

SOURCE TEST REPORT

CITY OF SACRAMENTO LANDFILL GAS FLARE

Prepared for

City of Sacramento
Solid Waste Division
921 10th Street, Suite 500
Sacramento, California 95814

June 26, 1996

Prepared by

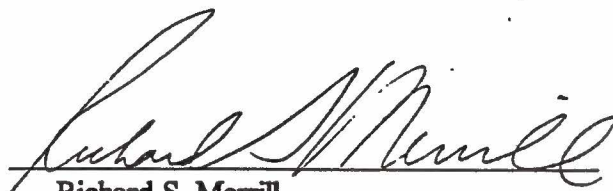
EMCON
1921 Ringwood Avenue
San Jose, California 95131

Project 20G28-001.005

Source Test Report
City of Sacramento Landfill Gas Flare

The material and data in this report were prepared and reviewed by the undersigned.

EMCON

A handwritten signature in cursive script, appearing to read "Richard S. Merrill", is written over a horizontal line.

Richard S. Merrill
Air Quality Services

Sailaja Yelamanchili
Staff Engineer

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1 INTRODUCTION

EMCON contracted and witnessed a source test on the landfill gas flare located at 20 28th Street in Sacramento, California. The test program was designed to characterize the gas phase pollutants for use in establishing emission factors from the flare. This data will be used to support ongoing permitting activities within the Sacramento Metropolitan Air Quality Management District (SMAQMD)

The source test protocols for collecting the required performance data are discussed in Section 2; the data review in Section 3; and the source testing results in Section 4. Backup information is presented in Appendices A through H.

2 SOURCE TEST PROTOCOLS

A source test plan was developed by EMCON based on prior landfill gas source tests in the SMAQMD. The plan and proposal prepared by Best Environmental, Inc., the source test contractor, is presented in Appendix A.

The sampling program was conducted on June 17, 1996. Sampling was conducted on the inlet (fuel) and outlet (stack gases) of the flare. Fuel samples were collected using Tedlar® bags for total nonmethane organic carbons (TNMOCs), heat content, volatile organic compounds (VOCs), and hydrogen sulfide (H₂S). The stack gas was sampled using continuous emission monitors measuring oxides of nitrogen (NO_x), carbon monoxide (CO), carbon dioxide (CO₂), oxygen (O₂), and total hydrocarbons (THCs).

Moisture content was determined using wet-bulb/dry-bulb temperature measurements at the inlet and by CARB Method 4 at the stack. The stack exhaust gas flow rate was measured using CARB Methods 1 and 2. The inlet gas flow was measured using the orifice plate and pressure gauge permanently installed in the system. This data was not used in the calculations since a flow calibration curve was not received from the operator.

EMCON was present during the execution of the source tests.

3 DATA REVIEW

Best Environmental submitted their test report to EMCON in a letter format on June 25, 1996. This letter is presented in Appendix B.

EMCON performed a quality assurance review of the source testing results. EMCON's data review included the following tasks:

- Reviewed the general text
- Checked the calculation algorithms
- Checked continuous emission monitoring data extraction
- Checked that all supporting data were present

Data quality issues were identified and corrected before release of this report.

4 SOURCE TEST RESULTS AND ANALYSES

The source tests were performed on June 17, 1996. The flare temperature set point was adjusted to 1600°F for the test program. This is the suggested operating temperature (by the flare manufacturer). EMCON has tabulated the source test data and calculated confidence limits for the data. The continuous emission monitoring results are presented in Table 1 and the fuel analysis results in Table 2. All backup data supporting the results are presented in Appendices D through H. The mean and upper 95th percent confidence levels were calculated for each gas phase pollutant. The test results, mean, standard deviation, and upper 95th percentile values are presented in Table 4. These calculation procedures are performed to provide a high degree of confidence that any future source test result will be below the (calculated) emission value.

VOC emissions are presented in Appendix B for information. The fuel was analyzed for the presence of CO using the continuous emission monitors per the clients request. The resulting CO concentrations were <1.0 ppm.

Table 1

Continuous Emission Monitoring Results

Run	1	2	3	Average
Test Location	Outlet	Outlet	Outlet	
Test Date	6/17/96	6/17/96	6/17/96	
Test Time	1400-1440	1450-1530	1538-1623	
Standard Temp., °F	68	68	68	
Fuel, mmBtu/hr	35.7	35.7	35.7	35.7
Flow Rate, DSCFM	12,838	12,838	12,838	12,838
O ₂ , %	11.8	11.8	11.8	11.8
CO ₂ , %	8.1	7.9	8.1	8.0
H ₂ O, %	9.5	9.5	9.5	9.5
NO _x , ppm	14.7	15.1	14.9	14.9
NO _x , ppm (@ 3% O ₂)	28.7	29.5	29.3	29.2
NO _x , lbs/hr	1.35	1.39	1.37	1.37
NO _x , lbs/mmBtu	0.0379	0.0387	0.0382	0.0381
CO, ppm	<1.0	<1.0	<1.0	<1.0
CO, ppm (@3% O ₂)	<2.0	<2.0	<2.0	<2.0
CO, lbs/hr	<0.056	<0.056	<0.056	<0.056
CO, lbs/mmBtu	<0.0016	<0.0016	<0.0016	<0.0016
SO ₂ , ppm**	0.1	0.15	0.15	0.13
SO ₂ , ppm (@3% O ₂)	0.19	0.29	0.29	0.26
SO ₂ , lbs/hr	0.0128	0.0192	0.0192	0.0171
SO ₂ , lbs/mmBtu	0.0004	0.0005	0.0005	0.0005
THC, ppm	<1.0	<1.0	<1.0	<1.0
TNMHC, ppm	<1.0	<1.0	<1.0	<1.0
TNMHC, ppm (@3% O ₂)	<2.0	<2.0	<2.0	<2.0
TNMHC, lbs/hr	<0.0321 (0.0160)*	<0.0321 (0.0160)*	<0.0321 (0.0160)*	0.0160
TNMHC, lbs/mmBtu	<0.0009	<0.0009	<0.0009	<0.0009
INLET TNMHC, lbs/hr	3.08	3.33	3.28	3.23
Destruction Efficiency, %	>98.96 (99.48)	>99.04 (99.52)	>99.02 (99.51)	99.50
Where: NO_x = Oxides of Nitrogen as NO₂ (MW = 46) SO₂ = Sulfur Dioxide (MW = 64.1) CO = Carbon Monoxide (MW = 28) lbs/mmBtu = Pounds per Million Btu ppm = Parts Per Million Concentration lbs/hr = Pound Per Hour Emission Rate F₁ = (EPA F Factor for Landfill Gas = 9415 Tstd. = Standard Temp.; °R = °F + 460 Calculations: 3% O₂ correction = ppm of pollutant * 17.95/(20.95-%O₂) lbs/hr = ppm * 8.223 E-5 * DSCFM * MW/Tstd. °R lbs/mmBtu = F₁ * MW * ppm * 2.59E-9 * 20.95/(20.95-%O₂) OR lbs/mmBtu = (lbs/hr) mmBtu/hr Destruction Efficiency = 100 * (Inlet-Outlet lbs/hr)/Inlet lbs/hr () * value of one-half the detection limit. ** Material balance calculations based on H₂S in fuel				

Table 2
Fuel Analysis Results

Run	1	2	3	Average
Test Location	Inlet	Inlet	Inlet	
Test Date	6/17/96	6/17/96	6/17/96	
Test Time	1400-1440	1450-1530	1538-1523	
Standard Temp., °F	68	68	68	
Flow Rate, DSCFM*	1577	1577	1577	
O ₂ , %	4.8	4.7	4.7	4.7
N ₂ , %	24.2	23.8	23.9	24.0
CO ₂ , %	29.3	29.5	29.4	29.4
H ₂ O, %	4.6	4.6	4.6	4.6
Methane, %	41.8	42.0	41.9	41.9
Ethane, %	0.000	0.000	0.000	0.000
Propane, %	0.000	0.000	0.000	0.000
Butane, %	0.000	0.000	0.000	0.000
Pentane, %	0.000	0.000	0.000	0.000
Hexanes +, %	0.020	0.020	0.020	0.020
TNMHC, ppm as CH ₄ (TO-12)	783	846	836	822
TNMHC, lbs/hr as CH ₄	3.08	3.33	3.28	3.23
Btu/Cf at 60°F dry basis	382.2	384.5	383.4	383.4
Heat input, mmBtu/hr at 68°F	35.6	35.8	35.7	35.7
H ₂ S, ppm (UOP 791)	0.8	1.2	1.2	1.1
* Fuel flow is back-calculated from stack flow measurements and fuel analysis F ₁ factor. Where: Calculation: mmBtu/hr = Million BTU's per Hour mmBtu/hr @ 68°F = Btu/cf (520/528) * DSCFM * 60 Btu/Cf = British Thermal Units per Cubic Foot TNMOC, lbs/hr as CH ₄ = ppm * DSCFM * M.W. * 8.22E-5/T _{std} (528)				

Table 3

Mean and Upper 95 Percentile Concentrations

Compound	Continuous Emission Monitoring Results			Mean Concentration	Standard Deviation	Upper 95 th Percentile
	Test 1	Test 2	Test 3			
NOx (lbs/mmBtu)	0.0379	0.0387	0.0382	0.0381	0.0004	0.0385
CO (lbs/mmBtu)	0.0016	0.0016	0.0016	0.0016	0	0.0016
SO2 (lbs/mmBtu)	0.0004	0.0005	0.0005	0.0005	0.0001	0.0006
TNMHC (lbs/mmBtu)	0.0009	0.0009	0.0009	0.0009	0	0.0009

Upper 95th percentile confidence limit = $x + \frac{ts}{\sqrt{N}}$

where: x = mean concentration

t = statistical factor that is a function of the number of degrees of freedom and the confidence level desired = 4.303 for 2 degrees of freedom

s = standard deviation of the mean

N = number of data points

LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, expressed or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

APPENDIX A
SOURCE TEST PLAN AND PROPOSAL

BEST ENVIRONMENTAL, INC.

15890 Foothill Boulevard
San Leandro, California 94578
(510) 278-4011 FAX (510) 278-4018

June 6, 1996

Attn: Richard Merrill
EMCON
1921 Ringwood Avenue
San Jose, CA 95131-1721

Re: Quotation for Emissions Monitoring of one landfill gas flare located in Sacramento.

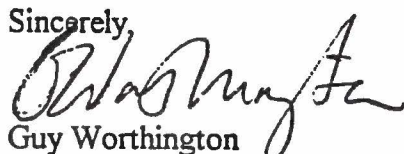
Dear Rich:

BEST ENVIRONMENTAL, Inc. (BEI) is pleased to present a quote for testing the flare referenced above. The price for the work, including all analytical, sampling, protocol preparation and reporting is \$5,397, which includes a boom lift. Work includes:

- At the flare exhaust, triplicate forty minute tests will be performed for NO_x, CO, TNMHC, CO₂ and O₂ using CARB Method 100. Triplicate integrated SUMMA canister samples will be collected for non-methane hydrocarbon speciation by EPA TO-14. Volumetric flow rate and stack gas water content will be measured using CARB Methods 1, 2, 3 and 4.
- At the inlet three integrated samples will be taken for non-methane hydrocarbon speciation by EPA TO-14 & Compliance Fuel Gas analysis; BTU/CF, hydrocarbons C₁-C₅, C₆+, O₂, CO₂, N₂ etc. by ASTM Methods D-1945 & D-3588 GC/FID/TCD, and H₂S by UOP 791 GC/FPD. Volumetric flow rate and stack gas water content will be measured using CARB Methods 1, 2, 3 and 4 (wet bulb/dry bulb method).
- Two copies of the technical compliance report will be submitted to client within six working days from completion of the field work (presenting concentrations and emission rates for all sampling parameters).
- Testing is scheduled for June 17th. The report will be delivered on or before June 26th.

EMCON and BEI have previously established terms and conditions, and these will apply. BEI is pleased to have this opportunity to be of service. If there are any questions, please contact Regan Best, Craig Thiry or myself at (510) 278 4011.

Sincerely,



Guy Worthington
Sr. Project Manager

APPENDIX B
BEST ENVIRONMENTAL TRANSMITTAL LETTER

BEST ENVIRONMENTAL, INC.

15890 Foothill Boulevard
San Leandro, California 94578
(510) 278-4011 FAX (510) 278-4018

June 25, 1996

EMCON

1921 Ringwood Avenue
San Jose CA 95131-1721

Attn.: Rich Merrill

Subject: Emission test report for the City of Sacramento Landfill Gas Flare in Sacramento, California.

Test Date: June 17, 1996.

Sampling Location: Sampling was conducted at the fuel inlet and exhaust stack of the landfill gas-fired flare, located at #20, 28th Street, Sacramento. Two 4-inch diameter test ports were located on exhaust stack of the flare, approximately 1.0 diameter upstream and 3.5 diameters downstream from the nearest disturbance. A series of port taps were located on the fuel line at the inlet to the flare, but none were suitable for flow measurements. The inlet sampling port was located approximately 1.0 diameter upstream and 1.0 diameter downstream from the nearest disturbance.

Sampling Personnel: Guy Worthington and Steve Allen of BEST ENVIRONMENTAL, Inc. (BEI).

Observing Personnel: Rich Merrill of the EMCON Associates was present during the test program to coordinate activities.

Process Description: The City of Sacramento Landfill gas-fired flare is operated by Laidlaw. The unit operates 24 hours a day. The flare was tested at a controlled exhaust temperature of 1600°F.

Test Program: At the outlet, triplicate 40 minute test runs were performed for oxides of nitrogen (NO_x), carbon monoxide (CO), total non-methane hydrocarbons (TNMHC), oxygen (O_2) and carbon dioxide (CO_2). Integrated exhaust gas samples (3 * 1lt SUMMA canisters) were collected from the inlet and outlet for speciation and quantification of non-methane hydrocarbons.

At the inlet, integrated Tedlar® bag fuel samples were taken of the landfill gas fuel for TNMHC, non-methane hydrocarbon speciation and quantification, B1 U/CF, C_1 - C_6 hydrocarbons, N_2 , O_2 , CO_2 . Hydrogen sulfide was analyzed within 24 hours from the same Tedlar® bag.

Moisture content was determined using wet-bulb/dry-bulb temperature measurements at the inlet and by CARB Method 4 at the exhaust. The stack exhaust gas flow rate was measured using CARB Methods 1 & 2, via the only accessible port.

Stratification of gases was not observed in the exhaust stack. A single sample point was selected and used for the duration of the testing.

Sampling Methods: The following source test methods were used:

CARB Method 100	NO _x , TNMHC, CO, O ₂ and CO ₂ .
EPA Method TO-14	GC/MS VOC Speciation
ASTM D-1945 & 3588	Compliance Fuel Gas Analysis
UOP Method 791	Hydrogen Sulfide GC/TCD

Instrumentation: The following continuous emissions analyzers were used:

Instrument	Analyte	Principle
TECO Model 10S	NO _x	Chemiluminescence
TECO Model 48	CO	GFC/IR
Summit Model 702D	CO ₂	IR
Siemens Model 5E	O ₂	Paramagnetic
Ratfish Model RS55	THC	Flame Ionization

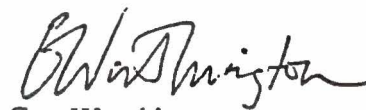
Test Results: Tables 1, 2 and 3 on the following pages summarize the fuel analysis and emission results for the flare. The average results are summarized below.

NO _x , lbs/MMBTU	0.0381
NO _x , lbs/day	32.87
CO, lbs/day	<1.34
TNMHC, lbs/day	<0.77
TNMHC DE %	>99.0%

Comments: Calculations, field data sheets, laboratory reports, strip chart recordings, calibration gas certifications, and equipment calibrations are appended to this report.

If there are any questions concerning this report, please contact Regan Best, Craig Thiry or me at (510) 278-4011.

Submitted by,


Guy Worthington
Sr. Project Manager

Reviewed by,

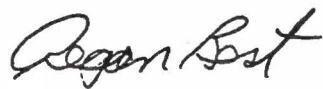

Regan Best
Source Test Manager

TABLE 1
CEM RESULTS
 EMCON-City of Sacramento
 Flare
 Normal / 1600°F

RUN	1	2	3	AVERAGE	LIMITS
Test Location	Outlet	Outlet	Outlet		
Test Date	6/17/96	6/17/96	6/17/96		
Test Time	1400-1440	1450-1530	1538-1623		
Standard Temp., °F	68	68	68		
MMBTUH	35.6	35.8	35.7	35.7	
Flow Rate, DSCFM	12,838	12,838	12,838	12,838	
O ₂ , %	11.8	11.8	11.8	11.8	
CO ₂ , %	8.1	7.9	8.1	8.0	
H ₂ O, %	9.5	9.5	9.5	9.5	
NO _x , ppm	14.7	15.1	14.9	14.9	
NO _x , ppm ((@3% O ₂))	28.7	29.5	29.3	29.2	
NO _x , lbs/day (24hrs)	32.38	33.27	32.97	32.87	
NO _x , lbs/mmBtu	0.0375	0.0386	0.0382	0.0381	
CO, ppm	<1.0	<1.0	<1.0	<1.0	
CO, ppm ((@3% O ₂))	<2.0	<2.0	<2.0	<2.0	
CO, lbs/day (24hrs)	<1.34	<1.34	<1.34	<1.34	
CO, lbs/mmBtu	<0.0016	<0.0016	<0.0016	<0.0016	
THC, ppm	<1.0	<1.0	<1.0	<1.0	
TNMHC, ppm	<1.0	<1.0	<1.0	<1.0	
TNMHC, ppm ((@3% O ₂))	<2.0	<2.0	<2.0	<2.0	
TNMHC, lbs/day (24hrs)	<0.77	<0.77	<0.77	<0.77	
TNMHC, lbs/mmBtu	<0.0009	<0.0009	<0.0009	<0.0009	
INLET TNMHC, lbs/hr	3.08	3.33	3.28	3.23	
DESTRUCTION EFFICIENCY, %	>98.95	>99.03	>99.02	>99.00	

WHERE:NO_x = Oxides of Nitrogen as NO₂ (MW = 46)

TNMHC = Total Non Methane Hydrocarbon (MW=16)

CO = Carbon Monoxide (MW = 28)

lbs/mmBtu = Pounds per Million Btu

ppm = Parts Per Million Concentration

lbs/hr = Pound Per Hour Emission Rate

F_d = (EPA F Factor for Natural Gas = 8710)(Landfill = 9415)

Tstd. = Standard Temp.: °R = °F + 460

CALCULATIONS:3% O₂ correction = ppm of pollutant * 17.95 / (20.95 - %O₂)

lbs/day = 24 * ppm * 8.223 E-5 * DSCFM * MW / Tstd. °R

lbs/mmBtu = F_d * MW * ppm * 2.59E-9 * 20.95 / (20.95 - %O₂)OR (lbs/hr)/MMBTUH

Destruction Efficiency = 100 * (Inlet-Outlet lbs/hr) / Inlet lbs/hr

TABLE 2
TO-14 VOLATILE ORGANICS
 EMCON-City of Sacramento
 Flare
 Normal / 1600°F

	Inlet				Outlet			
	Run 1 ppbv	Run 2 ppbv	Run 3 ppbv	AVG	Run 1 ppbv	Run 2 ppbv	Run 3 ppbv	AVG
Freon 12	530	490	490	503	<7.2	<7.4	<6.1	
Freon 114	<150	<150	<150		<7.2	<7.4	<6.1	
Chloromethane	<150	<150	<150		<7.2	<7.4	<6.1	
Vinyl Chloride	180	160	180	173	<7.2	<7.4	<6.1	
Bromomethane	<150	<150	<150		<7.2	8.2	<6.1	7
Chloroethane	320	<150	<150	287	<7.2	<7.4	<6.1	
Freon 11	<150	<150	<150		<7.2	<7.4	<6.1	
1,1-Dichloroethane	<150	<150	<150		<7.2	<7.4	<6.1	
Freon 113	<150	<150	<150		<7.2	<7.4	<6.1	
Methylene Chloride	<150	<150	150	150	<7.2	<7.4	<6.1	
1,1-Dichloroethene	<150	<150	<150		<7.2	<7.4	<6.1	
cis-1,2-Dichloroethene	860	780	860	833	<7.2	<7.4	<6.1	
Chloroform	<150	<150	<150		<7.2	<7.4	<6.1	
1,1,1-Trichloroethane	<150	<150	<150		<7.2	<7.4	<6.1	
Carbon Tetrachloride	<150	<150	<150		<7.2	<7.4	<6.1	
Benzene	180	<150	<150	160	<7.2	72.0	<6.1	28
1,2-Dichloropropane	<150	<150	<150	150	<7.2	<7.4	<6.1	
Trichloroethene	180	170	160	170	<7.2	<7.4	<6.1	
1,2-Dichloropropane	<150	<150	<150		<7.2	<7.4	<6.1	
cis-1,3-Dichloropropene	<150	<150	<150		<7.2	<7.4	<6.1	
Toluene	4400	4300	4300	4333	26.0	26.0	7.3	20
trans-1,3-Dichloropropene	<150	<150	<150		<7.2	<7.4	<6.1	
1,1,2-Trichloroethane	<150	<150	<150		<7.2	<7.4	<6.1	
Tetrachloroethene	<150	<150	<150		<7.2	<7.4	<6.1	
Ethylene Dibromide	<150	<150	<150		<7.2	<7.4	<6.1	
Chlorobenzene	<150	<150	<150		<7.2	<7.4	<6.1	
Ethyl Benzene	1300	1300	1300	1300	<7.2	<7.4	<6.1	
m,p-Xylene	2200	2300	2200	2233	18.0	12.0	<6.1	12
o-Xylene	1100	1100	1100	1100	7.6	<7.4	<6.1	7
Styrene	180	200	240	207	<7.2	8.5	<6.1	7
1,1,2,2-Tetrachloroethane	<150	<150	<150		<7.2	<7.4	<6.1	
1,3,5-Trimethylbenzene	320	320	350	330	<7.2	<7.4	<6.1	
1,2,4-Trimethylbenzene	1200	1100	1100	1133	9.2	<7.4	<6.1	8
1,3-Dichlorobenzene	<150	<150	<150		<7.2	<7.4	<6.1	
1,4-Dichlorobenzene	300	330	320	317	<7.2	<7.4	<6.1	
Chlorotoluene	<150	<150	<150		<7.2	<7.4	<6.1	
1,2-Dichlorobenzene	<150	<150	<150		<7.2	<7.4	<6.1	
1,2,4-Dichlorobenzene	<150	<150	<150		<7.2	<7.4	<6.1	
Hexachlorobutadiene	<150	<150	<150		<7.2	<7.4	<6.1	
Propylene	<610	<600	<610		<29	<29	<24	
1,3-Butadiene	<610	<600	<610		<29	<29	<24	
Acetone	2500	2300	2200	2333	300	90	79	156
Carbon Disulfide	<610	<600	<610		<29	180	<24	78
2-Propanol	2600	2500	2400	2500	<29	<29	35	31
trans-1,2-Dichloroethene	<610	<600	<610		<29	<29	<24	
Vinyl Acetate	<610	<600	<610		<29	<29	<24	
Chloroprene	<610	<600	<610		<29	<29	<24	
2-Butanone (MEK)	5900	5600	5700	5733	35	<29	<24	29
Hexane	<610	<600	<610		<29	<29	<24	
Tetrahydrofuran	<610	<600	<610		<29	<29	<24	
Cyclohexane	<610	<600	<610		<29	<29	<24	
1,4-Dioxane	<610	<600	<610		<29	<29	<24	
Bromodichloromethane	<610	<600	<610		<29	<29	<24	
4-Methyl-2-pentanone	<610	<600	<610		<29	<29	<24	
2-Hexanone	<610	<600	<610		<29	<29	<24	
Dibromochloromethane	<610	<600	<610		<29	<29	<24	
Bromoform	<610	<600	<610		<29	<29	<24	
4-Ethyltoluene	<610	<600	<610		<29	<29	<24	
Ethanol	59000	57000	48000	54667	52	<29	<24	35
Methyl tert-Butyl Ether	<610	<600	<610		<29	<29	<24	

TABLE 3
FUEL ANALYSIS RESULTS
EMCON-City of Sacramento
INLET GAS
Normal / 1600°F

RUN	1	2	3	AVERAGE	LIMITS
Test Location	Inlet	Inlet	Inlet		
Test Date	6/17/96	6/17/96	6/17/96		
Test Time	1400-1440	1450-1530	1538-1623		
Standard Temp., °F	68	68	68		
Flow Rate, DSCFM ‡	1,577	1,577	1,577		
O ₂ , %	4.8	4.7	4.7	4.7	
CO ₂ , %	29.3	29.5	29.4	29.4	
H ₂ O, %	4.6	4.6	4.6	4.6	
Methane, %	41.8	42.0	41.9	41.9	
Ethane, %	0.000	0.000	0.000	0.000	
Propane	0.000	0.000	0.000	0.000	
Butane, %	0.000	0.000	0.000	0.000	
Pentane, %	0.000	0.000	0.000	0.000	
Hexanes +, %	0.020	0.020	0.020	0.020	
H ₂ S, ppm (UOP 791)	0.8	1.2	1.2	1.1	
TNMHC, ppm as CH ₄ (TO-12)	783	846	836	822	
TNMHC, lbs/hr as CH ₄	3.08	3.33	3.28	3.23	
BTU/CF at 60°F	382.2	384.5	383.4	383.4	
MMBTUH @ 68°F	35.6	35.8	35.7	35.7	

‡ Fuel flow is back-calculated from stack flow measurements and fuel analysis Fd factor

WHERE:

MMBTUH = Million BTU's per Hour

BTU/CF Net Dry = British Thermal Units per Cubic Foot

CALCULATIONS:

MMBTUH @ 68°F = BTU/CF (520/528) * DSCFM * 60

TNMHC, lbs/hr as CH₄ = ppm * DSCFM * M.W. (16) * 8.22E-5 / Tstd(528)

APPENDIX C
CALCULATIONS

CEM CORRECTION SUMMARY

Facility: EMCON-City of Sacramento

Unit: Flare

Condition: Normal / 1600°F

Date: 6/17/96

Leak Check: OK

Strat. Check: OK

Personnel: GW, SA

Cylinders:

	O ₂	CO ₂	NO _x	CO	SO ₂	THC	CH ₄	TNMHC	Comments
Analyzer	5E	702D	10S	48		RS55		bag	
Range	25	15	25	100		100		sample	
Units, ppm or %	%	%	ppm	ppm		ppm			
Span Gas Value	20.26	13.49	21.8	76.0		84.3			

Run 1 1400-1440	0.0	0.0	0.0	0.0		0.0			zero (initial), Zi
	20.26	13.49	21.8	76.0		84.3			upscale cal (initial), Si
	11.75	8.10	14.6	<1.0		<1.0			TEST AVG
	0.0	0.0	0.0	0.0		0.0			zero (final), Zf
	20.20	13.49	21.6	76.0		83.0			upscale cal (final), Sf
	0.0%	0.0%	0.0%	0.0%		0.0%			zero drift
	-0.2%	0.0%	-0.8%	0.0%		-1.3%			cal drift
	11.8	8.1	14.7	<1.0		<1.0			CORRECTED AVG

Run 2 1450-1530	0.0	0.0	0.0	0.0		0.0			zero (initial), Zi
	20.26	13.49	21.6	76.0		84.3			upscale cal (initial), Si
	11.75	7.90	14.9	<1.0		<1.0			TEST AVG
	0.0	0.0	0.0	0.0		0.0			zero (final), Zf
	20.20	13.35	21.5	76.0		83.0			upscale cal (final), Sf
	0.0%	0.0%	0.0%	0.0%		0.0%			zero drift
	-0.2%	-0.9%	-0.4%	0.0%		-1.3%			cal drift
	11.8	7.9	15.1	<1.0		<1.0			CORRECTED AVG

Run 3 1538-1623	0.0	0.0	0.0	0.0		0.0			zero (initial), Zi
	20.26	13.49	21.5	76.0		84.3			upscale cal (initial), Si
	11.75	8.10	14.8	<1.0		<1.0			TEST AVG
	0.0	0.0	0.0	0.0		0.0			zero (final), Zf
	20.20	13.50	21.7	76.0		84.0			upscale cal (final), Sf
	0.0%	0.0%	0.0%	0.0%		0.0%			zero drift
	-0.2%	0.1%	0.8%	0.0%		-0.3%			cal drift
	11.8	8.1	14.9	<1.0		<1.0			CORRECTED AVG

AVERAGES	11.8	8.0	14.9	<1.0		<1.0			TEST AVG
----------	------	-----	------	------	--	------	--	--	----------

$$\text{CORRECTED VALUE} = [\text{Test Avg.} - ((Z_i + Z_f) / 2)] * \text{Span Gas Value} / [((S_i + S_f) / 2) - ((Z_i + Z_f) / 2)]$$

$$\text{ZERO DRIFT \%} = 100 * (Z_f - Z_i) / \text{Instrument Range}$$

$$\text{SPAN DRIFT \%} = 100 * (S_f - S_i) / \text{Instrument Range}$$

STACK GAS FLOW RATE DETERMINATION – PITOT TRAVERSE

Outlet

Facility: -- EMCON-City of Sacramento

Unit: Flare

Condition: Normal / 1600°F

Date: 6/17/96

Time:

1400

Run 1

Run 2

Run 3

1. Temperature of Stack (Ts)

2. Std Temperature (Tstd)

3. Square Root of ΔP ($\sqrt{\Delta P}$)

4. Barometric Pressure (Pb)

5. Static Pressure (Pstatic)

6. Stack Pressure (Ps)

7. Stack Gas:

Moisture (H₂O) M.W.= 18Oxygen (O₂) M.W.= 32Carbon Dioxide (CO₂) M.W.= 44

Carbon Monoxide (CO) M.W.= 28

Other: Methane M.W.= 16

Nitrogen (N₂) M.W.= 28

8. Mol. Weight of Stack Gas (MWs)

9. Stack Diameter (Ds) or Depth (D)

10. Stack Width (W)

11. Area of Stack (As)

10. Pitot Tube Factor (Cp)

1550.0	1550.0	1550.0	°F
68	68	68	°F
0.141	0.141	0.141	"H ₂ O
30.10	30.10	30.10	"Hg
-0.02	-0.02	-0.02	"H ₂ O
30.10	30.10	30.10	"H ₂ O
9.50	9.50	9.50	%
11.80	11.80	11.80	%
8.00	8.00	8.00	%
0.00	0.00	0.00	%
0.00	0.00	0.00	%
80.20	80.20	80.20	%
28.64	28.64	28.64	g/g-mol
103.0	103.0	103.0	
#N/A	#N/A	#N/A	
57.86	57.86	57.86	ft ²
0.84	0.84	0.84	

Stack Gas Velocity

Actual Flow Rate

Standard Flow Rate

15.46	15.46	15.46	ft/s
53,683	53,683	53,683	ACFM
12,838	12,838	12,838	DSCFM

WHERE:

Bws = % Moisture / 100

MWs = Molecular Weight of Stack Gas (wet-basis)

MWd = Molecular Weight of Stack Gas (dry-basis)

 ΔP = Pitot Differential Pressure

CALCULATIONS:

$$MWs = MWd * (1 - Bws) + 18 (Bws)$$

$$MWd = .44(\%CO_2) + .32(\%O_2) + .28(\%CO + \%N_2) + (\%Other * M.W./100)$$

$$Ps = (Pstatic / 13.6) + Pb$$

$$Vs = 85.49 * Cp * \sqrt{\Delta P} * \sqrt{(Ts + 460) / (Ps * MWs)}$$

$$ACFM = 60 * Vs * As$$

$$DSCFM = 60 (1 - Bws) * Vs * As * (Tstd + 460) / (Ts + 460) * (Ps / 29.92)$$

STACK MOISTURE DETERMINATION

Outlet

Facility: EMCON-City of Sacramento
 Unit: Flare
 Condition: Normal / 1600°F
 Date: 6/17/96
 Time:

1438-1508

Run 1

Run 2

Run 3

1. Uncorrected Meter Volume (Vm)
2. Meter Factor (Yd)
3. Barometric Pressure (Pb)
4. Meter Pressure (ΔH)
5. Meter Temperature (Tm)
6. Std. Temperature (Tstd)
7. Impinger H₂O Gain (Vw imp)
8. Silica Gel Wt. Gain (Vw sg)
9. Total H₂O Gain (Vw)
10. Moisture Vapor (Vw std)

18.603	18.603	18.603	ft ³
0.9904	0.9904	0.9904	
30.10	30.10	30.10	"Hg
0.25	0.25	0.25	"H ₂ O
101.7	101.7	101.7	°F
68	68	68	°F
34.0	34.0	34.0	g
4.8	4.8	4.8	g
38.8	38.8	38.8	g
1.8	1.8	1.8	ft ³

Std. Meter Volume (Vm std)

17.434	17.434	17.434	DSCF
9.5	9.5	9.5	%

Percent of H₂O in Stack

WHERE:

ft³ = Cubic Feet
 H₂O = Water
 Hg = Mercury
 °F = Fahrenheit
 ml = milliliters
 g = grams
 % = Percent

done
9.5%

CALCULATIONS:

$$Vw \text{ std} = 0.00267 * Vw * (Tstd + 460) / 29.92$$

$$Vm \text{ std} = Vm * Yd * (Tstd + 460) * (Pb + (\Delta H / 13.6)) / (Tm + 460) / 29.92$$

$$\text{Stack Moisture H}_2\text{O \%} = 100 * Vw \text{ std} / (Vw \text{ std} + Vm \text{ std})$$

STACK GAS FLOW RATE DETERMINATION – FUEL USAGE **Fuel Flow from Measured Stack Gas Flow**

Facility: EMCON-City of Sacramento
 Unit: Flare
 Condition: Normal / 1600°F
 Date: 6/17/96
 Time:

DRAFT

	Run 1	Run 2	Run3	
# cubic feet/rev	100	100	100	ft³
# of seconds/rev	4.0161	4.0161	4.0161	seconds
Gas Line Pressure(PSIG)	3.2	3.2	3.2	PSI Gauge
Gas Line Pressure(PSIA)	17.9	17.9	17.9	PSI Absolute
Gross Calorific Value @ 60°F	383.4	383.4	383.4	Btu / ft³
Stack Oxygen	11.8	11.8	11.8	%
Gas Fd-Factor @ 68°F	9415	9415	9415	DSCFM/MMBtu
Gas Temperature (°F)	149	149	149	°F
Standard Temperature (°F)	68	68	68	°F

Realtime Fuel Rate (CFM)	1494.0	1494.0	1494.0	CFM
Corrected Fuel Rate (SCFM) @ 68°F	1577.2	1577.2	1577.2	SCFM
Fuel Flow Rate (SCFH) @ 68°F	94,635	94,635	94,635	SCFH
Million Btu per minute	0.596	0.596	0.596	MMBtu/min
Heat Input (MMBtu/hour) <i>average</i>	35.7	35.7	35.7	MMBtu/Hr

Stack Gas Flow Rate	12,838	12,838	12,838	DSCFM
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WHERE:

Gas Fd-Factor = Fuel conversion factor (ratio of combustion gas volumes to heat inputs)
 MMBtu = Million Btu

CALCULATIONS:

SCFM = CFM * 528 * (gas line PSIA) / 14.7 / (gas °F + 460)
 MMBtu/min @ 68°F = SCFM @ 68°F * (Btu/ft³ @ 60°F) * (520/528) / 1,000,000
 DSCFM = Gas Fd-Factor * MMBtu/min * 20.95 / (20.95 - stack oxygen%)
 SCFH = SCFM * 60
 Heat Input = MMBtu/min * 60

STACK MOISTURE DETERMINATION

using wet bulb / dry bulb

fuel

EMCON-City of Sacramento

Flare

Normal / 1600°F

Date: 6/17/96

	Run 1	Run 2	Run 3
1. Dry Bulb Stack Temperature, (t)	149.0	149.0	149.0 °F
2. Wet Bulb Temperature, (tw)	101.0	101.0	101.0 °F
3. Barometric Pressure (Pb)	30.10	30.10	30.10 " Hg
4. Static Pressure (Pstatic)	20.00	20.00	20.00 " H ₂ O
5. Stack Absolute Pressure (Ps)	31.57	31.57	31.57 " Hg
6. Saturated Vapor Pressure, (SVP @tw)	2.016	2.016	2.016 " Hg
6. Saturated Vapor Pressure, (SVP @t)	7.695	7.695	7.695 " Hg
Percent of H ₂ O in <i>fuel</i> Stack Gas @ Saturation (% H ₂ O _{sat})	24.37	24.37	24.37 %
Percent of H ₂ O in <i>fuel</i> Stack Gas (% H ₂ O)	4.57	4.57	4.57 %

WHERE

H₂O = Inches of water

Hg = Inches of Mercury

°F = Fahrenheit

CALCULATIONS

$$P_s = P_b + (P_{static}/13.6)$$

$$SVP_{@tw} = EXP(-0.0000573tw^2 + 0.042232tw - 2.97986)$$

$$\% H_2O_{sat} = 100 * \{SVP_{@t} - (3.667E-04) * P_s * (t-tw) * (1 + (0.000639(t-tw)))\} / P_s$$

$$\% H_2O = 100 * \{SVP_{@tw} - (3.667E-04) * P_s * (t-tw) * (1 + (0.000639(t-tw)))\} / P_s$$

COMPUTATION SHEET

PROJECT TITLE: City of ... PROJECT NO: ...
 DESCRIPTION: SO₂ ... SHEET 1 OF 2
 PREP. BY: ... DATE: 8/26 CHKD BY: ... DATE: ...

H₂S in - 4.14E and SO₂ out - 14.14E

Run 1

$$\begin{aligned} \frac{Lb}{HR} &= \frac{0.5}{10^6} * \frac{34.1 \text{ lb/mole}}{379 \text{ ft}^3/\text{mole}} * 1577 \text{ D5 ft}^3/\text{min} * 60 \frac{\text{min}}{\text{hr}} \\ &= \frac{0.0068 \text{ lb/hr}}{34.1 \text{ lb/mole}} = \\ &= 0.0002 \frac{\text{lb/mole}}{\text{hr}} \text{ H}_2\text{S in} \Rightarrow 0.0002 \frac{\text{lb/mole}}{\text{hr}} \text{ SO}_2 \text{ out} \end{aligned}$$

Assuming 100% conversion of H₂S → SO₂

$$0.0002 \frac{\text{lb/mole}}{\text{hr}} \text{ SO}_2 \text{ out} \rightarrow 0.0128 \frac{\text{lb}}{\text{hr}} \text{ SO}_2 \text{ out} \checkmark$$

$$0.0128 \frac{\text{lb}}{\text{hr}} = \frac{\text{ppm}}{10^6} * \frac{34.1}{379 \text{ ft}^3/\text{mole}} * 12,838 \text{ D5 ft}^3/\text{min} * 60 \frac{\text{min}}{\text{hr}}$$

$$\text{ppm}_{\text{SO}_2} = 0.1 \checkmark$$

$$\begin{aligned} \text{ppm}_{\text{SO}_2} &= \% \text{O}_2 = 0.1 \left(\frac{17.95}{50.95 - 11.7} \right) - \\ &= 0.19 \checkmark \end{aligned}$$

$$\begin{aligned} \text{ft}^3/\text{min} \text{ SO}_2 &= \frac{0.0128}{35.7} \\ &= 0.0004 \text{ ft}^3/\text{min} \end{aligned}$$

COMPUTATION SHEET

PROJECT TITLE: _____ PROJECT NO: _____
 DESCRIPTION: _____ SHEET 2 OF 2
 PREP. BY: 1/1/1 DATE: 6/22 CHKD BY: _____ DATE: _____

$$F_{110} = 3$$

$$\frac{\text{lb SO}_2}{\text{hr}} = \frac{1.2 \text{ lbm H}_2\text{S}}{10^6} + \frac{1}{379 \text{ lb/lbmole}} + 1577 \text{ Dft}^3/\text{min} + 60 \text{ min/hr}$$

$$= 0.0003 \frac{\text{lbmole SO}_2}{\text{hr}} = \frac{\text{lbmole SO}_2 \text{ out}}{\text{hr}}$$

$$\frac{\text{lb SO}_2}{\text{hr}} = 0.0003 \times 64.1$$

$$= 0.0192 \checkmark$$

$$\text{PPM SO}_2 = \frac{0.0192 \text{ lb SO}_2/\text{hr} \times 10^6}{64.1 \times 12,838 \text{ Dft}^3/\text{min} \times 60 \text{ min/hr}}$$

$$= 0.15$$

APPENDIX D
LABORATORY REPORTS

oilwell research, inc.

ANALYTICAL LABORATORIES

Established 1949

Attention: Guy Worthington
BEST ENVIRONMENTAL, INC.
15890 Foothill Blvd.
San Leandro, CA 94578

Report Date: June 21, 1996
Submitted: June 18, 1996
Lab No. 96-3683-1

LABORATORY TEST REPORT

Project ID: GW61796
Sample ID: In / R1 Landfill Gas
Sampled: Jun-17-1996

Analyzed For: NMHC by GC-FID/PID
Method: TO-12

<u>Component</u>	<u>Found</u>	<u>Units</u>	<u>MDL</u>
Non-Methane Organic Carbon	261.0	ppm	0.1

f³
783 as CH₄

Calibrations performed using propane standards of 10, 100 & 1000 ppm

ND: None Detected at MDL
MDL: Method Detection Limit

Date Analyzed: 18-Jun-96
Analyst: VVM

3161 Pegasus Drive

P.O. Box 80475

Bakersfield, CA 93380-0475

805 392-8811

Attention: Guy Worthington
BEST ENVIRONMENTAL, INC.
15890 Foothill Blvd.
San Leandro, CA 94578

Report Date: June 21, 1996
Submitted: June 18, 1996
Lab No. 96-3683-2

LABORATORY TEST REPORT

Project ID: GW61796
Sample ID: In / R2 Landfill Gas
Sampled: Jun-17-1996

Analyzed For: NMHC by GC-FID/PID
Method: TO-12

<u>Component</u>	<u>Found</u>	<u>Units</u>	<u>MDL</u>
Non-Methane Organic Carbon	282.1	ppm	0.1
	x3		
	846.3 as CH ₄		

Calibrations performed using propane standards of 10, 100 & 1000 ppm

ND: None Detected at MDL
MDL: Method Detection Limit

Date Analyzed: 18-Jun-96
Analyst: VVM

Attention: Guy Worthington
BEST ENVIRONMENTAL, INC.
15890 Foothill Blvd.
San Leandro, CA 94578

Report Date: June 21, 1996
Submitted: June 18, 1996
Lab No. 96-3683-3

LABORATORY TEST REPORT

Project ID: GW61796
Sample ID: In / R3 Landfill Gas
Sampled: Jun-17-1996

Analyzed For: NMHC by GC-FID/PID
Method: TO-12

<u>Component</u>	<u>Found</u>	<u>Units</u>	<u>MDL</u>
Non-Methane Organic Carbon	278.5	ppm	0.1
	83		
	435.5 as CH ₄		

Calibrations performed using propane standards of 10, 100 & 1000 ppm

ND: None Detected at MDL
MDL: Method Detection Limit

Date Analyzed: 18-Jun-96
Analyst: VVM

Attention: Guy Worthington
BEST ENVIRONMENTAL, INC.
15890 Foothill Blvd.
San Leandro, CA 94578

Report Date: June 21, 1996
Submitted: June 18, 1996
Lab No. 96-3683-1

LABORATORY TEST REPORT

Project ID: GW61796
Sample ID: In / R1 Landfill Gas
Sampled: Jun-17-1996

Analyzed For: Hydrogen Sulfide by GC-FPD
Method: UOP 791

<u>Component</u>	<u>Found</u>	<u>Units</u>	<u>MDL</u>
Hydrogen Sulfide	0.8	ppm	0.1

ND: None Detected at MDL
MDL: Method Detection Limit

Date Analyzed: 18-Jun-96
Analyst: VVM

Attention: Guy Worthington
BEST ENVIRONMENTAL, INC.
15890 Foothill Blvd.
San Leandro, CA 94578

Report Date: June 21, 1996
Submitted: June 18, 1996
Lab No. 96-3683-2

LABORATORY TEST REPORT

Project ID: GW61796
Sample ID: In / R2 Landfill Gas
Sampled: Jun-17-1996

Analyzed For: Hydrogen Sulfide by GC-FPD
Method: UOP 791

<u>Component</u>	<u>Found</u>	<u>Units</u>	<u>MDL</u>
Hydrogen Sulfide	1.2	ppm	0.1

ND: None Detected at MDL
MDL: Method Detection Limit

Date Analyzed: 18-Jun-96
Analyst: VVM

Attention: Guy Worthington
BEST ENVIRONMENTAL, INC.
15890 Foothill Blvd.
San Leandro, CA 94578

Report Date: June 21, 1996
Submitted: June 18, 1996
Lab No. 96-3683-3

LABORATORY TEST REPORT

Project ID: GW61796
Sample ID: In / R3 Landfill Gas
Sampled: Jun-17-1996

Analyzed For: Hydrogen Sulfide by GC-FPD
Method: UOP 791

<u>Component</u>	<u>Found</u>	<u>Units</u>	<u>MDL</u>
Hydrogen Sulfide	1.2	ppm	0.1

ND: None Detected at MDL
MDL: Method Detection Limit

Date Analyzed: 18-Jun-96
Analyst: VVM

oilwell research, inc.

ANALYTICAL LABORATORIES

Established 1949

BEST ENVIRONMENTAL, INC.

15890 Foothill Blvd.
San Leandro, CA 94578

Attention: Guy Worthington

Report Date: June 19, 1996

Submitted Date: June 18, 1996

Lab No. : 96-3683-1

Project: GW61796

Gas Analysis by GC - ASTM D 1946 / 3588

Sample ID : In / R1 Landfill Gas

Sample Date : 6/17/96

Sample Time :

Component	Mole %	Weight %	GPM
Hydrogen	0.00	0.00	
Oxygen	4.79	5.50	
Nitrogen	24.15	24.25	
Carbon Dioxide	29.26	46.17	
Carbon Monoxide	0.00	0.00	
Hydrogen Sulfide	0.00	0.00	
Methane	41.78	24.02	
Ethane	0.00	0.00	
Propane	0.00	0.00	0.000
iso-Butane	0.00	0.00	0.000
n-Butane	0.00	0.00	0.000
iso-Pentane	0.00	0.00	0.000
n-Pentane	0.00	0.00	0.000
Hexanes Plus	0.02	0.06	0.008

Totals	100.00	100.00	0.008
--------	--------	--------	-------

Specific Volume, ft³/lb 13.59

Specific Gravity (Calculated) 0.9631 Air = 1.000 @ 760 mm Hg, 60 °F dry

BTU/ft³ Gross Dry: 423.7 Wet: 416.3BTU/ft³ Net Dry: 381.5 Wet: 374.9

BTU/lb Gross Dry: 5758.1 Wet: 5657.9

BTU/lb Net Dry: 5184.9 Wet: 5094.7

Compressibility (Z) Factor 0.9982

Specific Gravity - Corrected 0.9649

BTU/ft³ Gross - Corrected Dry: 424.4 Wet: 417.0BTU/ft³ Net - Corrected Dry: 382.2 Wet: 375.5

BTU/lb Gross - Corrected Dry: 5768.4 Wet: 5668.0

BTU/lb Net - Corrected Dry: 5194.1 Wet: 5103.8

Values Corrected
for Compressibility

Carbon Wt. % 30.634 C2+ Tons/MMSCF 0.02

Hydrogen Wt. % 6.046 Corrected (Z) 0.02

Oxygen Wt. % 39.069

Nitrogen Wt. % 24.250 "F" Factor @ 60 °F, dscf/MMBTU 9271.1

Sulfur Wt. % 0.000 "F" Factor @ 68 °F, dscf/MMBTU 9413.7

3161 Pegasus Drive

P.O. Box 80475

Bakersfield, CA 93380-0475

805 392-8811

oilwell research, inc.

ANALYTICAL LABORATORIES

Established 1949

BEST ENVIRONMENTAL, INC.

15890 Foothill Blvd.

San Leandro, CA 94578

Attention: Guy Worthington

Report Date: June 19, 1996

Submitted Date: June 18, 1996

Lab No. : 96-3683-2

Project: GW61796

Gas Analysis by GC - ASTM D 1946 / 3588

Sample ID : In / R2 Landfill Gas

Sample Date : 6/17/96

Sample Time :

Component	Mole %	Weight %	GPM
Hydrogen	0.00	0.00	
Oxygen	4.69	5.38	
Nitrogen	23.75	23.85	
Carbon Dioxide	29.52	46.55	
Carbon Monoxide	0.00	0.00	
Hydrogen Sulfide	0.00	0.00	
Methane	42.02	24.15	
Ethane	0.00	0.00	
Propane	0.00	0.00	0.000
iso-Butane	0.00	0.00	0.000
n-Butane	0.00	0.00	0.000
iso-Pentane	0.00	0.00	0.000
n-Pentane	0.00	0.00	0.000
Hexanes Plus	0.02	0.07	0.009

Totals	100.00	100.00	0.009
--------	--------	--------	-------

Specific Volume, ft³/lb 13.59

Specific Gravity (Calculated) 0.9635 Air = 1.000 @ 760 mm Hg, 60 °F dry

BTU/ft ³ Gross	Dry: 426.2	Wet: 418.8
---------------------------	------------	------------

BTU/ft ³ Net	Dry: 383.8	Wet: 377.1
-------------------------	------------	------------

BTU/lb Gross	Dry: 5790.7	Wet: 5690.0
--------------	-------------	-------------

BTU/lb Net	Dry: 5214.3	Wet: 5123.6
------------	-------------	-------------

Compressibility (Z) Factor 0.9982

Specific Gravity - Corrected 0.9652

BTU/ft ³ Gross - Corrected	Dry: 427.0	Wet: 419.6	Values Corrected for Compressibility
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BTU/ft ³ Net - Corrected	Dry: 384.5	Wet: 377.8
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BTU/lb Gross - Corrected	Dry: 5801.2	Wet: 5700.3
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BTU/lb Net - Corrected	Dry: 5223.7	Wet: 5132.8
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Carbon Wt. %	30.844	C2+ Tons/MMSCF	0.03
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Hydrogen Wt. %	6.081	Corrected (Z)	0.03
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Oxygen Wt. %	39.226		
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Nitrogen Wt. %	23.850	"F" Factor @ 60 °F, dscf/MMBTU	9272.6
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Sulfur Wt. %	0.000	"F" Factor @ 68 °F, dscf/MMBTU	9415.2
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3161 Pegasus Drive

P.O. Box 80475

Bakersfield, CA 93380-0475

805 392-8811

oilwell research, inc.

ANALYTICAL LABORATORIES

Established 1949

BEST ENVIRONMENTAL, INC.

15890 Foothill Blvd.

San Leandro, CA 94578

Attention: Guy Worthington

Report Date: June 19, 1996

Submitted Date: June 18, 1996

Lab No.: 96-3683-3

Project: GW61796

Gas Analysis by GC - ASTM D 1946 / 3588

Sample ID: In / R3 Landfill Gas

Sample Date: 6/17/96

Sample Time:

Component	Mole %	Weight %	GPM
Hydrogen	0.00	0.00	
Oxygen	4.73	5.42	
Nitrogen	23.92	24.02	
Carbon Dioxide	29.43	46.41	
Carbon Monoxide	0.00	0.00	
Hydrogen Sulfide	0.00	0.00	
Methane	41.90	24.08	
Ethane	0.00	0.00	
Propane	0.00	0.00	0.000
iso-Butane	0.00	0.00	0.000
n-Butane	0.00	0.00	0.000
iso-Pentane	0.00	0.00	0.000
n-Pentane	0.00	0.00	0.000
Hexanes Plus	0.02	0.07	0.009

Totals	100.00	100.00	0.009
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Specific Volume, ft³/lb 13.59

Specific Gravity (Calculated) 0.9635 Air = 1.000 @ 760 mm Hg, 60 °F dry

BTU/ft³ Gross Dry: 425.0 Wet: 417.6BTU/ft³ Net Dry: 382.7 Wet: 376.0

BTU/lb Gross Dry: 5773.9 Wet: 5673.5

BTU/lb Net Dry: 5199.2 Wet: 5108.7

Compressibility (Z) Factor 0.9982

Specific Gravity - Corrected 0.9653

BTU/ft³ Gross - Corrected Dry: 425.8 Wet: 418.4 Values CorrectedBTU/ft³ Net - Corrected Dry: 383.4 Wet: 376.7 for Compressibility

BTU/lb Gross - Corrected Dry: 5784.3 Wet: 5683.7

BTU/lb Net - Corrected Dry: 5208.5 Wet: 5117.9

Carbon Wt. % 30.753 C2+ Tons/MMSCF 0.03

Hydrogen Wt. % 6.063 Corrected (Z) 0.03

Oxygen Wt. % 39.164

Nitrogen Wt. % 24.020 °F Factor @ 60 °F, dscf/MMBTU 9274.0

Sulfur Wt. % 0.000 °F Factor @ 68 °F, dscf/MMBTU 9416.7

Ph (510) 278 4011; Fx (510) 278 4018

SAMPLE CHAIN OF CUSTODY

Project ID: GW61796
Analytical Lab: OKWELL

DATE	TIME	SAMPLE ID Source/Run#/Method/Fraction	CONTAINER size / type	STORAGE TEMP °F	SAMPLE DESCRIPTION	ANALYSIS	TAT
6.17.96		IN/R1	10L Tallav		LANDFILL GAS	SEE BELOW	H ₂ S-24hr
		IN/R2	"				
		IN/R3	"				

SPECIAL INSTRUCTIONS: Record & Report all liquid sample volumes.

RETURN C.O.C. with results.

H₂S ppm - 24hr holding

TNMHC ppm

COMPLIANCE FUEL ANALYSIS; BTU/C₁-C₆+Submit Results to: Attn: GUY WORTHINGTON

Best Environmental Inc, 15890 Foothill Blvd., San Leandro CA 94578

Relinquished by: Guy Worthington Received by: FED EX 6980091624 Date: 6.17.96 Time: _____
 Relinquished by: _____ Received by: Becky Bradley Date: 6.18.96 Time: 9:25 AM
 Relinquished by: _____ Received by: _____ Date: _____ Time: _____

SAMPLE CONDITION AS RECEIVED: OK or not OK

WORK ORDER #: 9606197

Work Order Summary

CLIENT: Mr. Guy Worthington
Best Environmental, Inc.
15890 Foothill Blvd
San Leandro, CA 94578

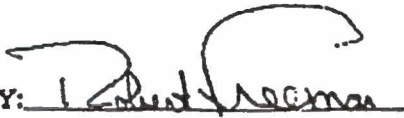
BILL TO: Same

PHONE: 510-278-4011
FAX: 510-278-4018
DATE RECEIVED: 6/18/96
DATE COMPLETED:

INVOICE #
P.O. #
PROJECT # GW61796

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC/PRES</u>
01A	9430	TO-14	5.0 "Hg
02A	9476	TO-14	13 "Hg
03A	9385	TO-14	4.5 "Hg
04A	9313	TO-14	13.5 "Hg
05A	9307	TO-14	1.5 "Hg
06A	9480	TO-14	10 "Hg
07A	Lab Blank	TO-14	NA

CERTIFIED BY:


Laboratory Director

DATE: 6/24/96

AIR TOXICS LTD.

SAMPLE NAME: 9430

ID#: 9606197-01A

EPA METHOD TO-14 GC/MS Full Scan

Compound	Det. Limit (ppbv)	Amount (ppbv)
Freon 12	150	530
Freon 114	150	Not Detected
Chloromethane	150	Not Detected
Vinyl Chloride	150	180
Bromomethane	150	Not Detected
Chloroethane	150	320
Freon 11	150	Not Detected
1,1-Dichloroethene	150	Not Detected
Freon 113	150	Not Detected
Methylene Chloride	150	Not Detected
1,1-Dichloroethane	150	Not Detected
cis-1,2-Dichloroethene	150	860
Chloroform	150	Not Detected
1,1,1-Trichloroethane	150	Not Detected
Carbon Tetrachloride	150	Not Detected
Benzene	150	180
1,2-Dichloroethane	150	Not Detected
Trichloroethene	150	180
1,2-Dichloropropane	150	Not Detected
cis-1,3-Dichloropropene	150	Not Detected
Toluene	150	4400
trans-1,3-Dichloropropene	150	Not Detected
1,1,2-Trichloroethane	150	Not Detected
Tetrachloroethene	150	Not Detected
Ethylene Dibromide	150	Not Detected
Chlorobenzene	150	Not Detected
Ethyl Benzene	150	1300
m,p-Xylene	150	2200
o-Xylene	150	1100
Styrene	150	180
1,1,2,2-Tetrachloroethane	150	Not Detected
1,3,5-Trimethylbenzene	150	320
1,2,4-Trimethylbenzene	150	1200
1,3-Dichlorobenzene	150	Not Detected
1,4-Dichlorobenzene	150	300
Chlorotoluene	150	Not Detected
1,2-Dichlorobenzene	150	Not Detected
1,2,4-Trichlorobenzene	150	Not Detected
Hexachlorobutadiene	150	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 9430

ID#: 9606197-01A

EPA METHOD TO-14 GC/MS Full Scan



Compound	Det. Limit (ppbv)	Amount (ppbv)
Propylene	610	Not Detected
1,3-Butadiene	610	Not Detected
Acetone	610	2500
Carbon Disulfide	610	Not Detected
2-Propanol	610	2600
trans-1,2-Dichloroethene	610	Not Detected
Vinyl Acetate	610	Not Detected
Chloroprene	610	Not Detected
2-Butanone (Methyl Ethyl Ketone)	610	5900
Hexane	610	Not Detected
Tetrahydrofuran	610	Not Detected
Cyclohexane	610	Not Detected
1,4-Dioxane	610	Not Detected
Bromodichloromethane	610	Not Detected
4-Methyl-2-pentanone	610	Not Detected
2-Hexanone	610	Not Detected
Dibromochloromethane	610	Not Detected
Bromoform	610	Not Detected
4-Ethyltoluene	610	Not Detected
Ethanol	610	59000
Methyl tert-Butyl Ether	610	Not Detected
Heptane	610	Not Detected

Container Type: 1 Liter Summa Canister



AIR TOXICS LTD.

SAMPLE NAME: 9476

ID#: 9606197-02A

EPA METHOD TO-14 GC/MS Full Scan

Compound	Det. Limit (ppbv)	Amount (ppbv)
Freon 12	7.2	Not Detected
Freon 114	7.2	Not Detected
Chloromethane	7.2	Not Detected
Vinyl Chloride	7.2	Not Detected
Bromomethane	7.2	Not Detected
Chloroethane	7.2	Not Detected
Freon 11	7.2	Not Detected
1,1-Dichloroethane	7.2	Not Detected
Freon 113	7.2	Not Detected
Methylene Chloride	7.2	Not Detected
1,1-Dichloroethane	7.2	Not Detected
cis-1,2-Dichloroethane	7.2	Not Detected
Chloroform	7.2	Not Detected
1,1,1-Trichloroethane	7.2	Not Detected
Carbon Tetrachloride	7.2	Not Detected
Benzene	7.2	Not Detected
1,2-Dichloroethane	7.2	Not Detected
Trichloroethane	7.2	Not Detected
1,2-Dichloropropane	7.2	Not Detected
cis-1,3-Dichloropropene	7.2	Not Detected
Toluene	7.2	26
trans-1,3-Dichloropropene	7.2	Not Detected
1,1,2-Trichloroethane	7.2	Not Detected
Tetrachloroethane	7.2	Not Detected
Ethylene Dibromide	7.2	Not Detected
Chlorobenzene	7.2	Not Detected
Ethyl Benzene	7.2	Not Detected
m,p-Xylene	7.2	18
o-Xylene	7.2	7.6
Styrene	7.2	Not Detected
1,1,2,2-Tetrachloroethane	7.2	Not Detected
1,3,5-Trimethylbenzene	7.2	Not Detected
1,2,4-Trimethylbenzene	7.2	9.2
1,3-Dichlorobenzene	7.2	Not Detected
1,4-Dichlorobenzene	7.2	Not Detected
Chlorotoluene	7.2	Not Detected
1,2-Dichlorobenzene	7.2	Not Detected
1,2,4-Trichlorobenzene	7.2	Not Detected
Hexachlorobutadiene	7.2	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 9476

ID#: 9606197-02A

EPA METHOD TO-14 GC/MS Full Scan



Compound	Det. Limit (ppbv)	Amount (ppbv)
Propylene	29	Not Detected
1,3-Butadiene	29	Not Detected
Acetone	29	300
Carbon Disulfide	29	Not Detected
2-Propanol	29	Not Detected
trans-1,2-Dichloroethene	29	Not Detected
Vinyl Acetate	29	Not Detected
Chloroprene	29	Not Detected
2-Butanone (Methyl Ethyl Ketone)	29	35
Hexane	29	Not Detected
Tetrahydrofuran	29	Not Detected
Cyclohexane	29	Not Detected
1,4-Dioxane	29	Not Detected
Bromodichloromethane	29	Not Detected
4-Methyl-2-pentanone	29	Not Detected
2-Hexanone	29	Not Detected
Dibromochloromethane	29	Not Detected
Bromoform	29	Not Detected
4-Ethyltoluene	29	Not Detected
Ethanol	29	52
Methyl tert-Butyl Ether	29	Not Detected
Heptane	29	Not Detected

Container Type: 1 Liter Summa Canister



AIR TOXICS LTD.

SAMPLE NAME: 93R5

ID#: 9606197-03A

EPA METHOD TO-14 GC/MS Full Scan

Compound	Det. Limit (ppbv)	Amount (ppbv)
Freon 12	150	490
Freon 114	150	Not Detected
Chloromethane	150	Not Detected
Vinyl Chloride	150	160
Bromomethane	150	Not Detected
Chloroethane	150	Not Detected
Freon 11	150	Not Detected
1,1-Dichloroethene	150	Not Detected
Freon 113	150	Not Detected
Methylene Chloride	150	Not Detected
1,1-Dichloroethane	150	Not Detected
cis-1,2-Dichloroethene	150	780
Chloroform	150	Not Detected
1,1,1-Trichloroethane	150	Not Detected
Carbon Tetrachloride	150	Not Detected
Benzene	150	Not Detected
1,2-Dichloroethane	150	Not Detected
Trichloroethene	150	170
1,2-Dichloropropane	150	Not Detected
cis-1,3-Dichloropropene	150	Not Detected
Toluene	150	4300
trans-1,3-Dichloropropene	150	Not Detected
1,1,2-Trichloroethane	150	Not Detected
Tetrachloroethene	150	Not Detected
Ethylene Dibromide	150	Not Detected
Chlorobenzene	150	Not Detected
Ethyl Benzene	150	1300
m,p-Xylene	150	2300
o-Xylene	150	1100
Styrene	150	200
1,1,2,2-Tetrachloroethane	150	Not Detected
1,3,5-Trimethylbenzene	150	320
1,2,4-Trimethylbenzene	150	1100
1,3-Dichlorobenzene	150	Not Detected
1,4-Dichlorobenzene	150	330
Chlorotoluene	150	Not Detected
1,2-Dichlorobenzene	150	Not Detected
1,2,4-Trichlorobenzene	150	Not Detected
Hexachlorobutadiene	150	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 9385

ID#: 9606197-03A

EPA METHOD TO-14 GC/MS Full Scan

Compound	Det. Limit (ppbv)	Amount (ppbv)
Propylene	600	Not Detected
1,3-Butadiene	600	Not Detected
Acetone	600	2300
Carbon Disulfide	600	Not Detected
2-Propanol	600	2500
trans-1,2-Dichloroethene	600	Not Detected
Vinyl Acetate	600	Not Detected
Chloroprene	600	Not Detected
2-Butanone (Methyl Ethyl Ketone)	600	5600
Hexane	600	Not Detected
Tetrahydrofuran	600	Not Detected
Cyclohexane	600	Not Detected
1,4-Dioxane	600	Not Detected
Bromodichloromethane	600	Not Detected
4-Methyl-2-pentanone	600	Not Detected
2-Hexanone	600	Not Detected
Dibromochloromethane	600	Not Detected
Bromoform	600	Not Detected
4-Ethyltoluene	600	Not Detected
Ethanol	600	57000
Methyl tert-Butyl Ether	600	Not Detected
Heptane	600	Not Detected

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: 9313

ID#: 9606197-04A

EPA METHOD TO-14 GC/MS Full Scan

Compound	Det. Limit (ppbv)	Amount (ppbv)
Freon 12	7.4	Not Detected
Freon 114	7.4	Not Detected
Chloromethane	7.4	Not Detected
Vinyl Chloride	7.4	Not Detected
Bromomethane	7.4	8.2
Chloroethane	7.4	Not Detected
Freon 11	7.4	Not Detected
1,1-Dichloroethene	7.4	Not Detected
Freon 113	7.4	Not Detected
Methylene Chloride	7.4	Not Detected
1,1-Dichloroethane	7.4	Not Detected
cis-1,2-Dichloroethene	7.4	Not Detected
Chloroform	7.4	Not Detected
1,1,1-Trichloroethane	7.4	Not Detected
Carbon Tetrachloride	7.4	Not Detected
Benzene	7.4	72
1,2-Dichloroethane	7.4	Not Detected
Trichloroethene	7.4	Not Detected
1,2-Dichloropropane	7.4	Not Detected
cis-1,3-Dichloropropene	7.4	Not Detected
Toluene	7.4	26
trans-1,3-Dichloropropene	7.4	Not Detected
1,1,2-Trichloroethane	7.4	Not Detected
Tetrachloroethene	7.4	Not Detected
Ethylene Dibromide	7.4	Not Detected
Chlorobenzene	7.4	Not Detected
Ethyl Benzene	7.4	Not Detected
m,p-Xylene	7.4	12
o-Xylene	7.4	Not Detected
Styrene	7.4	8.5
1,1,2,2-Tetrachloroethane	7.4	Not Detected
1,3,5-Trimethylbenzene	7.4	Not Detected
1,2,4-Trimethylbenzene	7.4	Not Detected
1,3-Dichlorobenzene	7.4	Not Detected
1,4-Dichlorobenzene	7.4	Not Detected
Chlorotoluene	7.4	Not Detected
1,2-Dichlorobenzene	7.4	Not Detected
1,2,4-Trichlorobenzene	7.4	Not Detected
Hexachlorobutadiene	7.4	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 9313

ID#: 9606197-04A

EPA METHOD TO-14 GC/MS Full Scan

Compound	Det. Limit (ppbv)	Amount (ppbv)
Propylene	29	Not Detected
1,3-Butadiene	29	Not Detected
Acetone	29	90
Carbon Disulfide	29	180
2-Propanol	29	Not Detected
trans-1,2-Dichloroethene	29	Not Detected
Vinyl Acetate	29	Not Detected
Chloroprene	29	Not Detected
2-Butanone (Methyl Ethyl Ketone)	29	Not Detected
Hexane	29	Not Detected
Tetrahydrofuran	29	Not Detected
Cyclohexane	29	Not Detected
1,4-Dioxane	29	Not Detected
Bromodichloromethane	29	Not Detected
4-Methyl-2-pentanone	29	Not Detected
2-Hexanone	29	Not Detected
Dibromochloromethane	29	Not Detected
Bromoform	29	Not Detected
4-Ethyltoluene	29	Not Detected
Ethanol	29	Not Detected
Methyl tert-Butyl Ether	29	Not Detected
Heptane	29	Not Detected

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: 9307

ID#: 9606197-05A

EPA METHOD TO-14 GC/MS Full Scan

Compound	Det. Limit (ppbv)	Amount (ppbv)
Freon 12	150	490
Freon 114	150	Not Detected
Chloromethane	150	Not Detected
Vinyl Chloride	150	Not Detected
Bromomethane	150	Not Detected
Chloroethane	150	Not Detected
Freon 11	150	Not Detected
1,1-Dichloroethene	150	Not Detected
Freon 113	150	Not Detected
Methylene Chloride	150	150
1,1-Dichloroethane	150	Not Detected
cis-1,2-Dichloroethene	150	860
Chloroform	150	Not Detected
1,1,1-Trichloroethane	150	Not Detected
Carbon Tetrachloride	150	Not Detected
Benzene	150	Not Detected
1,2-Dichloroethane	150	Not Detected
Trichloroethene	150	160
1,2-Dichloropropane	150	Not Detected
cis-1,3-Dichloropropene	150	Not Detected
Toluene	150	4300
trans-1,3-Dichloropropene	150	Not Detected
1,1,2-Trichloroethane	150	Not Detected
Tetrachloroethene	150	Not Detected
Ethylene Dibromide	150	Not Detected
Chlorobenzene	150	Not Detected
Ethyl Benzene	150	1300
m,p-Xylene	150	2200
o-Xylene	150	1100
Styrene	150	240
1,1,2,2-Tetrachloroethane	150	Not Detected
1,3,5-Trimethylbenzene	150	350
1,2,4-Trimethylbenzene	150	1100
1,3-Dichlorobenzene	150	Not Detected
1,4-Dichlorobenzene	150	320
Chlorotoluene	150	Not Detected
1,2-Dichlorobenzene	150	Not Detected
1,2,4-Trichlorobenzene	150	Not Detected
Hexachlorobutadiene	150	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 9307

ID#: 9606197-05A

EPA METHOD TO-14 GC/MS Full Scan

Compound	Det. Limit (ppbv)	Amount (ppbv)
Propylene	610	Not Detected
1,3-Butadiene	610	Not Detected
Acetone	610	2200
Carbon Disulfide	610	Not Detected
2-Propanol	610	2400
trans-1,2-Dichloroethene	610	Not Detected
Vinyl Acetate	610	Not Detected
Chloroprene	610	Not Detected
2-Butanone (Methyl Ethyl Ketone)	610	5700
Hexane	610	Not Detected
Tetrahydrofuran	610	Not Detected
Cyclohexane	610	Not Detected
1,4-Dioxane	610	Not Detected
Bromodichloromethane	610	Not Detected
4-Methyl-2-pentanone	610	Not Detected
2-Hexanone	610	Not Detected
Dibromochloromethane	610	Not Detected
Bromoform	610	Not Detected
4-Ethyltoluene	610	Not Detected
Ethanol	610	48000
Methyl tert-Butyl Ether	610	Not Detected
Heptane	610	Not Detected

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: 9480

ID#: 9606197-06A

EPA METHOD TO-14 GC/MS Full Scan

Compound	Det. Limit (ppbv)	Amount (ppbv)
Freon 12	6.1	Not Detected
Freon 114	6.1	Not Detected
Chloromethane	6.1	Not Detected
Vinyl Chloride	6.1	Not Detected
Bromomethane	6.1	Not Detected
Chloroethane	6.1	Not Detected
Freon 11	6.1	Not Detected
1,1-Dichloroethene	6.1	Not Detected
Freon 113	6.1	Not Detected
Methylene Chloride	6.1	Not Detected
1,1-Dichloroethane	6.1	Not Detected
cis-1,2-Dichloroethene	6.1	Not Detected
Chloroform	6.1	Not Detected
1,1,1-Trichloroethane	6.1	Not Detected
Carbon Tetrachloride	6.1	Not Detected
Benzene	6.1	Not Detected
1,2-Dichloroethane	6.1	Not Detected
Trichloroethene	6.1	Not Detected
1,2-Dichloropropane	6.1	Not Detected
cis-1,3-Dichloropropene	6.1	Not Detected
Toluene	6.1	7.3
trans-1,3-Dichloropropene	6.1	Not Detected
1,1,2-Trichloroethane	6.1	Not Detected
Tetrachloroethene	6.1	Not Detected
Ethylene Dibromide	6.1	Not Detected
Chlorobenzene	6.1	Not Detected
Ethyl Benzene	6.1	Not Detected
m,p-Xylene	6.1	Not Detected
o-Xylene	6.1	Not Detected
Styrene	6.1	Not Detected
1,1,2,2-Tetrachloroethane	6.1	Not Detected
1,3,5-Trimethylbenzene	6.1	Not Detected
1,2,4-Trimethylbenzene	6.1	Not Detected
1,3-Dichlorobenzene	6.1	Not Detected
1,4-Dichlorobenzene	6.1	Not Detected
Chlorotoluene	6.1	Not Detected
1,2-Dichlorobenzene	6.1	Not Detected
1,2,4-Trichlorobenzene	6.1	Not Detected
Hexachlorobutadiene	6.1	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 9480

ID#: 9606197-06A

EPA METHOD TO-14 GC/MS Full Scan

Compound	Det. Limit (ppbv)	Amount (ppbv)
Propylene	24	Not Detected
1,3-Butadiene	24	Not Detected
Acetone	24	79
Carbon Disulfide	24	Not Detected
2-Propanol	24	35
trans-1,2-Dichloroethene	24	Not Detected
Vinyl Acetate	24	Not Detected
Chloroprene	24	Not Detected
2-Butanone (Methyl Ethyl Ketone)	24	Not Detected
Hexane	24	Not Detected
Tetrahydrofuran	24	Not Detected
Cyclohexane	24	Not Detected
1,4-Dioxane	24	Not Detected
Bromodichloromethane	24	Not Detected
4-Methyl-2-pentanone	24	Not Detected
2-Hexanone	24	Not Detected
Dibromochloromethane	24	Not Detected
Bromoform	24	Not Detected
4-Ethyltoluene	24	Not Detected
Ethanol	24	Not Detected
Methyl tert-Butyl Ether	24	Not Detected
Heptane	24	Not Detected

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9606197-07A

EPA METHOD TO-14 GC/MS Full Scan



Compound	Det. Limit (ppbv)	Amount (ppbv)
Freon 12	0.50	Not Detected
Freon 114	0.50	Not Detected
Chloromethane	0.50	Not Detected
Vinyl Chloride	0.50	Not Detected
Bromomethane	0.50	Not Detected
Chloroethane	0.50	Not Detected
Freon 11	0.50	Not Detected
1,1-Dichloroethane	0.50	Not Detected
Freon 113	0.50	Not Detected
Methylene Chloride	0.50	Not Detected
1,1-Dichloroethane	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Carbon Tetrachloride	0.50	Not Detected
Benzene	0.50	Not Detected
1,2-Dichloroethane	0.50	Not Detected
Trichloroethene	0.50	Not Detected
1,2-Dichloropropane	0.50	Not Detected
cis-1,3-Dichloropropene	0.50	Not Detected
Toluene	0.50	Not Detected
trans-1,3-Dichloropropene	0.50	Not Detected
1,1,2-Trichloroethane	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
Ethylene Dibromide	0.50	Not Detected
Chlorobenzene	0.50	Not Detected
Ethyl Benzene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Styrene	0.50	Not Detected
1,1,2,2-Tetrachloroethane	0.50	Not Detected
1,3,5-Trimethylbenzene	0.50	Not Detected
1,2,4-Trimethylbenzene	0.50	Not Detected
1,3-Dichlorobenzene	0.50	Not Detected
1,4-Dichlorobenzene	0.50	Not Detected
Chlorotoluene	0.50	Not Detected
1,2-Dichlorobenzene	0.50	Not Detected
1,2,4-Trichlorobenzene	0.50	Not Detected
Hexachlorobutadiene	0.50	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

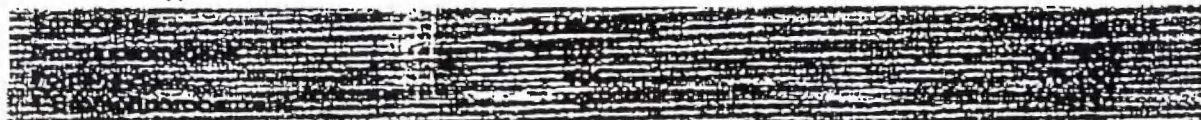
ID#: 9606197-07A

EPA METHOD TO-14 GC/MS Full Scan



Compound	Det. Limit (ppbv)	Amount (ppbv)
Propylene	2.0	Not Detected
1,3-Butadiene	2.0	Not Detected
Acetone	2.0	Not Detected
Carbon Disulfide	2.0	Not Detected
2-Propanol	2.0	Not Detected
trans-1,2-Dichloroethene	2.0	Not Detected
Vinyl Acetate	2.0	Not Detected
Chloroprene	2.0	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	Not Detected
Hexane	2.0	Not Detected
Tetrahydrofuran	2.0	Not Detected
Cyclohexane	2.0	Not Detected
1,4-Dioxane	2.0	Not Detected
Bromodichloromethane	2.0	Not Detected
4-Methyl-2-pentanone	2.0	Not Detected
2-Hexanone	2.0	Not Detected
Dibromochloromethane	2.0	Not Detected
Bromoform	2.0	Not Detected
4-Ethyltoluene	2.0	Not Detected
Ethanol	2.0	Not Detected
Methyl tert-Butyl Ether	2.0	Not Detected
Heptane	2.0	Not Detected

Container Type: NA



Page 15

SAMPLE CHAIN OF CUSTODY

Project ID: **6W61796**
Analytical Lab: **ATL**

9606197

DATE	TIME	SAMPLE ID Source/Location/Method/Function	CONTAINER Size / type	STORAGE TEMP °F	SAMPLE DESCRIPTION pH	ANALYSIS	TAT
6-17-96	1440	9430	14 SUMMA		Landfill Gas 5.0" H ₂	70-14	6-25-96
	1441	9476			Exhaust Gas 13" H ₂		
	1525	9385			Landfill Gas 7.5" H ₂		
	1525	9313			Exhaust Gas 13.5" H ₂		
	1615	9307			Landfill Gas 1.5" H ₂		
	1615	9480			Exhaust Gas 10" H ₂		
					6/18/96		

SPECIAL INSTRUCTIONS: Record & Report all liquid sample volumes.

Submit Results to: A/C: **GUY WORTHINGTON**

Best Environmental Inc, 15890 Foothill Blvd., San Leandro CA 94578

Relinquished by: **Dale Worthington** Received by: **EXPRESS-IT F1860345** Date: **6/18/96** Time: _____Relinquished by: _____ Received by: **Steve Anderson AD** Date: **6/18/96** Time: **1310**

Relinquished by: _____ Received by: _____ Date: _____ Time: _____

SAMPLE CONDITION AS RECEIVED: OK or not OK

Custody Seal intact? Y N **(None)** Temp. **AMBIENT**

APPENDIX E
FIELD DATA SHEETS

CONTINUOUS EMISSION MONITORING SUMMARY DATA SHEET

Facility: ^{E. of} ENCON- SACRAMENTO LANDFILL Test #: 1, 2, 3 Date: 6-17-96
 Location: FLAKE EXHAUST Barometric: 30.1 Leak Check: ☒
 Observers: Personnel: GW, SA Stratification Check:
 Cyl. #s: CA01047 (MIX), SA 7482 (THC), SA 12731 (MIX), SA 8536 (MIX)

	O ₂	CO ₂	NO _x	CO	THC	CH ₄	NMHC	SO _x	Comments
Analyzer	SIEMENS	702D	10.5	48	R855				
Range	25	15	25	100	100				
Span Value(s)	20.26	13.49	21.8	76	84.3				
Run	Time								
①	1400	11.75	8.1	14.5	<1	<1			
	1405	11.75	8.1	14.5	<1	<1			
	1410	11.75	8.1	14.75	<1	<1			
	1415	11.75	8.1	14.75	<1	<1			
	1420	11.75	8.1	14.75	<1	<1			
	1425	11.75	8.1	14.75	<1	<1			
	1430	11.75	8.1	14.25	<1	<1			
	1435	11.75	8.1	14.5	<1	<1			
	CAL	20.2	13.49	21.6	76	83			
	ZERO	0	0	0	0	0			
	AVG	11.75	8.1	14.6	<1	<1			
				21.6					
②	1450	11.75	7.9	15.0	<1	<1			
	1455	11.75	7.9	14.9	1	<1			
	1500	11.75	7.9	14.9	1	<1			
	1505	11.75	7.9	14.9	<1	<1			
	1510	11.75	7.9	14.8	<1	<1			
	1515	11.75	7.9	15.0	<1	<1			
	1520	11.75	7.9	14.9	<1	<1			
	1525	11.75	7.9	15.0	<1	<1			
	CAL	20.2	13.35	21.5	76	83			
	ZERO	0	0	0	0	0			
	AVG	11.75	7.9	14.9	<1	<1			
				21.5					
③	1538	11.75	8.1	14.5	<1	<1			CO spikes up to 3ppm
	1543	11.75	8.1	15.0	<1	<1			
	1548	11.75	8.1	14.9	<1	<1			
	1553	11.75	8.1	14.9	<1	<1			
	1558	11.75	8.1	15.0	<1	<1			
	1603	11.75	8.1	14.6	<1	<1			
	1608	11.75	8.1	15.0	<1	<1			
	1613-1618	11.75	8.1	14.8	<1	<1			
	CAL	20.2	13.5	21.7	76	83			
	ZERO	0	0	0	0	0			
	AVG	11.75	8.1	14.8	<1	<1			

Unit Description/Serial #:

Operating Conditions: 1600°F set point

Fuel: Landfill Gas

Inlet O₂ 4%?
CO 2ppm

36
75
11
-2
103

BEST ENVIRONMENTAL

Stack Gas Volumetric Flowrate Determination

Facility: <u>CITY OF SEASIDE / LAND 11 / EMCON</u>						Location: <u>Flare Out</u>	
Date: <u>6-17-96</u> Time: <u>1400</u>						Run#: <u>1</u>	
Pitot Factor (Cp): <u>.84</u> Pitot #: <u>6" Inert Probe</u>						Personnel: <u>SA GW</u>	
Assumed %O2: <u>—</u> Actual <u>12.2</u>						Barometric (Pb): <u>30.1</u>	
Assumed %CO2: <u>—</u> Actual <u>8</u>						Static Pressure (Pstatic): <u>-.02</u>	
Assumed %CO: <u>—</u> Actual <u>—</u>						Stack Diameter, in: <u>10.3</u>	
Assumed %H2O: <u>—</u> Actual <u>8</u>						Stack Area, ft² (As): <u>57.86</u>	
Port ID & Point #	Point Location Inches	Delta P (in P)	Stack Temp °F. (ts)	SQRT in P	Ø Avg <20"	Port Dia: <u>3"</u> Port Depth: <u>7"</u>	
1	10.3	.02	1538	.141		Downstream Distance: <u>4 dia</u>	
2	17.8	.02				Upstream Distance: <u>1 dia</u>	
3	27.0	.02				Pitot Leak Chk. (15secs@>3"):	
4	40.3	.02				CALCULATIONS	
5	76.7	.02				Molecular Weight of Dry Gas, g/g.mole (MWd)	
6	90.0	.02				MWd = 0.44(%CO2) + 0.32(%O2) + 0.28(%CO + N2)	
7	99.2	.02				MWd =	
8	106.7	.02				Water Vapor Fraction, (Bwo)	
						Bwo = 0.0473*ml/(DSCF + 0.0473*ml)	
						Bwo =	
1	10.3					Molecular Weight of Stack Gas, g/g.mole (MWs)	
2	17.8					MWs = MWd*(1-Bwo) + 18(Bwo)	
3	27.0					MWs = <u>28.85</u>	
4	40.3					Stack Pressure, in Hg (Ps)	
5	76.7					Ps = Pb + (Pstatic/13.6) = <u>30.1 + (-.02/13.6)</u>	
6	90.0					Stack Gas Velocity, actual feet per sec (Vs)	
7	99.2					Vs = 85.49*Cp*(SQRT in P)avg*SQRT[(ts+460)/(Ps*MWs)]	
8	106.7					Vs = <u>15.41</u>	
						Stack Area, ft² (As)	
						As = (Diameter/24)² * 3.1416	
						As = <u>57.86</u>	
						Stack Gas Flow Rate, DSCFM	
						DSCFM = 60(1-Bwo)*Vs*As*528/(ts+460)*Ps/29.92	
						ACFM = <u>53,505.17</u>	
						DSCFM = <u>13,007.84</u>	
						Comments: (i.e.: diag. or process info.)	
						Summary in: <u>1420 (-30) : 1440 (-7)</u>	
						Summary out: <u>1421 (-30) : 1441 (-15)</u>	
						B-g = <u>111</u>	

RAGES

1530

.141

#9430
#9476

R1

Isokinetic Sampling Data Sheet

Facility: ~~Richland~~ Date: 6.17.96 Method: 4 Run #: 1 Personnel: TA GW

Facility Information		Equipment		Sampling Data	
Location: <i>Flare - OUT</i>		Meter #: <i>3503</i>	Pitot #: <i>—</i>	PBar: <i>30.1</i>	P Static: <i>—</i>
Port Dia. <i>3"</i>	Depth: <i>3"</i>	Meter Yd: <i>.9904</i>	Pitot Cp: <i>—</i>	%O ₂ Ass. <i>—</i>	%O ₂ Actual: <i>—</i>
Fitting Type: <i>—</i>	Length: <i>—</i>	AH@: <i>1</i>	Noz. #: <i>—</i>	%CO ₂ Ass. <i>—</i>	%CO ₂ Actual: <i>—</i>
Stack Dia. <i>—</i>	Area: <i>—</i>	Filter Box #: <i>—</i>	Noz. Dia. <i>—</i>	%H ₂ O Ass. <i>—</i>	Pitot LC: <i>—</i>
Upstream Dist. <i>1 ft</i>		Probe #: <i>—</i>	Mag #: <i>—</i>	Test Mins. <i>30</i>	Filter #: <i>—</i>
Downstream Dist. <i>4 ft</i>		Temp. Meter #: <i>—</i>	Umb. #: <i>—</i>	Initial LC: <i>.008</i> CFM @ <i>10</i> "Hg	
				Final LC: <i>.008</i> CFM @ <i>10</i> "Hg	

[illegible]

MOISTURE DATA			
	Initial	Final	Net
Impinger #1	160	132	32
Impinger #2	100	102	02
Impinger #3&4	—		
Silica Gel	200	104.8	94.8
Rinse Vol. =			
TOTAL NET =			
TOTAL SAMPLE VOL =			39

CALCULATED VALUES	
Sample Vol. scf =	17.434
% H ₂ O =	9.5
MWs =	
Stack Vel.(ft/s) =	
Flowrate(acfm) =	
Flowrate(dscfm) =	
Isokinetics (%) =	

COMMENTS:

CITY OF

Date: 6-17-96

Method: *SHMM* Run #:

Personnel: *SA*

SUMMA CANS

Initial LC: _____ CFM @ _____ "Hg
Final LC: _____ CFM @ _____ "Hg

CANISTERS	TIME	VAC	VAC
15A	17B		
16A			
17A			

CALCULATED VALUES.	
Sample Vol. scf =	_____
% H ₂ O =	_____
MWs =	_____
Stack Vel.(ft/s) =	_____
Flowrate(acfm) =	_____
Flowrate(dscfm) =	_____
Isokinetics (%) =	_____

Inlet Wet bulb 101 °F $\equiv$ 4.6% H₂O.
Dry bulb 149 °F
Wet bulb 111 °F

APPENDIX F
STRIP CHART RECORDS

284.3cm

14509F

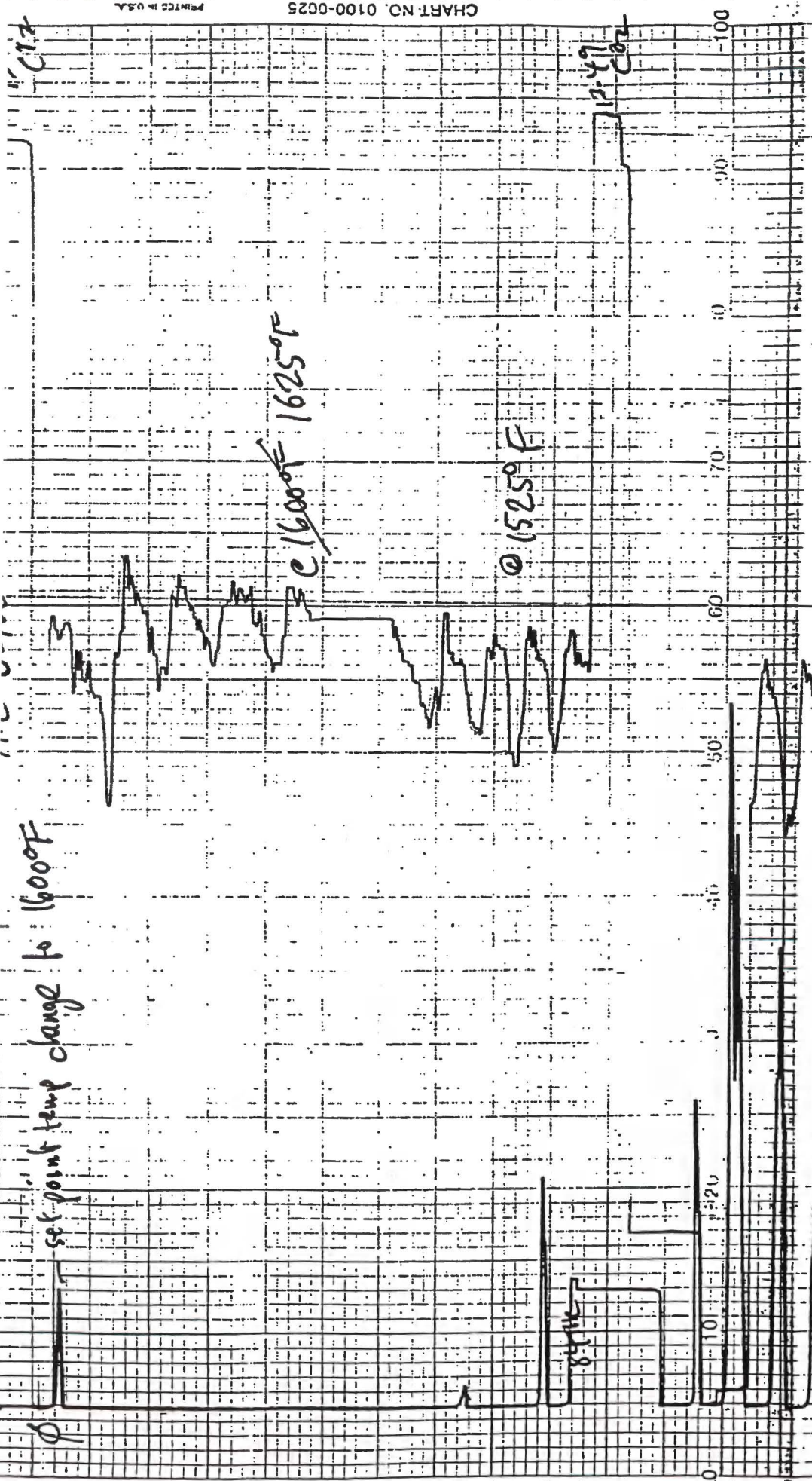
0-1000 THC

0-157. CO2

Facility: EMCON - CITY OF SACRAMENTO
Date: 6-17-76 Barometric: 30.10 SA
THK Analyzer RAT Cal Gas 81x.8 Cyl # 7482
W Analyzer Summit 702 Cal Gas 13.49 Cyl # AD1047
Analyzer _____ Cal Gas _____ Cyl # _____
Chart Speed 12cm/hr
Operator GN

Rat - 100
Summit CO2

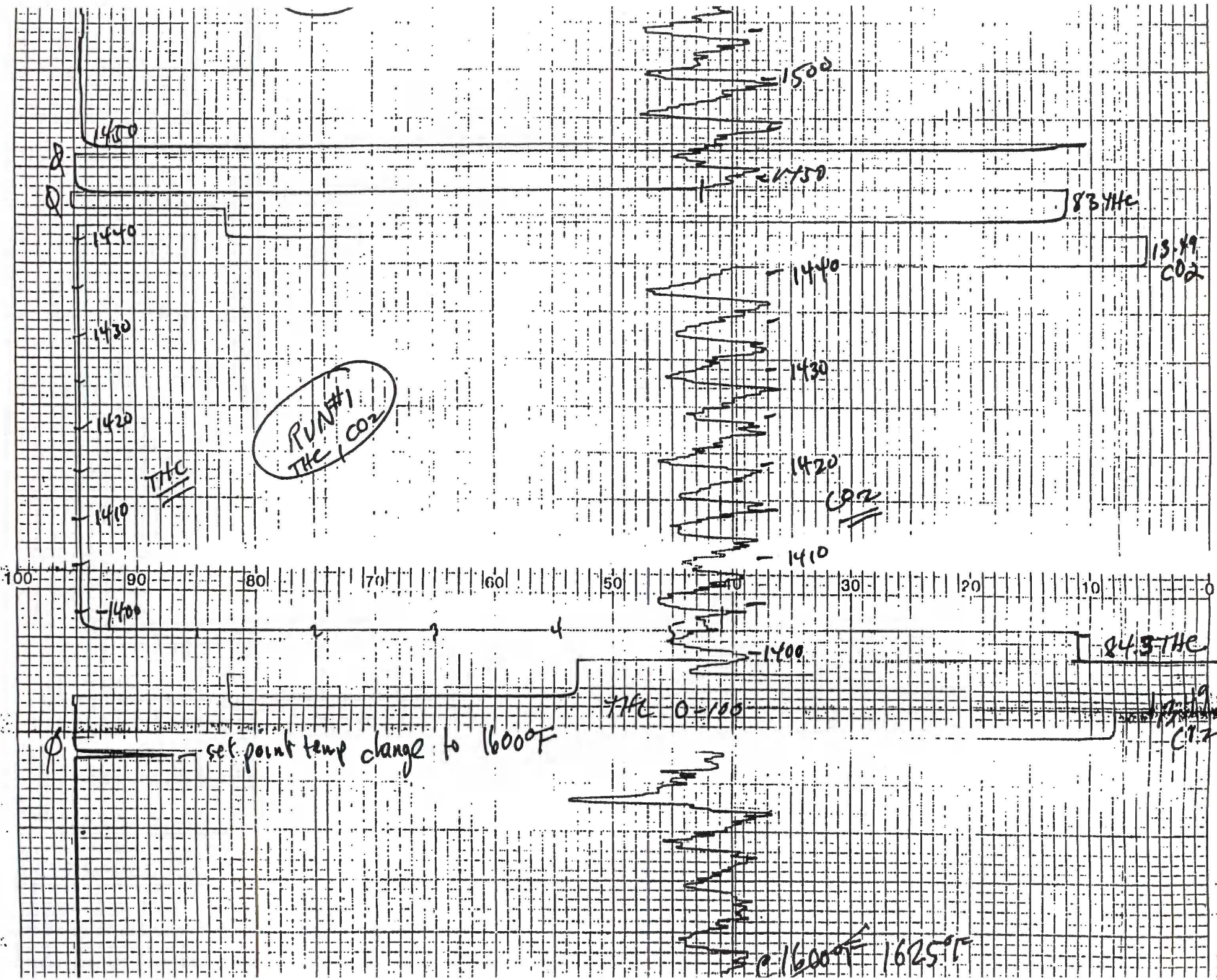
set point temp change to 1600F



1605/1

0-1000THC

200/5/10



18

561

63

13.85

1038

1530

1520

1510

1500

1450

some failure

Run #3
TIC1 com

Run #2
TIC1 com

0-25 NOx
0-100 CO
0-25 O2

12:00 Manifold in place
Timing to open ports.

CITY OF SACRAMENTO

Facility: EMCON - ~~WATER~~ LANDFILL

Date: 6-17-96 Barometric: 30.10
NOx Analyzer TECO 10.5 Cal Gas 21.8 Cyl # SA-12781 .87
CO Analyzer SIGMENS Cal Gas 20.26 Cyl # SA 8536 .81
CO Analyzer TECO 4.1 Cal Gas 76 Cyl # CA01047

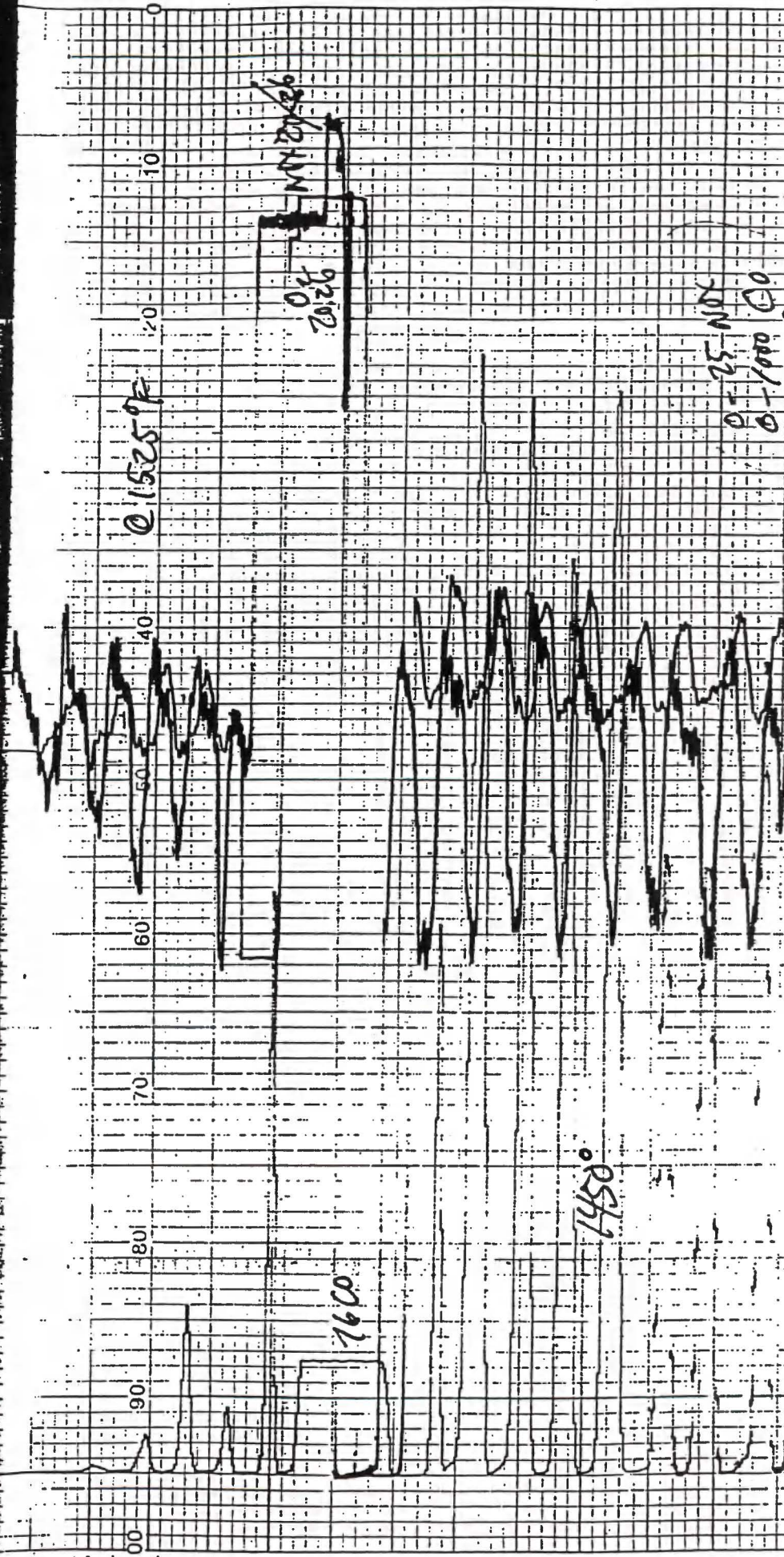
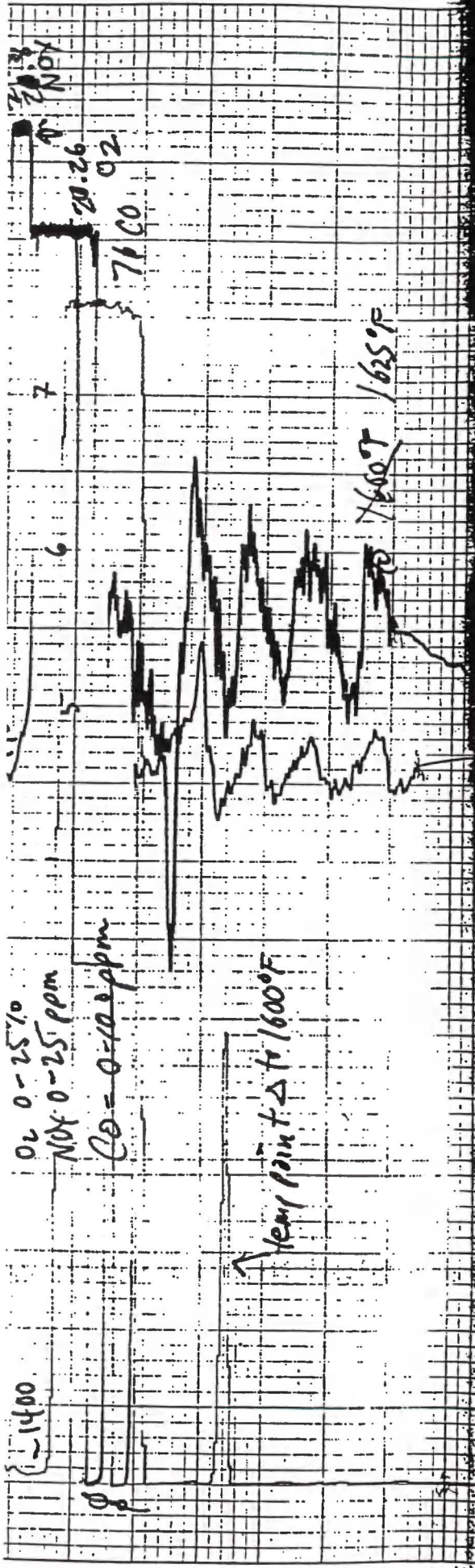
Chart Speed 12 cm/hr
Operator G.W.

1450°

NOx Lower

O2 mid

CO upper



20.20

22

7600 92 92.02

६।५।

1509

0571

1

056

1430.

1420

410

1400

...

و

0-7.5%

NiX-0-25 ppm

$$CO = 0.10 \text{ ppm}$$

1400



5-

Revlon
#2010101

2012
PUN #1207

4.0% O₂

fuel CO/O₂

ppm CO

O₂ offset

1608

1551

RUN #3 OK
CO 0.02

7.12
2.02E

1613

1608

1613

power failure

1551

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APPENDIX G
CALIBRATION GAS CERTIFICATIONS



213-585-2154
FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALAMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER BEST ENVIRONMENTAL.

P.O NUMBER SG140464 RE:8870

REFERENCE STANDARD

COMPONENT	NIST SRM NO.	CYLINDER NO.	CONCENTRATION
PROPANE	GMIS vs 1667b	579140	29.8 ppm

ANALYZER READINGS

R=REFERENCE STANDARD

Z=ZERO GAS

C=GAS CANDIDATE

1. COMPONENT	PROPANE	GMIS	ANALYZER MAKE-MODEL-S/N	HP 5890 SERIES II	S/N 3310A48533
ANALYTICAL PRINCIPLE	GC/ FLAME IONIZATION			LAST CALIBRATION DATE	06/19/95
FIRST ANALYSIS DATE	07/07/95			SECOND ANALYSIS DATE	
Z 0	R 131118	C 124399	CONC. 28.3 ppm	Z	R C CONC.
R 131235	Z 0	C 123006	CONC. 27.9 ppm	R	Z C CONC.
Z 0	C 123096	R 131152	CONC. 28.0 ppm	Z	C R CONC.
U/M uV-s		MEAN TEST ASSAY	28.1 ppm	U/M uV-s	MEAN TEST ASSAY

Values not valid below 150 psig

THIS CYLINDER NO.	SA 7482	CERTIFIED CONCENTRATION
HAS BEEN CERTIFIED ACCORDING TO SECTION	EPA-600/R93/224	PROPANE 28.1 ppm
OF TRACEABILITY PROTOCOL NO.	Rev. 9/93	ULTRA ZERO AIR BALANCE
PROCEDURE	G1	
CERTIFIED ACCURACY	± 1 % NIST TRACEABLE	
CYLINDER PRESSURE	2000 PSIG	
CERTIFICATION DATE	07/07/95	
EXPIRATION DATE	07/07/98 TERM 36 MONTHS	

84.3 CH4

ANALYZED BY

Maria Kochon
MARIA KOCHON

CERTIFIED BY

Kwan Young
KWAN YOUNG



213-585-2154
FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALAMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER BEST ENVIRO. PO# 8944

P.O NUMBER 8944

REFERENCE STANDARD

COMPONENT	NIST SRM NO.	CYLINDER NO.	CONCENTRATION
NITRIC OXIDE GMIS	vs 2629a	SGAL 929	25.6 ppm

ANALYZER READINGS

R=REFERENCE STANDARD

Z=ZERO GAS

C=GAS CANDIDATE

1. COMPONENT	NITRIC OXIDE	GMIS	ANALYZER MAKE-MODEL-S/N	Beckman 951A	S/N 0101354		
ANALYTICAL PRINCIPLE		Chemiluminescence	LAST CALIBRATION DATE 09/29/95				
FIRST ANALYSIS DATE		10/05/95	SECOND ANALYSIS DATE 10/12/95				
Z 0	R 928	C 772	CONC. 21.3 ppm	Z 0	R 921	C 770	CONC. 21.4 ppm
R 928	Z 0	C 773	CONC. 21.3 ppm	R 922	Z 0	C 770	CONC. 21.4 ppm
Z 0	C 774	R 930	CONC. 21.3 ppm	Z 0	C 770	R 925	CONC. 21.3 ppm
U/M mV	MEAN TEST ASSAY		21.3 ppm	U/M mV	MEAN TEST ASSAY		21.4 ppm

Values not valid below 150 psig

NOx values for reference only

THIS CYLINDER NO. SA12731

HAS BEEN CERTIFIED ACCORDING TO SECTION
OF TRACEABILITY PROTOCOL NO. Rev. 9/93

PROCEDURE G1

CERTIFIED ACCURACY ± 2 % NIST TRACEABLE

CYLINDER PRESSURE 2000 PSIG

CERTIFICATION DATE 10/12/95

EXPIRATION DATE 10/12/97 TERM 24 MONTHS

CERTIFIED CONCENTRATION

NITRIC OXIDE	21.4 ppm
NITROGEN	BALANCE
NOx	21.8 ppm

ANALYZED BY

VERAH ERVTH

CERTIFIED BY

SAHAR ALANY



LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALAMEDA STREET • LOS ANGELES, CA 90058

213-585-2154

FAX: 213-585-0582

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER BEST ENVIRON. P.O.# PGE9

P.O NUMBER SG 155996 RE: PGE9

REFERENCE STANDARD

COMPONENT	NIST SRM NO.	CYLINDER NO.	CONCENTRATION
CARBON MONOXIDE GMIS	vs 1679c	SA 7519	101 ppm
OXYGEN GMIS	vs 2658a	SA 11255	10.04%
CARBON DIOXIDE GMIS	vs 2745	282185	14.01 %

ANALYZER READINGS

R=REFERENCE STANDARD

Z=ZERO GAS

C=GAS CANDIDATE

1. COMPONENT		CARBON MONOXIDE		GMIS	ANALYZER MAKE-MODEL-S/N		Siemens Ultramat 5E		S/N A12-729						
ANALYTICAL PRINCIPLE				NDIR			LAST CALIBRATION DATE		03/15/96						
FIRST ANALYSIS DATE				03/12/96				SECOND ANALYSIS DATE		03/19/96					
Z	0.0	R	101.0	C	76.0	CONC.	76.0 ppm	Z	0.0	R	101.0	C	76.0	CONC.	76.0 ppm
R	101.0	Z	0.0	C	76.0	CONC.	76.0 ppm	R	101.0	Z	0.0	C	76.0	CONC.	76.0 ppm
Z	0.0	C	76.0	R	101.0	CONC.	76.0 ppm	Z	0.0	C	76.0	R	101.0	CONC.	76.0 ppm
U/M ppm				MEAN TEST ASSAY 76.0 ppm				U/M ppm				MEAN TEST ASSAY 76.0 ppm			
2. COMPONENT		OXYGEN		GMIS	ANALYZER MAKE-MODEL-S/N		Siemens Oxymat 5E		S/N A12-839						
ANALYTICAL PRINCIPLE				Paramagnetic			LAST CALIBRATION DATE		03/15/96						
FIRST ANALYSIS DATE				03/19/96				SECOND ANALYSIS DATE							
Z	0.00	R	10.04	C	8.50	CONC.	8.50 %	Z		R		C		CONC.	
R	10.04	Z	0.00	C	8.50	CONC.	8.50 %	R		Z		C		CONC.	
Z	0.00	C	8.50	R	10.04	CONC.	8.50 %	Z		C		R		CONC.	
U/M %				MEAN TEST ASSAY 8.50 %				U/M %				MEAN TEST ASSAY			
3. COMPONENT		CARBON DIOXIDE		GMIS	ANALYZER MAKE-MODEL-S/N		Siemens Ultramat 5E		S/N A12-730						
ANALYTICAL PRINCIPLE				NDIR			LAST CALIBRATION DATE		03/15/96						
FIRST ANALYSIS DATE				03/19/96				SECOND ANALYSIS DATE							
Z	0.00	R	14.02	C	13.50	CONC.	13.49 %	Z		R		C		CONC.	
R	14.02	Z	0.00	C	13.50	CONC.	13.49 %	R		Z		C		CONC.	
Z	0.00	C	13.50	R	14.02	CONC.	13.49 %	Z		C		R		CONC.	
U/M %				MEAN TEST ASSAY 13.49 %				U/M %				MEAN TEST ASSAY			

THIS CYLINDER NO. CA 01047

HAS BEEN CERTIFIED ACCORDING TO SECTION

EPA-600/R93/224

OF TRACEABILITY PROTOCOL NO.

Rev. 9/93

PROCEDURE G1

CERTIFIED ACCURACY ± 1 % NIST TRACEABLE

CYLINDER PRESSURE 1650 PSIG

CERTIFICATION DATE 03/19/96

EXPIRATION DATE 03/19/99 TERM 36 MONTHS

CERTIFIED CONCENTRATION

CARBON MONOXIDE	76.0 ppm
OXYGEN	8.50 %
CARBON DIOXIDE	13.49 %
NITROGEN	BALANCE

Values not valid below 150 psig

ANALYZED BY

Wanda E. P...
WANDA E. P...

CERTIFIED BY

D. J. Grant
D. J. GRANT

BEST ENVIRONMENTAL, INC.
METER BOX POST TEST CALIBRATION

Date: 5/23/95

Operator: Michael J. Wiley

Signature: *[Signature]*

Meter Yd: 0.9904

Meter Box ΔH@: 2.008

Vacuum: 2-3 in. Hg

0.9904

2.008

2-3 in. Hg

Meter Box #: RAC3/3503

Bar. Pressure (Pb): 29.84 in. Hg

Return from: Grafil

ΔH	ΔP	Yds	Standard Meter Gas Volume (ft³)			Meter Box Gas Volume (ft³)			Std. Meter Temp. (Tds) Avg.	Meter Box Temperature			Time (Min.) Ø	ΔH@	Yd	Q
			Initial	Final	(Vds) Net	Initial	Final	(Vd) Net		In	Out	(Td) Avg.				
0.50	-0.08	1.000	103.000	108.000	5.000	368.144	373.225	5.081	72.5	78.0	74.0	76.0	13.90	2.172	0.9891	0.356
0.55	-0.08	1.000	108.000	113.010	5.010	373.225	378.326	5.101	72.5	78.5	74.0	76.3	12.88	2.042	0.9875	0.385
0.55	-0.08	1.000	113.010	118.000	4.990	378.326	383.382	5.056	72.8	79.5	74.0	76.8	12.87	2.056	0.9927	0.383
1.10	-0.09	1.000	121.000	126.000	5.000	386.444	391.514	5.070	72.5	82.0	74.0	78.0	9.10	2.040	0.9935	0.543
1.10	-0.09	1.000	126.000	131.200	5.200	391.514	396.817	5.303	73.0	82.5	74.0	78.3	9.20	1.931	0.9873	0.558
1.10	-0.09	1.000	131.200	136.200	5.000	396.817	401.897	5.080	73.0	84.0	74.0	79.0	8.57	1.809	0.9924	0.576

Variables:

Q = Flow rate (DSCFM @ 68°F)

ΔH = Orifice pressure differential (in. H₂O)

ΔP = Inlet pressure differential standard meter (in. H₂O)

Yds = Standard meter correction factor (Unitless)

Yd = Meter box correction factor (unitless)

ΔH@ = Orifice pressure differential that gives 0.75 SDCFM of air at 68°F and 29.92 in. Hg (in. H₂O)

$$Yd = (Yds)(Vds)/(Vd)(Td+460)/((Tds+460)(Pb + (\Delta P/13.6))/(Pb + (\Delta H/13.6)))$$

$$\Delta H@ = 0.0317 (\Delta H)/(Pb(Td+460))/((Tds+460)\emptyset/(Vds*Yds))^2$$

$$Q = 17.647(Vds)(Pb)/((Tds+460)\emptyset)$$

Spring Type Thermometer Calibration

Calibrated By: Steve AllenDate Calibrated: 4-5-96Calibration Due: 6 months

Thermometer ID	Reference Thermometer Temp. (°F)	Test Thermocouple Temp (°F)	Temp. Difference	% Difference	Notes
12 B 3523	36	38	+2		
12 B 3523	60	61	+1		
12 B 3523	122	117	-5		
12 A 3523	36	33	-3		
12 A 3523	60	59	-1		
12 A 3523	122	117	-5		
1 3501	36	38	+2		
1 3501	61	61	0		
1 3501	115	113	-2		
2 3501	36	38	+2		
2 3501	61	59	-2		
2 3501	115	113	-2		

NIST Pyrometer: _____

STM Thermometer: 61132-006 (68.301) 4/302 F, 332 mmComments: Temp % Difference is not required by method.

Reference Thermometer: ASTM mercury in glass.

Method Reference: EPA QA Handbook Vol. III: Stationary Source Specific Methods, sect. 3.5.2.2

Tolerance Limits: ± 5.4 °F at ambient temperature and in hot water bath.