stack diameter	measure at site
Dn	in	nozzle diameter	avg of at least three measurements
	E		
E.A.	%	Excess air (for combustion)	((%O2-.5%CO)*100)/ (.264*%N2-%O2-.5*%CO)
E(front)	lbs/hr	part. emissions rate-front	(0.00857)(Qsd*Cs(front))
E(back)	lbs/hr	part. emissions rate-back	(0.00857)(Qsd*Cs(back))
E(total)	lbs/hr	part. emissions rate-total	(0.00857)(Qsd*Cs(total))
	H		
ΔH	in H2O	average differential pressure across the orifice meter	avg of the readings from the pressure measuring device
ΔH@	none	orifice pressure differential at STP	see EPA Method 5 Appendix
	I		
I	%	Isokinetics	[0.09450*Ts*Vm std]/ [Ps*vs*Ø*(An/144)*(1-(Bws/100))]
	M		
Md	g/g-mole	dry stack gas molecular wgt	0.44(%CO2)+0.320(%O2)+0.280 (%N2+inerts+CO)
mn(back)	g	particulate in impingers	measurement from lab analysis
mn(front)	g	particulate in nozzle & probe	measurement from lab analysis
mn(total)	g	total particulate collected	measurement from lab analysis
Ms	g/g-mole	wet stack gas molecular wgt	Md(1-Bws)+18.0(Bws)
MW CO2	g/mole	mo. wgt of carbon dioxide	44 (see periodic table)
MW N2	g/mole	mo. wgt of nitrogen	28 (see periodic table)
MW O2	g/mole	mo. wgt of oxygen	32 (see periodic table)
MW H2O	g/mole	mo. wgt of water	18 (see periodic table)
	N		
N2	%	percent nitrogen	100-(%CO2+%O2+%CO+inerts)
	O		
O2	%	percent oxygen	read from measuring device

NOMENCLATURE (cont.)

ver. 3 by DNS on 9/10/91

NOMENCLATURE (concl.)

symbol	units	explanation	equation
	P		
ΔP	in H2O	pitot diff. press.-velocity head of stack gas	read from measuring device
Pbar	in Hg	barometric pressure at sampling pt.	read from press measuring device
π(pi)	none	the ratio of the circumference of a circle to its diameter	3.14165 (see CRC)
Pm	in Hg	absolute meter pressure	Pbar+(ΔH/13.6)
Ps	in Hg	absolute stack pressure	Pbar+(Pstatic/13.6)
Pg	in H2O	static pressure of stack	read from pressure sensing device
Pstd	in Hg	press at std conditions (29.92)	see CFR
	Q		
Qs	acfm	flow rate	vs*Ao*60
Qstd	dscfm	dry volumetric stack gas flow rate, corrected to STP	17.64*Qs(1-Bws)*(Ps/Ts)
	R		
R	in Hg-ft^3/°R-lb-mo	ideal gas constant	21.85 (see CRC)
	S		
S.L.	none	Sea Level	read from a relief map
	T		
t1	°F	dry gas meter inlet temp, uncorrected	read from temp sensing device
t2	°F	dry gas meter outlet temp,uncorrected	read from temp sensing device
t1 corr	°F	dry gas meter outlet temp,corrected	t1 + temperature correction
t2 corr	°F	dry gas meter outlet temp,corrected	t2 + temperature correction
θ(theta)	min	sampling time/point	Ø/tn
Ø(Theta)	min	total sampling time	none
ti	°F	impinger outlet temp	read from temp sensing device
tm	°F	dry gas meter temp in F	(t1+t2)/2
Tm	°R	dry gas meter temp in R	tm+460
tn	none	ttl number or traverse pts	summation of the traverse points
ts	°F	stack temp in F	read from temp sensing device
Ts	°R	stack temp in R	ts+460
Tstd	°R	temp at std conditions (528)	see CFR
	U		
Vlc	ml	water collected from impingers and the silica gel (if applicable)	from lab analysis
Vm	ft^3	sample gas volume, uncorrected	read from dry gas meter
Vm'	ft^3	sample gas volume, corrected	Vm*Y
Vm std	ft^3	volume of gas sample by the dry gas meter,corrected to STP	((Vm*Tstd)Pm)/((Pstd*Tm)-corr Vm)
Vpw@ts	in Hg	vapor pressure of water at ts	see CRC water vapor press. tables
Vpw@ti	in Hg	vapor pressure of water at ti	see CRC water vapor press. tables
Vs	ft/sec	stack gas velocity	85.49*Cp((Ts*ΔP)/(Ps*Ms))^0.5
Vw std	ft^3	Vol. of water vapor in gas sample, corrected to STP	(Vlc*∂*R*Tstd)/(Pstd*MW H2O)+corr Vwm
	Y		
Y	none	dry gas meter calibration factor	see CFR 40, parts 53-60

Conversion Factors

(multiply by the number)			
0.002669	in Hg-ft^3/°R-ml	conversion to get in Hg-ft^3/R	see CRC
0.00857	lb/gr-min/hr	conv from gr/min to lb/hr (60/7000)	see Lange's Handbook of Chemistry
0.04707	ft^3/ml	conversion from ml to ft^3	see Lange's Handbook of Chemistry
15.43	gr/g	conversion from g to gr	see Lange's Handbook of Chemistry
17.64	°R/in H2O	Tstd/Pstd (528/29.92)	see Lange's Handbook of Chemistry
85.49	(ft/sec)-(lb-in Hg/lb-mo-°R-in H20))^.5	conversion factor to get velocity in ft/sec	see CRC
(divide by the number)			
144	in^2/ft^2	conversion from in^2 to ft^2	see CRC
13.6	in H20/in Hg	conversion from in H20 to in Hg	see CRC
(add to the number)			
460	°R/°F	conversion from F to R	see CRC

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
MONITORING AND TECHNICAL SERVICES
9150 CHESAPEAKE DRIVE
SAN DIEGO, CA 92123

NITROGEN OXIDES, CARBON MONOXIDE, PARTICULATE, AND SULFUR EMISSIONS SUMMARY REPORT

SITE: Arizona Street Flare

P/O NUMBER: 56896 and 59383 JOB NO: T1482-1

TEST DATE: 3/30/92

EQUIPMENT: Arizona Street Landfill Gas Collection and Incineration System

REPORT BY: R.P. Logan - SCEC DATE: 5/14/92

APCD PERSONNEL: Janet Cawyer/David Shina

SITE PERSONNEL: Ray Purtee

APPROVED BY: _____ DATE: _____

SCEC
1582-1 N. BATAVIA
ORANGE, CA 92667
(714)282-8240

COMPANY: S.D.A.P.C.D. @ ARIZONA STREET
DATE: MARCH 30, 1992
UNIT: FLARE @ EXHAUST
REPORT #:T1482-1

FIELD DATA @ 68'

SITE:

RUN #:	1	2	3
TIME:	1125	1403	1600
Vm (dry gas sampled)	31.727	36.28	33.18
Y (meter calib. factor)	0.976583	0.976583	0.976583
P bar (Barometric pressure)	29.85	29.85	29.85
P static (stack pressure, " H2O)	0	0	0
Delta H (differential meter press, " H2O)	0.885	1.117	1.105
Tm (meter temperature, R')	531.2	530.93	528.88
Vol H2O mls	62.5	80.8	65.1
Vm(std),dscf	30.79	35.25	32.36
Bws-H2O vapor	0.0872	0.0974	0.0865
MF-moisture factor	0.9128	0.9026	0.9135
% CO2	8.03	7.92	7.81
% O2	11.55	11.69	11.7
% N2	80.42	80.39	80.49
Md-MW stk gas,dry	29.75	29.73	29.72
Ms-MW stk gas,wet	28.73	28.59	28.71
Cp-pitot tube	0.84	0.84	0.84
Avg sq rt ^p	0.138	0.164	0.164
T stack, R'	1924.77	1714.5	1896.7
Stack area,ft2	12.25	12.25	12.25
Vs-fps	14.85	16.69	17.52
Qstd-dscfm	2727	3402	3267
Area noz,ft2	2.16E-03	2.16E-03	1.88E-03
Sample time	60	60	60
% Isokinetic	106.5	97.7	107.6

SAN DIEGO AIR POLLUTION CONTROL DISTRICT, 9150 CHESAPEAKE DRIVE, SAN DIEGO, CA. 92123 P.O.#none TEST #92090.2

SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE

TEST SITE: Balboa Park Landfill Flare
2850 Pershing Dr.
San Diego, CA

TEST WITNESS - RUN #1

TEST #: 92090.1 P.O.#: none TEST DATE: 3/30/92

Type of plant (Asphalt/Perlite/Combustion): COMBUSTION

UNIT TESTED: INCINERATOR

EQUIPMENT: LANDFILL FLARE

TESTED BY: Russ Logan & Ted Jackman of SCEC DATE: 3/30/92

SITE PERSONNEL: Ray Purtee DATE: 3/30/92

APCD ENGINEER: Archi de la Cruz DATE: 3/30/92

LAB ANALYSIS BY: SCEC DATE: 4/21/92

REPORT BY: SCEC (Russ Logan) DATE: 5/14/92

REVIEWED BY: David N. Shina DATE: 6/29/92

APPROVED BY: DATE:

JUDITH LAKE, CHIEF OF MONITORING

This report has been reviewed and found to be representative of the testing that was performed.

SDAPCD RULES

TEST	LIMIT	MEASURED	PASS/FAIL
RULE 53 SPECIFIC CONT.	0.10 gr/dscf	0.013 gr/dscf	NON-EXCEEDANCE

TEST RESULTS SUMMARY:

ITEM	I	Cs(12%)	E
UNITS	%	gr/dscf	lbs/hr
VALUE	106	0.0128	0.20

ENGINEERING SUMMARY

Qstd	TYPE OF FUEL	LOAD	RATE
dscfm		Tons/Hr	Tons
2749			

TEST PARAMETERS:

SYSTEM DESCRIPTION:
Landfill gas is sucked through the piping of this system. The landfill gas is constantly being burned off by the flare combustion system. The flare is at the bottom of the incinerator stack. The sampling points are near the top of the stack. The particulate emissions from this process are the subject of the report.

PROCEDURES:
The procedures and equipment utilized in these tests are based on EPA New Source Performance Standards Method 5. The sampling train utilized a front-end filter (fig. 1)

CALCULATIONS
All equations are from EPA CFR 40, July 1, 1991, Parts 53-60, Appendix A, Methods 1-5 inclusive.

PARTICULATE SAMPLING:
The test consisted of sampling at 16 traverse points, 4 from each of 4 sample ports (fig.2), collected from 84 inches below the stack (fig.3). All field data was transferred to the computer printout. All calculations were done by the computer and the emissions were compared to rule 53b of the SDAPCD.

ANALYSES:
Gas: A CEM analysis was performed by SCEC.
Particulate: All procedures follow EPA guidelines, except where noted in the SDAPCD QA manual.

EQUIPMENT:
All testing and analysis equipment was calibrated according to EPA guidelines and done by SCEC.

FIELD DATA & DATA SUMMARY:

Trav. Pt	Vm (ft^3)	ΔP	ΔH	Stack Temp	Box Temp	Imp Temp	t 1 (in)	t 2 (out)	velocity
	297.665	(in H2O)	(in H20)	(°F)	(°F)	(°F)	(°F)	(°F)	(ft/sec)
A1		0.010	1.800	1490		68	71	70	010.56
2		0.020	0.680	1420		68	71	70	015.04
3		0.020	0.700	1468		68	73	71	015.23
4		0.010	0.340	1420		68	73	71	010.63
B1		0.010	0.750	1470		68	73	72	010.77
2		0.010	0.700	1440		68	73	71	010.69
3		0.030	0.660	1475		68	73	71	015.27
4		0.020	0.670	1468		68	73	71	015.23
C1		0.020	1.340	1460		68	71	71	015.20
2		0.030	1.030	1460		68	72	70	018.61
3		0.030	1.000	1461		68	71	71	018.62
4		0.030	1.000	1457		68	71	70	018.60
D1		0.010	0.740	1470		68	72	69	010.77
2		0.020	0.710	1340		68	71	70	014.72
3		0.030	1.000	1472		68	71	70	018.67
4	329.392	0.030	1.040	1398		68	71	70	018.31

	Vm	ΔP	ΔH	***ts	tbox	ti	t 1 (in)	t 2 (out)	vs
Average:	31.727	0.019	0.885	1443	not done	68	71.88	70.50	14.81

*** SCEC took their thermocouple readings of the first point of each port too early (when they changed ports, the thermocouple cooled down to c.a. 300-500 °F). I had to correct the temperatures at the beginning of each port change. Their temperatures were too low. To correct for this, I gave the first point of each port the average of the previous three temperatures.

METER BOX PARAMETERS:
Box ID = NUTECH
ΔH@ =
Y = 0.9766

NOZZLE & PROBE:
Dn = 0.630 in
An = 0.3117 in^2
Cp = 0.840

MISCELLANEOUS:
Maximum vacuum = 5.0 in. Hg.
Circular stack (Y/N) = YES
Silica gel (Y/N) = YES

VOLUME:
start leak rate = 0.000 cfm
Pass/Fail PASS
final leak rate = 0.000 cfm
Pass/Fail PASS
Vm 31.727 ft^3

PRESSURES:
Pbar= 29.85 in Hg
Pg= 0.00 in H2O
Vpw @ ts= 29.9200 in Hg
Vpw @ ti= N/A in Hg

LABORATORY DATA:
mn(front) = 0.00000 g CO2 = 8.03 %
mn(back) = 0.01716 g O2 = 11.55 %
mn(total)= 0.01716 g CO = 0.00 %
Vlc 62.50 ml N2 = 80.42 %

STACK PARAMETERS:
Ds = 3.50 ft
Length = 3.50 ft
As = 12.25 ft^2

TIME:
ø = 60.0 min
tn = 16 points
ø = 3.8 min/pt

TEMPERATURES:
t1 = 71.88 °F ti= 68 °F
t2 = 70.50 °F tbox= not done °F
tm = 71.19 °F ts= 1443 °F

CALCULATIONS:

P.O.#none TEST #92090.2

TEMPERATURES:

01)	ts = (Σ ts(n))/total n's	1443 °F
02)	Ts =	1903 °R
03)	tm= (Σ [(t 1(n)+t 2t(n))/2}/total n's=(t1+t2)/2	71 °F
04)	Tm= (t+460) + 460	531 °R
05)	ti= (Σ ti(n))/total n's	68 °F
06)	Tstd	528 °R

PRESSURES:

07)	Pbar= [(P @ S.L.)+[ft. above S.L.*(-0.1 in Hg/100ft)]]	29.85 in Hg
08)	Pg= read from pressure sensing device	0.00 in H2O
09)	Ps= Pbar + (Pg/13.6)	29.85 in Hg
10)	ΔH	0.885 in H20
11)	Pm= Pbar+(ΔH/13.6)	29.92 in Hg
12)	Pstd	29.92 in Hg

VOLUME:

13)	Vm= Vm(end)-Vm(begin)	31.727 ft^3
14)	Y	0.9766
15)	Vm'= Vm*Y	30.985 ft^3
16)	Vpw @ ti = from appendix	N/A in Hg
17)	corr Vwm = [[(Vm'*Vpw@imp/Ps)*Pm*Tstd]/(Tm*Pstd)]	0.0000 ft^3
18)	Vm std = [[Vm'*(Tstd/Tm)*(Pm/Pstd)]-corr Vwm]	30.794 ft^3
19)	Vlc= (Σ Volume of impingers)	62.50 ml
20)	∂	0.002010 lb/ml
21)	R	21.85 in Hg-ft^3/°R-lb-mo
22)	MwH2O	18.00 g/g-mo
23)	Vw std = [[(Vlc*∂*R*Tstd)/(Pstd*MwH2O)]+corr Vwm]	2.9500 ft^3

MOISTURE:

24)	Bws(1) =[Vw std)/(Vw std+Vm std)100	8.74 %
25)	Vpw @ ts = from appendix	29.92 in Hg
26)	Bws(2) =[[Vpw @ ts]/Ps]*100	100.23 %
27)	Bws = lower value of equation 24 or 26	8.74 %

MOLECULAR WEIGHT:

28)	%O2	11.55 %
29)	%CO2	8.03 %
30)	%N2+inerts+%CO	80.42 %
31)	Md=[0.440(%CO2)]+[0.320*(%O2)]+[0.280(%N2+inerts+%CO)]	29.75 g/g*mole
32)	Ms=Md*[1-Bws)+18.0*(Bws]	28.72 g/g*mole

FLOW:

33)	ΔP	0.0192 in H2O
34)	Cp	0.848
35)	vs= 85.49*Cp*[[(Ts*ΔP)/(Ps*Ms)]^.5]	14.809 ft/sec
36)	As=3.14*[(Da)^2/4]	12.250 ft^2
37)	Qs = (vs)*As*60	10885 acfm
38)	Qstd =17.64*Qs*(1-Bws)*Ps/Ts	8749 dscfm

EMISSIONS:

FRONT HALF

39)	mn (front)	0.00000 g
40)	Cs [illegible]	0.00000 grains/dscf
41)	Cs(12%,front)=(12/%CO2)*Cs(front)	0.000 grains/dscf
42)	E [illegible] (front)	0.00 lbs/hr

BACK HALF

43)	mn (back)	0.01716 g
44)	Cs [illegible]	0.00860 grains/dscf
45)	Cs(12%,back)=(12/%CO2)*Cs(back)	0.013 grains/dscf
46)	E (back) = [illegible] (back)	0.20 lbs/hr

TOTAL

47)	mn (total) = mn(front)+mn(back)	0.01716 g
48)	Cs (total) =[5.43*mn(total)]/Vm std	0.00860 grains/dscf
49)	Cs(12%,total)=(12/%CO2)*Cs(total)	0.013 grains/dscf
50)	E (total) = (0.00857)*(Qstd)*Cs (total)	0.20 lbs/hr
51)	E.A. =[(%O2-.5(%CO)*100]/[0.264(%N2)-(%O2)-0.5(%CO)]	119.31 %

ISOKINETICS:

52)	Dn=	0.630 in
53)	An=3.14*[(Dn)^2/4]	0.3117 in^2
54)	I=.09450[Ts*Vm std/Ps*Vs*An*∂*(1-Bws) 105.87 % =	108 %

SAN DIEGO AIR POLLUTION CONTROL DISTRICT, 9150 CHESAPEAKE DRIVE, SAN DIEGO, CA. 92123

SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE

TEST SITE: Balboa Park Landfill Flare
2850 Pershing Dr.
San Diego, CA

TEST #: 92090.2 P.O.#: none TEST DATE: 3/30/92

Type of plant (Asphalt /Perlite / Combustion): COMBUSTION

UNIT TESTED: INCINERATOR

TEST WITNESS - RUN #2

EQUIPMENT: LANDFILLL FLARE

TESTED BY: Russ Logan & Ted Jackman of SCEC	DATE: 3/30/92
SITE PERSONNEL: Ray Purtee	DATE: 3/30/92
APCD ENGINEER: Archi de la Cruz	DATE: 3/30/92
LAB ANALYSIS BY: SCEC	DATE: 4/21/92
REPORT BY: SCEC (Russ Logan)	DATE: 5/14/92
REVIEWED BY: David N. Shina	DATE: 6/29/92
APPROVED BY:	DATE:

JUDITH LAKE, CHIEF OF MONITORING

This report has been reviewed and found to be representative of the testing that was performed.

SDAPCD RULES

TEST	LIMIT	MEASURED	PASS/FAIL
E 53 SPECIFIC CONT.	0.10 gr/dscf	0.0021 gr/dscf	NON-EXCEEDANCE

TEST RESULTS SUMMARY:

ITEM	I	Cs(12%)	E
UNITS	%	gr/dscf	lbs/hr
VALUE	103	0.0021	0.04

ENGINEERING SUMMARY

Qstd	TYPE OF FUEL	LOAD	RATE
dscfm		Tons/Hr	Tons
3223			

TEST PARAMETERS:

SYSTEM DESCRIPTION:
Landfill gas is sucked through the piping of this system. The landfill gas is constantly being burned off by the flare combustion system. The flare is at the bottom of the incinerator stack. The sampling points are near the top of the stack. The particulate emissions from this process are the subject of the report.

PROCEDURES:
The procedures and equipment utilized in these tests are based on EPA New Source Performance Standards Method 5. The sampling train utilized a front-end filter (fig. 1)

CALCULATIONS:
All equations are from EPA CFR 40, July 1, 1991, Parts 53-60, Appendix A, Methods 1-5 inclusive.

PARTICULATE SAMPLING:
The test consisted of sampling at 16 traverse points, 4 from each of 4 sample ports (fig.2), collected from 84 inches below the stack (fig.3). All field data was transferred to the computer printout. All calculations were done by the computer and the emissions were compared to rule 53b of the SDAPCD.

ANALYSES:
Gas: A CEM analysis was performed by SCEC.
Particulate: All procedures follow EPA guidelines, except where noted in the SDAPCD QA manual.

EQUIPMENT:
All testing and analysis equipment was calibrated according to EPA guidelines and done by SCEC.

Balboa Park Landfill Flare(Run #2) on 3/30/92

FIELD DATA & DATA SUMMARY:

P.O.#none TEST #92090.2

Trav. Pt	Vm (ft^3)	ΔP (in H2O)	ΔH (in H2O)	Stack Temp (°F)	Box Temp (°F)	Imp Temp (°F)	t 1 (in) (°F)	t 2 (out) (°F)	velocity (ft/sec)
	330.003								
A1		0.020	1.550	1450		68	71	70	018.19
2		0.030	1.000	1460		68	73	71	018.66
3		0.030	1.010	1452		68	72	70	018.62
4		0.030	1.020	1440		68	72	71	018.56
B1		0.030	1.000	1480		68	71	70	018.75
2		0.030	1.020	1430		68	70	69	018.51
3		0.030	1.000	1491		68	72	70	018.61
4		0.030	1.000	1470		68	71	70	018.71
C1		0.020	1.900	1430		68	72	71	018.51
2		0.030	1.030	1427		68	73	71	018.50
3		0.030	1.020	1442		68	73	71	018.57
4		0.030	1.020	1442		68	72	71	018.57
D1		0.020	1.400	1380		68	72	71	014.91
2		0.020	0.700	1388		68	71	70	014.94
3		0.020	0.700	1362		68	68	68	014.92
4	366.285	0.020	0.700	1371		68	69	68	014.88

Average:	Vm	ΔP	ΔH	***ts	tbox	ti	t 1 (in)	t 2 (out)	vs
	36.282	0.027	1.117	1433	not done	68	71.44	70.13	17.47

*** SCEC took their thermocouple readings of the first point of each port too early (when they changedports, the thermocouple cooled down to c.a. 300-500 °F). I had to correct the temperatures at the beginning of each port change. Their temperatures were too low. To correct for this, I gave the first point of each port the average of the previous three temperatures.

METER BOX PARAMETERS:
Box ID = NUTECH
ΔH@ =
Y = 0.9766

NOZZLE & PROBE:
Dn = 0.630 in
An = 0.3117 in^2
Cp = 0.840

MISCELLANEOUS:
Maximum vacuum = 5.0 in. Hg.
Circular stack (Y/N) = YES
Silica gel (Y/N) = YES

VOLUME:
start leak rate = 0.000 cfm
Pass/Fail PASS
final leak rate = 0.000 cfm
Pass/Fail PASS
Vm 36.282 ft^3

PRESSURES:
Pbar= 29.85 in Hg
Pg= 0.00 in H2O
Vpw @ ts= 29.9200 in Hg
Vpw @ ti= N/A in Hg

LABORATORY DATA:
mn(front) = 0.00322 g
mn(back) = 0.00000 g
mn(total)= 0.00322 g
Vlc 80.80 ml
CO2 = 7.92 %
O2 = 11.69 %
CO = 0.00 %
N2 = 80.39 %

STACK PARAMETERS:
Ds = 3.50 ft
Length = 3.50 ft
As = 12.25 ft^2

TIME:
ø = 60.0 min
tn = 16 points
ø = 3.8 min/pt

TEMPERATURES:
t1 = 71.44 °F
t2 = 70.13 °F
tm = 70.78 °F
ti= 68 °F
tbox= not done °F
ts= 1433 °F

Balboa Park (Run #1) on 3/30/92 P.O. #:none TEST#: 92090.1

SAN DIEGO AIR POLLUTION CONTROL DISTRICT, 9150 CHESAPEAKE DRIVE, SAN DIEGO, CA 92123

PARTICULATE TEST LABORATORY ANALYSIS DATA SHEET

TEST SITE: Balboa Park
2850 Pershing Dr.
San Diego, CA

TEST WITNESS - RUN #1

TEST #: 92090.1 P.O.#: none TEST DATE: 3/30/92

LAB ANALYSIS BY: Russ Logan (of SCEC) DATE: 4/21/92

LAB REPORT BY: Russ Logan (of SCEC) DATE: 4/21/92

REVIEWED BY: David Shina (of SDAPCD) DATE: 7/8/92

(1) IMPINGER VOLUMES

	FINAL WGT.		INIT WGT.		NET WGT.
#1	650.00 g	-	597.00 g	=	53.00 g
#2	614.00 g	-	612.40 g	=	1.60 g
#3	486.40 g	-	485.80 g	=	0.60 g
#4	708.10 g	-	700.80 g	=	7.30 g
#5	g	-	g	=	g

Was silica gel used (Y/N) ?= y

Total impinger charge= 200.00 ml

Total weight collected= 62.50 g

Total volume collected,Vlc= 62.50 ml

(2) BLANKS

							STANDARDS				
A	B	C	D	E	F	G	H	I	J	K	L
LOCATION	SOLVENT	ID	END WGT g	INIT WGT g	NET WGT. (E-F) g	RINSES ml	g/ml (G/D)	% (H*100)	ppm (H*10^6)	PASS FAIL	LIMITS
BLANK	ACETONE	E9	99.63435	99.63420	0.00015	100.00	0.0000015	0.0001500	1.50	P	0.0010%=10ppm
BLANK	WATER	E14	96.75430	96.75430	0.00000	100.00	0.0000000	0.0000000	0.00	P	0.0004%=4ppm

(3) WEIGHTS & RINSES

a	b	c	d	e	f	g	h	i	j	k
LOCATION	SOLVENT	ID	END WGT g	INIT. WGT g	NET WGT. (e-f) g	RINSES ml	SOLV. WGT (g*H) g	WGT (corr) (f-h) g	ALIQUOTS g	Totals (ΣSubtotals(i+j)) g
FRONT	ACETONE									
FRONT	WATER									
FRONT	TOTAL	*								
FRONT	FILTER	G15	0.51660	0.51660	0.00000	N/A	N/A	0.000000	N/A	
FRONT						Subtotals (Σcolumn)=		0.00000		0.00000 g
BACK	ACETONE									
BACK	WATER									
BACK	TOTAL	**E4	99.81770	99.81140	0.00630	***N/A	0.000000	0.006300	0.01086	
BACK	FILTER	N/A								
BACK						Subtotals (Σcolumn)=		0.00630	0.01086	0.01716 g
TOTAL						Totals =(Σsubtotals= Σcolumn k(front & back))=				0.01716 g

* SCEC broke the probe/nozzle; so NO particulate could be analyzed for in the front half.

** For the BACK HALF totals, SCEC did NOT allow the beakers to come to a constant weight and they took an incorrect ɔrage weight. To get a weight, I took the last recorded weight and deemed it the "official average" weight.

*** SCEC did not wash out the BACK half with acetone, so the SOLV. WGT. contribution will be zero.

CONTRACTOR TEST REPORT

CONTRACTOR TEST REPORT

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
MONITORING AND TECHNICAL SERVICES
9150 CHESAPEAKE DRIVE
SAN DIEGO, CA 92123

NITROGEN OXIDES, CARBON MONOXIDE, PARTICULATE, AND SULFUR EMISSIONS SUMMARY REPORT

SITE: Arizona Street Flare

P/O NUMBER: 56896 and 59383 JOB NO: T1482-1

TEST DATE: 3/30/92

EQUIPMENT: Arizona Street Landfill Gas Collection and Incineration System

REPORT BY: R.P. Logan - SCEC DATE: 5/14/92

APCD PERSONNEL: Janet Cawyer/David Shina

SITE PERSONNEL: Ray Purtee

APPROVED BY: DATE: 10/12/92

CALCULATIONS:

TEMPERATURES:

01)	ts = (Σ ts(n))/total n's	1433 °F
02)	Ts = ts+460	1893 °R
03)	tm= (Σ ((t 1(n)+t 2t(n))/2)/total n's=(t1+t2)/2	71 °F
04)	Tm= (t1+t2)/2 + 460	531 °R
05)	ti= (Σ ti(n))/total n's	68 °F
06)	Tstd	528 °R

PRESSURES:

07)	Pbar= {(P @ S.L.)+[ft. above S.L.*(-0.1 in Hg/100ft)]}	29.85 in Hg
08)	Pg= read from pressure sensing device	0.00 in H2O
09)	Ps= Pbar + (Pg/13.6)	29.85 in Hg
10)	ΔH	1.117 in H2O
11)	Pm= Pbar+(ΔH/13.6)	29.93 in Hg
12)	Pstd	29.92 in Hg

VOLUME:

13)	Vm= Vm(end)-Vm(begin)	36.282 ft^3
14)	Y	0.9764
15)	Vm'= Vm*Y	35.433 ft^3
16)	Vpw @ ti = from appendix	N/A in Hg
17)	corr Vwm = {[(Vm'*Vpw@imp/Ps)*Pm*Tstd]/(Tm*Pstd)}	0.0000 ft^3
18)	Vm std = [[Vm'*(Tstd/Tm)*(Pm/Pstd)]-corr Vwm]	35.252 ft^3
19)	Vlc= (Σ Volume of impingers)	80.80 ml
20)	∂	0.002019 lb/ml
21)	R	21.85 in Hg-ft^3/°R-lb-mo
22)	MwH2O	18.00 g/g-mo
23)	Vw std = {[(Vlc*∂*R*Tstd)/(Pstd*MwH2O)}+corr Vwm}	3.8138 ft^3

MOISTURE:

24)	Bws(1) =[Vw std)/(Vw std+Vm std)100	9.76 %	
25)	Vpw @ ts = from appendix	29.92 in Hg	
26)	Bws(2) =[(Vpw @ ts)/Ps]*100	100.23 %	
27)	Bws = lower value of equation 24 or 26		9.76 %

MOLECULAR WEIGHT:

28)	%O2	11.69 %
29)	%CO2	7.92 %
30)	%N2+inerts+%CO	80.39 %
31)	Md=[0.440(%CO2)]+[0.320*(%O2)]+[0.280(%N2+inerts+%CO)]	29.73 g/g*mole
32)	Ms=Md*(1-Bws)+18.0*(Bws)	28.59 g/g*mole

FLOW:

33)	ΔP	0.0267 in H2O
34)	Cp	0.840
35)	vs= 85.49*Cp*[(Ts*ΔP)/(Ps*Ms)]^.5]	17.475 ft/sec
36)	As=3.14*[(Dn)^2/4]	12.250 ft^2
37)	Qs = (vs)*As*60	12844 acfm
38)	Qstd =17.64*Qs*(1-Bws)*Ps/Ts	9223 dscfm

EMISSIONS:

FRONT HALF

39)	mn (front)	0.00322 g
40)	Cs (front)=15.43*mn(front)/Vm std	0.001411 grains/dscf
41)	Cs(12%,front)=(12/%CO2)*Cs(front)	0.002 grains/dscf
42)	E (front) = (0.00857)*(Qstd)*Cs (front)	0.04 lbs/hr

BACK HALF

43)	mn (back)	0.00000 g
44)	Cs (back)=15.43*mn(back)/Vm std	0.000000 grains/dscf
45)	Cs(12%,back)=(12/%CO2)*Cs(back)	0.000 grains/dscf
46)	E (back) = (0.00857)*(Qstd)*Cs (back)	0.00 lbs/hr

TOTAL

47)	mn (total) = mn(front)+mn(back)	0.00322 g
48)	Cs (total) =15.43*mn(total)/Vm std	0.001411 grains/dscf
49)	Cs(12%,total)=(12/%CO2)*Cs(total)	0.002 grains/dscf
50)	E (total) = (0.00857)*(Qstd)*Cs (total)	0.04 lbs/hr
51)	E.A. =[(%O2-.5(%CO)*100]/[0.264(%N2)-(%O2)-0.5(%CO)]	122.63 %

ISOKINETICS:

52)	Dn=	0.630 in.
53)	An=3.14*[(Dn)^2/4]	0.3117 in^2
54)	I=.09450(Ts*Vm std)/Ps*Vs*As(1-Bws) 103.28 % =	103 %

Balboa Park (Run #2) on 3/30/92

SAN DIEGO AIR POLLUTION CONTROL DISTRICT, 9150 CHESAPEAKE DRIVE, SAN DIEGO, CA 92123 P.O. #:none TEST#: 92090.2

PARTICULATE TEST LABORATORY ANALYSIS DATA SHEET

TEST SITE: Balboa Park
2850 Pershing Dr.
San Diego, CA

TEST WITNESS - RUN #2

TEST #: 92090.2 P.O.#: none

LAB ANALYSIS BY: Russ Logan (of SCEC) TEST DATE: 3/30/92

LAB REPORT BY: Russ Logan (of SCEC) DATE: 4/21/92

REVIEWED BY: David Shina (of SDAPCD) DATE: 4/21/92

DATE: 7/8/92

(1) IMPINGER VOLUMES

	FINAL WGT.		INIT WGT.		NET WGT.
#1	657.80 g	-	587.60 g	=	70.20 g
#2	612.10 g	-	610.10 g	=	2.00 g
#3	488.80 g	-	486.40 g	=	2.40 g
#4	714.30 g	-	708.10 g	=	6.20 g
#5	g	-	g	=	g

Was silica gel used (Y/N) ?= y

Total impinger charge= 200.00 ml

Total weight collected= 80.80 g

Total volume collected,Vlc= 80.80 ml

(2) BLANKS

A	B	C	D	E	F	G	STANDARDS H	I	J	K	L
LOCATION	SOLVENT	ID	END WGT g	INIT WGT g	NET WGT. (E-F) g	RINSES ml	g/ml (G/D)	% (H*100)	ppm (H*10^6)	PASS FAIL	LIMITS
BLANK	ACETONE	E9	99.63435	99.63420	0.00015	100.00	0.0000015	0.0001500	1.50	P	0.0010%=10ppm
ANK	WATER	E14	96.75430	96.75430	0.00000	100.00	0.0000000	0.0000000	0.00	P	0.0004%=4ppm

(3) WEIGHTS & RINSES

a	b	c	d	e	f	g	h	i	j	k
LOCATION	SOLVENT	ID	END WGT g	INIT. WGT g	NET WGT. (e-f) g	RINSES ml	SOLV. WGT (g*H) g	WGT (corr) (f-h) g	ALIQUOTS g	Totals (ΣSubtotals(i+j)) g
FRONT	ACETONE									
FRONT	WATER									
FRONT	TOTAL	*E17	95.88510	95.88240	0.00270	**50	0.000075	0.002625	0.00000	
FRONT	FILTER	**G16	0.51900	0.51840	0.00060	N/A	N/A	0.000600	N/A	
FRONT							Subtotals (Σcolumn)=	0.00322	0.00000	0.00322 g
BACK	ACETONE									
BACK	WATER									
BACK	TOTAL	***E2	97.28090	97.28160	0.00000	*****N/A	0.000000	0.000000	0.00000	
BACK	FILTER	N/A								
BACK							Subtotals (Σcolumn)=	0.00000	0.00000	0.00000 g
TOTAL							Totals =(Σsubtotals= Σcolumn k(front & back))=			0.00322 g

* For the FRONT HALF totals, SCEC did NOT allow the beakers to come to a constant weight and they took an incorrect average weight. To get a weight, I took the last recorded weight and deemed it the "official average" weight.

** SCEC used only 50 mls of acetone for the FRONT half rinses. The water is blank is 0 ppm, so there will be no SOLV. WGT. value.

*** Scec did not allow the filter to come to a constant weight. To get a weight, I used the last recorded weight. SCEC took an incorrect average weight. When I corrected for this, E2's END WEIGHT was more than the tare. INITIAL WEIGHT Because of this, I had to make the NET WEIGHT zero, and this is why there is NO particulate contribution from the back half.

*****SCEC did not wash out the BACK half with acetone, so the SOLV. WGT. contribution will be zero

COMPANY: ARIZONA STREET
DATE: 3/30/92
UNIT: FLARE
REPORT #:T1482-1

RUN #2
@ 68'F
EPA METHOD 5/8

PARTICULATE RESULTS:	net mg	gr/dscf	gr/scf	gr/dscf @ 12% CO2	lbs/hr
Probe & Nozzle:	4.9	0.002140	0.001932	0.003243	0.06
Filter:	0.7	0.000305	0.000276	0.000463	0.01
Condensables:	8.33	0.003639	0.003284	0.005513	0.11
Total:	13.93	0.006085	0.005492	0.009220	0.18

N BaCl = 0.00971

SULFATE RESULTS:	Vol aliq	Vt	gr/dscf	gr/scf	gr/dscf @ 12% CO2	lbs/hr
Probe & Nozzle:	7	0	0	0	0	0
Filter:	10	0	0	0	0	0
Condensables:	34	0.18	0.001259	0.001136	0.001907	0.04
Total:			0.001259	0.001136	0.001907	0.04

ADDITIONAL DATA:

TIME start	TIME finish	%O2	%CO2	%H2O	Vm(std)	SDCFM
1403	1508	11.69	7.92	9.74	35.25	3402

SOUTH COAST ENVIRONMENTAL COMPANY

PLANT Arizona-St TEST TY CARB 5 METHOD 5 FIELD TEST DATA SHEET

Date 3/30/92
Test Location Fabre
Run Number #2
Stack Diameter 42"x42"
Operator T.G
Filter No. G16 0.5184

Barometric Pressure 29.85
Static in. wg. 0.00
Probe Type/Length 6' H2O Probe
Pitot Coefficient 0.84
Meter Box No. NuTech
Nozzle No./Size 0.587 0.630

Start Time: 1103

Impinger Volumes/Weights			
Contents	Final	Initial	Net
H2O	659.8	587.6	72.2
H2O	612.1	610.1	2.0
KOH	488.8	486.4	2.4
Silica Gel	714.5	708.1	6.2
		Total	80.8

Gas Composition			
Time	CO_2	O_2	CO
	8.0	12.0	
	7.92	11.69	

Leak Rate	cfm	"Hg
Initial	0.000	20"
Final	0.00	20"

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft³	Temperature °F: Stack	Probe	Oven	Imp.	Gas Meter: In	Out	Pump Vacuum In. Hg	√ΔP	Comments
4	0:00	0.02	1.55	330.003	1400				71	70		5	
3	3:45	0.03	1.00	332.5	1460				73	71		5	
2	7:30	0.03	1.01	334.6	1452				72	70		5	$\sqrt{\ }$ = 36.28
1	11:15	0.03	1.02	336.55	1440				72	71		5	ΔP = 0.027
1	15:00	0.03	1.8	339	606				71	70		5	ΔH = 1.117
	18:45	0.03	1.02	341	1430				70	69		5	$\sqrt{T_s}$ = 1.2545
	22:50	0.03	1.00	343.5	1491				72	70		5	T_m = 70.93
1	26:15	.03	1.00	345	1470				71	70		5	Duration = 60 min
1	30:00	0.03	1.9	348	554				72	71		5	
3	33:45	0.03	1.03	351	1427				73	71		5	
2	37:30	0.03	1.02	353	1442				73	71		5	
1	41:15	0.03	1.02	356	1442				72	71		5	
1	45:00	0.02	1.1	358									

SOUTH COAST ENVIRONMENTAL COMPANY

PLANT Arizona TEST TY Carb Method 5 FIELD TEST DATA SHEET

Date 3/30/92
Test Location Flare @ Exhaust
Run Number #2 Cont.
Stack Diameter 42x42
Operator TJE
Filter No. 616

Barometric Pressure
Static in. wg. 0.00
Probe Type/Length 6' H2O
Pitot Coefficient 0.84
Meter Box No. NuTech
Nozzle No./Size 0.547 0.630

Impinger Volumes/Weights			
Contents	Final	Initial	Net
		Total	

Gas Composition			
Time	CO_2	O_2	CO

Leak Rate	cfm	"Hg
Initial		
Final		

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F: Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
3	50-	0.02	0.70	360.	1388				71	70	5"		
2	55-	0.02	0.70	363.	1382				69	68	5"		
1	60-	0.02	0.70	364.	1371				69	68	5"		
				366.295									

Client: SOAR'D @ ARGONNE ST.

Report #: T'452

Test Date: 3/30/92

Analyst: [illegible]

Site: [illegible]

Run No: 2

GRAVIMETRIC ANALYSIS

E12

Fraction: Probes and Nozzle Washings [illegible] 70 — REF: ST17 [illegible] 70

Date: [illegible] Time: [illegible] #1	Date: Time: #2	Date: Time: #3	No const weight? AVERAGE
Final: 95.8910 Tare:	95.8858	95.8851	95.8873 grms. 95.8824 grms.
		NET:	4.9 mg.

Fraction: Filter — Filter No: 616

Date: Time: #1	Date: Time: #2	Date: Time: #3	AVERAGE
Final: 0.5200 Tare:	0.5182	0.5190	0.5191 grms. 0.5184 grms.
		NET:	0.7 mg.

E2

Fraction: Condensables — Aliquot: 200 — Total Sample: 340 mls

Date: 4/14 Time: 1357 #1	Date: Time: #2	Date: Time: #3	AVERAGE
Final: 97.2978 Tare:	97.2808	97.2810	97.2865 grms. 97.2816 grms.
		NET:	4.9 mg. Scale up aliquot
		TOTAL:	8.33 mg.

E1

Fraction: ~~Condensable Organics~~ Acetone Blank 100 mls

Date: 4/13 Time: #1	Date: 4/14 Time: #2	Date: Time: #3	AVERAGE
Final: 99.6341 Tare:	99.6346		99.6343 grms. 99.6342 grms.
		NET:	0.01 mg.

DO they mix Rinse Ac & H_2O ?

Balboa Park Landfill Flare(Run #3) on 3/30/92 P.O.#none TEST #92090.3

FIELD DATA & DATA SUMMARY:

Trav. Pt	Vm (ft^3)	ΔP	ΔH	Stack Temp	Box Temp	Imp Temp	t 1 (in)	t 2 (out)	velocity
	367.164	(in H2O)	(in H2O)	(°F)	(°F)	(°F)	(°F)	(°F)	(ft/sec)
A1		0.020	1.330	1445		68	73	71	015.14
2		0.030	1.020	1445		68	73	71	018.55
3		0.030	1.010	1445		68	71	69	018.55
4		0.020	0.690	1405		68	70	69	014.98
B1		0.030	1.890	1470		68	71	70	018.67
2		0.040	1.320	1482		68	70	70	021.62
3		0.030	1.000	1470		68	71	70	018.67
4		0.030	1.000	1464		68	68	68	018.64
C1		0.030	2.400	1395		68	69	68	018.30
2		0.020	0.690	1391		68	69	69	014.93
3		0.020	0.690	1406		68	68	68	014.99
4		0.030	0.690	1395		68	67	67	018.30
D1		0.020	1.300	1440		68	66	66	015.12
2		0.020	0.670	1454		68	67	67	015.18
3		0.030	1.010	1431		68	67	67	018.48
4	400.344	0.030	1.000	1452		68	67	67	018.58

	Vm	ΔP	ΔH	***ts	tbox	ti	t 1 (in)	t 2 (out)	vs
Average:	33.180	0.027	1.106	1437	not done	68	69.19	68.56	17.42

*** SCEC took their thermocouple readings of the first point of each port too early (when they changed ports, the thermocouple cooled down to c.a. 300-500 °F). I had to correct the temperatures at the beginning of each port change. Their temperatures were too low. To correct for this, I gave the first point of each port the average of the previous three temperatures.

METER BOX PARAMETERS:
Box ID = NUTECH
ΔH@ =
Y = 0.9766

NOZZLE & PROBE:
Dn = 0.587 in
An = 0.2706 in^2
Cp = 0.840

MISCELLANEOUS:
Maximum vacuum = 5.0 in. Hg.
Circular stack (Y/N) = YES
Silica gel (Y/N) = YES

VOLUME:
start leak rate = 0.000 cfm
Pass/Fail PASS
final leak rate = 0.000 cfm
Pass/Fail PASS
Vm 33.180 ft^3

PRESSURES:
Pbar= 29.85 in Hg
Pg= 0.00 in H2O
Vpw @ ts= 29.9200 in Hg
Vpw @ ti= N/A in Hg

LABORATORY DATA:
mn(front) = 0.004675 g CO2 = 7.81 %
mn(back) = 0.001960 g O2 = 11.70 %
mn(total)= 0.00664 g CO = 0.00 %
Vlc 65.10 ml N2 = 80.49 %

STACK PARAMETERS:
Ds = 3.50 ft
Length = 3.50 ft
As = 12.25 ft^2

TIME:
Ø = 60.0 min
tn = 16 points
ø = 3.8 min/pt

TEMPERATURES:
t1 = 69.19 °F ti= 68 °F
t2 = 68.56 °F tbox= not done °F
tm = 68.88 °F ts= 1437 °F

SAN DIEGO AIR POLLUTION CONTROL DISTRICT, 9150 CHESAPEAKE DRIVE, SAN DIEGO, CA. 92123 P.O.#none TEST #92090.3

SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE

TEST SITE: Balboa Park Landfill Flare
2850 Pershing Dr.
San Diego, Ca

TEST WITNESS - RUN #3

TEST #: 92090.3 P.O.#: none TEST DATE: 3/30/92

Type of plant (Asphalt /Perlite / Combustion) : COMBUSTION

UNIT TESTED: INCINERATOR

EQUIPMENT: LANDFILL FLARE

TESTED BY: Russ Logan & Ted Jackman of SCEC DATE: 3/30/92

SITE PERSONNEL: Ray Purtee DATE: 3/30/92

APCD ENGINEER: Archi de la Cruz DATE: 3/30/92

LAB ANALYSIS BY: SCEC DATE: 4/21/92

REPORT BY: SCEC (Russ Logan) DATE: 4/21/92

REVIEWED BY: David N. Shina DATE: 7/9/92

APPROVED BY: DATE:

JUDITH LAKE, CHIEF OF MONITORING

This report has been reviewed and found to be representative of the testing that was performed.

SDAPCD RULES

TEST	LIMIT	MEASURED	PASS/FAIL
E 53 SPECIFIC CONT.	0.10 gr/dscf	0.005 gr/dscf	NON-EXCEEDANCE

TEST RESULTS SUMMARY:

ITEM	I	Cs(12%)	E
UNITS	%	gr/dscf	lbs/hr
VALUE	108	0.0049	0.09

ENGINEERING SUMMARY

Qstd	TYPE OF FUEL	LOAD	RATE
dscfm		Tons/Hr	Tons
3246			

TEST PARAMETERS:

SYSTEM DESCRIPTION:
Landfill gas is sucked through the piping of this system. The landfill gas is constantly being burned off by the flare combustion system. The flare is at the bottom of the incinerator stack. The sampling points are near the top of the stack. The particulate emissions from this process are the subject of the report.

PROCEDURES:
The procedures and equipment utilized in these tests are based on EPA New Source Performance Standards Method 5. The sampling train utilized a front-end filter (fig. 1)

CALCULATIONS
All equations are from EPA CFR 40, July 1, 1991, Parts 53-60, Appendix A, Methods 1-5 inclusive.

PARTICULATE SAMPLING:
The test consisted of sampling at 16 traverse points, 4 from each of 4 sample ports (fig.2), collected from 84 inches below the stack (fig.3). All field data was transferred to the computer printout. All calculations were done by the computer and the emissions were compared to rule 53b of the SDAPCD.

ANALYSES:
Gas: A CEM analysis was performed by SCEC.
Particulate: All procedures follow EPA guidelines, except where noted in the SDAPCD QA manual.

EQUIPMENT:
All testing and analysis equipment was calibrated according to EPA guidelines and done by SCEC.

CALCULATIONS:

TEMPERATURES:

01)	ts = (Σ ts(n))/total n's		1437 °F
02)	Ts = ts+460		1897 °R
03)	tm= (Σ {(t 1(n)+t 2t(n))/2}/total n's=(t1+t2)/2		69 °F
04)	Tm= (t1+t2)/2 + 460		529 °R
05)	ti= (Σ ti(n))/total n's		68 °F
06)	Tstd		528 °R

PRESSURES:

07)	Pbar= {(P @ S.L.)+[ft. above S.L.*(-0.1 in Hg/100ft)]}		29.85 in Hg
08)	Pg= read from pressure sensing device		0.00 in H2O
09)	Ps= Pbar + (Pg/13.6)		29.85 in Hg
10)	ΔH		1.106 in H2O
11)	Pm= Pbar+(ΔH/13.6)		29.93 in Hg
12)	Pstd		29.92 in Hg

VOLUME:

13)	Vm= Vm(end)-Vm(begin)		33.180 ft^3
14)	Y		0.9766
15)	Vm'= Vm*Y		32.404 ft^3
16)	Vpw @ ti = from appendix		N/A in Hg
17)	corr Vwm = {[(Vm'*Vpw@imp/Ps)*Pm*Tstd]/(Tm*Pstd)}		0.0000 ft^3
18)	Vm std = [[Vm'*(Tstd/Tm)*(Pm/Pstd)]-corr Vwm]		32.362 ft^3
19)	Vlc= (Σ Volume of impingers)		65.10 ml
20)	d		0.002010 lb/ml
21)	R		21.85 in Hg-ft^3/°R-lb-mo
22)	MwH2O		18.00 g/g-mo
23)	Vw std = {[(Vlc*d*R*Tstd)/(Pstd*MwH2O)}+corr Vwm]		3.0727 ft^3

MOISTURE:

24)	Bws(1) =(Vw std)/(Vw std+Vm std)100	8.67 %	
25)	Vpw @ ts = from appendix	29.92 in Hg	
26)	Bws(2) =[(Vpw @ ts)/Ps]*100	100.23 %	
27)	Bws = lower value of equation 24 or 26		8.67 %

MOLECULAR WEIGHT:

28)	%O2	11.70 %
29)	%CO2	7.81 %
30)	%N2+inerts+%CO	80.49 %
31)	Md=[0.440(%CO2)]+[0.320*(%O2)]+[0.280(%N2+inerts+%CO)]	29.72 g/g*mole
32)	Ms=Md*(1-Bws)+18.0*(Bws)	28.70 g/g*mole

FLOW:

33)	ΔP	0.0266 in H2O
34)	Cp	0.840
35)	vs= 85.49*Cp*[(Ts*ΔP)/(Ps*Ms)]^.5]	17.419 ft/sec
36)	As=3.14*[(Ds)^2/4]	12.250 ft^2
37)	Qs = (vs)*As*60	12803 acfm
38)	Qstd =17.64*Qs*(1-Bws)*Ps/Ts	9245 dscfm

EMISSIONS:

FRONT HALF

39)	mn (front)	0.00468 g
40)	Cs (front) =15.43*mn(front)/Vm std	0.00223 grains/dscf
41)	Cs(12%,front)=(12/%CO2)*Cs(front)	0.003 grains/dscf
42)	E (front) = [0.00857]*[Qstd]*Cs (front)	0.06 lbs/hr

BACK HALF

43)	mn (back)	0.00196 g
44)	Cs (back) =15.43*mn(back)/Vm std	0.00093 grains/dscf
45)	Cs(12%,back)=(12/%CO2)*Cs(back)	0.001 grains/dscf
46)	E (back) = (0.00857)*[Qstd]*Cs (back)	0.03 lbs/hr

TOTAL

47)	mn (total) = mn(front)+mn(back)	0.00664 g
48)	Cs (total) =15.43*mn(total)/Vm std	0.00316 grains/dscf
49)	Cs(12%,total)=(12/%CO2)*Cs(total)	0.005 grains/dscf
50)	E (total) = (0.00857)*[Qstd]*Cs (total)	0.09 lbs/hr
51)	E.A. =[(%O2-.5(%CO)*100]/[0.264(%N2)-(%O2)-0.5(%CO)]	122.52 %

ISOKINETICS:

52)	Dn=		0.587 in
53)	An=3.14*[(Dn)^2/4]		0.2706 in^2
54)	I=.09450[Ts*Vm std)/Ps*Vs*An*(1-Bws)	108.34 % =	108 %

Balboa Park Landfill Flare(Run #3) on 3/30/92

P.O. #:none TEST#: 92090.3

SAN DIEGO AIR POLLUTION CONTROL DISTRICT, 9150 CHESAPEAKE DRIVE, SAN DIEGO, CA 92123

PARTICULATE TEST LABORATORY ANALYSIS DATA SHEET

TEST SITE: Balboa Park Landfill flare
2850 Pershing Dr.
San Diego, CA

TEST WITNESS - RUN #3

TEST #: 92090.3 P.O.#: none

LAB ANALYSIS BY: Russ Logan (of SCEC) TEST DATE: 3/30/92

LAB REPORT BY: Russ Logan (of SCEC) DATE: 4/21/92

REVIEWED BY: David Shina (of SDAPCD) DATE: 4/21/92

DATE: 7/8/92

(1) IMPINGER VOLUMES

	FINAL WGT.		INIT WGT.		NET WGT.
#1	658.00 g	-	597.10 g	=	60.90 g
#2	613.60 g	-	612.10 g	=	1.50 g
#3	487.50 g	-	488.80 g	=	-1.30 g
#4	718.30 g	-	714.30 g	=	4.00 g
#5	g	-	g	=	g

Was silica gel used (Y/N) ?= y

Total impinger charge= 200.00 ml

Total weight collected= 65.10 g

Total volume collected,Vlc= 65.10 ml

(2) BLANKS

A	B	C	D	E	F	G	STANDARDS H	I	J	K	L
LOCATION	SOLVENT	ID	END WGT g	INIT WGT g	NET WGT. (E-F) g	RINSES ml	g/ml (G/D)	% (H*100)	ppm (H*10^6)	PASS FAIL	LIMITS
BLANK	ACETONE	E9	99.63435	99.63420	0.00015	100.00	0.0000015	0.0001500	1.50	P	0.0010%=10ppm
ANK	WATER	E14	96.75430	96.75430	0.00000	100.00	0.0000000	0.0000000	0.00	P	0.0004%=4ppm

(3) WEIGHTS & RINSES

a	b	c	d	e	f	g	h	i	j	k
LOCATION	SOLVENT	ID	END WGT g	INIT. WGT g	NET WGT. (e-f) g	RINSES ml	SOLV. WGT (g*H) g	WGT (corr) (f-h) g	ALIQUOTS g	Totals (ΣSubtotals(i+j)) g
FRONT	ACETONE									
FRONT	WATER									
FRONT	TOTAL	*E20	99.07780	99.07570	0.00210	**50	0.000075	0.002025	0.00000	
FRONT	FILTER	G17	0.51905	0.51640	0.00265	N/A	N/A	0.002650	N/A	
FRONT							Subtotals (Σcolumn)=	0.00467	0.00000	0.004575 g
BACK	ACETONE									
BACK	WATER									
BACK	TOTAL	***E18	96.32470	96.32330	0.00140	****0.00	0.000000	0.001400	0.00056	
BACK	FILTER	N/A								
BACK							Subtotals (Σcolumn)=	0.00140	0.00056	0.001960 g
TOTAL							Totals =(Σsubtotals= Σcolumn k(front & back))=			0.00664 g

* For the FRONT HALF totals, SCEC did NOT allow the beakers to come to a constant weight and they took an incorrect average weight. To get a weight, I took the last recorded weight and deemed it the 'official average' weight.

** SCEC used only 50 mls of acetone for the FRONT half rinses. The water is blank is 0 ppm, so there will be no SOLV. WGT. value.

**** SCEC took an incorrect average weight, so I had to correct for it.

**** SCEC did not wash out the BACK half with acetone, so the SOLV. WGT. contribution will be zero

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
MONITORING AND TECHNICAL SERVICES
9150 CHESAPEAKE DRIVE
SAN DIEGO, CA 92123

NITROGEN OXIDES, CARBON MONOXIDE, PARTICULATE, AND SULFUR EMISSIONS SUMMARY REPORT

SITE: Arizona Street Flare

P/O NUMBER: 56896 and 59383 JOB NO: T1482-1

TEST DATE: 3/30/92

EQUIPMENT: Arizona Street Landfill Gas Collection and Incineration System

REPORT BY: R.P. Logan - SCEC DATE: 5/14/92

APCD PERSONNEL: Janet Cawyer/David Shina

SITE PERSONNEL: Ray Purtee

APPROVED BY: DATE: 10/12/92

CONTRACTOR TEST REPORT

COMPANY: ARIZONA STREET
DATE: 3/30/92
UNIT: FLARE
REPORT #:T1482-1

RUN #3
@ 68'F
EPA METHOD 5/8

PARTICULATE RESULTS:

	net mg	gr/dscf	gr/scf	gr/dscf @ 12% CO2	lbs/hr
Probe & Nozzle:	5.3	0.002522	0.002304	0.003875	0.07
Filter:	2.6	0.001237	0.001130	0.001901	0.03
Condensables:	1.26	0.000599	0.000547	0.000921	0.02
Total:	9.16	0.004359	0.003982	0.006697	0.12

N BaCl = 0.00971

SULFATE RESULTS:

	Vol aliq	Vt	gr/dscf	gr/scf	gr/dscf @ 12% CO2	lbs/hr
Probe & Nozzle:	15	0	0	0	0	0
Filter:	10	0	0	0	0	0
Condensables:	28	0.24	0.001506	0.001375	0.002314	0.04
Total:			0.001506	0.001375	0.002314	0.04

ADDITIONAL DATA:

TIME start	TIME finish	%O2	%CO2	%H2O	Vm(std)	SDCFM
1600	1700	11.7	7.81	8.65	32.36	3267

PLANT LANDFILL FLARE ARIZONA ST. TEST TYI METHOD 5 CARB FIELD TEST DATA SHEET

UNMENTAL
PANY

3/30/92

Location LANDFILL FLARE

Number 43

Diameter

ator TJE

er No. 617 0.5164

Barometric Pressure 29.92

Static In. wg. 0.00

Probe Type/Length 6' H2O cooled

Pitot Coefficient .84

Meter Box No. Nutech CB-2

Nozzle No./Size 0.58

Start time = 16:00

Impinger Volumes/Weights			
Contents	Final	Initial	Net
H_2O	658.0	597.1	60.90
H_2O	613.6	612.1	1.50
H_2O	787.5	786.8	-1.30
K.O.	718.3	714.3	4.00
Silica Gel			
		Total	65.10

Gas Composition			
Time	CO_2	O_2	CO
	7.81	11.7	

Leak Rate	cfm	"Hg
Initial	0.00	20
Final	0.00	15"

Sample Point	Time	ΔP In wg	ΔH In wg	Gas Meter Volume Ft^3	Temperature °F: Stack	Probe	Oven	Imp.	Gas Meter: In	Out	Pump Vacuum In. Hg	$\sqrt{\Delta P}$	Comments
									73	71		5	
4	0:00	0.02	1.33	367.164	510				73	71		5	$\sqrt{}_{av}$ = 33.180
3	3:45	0.03	1.02	369	1445				71	69		5	ΔP = 0.027
2	7:30	0.03	1.01	371	1445				70	69		5	ΔH = 1.105
1	11:15	0.02	0.89	374	1405				71	70		5	T_s = 1,436.7
4	15:00	0.03	1.89	376	562				70	70		5	T_m = 68.88
3	18:45	0.04	1.32	378	1482				71	70		5	60 min.
2	22:30	0.03	1.00	380	1470				68	68		5	
1	26:15	0:03	1.00	382	1464				69	68		5	
4	30:00	0.03	2.40	385	341				69	69		5	
	33:45	1.02	0.89	387	1391				68	66		5	

SOUTH COAST ENVIRONMENTAL COMPANY

PLANT Arizona St Landfill Flare TEST T' Lower Marlow 5 FIELD TEST DATA SHEET

Date 3/30/92
Test Location Flare Exhaust
Run Number #3 6
Stack Diameter 42x42
Operator TSE
Filter No. 617

Barometric Pressure 29.92
Static in. wg. 0.00
Probe Type/Length 6' H2O
Pitot Coefficient 0.84
Meter Box No. NuTech
Nozzle No./Size 0.58

Impinger Volumes/Weights			
Contents	Final	Initial	Net
		Total	

Gas Composition			
Time	CO_2	O_2	CO

Leak Rate	cfm	"Hg
Initial		
Final		

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F: Stack	Probe	Oven	Imp.	Gas Meter: In	Out	Pump Vacuum In. Hg	$\sqrt{\Delta P}$	Comments
3	48:45	0.02	0.67	395.	1454				67	67	5"		
2	52:30	0.03	1.01	397.	1431				67	67	"		
1	56:25	0.03	1.00	399.	1452				67	67	"		
	60-			400.344									

Client: SDAPCD - Arcadis

Report #: T1482

Test Date: 3/30/17

Analyst: [illegible]

Site: [illegible]

Run No: 3

GRAVIMETRIC ANALYSIS

Fraction: Probes and Nozzle Washings - [illegible] 100 REF: ST17

Date: Time: #1	Date: Time: #2	Date: Time: #3	AVERAGE
Final: [illegible]	[illegible]	[illegible]	99.0280 grms.
Tare:			99.0252 grms.
		NET:	[illegible] mg.

Fraction: Filter Filter No: G12

Date: Time: #1	Date: Time: #2	Date: Time: #3	AVERAGE
Final: 0.5217	0.5191	0.5190	0.5190 grms.
Tare:			0.5164 grms.
		NET:	[illegible] mg.

Fraction: Condensables Aliquot: 200 Total Sample: 280

Date: Time: #1	Date: Time: #2	Date: Time: #3	AVERAGE
Final: [illegible]	96.3253	96.3247	[illegible] grms.
Tare:			96.3233 grms.
		NET:	0.9 mg.
		TOTAL:	1.26 2.52 mg.

Fraction: ~~Condensable Organics~~ - Water Blank 100mL

Date: 4/13 Time: #1	Date: 4/14 Time: #2	Date: Time: #3	AVERAGE
Final: 96.7541	96.7544		96.75[illegible] grms.
Tare:			96.7543 grms.
		NET:	0 mg.

1113

SCEC

FACSIMILE TRANSMISSION

DATE: 7-8-92

TO: David SHiWa

COMPANY: SDAPCD

TRANSMITTING TO TELECOPY #: (619) 694-2730

FROM: RUSS LOGAN

TELEPHONE #: (714) 282-8240

TELECOPY #: (714) 282-8247

REGARDING: TARE Weights

TOTAL NUMBER OF PAGES INCLUDING COVER SHEET: 2

If there is a transmission problem, please call ASAP

TRANSMISSION SENT FROM: SCEC
1582-1 N. Batavia Street
Orange, CA 92667
(714) 282-8240
FAX (714) 282-8247

COMMENTS:

David,
Here's the Tare Weights sheet.
Russ

MESSAGE # 2613

EVAPORATION DISH TARE WEIGHTS

Use new anti-static gloves!

D/T T/RH BP	4/8/92 1000	4/11/92 1230	4/12/92 1110	
DISH #	TARE 1	TARE 2	TARE 3	AVERAGE
E 1				
E 2	97.2815	97.2817	97.2817	97.2816
E 3	101.9300	101.9300	101.9302	101.9301
E 4	99.8116	99.8115	99.8112	99.8114
E 5	95.4200	95.4202	95.4199	95.4200
E 6	101.3355	101.3356	101.3356	101.3356
E 7	98.4943	98.4942	98.4941	98.4942
E 8				
E 9	99.6342	weight @ 4: 99.6342	99.6341	99.6342
E 10	Haskel final			
E 11				
E 12	96.8153	96.8155	96.8155	96.8154
E 13	Haskel			
E 14	96.7543	96.7543		96.7543
E 15	Haskel	final weights		
E 16				
E 17	95.8822	95.8824	95.8822	95.8824
E 18	96.3234	96.3234	96.3231	96.3233
E 19	Haskel final			
E 20	99.0757	99.0758	99.0757	99.0757
E 21				
E 22				

→ broken, opps!

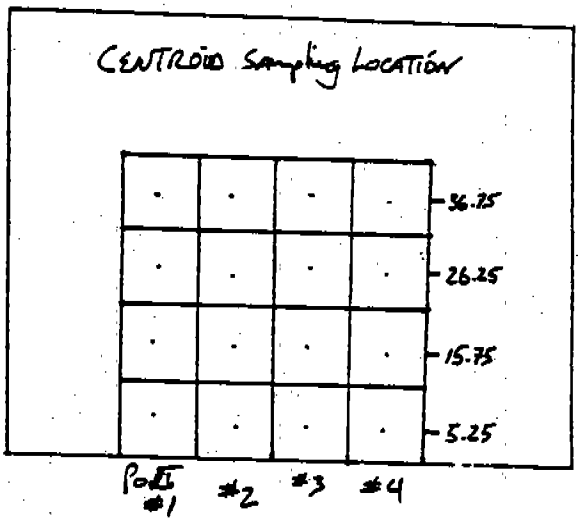
SCEC

SCEC
1582-1 N. BATAVIA
ORANGE, CA 92667

FILE REF: ST12

SAMPLE POINT LOCATION DATA SHEET

FACILITY: ARIZONA STREET
PROJECT #: T-1482
DATE: 3/30/92
STACK DIMENSIONS: L= 42"
W= 42"
H=
UPSTREAM DIST./
EQUIVALENT DIAMETERS 5
DOWNSTREAM DIST./
EQUIVALENT DIAMETERS 2
NO. OF SAMPLING POINTS
SAMPLING PORT DIMENSIONS:
DIA.= 3"
PROTRUSION DIST.= 3"



SAMPLE POINT	% OF STACK DIAMETER	DISTANCE FROM STACK WALL (IN.)	DISTANCE FROM SAMPLE PORT (IN.)
EACH PORT		36.75	39.75
#1		26.25	29.25
#2		15.75	18.75
#3		5.25	8.25
#4			

1582-1 N. Batavia
Orange, CA 92667
714-282-8210
714-282-8211 (FAX)