Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

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Western States Petroleum Association

Bakersfield, California

ENSR

Pooled Source Emission Test Report: Oil and Gas Production Combustion Sources, Fresno and Ventura Counties, California

(Without Appendices)

ENSR Consulting and Engineering

January 1991

Document Number 7230-007-700

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ENSR

Formerly ERT

January 2, 1991

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Ms. Catherine Reheis
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Dear Ms. Reheis:

Enclosed please find a copy of the final report "Pooled Source Emission Test Report: Oil and Gas Production Combustion Sources, Fresno and Ventura Counties, California." I will contact you on January 4 regarding the number of copies you will need printed.

Please call me or Bill Powers at (805) 388-3775 if you have any questions regarding this report.

Sincerely,

Michael Short
Air Quality Engineer

MS:ab

ENSR Document No. 7230-007-700
ENSR Reference No. ARS/001/91

Pooled Source Emission Test Report:
Oil and Gas Production
Combustion Sources
Fresno and Ventura Counties, California

ENSR Document No. 7230-007-700
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Prepared for

Western States Petroleum Association
Bakersfield, California

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ENSR

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1.0 INTRODUCTION

1.1 Project Background

ENSR Consulting and Engineering of Camarillo, California was contracted by the Western States Petroleum Association (WSPA) to conduct an AB 2588 pooled emission testing program of oil field combustion sources in Fresno and Ventura counties. This WSPA pooled source test program was intended to augment AB 2588 emissions data generated during AB 2588 pooled source testing conducted by WSPA in Kern County between April 2 and April 26, 1990.

This report provides test results from AB 2588 source testing performed on four sources by ENSR in September 1990. These results will be incorporated into AB 2588 Emission Inventory Reports being submitted to Ventura and Fresno counties by participating member companies.

1.2 Project Scope

The program consisted of stack sampling to develop AB 2588 emission factors for four source types. The sources tested were:

- Crude oil-fired steam generator bank with scrubber
- Natural gas-fired steam generator
- Diesel-fired workover rig IC engine
- Diesel-fired drilling rig IC engine

The crude oil-fired steam generator bank and diesel IC engine sources were tested for:

- Benzene, toluene, xylene (BTX)
- Propylene
- Formaldehyde, acetaldehyde, acrolein
- PAH
- AB 2588 listed metals (steam generator bank only)

The natural gas-fired generator was tested for:

- BTX
- Formaldehyde

Total hydrocarbons were measured at each test site to allow the development of AB 2588 volatile organic compound (VOC) species profiles for each source type tested.

Table 1-1 provides the test matrix for the program: target compounds, sampling methods, and analysis methods. Table 1-2 provides the tests that were conducted on each source, as well as the test locations, source descriptions, and test dates.

The test program was conducted from September 14 to September 27, 1990. Ms. Catherine Reheis coordinated all activities for WSPA. Mr. Bill Powers, P.E., was the project manager and onsite supervisor for ENSR. Mr. Nadir Aghdale of the Ventura County Air Pollution Control District (APCD) witnessed testing of the workover and drilling rig IC engines. Mr. Roger Isom of the Fresno County APCD witnessed portions of the crude oil-fired steam generator bank testing at Santa Fe Energy's Midway Sunset Facility.

The results of the testing program are summarized in Tables 1-3, 1-4, 1-5, and 1-6. Organic compound emission rates are shown as lb/MMBtu and as weight fractions of total hydrocarbons (THC). Calculations of emission factors, in lb/MMBtu, are explained in Section 2 and Appendix D. Weight fractions are simply the ratios of organic compound emission factors (lb/MMBtu) to THC emission factors (lb/MMBtu). Detailed results are presented in Sections 2.1 through 2.6. Descriptions of the tested sources are provided in Section 3. Test methods are described in Sections 4.1 through 4.10. Quality assurance and quality control procedures, calibration data, chain-of-custody records, field data sheets, laboratory reports, and calculations are provided in the appendices to this report.

Sample identification numbers, shown on chain-of-custody forms, field data sheets, and laboratory reports can be interpreted according to the following key:

DW	-	Diesel-Fired Workover Rig, Unocal, Ventura County
DD	-	Diesel-Fired Drilling Rig, SWEPI, Ventura County
CG	-	Crude Oil-Fired Steam Generator Bank, Santa Fe Energy, Kern County
CFG	-	Gas-Fired Steam Generator, SWEPI, Fresno County
104	-	CARB Method 104 (Beryllium)
MMT	-	EPA Draft Multiple Metals Method
425	-	CARB Method 425 (Hexavalent Chromium)

410 - CARB Method 410 (VOC)
430 - CARB Method 430 (Aldehydes)

Example: Sample ID No. 7230-007-DW-A-429-A

7230-007-	DW-	A-	429-	A
ENSR Project Number	Test Site	Test Run	Test Method	Sample Train Identifier

TABLE 1-1

Test Program Matrix

Test Number	Analyte	Sampling Method	Analysis Method
1	Exhaust flowrate	CARB 1 & 2	Pitot tube
2	Moisture	CARB 4	Gravimetric
3	Total hydrocarbons	CARB 100	Flame ionization detection (FID)
4	Oxygen	CARB 100	Electrochemical cell
5	Carbon monoxide	CARB 100	Nondispersive infrared (NDIR)
6	Carbon dioxide	CARB 100	NDIR
7	Benzene, toluene, xylenes	CARB 410A	Gas chromatography/photoionization detection (GC/PID)
8	Propylene	EPA 18	GC/FID
9	Formaldehyde	CARB 430	High-performance liquid chromatography (HPLC)
10	Acetaldehyde, acrolein	CARB 430	HPLC
11	PAH	Modified CARB 429	GC/MS
12	AB 2588 Metals	EPA Multi-metals	Atomic absorption
13	Cr^{+6}	Proposed CARB 425	Colorimetric
14	Beryllium	CARB 104	Atomic absorption

TABLE 1-2

Device Description and Test Schedule

Device	Fuel	Company	Rating	Burner Type	Location	Date	Test Methods
Steam Generator	Natural Gas[a]	SWEPI	59.5 MMBtu/hr	Conventional	Fresno	09/27/90	3 through 7, 9
	Crude Oil[a,b]	Santa Fe	62.5 MMBtu/hr (8 units)	Low-NO_x	Kern	09/20-26/90	1 through 14
Drilling Rig IC Engine	Diesel[a,b]	SWEPI	850 hp	NA	Ventura	09/18/90	3 through 11
Workover Rig IC Engine	Diesel[a,b]	Unocal	350 hp	NA	Ventura	09/14/90	3 through 11

[a] One fuel sample from each test site was collected and analyzed for HHV, ultimate analysis, and specific gravity.

[b] Fuel was analyzed for AB 2588 metals using EPA SW-846 test methods, either 6000 or 7000 series, to achieve the lowest detection limit on a metal by metal basis. Chloride was analyzed using EPA Method 9076.

NA = not applicable.

TABLE 1-3a

Organic Compound Emission Rates
Diesel Workover Rig: 350-hp IC Engine

Compound		Emission Data	Weight Fraction of THC
Total Hydrocarbons[a]	(ppmv)	67.8	1.0000
	(lb/MMBtu)	1.15E-01	
Benzene	(ppmv)	0.147	0.0115
	(lb/MMBtu)	1.33E-03	
Toluene	(ppmv)	0.050	0.0048
	(lb/MMBtu)	5.56E-04	
Xylenes	(ppmv)	0.021	0.0022
	(lb/MMBtu)	2.58E-04	
Propylene	(ppmv)	0.793	0.0335
	(lb/MMBtu)	3.86E-03	
PAH[b]	(ppmv)	0.0108	0.0014
	(lb/MMBtu)	1.61E-04	
Formaldehyde	(ppmv)	0.284	0.0086
	(lb/MMBtu)	9.87E-04	
Acetaldehyde	(ppmv)	0.091	0.0040
	(lb/MMBtu)	4.64E-04	
Acrolein	(ppmv)	0.020	0.0011
	(lb/MMBtu)	1.32E-04	

[a] Reported as methane.
[b] Reported as naphthalene.

TABLE 1-3b

Fuel Analysis Results
Diesel Workover Rig

HHV, Btu/gal	141,800
API Gravity at 60° F	31.7
Specific Gravity at 60° F	0.867
F-factor, dscf/MMBtu	9,194
Carbon (wt. %)	86.71
Hydrogen (wt. %)	13.12
Oxygen (wt. %)	<0.1
Nitrogen (wt. %)	0.17
Sulfur (wt. %)	0.004
Ash (wt. %)	<0.01
Inorganics Results	
Arsenic (mg/kg)	<0.3
Beryllium (mg/kg)	<0.5
Bromide (mg/kg)	<2.0
Cadmium (mg/kg)	<0.3
Chloride (mg/kg)	<2.0
Chromium, total (mg/kg)	<0.5
Copper (mg/kg)	0.1
Lead (mg/kg)	<3.0
Manganese (mg/kg)	<1.0
Mercury (mg/kg)	<0.02
Nickel (mg/kg)	<3.0
Selenium (mg/kg)	<0.3
Phosphorus (mg/kg)	<30
Zinc (mg/kg)	1.9

TABLE 1-4a

Organic Compound Emission Rates
Diesel Drilling Rig: 850-hp IC Engine

Compound		Emission Data	Weight Fraction of THC
Total Hydrocarbons[a]	(ppmv)	34.5	1.0000
	(lb/MMBtu)	2.35E-02	
Benzene	(ppmv)	0.214	0.0330
	(lb/MMBtu)	7.76E-04	
Toluene	(ppmv)	0.063	0.0120
	(lb/MMBtu)	2.81E-04	
Xylenes	(ppmv)	0.039	0.0082
	(lb/MMBtu)	1.93E-04	
Propylene	(ppmv)	1.433	0.1190
	(lb/MMBtu)	2.79E-03	
PAH[b]	(ppmv)	0.0356	0.0090
	(lb/MMBtu)	2.12E-04	
Formaldehyde	(ppmv)	0.057	0.0034
	(lb/MMBtu)	7.89E-05	
Acetaldehyde	(ppmv)	0.012	0.0011
	(lb/MMBtu)	2.52E-05	
Acrolein	(ppmv)	0.003	0.0003
	(lb/MMBtu)	7.88E-06	

[a] Reported as methane.

[b] Reported as naphthalene.

TABLE 1-4b

Fuel Analysis Results
Diesel Drilling Rig

HHV, Btu/gal	138,300
API Gravity at 60° F	34.9
Specific Gravity at 60° F	0.850
F-factor, dscf/MMBtu	9,157
Carbon (wt. %)	87.06
Hydrogen (wt. %)	12.52
Oxygen (wt. %)	0.03
Nitrogen (wt. %)	0.35
Sulfur (wt. %)	0.03
Ash (wt. %)	0.01
Inorganics Results	
Arsenic (mg/kg)	<0.3
Beryllium (mg/kg)	<0.5
Bromide (mg/kg)	<2.0
Cadmium (mg/kg)	<0.3
Chloride (mg/kg)	<2.0
Chromium, total (mg/kg)	0.7
Copper (mg/kg)	<0.1
Lead (mg/kg)	<3.0
Manganese (mg/kg)	<1.0
Mercury (mg/kg)	<0.02
Nickel (mg/kg)	<3.0
Phosphorus (mg/kg)	<30
Selenium (mg/kg)	<0.3
Zinc (mg/kg)	4.8

TABLE 1-5a

Organic Compound Emission Rates
Crude Oil-Fired Steam Generator Bank
Scrubber Outlet

Compound		Emission Data	Weight Fraction of THC
Total Hydrocarbons[a]	(ppmv)	1.200	
	(lb/MMBtu)	5.66E-04	1.000
Benzene	(ppmv)	0.002	
	(lb/MMBtu)	5.36E-06	0.010
Toluene	(ppmv)	0.005	
	(lb/MMBtu)	1.42E-05	0.025
Xylenes	(ppmv)	<0.010	
	(lb/MMBtu)	<3.12E-05	<0.055
Propylene	(ppmv)	<0.010	
	(lb/MMBtu)	<1.24E-05	<0.022
PAH[b]	(ppmv)	0.003	
	(lb/MMBtu)	1.15E-05	0.020
Formaldehyde	(ppmv)	0.005	
	(lb/MMBtu)	4.01E-06	0.007
Acetaldehyde	(ppmv)	0.011	
	(lb/MMBtu)	1.44E-05	0.025
Acrolein	(ppmv)	<0.002	
	(lb/MMBtu)	<3.79E-06	<0.007

[a] Reported as methane.

[b] Reported as naphthalene.

TABLE 1-5b

Inorganic Compound Emission Rates
Crude Oil-Fired Steam Generator Bank

Species	Method	µg/m³	lb/MMBtu
Arsenic	MMT	3.88	2.74E-06
Beryllium	MMT	<2.62	<1.84E-06
Beryllium	104	1.22	8.58E-07
Bromide	FA	<149	<1.05E-04
Cadmium	MMT	2.53	1.79E-06
Chloride	FA	149	1.05E-04
Chromium, total	MMT	14.72	1.04E-05
Chromium, hexavalent	425	<2.43	<1.72E-06
Copper	MMT	7.38	5.21E-06
Lead	MMT	1.96	1.38E-06
Manganese	MMT	34.97	2.47E-05
Mercury	MMT	0.31	2.20E-07
Nickel	MMT	3355.	2.37E-03
Phosphorus	MMT	<131	<9.22E-05
Selenium	MMT	2.21	1.56E-06
Zinc	MMT	111.5	7.87E-05

Notes

MMT = EPA Multi-metals Train
104 = CARB Method 104
FA = Fuel Analysis
425 = CARB Method 425

TABLE 1-5c

Fuel Analysis Results
Crude Oil-Fired Steam Generator Bank

HHV, Btu/gal	151,100	
API Gravity at 60° F	10.8	
Specific Gravity at 60° F	0.994	
F-factor, dscf/MMBtu	9,425	
Carbon (wt. %)	86.21	
Hydrogen (wt. %)	10.76	
Oxygen (wt. %)	0.32	
Nitrogen (wt. %)	0.99	
Sulfur (wt. %)	1.67	
Ash (wt. %)	0.05	
Inorganics Results	**mg/kg**	**µg/m³**
Arsenic	<0.3	<22
Beryllium	<0.5	<37
Bromide	<2.0	<149
Cadmium	<0.3	<22
Chloride	2.0	149
Chromium, total	1.9	141
Copper	5.5	409
Lead	<3.0	<22.3
Manganese	<1.0	<74
Mercury	<0.02	<1.5
Nickel	69.0	5,135
Selenium	<3.0	<223
Phosphorus	<30	<2,233
Zinc	1.7	127

TABLE 1-6a

Organic Compound Emission Rates
Natural Gas-Fired Steam Generator

Compound		Emission Data	Weight Fraction of THC
Total Hydrocarbons	(ppmv)	0.9	1.0000
	(lb/MMBtu)	3.68E-04	
Benzene	(ppmv)	<0.002	0.0108
	(lb/MMBtu)	<3.99E-06	
Toluene	(ppmv)	<0.005	0.0333
	(lb/MMBtu)	<1.23E-05	
Xylenes	(ppmv)	<0.010	<0.0736
	(lb/MMBtu)	<2.71E-05	
Formaldehyde	(ppmv)	0.011	0.0227
	(lb/MMBtu)	8.36E-06	

TABLE 1-6b

Fuel Analysis Results
Natural Gas-Fired Steam Generator

HHV, Btu/cu.ft.	1,025
Specific Gravity (air = 1) dscf exhaust per scf fuel F-factor, dscf/MMBtu	0.5913 8.6982 8,630.437
Carbon (wt. %) Hydrogen (wt. %) Oxygen (wt. %) Nitrogen (wt. %) Sulfur (wt. %)	72.45 23.57 1.89 2.09 0.00
Total S, as H_2S (ppmv)	<1.0

2.0 RESULTS

The results of all tests are provided in the following subsections:

- 2.1: Fuel Analyses
- 2.2: Metals
- 2.3: PAH
- 2.4: VOC
- 2.5: Aldehydes
- 2.6: Total Hydrocarbons and Combustion Gases

Emission results are given as concentrations, and as emission rates in pounds per unit fuel input (such as lb/Mgal) and pounds per MMBtu input. Emission factors (lb/MMBtu) have been developed from fuel analysis data (F-factors), excess oxygen measurements, and concentration results.

Average concentration results were used to calculate emission factors. When three non-detectables were reported, the average detection limit is shown as the concentration, with a "less than" symbol to indicate the compound was not detected. For cases in which one or two non-detectables were reported, the three values (detected concentrations and detection limits) have been averaged as if all three were actual values.

Results are not blank corrected. Blank results have been presented as concentrations ($\mu g/m^3$ or ppmv) to allow comparison between sample and blank results. For metals and PAH blanks, the average of the sample volumes for each set of test runs was used to compute each blank concentration. Blank sampling and recovery are discussed in more detail in Section 4.

Emission factors in units of lb/MMBtu were calculated for all sources using fuel-specific F-factors corrected for oxygen concentration measured during sampling. The following equation was used to calculate these emission factors:

$$E = C_s F_d \left(\frac{20.9}{20.9 - O_2\%} \right) \quad (1)$$

where:

E	=	emission factor, lb/MMBtu
C_s	=	toxic concentration, lb/dscf
F_d	=	F-factor, dscf/MMBtu
$O_2\%$	=	percent oxygen in exhaust gas

Emissions were also calculated in units of lb/Mgal or lb/MMcf.

Crude oil-fired steam generator emission factors, in units of lb/Mgal, were calculated from specific fuel usage data and average stack velocity measured during sampling for EPA metals, chromium VI, and beryllium. These source-specific emission factors were calculated as follows:

$$E_l = C_s Q_{std} / U \quad (2)$$

where:

E_l	=	emission factor, lb/Mgal
Q_{std}	=	stack exhaust flowrate, dscfh
U	=	fuel usage, Mgal/hr

For all other sources, each emission factor in units of lb/Mgal or lb/MMcf was calculated using the source-specific fuel heating value and the previously calculated emission factor E (in units of lb/MMBtu) as shown below:

$$E_l = E \times HHV \quad (3)$$

where:

HHV	=	fuel heating value, MMBtu/Mgal, or MMBtu/MMcf

2.1 Fuel Analyses

Oil fuel analyses results are presented in Table 2-1. One crude oil sample from the crude oil-fired steam generator bank was analyzed by Zalco Laboratories of Bakersfield, California for heating value, ultimate analysis, and F-factor. Two additional crude oil samples were obtained at regular intervals during the testing. These two samples were analyzed by Coast-To-Coast Laboratory of San Luis Obispo, California for AB 2588 metals, bromide, and chloride.

Two diesel oil samples were obtained from each of the two IC engines tested. One sample was analyzed for trace metals, bromide, and chloride by Coast-To-Coast Laboratory. One sample from each source was analyzed for heating value, ultimate analysis, and F-factor by Zalco Laboratories.

Metals results for crude oil samples indicate that nickel averaged 69 ppmw; barium, copper, chromium, and zinc were present between 1.7 and 5.8 ppmw; none of the other metals were detected.

Diesel fuel analyses showed that zinc was detected at 4.8 ppmw; chromium was detected in one sample at 0.7 ppmw; and copper was detected in one sample at 0.1 ppmw; none of the other metals were detected.

One natural gas fuel sample from the gas-fired steam generator was analyzed by Zalco Laboratories for heating value, ultimate analysis, sulfur (as H_2S), and F-factor. Results of the gas fuel analysis are presented in Table 2-2.

Laboratory reports from Zalco and Coast-to-Coast Laboratories are provided in Appendix B.

2.2 Metals

Trace metals emissions were sampled at the scrubber outlet of a bank of three crude oil-fired steam generators at Santa Fe Energy's North Midway Field in Kern County. These separate test methods were used: EPA MMT, CARB 104 (beryllium), and CARB 425 (Cr & Cr^{+6}). The draft EPA Multimetals Train (MMT) and the CARB Method 104 beryllium sampling train were operated simultaneously. These sampling methods are discussed in more detail in Section 4. All metals samples were analyzed by Coast-To-Coast Laboratories of San Luis Obispo, California.

TABLE 2-1

Fuel Oil Analyses

Date (1990): Oil Type: Location:	Sept. 14 Diesel Unocal, Ventura	Sept. 18 Diesel SWEPI, Ventura	Sept. 21 Crude Santa Fe, Kern
Compound	Result	Result	Result
Heating Valve (Btu/gal)	141,800	138,300	151,100
API Gravity @ 60°F	31.7	34.9	10.8
Specific Gravity @ 60°F	0.867	0.850	0.994
F Factor (dscf/MMBtu)	9,194	9,157	9,425
Carbon (wt. %)	86.71	87.06	86.21
Hydrogen (wt. %)	13.12	12.52	10.76
Oxygen (wt %)	<0.1	0.03	0.32
Nitrogen (wt. %)	0.17	0.35	0.99
Sulfur (wt. %)	0.004	0.03	1.67
Ash (wt. %)	<0.01	0.01	0.05
Arsenic (mg/kg)	<0.3	<0.3	<0.3
Beryllium (mg/kg)	<0.5	<0.5	<0.5
Bromide (mg/kg)	<2.0	<2.0	<2.0
Cadmium (mg/kg)	<0.3	<0.3	<0.3
Chloride (mg/kg)	<2.0	<2.0	2.0
Chromium (mg/kg)	<0.5	0.7	1.9
Copper (mg/kg)	0.1	<0.1	5.5
Lead (mg/kg)	<3.0	<3.0	<3.0
Manganese (mg/kg)	<1.0	<1.0	<1.0

TABLE 2-1 (cont.)

Date (1990): Oil Type: Location:	Sept. 14 Diesel Unocal, Ventura	Sept. 18 Diesel SWEPI, Ventura	Sept. 21 Crude Santa Fe, Kern
Compound	Result	Result	Result
Mercury (mg/kg)	<0.02	<0.02	<0.02
Nickel (mg/kg)	<3.0	<3.0	69.0
Phosphorus (mg/kg)	<30	<30	<30
Selenium (mg/kg)	<0.3	<0.3	<0.3
Zinc (mg/kg)	1.9	4.8	1.7

TABLE 2-2

Fuel Gas Analysis

Site: **SWEPI, Coalinga, Fresno County**
Date: **September 27, 1990**

Btu/cu.ft. (HHV): 1,025 Specific Volume (cu.ft./lb): 22.16
DSCF Exhaust per SCF Fuel (0% Oxygen): 8.698 F Factor (dscf/MMBtu): 8,631
Total Sulfur: as H_2S (ppmv) = <1.0; as S (grains/100 scf) = <0.06

Components	Mole %	Weight %
Hydrogen	0.000	0.000
Carbon Dioxide	0.893	2.298
Oxygen	0.116	0.218
Nitrogen	1.273	2.086
Carbon Monoxide	0.000	0.000
Hydrogen Sulfide	0.000	0.000
Methane	94.216	88.414
Ethane	2.787	4.901
Propane	0.532	1.372
Isobutane	0.046	0.157
n-Butane	0.064	0.219
Isopentane	0.019	0.079
n-Pentane	0.021	0.087
Hexanes +	0.034	0.170
Totals	100.000	100.000

TABLE 2-2 (cont.)

Site: **SWEPI, Coalinga, Fresno County**
Date: **September 27, 1990**

Btu/cu.ft. (HHV): 1,025 Specific Volume (cu.ft./lb): 22.16
DSCF Exhaust per SCF Fuel (0% Oxygen): 8.698 F Factor (dscf/MMBtu): 8,631
Total Sulfur: as H_2S (ppmv) = <1.0; as S (grains/100 scf) = <0.06

Elements	Weight %
Carbon	72.45
Hydrogen	23.57
Oxygen	1.89
Nitrogen	2.09
Sulfur	0.00
Totals	99.99

The results from the MMT and beryllium sampling are provided in Table 2-3. Results from the chromium sampling are provided in Table 2-4. The laboratory reports from these tests are provided in Appendix B.

Nickel was the most prevalent metal in the emissions from the crude oil-fired steam generators. Nickel concentrations averaged 3,373 $\mu g/m^3$. Average zinc concentration was greater than 100 $\mu g/m^3$, manganese averaged 35 $\mu g/m^3$.

Beryllium was measured by CARB Method 104 during the MMT testing for CARB method validation. Beryllium was not detected by the MMT at an average detection limit of 2.62 $\mu g/m^3$. Beryllium was detected at 1.4 $\mu g/m^3$ for one sample run, and not detected above 2.2 $\mu g/m^3$ for the other two runs of CARB Method 104.

The EPA MMT results also included bromide. Due to the limitations of the analytical method, the bromide detection limit was three orders of magnitude greater than the other analytes. For this reason, the fuel analysis result for bromide was used to calculate emission factors. The average crude oil fuel analysis result (<2 mg/kg) was used to calculate an emission concentration based on fuel usage and stack exhaust flow measurements, as follows:

$$C_S = C_F \times F / Q_{std} \qquad (4)$$

where:

C_S = emission concentration, $\mu g/dscm$
C_F = fuel concentration $\mu g/gal$
F = fuel usage, gal/hr
Q_{std} = stack flowrate, dscm/hr

Chloride emission rate was calculated from the fuel analysis in the same manner as bromide emissions. Equation 4 was used to determine the emission concentration based on a fuel chloride concentration of 2 mg/kg.

2.3 PAH

Results of PAH analyses by CARB Method 429 are presented in Tables 2-5 through 2-7. Samples were analyzed by Enseco-CRL Laboratory of Sacramento, California. PAH testing was performed at the crude oil-fired steam generator bank of Santa Fe Energy, North Midway (Kern County). PAH emissions were also measured from an 850-hp diesel-fired drilling rig IC

TABLE 2-3

Trace Metals Results
EPA MMT and CARB Method 104

Site: Crude Oil-Fired Steam Generator Scrubber - Kern County								
Date (1990):	Sept. 22	Sept. 23	Sept. 23	Average			Blank	
Test:	Run A	Run B	Run C					
Species	µg/m³	µg/m³	µg/m³	µg/m³	lb/Mgal	lb/MMBtu	µg/Sample	µg/m³
Arsenic	3.32	3.87	4.45	3.88	0.0004	2.74E-06	<3	<1.93
Beryllium (by multi-metals)	<2.66	<2.21	<2.96	<2.61	<0.0003	<1.84E-06	<4	<2.57
Beryllium (by CARB 104)	<2.15	0.45	1.04	1.22	0.0001	8.58E-07	1.0	0.60
Cadmium	5.05	0.77	1.78	2.53	0.0003	1.79E-06	<0.4	<0.26
Chromium, total[a]	16.60	12.73	14.82	14.72	0.0016	1.04E-05	8	5.15
Copper	8.63	6.09	7.41	7.38	0.0008	5.21E-06	3	1.93
Lead	1.99	<1.66	<2.22	1.96	0.0002	1.38E-06	<3	<1.93
Manganese	53.12	22.14	29.64	34.97	0.0039	2.47E-05	50	32.17
Mercury	0.48	0.08	0.37	0.31	0.00003	2.20E-07	<0.1	<0.06
Nickel	3,519	3,210	3,335	3,355	0.3741	2.37E-03	<30	<19.30
Selenium	<1.99	<1.66	2.96	2.21	0.0002	1.56E-06	<3	<1.93
Phosphorus	<133.	<111.	<148	<131.	<0.0145	9.22E-05	<200	<128.69
Zinc	66.40	149.4	118.6	111.5	0.0124	7.87E-05	80	51.48
Bromide	Calculated from Fuel Analysis			<152	<0.0011	<1.08E-04	NA	NA
Chloride	Calculated from Fuel Analysis			152	0.0011	1.08E-04	NA	NA

F Factor = 9,425 dscf/MMBtu.
HHV = 151,100 Btu/gal.
Fuel usage = 1,026 gal/hr.
Stack flowrate = 30,572 dscfm.
[a] Total chromium is not listed in AB-2588; See Table 2-4 for hexavalent chromium results.
NA = not applicable.

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TABLE 2-4

Chromium Results
CARB Proposed Method 425

Site: Crude Oil-Fired Steam Generator Scrubber - Kern County

Date:	Sept. 21	Sept. 22	Sept. 22	Average			Blank	
	Run A ($\mu g/m^3$)	Run B ($\mu g/m^3$)	Run C ($\mu g/m^3$)	$\mu g/m^3$	lb/Mgal	lb/MMBtu	μg/Sample	$\mu g/m^3$
Total Chromium	5.34	5.30	5.79	5.48	0.0006	3.87E-06	4.0	4.17
Hexavalent Chromium	<2.27	3.11	<1.93	<2.43	<0.0002	<1.72E-06	<2	<2.09

F Factor = 9.425 dscf/MMBtu
HHV = 151,100 Btu/gal
Fuel usage = 1026 gal/hr
Stack flowrate = 30,572 dscfm

TABLE 2-5

Polycyclic Aromatic Hydrocarbon Emissions

Site: Diesel-Fired Workover Rig - Unocal, Ventura County
Date: September 14, 1990

Compound	Run A	Run B	Run C	Average			Blank	
	µg/m³	µg/m³	µg/m³	µg/m³	lb/Mgal	lb/MMBtu	µg/Sample	µg/m³
Naphthalene	78.27	15.23	32.19	41.90	0.0166	1.17E-04	38	15.37
Acenaphthylene	4.44	4.80	1.61	3.61	0.0014	1.01E-05	0.23	0.09
Acenaphthene	1.77	0.68	0.59	1.01	0.0004	2.83E-06	0.083	0.03
Fluorene	3.03	2.93	<0.54	2.17	0.0009	6.04E-06	0.091	0.04
Phenanthrene	7.31	6.21	0.80	4.77	0.0019	1.33E-05	0.090	0.04
Anthracene	0.78	0.68	0.08	0.51	0.0002	1.43E-06	0.0037	0.001
Fluoranthene	1.57	0.96	0.18	0.90	0.0004	2.51E-06	0.021	0.01
Pyrene	2.61	1.64	0.30	1.51	0.0006	4.22E-06	0.014	0.01
Benz(a)anthracene	0.63	0.04	0.05	0.24	0.0001	6.62E-07	<0.0065	<0.003
Chrysene	0.13	0.07	0.08	0.09	0.00004	2.61E-07	<0.0061	<0.002
Benzo(b)fluoranthene	0.10	<0.03	<0.07	0.07	0.00003	1.88E-07	<0.0038	<0.002
Benzo(k)fluoranthene	0.16	<0.11	<0.05	0.11	0.00004	3.00E-07	<0.00069	<0.0003
Benzo(a)pyrene	<0.15	<0.15	<0.09	<0.13	<0.00005	<3.65E-07	<0.010	<0.004
Indeno(1,2,3-cd)pyrene	<0.02	<0.34	<0.34	<0.17	<0.0001	<4.75E-07	<0.011	<0.004
Dibenz(a,h)anthracene	<0.31	<0.37	<0.13	<0.27	<0.0001	<7.51E-07	<0.026	<0.01
Benzo(g,h,i)perylene	<0.03	<0.40	<0.17	<0.20	<0.0001	<5.61E-07	<0.013	<0.005
Total PAH	101.29	34.63	37.08	57.67	0.0228	1.61E-04	38.61	15.62

F Factor = 9,194 dscf/MMBtu
HHV = 141,800 Btu/gal
Oxygen (dry basis) = 16.6%

TABLE 2-6

Polycyclic Aromatic Hydrocarbon Emissions

Site: Diesel-Fired Drilling Rig - SWEPI, Ventura County
Date: September 18, 1990

Compound	Run A	Run B	Run C	Average			Blank	
	µg/m³	µg/m³	µg/m³	µg/m³	lb/Mgal	lb/MMBtu	µg/Sample	µg/m³
Naphthalene	117.98	120.48	111.97	116.81	0.0180	1.30E-04	29	14.68
Acenaphthylene	7.69	8.61	8.51	8.27	0.0013	9.23E-06	<0.0012	<0.001
Acenaphthene	5.64	4.47	2.46	4.19	0.0006	4.68E-06	0.016	0.01
Fluorene	11.80	11.47	11.20	11.49	0.0018	1.28E-05	0.021	0.01
Phenanthrene	37.44	35.57	36.73	36.58	0.0056	4.08E-05	0.093	0.05
Anthracene	0.87[a]	0.56[a]	1.88	1.11	0.0002	1.23E-06	<0.0042	<0.002
Fluoranthene	3.80	3.56	3.49	3.62	0.0006	4.03E-06	0.022	<0.01
Pyrene	3.64	3.16	3.18	3.33	0.0005	3.71E-06	0.013	0.01
Benz(a)anthracene	0.51	0.53	0.63	0.56	0.0001	6.22E-07	0.0022	0.001
Chrysene	1.44	1.20	1.48	1.37	0.0002	1.53E-06	<0.0055	<0.003
Benzo(b)fluoranthene	0.82	<0.92	<1.25	1.00	0.0002	1.11E-06	0.0025	0.001
Benzo(k)fluoranthene	<0.45[a]	<0.06	<0.08	0.20	<0.00003	<2.18E-07	<0.00043	<0.0002
Benzo(a)pyrene	<0.31[a]	<0.13	<0.25	<0.23	<0.00004	<2.57E-07	<0.0051	<0.003
Indeno(1,2,3-cd)pyrene	<0.30	<0.38[a]	<0.43	<0.37	<0.0001	<4.14E-07	<0.0065	<0.003
Dibenz(a,h)anthracene	<0.33	<0.30	<0.30	<0.31	<0.00005	<3.46E-07	<0.013	<0.01
Benzo(g,h,i)perylene	<0.45[a]	<0.51[a]	<0.54[a]	<0.50	<0.0001	<5.56E-07	<0.0079	<0.004
Total PAH	193.47	191.92	184.37	189.92	0.0293	2.12E-04	29.21	14.79

F Factor = 9,157 dscf/MMBtu
HHV = 138,300 Btu/gal
Oxygen (dry basis) = 10.2%
[a] Maximum possible concentration for analytical method

TABLE 2-7

Polycyclic Aromatic Hydrocarbon Emissions

Site: Crude Oil-Fired Steam Generator - Kern County
Date: September 26, 1990

Compound	Run A	Run B	Run C	Average			Blank	
	µg/m³	µg/m³	µg/m³	µg/m³	lb/Mgal	lb/MMBtu	µg/Sample	µg/m³
Naphthalene	15.00	15.15	13.97	14.71	0.0017	1.04E-05	33	14.68
Acenaphthylene	0.01	0.04	0.002	0.02	0.000002	1.15E-08	0.028	0.01
Acenaphthene	0.03	0.25	0.01	0.10	0.00001	6.77E-08	0.059	0.03
Fluorene	0.07	0.43	0.01	0.17	0.00002	1.20E-07	0.14	0.06
Phenanthrene	0.22	1.52	0.04	0.59	0.0001	4.17E-07	0.61	0.27
Anthracene	0.02	0.22	0.003	0.08	0.00001	5.77E-08	<0.011	<0.01
Fluoranthene	0.11	0.49	0.01	0.20	0.00002	1.44E-07	0.11	0.05
Pyrene	0.06	0.26	0.01	0.11	0.00001	7.73E-08	0.072	0.03
Benz(a)anthracene	0.04	0.14	0.005	0.06	0.00001	4.48E-08	0.017	0.01
Chrysene	0.04	0.17	0.01	0.07	0.00001	5.24E-08	0.018	0.01
Benzo(b)fluoranthene	<0.04	<0.15	<0.01	<0.06	<0.00001	<4.53E-08	<0.0076	<0.003
Benzo(k)fluoranthene	<0.01	<0.005	<0.002	<0.01	0.000001	<3.56E-09	<0.0022	<0.001
Benzo(a)pyrene	0.04	0.07	<0.005	0.04	0.000004	2.68E-08	0.0052	0.002
Indeno(1,2,3-cd)pyrene	0.02	0.08	<0.01	0.04	0.000004	2.66E-08	<0.012	<0.005
Dibenz(a,h)anthracene	<0.03	<0.07	<0.01	<0.04	<0.000004	<2.62E-08	<0.42	<0.187
Benzo(g,h,i)perylene	0.03	0.06	<0.01	0.03	0.000003	2.23E-08	<0.013	<0.006
Total PAH	15.76	19.11	14.11	16.33	0.0019	1.15E-05	34.53	15.35

F Factor = 9,425 dscf/MMBtu
HHV = 151,100 Btu/gal
Oxygen (dry basis) = 3.5%
Stack flowrate = 30,572 dscfm
Fuel usage = 968 gal/hr

engine operating at SWEPI's Ventura Facility, and a 350-hp diesel-fired workover rig IC engine operating at by Unocal's Bardsdale Facility near Piru, California.

Results shown in Tables 2-5 through 2-7 are not blank corrected. Blank train results are also shown in Tables 2-5 through 2-7.

Naphthalene concentrations averaged 42 $\mu g/m^3$ from the diesel-fired workover rig engine and 117 $\mu g/m^3$ from the diesel-fired drilling rig engine. Total PAH averaged 58 $\mu g/m^3$ and 190 $\mu g/m^3$ from the diesel-fired workover rig and drilling rig, respectively. It should be noted that the workover rig blank train naphthalene result was 38 µg/sample, which is equivalent to 15 $\mu g/m^3$ based on the average sample volume (87.3 dscf) at this site.

Naphthalene concentration averaged 14.7 $\mu g/m^3$ from the crude oil-fired steam generator bank. Total PAH averaged 16.3 $\mu g/m^3$ at this site. The crude oil-fired steam generator blank-train results are 33 µg naphthalene per sample and 34.1 µg total PAH per sample. Based on the average sample volume (79.4 dscf), these results indicate blank concentrations of 14.7 $\mu g/m^3$ and 15.3 $\mu g/m^3$ for naphthalene and total PAH, respectively.

The PAH samples were collected in a sample train that uses XAD-2 resin as an adsorption medium (see Section 4.4). Based on discussions in CARB source test method workshops held in July and December 1990, naphthalene contamination caused by breakdown of the XAD-2 resin is a well-documented phenomenon. The results of their test program indicate that the XAD-2 resin samples contained an average of 33 µg/sample (±5 µg/sample) of baseline naphthalene contamination. ENSR recommends that the results shown in Tables 2-5 through 2-7 be corrected for naphthalene blank concentrations when calculating naphthalene emission rates for AB 2588 Emission Inventory Reports. The emission factors, in lb/MMBtu, shown for naphthalene should be corrected as follows:

$$E_C = E(C_S - C_B)/C_S \qquad (5)$$

where:

E_C = corrected naphthalene emission factor, lb/MMBtu
C_B = Blank concentration, $\mu g/m^3$

TABLE 2-8

VOC Results
CARB Method 410A

Site: Diesel-Fired Workover Rig IC Engine - Ventura County
Date: September 14, 1990

Compound	Run A (ppmv)	Run B (ppmv)	Run C (ppmv)	Average			N_2 Blank (ppmv)	Ambient Blank (ppmv)
				ppmv	lb/Mgal	lb/MMBtu		
Benzene	0.130	0.160	0.150	0.147	0.1880	1.33E-03	<0.002	0.004
Toluene	0.050	0.049	0.051	0.050	0.0789	5.56E-04	<0.005	<0.005
Xylenes	0.026	0.011	0.026	0.021	0.0366	2.58E-04	<0.010	<0.010
Propylene	0.680	0.840	0.860	0.793	0.5477	3.86E-03	<0.010	<0.010

F Factor = 9,194 dscf/MMBtu
HHV = 141,800 Btu/gal
Oxygen (dry basis) = 16.6%

TABLE 2-9

VOC Results
CARB Method 410A

Site: Diesel-Fired Drilling Rig IC Engine - Ventura County
Date: September 18, 1990

Compound	Run A (ppmv)	Run B (ppmv)	Run C (ppmv)	Average			N_2 Blank (ppmv)	Ambient Blank (ppmv)
				ppmv	lb/mgal	lb/MMBtu		
Benzene	0.220	0.210	0.210	0.213	0.1073	7.76E-04	0.006	<0.002
Toluene	0.062	0.066	0.063	0.064	0.0388	2.81E-04	<0.005	0.006
Xylenes	0.040	0.041	0.038	0.040	0.0268	1.93E-04	<0.010	0.021
Propylene	1.300	1.500	1.500	1.433	0.3863	2.79E-03	0.009	<0.010

F Factor = 9,157 dscf/MMBtu
HHV = 138,300 Btu/gal
Oxygen (dry basis) = 10.2%

TABLE 2-10

VOC Results
CARB Method 410A

Site: Crude Oil-Fired Steam Generator Scrubber Outlet - Kern County
Date: September 20, 1990

Compound	Run A (ppmv)	Run B (ppmv)	Run C (ppmv)	Average			N_2 Blank (ppmv)	Ambient Blank (ppmv)
				ppmv	lb/mgal	lb/MMBtu		
Benzene	0.003	0.003	<0.002	0.003	0.0010	6.14E-06	0.003	0.003
Toluene	0.005	0.005	<0.005	0.005	0.0022	1.42E-05	<0.005	<0.005
Xylenes	<0.010	<0.010	<0.010	<0.010	<0.0049	<3.13E-05	<0.010	<0.010
Propylene	<0.010	<0.010	<0.010	<0.010	<0.0019	<1.24E-05	<0.010	<0.010

F Factor = 9,425 dscf/MMBtu
Oxygen (dry basis) = 3.6%
Stack flowrate = 30,572 dscfm
Fuel usage = 1,026 gal/hr

TABLE 2-11

VOC Results
CARB Method 410A

Site: Crude Oil-Fired Steam Generator Scrubber Outlet - Kern County
Date: September 26, 1990

Compound	Run A (ppmv)	Run B (ppmv)	Run C (ppmv)	Average			N_2 Blank (ppmv)	Ambient Blank (ppmv)
				ppmv	lb/mgal	lb/MMBtu		
Benzene	<0.002	<0.002	<0.002	<0.002	<0.0008	<4.58E-06	<0.002	<0.002
Toluene	<0.005	<0.005	<0.005	<0.005	<0.0024	<1.41E-05	<0.005	<0.005
Xylenes	<0.010	<0.010	<0.010	<0.010	<0.0052	<3.11E-05	<0.010	<0.010
Propylene	<0.010	<0.010	<0.010	<0.010	<0.0021	<1.23E-05	<0.010	<0.010

F Factor = 9,425 dscf/MMBtu
Oxygen (dry basis) = 3.6%
Stack flowrate = 30,572 dscfm
Fuel usage = 968 gal/hr

TABLE 2-12

VOC Results
CARB Method 410A

Site: Natural Gas-Fired Steam Generator - Fresno County
Date: September 27, 1990

Compound	Run A (ppmv)	Run B (ppmv)	Run C (ppmv)	Average			N_2 Blank (ppmv)	Ambient Blank (ppmv)
				ppmv	lb/MMcf	lb/MMBtu		
Benzene	<0.002	<0.002	<0.002	<0.002	<0.004	<3.99E-06	<0.002	<0.002
Toluene	<0.005	<0.005	<0.005	<0.005	<0.010	<1.23E-05	<0.005	<0.005
Xylenes	<0.010	<0.010	<0.010	<0.010	<0.030	<2.71E-05	<0.010	<0.010

F Factor = 8,631 dscf/MMBtu
HHV = 1,025 Btu/cu.ft.
Oxygen (dry basis) = 2.6%

TABLE 2-13

Aldehyde Results
CARB Method 430

Site: Diesel-Fired Workover Rig IC Engine - Ventura County
Date: September 14, 1990

Compound	Run A (ppmv)	Run B (ppmv)	Run C (ppmv)	Average			N_2 Blank (ppmv)	Ambient Sample (ppmv)
				ppmv	lb/Mgal	lb/MMBtu		
Formaldehyde	0.394	0.283	0.175	0.284	0.1400	9.87E-04	0.013	0.012
Acetaldehyde	0.097	0.082	0.095	0.091	0.0658	4.64E-04	0.009	0.010
Acrolein	0.035	0.010	0.017	0.020	0.0187	1.32E-04	<0.002	<0.002

F Factor = 9,194 dscf/MMBtu
HHV = 141,800 Btu/gal
Oxygen (dry basis) = 16.6%

TABLE 2-14

Aldehyde Results
CARB Method 430

Site: Diesel-Fired Drilling Rig IC Engine - Ventura County
Date: September 18, 1990

Compound	Run A (ppmv)	Run B (ppmv)	Run C (ppmv)	Average			N_2 Blank (ppmv)	Ambient Sample (ppmv)
				ppmv	lb/mgal	lb/MMBtu		
Formaldehyde	0.009	0.024	0.136	0.057	0.0109	7.89E-05	0.012	0.011
Acetaldehyde	0.023	0.008	0.006	0.012	0.0035	2.52E-05	0.015	0.007
Acrolein	0.005	<0.002	<0.002	0.003	0.0011	7.88E-06	<0.002	<0.002

F Factor = 9,157 dscf/MMBtu
HHV = 138,300 Btu/gal
Oxygen (dry basis) = 10.2%

TABLE 2-15

Aldehyde Results
CARB Method 430

Site: Crude Oil-Fired Steam Generator Scrubber Outlet - Kern County
Date: September 20, 1990

Compound	Run A (ppmv)	Run B (ppmv)	Run C (ppmv)	Average			N_2 Blank (ppmv)	Ambient Sample (ppmv)
				ppmv	lb/mgal	lb/MMBtu		
Formaldehyde	0.006	0.003	0.005	0.005	0.0007	4.16E-06	0.008	0.012
Acetaldehyde	0.026	0.011	0.009	0.015	0.0031	1.99E-05	0.003	0.008
Acrolein	<0.002	<0.002	<0.002	<0.002	0.0006	<3.80E-06	<0.002	<0.002

F Factor = 9,425 dscf/MMBtu
HHV = 151,100 Btu/gal
Oxygen (dry basis) = 3.6%

TABLE 2-16

Aldehyde Results
CARB Method 430

Site: Crude Oil-Fired Steam Generator Scrubber Outlet - Kern County
Date: September 26, 1990

Compound	Run A (ppmv)	Run B (ppmv)	Run C (ppmv)	Average			N_2 Blank (ppmv)	Ambient Sample (ppmv)
				ppmv	lb/mgal	lb/MMBtu		
Formaldehyde	0.006	0.005	0.003	0.004	0.0006	3.85E-06	0.005	0.003
Acetaldehyde	0.007	0.006	0.007	0.007	0.0015	8.87E-05	0.007	0.006
Acrolein	<0.002	<0.002	<0.002	<0.002	<0.0006	<3.78E-05	<0.002	<0.002

F Factor = 9.425 dscf/MMBtu
HHV = 151,100 Btu/gal
Oxygen (dry basis) = 3.6%

TABLE 2-17

Aldehyde Results
CARB Method 430

Site: Natural Gas-Fired Steam Generator - Fresno County
Date: September 27, 1990

Compound	Run A (ppmv)	Run B (ppmv)	Run C (ppmv)	Average			N_2 Blank (ppmv)	Ambient Sample (ppmv)
				ppmv	lb/MMcf	lb/MMBtu		
Formaldehyde	0.008	0.005	0.020	0.011	0.010	8.36E-06	0.010	0.009

F Factor = 8,631 dscf
HHV = 1,025 Btu/cu.ft.
Oxygen (dry basis) = 2.6%

Formaldehyde was detected at an average of 0.008 ppmv in the ambient air near the crude oil-fired steam generator bank, which is almost twice the average stack concentration of formaldehyde. Acetaldehyde was present in the ambient air at this site at 0.006 ppmv, while acetaldehyde in the stack averaged 0.011 ppmv. At the natural gas-fired steam generator site, formaldehyde was detected at 0.009 ppmv. The stack concentration was 0.011 ppmv.

2.6 Total Hydrocarbons and Combustion Gases

Emissions of total hydrocarbons, oxygen, carbon dioxide, and carbon monoxide were measured at all four sites. Table 2-18 provides a summary of the average concentrations of these gases from each source.

THC was measured at each source to permit the development of VOC species profiles for volatile and semivolatile AB 2588 compounds measured during this program. THC concentrations, reported as methane, averaged 1.2 ppm in the crude oil-fired steam generator exhaust, 0.9 ppm in the gas-fired steam generator exhaust, and 34.5 and 67.8 ppmv, respectively, in the exhausts of the drilling rig and workover rig engines.

THC measurements of ambient air near the crude oil-fired steam generator bank indicate levels of 5 ppmv. Ambient THC concentration was approximately four times higher than the stack THC concentration.

Difficulty was experienced in maintaining the Ratfisch 55 THC analyzer within span and zero calibration during testing of the natural gas-fired steam generator at SWEPI's Coalinga Field. Instrument drift was noticeably higher than at the other test sites. ENSR's onsite test supervisor suspected voltage fluctuations in the power supply available at the lease. Based on the degree of drift observed during testing, the THC concentrations reported for the natural gas-fired steam generator are accurate within $\pm$ 50 percent.

TABLE 2-18

Total Hydrocarbons and Combustion Gases

Date	Site	O_2 (%)	CO_2 (%)	THC[a] (ppm)	CO (ppm)
09/14	Unocal - Workover Rig	16.6	3.5	67.8	1,500
09/18	SWEPI - Drilling Rig	10.2	9.4	34.5	308
09/21	Santa Fe - Crude Oil-Fired Steam Generator	3.6	13.7		
09/22		3.6	13.2		2.0
09/23		3.5	13.2		
09/26		3.5	13.6	1.2	4.6
09/27	SWEPI - Gas-Fired Steam Generator	2.6	10.5	0.9	0.1

[a] Reported as methane.

3.0 UNIT/PROCESS DESCRIPTIONS

3.1 Description of Equipment

WSPA member companies have gas, diesel, and crude oil combustion sources operating at various oil and gas production facilities in Fresno County. Diesel- and gas-fired equipment is operated at member company facilities in Ventura County. The types of combustion equipment used in oil and gas production operations vary little between companies, as the equipment selected is primarily a function of site-specific oil field characteristics. The categories of combustion equipment used in Fresno and Ventura Counties are discussed separately below.

Fresno County

Crude oil is used as fuel in steam generators that inject steam in thermally enhanced oil recovery (TEOR) fields. Crude oil is also combusted in heater treaters and process heaters used in oil dehydration operations. Diesel is used as fuel in internal combustion (IC) engines serving as prime movers on drilling and workover rigs. Gas generated during TEOR operations, or TEOR gas, is burned along with crude oil or natural gas in some steam generators. Field gas is used as fuel in steam generators used in TEOR operations and in a variety of IC engines, such as those used to drive pumping units and gas compressor engines.

Ventura County

Diesel is used as fuel in IC engines serving as prime movers on drilling and workover rigs. Field gas is used as fuel in heater treaters, reboilers, and IC engines. There are no TEOR operations in Ventura County, and no crude oil is fired at Ventura County oil production facilities.

3.2 Unit Descriptions

3.2.1 Crude Oil-Fired Steam Generator

The crude oil-fired steam generator test site was a bank of three 62.5 MMBtu/hr steam generators owned by Santa Fe Energy Company. The steam generators vent their exhaust through a common duct leading to an SO_2 scrubber. The exhaust leaves the scrubber through an 8-foot diameter stack at approximately 140°F. All tests, shown in Table 1-2, were performed through sampling ports installed in the stack, approximately 50 feet above ground level and 3 feet below the stack outlet. The steam generators are equipped with low-NO_x burners and automatic O_2 trim systems which maintained the excess oxygen at approximately 3.5 percent (dry basis). Generators tested between September 20 and 26, 1990 were numbers 105, 112, and 113.

Originally, crude oil-fired steam generator testing was to be performed in Fresno County. Due to the sudden increase in crude oil prices in the period preceding the scheduled field sampling, no member companies in Fresno County were firing crude oil. With the approval of the Fresno County APCD, the test was relocated to Santa Fe's North Midway Field in Kern County, where crude oil remains the predominant steam generator fuel.

3.2.2 Natural Gas-Fired Steam Generator

A natural gas-fired, 59.5 MMBtu/hr steam generator owned by SWEPI in Fresno County was tested for BTX, formaldehyde, and THC emissions on September 27, 1990. The exhaust gas temperature was approximately 350°F.

3.2.3 Diesel-Fired Drilling Rig IC Engines

An 850-hp, diesel-fired drilling rig IC engine was tested on September 18, 1990. The engine was part of a bank of three similar engines used to drive Kenai Drilling Rig No. 24 operated on the SWEPI Taylor Lease in Ventura County. The exhaust gas temperature averaged 785°F. Sampling was performed at the centerpoint of the 8-inch diameter, horizontal stack. The rig was drilling at a rate of approximately 30 ft/hr during testing.

3.2.4 Diesel-Fired Workover Rig Engine

Testing was performed on a 350-hp, diesel-fired workover rig IC engine owned by Oilfield Services Company and operated at Unocal's Torry Road facility in Ventura County. The engine was tested on September 14, 1990. Exhaust gas temperature averaged approximately 500° F.

4.0 TEST METHODS

4.1 Introduction

Emissions from one natural gas-fired steam generator (SWEPI), three crude oil-fired steam generators (Santa Fe), one diesel-fired drilling rig IC engine (SWEPI), and one diesel-fired workover rig IC engine (Unocal) were sampled between September 14 and September 27, 1990. The exact sample dates are given in Table 4-1 below.

TABLE 4-1

Equipment Type	Sample Date
Diesel IC Engine, Workover Rig	09/14/90
Diesel IC Engine, Drilling Rig	09/18/90
Crude Oil-Fired Steam Generator	09/20-23/90, 09/26/90
Gas-Fired Steam Generator	09/27/90

All VOC and aldehyde samples were returned to ENSR's Air Toxics Laboratory in Camarillo, California for analysis. PAH samples were shipped to Enseco-CRL Laboratory in Sacramento, California. All metal samples were analyzed by Coast-To-Coast Laboratory in San Luis Obispo, California, and fuels were analyzed by both Coast-To-Coast and Zalco Laboratory in Bakersfield, California. All samples were protected from sunlight during transportation. Impinger catches were transported on ice. Strict adherence to chain-of-custody procedures was maintained at all times during the test program. See Appendix A for a complete discussion of the quality control/quality assurance procedures used during these emission tests.

The following sections briefly describe the analytical procedures used in each emission test.

4.2 Method 410A (BTX)

Each BTX test consisted of three 30-minute sampling runs, one nitrogen gas method blank, and one ambient air sample. The whole air samples (BTX and propylene) were collected in new 12-liter Tedlar bags. One Tedlar bag was purged with nitrogen at each test site and tested for blank levels of each analyte. The ambient sample was collected near the combustion air inlet of each combustion device. Figure 4-1 is a schematic of the Method 410A sample train.

Samples were returned to ENSR's Air Toxics Laboratory where they were analyzed within 48 hours. BTX was analyzed by gas chromatography/photoionization detection (GC/PID) and propylene was analyzed by GC/flame ionization (GC/FID).

VOC samples were obtained from the crude oil-fired steam generator on September 20 and September 26, 1990. Sampling was repeated at this site as THC concentration data were not available during September 20 testing, due to a malfunction of the THC monitor.

4.3 Method 430 (Aldehydes)

Aldehyde samples were collected using CARB Method 430. Each test performed on the crude oil-fired steam generator bank (three generators total) and the natural gas-fired steam generator consisted of three 1-hour sampling runs, one nitrogen gas method blank, and one ambient air sample. The Method 430 sample train is shown schematically in Figure 4-2.

Each test performed on the diesel-fired IC engines (workover and drilling rigs) consisted of three 60-minute sampling runs, one nitrogen gas method blank, and one ambient air sample.

Ambient air samples were taken near the combustion air inlet for each combustion device.

Aldehyde samples were sealed with Teflon tape and transported on ice to ENSR's Air Toxics Laboratory. Samples were analyzed by high-performance liquid chromatography according to CARB Method 430.

4.4 Modified Method 429 (PAH)

Each PAH test consisted of three 2-hour sampling runs as well as one field blank train. Samples were collected in a sampling train consisting of a glass probe, Teflon sample line, Teflon-coated glass fiber filter, XAD-2 adsorbent cartridge, and impingers in an ice bath. The sampling methodology was modified for non-isokinetic testing by eliminating the glass nozzle

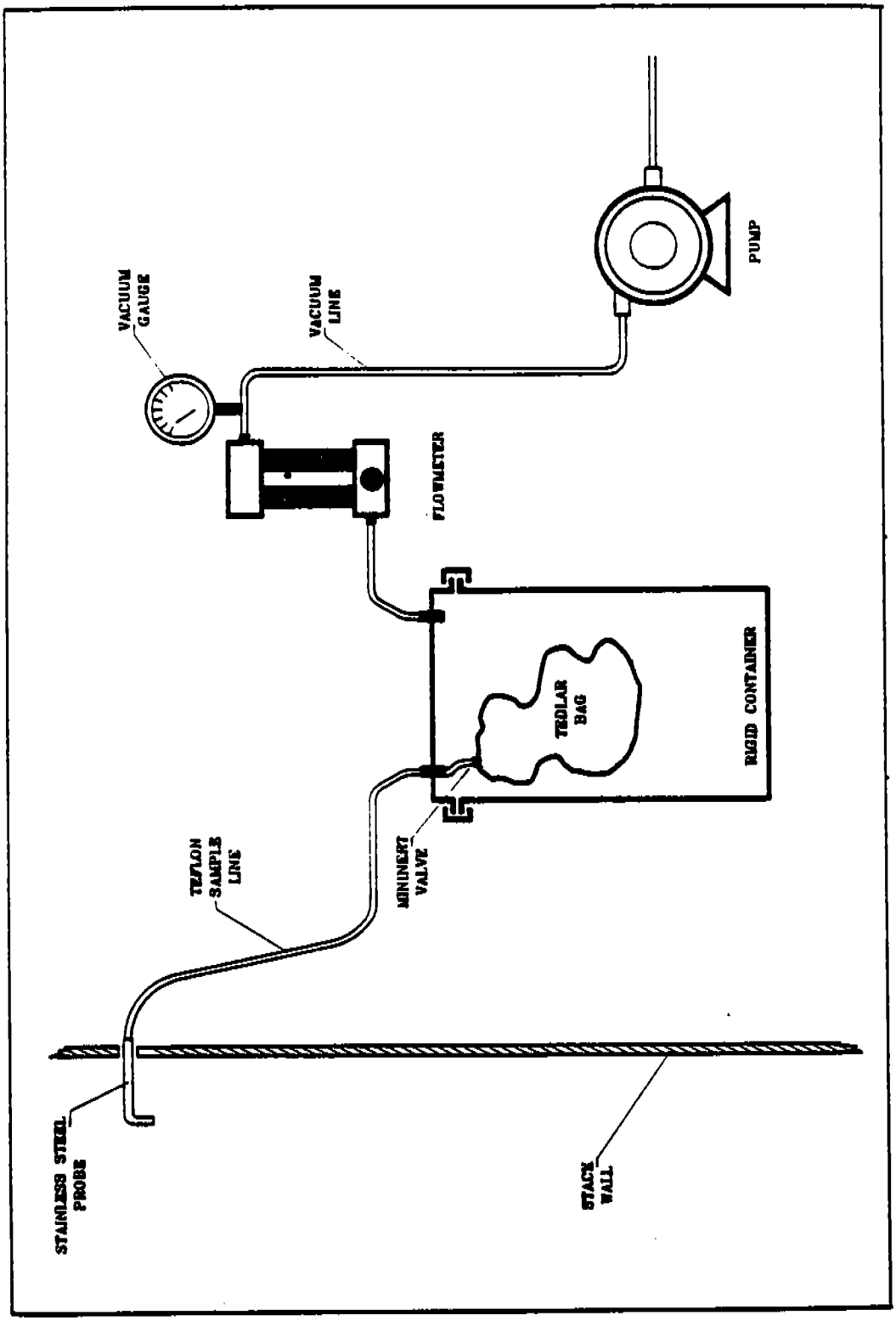

Figure 4-1. Method 410A Sample Train

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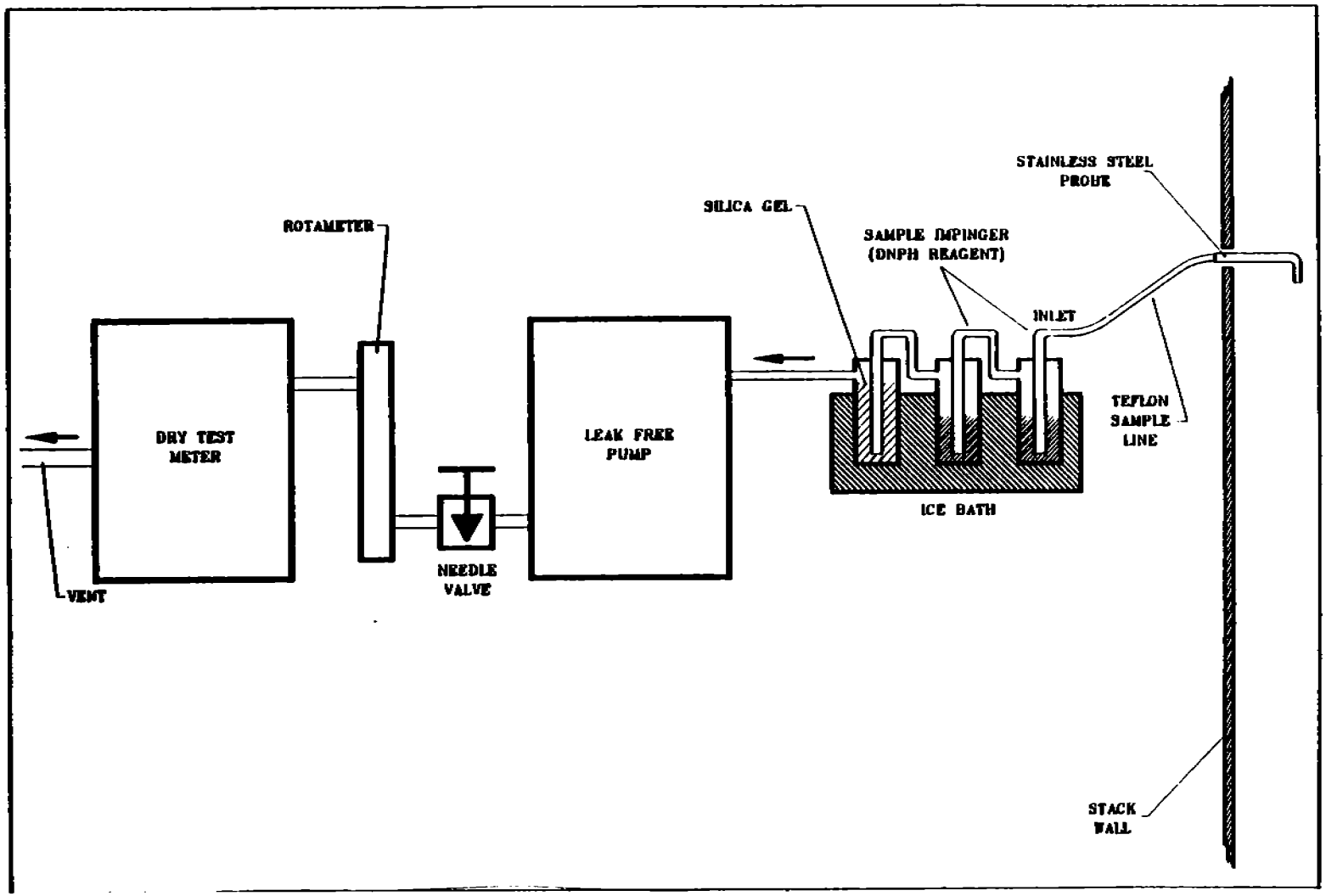

Figure 4-2. Method 430 Sample Train

and probe from the sampling train. The diesel IC engines were sampled using a 3/8-inch-diameter glass probe placed in the center of the exhaust stack. The glass probe was connected directly to a Teflon sample line. A 3/8-inch Teflon probe was used for sampling the crude oil-fired steam generator bank scrubber outlet. Figure 4-3 is a schematic of the modified Method 429 sampling train.

Samples were recovered per CARB Method 429 and shipped to Enseco-CRL Laboratory. Analysis was performed by GC/mass spectroscopy (GC/MS). One method blank train was assembled, recovered, and analyzed for each test.

4.5 EPA Multiple-Metals Train

Each metals test consisted of three 2-hour sampling runs. The sampling runs were performed isokinetically according to CARB Method 5, employing the sampling train required by EPA MMT. Figure 4-4 shows the multiple metals sampling train in schematic form.

Sample recovery was performed according to the EPA MMT method. Filters appeared in good condition, without holes or cracks. Silica gel appeared less than 50 percent expended upon recovery. One method blank was assembled, recovered, and analyzed for each test.

Sample analysis was performed by atomic absorption at Coast-To-Coast Laboratory.

4.6 Method 104 (Be)

Each beryllium test consisted of three 2-hour sampling runs. These isokinetic sampling runs were performed simultaneously with the EPA Multiple Metals Train described in Section 4.5 above. Figure 4-5 provides a schematic of the CARB Method 104 sample train.

Samples were recovered according to CARB Method 104 and shipped to Coast-To-Coast Laboratory for analysis by atomic absorption.

The filter used during Run A was burned during sampling and was not recovered intact. The filter pieces were placed in the filter sample container, then the glass filter-frit was acetone-rinsed into container No. 2 (containing impinger contents and rinses of front and back halves). During sampling Run A, the filter compartment was maintained at an average temperature of about 290°F due to temperature control malfunction. During Runs B and C, the filter compartment temperature averaged approximately 200°F and did not exceed 219°F. The filters from Runs B and C appeared charred but were recovered intact.

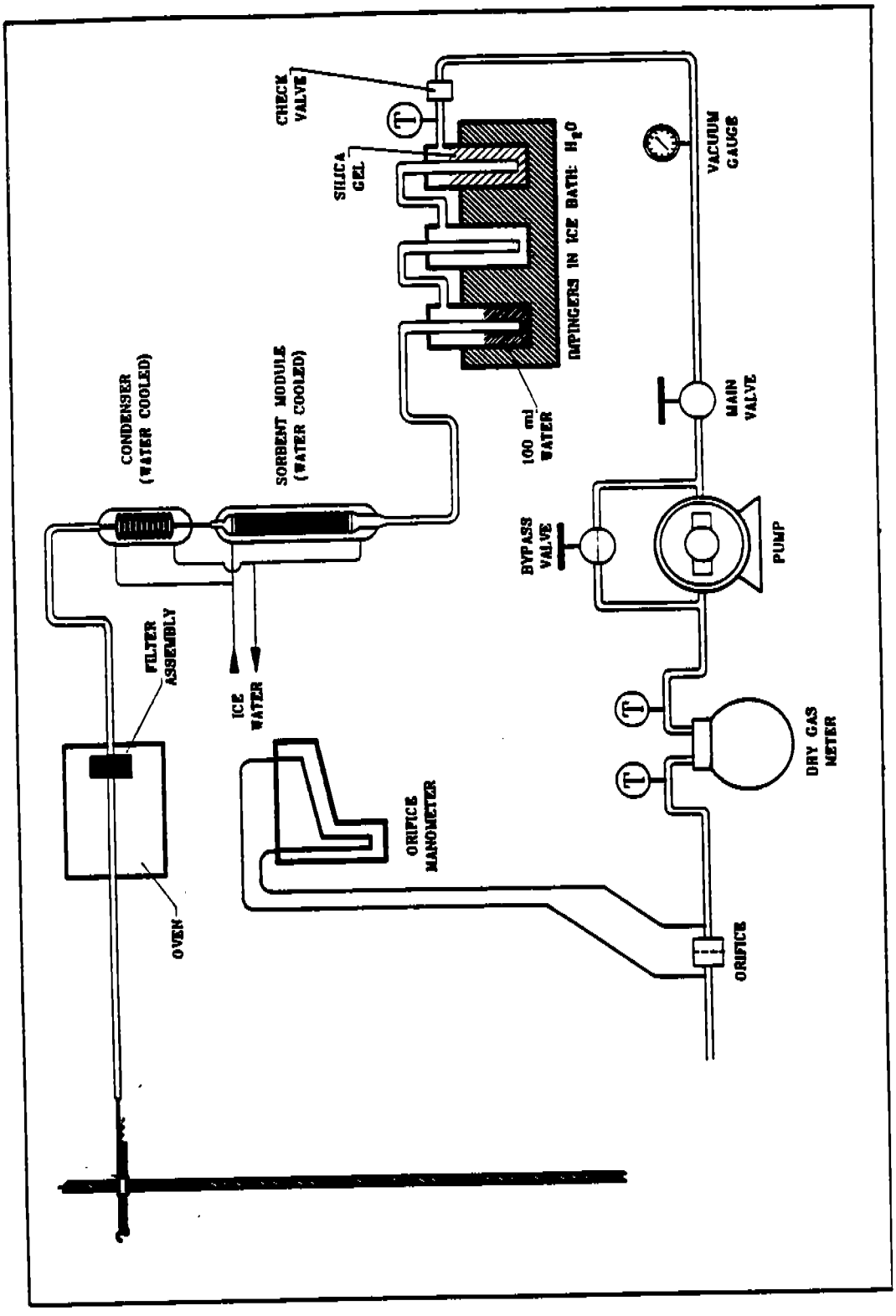

Figure 4-3. Method 429 Sample Train

Figure 4-4

EPA Multi-Metals Train
(Proposed ARB Method 436)

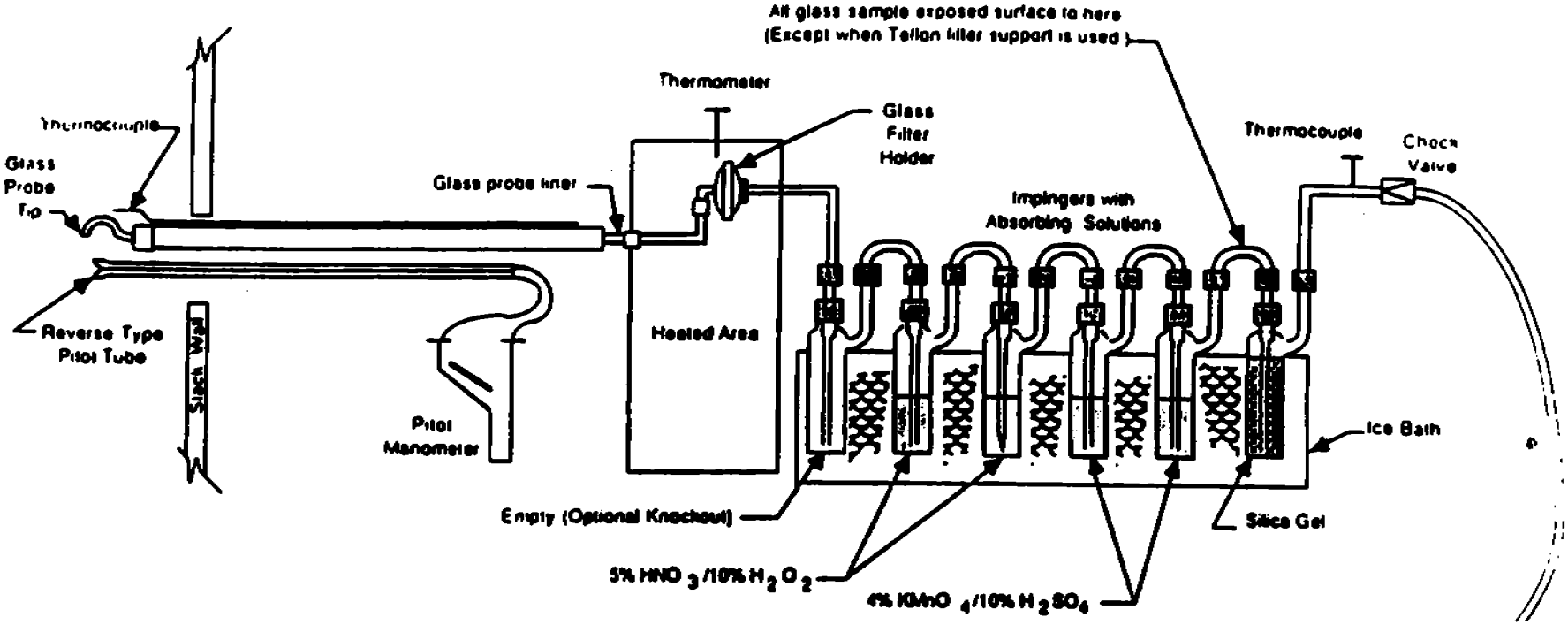

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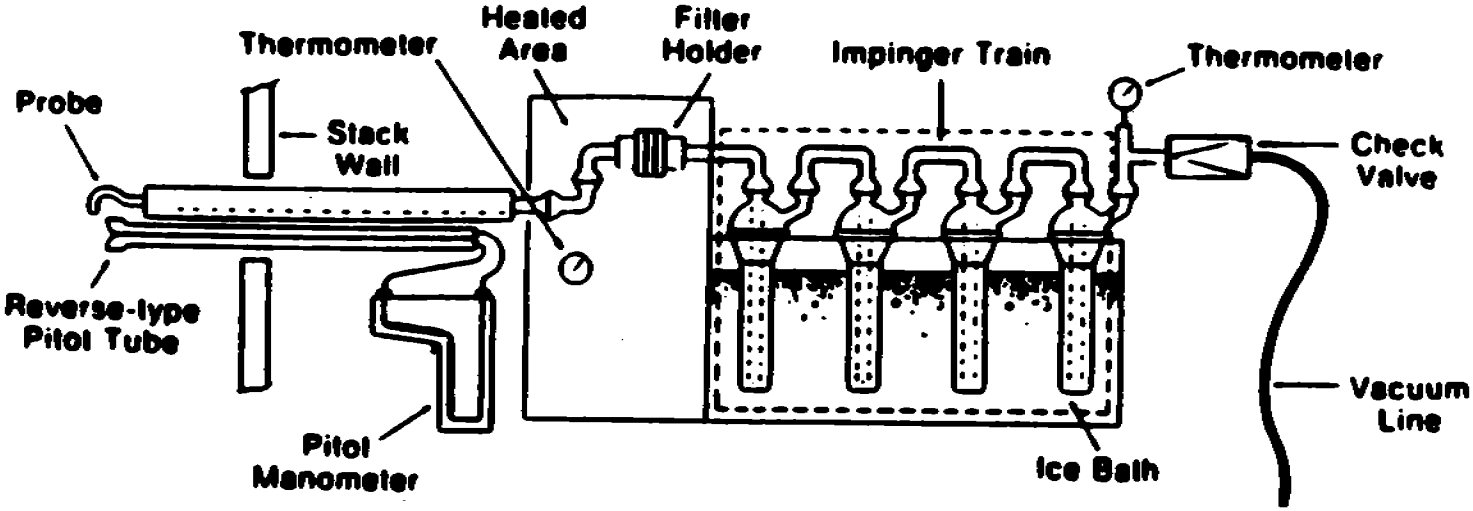
Figure 4-5

RAC Stacksampler Schematic of EPA Particulate Sampling Train (Method 5)

Same basic configuration used to sample Beryllium & Mercury Vapor (Federal Register, Vol. 36, Nos. 234 [Be, Hg] & 247)



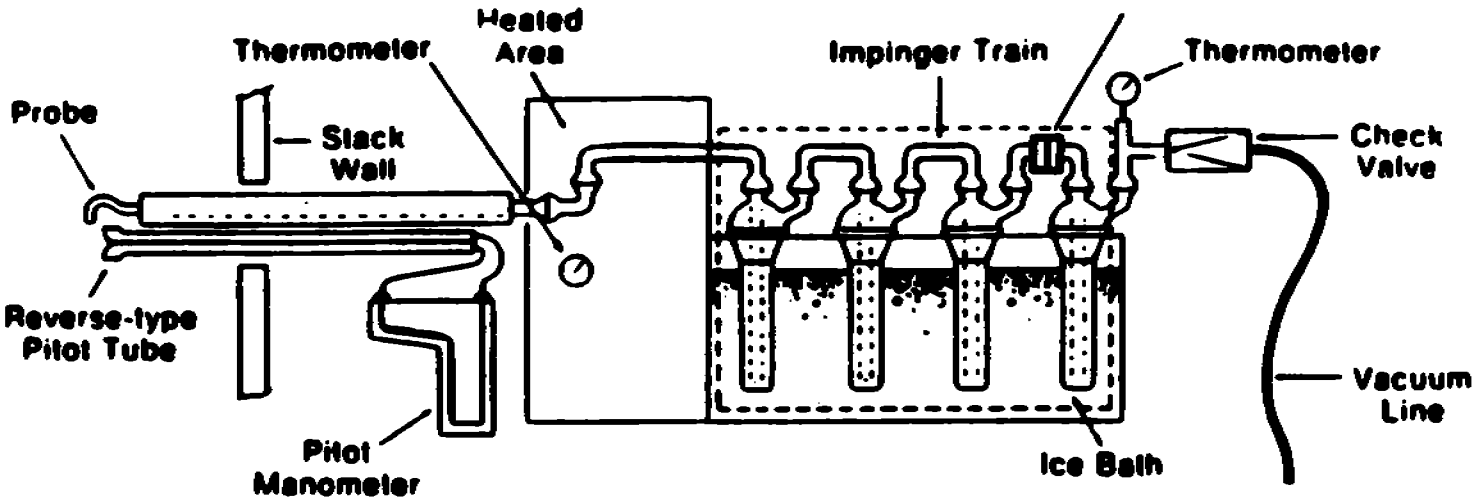
4.7 Method 425 (Cr^{+6})

Each Cr^{+6} test consisted of three 72-minute sampling runs. The sampling runs were performed isokinetically, according to CARB Method 5, using the sampling train specified by CARB Method 425 (shown in Figure 4-6).

Samples were recovered as required by CARB Method 425 and analyzed by ion chromatography at Coast-To-Coast Laboratory. All samples were split for separate analyses of total and hexavalent chromium.

Figure 4-6

RAC Stakesampir Schematic of EPA Particulate Sampling Train (Method 5)
Same basic configuration used to sample Beryllium & Mercury Vapor
(Federal Register, Vol. 36, Nos. 234 [Be, Hg] & 247)



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APPENDIX A

QUALITY CONTROL/QUALITY ASSURANCE

A. Overview

Quality control measures implemented during this program were consistent with those outlined in each of the test methodologies used. These included the use of a number of discrete measures to monitor the quality of field associated activities as well as subsequent laboratory analyses. These included the following elements:

- field blanks
- method blanks
- laboratory control spikes
- laboratory surrogate spikes

Quality control data included in this appendices are as follows:

- Calibration data
- CEM performance data
- Chain-of-custody forms

A brief discussion of the quality control measures employed by test method is provided in the subsequent subsections.

A.1 Fuel Analyses

A.2 AB2588 Metals

A.3 PAH - Modified Method 429

Each XAD-2 resin cartridge was spiked with a naphthalene surrogate by Enseco/Cal Analytical of Sacramento, California prior to testing. More detailed information of the surrogate spike is provided in Appendix C. ENSR received permission from the ARB to combine all PAH extracts for a single analysis. Documentation of ARB approval to combine the extracts is presented in this

appendix. The recovery efficiency of the XAD-2 resin spike and laboratory spikes prepared by Enseco during analysis are provided in Appendix C.

All glassware used for Method 429 sampling trains and for sample recovery was cleaned as described in Section 3A of the 1974 issue of the Manual of Analytical Methods for Analysis of Pesticide Residues in Human and Environmental Samples.

Field blank trains, identical to the actual sampling trains, were assembled, leak checked, and recovered following Method 429 procedures.

A.4 Volatile Organics - Method 410A

The 1/4-inch stainless steel (SS) sampling probe and 1/4-inch Teflon sampling line were replaced following use at each sampling site to minimize the possibility of contamination. Tedlar bags were stored in styrofoam containers to prevent exposure to light following testing. Analyses were performed within 48 hours of sample collection in ENSR's Air Toxics Laboratory in Camarillo, California. A nitrogen field blank was prepared at each sampling site. The field blank was analyzed concurrently with field samples.

A.5 Aldehydes - Method 430

The 1/4-inch stainless steel (SS) sampling probe and the 1/4-inch Teflon sampling line were replaced following use at each sampling site. The DNPH impingers were packed in ice throughout the sampling runs and were maintained on ice or refrigerated at all times until analyzed in the laboratory. A system of couriers was used to ensure the DNPH solution was used within 48 hours of solution preparation in the laboratory. All samples were analyzed within 7 days of field sampling. A field blank was prepared at each test site. The field blank was prepared by pulling nitrogen through a Method 430 sampling train for 30 minutes using the same procedure employed with stack sampling.

A.6 Total Hydrocarbons and Combustion Gases

The following continuous emission monitors were used during the test program:

a. Diesel IC Engine Testing:

CEM	CAL Gas[1]
J.U.M. VE-7 THC Analyzer	50 ppm C_3H_8
Teledyne 326A O_2 Analyzer	8%, 15%
Fuji Infrared CO_2 Analyzer	11.9%
Anarad AR-411 CO Analyzer	1000 ppm

b. Crude Oil-Fired and Natural Gas-Fired Steam Generator

CEM	CAL Gas
Ratfisch 55 THC Analyzer	8.2 ppm CH_4
Teledyne 326A O_2 Analyzer	8%, 15%
Fuji Infrared CO_2 Analyzer	11.9%
TECO 48 CO Analyzer	39.87 ppm

All instruments were zeroed and spanned before initiating testing each day. The instruments were also calibrated periodically, usually on an hourly basis, during testing. A pretest leak check was performed on the sample gas delivery system by closing off the sampling line and observing the sample metering rotometer. No flow in the metering rotometer indicated a leak-free system.

A four-pen strip chart recorder was used to generate a continuous record of gas concentrations at each test site. Portions of the strip chart record are provided in Appendix F. Gas concentrations were also recorded on CEM data record sheets at 15-minute intervals during each test.

[1] N_2 used as zero calibration gas

STATE OF CALIFORNIA
George Deukmejian, Governor

AIR RESOURCES BOARD
1102 Q STREET
P.O. BOX 2815
SACRAMENTO, CA 95812

April 2, 1990

Mike Short
ENSR Consulting and Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Dear Mr. Short:

Approval of Modification to ARB Method 429 (PAH)
for Air Toxics "Hot Spots" Source Tests

We have evaluated your verbal request to modify an existing ARB Test Method 429, Determination of Polycyclic Aromatic Hydrocarbon Emissions from Stationary Sources, for testing to meet the requirements of the Air Toxics "Hot Spots" Information and Assessment Act of 1987. As stated in Section 93336(c) of the Emission Inventory Criteria and Guidelines Regulation, equivalent sampling and analysis methods may be approved only if the Executive Officer of the Air Resources Board (ARB) determines that the alternative method is substantially equivalent to the ARB-adopted method for that facility for purposes of complying with this regulation.

The ARB staff has concluded that analysis of one composite sample containing the concentrated extracts from the cyclone, filter resin, rinses and impinger catch is substantially equivalent to the current ARB-adopted method for PAH. The adopted method states that the impinger catch and impinger rinses should be analyzed separately (ARB Method 429 - Section 4.6.3). Separate analyses for the impinger catch and impinger rinses were included in the adopted method to allow for additional compound determination and is not necessary for your stated purposes.

Please contact George Lew at (916) 445-0657 or Cindy Castronovo at (916) 323-0736 if you need more information on this matter.

Sincerely,

William V. Loscutoff

William V. Loscutoff, Chief
Monitoring and Laboratory Division

cc: Linda Murchison, TSD

CALIBRATION DATA

ROTAMETER CALIBRATION
DATE: SEPTEMBER 9,1990
NAME: SPENCER HAMMON
ROTAMETER RANGE 0-1 LITER

ROTAMETER NUMBER ENSR 1000-1
BUCK CALIBRATOR MODEL # M-5
SERIAL # M-3065

SETTING	MINIBUCK VALUE	AVERAGE	PBAR	TEMP	CORRECTED VALUE
200 CC/MIN	199.20	199.63	29.90	74.0	202.04
	199.80				
	199.90				
400 CC/MIN	388.70	388.70	29.90	74.0	393.38
	388.40				
	389.00				
600 CC/MIN	612.00	611.13	29.90	74.0	618.49
	611.10				
	610.30				
800 CC/MIN	803.90	802.40	29.90	74.0	812.06
	802.40				
	800.90				
1000 CC/MIN	1000.60	1000.33	29.90	74.0	1012.38
	1000.40				
	1000.00				
OCTOBER 1, 1990					
200 CC/MIN	188.60	188.80	29.60	72.00	192.29
	188.70				
	189.10				
400 CC/MIN	380.90	375.60	29.60	72.00	382.54
	373.00				
	372.90				
600 CC/MIN	576.80	576.50	29.60	72.00	587.15
	577.10				
	575.60				
800 CC/MIN	763.50	766.20	29.60	72.00	780.35
	766.80				
	768.30				
1000 CC/MIN	986.90	982.73	29.60	72.00	1000.88
	982.30				
	979.00				

Regression Output: Sept. 9 1990

Constant	-4.14
Std Err of Y Est	8.94
R Squared	0.9994
No. of Observati	5.00
Degrees of Freed	3.00
X Coeffic	1.02
Std Err o	0.01

Regression Output:October 1, 1990

Constant	-15.86
Std Err of Y Est	9.11
R Squared	0.9994
No. of Observations	5.00
Degrees of Freedom	3.00
X Coefficient(s)	1.01
Std Err of Coef.	0.01

ROTAMETER CALIBRATION — ROTAMETER NUMBER ENSR 1000-1
DATE: SEPTEMBER 9,1990 — BUCK CALIBRATOR MODEL # M-5
NAME: SPENCER HAMMON — SERIAL # M-3065
ROTAMETER RANGE 0-1 LITER

SETTING	MINIBUCK VALUE	AVERAGE	PBAR	TEMP	CORRECTED VALUE
200 CC/MIN	199.20 199.80 199.90	199.63	29.90	74.0	202.04
400 CC/MIN	388.70 388.40 389.00	388.70	29.90	74.0	393.38
600 CC/MIN	612.00 611.10 610.30	611.13	29.90	74.0	618.49
800 CC/MIN	803.90 802.40 800.90	802.40	29.90	74.0	812.06
1000 CC/MIN	1000.60 1000.40 1000.00	1000.33	29.90	74.0	1012.38
OCTOBER 1, 1990					
200 CC/MIN	188.60 188.70 189.10	188.80	29.60	72.00	192.29
400 CC/MIN	380.90 373.00 372.90	375.60	29.60	72.00	382.54
600 CC/MIN	576.80 577.10 575.60	576.50	29.60	72.00	587.15
800 CC/MIN	763.50 766.80 768.30	766.20	29.60	72.00	780.35
1000 CC/MIN	986.90 982.30 979.00	982.73	29.60	72.00	1000.88

Regression Output: Sept. 9 1990

Constant	-4.14
Std Err of Y Est	8.94
R Squared	0.9994
No. of Observati	5.00
Degrees of Freed	3.00
X Coeffic	1.02
Std Err o	0.01

Regression Output:October 1, 1990

Constant	-15.86
Std Err of Y Est	9.11
R Squared	0.9994
No. of Observations	5.00
Degrees of Freedom	3.00
X Coefficient(s)	1.01
Std Err of Coef.	0.01

ROTAMETER CALIBRATION
DATE: SEPTEMBER 9,1990
NAME: SPENCER HAMMON
ROTAMETER RANGE 0-1 LITER

ROTAMETER NUMBER ENSR 1000-2
BUCK CALIBRATOR MODEL# M-5
SERIAL # M-3065

SETTING	MINIBUK VALUE	AVERAGE	PBAR	TEMP	CORRECTED VALUE
200 CC/MIN	188.00 187.10 186.90	187.33	29.90	74.0	189.59
400 CC/MIN	381.50 380.50 383.40	381.80	29.90	74.0	386.40
600 CC/MIN	593.30 595.40 597.00	595.23	29.90	74.0	602.40
800 CC/MIN	779.70 780.20 780.10	780.00	29.90	74.0	789.39
1000 CC/MIN	997.70 1000.00 1000.00	999.23	29.90	74.0	1011.26
OCTOBER 1, 1990					
200 CC/min	197.30 197.00 197.10	197.13	29.60	72.00	200.77
400 CC/MIN	379.50 379.40 379.60	379.50	29.60	72.00	386.51
600 CC/MIN	595.20 598.80 599.90	597.97	29.60	72.00	609.01
800 CC/MIN	778.10 778.90 778.10	778.37	29.60	72.00	792.74
1000 CC/MIN	991.60 994.20 986.70	990.83	29.60	72.00	1009.13

Regression Output:Sept. 9,1990

Constant	-18.10
Std Err of Y Est	8.87
R Squared	0.9994
No. of Observati	5.00
Degrees of Freed	3.00
X Coeffic	1.02
Std Err o	0.01

Regression Output: OCT. 1, 1990

Constant	-7.25
Std Err of Y Est	10.75
R Squared	0.999
No. of Observations	5.00
Degrees of Freedom	3.00
X Coefficient(s)	1.01
Std Err of Coef.	0.02

ROTAMETER CALIBRATION — ROTAMETER NUMBER ENSR 1000-2
DATE: SEPTEMBER 9,1990 — BUCK CALIBRATOR MODEL# M-5
NAME: SPENCER HAMMON — SERIAL # M-3065
ROTAMETER RANGE 0-1 LITER

SETTING	MINIBUK VALUE	AVERAGE	PBAR	TEMP	CORRECTED VALUE
200 CC/MIN	188.00	187.33	29.90	74.0	189.59
	187.10				
	186.90				
400 CC/MIN	381.50	381.80	29.90	74.0	386.40
	380.50				
	383.40				
600 CC/MIN	593.30	595.23	29.90	74.0	602.40
	595.40				
	597.00				
800 CC/MIN	779.70	780.00	29.90	74.0	789.39
	780.20				
	780.10				
1000 CC/MIN	997.70	999.23	29.90	74.0	1011.26
	1000.00				
	1000.00				
OCTOBER 1, 1990					
200 CC/min	197.30	197.13	29.60	72.00	200.77
	197.00				
	197.10				
400 CC/MIN	379.50	379.50	29.60	72.00	386.51
	379.40				
	379.60				
600 CC/MIN	595.20	597.97	29.60	72.00	609.01
	598.80				
	599.90				
800 CC/MIN	778.10	778.37	29.60	72.00	792.74
	778.90				
	778.10				
1000 CC/MIN	991.60	990.83	29.60	72.00	1009.13
	994.20				
	986.70				

Regression Output: Sept. 9,1990		Regression Output: OCT. 1, 1990	
Constant	-18.10	Constant	-7.25
Std Err of Y Est	8.87	Std Err of Y Est	10.75
R Squared	0.9994	R Squared	0.999
No. of Observati	5.00	No. of Observations	5.00
Degrees of Freed	3.00	Degrees of Freedom	3.00
X Coeffic	1.02	X Coefficient(s)	1.01
Std Err o	0.01	Std Err of Coef.	0.02

DATE: SEPTEMBER 9,1990 BUCK CALIBRATOR MODEL # M-5
NAME: SPENCER HAMMON SERIAL # M-3065
ROTAMETER RANGE 0-1 LITER

SETTING	MINIBUCK VALUE	AVERAGE	PBAR	TEMP	CORRECTED VALUE
200 CC/MIN	199.20 199.80 199.90	199.63	29.90	74.0	202.04
400 CC/MIN	388.70 388.40 389.00	388.70	29.90	74.0	393.38
600 CC/MIN	612.00 611.10 610.30	611.13	29.90	74.0	618.49
800 CC/MIN	803.90 802.40 800.90	802.40	29.90	74.0	812.06
1000 CC/MIN	1000.60 1000.40 1000.00	1000.33	29.90	74.0	1012.38

Regression Output:

Constant	-4.14
Std Err of Y Est	8.94
R Squared	1.00
No. of Observati	5.00
Degrees of Freed	3.00
X Coeffic	1.02
Std Err o	0.01

ROTAMETER CALIBRATION
DATE: SEPTEMBER 9,1990
NAME: SPENCER HAMMON
ROTAMETER RANGE 0-1 LITER

ROTAMETER NUMBER ENSR 1000-2
BUCK CALIBRATOR MODEL# M-5
SERIAL # M-3065

SETTING	MINIBUK	AVERAGE	PBAR	TEMP	CORRECTED VALUE
200 CC/MIN	188.00 187.10 186.90	187.33	29.90	74.0	189.59
400 CC/MIN	381.50 380.50 383.40	381.80	29.90	74.0	386.40
600 CC/MIN	593.30 595.40 597.00	595.23	29.90	74.0	602.40
800 CC/MIN	779.70 780.20 780.10	780.00	29.90	74.0	789.39
1000 CC/MIN	997.70 1000.00 1000.00	999.23	29.90	74.0	1011.26

Regression Output:

Constant	-18.10
Std Err of Y Est	8.87
R Squared	1.00
No. of Observati	5.00
Degrees of Freed	3.00
X Coeffic	1.02
Std Err o	0.01

ROTAMETER CALIBRATION
DATE: SEPTEMBER 9,1990
NAME: SPENCER HAMMON
ROTAMETER RANGE 0-2.5 LITER

ROTAMETER NUMBER ENSR R2500-2
BUCK CALIBRATOR MODEL # M-5
SERIAL # M-3065

SETTING	MINIBUK	AVERAGE	PBAR	TEMP	CORRECTED VALUE
500 CC/MIN	510.50 506.80 505.10	507.47	29.90	74.0	513.58
1000 CC/MIN	988.20 988.50 988.70	988.47	29.90	74.0	1000.37
1500 CC/MIN	1462.00 1459.00 1456.00	1459.00	29.90	74.0	1476.57
2000 CC/MIN	1964.00 1963.00 1961.00	1962.67	29.90	74.0	1986.30
2500 CC/MIN	2509.00 2508.00 2509.00	2508.67	29.90	74.0	2538.87

0.00 Regression Output:

Constant	-7.82
Std Err of Y Est	27.38
R Squared	1.00
No. of Observati	5.00
Degrees of Freed	3.00
X Coeffic	1.01
Std Err o	0.02

ROTAMETER CALIBRATION — ROTAMETER NUMBER — ENSR R2500-4
DATE: SEPTEMBER 9,1990 — SERIAL # M-3065
NAME: SPENCER HAMMON
ROTAMETER RANGE 0-2.5 LITER

SETTING	MINIBUK	AVERAGE	PBAR	TEMP	CORRECTED VALUE
500 CC/MIN	500.80 500.50 500.80	500.70	29.90	74.0	506.73
1000 CC/MIN	972.60 972.20 971.80	972.20	29.90	74.0	983.91
1500 CC/MIN	1450.00 1453.00 1455.00	1452.67	29.90	74.0	1470.16
2000 CC/MIN	1965.00 1967.00 1970.00	1967.33	29.90	74.0	1991.02
2500 CC/MIN	2499.00 2497.00 2497.00	2497.67	29.90	74.0	2527.74

Regression Output:

Constant	-18.83
Std Err of Y Est	23.94
R Squared	1.00
No. of Observati	5.00
Degrees of Freed	3.00
X Coeffic	1.01
Std Err o	0.02

ROTAMETER CALIBRATION
DATE: SEPTEMBER 9,1990
NAME: SPENCER HAMMON
ROTAMETER RANGE 0-2.5 LITER

ROTAMETER NUMBER ENSR R2500-5
BUCK CALIBRATOR MODEL # M-5
SERIAL # M-3065

SETTING	MINIBUK	AVERAGE	PBAR	TEMP	CORRECTED VALUE
500 CC/MIN	528.40 528.20 528.60	528.40	29.90	74.0	534.76
1000 CC/MIN	977.50 978.00 977.90	977.80	29.90	74.0	989.57
1500 CC/MIN	1461.00 1461.00 1460.00	1460.67	29.90	74.0	1478.25
2000 CC/MIN	1984.00 1976.00 1971.00	1977.00	29.90	74.0	2000.80
2500 CC/MIN	2501.00 2497.00 2496.00	2498.00	29.90	74.0	2528.08

Regression Output:

Constant	6.94
Std Err of Y Est	28.17
R Squared	1.00
No. of Observati	5.00
Degrees of Freed	3.00
X Coeffic	1.00
Std Err o	0.02

file = 3-RAC.wk1 Rev. 5.06

DRY GAS METER CALIBRATION DATA

Date -- 27-Aug-90
Bar.Pres(in.Hg) 30.02
Y(i) Average = 1.0131

Pump(s/n) rac3
Meter Box # 588-3093
Calibrated by: spencer

WTM Singer mdl# AL-20
WTM s/n P2755
WTM Calib. -n/a-

Orifice delta pres. HOH(in)	Gas Volume (cubic feet) WTM	DGM (init)	DGM (final)	Temperature (Degrees F) WTM (in)	DGM (in)	DGM (out)	Time (min)	Y(i)	delta-H(@i)
0.5	5.0	537.300	542.346	70.5	79	72	13.12283	0.99900	1.91137
1.0	5.0	542.700	547.671	70.5	80	71	9.2465	1.01283	1.89791
1.5	10.0	548.499	558.410	70.5	80	71	14.9485	1.01476	1.86014
2.0	10.0	559.010	568.921	70.5	83	72	12.70316	1.01731	1.78441
3.0	10.0	516.499	526.391	70.5	81	73	10.63616	1.01584	1.87818
4.0	10.0	527.201	537.067	70.5	85	72	9.054166	1.01888	1.80963
							Averages	1.01310	1.85694

Operator Signature J. S. Spencer

file = 3-RAC.wk1

file = 1-RAC.wk1 Rev. 5.05

DRY GAS METER CALIBRATION DATA

Date -- 27-Aug-90
Bar.Pres(in.Hg) 30.02
Y(i) Average = 1.0072

Pump(s/n) rac1
Meter Box # 587-3074
Calibrated by: spencer

Orifice delta pres. HOH(in)	Gas Volume (cubic feet) WTM	DGM (init)	DGM (final)	Temperature (Degrees F) WTM	DGM (in)	DGM (out)	Time (min)	Y(i)	delta-H(@i)
0.5	5.0	132.399	137.383	72.0	78.0	74.0	12.432	1.00952	1.72382
1.0	5.0	126.899	131.895	72.0	81.0	75.0	8.892	1.00961	1.75702
1.5	10.0	105.999	116.035	72.0	84.0	76.0	14.550	1.00769	1.75783
2.0	10.0	116.500	126.515	73.0	82.0	76.0	12.740	1.00482	1.80699
3.0	10.0	83.901	93.927	73.0	87.0	78.0	10.366	1.00778	1.78265
4.0	10.0	95.701	105.741	73.0	87.0	78.0	9.054	1.00393	1.81345
						Averages		1.00723	1.77363

Operator Signature J Shannon

file = 2-RAC.wk1 Rev. 5.05

DRY GAS METER CALIBRATION DATA

Date -- 28-Aug-90 Pump(s/n) rac3
Bar.Pres(in.Hg) 29.95 Meter Box # 588-3092
Y(i) Average = 1.0166 Calibrated by: spencer

Orifice delta pres. HOH(in)	Gas Volume (cubic feet) WTM	DGM (init)	DGM (final)	Temperature (Degrees F) WTM (in)	DGM (out)	Time (min)	Y(i)	delta-H(@i)
0.5	5.0	319.5	324.444	70	78	70 12.27983	1.01771	1.67914
1.0	5.0	335.2	340.175	70	82	72 8.984333	1.01581	1.78761
1.5	10.0	361.5	371.505	70	84	74 15.1235	1.01274	1.89244
2.0	10.0	351	360.985	70	86	74 12.8645	1.01541	1.82237
3.0	10.0	309	318.807	69	76	68 10.45166	1.01796	1.82454
4.0	10.0	325	334.876	69	85	71 9.134166	1.01977	1.83734
						Averages	1.01657	1.80724

Operator Signature Spencer Hammon

file = 4-RAC.wk1 Rev. 5.05

DRY GAS METER CALIBRATION DATA

Date -- 09-Sep-90
Bar.Pres(in.Hg) 29.9
Y(i) Average = 0.9995

Pump(s/n) rac-4
Meter Box # 1286-3058
Calibrated by: spencer

Orifice delta pres. HOH(in)	Gas Volume (cubic feet) WTM	DGM (init)	DGM (final)	Temperature (Degrees F) WTM (in)	DGM (out)	Time (min)	Y(i)	delta-H(@i)
0.5	5.0	117.401	122.451	74.5	80	79	12.105	0.99813	1.64519
1.0	5.0	135	140.071	74.5	86	82	8.724	1.00106	1.69496
1.5	10.0	140.4	150.576	75	87	84	14.575	0.99831	1.77259
2.0	10.0	151.2	161.386	75	90	85	12.647	0.99976	1.77313
3.0	10.0	162	172.179	75	90	86	10,328	0.99892	1.77191
4.0	10.0	124.502	134.551	75	86	81	8.871	1.00109	1.75766
						Averages		0.99954	1.73590

Operator Signature John S Hamer

file = 4-RAC.wk1 Rev. 5.05

DRY GAS METER CALIBRATION DATA

Date -- 09-Sep-90
Bar.Pres(in.Hg) 29.9
Y(i) Average = 0.9995

Pump(s/n) rac-4
Meter Box # 1286-3058
Calibrated by: spencer

Orifice delta pres. HOH(in)	Gas Volume (cubic feet) WTM	DGM (init)	DGM (final)	Temperature (Degrees F) WTM (in)	DGM (out)	Time (min)	Y(i)	delta-H(@i)
0.5	5.0	117.401	122.451	74.5	80	79	12.105	0.99813	1.64519
1.0	5.0	135	140.071	74.5	86	82	8.724	1.00106	1.69496
1.5	10.0	140.4	150.576	75	87	84	14.575	0.99831	1.77259
2.0	10.0	151.2	161.386	75	90	85	12.647	0.99976	1.77313
3.0	10.0	162	172.179	75	90	86	10.328	0.99892	1.77191
4.0	10.0	124.502	134.551	75	86	81	8.871	1.00109	1.75766
						Averages		0.99954	1.73590

Operator Signature John S Spencer

file = 4-RAC.wk1 Rev. 5.05

DRY GAS METER CALIBRATION DATA

Date -- 01-Oct-90
Bar.Pres(in.Hg) 29.92
Y(i) Average = 0.9926

Pump(s/n) rac-4
Meter Box # 1286-3058
Calibrated by: spencer

Orifice delta pres. HOH(in)	Gas Volume (cubic feet) WTM	DGM (init)	DGM (final)	Temperature (Degrees F) WTM (in)	DGM (out)	Time (min)	Y(i)	delta-H(@i)
0.5	5.0	577.6	582.737	68	80	78 12.06383	0.99239	1.59506
1.0	5.0	583.2	588.323	68	81	78 8.7055	0.99480	1.65967
1.5	10.0	588.951	599.292	68.5	81	78 14.54266	0.98353	1.74011
2.0	10.0	599.821	610.056	68.4	82	79 12.57016	0.99452	1.72958
3.0	10.0	611.014	621.235	68.9	83	79 10.27666	0.99344	1.73569
4.0	10.0	567	577.132	68	79	78 8.947833	0.99680	1.75661
						Averages	0.99258	1.70279

Operator Signature Glen Prior

file = 1-RAC.wk1 Rev. 5.05

DRY GAS METER CALIBRATION DATA

-- 01-Oct-90
Pres(in.Hg) 29.96
Average = 1.0095

Pump(s/n) rac-4
Meter Box # 587-3074
Calibrated by: glen

ifice delta res. (in)	Gas Volume (cubic feet) WTM	DGM (init)	DGM (final)	Temperature (Degrees F) WTM (in)	DGM (out)	Time (min)	Y(i)	delta-H(@i
0.5	5.0	140.569	145.601	68.4	79	71 12.31566	1.00482	1.67508
1.0	5.0	146.803	151.834	68.4	83	73 8.891833	1.00942	1.73661
1.5	10.0	152.74	162.826	69	88	76 14.76933	1.01211	1.78749
2.0	10.0	164.243	174.363	69	89	76 12.815	1.00841	1.79265
3.0	10.0	175.367	185.5	69	90	78 10.457	1.00744	1.78552
4.0	10.0	187.284	197.355	69.1	93	79 9.128166	1.01470	1.80812
						Averages	1.00948	1.76425

Operator Signature Glen Pace

= 3-RAC.wk1 POST CAL. Rev. 5.06

DRY GAS METER CALIBRATION DATA

-- 02-Oct-90 Pump(s/n) rac-4 WTM Singer mdl# AL-20
'res(in.Hg) 29.85 Meter Box # 588-3093 WTM s/n P2755
Average = 0.9894 Calibrated by: GLEN WTM Calib. -n/a-

ice lta es. in)	Gas Volume (cubic feet) WTM	DGM (init)	DGM (final)	Temperature (Degrees F) WTM (in)	DGM (out)	Time (min)	Y(i)	delta-H(@i
0.5	5.0	715.247	720.407	70	85	74	11.622	0.98515	1.49371
1.0	5.0	721.035	726.189	69.3	86	75	8.582	0.98821	1.62166
1.5	10.0	727.152	737.481	69.5	89	75	14.39633	0.98735	1.70782
2.0	10.0	738.356	748.707	69.5	91	76	12.61833	0.98677	1.74454
3.0	10.0	749.517	759.863	69.3	91	77	10.4485	0.98611	1.79122
4.0	10.0	698.48	708.562	69	86	74	9.096666	1.00261	1.82162
						Averages		0.98937	1.69676

Operator Signature Glen Prier

= 3-RAC.wk1 PRECAL. Rev. 5.06

DRY GAS METER CALIBRATION DATA

-- 03-Oct-90 Pump(s/n) 4 WTM Singer mdl# AL-20
'res(in.Hg) 29.92 Meter Box # 588-3093 WTM s/n P2755
Average = 0.9896 Calibrated by: Glen WTM Calib. -n/a-

ice lta es. in)	Gas Volume (cubic feet) WTM	DGM (init)	DGM (final)	Temperature (Degrees F) WTM (in)	DGM (out)	Time (min)	Y(i)	delta-H(@i
0.5	5.0	792.8	797.909	69.8	82	72	12.41166	0.99075	1.70623
1.0	5.0	787.155	792.25	69.2	84	72	8.9975	0.99523	1.78591
1.5	10.0	799.059	809.397	70.5	89	74	14.916	0.98374	1.83766
2.0	10.0	810.075	820.359	70.9	91	75	12.96383	0.98968	1.84850
3.0	10.0	821.674	831.976	71	92	76	10.65466	0.98717	1.87020
4.0	10.0	776.262	786.425	68.6	85	70	9.244333	0.99079	1.88272
							Averages	0.98956	1.82187

Operator Signature Glen Prior

POST CAL.

file = 2-RAC.wk1 Rev. 5.05

DRY GAS METER CALIBRATION DATA

Date -- 01-Oct-90
Bar.Pres(in.Hg) 29.5
Y(i) Average = 1.0224

Pump(s/n) 4
Meter Box # 588-3092
Calibrated by: GLEN

Orifice delta pres. HOH(in)	Gas Volume (cubic feet) WTM	DGM (init)	DGM (final)	Temperature (Degrees F) WTM (in)	DGM (out)	Time (min)	Y(i)	delta-H(@i)
0.5	5.0	154.845	159.786	69.3	80	70 12.39383	1.02157	1.72874
1.0	5.0	162.45	167.411	69.4	86	71 8.969166	1.02264	1.79963
1.5	10.0	168.876	178.806	69.5	89	73 14.90566	1.02509	1.85595
2.0	10.0	180.639	190.61	69	92	74 12.9515	1.02434	1.85789
3.0	10.0	205.679	215.555	69.5	87	71 10.529	1.02307	1.85899
4.0	10.0	218.345	228.271	69.8	88	73 9.158666	1.01766	1.87236
						Averages	1.02239	1.82892

Operator Signature Glen Prior

PRECAL

file = 2-RAC.wk1 Rev. 5.05

DRY GAS METER CALIBRATION DATA

Date -- 02-Oct-90
Bar.Pres(in.Hg) 29.99
Y(i) Average = 1.0088

Pump(s/n) rac4
Meter Box # 588-3092
Calibrated by: GLEN

Orifice delta pres. HOH(in)	Gas Volume (cubic feet) WTM	DGM (init)	DGM (final)	Temperature (Degrees F) WTM (in)	DGM (out)	Time (min)	Y(i)	delta-H(@i)
0.5	5.0	256.367	261.365	69.4	81	71 12.35866	1.01163	1.68834
1.0	5.0	250.702	255.694	68.9	80	71 8.942333	1.01162	1.76617
1.5	10.0	273.416	283.425	69	86	73 14.8635	1.01520	1.81692
2.0	10.0	284.8	294.818	69.5	87	73 12.88466	1.01303	1.82221
3.0	10.0	298.448	308.578	69	92	74 10.55133	1.00589	1.81941
4.0	10.0	240.155	250.196	69.7	78	71 9.140833	0.99518	1.85450
						Averages	1.00876	1.79459

Operator Signature Glen Price

CEM PERFORMANCE DATA

ENSR

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT WSPA / UNOCAL

LOCATION BARDSDALE WELL #96

OPERATOR H&H WORKOVER RIG

DATE 9/14/90 B.P.

TEMPERATURE 85°F

PRESSURE (ATM)

STATIC PRESSURE

FUEL TYPE DIESEL

0-100 ppm THC

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl	HCo			CORRECTED TO CO	% HCl	DRY HCo
	1:00	CENTER/OUTLET	13.8	5%	>10³		20.5					
	1:05		14.0%	5.5%	>10³		13.2					
	1:10		14.0%	6.0%	>10³		29.7					
	1:15		15.0%	4.0%	>10³		52.7					
	1:20		13.0	6.5%	>10³		14.0					
	1:25	CALIBRATION[1]										
	1:30											
	1:35											
	1:40											
	1:45	CALIBRATION[1]		CREW	BREAK							
	1:50											
	1:55											
	2:00		18.0	3.0	2100[2]		31.5					
	2:05		15.5	4.0	4000		36.2					
	2:10		15.5	3.5	2960		27.8					
	2:15		15.0	5.0	2620		24.6					
	2:20		16.0	3 5	3120		16.9					
	2:25		16.5	2.5	3000		10.3					
	2:30		15.0	5.5	3410		17.3					
	2:35		17.5	2.5	4700		15.1					
	2:40		17.5	1.7	70		15.2					
SPAN GAS CONCENTRATION												

REMARKS:

1 ZERO GAS → N_2
CO SPAN 1000 ppm
O_2 SPAN 8%, 20.9%
CO_2 SPAN 11.9%

THC ZERO → N_2
SPAN C_3H_8 50 ppm

± 5% DEV. IN INSTR.

2) SUB ANAER'S CO [0-2000 ppm] FOR INFRARED.

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT WSPA / UNOCAL

LOCATION BARDSDALE WELL #96

OPERATOR H & H

DATE 9/14/90 B.P.

TEMPERATURE

PRESSURE (ATM)

STATIC PRESSURE

FUEL TYPE DIESEL

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl	HCo			CORRECTED TO 15% CO	15% HCl	DRY HCo
	2:45		18.5	1.8	70		17.1					
	2:50		18.5	1.8	70		18.1					
	2:55		18.5	1.8	70		18.9					
	3:00		18.5	1.8	70		18.1					
	3:05		18.5	1.7	70		18.5					
	3:10	RESTART	18.0	1.9	70		18.5					
	3:15	ACTIVITY	15.5	5.0	2940		36.4					
	3:20	CALIBRATIONS[1]	17.5	3.0	5020		20.4					
	3:25	CO_2, O_2 & CO	16.5	3.7	3630		21.8					
	3:30		16.5	4.6	4350		17.1					
	3:35		17.0	4.0	520		16.7					
	3:40		17.5	2.5	5560		23.6					
	3:45		15.5	4.5	1900		21.5					
	3:50		16.5	4.0	700		39.3					
	3:55		16.0	5.0	740		14.5					
	4:00	CAL. THC[2]	15.5	3.7	2560		25.4					
	4:05		15.5	5.0	890		11.5					
	4:10		16.0	4.0	940		19.0					
	4:15		16.0	5.0	590		15.0					
	4:20		16.0	4.3	350		17.7					
	4:25	WORKOVER CREW BREAK	19.0	1.8	100		14.4					
SPAN GAS CONCENTRATION												

REMARKS:

1 = 5% DRIFT

2 = 3% DRIFT

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT WSPA / UNOCAL

LOCATION BARNSDALE WELL #96

OPERATOR H & H

DATE 9/14/90 B.P.

TEMPERATURE

PRESSURE (ATM)

STATIC PRESSURE

FUEL TYPE DIESEL

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl	HCo			CORRECTED TO CO	% HCl	DRY HCo
	2:45		18.5	1.8	70		17.1					
	2:50		18.5	1.8	70		18.1					
	2:55		18.5	1.8	70		18.9					
	3:00		18.5	1.8	70		18.1					
	3.05		18.5	1.7	70		18.5					
	3.10	RESTART	18.0	1.9	70		18.5					
	3:15	ACTIVITY	15.5	5.0	2940		36.4					
	3:20	CALIBRATIONS[1]	17.5	3.0	5020		20.4					
	3:25	CO_2, O_2 & CO	16.5	3.7	3630		21.8					
	3:30		16.5	4.6	4350		17.1					
	3:35		17.0	4.0	520		16.7					
	3:40		17.5	2.5	5560		23.6					
	3:45		15.5	4.5	1900		21.5					
	3:50		16.5	4.0	700		39.3					
	3:55		16.0	5.0	740		14.5					
	4:00	CAL. THC[2]	15.5	3.7	2560		25.4					
	4:05		15.5	5.0	890		11.5					
	4:10		16.0	4.0	940		19.0					
	4:15		16.0	5.0	590		15.0					
	4:20		16.0	4.3	350		17.7					
	4:25	WORKOVER CREW BREAK	19.0	1.8	100		14.4					
SPAN GAS CONCENTRATION												

REMARKS:

1 ± 5% DRIFT

2 ± 3% DRIFT

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT WSPA / UNOCAL

LOCATION BARDSDALE WELL #96

OPERATOR H & H

DATE 9/14/90 B.P.

TEMPERATURE

PRESSURE (ATM)

STATIC PRESSURE

FUEL TYPE DIESEL

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl	HCo	CORRECTED TO CO %	HCl	DRY HCo
	4:30	CREW BREAK	18.5	1.8	130		20.4			
	4:35	" "	18.5	1.8	140		22.0			
	4:40		18.5	1.8	140		22.2			
	4:45		18.5	1.8	140		22.2			
	4:50		18.5	1.8	140		22.0			
	4:55		18.5	1.8	140		22.2			
	5:00		19.0	1.8	140		20.6			
	5:05		18.5	1.8	140		22.0			
	5:10		18.5	1.8	140		22.2			
	5:15	RESTART 5:12	15.0	5.5	1510		350			
	5:20		16.5	5.0	5440		29.4			
	5:25		150	4.5	2940		28.2			
	5:30		16.5	5.0	400		24.0			
	5:35		16.0	4.0	4600		23.0			
	5:40	THC CAL.[1]								
	5:45		18.5	1.8	120		21.1			
	5:50		14.5	6.0	430		56.2			
	5:55		15.5	5.0	1060		18.2			
	6:00		14.5	5.6	790		23.6			
	6:05									
	6:10	THC CAL.[2]								
SPAN GAS CONCENTRATION			8% (20.9%)	11.9%	1000 PPM		50 PPM			

REMARKS:

1 SPAN ON 50 ppm CAL GAS: 49.3 ppm
ZERO ON N_2 : -1.0 ppm

2 FINAL SPAN : 50.6 PPM

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT WSPA / UNOCAL

LOCATION BARDSDALE WELL #96

OPERATOR H & H

DATE 9/14/90 B.P.

TEMPERATURE

PRESSURE (ATM)

STATIC PRESSURE

FUEL TYPE DIESEL

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl	HCo			CORRECTED TO CO %	HCl	DRY HCo
	4:30	CREW BREAK	18.5	1.8	130		20.4					
	4:35	" "	18.5	1.8	140		22.0					
	4:40		18.5	1.8	140		22.2					
	4:45		18.5	1.8	140		22.2					
	4:50		18.5	1.8	140		22.0					
	4:55		18.5	1.8	140		22.2					
	5:00		19.0	1.8	140		20.6					
	5:05		18.5	1.8	140		22.0					
	5:10	↓	18.5	1.8	140		22.2					
	5:15	RESTART 5:12	15.0	5.5	1510		350					
	5:20		16.5	5.0	5440		29.4					
	5:25		15.0	4.5	2940		28.2					
	5:30		16.5	5.0	400		24.0					
	5:35		16.0	4.0	4600		23.0					
	5:40	THC CAL. 1										
	5:45	↓	18.5	1.8	120		21.1					
	5:50		14.5	6.0	430		56.2					
	5:55		15.5	5.0	1060		18.2					
	6:00		14.5	5.6	790		23.6					
	6:05											
	6:10	THC CAL. 2										
SPAN GAS CONCENTRATION			8% 20.9%	11.9%	1000 PPM		50 PPM					

REMARKS:

1 SPAN ON 50 PPM CAL GAS: 49.3 PPM
ZERO ON N_2 : -1.0 PPM

2 FINAL SPAN : 50.6 PPM

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT SWEPI / WSPA

LOCATION TAYLOR LEASE

OPERATOR KENAI DRILLING RIG #24

DATE 9/18/90 B POWERS

TEMPERATURE

PRESSURE (ATM)

STATIC PRESSURE

FUEL TYPE DIESEL

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl	HCo			CORRECTED TO % CO	HCl	DRY HCo
DRILLING	11:15	STACK CENTER	10%	9.9%	290		21.7					
IN PROGRESS	11:20		9.6%	9.9%	300		21.5					
	11:25		10%	9.9%	300		20.4					
	11:30		10.2%	9.9%	290		18.5					
	11:35		10.3	9.9	290		19.0					
	11:40		10.3	9.8	300		20.6					
	11:45		10.4	9.8	290		20.0					
Stopped Drilling	11:50		10.3	9.8	290		19.7					
Drilling	11:55		10.3	9.8	260		17.1					
[illegible]	12:00	cal. zero	0.3	Ø	-20		.1 ppm					
Calibration	12:05	span	8.3	12	920		50.7					
	12:10		10	9.9	320		17.1					
	12:15		10.2%	9.8	330		17.2					
	12:20		10.1	9.8	330		16.8					
	12:25		10.2	9.8	310		15.3					
	12:30		10.1	9.7	310		15.6					
	12:35		10.1	9.7	300		14.5					
	12:40	~~[illegible]~~ Drilling Stopped	10.1	9.8	290		13.5					
	12:45		10.2	9.8	300		14.0					
	12:50		10.2	9.7	320		14.6					
	12:55	AT IDLE	18.2	4.5	460		10.6					
SPAN GAS CONCENTRATION			8.0	11.9	1000		50					

REMARKS:

SPAN CONC: CO : 1000 ppm

O_2 : 8.0%, 20.9%

CO_2 : 11.9%

ZERO GAS : N_2

THC : 9.0 ppm (N_2), 50 ppm C_3H_8, 150 ppm C_3H_8

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT SWEPI / WSPA

LOCATION Taylor Lease

OPERATOR Kenai Drilling Rig #24

DATE 9-18-90 J. Ritchey

TEMPERATURE

PRESSURE (ATM)

STATIC PRESSURE

FUEL TYPE Diesel

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl	HCo	CORRECTED TO % CO	% HCl	DRY HCo
	1300	Drilling Resumed	10.2	9.8	320		14.6			
	1305		10.0	9.8	330		14.9			
	1310		10.0	9.8	320		13.9			
	1315		10.0	9.8	310		12.3			
	1320		10.0	9.7	290		10.8			
	1325		10.0	9.7	290		10.9			
	1330		10.0	9.7	300		10.4			
CALS	1335	Zero Cal	0	0	0		-.5			
	1340	Span Cal	8.0	11.9	1000		50.3			
	1345		10.0	9.7	290		10.3			
	1350		10.0	9.7	300		11.1			
	1355	~~Engine Idle~~	10.0	9.7	320		11.8			
	1400	Idle Drilling	9.9	2.6	420		7.2			
	1405	Drilling	9.9	9.9	290		10.3			
	1410		10.0	9.8	300		10.0			
	1415		10.0	9.8	320		11.1			
	1420		10.0	9.8	290		9.5			
	1425		10.0	9.8	290		9.0			
	1430		10.0	9.8	300		8.9			
	1435		10.0	9.8	300		9.2			
	1440		10.0	9.7	300		9.4			
SPAN GAS CONCENTRATION			8.0	11.9	1000		50			

REMARKS:

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT SWEPI / WSPA — TEMPERATURE

LOCATION Taylor Lease — PRESSURE (ATM)

OPERATOR Kenai Drilling Rig # 24 — STATIC PRESSURE

DATE 9-18-90 J Ritchey — FUEL TYPE Diesel

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl	HCo			CORRECTED TO % CO	% RCT	DRY HCo
	1445		10.0	9.8	300		9.5					
	1450		10.0	9.8	290		9.2					
	1455		10.0	9.8	320		10.2					
	1500		10.0	9.7	330		10.3					
	1505	Engine Idle	17.9	2.5	460		7.2					
	1510		9.9	9.9	290		9.7					
	1515		9.9	9.9	310		9.8					
	1520	Zero Cal	0.1	0	-10		-.5					
	1525	Span Cal	7.8	11.7	1000		51.5					
	1530		9.9	9.9	300		8.4					
	1535		9.9	9.9	310		9.0					
	1540		9.9	9.9	310		9.2					
	1545		9.9	9.9	320		9.3					
	1550		9.8	9.9	300		8.4					
	1555		9.9	9.9	310		8.8					
	1600		9.9	9.9	320		9.0					
	1605		9.9	9.8	310		9.1					
	1610		9.9	9.9	330		9.1					
	1615		9.9	9.9	300		8.8					
	1620		9.9	9.9	320		9.5					
	1625											
SPAN GAS CONCENTRATION			8.0	11.9	1000		50					

REMARKS:

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT SUEPT/USPA

LOCATION Taylor Lease

OPERATOR Kenai Drilling Rig #24

DATE 9-18-90 J. Ritchey

TEMPERATURE

PRESSURE (ATM)

STATIC PRESSURE

FUEL TYPE Diesel

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl	HCo	CORRECTED TO CO %	HCl	DRY HCo
	1625		9.9	9.9	310		9.0			
	1630		9.9	9.9	290		8.6			
	1650		9.9	9.9	300		8.7			
	1655		9.9	9.9	300		8.8			
	1700		9.9	9.9	280		8.0			
	1705		9.9	9.9	300		8.3			
	1710		9.9	9.9	290		8.0			
	1715		9.9	9.9	300		8.1			
	1720		9.9	9.9	290		7.7			
	1725		9.9	9.8	300		8.1			
	1730		9.9	9.8	290		7.5			
	1735		9.9	9.8	290		7.8			
	1740		9.9	9.8	290		8.0			
	1745		9.9	9.8	290		7.4			
	1750		9.9	9.8	300		7.9			
	1755		9.9	9.8	280		7.7			
	1800	Zero	Ø	Ø	Ø		-1.9			
		Span	7.6	11.9	1010		49.3			
SPAN GAS CONCENTRATION										

REMARKS: THC Leak check 0 cc/min on reformer
O2, CO2, CO leak check OK

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT WSPA / SANTA FE

LOCATION NORTH MIDWAY 105, 112, 113

OPERATOR

DATE 9-21-90

TEMPERATURE 85°F

PRESSURE (ATM)

STATIC PRESSURE

FUEL TYPE CRUDE OIL

PRETEST LEAKCHECK GOOD NO ROTAMETER FLOW WHEN INLET LINE SEALED

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl	HCo			CORRECTED TO CO	% HCl	DRY HCo
	1:45		3.5	14.4								
	1:55		3.5	14.4								
	2:05											
	2:15											
	2:25		3.5	14.1								
	2:35											
	2:45		3.6	13.4								
	2:55											
	3:05	CAL.	/	/								
	3:15	Zero	0	0								
	3:25	Span	8.0	11.8								
	3:35		3.6	13.3								
	3:45		4.0	13.2								
	3:55		3.8	13.4								
	4:05		3.6	13.6								
	4:15											
	4:25		3.4	13.6								
	4:35		3.6	13.4								
	4:45		3.6	13.6								
	4:55		3.5	13.4								
	5:05											
SPAN GAS CONCENTRATION												

REMARKS:

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT WSPA / Santa Fe

LOCATION North Midway 105, 112, 113

OPERATOR

DATE 9-21-90

TEMPERATURE

PRESSURE (ATM)

STATIC PRESSURE

FUEL TYPE Crude Oil

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl	HCo	CORRECTED TO CO %	HCl	DRY HCo
	5:20		3.6	14.0		3.5				
	5:30		3.5	13.9		0.5				
	5:40		3.4	13.8		0.8				
	5:50		3.5	13.7		0.0				
			Final leak check ✓ from sample to rotameter ✓ good							
SPAN GAS CONCENTRATION										

REMARKS: Span: O_2 = 8.0%, CO_2 = 11.9 %

Zero: N_2 = 0.0 % O_2, 0.0 % CO_2

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT WSTA / SANTA FE

LOCATION MIDWAY SUNSET

OPERATOR B. POWERS

DATE 9/22/90

TEMPERATURE 80°F

PRESSURE (ATM) 29.5 " Hg

STATIC PRESSURE

FUEL TYPE CRUDE OIL

PRETEST LEAK CHECK GOOD 11:40 AM

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	~~HCl~~ O2	~~HCl~~ CO2	CO	CORRECTED TO CO	% HCl	DRY HCl
	11:45	ZERO	0.0	0.0	0.1						
	11:45	SPAN	50%/15.0	11.9%/5.2	39.4						
	11:50		3.7	13.5	2.1						
	12:00		3.6	13.3	1.9						
	12:15		3.8	13.0	1.9						
	12:30		3.5	13.3	1.8						
	12:45		3.7	13.0	(0.7)	INSUFFICIENT SAMPLE FLOW BYPASS PULLING IN AMBIENT AIR SOME					
	~~1:00~~ 1:00		3.6	13.3	2.0						
	1:15		3.8	13.0	1.9		SPAN				
	1:30	CALIBRATION	15.0/15.0	5.1/5.0	39.2/39.8	8.1/8.0	11.8/11.9		1 ACTUAL/CALC		
	1:45		3.5	13.4	2.1	0.0/0.0	0.0/0.0	4.1/0.0			
	2:00		3.4	13.3	2.0		ZERO				
	2:15		3.5	13.1	2.0						
	2:30		3.5	13.2	1.9						
	2:45		↓	↓	↓						
	3:00		↓	↓	↓						
	3:15		3.5	13.2	1.9		SPAN				
	3:30	CALIBRATION	14.9/15.0	5.1/5.0	39.1/39.8	9.0/8.0	11.7/11.9				
	3:45		3.5	13.4	1.7	0.0/0.0	0.0/0.0	0.0/0.0			
	4:00		35	13.2	1.9		ZERO				
	4:15		↓	↓	↓						
SPAN GAS CONCENTRATION											

← EXAMPLE

REMARKS:

1 ACTUAL VALUE BEFORE CALIBRATION ADJUSTMENT

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT USPA / SANTA FE

LOCATION

OPERATOR B.P.

DATE 9/22/90

TEMPERATURE

PRESSURE (ATM)

STATIC PRESSURE

FUEL TYPE

4 30 pm - page 2

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	~~HCl~~ SO2	~~HCo~~ NOx	CO		CORRECTED TO CO %	HCl	DRY HCo
	4:30		3.5	13.2	1.9							
	4:45		3.5	13.2	1.9							
	5:00		3.6	13.0	2.0							
	5:30		3.6	13.0	2.4							
	6:00		3.6	13.0	1.9							
	6:30		↓	↓	↓							
	7:50	END TEST	3.6	13.0	2.1							
	8:00	CALIBRATION	15.2 / 15.0	5.0 / 5.0		8.1 / 8.0	11.7 / 11.9					
						0.0 / 0.0	0.0 / 0.0	0.2 / 0.0				
							zero					
SPAN GAS CONCENTRATION												

REMARKS: 39.8 ppm CO CAL GAS DEPLETED. TRACE CO IN 8.0% O_2, 11.9% CO_2 IS ~ 3 PPM. THIS WILL SERVE AS INDICATOR SPAN VALUE FOR 9/23 TESTING.

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT WSPA / SANTA FE

LOCATION MIDWAY SUNSET

OPERATOR B.P.

DATE 9/23

TEMPERATURE 70 °F

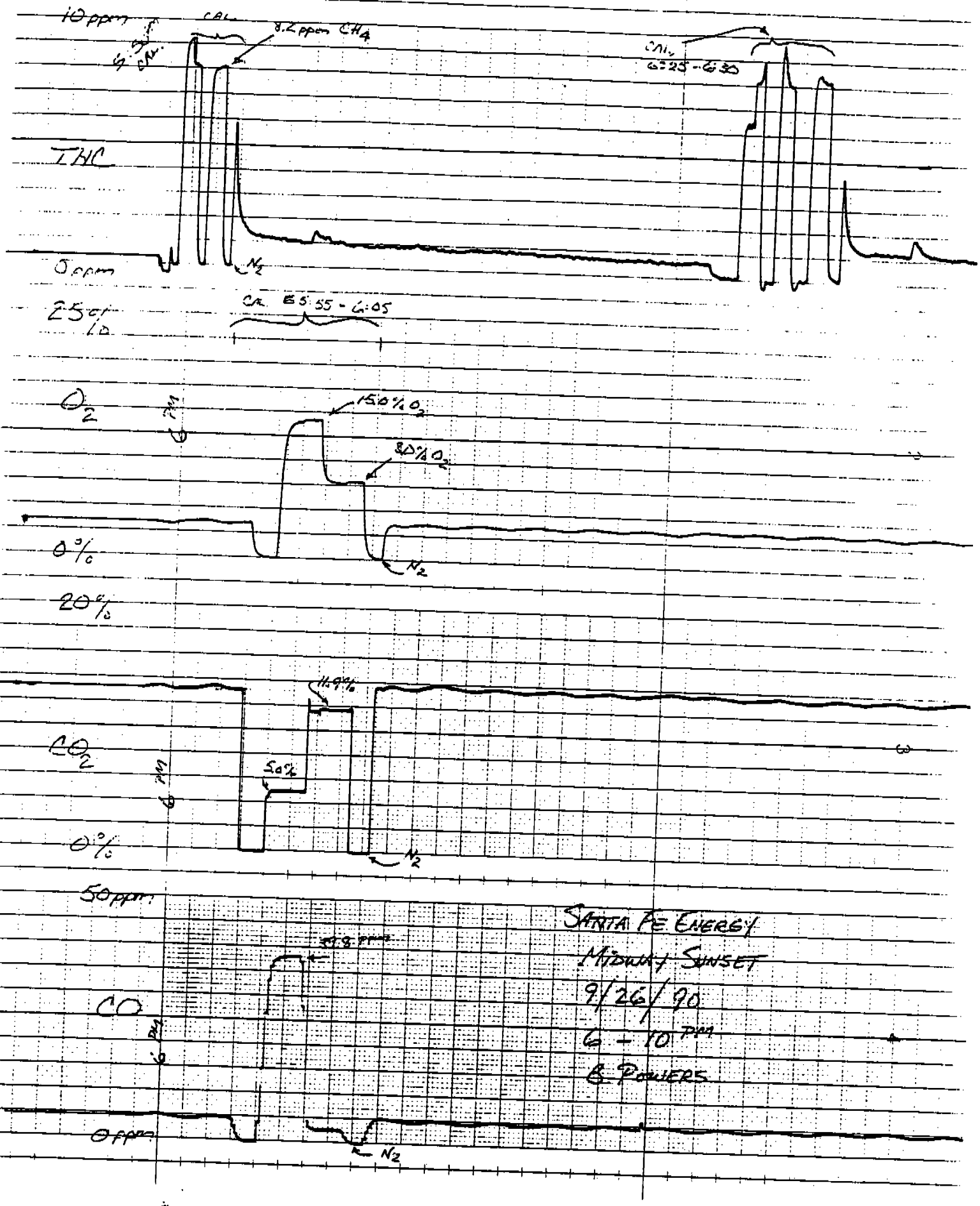
PRESSURE (ATM)

STATIC PRESSURE

FUEL TYPE CRUDE OIL

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl / O2	HBr / CO2	CO	CORRECTED TO CO %	RCT	DRY HCo
	8:00	CALIBRATION	8.0 / 8.0	11.9 / 11.9	2.5 / 2.6	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0			
							ZERO				
	8:15		3.5	13.7							
	8:45										
	9:15		3.5	13.6							
	9:45		3.7	13.2							
	10:15		3.7	13.2							
	10:45		3.7	13.4							
	11:15		3.6	13.2							
	11:45		3.6	13.2							
	12:15		3.5	13.2							
	12:45		3.5	13.0							
	1:30		3.4	13.4							
	2:00		↓	↓							
	2:45		3.5	13.2							
	3:00		3.5	13.2							
	3:30		3.5	13.0							
	4:00		3.5	13.0							
	4:30		3.4	13.2							
		CALIBRATION	7.5 / 8.0	11.7 / 11.9		0.0 / 0.0	0.1 / 0.0				
		FINAL 5:15 PM									
SPAN GAS CONCENTRATION											

REMARKS:


10 ppm
CAL
8.2 ppm CH4
CAL
6:25 - 6:30
THC
0 ppm
N2
25%
CAL 6:55 - 6:05
O2
6 PM
15.0% O2
8.0% O2
0%
N2
20%
11.9%
CO2
6 PM
5.0%
0%
N2
50 ppm
CO
6 PM
0 ppm
N2
SANTA FE ENERGY
MIDWAY SUNSET
9/26/90
6 - 10 PM
8 POWERS

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT WSPA / SANTA FE — TEMPERATURE 90 °F

LOCATION MIDWAY SUNSET — PRESSURE (ATM)

OPERATOR B.P. — STATIC PRESSURE

DATE 9/26/90 — FUEL TYPE

The three S.G.s were L.T.S. to Tom 12-1 PM For final Tune Up, which were attached.

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl	HCo			CORRECTED TO CO %	HCT	DRY HCo
	2:00	CALIBRATION	3.0 / 3.0	11.9 / 11.9	39.5 / 5.8	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0				
	2:05		3.5	13.5	4.2		18					
	2:35		3.6	13.2	5.8		13	0-100	PPM	SCALE		
	3:05		3.6	13.0	5.8		12					
	3:35		3.5	13.6	3.2		9					
	4:05		3.5	13.6	3.7		CALIBRATION	0-10	ppm	SCALE 4		
	4:15		3.4	13.7	5.2		1.6					
	4:35		3.5	13.8	5.2		0.6					
	4:55		3.5	13.7	4.1		2.0					
	5:00						1.5	STRIP CHART MALFUNCTIONING -				
	5:05						1.7	OUT OF PAPER / NEW ROLL INSERTED				
	5:10						1.4					
	5:15		3.5	13.7	3.9		1.0					
	5:55		3.4	13.8	5.0		1.6					
	CALIBRATION	SPAN	14.5 / 15.0				CALIBRATION					
		ZERO	0.0 / 0.0	0.0 / 0.0	-0.1 / 0.0					ACTUAL / CAL GAS		
	6:10	SPAN	7.7 / 8.0	12.0 / 11.9			1.2					
	6:15		3.4	13.9	4.6		1.0	CAL	ZERO: 0.10 / 0.0			
	6:20		3.4	13.8	5.1		CALIBRATION		SPAN: 6.6 / 8.2 (20% DRIFT)			
	6:30		3.5	13.7	4.5		1.4					
	6:40		3.5	13.7	4.7		1.2					
SPAN GAS CONCENTRATION	6:50		3.6	13.6	4.9		1.2					

REMARKS:

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT: USPA / SANTA FE
LOCATION: MIDWAY SUNSET
OPERATOR: E.F.
DATE: [illegible]/30
TEMPERATURE: 80 °F
PRESSURE (ATM):
STATIC PRESSURE:
FUEL TYPE: CRUDE OIL

TEST NO.	SAMPLE TIME	POINT	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl	HCo			CORRECTED TO CO	% HCl	DRY HCo
	7:00		3.5	13.6	4.6		1.1					
	7:15		3.7	13.5	4.3		1.1					
	7:30		3.6	13.5	4.6		1.0					
	8:00	CALIBRATION	0.0/0.0	0.0/0.0	0.0/0.0		0.8					
			14.0/15.0	5.4/5.0	53.5/57.8		AMBIENT AIR SAMPLE		≈	5 ppm THC		
			8.0/3.0	11.9/11.9								
	8:15		3.6	13.4	4.7		CAL.	SPAN	7.5/8.2			
	8:30		3.5	13.4	4.9		1.1	ZERO	-0.4/0.0			
	8:45		3.5	13.5	4.3		1.1					
	9:00		3.5	13.4	5.0		AMBIENT AIR					
	9:15		3.4	13.6	4.7		CALIBRATION	SPAN	7.5/8.2			
	9:30		3.5	13.5	4.6		1.2	ZERO	-0.3/0.0			
	9:45		3.4	13.5	4.1		1.1					
	10:00		3.5	13.4	4.2		1.2					
	10:15		3.5	13.4	4.5		1.1					
	10:15	FINAL					CALIBRATION	SPAN	7.2/8.2			
	↓	CALIBRATION						ZERO	0.0/0.0			
	10:30	CHECK										
SPAN GAS CONCENTRATION												

REMARKS:

ENSR

CONTINUOUS EMISSIONS DATA

CLIENT: SWEPI / COALINGA
TEMPERATURE: 90 °F
LOCATION: SG N-8
PRESSURE (ATM):
OPERATOR: B.P.
STATIC PRESSURE:
DATE: 9/27/90
FUEL TYPE: NATURAL GAS

PRETEST: ① SAMPLE GAS SYSTEM LEAK CHECKED TWICE FROM INLET TO SAMPLE CONDITIONER 10:10 - 10:[illegible] NO LEAK.
② CO_2, O_2 & CO ANALYZERS ZEROED AND SPANNED 3X PRIOR TO SAMPLING 10:10-10:[illegible]

TEST NO.	SAMPLE TIME	N-8 FIRING RATE ~~POINT~~ MCF PER HOUR	CONCENTRATION (DRY, UNCORRECTED) O2	CO2	CO	HCl	HCo			CORRECTED TO % CO	HCl	DRY HCo
	10:30	51.5	2.4	10.4	0.0							
	10:45		0.0	10.3	0.0		CALI-	SPAN / ZERO 6 TIMES				
	11:00	O_2 ANALYZER FAILURE	0.0	10.3	0.0		BRATION	8.2 CH_4 SPAN	0.0 N_2 ZE			
	11:15		0.0	10.3	0.0		1.5					
	11:30		ANALYZER REPLACED	10.3	0.0		2.0					
	11:45		2.5	10.8	0.0		1.8					
	12:00		2.5	10.9	0.0		1.7					
		SPAN	8.2 / 8.0	12.6 / 11.9	40.4 / 39.3		1.8					
		ZERO	0.0 / 0.0	0.0 / 0.0	-0.7 / 0.0		-0.2 / 0.0	7.6 / 8.2				
	12:30	51.3 MCFH	2.5	/	0.2		0.7					
	12:45		2.5	/	0.2		RECALIBRATED					
	1:00		2.5	/	0.1		0.3					
	1:15		2.5	/	0.2		0.2					
	1:30		2.5	/	0.1		0.2					
	1:45		2.6	/	0.1		THC OFF					
	2:00		2.5	/	0.2		CALIBRATION	7.9 / 8.2	-0.4 / 0.0			
	2:45		2.6	/	0.3		0.5[1]					
	3:00		2.7	/	0.0		0.4					
	3:15		2.7	/	0.0		0.3					
	3:30	51.9 MCFH	2.7	/	0.0		0.2					
	FINAL 3:30	CAL. CHECK.	0.3 / 0.0		0.1 / 0.0		0.5 / 0.0					
SPAN GAS CONCENTRATION							8.3 / 8.2					

REMARKS: Temperature at economizer outlet 380 °F
" " stack outlet 275

1 PROBE LOCATION CHANGED FROM ECONOMIZER OUTLET TO STACK OUTLET, PRIMARILY DUE TO ERRATIC READINGS @ ORIGINAL TEST POINT → SWITCH MADE @ ~ 2:30 PM

CHAIN-OF-CUSTODY FORMS

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
ENSR	[illegible] SPA

Project No.	Field Logbook No.
7230 007	1

Sampler: (Signature)	Chain of Custody Tape No.
[illegible]	—

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	FUEL ANALYSIS (HHV, ULT., F. FACTOR)						REMARKS
7230 007											
DW DIESEL 1	9/14/90			DIESEL FUEL	✓						
DW DIESEL 2	"			"							PACKUP SAMPLE
DD DIESEL 1	9/18/90			DIESEL FUEL	✓						
DD DIESEL 2	"			"							PACKUP SAMPLE

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Michael Short	9-21-90	1200	[illegible]	9-21-90	[illegible]
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Ellen Price	9-21-90	12:46	[illegible]	9/21/90	12 46
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY	ENSR
ENSR	[illegible]	

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
ENSR	USPA [illegible] SEA [illegible] JACK

Project No.	Field Logbook No.
7230-007	[illegible]

Sampler: (*Signature*)	Chain of Custody Tape No.
M. Short	

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	[illegible]						REMARKS
7230-007 CRUDE-1	9/21/90	1030		CRUDE OIL	✓						
" CRUDE-2	"	"									[illegible] SAMPLE

Relinquished by: (*Signature*)	Date	Time	Received by: (*Signature*)	Date	Time
M. Short	9/21/[illegible]	[illegible]	Glen Price	9-21-90	10:[illegible]
Glen Price	9-21-90	12:46	[illegible]	9/21/90	12:46
Relinquished by: (*Signature*)	Date	Time	Received for Laboratory: (*Signature*)	Date	Time

Sample Disposal Method:	Disposed of by: (*Signature*)	Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY	
LIFE	ZALCO	ENSR

3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
ENSR	SWEPI, COALINGA

Project No.	Field Logbook No.
7230007	1

Sampler: (Signature)	Chain of Custody Tape No.
[signature]	—

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	FUEL ANALYSIS (ULT., FUFACTK etc)	(HHV [illegible] BTU VALUE)					REMARKS
7230 007											
GFG GAS 1	9/27/90	10:00AM		TEDLAR BAG	✓						[illegible] FUEL GAS
GFG GAS 2	"	"		"	✓	→ BACKUP SAMPLE.					"

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature] J. FRED PRETORIUS	9/27/90	1:47	[signature]		1:47
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY
ENSR 1220 AVENIDA ACASO CAMARILLO CA 93012 (505) 388 3775 BILL POWERS CK	ZALCO BAKERSFIELD, CA.

ENSR

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
ENSR	WSPA
Project No.	**Field Logbook No.**
7230 007	1
Sampler: (Signature)	**Chain of Custody Tape No.**
[redacted]	—

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	ANALYSES: METALS	ANALYSES: CHLORIDES	ANALYSES	ANALYSES	ANALYSES	ANALYSES	REMARKS
7230 007	9										
DW DIESEL 1	9/9/96			DIESEL FUEL	✓	✓					
DW DIESEL 2	"			"							BACKUP SAMPLE
DD DIESEL 1	9/12/96			DIESEL FUEL	✓	✓					
DD DIESEL 2	"			"							BACKUP SAMPLE

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Michael Slack	9/13	[illegible]	[illegible]	[illegible]	[illegible]
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY	
ENSR	COAST - TO - COAST	ENSR

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location	ANALYSES
ENSR	CRUDE FIRED S.G. SCRUBBER STACK SANTA FE ENERGY MIDWAY	
Project No.	**Field Logbook No.**	
7230 -007		
Sampler: (Signature)	**Chain of Custody Tape No.**	
Michael Short		

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	HEX. CHROMIUM (Cr+6) ARB 425	TOTAL CHROMIUM (Cr T) ARB 425					REMARKS
7230 007-			563609-								
CG-C-425-A	9/21/90	1700	-3	LIQUID	X						PROBE RINSE
CG-C-425-B	"	"		LIQUID + FILTER	X						1ST IMPINGER + FILTER
CG-C-425-C	"	"		LIQUID	X						2ND & 3RD IMPINGERS
CG-D-425-A	9/22/90	1200	-4	LIQUID	X						PROBE RINSE
CG-D-425-B	"	"		LIQ. + FILTER	X						1ST IMP. + FILTER (FILTER DIA)
CG-D-425-C	"	"		LIQUID	X						2ND & 3RD IMPINGERS
CG-E-425-NaOH	9/21/90	1800	-5	LIQUID	X	X					NaOH Solution Blank

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Bill Powers	9/24	8PM	Glen Prior	9.25	10am
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Glen Prior	9.25	2pm			
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
			Phillie Hoyt rec'd intact	9-25 90	1400
Sample Disposal Method:			Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR

FRED PRETORIUS
BILL POWERS
MICHAEL SHORT

ENSR
1220 Avenida Acaso
Camarillo, California 93012
(805) 388-3775

ANALYTICAL LABORATORY

COAST TO COAST

ATTN: JAMES WHITE

ENSR

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location	ANALYSES
ENSR	CRUDE FIRED S.G. SCRUBBED STACK SANTA FE ENERGY. MIDWAY	
Project No. 7230007	**Field Logbook No.**	
Sampler: (Signature) Michael Stuart	**Chain of Custody Tape No.**	

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	HEX CHROMIUM (Cr+6) ARB 425	TOTAL CHROMIUM (CrT) ARB 425					REMARKS
7230-007-CG-A-425-A	9/22/90	1200	S63609-	LIQUID	Y			4			PROBE RINSE
-CG-A-425-B	"	"	-1	LIQUID + FILTER	Y						1ST IMP. + FILTER
-CG-A-425-C	"	"		LIQUID	X						2ND & 3RD IMPINGERS
-CG-B-425-A	9/21/90	1700		LIQUID	X						PROBE RINSE
-CG-B-425-B	"	"	-2	LIQ + FILTER	X						1ST IMP + FILTER
-CG-B-425-C	"	"		LIQUID	X						2ND + 3RD IMP.
-CG-E-425-DI	"	1800	-5	LIQUID	X	X					DDI H_2O BLANK

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Bill Powers	9/24	8PM	Glen Price	9-25	10am
Relinquished by: (Signature) Glen Price	9-25	2p.m.	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature) Shellie Hoyt Rec'd Intact	Date 9-25-90	Time 1400
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR
BILL POWERS
FRED PRETORIUS
MICHAEL STUART

ENSR
1220 Avenida Acaso
Camarillo, California 93012

ANALYTICAL LABORATORY
COAST TO COAST
141 SUBURBAN RD.
SLO, CA
ATTN. JAMES LUNTE

ENSR

174-3

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location	ANALYSES
ENSR	S.G. SCRUBBER STACK CRUDE FIRED SANTA FE ENERGY, MIDWAY SUNSET	
Project No. 7230-007	**Field Logbook No.**	
Sampler: (Signature) Bill Powers	**Chain of Custody Tape No.**	

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	TOTAL CHROMIUM (CrT) ARB 425						REMARKS
7230-007-			S63609								
CG-C-425-AT	9/21/90	1700	8	LIQUID	X						PROBE RINSE
CG-C-425-BT	" " "	"		"	X						1ST IMPINGER
CG-C-425-CT	" " "	"		"	X						2ND & 3RD IMPINGERS
CG-D-425-AT	9/22/90	1200	9	LIQUID	X						PROBE RINSE
CG-D-425-BT	" " "	"		"	X						1ST IMPINGER
CG-D-425-CT	" " "	"		"	X						2ND & 3RD IMPINGERS

	Date	Time		Date	Time
Relinquished by: (Signature) Bill Powers	9/24	8 PM	**Received by: (Signature)** Glen Prior	9.25	10 am
Relinquished by: (Signature) Glen Prior	9.25	2 pm	**Received by: (Signature)**		
Relinquished by: (Signature)			**Received for Laboratory: (Signature)** Phillip Hyde rec'd intact	9-25-90	1400
Sample Disposal Method:			**Disposed of by: (Signature)**		

SAMPLE COLLECTOR
Bill Powers
Fred Pretorius
Mike Short

ANALYTICAL LABORATORY
Coast to Coast
141 Suburban Rd.
S.L.O, CA.
Attn. James Hunt

ENSR

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
ENSR	CRUDE FIRED S.G. SCRUBBER STACK SANTA FE ENERGY, MIDWAY SUNSET
Project No. 7230-007	Field Logbook No.
Sampler: (Signature) Bill Powers	Chain of Custody Tape No.

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	TOTAL CHROMIUM (CrT) ARB 425						REMARKS
~~7230-007~~-			563609-								
7230-007- CG-A-425-AT	9/22/90	1200	6	LIQUID	X						PROBE RINSE
CG-A-425-BT	" " "	1200		LIQUID	X						1ST IMPINGER
CG-A-425-CT	" " "	1200		LIQUID	X						2ND & 3RD IMPINGERS
CG-B-425-AT	9/21/90	1700	7	LIQUID	X						PROBE RINSE
CG-B-425-BT	9/21/90	"		LIQUID	X						1ST IMPINGER
CG-B-425-CT	9/21/90	"		LIQUID	X						2ND & 3RD IMPINGERS

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Bill Powers	9/24	8 PM	Glen Prior	9.25	10 pm
Glen Prior	9.25	2 pm			
			Received for Laboratory: (Signature) Shellie Hoyt recd intact	9 25 90	1400

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY
BILL POWERS FRED PRETORIUS MIKE SHORT	COAST TO COAST 141 SUBURBAN RD SLO, CA. ATTN: JAMES / JUNE

ENSR

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
ENSR	MIDWAY SUNSET - S.G. CRUDE OIL FUEL LINE

Project No.	Field Logbook No.
7230-007	

Sampler: (Signature)	Chain of Custody Tape No.
Bill Powers	

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	AB 2588 METALS	BR	Cl				REMARKS
7230-007-			SG3609								
DD-DIESEL 1	9/18/90	-	-20	DIESEL	X	X	X				
DD-DIESEL 2	" " "	-	-24	"							BACK UP SAMPLE
DW-DIESEL 1	9/14/90	-	-21	"	X	X	X				
DW-DIESEL 2	" " "	-	-25	"							BACK UP SAMPLE
			-24								

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Bill Powers	9/24	8 PM	Glen Prior	9-24	10 pm
Glen Prior	9-25	2 pm			
			Received for Laboratory: (Signature) Shellie Hyt rec'd intact	9-25-90	1400

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY
BILL POWERS FRED PRETORIUS MIKE SHORT	COAST TO COAST 141 SUBURBAN RD. SLO, CA. ATTN: JAMES WHITE

ENSR

1974-3-84

ORANGE DENOTES TOP OF SAMPLE CONTANER

** KEEP UPRIGHT

CHAIN OF CUSTODY RECORD

KEEP UPRIGHT **

Client/Project Name: ENSR	Project Location: SANTA FE ENERGY MIDWAY CRUDE FIR
Project No.: 7230 007	Field Logbook No.:
Sampler: (Signature) S. Hammon	Chain of Custody Tape No.:

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	AB-3548 METALS BY EPA MULTI-METALS MTD						REMARKS
7230-007	9/22		SG3609								
CGA-MMT-H	9/22	1500			X						0.1N NITRIC ACID BLANK
CGA-MMT-I	9/22	1500			X						5% HNO_3/10% H_2O_2 BLANK
CGA-MMT-J	9/22	1500	167		X						ACIDIFIED KM MnO_4/H_2SO_4 BLANK
CGA-MMT-K	9/22	1500	31		X						.8N HCl BLANK
CGA-MMT-L	9/22	1500			X						FILTER BLANK

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Bill Powers	9/24	8 PM	Glen Prior	9.25	10 am
Glen Prior	9.25	2 pm			
			Received for Laboratory: (Signature) Shellie Hoyt rec'd intact	9 25 90	1400

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY	
ENSR	COAST-TO-COAST ATTN: JAMES [illegible]	ENSR

1074-3-84

** ORANGE LAB[illegible] DENOTES HOLE IN TOP OF SAMPLE CONTAINER
KEEP UPRIGHT

CHAIN OF CUSTODY RECORD

KEEP UPRIGHT **

Client/Project Name: ENSR	Project Location: SANTA FE ENERGY MIDWAY CRUDE FIRED SCRUBBER
Project No.: 7230-007	Field Logbook No.:
Sampler: (Signature) S Hammon	Chain of Custody Tape No.:

ANALYSES: AB-25 88 METALS BY EPA MULTIMETALS MTD

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	AB-25 88 METALS BY EPA MULTIMETALS MTD						REMARKS
7230 007	9/22	1500	SG3609								
CGA-MMT-A	9/22	1500		FILTER	x						FILTER
CGA-MMT-B	9/22	1500			x						ACETONE RINSE
CGA-MMT-C	9/22	1500	15		x						PROBE RINSE
CGA-MMT-D	9/22	1500			x						IMPINGERS 1,2,3
CGA-MMT-E	9/22	1500	-30		x						IMPINGERS 4,5
CGA-MMT-F	9/22	1500			x						SILICA GEL
CGA-MMT-G	9/22	1500	-16		x						ACETONE BLANK

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Bill Powers	9/24	8PM	Glen Prior	9.25	10am
Glen Prior	9:25	2 pm			
			Received for Laboratory: (Signature) Shellie Hoyt rec'd intact	9 25 90	1400

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR

?'s CALL ENSR CAMARILLO 388 3775
FRED PRETORIUS
BILL POWERS
MIKE SHORT
ENSR

ANALYTICAL LABORATORY

COAST-TO-COAST

ATTN: JAMES [illegible]

ENSR

1974-3-84

** ORANGE LABEL DENOTES SAMPLE CONTAINER LID HAS A SMALL HOLE - KEEP UPRIGHT **

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
ENSR	CRUDE FIRED S.G. SCRUBBER STACK SANTA FE ENERGY - MIDWAY
Project No.	**Field Logbook No.**
7230-007	
Sampler: (Signature)	**Chain of Custody Tape No.**
Michael Short	

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	ANALYSES: AB 2588 METALS BY EPA MULTI-METALS MTD	ANALYSES: 2 BOTTLES - SAME SAMPLE	REMARKS
7230007-CG-B-MMT-A	9/23/90	1100	SG3609-	FILTER	X		FILTER
CG-B-MMT-B				LIQUID	X		ACETONE RINSE
CG-B-MMT-C					X		PROBE RINSE
CG-B-MMT-D			17		X		IMPINGERS 1,2,3 & RINSE
CG-B-MMT-E			- 3½		X		IMPINGERS 4,5
CG-B-MMT-F				SILICA GEL	X		IMPINGER 6 - SILICA GEL
CG-B-MMT-D2	9/23/90	1100		LIQUID	X		IMPINGERS 1-3, RINSE

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Bill Powers	9/24	8PM	Glen Prier	9-25	10pm
Glen Prier	9-25	2pm			
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
			Phillie Hoyt Rec'd in Lab	9-25-90	1400
Sample Disposal Method:			Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR

BILL POWERS
FRED PRETORIUS
MICHAEL SHORT

ENSR
1220 Avenida Acaso
Camarillo, California 93012
(805) 388-3775

ANALYTICAL LABORATORY

COAST TO COAST

ATTN: JAMES WHITE

ENSR

4-3-8

[illegible] ORANGE LABEL DENOTES SAMPLE CONTAINER LID HAS A SMALL HOLE ** KEEP [illegible]

CHAIN OF CUSTODY RECORD

Client/Project Name ENSR	**Project Location** CRUDE FIRED S.G. SCRUBBER STACK SANTA FE ENERGY MIDWAY
Project No. 7230-007	**Field Logbook No.**
Sampler: (Signature) Michael Short	**Chain of Custody Tape No.**

ANALYSES: AB2588 METALS BY EPA MULTI-METALS MTD

2 Bottles, 1 sample

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	AB2588 METALS BY EPA MULTI-METALS MTD						REMARKS
7230007-			SG3609-								
CG-C-MMT-A	9-23-90	1500		FILTER	X						FILTER
CG-C-MMT-B				LIQUID	X						ACETONE RINSE
CG-C-MMT-C					X						PROPE RINSE
CG-C-MMT-D1			18		X						IMP# 1-3 & RINSE
CG-C-MMT-E			33		X						IMP# 4, 5
CG-C-MMT-F				SILICA GEL	X						IMP# 6 (SILICA GEL)
CG-C-MMT-D2				LIQUID	X						IMP# 1-3 & RINSE

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Bill Powers	9/24	8PM	Glen Prior	9-25	10am
Glen Prior	9-25	2pm			
			Received for Laboratory: (Signature) Shellie Hayt rec'd intact	9-25-90	1400

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR
BILL POWERS
FRED PRETORIUS
MICHAEL SHORT

ENSR
1220 Avenida Acaso
Camarillo, California 93012
(805) 388-3775

ANALYTICAL LABORATORY
COAST TO COAST

ATTN: JAMES WHITE

ENSR

1974-3-84

* * ORANGE LABEL DENOTES SAMPLE CONTAINER LID HAS A SMALL HOLE — KEEP UPRIGHT **

CHAIN OF CUSTODY RECORD

Client/Project Name ENSR	**Project Location** CRUDE - FIRED S.G. SCRUBBER STACK SANTA FE ENERGY - MIDWAY
Project No. 7230 - 007	**Field Logbook No.**
Sampler: (Signature) Michael Short	**Chain of Custody Tape No.**

ANALYSES: AB 2588 METALS BY EPA MULTI-METALS MTD

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	AB 2588 METALS BY EPA MULTI-METALS MTD						REMARKS
7230 007-			SG3609								
CG-D-MMT-A	9/23/90	1100		FILTER							FILTER - BLANK TRAIN
CG-D-MMT-B				LIQUID							ACETONE RINSE - " "
CG-D-MMT-C			19								PROBE RINSE " "
CG-D-MMT-D											IMP.# 1-3 " "
CG-D-MMT-E			340								IMP.# 4,5 " "
CG-D-MMT-F				SILICA GEL							IMP.# 6 - SILICA GEL " "

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Bill Powers	9/24	8 PM	Glen Prior	9.25	10pm
Glen Prior	9.25	2pm.			
			Received for Laboratory: (Signature) Shellie Hyt rec'd in fact	9-25-90	1400

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR
BILL POWERS
FRED PRETORIUS
MICHAEL SHORT

ENSR
1220 Avenida Acaso
Camarillo, California 93012
(805) 388-3775

ANALYTICAL LABORATORY
COAST TO COAST

ATTN: JAMES WHITE

ENSR

74-3-

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
ENSR	SANTA FE ENERGY MIDWAY CF SCRUBBER

Project No.	Field Logbook No.
7230 007	

Sampler: (Signature)	Chain of Custody Tape No.
Spencer Hammer	

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	BERYLLIUM - ARE 1-4	BROMINE					REMARKS
7230007			SG3609-								
CGA104A	9/22	1500	10	~~LIQUID~~ FILTER	X	X					FILTER
CGA104B	9/22	1500		LIQUID	X	X					FIRST IMPINGER
CGA104C	9/22	1500		LIQUID	X	X					Second, THIRD, + RINSE
CGA104D	9/22	1500	14	LIQUID	X	X					100ml ACETONE Blank
CGA104E	9/22	1500		LIQUID	X	X					100ml DI. WATER Blank

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Bill Powers	9/24	8PM	Glen Prior	9.25	10pm
Glen Prior	9.25	2pm			
			Received for Laboratory: (Signature) Shellie Hayt Rec'd intact	9.25.90	1400

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY
?'s, call 388-3775 ENSR FRED PRETORIUS BILL POWERS MIKE SHORT	COAST TO COAST ATTN. JAMES WHITE

ENSR

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location	ANALYSES
ENSR	Midway Sunset S.G. Crude Oil Fuel Line	
Project No. 7230-007	**Field Logbook No.**	
Sampler: (Signature) Bill Powers	**Chain of Custody Tape No.**	

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	AB 2588 METALS	Be	Cl				REMARKS
7230-007-	~~9/21~~		563609								
CG-CRUDE-1	9/21/90		-26		~~X~~	~~X~~					BACKUP
CG-CRUDE-2	9/21/90		-27								BACKUP
CG-CRUDE-3	9/22/90		-22		X	X	X				FUEL SAMPLE
CG-CRUDE-4	9/22/90		-28								BACKUP
CG-CRUDE-5	9/23/90		-23		X	X	X				FUEL SAMPLE
CG-CRUDE-6	9/23/90		-29								BACKUP

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Bill Powers	9/24	8 PM	Glen Prior	9-24	10 PM
Relinquished by: (Signature) Glen Prior	Date 9-25	Time 2 PM	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature) Shelli Floyd Iced Intact	Date 9-25-90	Time 1400
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR

Bill Powers
Fred Pretorius
Mike Short

ANALYTICAL LABORATORY

Coast to Coast
141 Suburban Rd SLO, CA.
ATTN: James White

ENSR

3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
ENSR	CRUDE FIRED S.G. CORMBBER JACK SANTA FE MIDWAY

Project No.	Field Logbook No.
7230-007	

Sampler: (Signature)	Chain of Custody Tape No.
Michael Short	

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	Beryllium Arsenic	Bromine					REMARKS
7230007-CG-B-104-A	9/23/90	1100	SG3609-	FILTER	x	X					FILTER
" CG-B-104-B		1100	11	LIQUID	x	X					IMP. 1-3 & RINSES
" CG-B-104-B1	"	1100		"	x	X					IMP. 1-3 & RINSES
" CG-C-104-A	"	1100		FILTER	x	X					FILTER
" CG-C-104-B	"	1100	12	LIQUID	x	X					IMP. 1-3 & RINSES
" CG-C-104-B1	"	1100		LIQUID	X	X					IMP. 1-3 & RINSES
CG-D-104-A	"	1100	13	FILTER	x	X					FILTER } BLANK
CG-D-104-B	"	1100		LIQUID	x	X					IMP. 1-3 & RINSES } TRAIN

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Bill Powers	9/24	8 PM	Glen Prior	9.25	10 am
Glen Prior	9.25	2pm			
			Received for Laboratory: (Signature) Shellie Hyst Rec'd Intact	9.25.90	1400

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY	
FRED PREFRIUS BILL POWERS MICHAEL SHORT ENSR (805) 588-3775	[illegible] ATTN: JAMES [illegible]	ENSR

1974-3-84

CALLAB-054822

Enseco, Inc. - Cal Lab Analytical
2544 Industrial Bvd.

West Sacramento, California 95691
(916) 372-1393

Date Received : 18 SEP 90 07:55

ENSR Consulting & Engineering -
1220 Avenida Acaso
Camarillo, California
93010

(805) 388-3775

Project ID,
EPA Case, RMA Lot : ENSR WSPA 7230-007
Sample Trains for PAH
P.O. Number : WSPA 7230-007

Delivered By :

Storage Location : R15

Logged in by : MDYAS

4 air train samples received under COC in good condition.
Delivered by Federal Express.

Sample ID	Enseco ID	Client's label info	Date/Time Samp.	Containers
054822-0001-SA	165609	7230007DWA429	14 SEP 90	6 components: XAD, 5
054822-0002-SA	165612	7230007DWB429	14 SEP 90	6 components: XAD, 5
054822-0003-SA	165614	7230007DWC429	14 SEP 90	6 components: XAD, 5
054822-0004-SA	165629	7230007DWD429	14 SEP 90	6 components: XAD, 5

Samples not destroyed in testing are retained a maximum
of thirty (30) days unless otherwise requested.

Client Manager: Tim Cleary

Enseco
A CORNING Company

☐ 7440 Lincoln Way, Garden Grove, CA [illegible], (714) [illegible]
☐ 2810 Bunsen Ave., Unit A Ventura, CA 93003, (805) 650-0546
☐ 2325 Skyway Dr., Unit K, Santa Maria, CA 93455, (805) 922-2776
☐ 9537 Telstar Ave., Unit 118, El Monte, CA 91731, (818) 442-8400
☐ Mobile Labs, (800) ENSECO-8

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSR

ADDRESS 1220 AVENIDA ACASO, CAMARILLO, CA. 93012

WSPA 7230-007

PROJECT NAME

CONTRACT / PURCHASE ORDER / QUOTE #

PROJECT MANAGER BILL POWERS

PHONE NUMBER (805) 388 3775

SITE CONTACT —

ANALYSES

Sample No. / Identification	Date	Time	Lab Sample Number	SAMPLE TYPE LIQ.	AIR	SOLID	No. of Containers	PAH - ARB 429							Sample Condition/ REMARKS
7230 007 DW A 429 A	9/14/90			✓			1	✓							PROBE WASH
B	"					✓	1	✓							FILTER
C	"			✓			1	✓							BACK HALF WASH
D	"			✓			1	✓							FIRST IMPINGER
E	"			✓			1	✓							2ND IMPINGER
7230 007 DW B 429 A	"			✓			1	✓							PROBE WASH
B	"					✓	1	✓							FILTER
C	"			✓			1	✓							BACK HALF WASH
D	"			✓			1	✓							FIRST IMPINGER
E	"			✓			1	✓							2ND IMPINGER

SAMPLERS: (Signature) [signature]

Received by: (Signature) [signature] Date Time

Relinquished by: (Signature) Received by: (Signature) Date Time

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Enseco Terms and Conditions, unless a contract or purchase order has been executed and is cited above.

Relinquished by: (Signature) [signature] 3:PM 9/17/90 Date 1ST 1990 Time 10:00p

Received for Laboratory by: [signature]

Date	RECEIVED	Time	Date	ACCEPTED	Time
9-18-90	07:55				

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:
1. Storage time requested:_____days
(Samples will be stored for 30 days without additional charges; thereafter storage charges will be billed at the published rates.)
2. Sample to be returned to client: Y N
(Enseco will dispose of unreturned samples at no extra charge. Disposal will be by incineration wherever possible; otherwise, as appropriate, according to legal requirements.)

DISTRIBUTION: White with report, Yellow to Enseco, Pink to Courier, Gold to Sample Control

Enseco
A CORNING Company

☐ 7440 Lincoln Way, Garden Grove, CA 92641, (714) 898-6370
☐ 2610 Bunsen Ave., Unit A Ventura, CA 93003, (805) 650-0546
☐ 2325 Skyway Dr., Unit K, Santa Maria, CA 93455, (805) 922-2776
☐ 9537 Telstar Ave., Unit 118, El Monte, CA 91731, (818) 442-8400
☐ Mobile Labs, (800) ENSECO-8

CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSR 93642

ADDRESS 1220 AVENIDA ACASO, CAMARILLO, CA

WSPA 7230 - oct 7

PROJECT NAME

CONTRACT / PURCHASE ORDER / QUOTE #

PROJECT MANAGER

BILL POWERS

PHONE NUMBER

(805) 388 3775

SITE CONTACT

—

ANALYSES

Sample No. / Identification	Date	Time	Lab Sample Number	SAMPLE TYPE LIQ.	AIR	SOLID	No. of Containers	PAH - ARB 429	Sample Condition/ REMARKS
7230 oct 7 DW C 429 A	9/14			✓			1	✓	PROBE WASH
B	"					✓	1	✓	FILTER
C	"			✓			1	✓	BACK HALF WASH
D	"			✓			1	✓	FIRST IMPINGER
E	"			✓			1	✓	2ND IMPINGER
7230 oct 7 DW D 429 A	"			✓			1	✓	PROBE WASH
B	"					✓	1	✓	FILTER
C	"			✓			1	✓	BACK HALF WASH
D	"			✓			1	✓	FIRST IMPINGER
E	"			✓			1	✓	2ND IMPINGER

BLANK TRAIN

SAMPLERS: (Signature)

Received by: (Signature)

Date | Time

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Enseco Terms and Conditions, unless a contract or purchase order has been executed and is cited above.

Relinquished by: (Signature)

Received by: (Signature)

Date | Time

Relinquished by: (Signature) 9/17/90 15:00

Date | Time

Received for Laboratory by:

Date RECEIVED	Time	Date ACCEPTED	Time
9-18-90	07:55		

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:

1. Storage time requested:_____ days
(Samples will be stored for 30 days without additional charges; thereafter storage charges will be billed at the published rates.)

2. Sample to be returned to client: Y N
(Enseco will dispose of unreturned samples at no extra charge. Disposal will be by incineration wherever possible; otherwise, as appropriate, according to legal requirements.)

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☐ 9537 Telstar Ave., Unit 118, El Monte, CA 91731. (818) 442-8400
☐ Mobile Labs, (800) ENSECO-8

Date_____ Page_____ of_____

Lab Number_____

CLIENT E.V.S.

ADDRESS 1220 Wenida Alaso Camarillo CA 93012

WSPA 7230-007

PROJECT NAME

CONTRACT / PURCHASE ORDER / QUOTE #

PROJECT MANAGER
BILL POWERS

PHONE NUMBER
(805) 388 3775

SITE CONTACT

ANALYSES

Sample No. / Identification	Date	Time	Lab Sample Number	SAMPLE TYPE LIQ.	AIR	SOLID	No. of Containers	PAH - ARB 429							Sample Condition/ REMARKS
7230-007 DW A429XAD91P	9/14					✓	1	✓							
7230-007 DW D429XAD91T	9/14					✓	1	✓							
7230-007 DW B429XAD91X	9/14					✓	1	✓							
7230-007 DW C429XAD91J	9/14					✓	1	✓							

SAMPLERS: (Signature) [signature]

Relinquished by: (Signature) [signature]

Received by: (Signature) | Date | Time

Received by: (Signature) | Date | Time

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Enseco Terms and Conditions, unless a contract or purchase order has been executed and is cited above.

Relinquished by: (Signature) [signature] 9/17/90 3:00 PM | Date 9/18/90 | Time 10:00p | Received for Laboratory by: [signature] | Date RECEIVED 9-18-90 | Time 07:55 | Date ACCEPTED | Time

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:
1. Storage time requested:_____days
(Samples will be stored for 30 days without additional charges; thereafter storage charges will be billed at the published rates.)
2. Sample to be returned to client: Y N
(Enseco will dispose of unreturned samples at no extra charge. Disposal will be by incineration wherever possible; otherwise, as appropriate, according to legal requirements.)

DISTRIBUTION: White with report, Yellow to Enseco, Pink to Courier, Gold to Sample Control

Enseco, Inc. - Cal Lab Analytical
2544 Industrial Bvd.

West Sacramento, California 95691
(916) 372-1393

Date Received : 20 SEP 90 08:50

ENSR Consulting & Engineering -
1220 Avenida Acaso
Camarillo, California
93010

(805) 388-3775

Project ID,
EPA Case, RMA Lot : ENSR WSPA 7230-007
Sample Trains for PAH
P.O. Number : WSPA 7230-007

Delivered By :

Storage Location : R16

Logged in by : RBONALY

Four sample trains received under Chain-of-Custody in good condition.
Delivered by Federal Express.

Sample ID	Enseco ID	Client's label info	Date/Time Samp.	Containers
054880-0001-SA	166112	7230 007 DDA 429 (A-E,XAD91N)	18 SEP 90	6 Components:
054880-0002-SA	166113	7230 007 DDB 429 (A-E,XAD91W)	18 SEP 90	6 Components:
054880-0003-SA	166114	7230 007 DDC 429 (A-E,XAD91L)	18 SEP 90	6 Components:
054880-0004-SA	166115	7230 007 DDD 429 (A-E,XAD91G)	18 SEP 90	6 Components:

Samples not destroyed in testing are retained a maximum
of thirty (30) days unless otherwise requested.

Client Manager: Tim Cleary

Enseco
A CORNING Company

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☐ 2325 Skyway Dr., Unit K, Santa Maria, CA 93455, (805) 922-2776
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☐ Mobile Labs, (800) ENSECO-8

CHAIN OF CUSTODY RECORD

Date _____ Page _____ of _____

Lab Number _____

CLIENT ENSR 93012

ADDRESS 1220 AVENIDA ACASO CAMARILLO CA

7230 007

PROJECT NAME

#6

CONTRACT / PURCHASE ORDER / QUOTE #

PROJECT MANAGER
BILL POWERS

PHONE NUMBER
(805) 358 3775

SITE CONTACT
—

ANALYSES

Sample No. / Identification	Date	Time	Lab Sample Number	SAMPLE TYPE LIQ.	AIR	SOLID	No. of Containers	PAH							Sample Condition/ REMARKS
7230 007 ODA429 A	9/5/90			✓			1	✓							PROBE/FRONT HALF
B	"					✓	1	✓							FILTER
C	"			✓			1	✓							BACK HALF
D	"			✓			1	✓							1ST IMP.
E	"			✓			1	✓							2ND IMP.
7230 007 DDB429 A	"			✓			1	✓							PROBE/FRONT HALF
B	"					✓	1	✓							FILTER
C	"			✓			1	✓							BACK HALF
D	"			✓			1	✓							1ST IMP.
E	"			✓			1	✓							2ND IMP.

SAMPLERS: (Signature)

Relinquished by: (Signature)

Relinquished by: (Signature) J Bauer

Received by: (Signature)

Received by: (Signature) J Bauer

Date 9-18-90 Time 1:30 pm

Date | Time

Date 9-18-90 Time 3:00 pm

Received for Laboratory by: R Bonaly

Date RECEIVED 9-20-90 Time 0850

Date ACCEPTED | Time

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Enseco Terms and Conditions, unless a contract or purchase order has been executed and is cited above.

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:
1. Storage time requested: _____ days
(Samples will be stored for 30 days without additional charges; thereafter storage charges will be billed at the published rates.)
2. Sample to be returned to client: Y N
(Enseco will dispose of unreturned samples at no extra charge. Disposal will be by incineration wherever possible; otherwise, as appropriate, according to legal requirements.)

DISTRIBUTION: White with report, Yellow to Enseco, Pink to Courier, Gold to Sample Control

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☐ Mobile Labs, (800) ENSECO-8

CHAIN OF CUSTODY RECORD

Date _____ Page _____ of _____

Lab Number _____

CLIENT ENSR 93012
ADDRESS 1220 AVENIDA ACASO, CAMARILLO CA

PROJECT NAME
7230 007

CONTRACT / PURCHASE ORDER / QUOTE #

PROJECT MANAGER
BILL POWERS

PHONE NUMBER
(805) 388 3775

SITE CONTACT
—

ANALYSES

Sample No. / Identification	Date	Time	Lab Sample Number	SAMPLE TYPE: LIQ.	AIR	SOLID	No. of Containers	PAH							Sample Condition/ REMARKS
7230 007 DDC 429 A	9/18/90			✓			1	✓							PROBE/FRONT HALF
B	"					✓	1	✓							FILTER
C	"			✓			1	✓							BACK HALF
D	"			✓			1	✓							1ST IMP.
E	"			✓			1	✓							2ND IMP.
7230 007 DDD 429 A	"			✓			1	✓							PROBE/FRONT HALF
B	"					✓	1	✓							FILTER
C	"			✓			1	✓							BACK HALF
D	"			✓			1	✓							1ST IMP.
E	"			✓			1	✓							2ND IMP.

BLANK TRAIN

SAMPLERS: (Signature)

Relinquished by: (Signature)

Relinquished by: (Signature)

Received by: (Signature) J. Dauer — Date 9-18-90 — Time 1:30 PM

Received by: (Signature) — Date — Time

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Enseco Terms and Conditions, unless a contract or purchase order has been executed and is cited above.

Relinquished by: (Signature) J. Dauer — Date 9-18-90 — Time 3:00 PM

Received for Laboratory by: R Boualy

Date RECEIVED: 9-20-90 — Time: 0850

Date ACCEPTED — Time

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:
1. Storage time requested: _____ days
(Samples will be stored for 30 days without additional charges; thereafter storage charges will be billed at the published rates.)
2. Sample to be returned to client: Y N
(Enseco will dispose of unreturned samples at no extra charge. Disposal will be by incineration wherever possible; otherwise, as appropriate, according to legal requirements.)

DISTRIBUTION: White with report, Yellow to Enseco, Pink to Courier, Gold to Sample Control

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☐ 2325 Skyway Dr., Unit K, Santa Maria, CA 93455, (805) 922-2776
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☐ Mobile Labs, (800) ENSECO-8

CHAIN OF CUSTODY RE

Date _____ Page _____ of _____

Lab Number _____

CLIENT ENSR 93012
ADDRESS 1220 AVENIDA ACASO, CAMARILLO, CA.

PROJECT NAME
7230 007

CONTRACT / PURCHASE ORDER / QUOTE #
—

PROJECT MANAGER
BILL POWERS

PHONE NUMBER
(805) 388 3775

SITE CONTACT
—

ANALYSES

Sample No. / Identification	Date	Time	Lab Sample Number	SAMPLE TYPE LIQ.	AIR	SOLID	No. of Containers	PAH	Sample Condition/ REMARKS
7230 007 DD A 429 XAD 91N	9/18/90					✓	1	✓	Resin cartridges logged with compone listed on other COC received w/ shipme RJB 9-2
7230 007 DD B 429 XAD 91W	"					✓	1	✓	
7230 007 DD C 429 XAD 91L	"					✓	1	✓	
	"					"	"		
7230 007 DD D 429 XAD 91G	"					✓	1	✓	BLANK.

SAMPLERS: (Signature)

Relinquished by: (Signature)

Relinquished by: (Signature)
J Bauer

Method of Shipment:

Special Instructions:

Received by: (Signature)
J Bauer

Received by: (Signature)

Date 9-18-90 Time 1230

Date — Time —

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Enseco Terms and Conditions, unless a contract or purchase order has been executed and is cited above.

Date 9-18-90 Time 2000 Received for Laboratory by: R Bonaly

Date RECEIVED	Time	Date ACCEPTED	Time
9-20-90	0850		

SAMPLE DISPOSITION:
1. Storage time requested: _____ days
(Samples will be stored for 30 days without additional charges; thereafter storage charges will be billed at the published rates.)
2. Sample to be returned to client: Y N
(Enseco will dispose of unreturned samples at no extra charge. Disposal will be by incineration wherever possible; otherwise, as appropriate, according to legal requirements.)

DISTRIBUTION: White with report, Yellow to Enseco, Pink to Courier, Gold to Sample Control

Enseco
A CORNING Company

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☐ 2810 Bunsen Ave., Unit A Ventura, CA 93003, (805) 650-0546
☐ ~~2325 Skyway Dr., Unit K, Santa Maria, CA 93455, (805) 922-2776~~
☐ 9537 Telstar Ave., Unit 118, El Monte, CA 91731, (818) 442-8400
☐ Mobile Labs, (800) ENSECO-8

CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSR

ADDRESS 1220 AVENIDA ACASO
CAMARILLO CA 93012

PROJECT NAME
7230 007

CONTRACT / PURCHASE ORDER / QUOTE #

PROJECT MANAGER
BILL POWERS

PHONE NUMBER
(805) 388 3775

SITE CONTACT
—

ANALYSES

Sample No. / Identification	Date	Time	Lab Sample Number	SAMPLE TYPE LIQ.	AIR	SOLID	No. of Containers	PAH							Sample Condition/ REMARKS
7230007 CG C PAH 1	9/26	8:00 PM		✓			1	✓							PROBE/FRONT HALF
2	"	"				✓	1	✓							FILTER
3	"	"		✓			1	✓							BACK HALF
4	"	"		✓			1	✓							1ST IMP.
5	"	"		✓			1	✓							2ND IMP.
7230 007 CG D PAH 1	"	11:00 AM		✓			1	✓							PROBE/FRONT HALF
2	"	"				✓	1	✓							FILTER
3	"	"		✓			1	✓							BACK HALF
4	"	"		✓			1	✓							1ST IMP.
5	"	"		✓			1	✓							2ND IMP.

SAMPLERS: (Signature)

Relinquished by: (Signature)

Relinquished by: (Signature)

Received by: (Signature)

Received by: (Signature)

Date	Time
9/27/96	10:00
9/27/96	2:25 PM

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Enseco Terms and Conditions, unless a contract or purchase order has been executed and is cited above.

Date	Time	Received for Laboratory by:	Date RECEIVED	Time	Date ACCEPTED	Time

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:
1. Storage time requested:_____days
(Samples will be stored for 30 days without additional charges; thereafter storage charges will be billed at the published rates.)
2. Sample to be returned to client: Y N
(Enseco will dispose of unreturned samples at no extra charge. Disposal will be by incineration wherever possible; otherwise, as appropriate, according to legal requirements.)

DISTRIBUTION: White with report, Yellow to Enseco, Pink to Courier, Gold to Sample Control

Enseco
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CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSR

ADDRESS 1220 AVENIDA ACASO
CAMARILLO CA 93012

PROJECT NAME
7230 007

CONTRACT / PURCHASE ORDER / QUOTE #

PROJECT MANAGER
BILL POWERS

PHONE NUMBER
(805) 388 3775

SITE CONTACT
—

ANALYSES

Sample No. / Identification	Date	Time	Lab Sample Number	SAMPLE TYPE LIQ.	AIR	SOLID	No. of Containers	PAH (ARB 429)	Sample Condition/ REMARKS
7230 007 CG A XAD 91R	9/26	2:25 PM				✓	1	✓	XAD 91R
7230 007 CG B XAD 91U	"	4:00 PM				✓	1	✓	XAD
7230 007 CG C XAD 91Q	"	8:10 PM				✓	1	✓	XAD
7230 007 GG D XAD 91C	"	11:00 AM				✓	1	✓	XAD 91C

SAMPLERS: (Signature) Spencer Hansen

Relinquished by: (Signature) Mark Peterson

Received by: (Signature) Mark Peterson — Date 9/27/90 Time 10:00

Received by: (Signature) Tony Mills — Date 9/27/90 Time 2:25pm

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Enseco Terms and Conditions, unless a contract or purchase order has been executed and is cited above.

Relinquished by: (Signature) | Date | Time | Received for Laboratory by: | Date RECEIVED | Time | Date ACCEPTED | Time

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:
1. Storage time requested:_____days
(Samples will be stored for 30 days without additional charges; thereafter storage charges will be billed at the published rates.)
2. Sample to be returned to client: Y N
(Enseco will dispose of unreturned samples at no extra charge. Disposal will be by incineration wherever possible; otherwise, as appropriate, according to legal requirements.)

DISTRIBUTION: White with report, Yellow to Enseco, Pink to Courier, Gold to Sample Control

Enseco
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CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSR
ADDRESS 1220 AVENIDA ACASO
CAMARILLO CA 93012
PROJECT NAME
7230 007
CONTRACT / PURCHASE ORDER / QUOTE #

PROJECT MANAGER
BILL POWERS
PHONE NUMBER
(805) 388 3775
SITE CONTACT
—

ANALYSES

Sample No. / Identification	Date	Time	Lab Sample Number	SAMPLE TYPE LIQ.	AIR	SOLID	No. of Containers	PAH (ARB 429)	Sample Condition/ REMARKS
7230 007CC A PAH 1	9/26	2:25 PM		✓			1	✓	PROBE/FRONT HALF
2	"	"				✓	1	✓	FILTER
3	"	"		✓			1	✓	BACK HALF
4	"	"		✓			1	✓	1ST IMP.
5	"	"		✓			1	✓	2ND IMP.
7230 007 CC B PAH 1	"	4:00 PM		✓			1	✓	PROBE/FRONT HALF
2	"	"				✓	1	✓	FILTER
3	"	"		✓			1	✓	BACK HALF
4	"	"		✓			1	✓	1ST IMP.
5	"	"		✓			1	✓	2ND IMP.

SAMPLERS: (Signature) [signature]

Relinquished by: (Signature) [signature]

Received by: (Signature) [signature]

Relinquished by: (Signature) [signature]

Received by: (Signature) [signature]

Date	Time
9/27/88	10:00
9/27/88	2:25 PM

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Relinquished by: (Signature)	Date	Time	Received for Laboratory by:	Date RECEIVED	Time	Date ACCEPTED	Time

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:
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CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT: ENSR

ADDRESS: 1220 AVENIDA ACASO
CAMARILLO CA 93012

PROJECT NAME: 7230 007

CONTRACT / PURCHASE ORDER / QUOTE #

PROJECT MANAGER: Bill Powers

PHONE NUMBER: (805) 388 3775

SITE CONTACT: —

ANALYSES: PAH (ARB 429)

Sample No. / Identification	Date	Time	Lab Sample Number	SAMPLE TYPE: LIQ.	AIR	SOLID	No. of Containers	PAH (ARB 429)	Sample Condition/ REMARKS
7230 007CC A PAH 1	9/26	2:25 PM		✓			1	✓	PROBE/FRONT HALF
2	"	"				✓	1	✓	FILTER
3	"	"		✓			1	✓	BACK HALF
4	"	"		✓			1	✓	1ST IMP.
5	"	"		✓			1	✓	2ND IMP.
7230 007 CC B PAH 1	"	4:00 PM		✓			1	✓	PROBE/FRONT HALF
2	"	"			[illegible]	✓	1	✓	FILTER
3	"	"		✓			1	✓	BACK HALF
4	"	"		✓			1	✓	1ST IMP.
5	"	"		✓			1	✓	2ND IMP.

SAMPLERS: (Signature)

Relinquished by: (Signature)

Relinquished by: (Signature) | Date | Time

Received by: (Signature)

Received by: (Signature)

Received for Laboratory by:

Date	Time
9/27/96	10:00
9/27/96	2:25 PM

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Enseco Terms and Conditions, unless a contract or purchase order has been executed and is cited above.

Date RECEIVED	Time	Date ACCEPTED	Time

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:
1. Storage time requested:_____ days
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CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSR

ADDRESS 1220 AVENIDA ACASO
CAMARILLO CA 93012

PROJECT NAME
7230 00[illegible]

CONTRACT / PURCHASE [illegible]

PROJECT MANAGER
BILL POWER

PHONE NUMBER
(805) 388 3775

SITE CONTACT
—

ANALYSES

Sample No. / [illegible]	[illegible]	Time	Lab Sample Number	SAMPLE TYPE LIQ.	AIR	SOLID	No. of Containers	PAH (ARB 429)							Sample Condition/ REMARKS
7230 007 CA [illegible]		[illegible]				✓	1	✓							XAD 91R
7230 007 CC B XAD 91B	"	9:00 am				✓	1	✓							XAD
7230 007 CC C XAD 91Q	"	[illegible]				✓	1	✓							XAD
7230 007 CC D XAD 91C	"	11:00 am				✓	1	✓							XAD 91C

SAMPLERS: (Signature)	Received by: (Signature)	Date	Time
	[signature]	9/21/90	10:00
Relinquished by: (Signature)	Received by: (Signature)	Date	Time

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Relinquished by: (Signature)	Date	Time	Received for Laboratory by:	Date	RECEIVED	Time	Date	ACCEPTED	Time

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:
1. Storage time requested:_____days
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CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSE

ADDRESS 1220 AVENIDA ACASO

CAMARILLO CA

PROJECT NAME

7230.007

CONTRACT / PURCHASE [redacted]

PROJECT MANAGER

Bill Powers

PHONE NUMBER

(805) 383 3775

SITE CONTACT

—

ANALYSES

Sample No. / Identification	Sample Date	Sample Time	Lab Sample Number	SAMPLE TYPE: LIQ.	AIR	SOLID	No. of Containers	PAH (MLB 929)							Sample Condition/ REMARKS
7230.007 CK 1	[redacted]			✓			1	✓							PROBE/FRONT HALF
2						✓	1	✓							FILTER
3				✓			1	✓							BACK HALF
4				✓			1	✓							1ST IMP.
5				✓			1	✓							2ND IMP.
7230.007 CK 8 AM 1				✓			1	✓							PROBE/FRONT HALF
2						✓	1	✓							FILTER
3				✓			1	✓							BACK HALF
4				✓			1	✓							1ST IMP.
5				✓			1	✓							2ND IMP.

SAMPLERS: (Signature) [redacted]

Relinquished by: (Signature)

Received by: (Signature) [redacted]

Received by: (Signature)

Date 7/27/90 Time 10:00

Date Time

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Relinquished by: (Signature)	Date	Time	Received for Laboratory by:	Date RECEIVED	Time	Date ACCEPTED	Time

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:

1. Storage time requested:_____days
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CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSR

ADDRESS 1220 AVENIDA ACASO
CAMARILLO

PROJECT NAME
7230 007

CONTRACT / PURCHASE

PROJECT MANAGER
BILL POWERS

PHONE NUMBER
(805) 388 3775

SITE CONTACT
—

ANALYSES

Sample No. / Identification	Time	Lab Sample Number	SAMPLE TYPE LIQ.	AIR	SOLID	No. of Containers	PAH	Sample Condition/ REMARKS
7230 007 CG C			✓			1	✓	PROBE/FRONT HALF
2					✓	1	✓	FILTER
3			✓			1	✓	BACK HALF
4			✓			1	✓	1ST IMP.
5			✓			1	✓	2ND IMP
7230 007 CG D MW 1			✓			1	✓	PROBE/FRONT HALF
2					✓	1	✓	FILTER
3			✓			1	✓	BACK HALF
4			✓			1	✓	1ST IMP.
5			✓			1	✓	2ND IMP.

SAMPLERS: (Signature)

Received by: (Signature) — Date 9/6/90 — Time 15:00

Relinquished by: (Signature) — Received by: (Signature) — Date — Time

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Relinquished by: (Signature)	Date	Time	Received for Laboratory by:	Date RECEIVED	Time	Date ACCEPTED	Time

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:
1. Storage time requested:_____ days
(Samples will be stored for 30 days without additional charges; thereafter storage charges will be billed at the published rates.)
2. Sample to be returned to client: Y N
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DISTRIBUTION: White with report, Yellow to Enseco, Pink to Courier, Gold to Sample Control

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
WSPA	SANTA FE ENERGY – KERN CO. CRUDE-FIRED STEAM GEN. STACK
Project No.	**Field Logbook No.**
7230-007	MS 1
Sampler: (Signature)	**Chain of Custody Tape No.**
Michael Short	

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	ANALYSES: FORMALDEHYDE	ACETALDEHYDE	ACROLEIN				REMARKS
7230-007-											
CG-D-430-A	9/20/90	1600		DNPH in IMPINGER							FIELD BLANK (N_2) FRONT
CG-D-430-B	"	1610		"							" " " BACK
CG-D-430-A	"	1700		"							AMBIENT BLANK-FRONT
CG-D-430-B	"	1700		"							" " -BACK

	Date	Time		Date	Time
Relinquished by: (Signature)	9/20/90	10:00	**Received by: (Signature)** Glen Prior	9.21.90	10:00 am
Relinquished by: (Signature) Glen Prior	9-21-90	3:30 pm	**Received by: (Signature)**	9/21/90	3:30 pm
Relinquished by: (Signature)			**Received for Laboratory: (Signature)**		
Sample Disposal Method:			**Disposed of by: (Signature)**		

SAMPLE COLLECTOR

ENSR
1220 Avenida Acaso
Camarillo, California 93012

ANALYTICAL LABORATORY

ENSR AIR ANALYSIS LAB
CAMARILLO, CA

ENSR

1974-3-84

D N_2 Blank

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location	ANALYSES
WSPA	SANTA FE ENERGY – KERN CO. CRUDE-FIRED STEAM GEN. STACK	
Project No.	**Field Logbook No.**	
7230-007	[illegible]-1	
Sampler: (Signature)	**Chain of Custody Tape No.**	
Michael Short		

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	FORMALDEHYDE	ACETALDEHYDE	ACROLEIN				REMARKS
7230007. -CG-A-430-A	9/20/90	1500		DNPH IMPINGER							STACK SAMPLE - FRONT
" " A-430-B	"	[illegible]00		" "							" " - BACK
" " B-430-A	"	1600		" "							" " - FRONT
" " B430-B	"	1600		" "							" " - BACK
" " C430-A	"	1700		" "							" " - FRONT
" " C430-B	"	1700		" "							" " - BACK

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Michael Short	9/20/90	1000	Glen Prior	9.21.90	10:00 am
Glen Prior	9.21.90	3:30	Donna Lei	9/21/90	3:30 pm

Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY
ENSR 1220 Avenida Acaso Camarillo, California 93012	ENSR AIR ANALYSIS LAB CAMARILLO CA

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
INSPA	SANTA FE ENERGY, NORTH LUDLUM
Project No.	**Field Logbook No.**
7230 007	1
Sampler: (Signature)	**Chain of Custody Tape No.**
	—

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	ANALYSES: FORMALDEHYDE	ACETALDEHYDE	ACROLEIN				REMARKS
7230007CG											
D DN 1	9/26/90			DNPA solution	✓	✓	✓				AMBIENT BLANK
D DN 2	"			"	✓	✓	✓				
E DN 1	"			"	✓	✓	✓				N_2 BLANK
E DN 2	"			"	✓	✓	✓				

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
D. Herman	9/27	930	[signature]	9-27-90	9:30 am
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY	
ENSR	ENSR	ENSR

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
WSPA	SANTA FE ENERGY, NORTH MIDWAY
Project No.	**Field Logbook No.**
7230 007	1
Sampler: (Signature)	**Chain of Custody Tape No.**
[signature]	—

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	FORMALDEHYDE	ACETALDEHYDE	ACROLEIN				REMARKS
7230 007 CG											
A DN 1	9/26/90			DNPH solution	✓	✓	✓				RUN 1
A DN 2	"			"	✓	✓	✓				
B DN 1	"			"	✓	✓	✓				RUN 2
B DN 2	"			"	✓	✓	✓				
C DN 1	"			"	✓	✓	✓				RUN 3
C DN 2	"			"	✓	✓	✓				

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
S. Hamm	9/27	930	[signature]	9-27-90	9:30 am
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY	
ENSR	ENSR	ENSR

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
WSPA	SWEPI, COALINGA

Project No.	Field Logbook No.
7230007	1

Sampler: (Signature)	Chain of Custody Tape No.
[signature]	—

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	FORMALDEHYDE						REMARKS
7230007GFG											
ADN 1	9/27/90			DNPH solution	✓						Run 1
ADN 2	"			"	✓						
BDN 1	"			"	✓						Run 2
BDN 2	"			"	✓						
CDN 1	"			"	✓						Run 3
CDN 2	"			"	✓						

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	28 Sep 90	11:15			
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY	
ENSR	ENSR	ENSR

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
WSPA	SWEPI, COALINGA
Project No.	**Field Logbook No.**
7230 007	1
Sampler: (Signature)	**Chain of Custody Tape No.**
[signature]	–

Sample No./ Identification	Date	Volume Time (ml)	Lab Sample Number	Type of Sample	ANALYSES: FORMALDEHYDE	REMARKS
7230007GFG	9/27/90					
D DN1	"	8.1		DNPH Solution	✓	AMBIENT BLANK RUN
D DN2	"	9.2		"	✓	
E DN1	"	8.8		"	✓	NITROGEN BLANK RUN
E DN2	"	9.2		"	✓	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	28SEPT90	11:25	Donna Li	9/28/90	11:25
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY
ENSR	ENSR

ENSR

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
WSPA	SWEPI, COALINGA
Project No.	**Field Logbook No.**
7230007	1
Sampler: (Signature)	**Chain of Custody Tape No.**
	—

Sample No./ Identification	Date	Volume Time (GAL)	Lab Sample Number	Type of Sample	ANALYSES: FORMALDEHYDE	REMARKS
7230007GFG						
ADN 1	9/27/90	8.8		DNPH solution	✓	Run 1
ADN 2	"	9.2		"	✓	
BDN 1	"	10.2		"	✓	Run 2
BDN 2	"	9.2		"	✓	
CDN 1	"	10.5		"	✓	Run 3
CDN 2	"	9.3		"	✓	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
R. TORRES	28 SEP 90	11:25	Donna Lin	9/28/90	11:25 AM
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY	
ENSR	ENSR	ENSR

1974-3-84

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A CORNING Company

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☐ Mobile Labs, (800) ENSECO-8

CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSR

ADDRESS 1220 AVENIDA ACASO, CAMARILLO, CA. 93012

USPA 7230-[illegible]

PROJECT NAME

CONTRACT / PURCHASE ORDER

PROJECT MANAGER: BILL POWERS

PHONE NUMBER: (805) 388 3775

SITE CONTACT

ANALYSES: PAH - ARE 429

Sample No. / Identification			Lab Sample Number	SAMPLE TYPE LIQ.	AIR	SOLID	No. of Containers	PAH - ARE 429							Sample Condition/ REMARKS
7230 007 DW A429XA[illegible]	[illegible]					✓	1	✓							
7230 007 DW D429XAD91T	9/14					✓	1	✓							
7230 007 DW B429XAD91X	9/14					✓	1	✓							
7230 007 DW C429XAD91J	9/14					✓	1	✓							

SAMPLERS: (Signature) [signature]

Relinquished by: (Signature) [signature]

Relinquished by: (Signature)

Received by: (Signature) | Date | Time

Received by: (Signature) | Date | Time

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Enseco Terms and Conditions, unless a contract or purchase order has been executed and is cited above.

Date	Time	Received for Laboratory by:	Date	RECEIVED	Time	Date	ACCEPTED	Time
[illegible]	10:00							

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:
1. Storage time requested:_____days
(Samples will be stored for 30 days without additional charges; thereafter storage charges will be billed at the published rates.)
2. Sample to be returned to client: Y N
(Enseco will dispose of unreturned samples at no extra charge. Disposal will be by incineration wherever possible; otherwise, as appropriate, according to legal requirements.)

DISTRIBUTION: White with report, Yellow to Enseco, Pink to Courier, Gold to Sample Control

Enseco
A CORNING Company

☐ 7440 Lincoln Way, Garden Grove, CA 92641, (714) 898-6370
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☐ 9537 Telstar Ave., Unit 116, El Monte, CA 91731, (818) 442-8400
☐ Mobile Labs, (800) ENSECO-8

CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSR

ADDRESS 1220 AVENIDA ACASO, CAMARILLO, CA. 93012

USPA 7230 - 007

PROJECT NAME

CONTRACT / PURCHASE ORD

PROJECT MANAGER
BILL POWERS

PHONE NUMBER
(805) 388 3775

SITE CONTACT

ANALYSES

Sample No. / Identification		Time	Lab Sample Number	SAMPLE TYPE LIQ.	AIR	SOLID	No. of Containers	PAH - MCB 429							Sample Condition/ REMARKS
7230 007 Duct 429	A			✓			1	✓							PROBE WASH
	B	"				✓	1	✓							FILTER
	C	"		✓			1	✓							BACK HALF WASH
	D	"		✓			1	✓							FIRST IMPINGER
	E	"		✓			1	✓							2ND IMPINGER
7230 007 Duct 429	A	"		✓			1	✓							PROBE WASH
	B	"				✓	1	✓							FILTER
	C	"		✓			1	✓							BACK HALF WASH
	D	"		✓			1	✓							FIRST IMPINGER
	E	"		✓			1	✓							2ND IMPINGER

SAMPLERS: (Signature)

Relinquished by: (Signature)	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Received by: (Signature)	Date	Time

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Enseco Terms and Conditions, unless a contract or purchase order has been executed and is cited above.

Relinquished by: (Signature)	Date	Time	Received for Laboratory by:	Date RECEIVED	Time	Date ACCEPTED	Time
	14SEP90	10:00					

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:
1. Storage time requested:_____days
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DISTRIBUTION: White with report, Yellow to Enseco, Pink to Courier, Gold to Sample Control

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
WSPA	UNOCAL, FILLMORE
Project No.	**Field Logbook No.**
7230 007	1
Sampler: (Signature)	**Chain of Custody Tape No.**
	—

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	ANALYSES: FORMALDEHYDE	ACETALDEHYDE	ACROLEIN				REMARKS
7230 007											
DW A430A	9/14/90	12:30 PM		DNPH LIQUID	✓	✓	✓				
DW A430B	"	"		"	✓	✓	✓				
DW B430A	"			"	✓	✓	✓				
DW B430B	"			"	✓	✓	✓				
DW C430A	"			"	✓	✓	✓				
DW C430B	"			"	✓	✓	✓				

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	14 SEP 90	10:00	[signature]	9/17/90	10:00 AM
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:			Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR

ENSR Consulting and Engineering
1220 Avenida Acaso
Camarillo, Ca. 93010
(805) 388-3775

ANALYTICAL LABORATORY

ENSR, CAMARILLO

ENSR

№1775

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
WSPA	UNOCAL, FILLMORE

Project No.	Field Logbook No.
7230 007	1

Sampler: (*Signature*)	Chain of Custody Tape No.
J F Pres	—

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	FORMALDEHYDE	ACETALDEHYDE	ACROLEIN				REMARKS
7230 007											
DW 430 ABA	7/19/90	DW C 430 AB		DNPH LIQUID	✓	✓	✓				
DW 430 ABB	"			"	✓	✓	✓				
DW 430 N_2BA	"	DW D430 AB		"	✓	✓	✓				
DW 430 N_2BB	"			"	✓	✓	✓				
~~[illegible]~~	"										

Relinquished by: (*Signature*)	Date	Time	Received by: (*Signature*)	Date	Time
J. JOJORRE	14 SEP 90	10:00 p	[signature]	9/17/90	10:00 am
Relinquished by: (*Signature*)	Date	Time	Received by: (*Signature*)	Date	Time
Relinquished by: (*Signature*)	Date	Time	Received for Laboratory: (*Signature*)	Date	Time

Sample Disposal Method:	Disposed of by: (*Signature*)	Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY	
ENSR	ENSR, CAMARILLO	ENSR

1974-3-84

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CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSR

ADDRESS 1220 AVENIDA ACASO CAMARILLO, CA. 93012

WSPA 7230-007

PROJECT NAME

CONTRACT / PURCHASE ORDER / QUOTE #

PROJECT MANAGER
BILL POWERS

PHONE NUMBER
(805) 388 3775

SITE CONTACT

ANALYSES

Sample No. / Identification	Date	Time	Lab Sample Number	SAMPLE TYPE LIQ.	AIR	SOLID	No. of Containers	PAH - ARB 429							Sample Condition/ REMARKS
7230007DWA429 A	9/11/90			✓			1	✓							PROBE WASH
B	"			✓		✓	1	✓							FILTER
C	"			✓			1	✓							BACK HALF WASH
D	"			✓			1	✓							FIRST IMPINGER
E	"			✓			1	✓							2ND IMPINGER
7230007DWB429 A	"			✓			1	✓							[illegible] WASH
B	"					✓	1	✓							FILTER
C	"			✓			1	✓							BACK HALF WASH
D	"			✓			1	✓							FIRST IMPINGER
E	"			✓			1	✓							2ND IMPINGER

SAMPLERS: (Signature)

Relinquished by: (Signature)

Relinquished by: (Signature)

Received by: (Signature) Date Time

Received by: (Signature) Date Time

Date Time Received for Laboratory by: Date RE[illegible] Date ACCEPTED Time

11 SEPT 90 10:00

[illegible]ges and the signature on this chain [illegible]titutes authorization to perform the above under the Enseco Terms and [illegible] contract or purchase order has been [illegible] above.

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:
1. Storage time requested:_____days
(Samples will be stored for 30 days without additional charges; thereafter storage charges will be billed at the published rates.)
2. Sample to be returned to client: Y N
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DISTRIBUTION: White with report, Yellow to Enseco, Pink to Courier, Gold to Sample Control

Enseco
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CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSR 93012

ADDRESS 1220 AVENIDA ACASO, CAMARILLO, CA.

WSPA 7230 - 007

PROJECT NAME

CONTRACT / PURCHASE ORDER / QUOTE #

PROJECT MANAGER: BILL POWERS

PHONE NUMBER: (805) 388 3775

SITE CONTACT: —

ANALYSES: PAH - ARB 429

Sample No. / Identification	Date	Time	Lab Sample Number	SAMPLE TYPE LIQ.	AIR	SOLID	No. of Containers	PAH - ARB 429							Sample Condition/ REMARKS
7230 007 DW C 429 A	9/14			✓			1	✓							PROBE WASH
B	"					✓	1	✓							FILTER
C	"			✓			1	✓							BACK HALF WASH
D	"			✓			1	✓							FIRST IMPINGER
E	"			✓			1	✓							2ND IMPINGER
7230 007 DW D 429 A	"			✓			1	✓							PROBE WASH
B	"					✓	1	✓							FILTER
C	"			✓			1	✓							BACK HALF WASH
D	"			✓			1	✓							FIRST IMPINGER
E	"			✓			1	✓							2ND IMPINGER

BLANK TRAIN

SAMPLERS: (Signature)	Received by: (Signature)	Date	Time
[signature]			
Relinquished by: (Signature)	Received by: (Signature)	Date	Time

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the [illegible] above under the Enseco Terms and [illegible] contract or purchase order has been [illegible] above.

Relinquished by: (Signature)	Date	Time	Received for Laboratory by:	Date	REC[illegible]	Date	ACCEPTED	Time
[signature]	14 SEP 90	10:00 p						

Method of Shipment:

Special Instructions:

SAMPLE DISPOSITION:
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☐ Mobile Labs, (800) ENSECO-8

CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSR

ADDRESS 1220 AVENIDA ACASO CAMARILLO, CA. 93012

PROJECT NAME
7230 007

CONTRACT / PURCHASE ORDER #
—

PROJECT MANAGER
BILL POWERS

PHONE NUMBER
(805) 388 3775

SITE CONTACT
—

ANALYSES

Sample No. / Identification	Lab Sample Number	SAMPLE TYPE: LIQ.	AIR	SOLID	No. of Containers	PAH							Sample Condition/ REMARKS
7230 007 DA A 129 XAD			–	✓	1	✓							
7230 007 DA A 129 XAD DUP				✓	1	✓							
7230 007 DA C 129 XAD 9/4				✓	1	✓							
"				"	"								
7230 007 DA D 129 XAD 9/5				✓	1	✓							BLANK.

SAMPLERS: (Signature)	Received by: (Signature)		Date	Time	The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Enseco Terms and Conditions, unless a contract or purchase order has been executed and is cited above.
Relinquished by: (Signature)	Received by: (Signature)		Date	Time	
Relinquished by: (Signature)	Date / Time	Received for Laboratory by:	Date RECEIVED / Time		Date ACCEPTED / Time
Method of Shipment:					
Special Instructions:					

SAMPLE DISPOSITION:
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CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSR 93012

ADDRESS 1220 AVENIDA ACASO CAMARILLO CA

PROJECT NAME 7230 007

CONTRACT / PURCHASE ORDER [redacted]

PROJECT MANAGER BILL POWERS

PHONE NUMBER (805) 388 3775

SITE CONTACT —

ANALYSES

Sample No. / Identification	Lab Sample Number	SAMPLE TYPE: LIQ.	AIR	SOLID	No. of Containers	PAH							Sample Condition / REMARKS
7230 007 DDC 429 A		✓			1	✓							PROBE/FRONT HALF
B				✓	1	✓							FILTER
C		✓			1	✓							BACK HALF
D		✓			1	✓							1ST IMP.
E		✓			1	✓							2ND IMP.
7230 007 DDD 429 A		✓			1	✓							PROBE/FRONT HALF
B				✓	1	✓							FILTER
C		✓			1	✓							BACK HALF
D		✓			1	✓							1ST IMP.
E		✓			1	✓							2ND IMP.

BLANK TRAIN

SAMPLERS: (Signature) [redacted]

Received by: (Signature) | Date | Time

Relinquished by: (Signature) | Received by: (Signature) | Date | Time

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Relinquished by: (Signature)	Date	Time	Received for Laboratory by:	Date RECEIVED	Time	Date ACCEPTED	Time

Method of Shipment:

Special Instructions:

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DISTRIBUTION: White with report, Yellow Enseco to Cooler to Client

Enseco
A CORNING Company

☐ 7440 Lincoln Way, Garden Grove, CA 92641, (714) 898-6370
☐ 2810 Bunsen Ave., Unit A Ventura, CA 93003, (805) 650-0546
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☐ 9537 Telstar Ave., Unit 118, El Monte, CA 91731, (818) 442-8400
☐ Mobile Labs, (800) ENSECO-8

CHAIN OF CUSTODY RECORD

Date_____ Page_____ of_____

Lab Number_____

CLIENT ENSR 93012

ADDRESS 1220 AVENIDA ACASO CAMARILLO CA

7230 007

PROJECT NAME

#

CONTRACT / PURCHASE ORDER

PROJECT MANAGER
Bill Powers

PHONE NUMBER
(805) 388 3775

SITE CONTACT
—

ANALYSES

Sample No. / Identification	Lab Sample Number	SAMPLE TYPE: LIQ.	AIR	SOLID	No. of Containers	PAH							Sample Condition/ REMARKS
7230 007 [redacted]		✓			1	✓							PROBE/FRONT HALF
[redacted]				✓	1	✓							FILTER
[redacted]		✓			1	✓							BACK HALF
[redacted]		✓			1	✓							1ST IMP.
[redacted]		✓			1	✓							2ND IMP.
7230 007 [redacted]		✓			1	✓							PROBE/FRONT HALF
[redacted]				✓	1	✓							FILTER
[redacted]		✓			1	✓							BACK HALF
[redacted]		✓			1	✓							1ST IMP.
[redacted]		✓			1	✓							2ND IMP.

SAMPLERS: (Signature)	**Received by: (Signature)**	**Date**	**Time**	The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Enseco Terms and Conditions, unless a contract or purchase order has been executed and is cited above.
Relinquished by: (Signature)	**Received by: (Signature)**	**Date**	**Time**	

Relinquished by: (Signature)	**Date**	**Time**	**Received for Laboratory by:**	**Date** RECEIVED	**Time**	**Date** ACCEPTED	**Time**

Method of Shipment:

Special Instructions:

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DISTRIBUTION: White with report, Yellow to Enseco, Pink to Courier, Gold to Sample Control

CHAIN OF CUSTODY RECORD

ent/Project Name: WSPA	Project Location: SWEPI, VENTURA
oject No.: 7230 007	Field Logbook No.: 1
mpler: (Signature) [signature]	Chain of Custody Tape No.: —

ANALYSES: BTX, PROPYLENE

DRILLING
NG DIESEL
L ENGINE.

ample No./ entification	Date	Time	Lab Sample Number	Type of Sample	BTX	PROPYLENE					REMARKS
-30 007											
A TB	9/18/90			TEDLAR BAG	✓	✓					RUN 1
B TB	"			"	✓	✓					RUN 2
C TB	"			"	✓	✓					RUN 3
D TB	"			"	✓	✓					AMBIENT BLANK
E TB	"			"	✓	✓					NITROGE. BLANK.

inquished by: (Signature) [signature]	Date: 19SEPT90	Time: 8:30a	Received by: (Signature) [signature]	Date: "	Time: "
inquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
inquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
mple Disposal Method:	Disposed of by: (Signature)			Date	Time

MPLE COLLECTOR: ENSR	ANALYTICAL LABORATORY: ENSR	ENSR

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location	ANALYSES
Project No.	**Field Logbook No.**	
Sampler: (Signature)	**Chain of Custody Tape No.**	

Sample No./ Identification	Date	Time	Sample Number	Type of Sample							REMARKS

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	**Date**	**Time**	**Received by: (Signature)**	**Date**	**Time**
Relinquished by: (Signature)	**Date**	**Time**	**Received for Laboratory: (Signature)**	**Date**	**Time**
Sample Disposal Method:	**Disposed of by: (Signature)**			**Date**	**Time**

SAMPLE COLLECTOR

ENSR Consulting and Engineering
1220 Avenida Acaso
Camarillo, Ca. 93010
(805) 388-3775

ANALYTICAL LABORATORY

ENSR

№1785

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name: WSPA	Project Location: SANTA FE - KERN CO. STEAM GEN. - CRUDE OIL FIRED
Project No.: 7230-007	Field Logbook No.: 1-[illegible]
Sampler: (Signature) Michael Short	Chain of Custody Tape No.

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	BENZENE	TOLUENE	XYLENES	PROPYLENE			REMARKS
7230007-CG-A-410	9-20-90	1500		TEDLAR BAG	x	x	x	x			[illegible]
" " -B-410	"	1600		" "	x	x	x	x			
" " -C-410	"	1700		" "	x	x	x	x			
" " -D-410	"	1630		" "	x	x	x	x			[illegible]
" " E-410	"	1730		" "	x	x	x	x			[illegible]

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Michael Short	9-20-90		[illegible]	[illegible]	[illegible]
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Glen Prior	9-21-90	3:26	Luda Ugarova	9-21-90	3:20PM
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR

ENSR
1220 Avenida Acaso
Camarillo. California 93012

ANALYTICAL LABORATORY
ENSR AIR ANALYSIS LAB
CAMARILLO, CA

ENSR

9 14

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location	ANALYSES
[redacted] WSPA	WSPA, SANTA FE ENERGY, NORTH [illegible]	

Project No.	Field Logbook No.
7230 007	1

Sampler: (*Signature*)	Chain of Custody Tape No.
[redacted]	—

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	[redacted]	BTX	PROPYLENE				REMARKS
7230 007CG											
ATB1	9/24/90			TEDLAR BAG		✓	✓				RUN 1
BTB2	"			"		✓	✓				RUN 2
CTB3	"			"		✓	✓				RUN 3
DTB4	"			"		✓	✓				AMBIENT BLANK
ETB5	"			"		✓	✓				N_2 BLANK.

Relinquished by: (*Signature*)	Date	Time	Received by: (*Signature*)	Date	Time
Relinquished by: (*Signature*)	Date	Time	Received by: (*Signature*)	Date	Time
Relinquished by: (*Signature*)	Date	Time	Received for Laboratory: (*Signature*)	Date	Time
Sample Disposal Method:	Disposed of by: (*Signature*)			Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY	
ENSR	ENSR	ENSR

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name: WSPA	Project Location: SWEPI, COALINGA
Project No.: 7230 007	Field Logbook No.: 1
Sampler: (Signature) [signature]	Chain of Custody Tape No.: —

ANALYSES: BTX; NATURAL GAS FIRED STEAM GENERATOR

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	BTX						REMARKS
7230 007GFG	9/25/90										
✓ ATB A	"			TEDLAR BAG	✓						RUN 1
✓ BTB A	"			"	✓						RUN 2
✓ CTB A	"			"	✓						RUN 3
✓ DTB A	"			"	✓						AMBIENT BLANK
✓ ETB A	"			"	✓						N_2 BLANK

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	28 SEP 90	11:15p			
Relinquished by: (Signature)	Date	Time	Received by: (Signature) Linda Ugarte	Date 9-28-90	Time 11:[illegible] AM
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY	
ENSR	ENSR	ENSR

1-3-8

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
WSPA	SWEPI, VENTURA

Project No.	Field Logbook No.
7230 007	1

Sampler: (*Signature*)	Chain of Custody Tape No.
[signature]	—

ANALYSES: FORMALDEHYDE, ACETALDEHYDE, ACROLEIN

DRILLING RIG DIESEL IC ENGINE

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	FORMALDEHYDE	ACETALDEHYDE	ACROLEIN				REMARKS
7230 007											
DD A DN A	9/19/90			DNPH SOLUTION	✓	✓	✓				RUN 1
DD A DN B	"			"	✓	✓	✓				
DD B DN A	"			"	✓	✓	✓				RUN 2
DD B DN B	"			"	✓	✓	✓				
DD C DN A	"			"	✓	✓	✓				RUN 3
DD C DN B	"			"	✓	✓	✓				

Relinquished by: (*Signature*)	Date	Time	Received by: (*Signature*)	Date	Time
			[signature]	9-18-90	1:30 PM
Relinquished by: (*Signature*)	Date	Time	Received by: (*Signature*)	Date	Time
Relinquished by: (*Signature*)	Date	Time	Received for Laboratory: (*Signature*)	Date	Time

Sample Disposal Method:	Disposed of by: (*Signature*)	Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY
ENSR	ENSR

ENSR

1974-3-84

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
WSPA	SWEPI, VENTURA
Project No.	**Field Logbook No.**
7230 007	1
Sampler: (Signature)	**Chain of Custody Tape No.**
[signature]	—

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	FORMALDEHYDE	ACETALDEHYDE	ACROLEIN				REMARKS
7230 007											
DD D DNA	9/18/90			DNPH SOLUTION	✓	✓	✓				AMBIENT BLANK
DD D DNB	"			"	✓	✓	✓				
DD E DNA	"			"	✓	✓	✓				NITROGEN BLANK
DD E DNB	"			"	✓	✓	✓				

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
			[signature]	9-18-90	1:30 PM
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:			Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR	ANALYTICAL LABORATORY
ENSR	ENSR

ENSR

1974-3-84

APPENDIX B.1

FUEL ANALYSES
LABORATORY REPORTS

ZALCO LABORATORIES, INC
Analytical & Consulting Services

ENSR
1220 Avenida Acaso
Camarillo, CA 93012

Laboratory No: 25149-3
Date Received: 9-21-90
Date Reported: 10-1-90

Attention: M. Short

Sample: Crude Oil

Sample Description: 7230-007 DW Diesel-1 sampled on 9-14-90 by M. Short

COMPLIANCE FUEL OIL ANALYSIS

Bottom Sediment & Water (ASTM D 96)	vol %
Total Cut	< 0.05
Emulsion	< 0.05
Water	< 0.05
Sediment	< 0.05
API Gravity @ 60 °F (ASTM D 287)	31.7
Specific Gravity @ 60 °F	0.867
Density, lbs/bbl @ 60 °F	303

Gross Heating Value: (ASTM D 240)	
cal/g	10910
Btu/lb	19640
Btu/gal	141800
Btu/bbl	5955000

Elemental Analysis (CFR 40:60.45)	Normalized wt. %
Carbon	86.71
Hydrogen	13.12
Oxygen	< 0.1
Nitrogen	0.17
Sulfur	0.004
Ash	< 0.01

"F" Factors	DSCF/MMBtu
EPA @ 68 °F	9194
KCAPCD @ 60 °F	9056

Richard L. Penner
Laboratory Director

RLP/jr

4309 Armour Avenue Bakersfield, California 93308
(805) 395-0539 FAX (805) 395-3069

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

ENSR
1220 Avenida Acaso
Camarillo, CA 93012

Laboratory No: 25149-5
Date Received: 9-21-90
Date Reported: 10-1-90

Attention: M. Short

Sample: Diesel

Sample Description: 7230-007 DD Diesel-1 sampled on 9-18-90 by M. Short

COMPLIANCE FUEL OIL ANALYSIS

		vol %
Bottom Sediment & Water (ASTM D 96)		
	Total Cut	< 0.05
	Emulsion	< 0.05
	Water	< 0.05
	Sediment	< 0.05
API Gravity @ 60 °F (ASTM D 287)		34.9
Specific Gravity @ 60 °F		0.850
Density, lbs/bbl @ 60 °F		297
Gross Heating Value: (ASTM D 240)	cal/g	10850
	Btu/lb	19530
	Btu/gal	138300
	Btu/bbl	5809000

Elemental Analysis (CFR 40:60.45)	As Rec'd wt. %
Carbon	87.06
Hydrogen	12.52
Oxygen	0.03
Nitrogen	0.35
Sulfur	0.03
Ash	0.01

"F" Factors	DSCF/MMBtu
EPA @ 68 °F	9157
KCAPCD @ 60 °F	9019

Richard L. Penner
Laboratory Director

RLP/jr

4309 Armour Avenue Bakersfield, California 93308
(805) 395-0539 FAX (805) 395-3069

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

ENSR
1220 Avenida Acaso
Camarillo, CA 93012

Laboratory No: 25149-1
Date Received: 9-21-90
Date Reported: 10-1-90

Attention: M. Short

Sample: Crude Oil

Sample Description: 7230-007 Crude-1 sampled on 9-21-90 by M. Short

COMPLIANCE FUEL OIL ANALYSIS

Bottom Sediment & Water (ASTM D 96)		vol %
	Total Cut	< 0.05
	Emulsion	< 0.05
	Water	< 0.05
	Sediment	< 0.05
API Gravity @ 60 °F (ASTM D 287)		10.8
Specific Gravity @ 60 °F		0.994
Density, lbs/bbl @ 60 °F		348
Gross Heating Value: (ASTM D 240)	cal/g	10140
	Btu/lb	18250
	Btu/gal	151100
	Btu/bbl	6347000

Elemental Analysis (CFR 40:60.45)	As Rec'd wt. %
Carbon	86.21
Hydrogen	10.76
Oxygen	0.32
Nitrogen	0.99
Sulfur	1.67
Ash	0.05

"F" Factors	DSCF/MMBtu
EPA @ 68 °F	9425
KCAPCD @ 60 °F	9284

Richard L. Penner
Laboratory Director

RLP/jr

4309 Armour Avenue Bakersfield, California 93308
(805) 395-0539 FAX (805) 395-3069

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

ENSR
1220 Avenida Acaso
Camarillo, CA 93012

Laboratory No: 26204
Date Received: 9-27-90
Date Reported: 10-2-90
P.O.# 82137

Attention: Bill Powers

Sample: Fuel Gas

Sample Description: Project #72 30007 SWEPI Coalinga
Sampled by J. Pretorius on 9-27-90 at 1000 Hrs

Total Sulfur ASTM D3246	Results
As H_2S, ppm (vol.)	< 1.0
As S, Grains/100 SCF*	< 0.06

* Standard cubic feet (60 °F, 14.7 psia)

Richard L. Penner
Laboratory Director

RLP/jr

4309 Armour Avenue Bakersfield, California 93308
(805) 395-0539 FAX (805) 395-3069

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

ENSR
1220 Avenida Acaso
Camarillo, CA 93012

Lab. No.: 025204_001
Received: Sep 27, 1990
Reported: Sep 27, 1990

Attention: Bill Powers

Sample Description: Project #7230002 Swepi Coalinga 9/27

* CHROMATOGRAPHIC ANALYSIS (Z 1635) *

Components	Mole %	Wt %	CHONS	Wt %
Hydrogen	0.000	0.000	CARBON	72.45
Carbon Dioxide	.893	2.298	HYDROGEN	23.57
Oxygen	.116	.218	OXYGEN	1.89
Nitrogen	1.273	2.086	NITROGEN	2.09
Carbon Monoxide	0.000	0.000	SULFUR	0.00
Hydrogen Sulfide	0.000	0.000		
Methane	94.216	88.414	Totals	99.99
Ethane	2.787	4.901	Total H/C	.33
Propane	.532	1.372		
IsoButane	.046	.157		
N-Butane	.064	.219		
IsoPentane	.019	.079		
N-Pentane	.021	.087		
Hexanes+	.034	.170		
Totals =	100.000	100.000		

SPECIFIC GRAVITY (Air = 1)		.5913
SPECIFIC VOLUME, cu.ft./lb	*	22.16
GROSS CALORIFIC VALUE, BTU/cu.ft.	*	1007.77
GROSS CALORIFIC VALUE, BTU/cu.ft.	**	1025.20
GROSS CALORIFIC VALUE, BTU/lb	**	22716.12
NET CALORIFIC VALUE, BTU/cu.ft.	**	924.22
NET CALORIFIC VALUE, BTU/lb	**	20478.55
DSCF EXHAUST PER SCF FUEL (0% Oxygen)		8.6982
COMPRESSIBILITY FACTOR 'Z' (60 F,1 ATM)		.9979
EPA 'F' Factor @ 68 F:	8630.900 DSCF / MM Btu.	
KCAPCD 'F' Factor @ 60 F:	8501.437 DSCF / MM Btu.	

* Water Saturated

** Dry Gas @ 60 F, 14.73 psia

Maryann W. Benoit
Organics Supervisor

Richard L. Penner
Laboratory Director

4309 Armour Avenue Bakersfield, California 93308
(805) 395-0539 FAX (805) 395-3069

APPENDIX B.2

AB 2588 METALS
LABORATORY REPORTS

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road, Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: 0-3609-23
Collected: 09/23/90
Received: 09/25/90
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:

Project #7230-007 Santa Fe Energy
-Midway, CO Crude 5, Free Product

*Digested by EPA 3030 on 10/03/90 by JMW

REPORT

CONSTITUENT	EPA METHOD	DATE	ANALYST	DETECTION LIMIT mg/kg	TOTAL LEVEL mg/kg	TTLC*** mg/kg
*ANTIMONY	7040	10/08/90	MSM	0.3	<0.3	500.
*ARSENIC	7061	10/05/90	MSMS	0.3	<0.3	500.
*BARIUM	6010	10/04/90	AEA	0.5	6.4	10000.
*BERYLLIUM	6010	10/04/90	AEA	0.5	<0.5	75.
*CADMIUM	7131	10/04/90	MSM	0.3	<0.3	100.
*CHROMIUM, TOTAL	7190	10/04/90	MSM	0.5	1.8	2500.
*COPPER	7210	10/03/90	MSM	0.1	0.8	2500.
*LEAD	7420	10/09/90	MSM	3.	<3.	1000.
*MANGANESE	6010	10/04/90	AEA	1.	<1.	NO LIMIT
MERCURY	7471	10/05/90	RWJ	0.02	<0.02	20.
*NICKEL	6010	10/04/90	AEA	3.	68.	2000.
*SELENIUM	7741	10/05/90	MSM	0.3	<0.3	100.
*SILVER	7760	10/03/90	MSM	0.1	<0.1	500.
*THALLIUM	7840	10/04/90	MSM	3.	<3.	700.
*ZINC	7950	10/02/90	MSM	0.3	2.7	5000.

***TOTAL THRESHOLD LIMIT CONCENTRATION as listed in 22 Cal Adm Code Art 11 Sec. 66699 as persistent & bioaccumulative toxic substance. "NO LIMIT" means not listed therein as persistent and bioaccumulative toxic substance.

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D., President

10/09/90
03609-23.WR1/002
MH/ke

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road, Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: 0-3888-22
Collected: 09/22/98
Received: 09/25/98
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:

Project #7230-007 Santa Fe Energy
-Midway, CQ Crude 3, Free Product

*Digested by EPA 3030 on 10/03/98 by JMW

REPORT

CONSTITUENT	EPA METHOD	DATE	ANALYST	DETECTION LIMIT mg/kg	TOTAL LEVEL mg/kg	TTLC*** mg/kg
*ANTIMONY	7040	10/08/98	MSM	0.3	<0.3	500.
*ARSENIC	7061	10/05/98	MSMS	0.3	<0.3	500.
*BARIUM	6010	10/04/98	AEA	0.5	5.2	10000.
*BERYLLIUM	6010	10/04/98	AEA	0.5	<0.5	75.
*CADMIUM	7131	10/04/98	MSM	0.3	<0.3	100.
*CHROMIUM, TOTAL	7190	10/04/98	MSM	0.5	2.1	2500.
*COPPER	7210	10/03/98	MSM	0.1	10.1	2500.
*LEAD	7420	10/09/98	MSM	3.	<3.	1000.
*MANGANESE	6010	10/04/98	AEA	1.	<1.	NO LIMIT
MERCURY	7471	10/05/98	RWJ	0.02	<0.02	20.
*NICKEL	6010	10/04/98	AEA	3.	79.	2000.
*SELENIUM	7741	10/05/98	MSM	0.3	<0.3	100.
*SILVER	7760	10/03/98	MSM	0.1	<0.1	500.
*THALLIUM	7840	10/04/98	MSM	3.	<3.	700.
*ZINC	7950	10/08/98	MSM	0.3	0.6	5000.

***TOTAL THRESHOLD LIMIT CONCENTRATION as listed in 22 Cal Adm Code Art 11 Sec. 66699 as persistent & bioaccumulative toxic substance. "NO LIMIT" means not listed therein as persistent and bioaccumulative toxic substance.

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D., President

10/09/98
03888-22.WR1/#02
MH/ke

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road, Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: 0-3600-20
Collected: 09/18/90
Received: 09/25/90
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:

Project #7230-007 Santa Fe Energy
-Midway, DD-Diesel 1, Free Product

*Digested by EPA 3030 on 10/03/90 by JMW

REPORT

CONSTITUENT	EPA METHOD	DATE	ANALYST	DETECTION LIMIT mg/kg	TOTAL LEVEL mg/kg	TTLC*** mg/kg
*ANTIMONY	7040	10/08/90	MSM	0.3	<0.3	500.
*ARSENIC	7061	10/05/90	MSMS	0.3	<0.3	500.
*BARIUM	6010	10/04/90	AEA	0.5	4.2	10000.
*BERYLLIUM	6010	10/04/90	AEA	0.5	<0.5	75.
*CADMIUM	7131	10/04/90	MSM	0.3	<0.3	100.
*CHROMIUM, TOTAL	7190	10/04/90	MSM	0.5	0.7	2500.
*COPPER	7210	10/03/90	MSM	0.1	<0.1	2500.
*LEAD	7420	10/09/90	MSM	3.	<3.	1000.
*MANGANESE	6010	10/04/90	AEA	1.	<1.	NO LIMIT
MERCURY	7471	10/05/90	RWJ	0.02	<0.02	20.
*NICKEL	6010	10/04/90	AEA	3.	<3.	2000.
*SELENIUM	7741	10/05/90	MSM	0.3	<0.3	100.
*SILVER	7760	10/03/90	MSM	0.1	<0.1	500.
*THALLIUM	7840	10/04/90	MSM	3.	<3.	700.
*ZINC	7950	10/08/90	MSM	0.3	4.8	5000.

***TOTAL THRESHOLD LIMIT CONCENTRATION as listed in 22 Cal Adm Code Art 11 Sec. 66699 as persistent & bioaccumulative toxic substance. "NO LIMIT" means not listed therein as persistent and bioaccumulative toxic substance.

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES

10/09/90
03600-20.WR1/092
MH/ke

Mary Havlicek, Ph.D., President

AIR, WATER & HAZARDOUS WASTE LABORATORY (No.131) CERTIFIED by CALIFORNIA DEPT of HEALTH SERVICES

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road, Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: 0-3600-21
Collected: 09/14/90
Received: 09/25/90
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:

Project #7250-007 Santa Fe Energy
-Midway, DW-Diesel 1, Free Product

*Digested by EPA 3030 on 10/03/90 by JMW

REPORT

CONSTITUENT	EPA METHOD	DATE	ANALYST	DETECTION LIMIT mg/kg	TOTAL LEVEL mg/kg	TTLC*** mg/kg
*ANTIMONY	7040	10/08/90	MSM	0.3	<0.3	500.
*ARSENIC	7061	10/05/90	MSMS	0.3	<0.3	500.
*BARIUM	6010	10/04/90	AEA	0.5	3.8	10000.
*BERYLLIUM	6010	10/04/90	AEA	0.5	<0.5	75.
*CADMIUM	7131	10/04/90	MSM	0.3	<0.3	100.
*CHROMIUM, TOTAL	7190	10/04/90	MSM	0.5	<0.5	2500.
*COPPER	7210	10/03/90	MSM	0.1	0.1	2500.
*LEAD	7420	10/09/90	MSM	3.	<3.	1000.
*MANGANESE	6010	10/04/90	AEA	1.	<1.	NO LIMIT
MERCURY	7471	10/05/90	RWJ	0.02	<0.02	20.
*NICKEL	6010	10/04/90	AEA	3.	<3.	2000.
*SELENIUM	7741	10/05/90	MSM	0.3	<0.3	100.
*SILVER	7760	10/03/90	MSM	0.1	<0.1	500.
*THALLIUM	7840	10/04/90	MSM	3.	<3.	700.
*ZINC	7950	10/08/90	MSM	0.3	1.9	5000.

***TOTAL THRESHOLD LIMIT CONCENTRATION as listed in 22 Cal Adm Code Art 11 Sec. 66699 as persistent & bioaccumulative toxic substance. "NO LIMIT" means not listed therein as persistent and bioaccumulative toxic substance.

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D., President

10/09/90
03600-21.WR1/092
MH/ke

AIR, WATER & HAZARDOUS WASTE LABORATORY (No.131) CERTIFIED by CALIFORNIA DEPT of HEALTH SERVICES

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: As Listed
Collected: As Listed
Received: 09/25/90
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:

Project #7230-007, Santa Fe Energy
-Midway, Aqueous, Samples As Listed

PREPARED AND ANALYZED BY CARB 425 METHOD
ON 10/04/90 & 10/08/90 BY KES & RWJ.

	TOTAL CHROMIUM Total ug	HEXAVALENT CHROMIUM Total ug
EPA METHOD----------	7191	7196
DETECTION LIMIT(PQL)**-----	0.1	2.
DATE/ANALYST----------	10/09/90/KES	10/04/90/RWJ

LAB NUMBER	SAMPLE DESCRIPTION	LEVEL FOUND	
G-3609-1	CG-A-425A,B,C, Vessel #9 Coll: 09/22/90 @ 1200	-----	<2.
G-3609-2	CG-B-425A,B,C, Vessel #11 Coll: 09/21/90 @ 1700	-----	3.
G-3609-3	CG-C-425A,B,C, Vessel #8 Coll: 09/21/90 @ 1700	-----	<2.
G-3609-4	CG-D-425A,B,C, Vessel #10 Coll: 09/22/90 @ 1200	-----	<2.
G-3609-5	CG-E-425 DI & NaOH Blanks Coll: 09/21/90 @ 1800	<0.005 mg/l	<0.01 mg/l
	SPIKED AT	2.0 mg/l	1.0 mg/l
	FOUND W/SPIKE	1.6 mg/l	1.0 mg/l
	PERCENT RECOVERY	80.	100.
G-3609-6	CG-A-425-AT,BT,CT, Coll: 09/22/90 @ 1200	4.7	-----
G-3609-7	CG-B-425-AT,BT,CT, Coll: 09/21/90 @ 1700	5.1	-----
G-3609-8	CG-C-425-AT,BT,CT, Coll: 09/21/90 @1700	6.0	-----
C-3609-9	CG-D-425-AT,BT,CT, Coll: 09/22/90 @ 1200	4.0	-----

**Practical Quantitation Limit

10/09/90
G3609-1E.WR1/#90
MH/ke

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES
Mary Havlicek, Ph.D., President

AIR, WATER & HAZARDOUS WASTE LABORATORY (No.131) CERTIFIED by CALIFORNIA DEPT of HEALTH SERVICES

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road, Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: G-3699-15
Collected: 09/22/90 @ 1500
Received: 09/25/90 @ 1400
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:
AB2588 Air Testing
7230-007 Santa Fe Energy - Midway
CG-A-MMT-A,B,C,D,F, Front & Back Half,
Air Sampling Train

PRELIMINARY

PREPARED ACCORDING TO EPA MULTIMETALS DRAFT METHOD ON 10/01/90 BY JMW.

REPORT

CONSTITUENT	EPA METHOD/DATE/ANALYST	DETECTION LIMIT (PQL)**	LEVEL FOUND Total ug
ANTIMONY	7041 10/22/90 JMW	3.	4.
ARSENIC	7060 10/01/90 JMW	3.	5.
BARIUM	6010 10/03/90 AEA	4.	86.
BERYLLIUM	6010 10/03/90 AEA	4.	<4.
CADMIUM	7131 10/01/90 JMW	0.4	7.6
CHROMIUM	7191 10/01/90 JMW	3.	25.
COPPER	7210 10/03/90 MSM	1.0	13.
LEAD	7421 10/01/90 JMW	3.	3.
MANGANESE	6010 10/03/90 AEA	10.	80.
MERCURY	7470 10/02/90 KES	0.2	<0.2
NICKEL	6010 10/04/90 AEA	30.	5300.
SELENIUM	7740 10/03/90 JMW	3.	<3.
SILVER	7760 10/03/90 MSM	3.	32.
PHOSPHORUS	6010 10/03/90 AEA	200.	<200.
ZINC	6010 10/03/90 AEA	30.	100.

**Practical Quantitation Limit

PRELIMINARY

10/05/90
03699-15.WR1/090
MH/ke

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D., President

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road, Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: G-3809-16
Collected: 09/22/90 @ 1500
Received: 09/25/90 @ 1400
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:
AB2588 Air Testing
7230-007 Santa Fe Energy - Midway
CT-A-MMT-G,H,I,K,L, Blank,
Air Sampling Train

PREPARED ACCORDING TO EPA MULTIMETALS DRAFT METHOD ON 10/01/90 BY JMW.

PRELIMINARY REPORT

CONSTITUENT	EPA METHOD/DATE/ANALYST	DETECTION LIMIT (PQL)**	LEVEL FOUND Total ug
ANTIMONY	7041 10/22/90 JMW	2.	<2.
ARSENIC	7060 10/01/90 JMW	2.	<2.
BARIUM	6010 10/03/90 AEA	3.	60.
BERYLLIUM	6010 10/03/90 AEA	3.	<3.
CADMIUM	7131 10/01/90 JMW	0.3	<0.3
CHROMIUM	7191 10/01/90 JMW	2.	8.
COPPER	7210 10/03/90 MSM	0.5	1.8
LEAD	7421 10/01/90 JMW	2.	<2.
MANGANESE	6010 10/03/90 AEA	5.	11.
MERCURY	7470 10/02/90 KES	0.05	<0.05
NICKEL	6010 10/04/90 AEA	20.	<20.
SELENIUM	7740 10/03/90 JMW	2.	<2.
SILVER	7760 10/03/90 MSM	2.	<2.
PHOSPHORUS	6010 10/03/90 AEA	150.	<150.
ZINC	6010 10/03/90 AEA	20.	40.

**Practical Quantitation Limit

PRELIMINARY

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D., President

10/05/90
G3809-16.WR1/090
MH/ke

AIR, WATER & HAZARDOUS WASTE LABORATORY (No.131) CERTIFIED by CALIFORNIA DEPT of HEALTH SERVICES

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road, Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: 0-3609-17
Collected: 09/25/90 @ 1155
Received: 09/25/90 @ 1460
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:
AB2588 Air Testing
7230-007 Santa Fe Energy - Midway
CG-8-MMT-A,B,C,D1,F,D2, Front & Back Half, Air Sampling Train

PREPARED ACCORDING TO EPA MULTIMETALS DRAFT METHOD ON 10/01/90 BY JMW.

PRELIMINARY REPORT

CONSTITUENT	EPA METHOD/DATE/ANALYST	DETECTION LIMIT (PQL)**	LEVEL FOUND Total ug
ANTIMONY	7041 10/22/90 JMW	3.	<3.
ARSENIC	7060 10/01/90 JMW	3.	7.
BARIUM	6010 10/03/90 AEA	4.	100.
BERYLLIUM	6010 10/03/90 AEA	4.	<4.
CADMIUM	7131 10/01/90 JMW	0.4	1.4
CHROMIUM	7191 10/01/90 JMW	3.	23.
COPPER	7210 10/03/90 MSM	1.0	11.
LEAD	7421 10/01/90 JMW	3.	<3.
MANGANESE	6010 10/03/90 AEA	10.	40.
MERCURY	7470 10/02/90 KES	0.2	<0.2
NICKEL	6010 10/04/90 AEA	30.	5800.
SELENIUM	7740 10/03/90 JMW	3.	<3.
SILVER	7760 10/03/90 MSM	3.	5.
PHOSPHORUS	6010 10/03/90 AEA	200.	<200.
ZINC	6010 10/03/90 AEA	30.	270.

**Practical Quantitation Limit

PRELIMINARY

10/05/90
03609-17.WR1/090
MH/ke

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D., President

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road, Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: C-3609-18
Collected: 09/23/90 @ 1500
Received: 09/25/90 @ 1400
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:
AB2588 Air Testing
7230-007 Santa Fe Energy - Midway
CG-C-MMT-A,B,C,D1,F,D2, Front & Back Half, Air Sampling Train

PRELIMINARY

PREPARED ACCORDING TO EPA MULTIMETALS DRAFT METHOD ON 10/01/90 BY JMW.

REPORT

CONSTITUENT	EPA METHOD/DATE/ANALYST	DETECTION LIMIT (PQL)**	LEVEL FOUND Total ug
ANTIMONY	7041 10/22/90 JMW	3.	<3.
ARSENIC	7060 10/01/90 JMW	3.	6.
BARIUM	6010 10/03/90 AEA	4.	87.
BERYLLIUM	6010 10/03/90 AEA	4.	<4.
CADMIUM	7131 10/01/90 JMW	0.4	2.4
CHROMIUM	7191 10/01/90 JMW	3.	20.
COPPER	7210 10/03/90 MSM	1.0	10.
LEAD	7421 10/01/90 JMW	3.	<3.
MANGANESE	6010 10/03/90 AEA	10.	40.
MERCURY	7470 10/02/90 KES	0.2	0.3
NICKEL	6010 10/04/90 AEA	30.	4500.
SELENIUM	7740 10/03/90 JMW	3.	4.
SILVER	7760 10/03/90 MSM	3.	24.
PHOSPHORUS	6010 10/03/90 AEA	200.	<200.
ZINC	6010 10/03/90 AEA	30.	160.

**Practical Quantitation Limit

PRELIMINARY

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D., President

10/05/90
C3609-18.WR1/#08
MH/ke

AIR, WATER & HAZARDOUS WASTE LABORATORY (No.131) CERTIFIED by CALIFORNIA DEPT of HEALTH SERVICES

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road, Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: G-3688-19
Collected: 09/23/90 @ 1100
Received: 09/25/90 @ 1400
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:
AB2588 Air Testing
7230-007 Santa Fe Energy - Midway
CG-D-MMT-A,B,C,D,F, Front & Back
Half, Air Sampling Train

PRELIMINARY

PREPARED ACCORDING TO EPA MULTIMETALS DRAFT METHOD ON 10/01/90 BY JMW.

REPORT

CONSTITUENT	EPA METHOD/DATE/ANALYST	DETECTION LIMIT (PQL)**	LEVEL FOUND Total ug
ANTIMONY	7041 10/22/90 JMW	3.	<3.
ARSENIC	7060 10/01/90 JMW	3.	<3.
BARIUM	6010 10/03/90 AEA	4.	65.
BERYLLIUM	6010 10/03/90 AEA	4.	<4.
CADMIUM	7131 10/01/90 JMW	0.4	<0.4
CHROMIUM	7191 10/01/90 JMW	3.	8.
COPPER	7210 10/03/90 MSM	1.0	3.
LEAD	7421 10/01/90 JMW	3.	<3.
MANGANESE	6010 10/03/90 AEA	10.	50.
MERCURY	7470 10/02/90 KES	0.1	<0.1
NICKEL	6010 10/04/90 AEA	30.	<30.
SELENIUM	7740 10/03/90 JMW	3.	<3.
SILVER	7760 10/03/90 MSM	3.	<3.
PHOSPHORUS	6010 10/03/90 AEA	200.	<200.
ZINC	6010 10/03/90 AEA	30.	80.

**Practical Quantitation Limit

PRELIMINARY

10/05/90
G3688-19.WR1/090
MH/ke

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D., President

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: As Listed
Collected: As Listed
Received: 09/25/90
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:
AB2588 Air Sampling
Project: 7230-001, Santa Fe Energy
Midway, Air Sampling Train,
Samples As Listed

PRELIMINARY REPORT

	MERCURY Total ug
EPA METHOD----------	7470
DETECTION LIMIT(PQL)**-----	0.06
DATE/ANALYST----------	10/02/90/KES

LAB NUMBER	SAMPLE DESCRIPTION	LEVEL FOUND
G-3609-30	CG-A-MMT-E, Coll: 09/22/90 @ 1500	0.73
G-3609-31	CG-A-MMT-J, Coll: 09/22/90 @ 1500	0.07
G-3609-32	CG-B-MMT-E, Coll: 09/23/90 @ 1100	0.14
G-3609-33	CG-C-MMT-E, Coll: 09/23/90 @ 1100	0.20
G-3609-34	CG-D-MMT-E, Coll: 09/23/90 @ 1100	<0.04

**Practical Quantitation Limit

PRELIMINARY

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D., President

10/05/90
G3609-30.WR1/090
MH/ke

AIR, WATER & HAZARDOUS WASTE LABORATORY (No.131) CERTIFIED by CALIFORNIA DEPT of HEALTH SERVICES

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road, Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: C-3809-19
Collected: 09/22/90 @ 1500
Received: 09/25/90 @ 1400
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:
AB2588 Air Testing
7230-937 Santa Fe Energy - Midway
CG-A-184-A,B,C, Air Sampling Train

PRELIMINARY

PREPARED ACCORDING TO ARB METHOD 104
ON 10/02/90 BY JMW.

REPORT

CONSTITUENT	EPA METHOD/DATE/ANALYST	DETECTION LIMIT (PQL)**	LEVEL FOUND Total ug
BERYLLIUM	6010 10/03/90 AEA	4.	<4.
BROMIDE	300.0 10/04/90 CS	4000.	<4000.

**Practical Quantitation Limit

PRELIMINARY

10/05/90
C3809-1.WR1/090
MH/ke

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D., President

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road, Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: 0-3609-12
Collected: 09/23/95 @ 1500
Received: 09/25/95 @ 1400
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:
AB2588 Air Testing
7230-007 Santa Fe Energy - Midway
CG-C-104-A,B,B1, Air Sampling Train

PRELIMINARY REPORT

PREPARED ACCORDING TO ARB METHOD 104
ON 10/02/95 BY JMW.

CONSTITUENT	EPA METHOD/DATE/ANALYST	DETECTION LIMIT (PQL)**	LEVEL FOUND Total ug
BERYLLIUM	6010 10/03/95 AEA	0.2	1.4
BROMIDE	300.0 10/04/95 CS	4000.	<4000.

**Practical Quantitation Limit

PRELIMINARY

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D., President

10/05/95
03609-12.WR1/#05
MH/ke

AIR, WATER & HAZARDOUS WASTE LABORATORY (NO. 191) CERTIFIED by CALIFORNIA DEPT of HEALTH SERVICES

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road, Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: C-3889-13
Collected: 09/23/90 @ 1100
Received: 09/25/90 @ 1400
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:
AB2588 Air Testing
7250-007 Santa Fe Energy - Midway
CG-D-104-A,B, Blank Train

PRELIMINARY

REPORT

PREPARED ACCORDING TO ARB METHOD 104
ON 10/02/90 BY JMW.

CONSTITUENT	EPA METHOD/DATE/ANALYST	DETECTION LIMIT (PQL)**	LEVEL FOUND Total ug
BERYLLIUM	6010 10/03/90 AEA	0.2	1.0
BROMIDE	300.0 10/04/90 CS	400.	<400.

**Practical Quantitation Limit

PRELIMINARY

10/05/90
03889-13.WR1/090
MH/ke

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D., President

Coast-to-Coast Analytical Services

Coast-to-Coast
Analytical Services
141 Suburban Road, Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: C-3809-14
Collected: 09/22/98 @ 1500
Received: 09/25/98 @ 1400
Tested: As Listed
Collected by: BP/FP/MS

ATTN: Bill Powers
ENSR Consulting And Engineering
1220 Avenida Acaso
Camarillo, CA 93012

Sample Description:
AB2588 Air Testing
7230-007 Santa Fe Energy - Midway
CG-A-104-D,E, Acetone & Deionized Water Blank

PRELIMINARY REPORT

PREPARED ACCORDING TO ARB METHOD 104 ON 10/02/98 BY JMW.

CONSTITUENT	EPA METHOD/DATE/ANALYST	DETECTION LIMIT (PQL)**	LEVEL FOUND Total ug
BERYLLIUM	6010 10/03/98 - AEA	0.2	<0.2
BROMIDE	300.0 10/04/98 CS	30.	<30.

**Practical Quantitation Limit

PRELIMINARY

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D., President

10/05/98
C3809-14.WR1/#98
MH/ke

APPENDIX B.3

PAH
LABORATORY REPORTS

Polynuclear Aromatic Hydrocarbons, SIM

EPA 8270/SIM

Client Name: ENSR Consulting & Engineering
Client ID: 7230007DWD429
Lab ID: 054822-0004-SA
Matrix: GAS Sampled: 14 SEP 90 Received: 18 SEP 90
Authorized: 18 SEP 90 Prepared: 20 SEP 90 Analyzed: 11 OCT 90

Parameter	Result	Wet wt. Units	Reporting Limit
Naphthalene	38	UG/sample	--
Acenaphthylene	0.23	UG/sample	--
Acenaphthene	0.083	UG/sample	--
Fluorene	0.091	UG/sample	--
Phenanthrene	0.090	UG/sample	--
Anthracene	0.0037	UG/sample	--
Fluoranthene	0.021	UG/sample	--
Pyrene	0.014	UG/sample	--
Benzo(a)anthracene	ND	UG/sample	0.0065
Chrysene	ND	UG/sample	0.0061
Benzo(b)fluoranthene	ND	UG/sample	0.0038
Benzo(k)fluoranthene	ND	UG/sample	0.00069
Benzo(a)pyrene	ND	UG/sample	0.010
Dibenz(a,h)anthracene	ND	UG/sample	0.026
Benzo(g,h,i)perylene	ND	UG/sample	0.013
Indeno(1,2,3-cd)pyrene	ND	UG/sample	0.011

Surrogate	Recovery	
Biphenyl-d10	NA	%
Naphthalene-d8	43	%
Acenaphthylene-d8	61	%
Acenaphthene-d10	72	%
Fluorene-d10	74	%
Phenanthrene-d10	66	%
Anthracene-d10	55	%
Fluoranthene-d10	71	%
Pyrene-d10	81	%
Benzo(a)anthracene-d12	64	%
Chrysene-d12	76	%
Benzo(b)fluoranthene-d12	56	%
Benzo(k)fluoranthene-d12	ND	%
Benzo(a)pyrene-d12	22	%
Benzo(g,h,i)perylene-d12	23	%
Dibenzo(a,h)anthracene-d14	10	%

ND = Not detected
NA = Not applicable

Polynuclear Aromatic Hydrocarbons, SIM

EPA 8270/SIM

Client Name: ENSR Consulting & Engineering
Client ID: 7230 007 DDA 429 (A-E,XAD91N)
Lab ID: 054880-0001-SA
Matrix: GAS Sampled: 18 SEP 90 Received: 20 SEP 90
Authorized: 21 SEP 90 Prepared: 25 SEP 90 Analyzed: 10 OCT 90

Parameter	Result	Wet wt. Units	Reporting Limit	
Naphthalene	230	ug/sample	--	
Acenaphthylene	15	ug/sample	--	
Acenaphthene	11	ug/sample	--	
Fluorene	23	ug/sample	--	
Phenanthrene	73	ug/sample	--	
Anthracene	MPC	ug/sample	1.7	w
Fluoranthene	7.4	ug/sample	--	
Pyrene	7.1	ug/sample	--	
Benzo(a)anthracene	1.0	ug/sample	--	
Chrysene	2.8	ug/sample	--	
Benzo(b)fluoranthene	1.6	ug/sample	--	
Benzo(k)fluoranthene	MPC	ug/sample	0.87	
Benzo(a)pyrene	MPC	ug/sample	0.60	
Dibenz(a,h)anthracene	ND	ug/sample	0.64	
Benzo(g,h,i)perylene	MPC	ug/sample	0.87	
Indeno(1,2,3-cd)pyrene	ND	ug/sample	0.59	

Surrogate	Recovery	
Biphenyl-d10	NA	%
Naphthalene-d8	88	%
Acenaphthylene-d8	98	%
Acenaphthene-d10	129	%
Fluorene-d10	127	%
Phenanthrene-d10	99	%
Anthracene-d10	108	%
Fluoranthene-d10	94	%
Pyrene-d10	115	%
Benzo(a)anthracene-d12	93	%
Chrysene-d12	99	%
Benzo(b)fluoranthene-d12	72	%
Benzo(k)fluoranthene-d12	84	%
Benzo(a)pyrene-d12	68	%
Benzo(g,h,i)perylene-d12	54	%
Dibenzo(a,h)anthracene-d14	52	%

Note w : MPC - Maximum Possible Concentration.

ND = Not detected
NA = Not applicable

Polynuclear Aromatic Hydrocarbons, SIM

EPA 8270/SIM

Client Name: ENSR Consulting & Engineering
Client ID: 7230 007 DDB 429 (A-E,XAD91W)
Lab ID: 054880-0002-SA
Matrix: GAS Sampled: 18 SEP 90 Received: 20 SEP 90
Authorized: 21 SEP 90 Prepared: 25 SEP 90 Analyzed: 10 OCT 90

Parameter	Result	Wet wt. Units	Reporting Limit	
Naphthalene	210	ug/sample	--	
Acenaphthylene	15	ug/sample	--	
Acenaphthene	7.8	ug/sample	--	
Fluorene	20	ug/sample	--	
Phenanthrene	62	ug/sample	--	
Anthracene	MPC	ug/sample	0.98	w
Fluoranthene	6.2	ug/sample	--	
Pyrene	5.5	ug/sample	--	
Benzo(a)anthracene	0.93	ug/sample	--	
Chrysene	2.1	ug/sample	--	
Benzo(b)fluoranthene	1.6	ug/sample	--	
Benzo(k)fluoranthene	ND	ug/sample	0.11	
Benzo(a)pyrene	ND	ug/sample	0.23	
Dibenz(a,h)anthracene	ND	ug/sample	0.52	
Benzo(g,h,i)perylene	MPC	ug/sample	0.89	
Indeno(1,2,3-cd)pyrene	MPC	ug/sample	0.67	

Surrogate	Recovery	
Biphenyl-d10	NA	%
Naphthalene-d8	92	%
Acenaphthylene-d8	89	%
Acenaphthene-d10	116	%
Fluorene-d10	109	%
Phenanthrene-d10	84	%
Anthracene-d10	94	%
Fluoranthene-d10	81	%
Pyrene-d10	97	%
Benzo(a)anthracene-d12	74	%
Chrysene-d12	88	%
Benzo(b)fluoranthene-d12	71	%
Benzo(k)fluoranthene-d12	78	%
Benzo(a)pyrene-d12	66	%
Benzo(g,h,i)perylene-d12	52	%
Dibenzo(a,h)anthracene-d14	51	%

Note w : MPC - Maximum Possible Concentration.

ND = Not detected
NA = Not applicable

Polynuclear Aromatic Hydrocarbons, SIM

EPA 8270/SIM

Client Name: ENSR Consulting & Engineering
Client ID: 7230 007 DDC 429 (A-E,XAD91L)
Lab ID: 054880-0003-SA
Matrix: GAS Sampled: 18 SEP 90 Received: 20 SEP 90
Authorized: 21 SEP 90 Prepared: 25 SEP 90 Analyzed: 11 OCT 90

Parameter	Result	Wet wt. Units	Reporting Limit	
Naphthalene	250	ug/sample	--	
Acenaphthylene	19	ug/sample	--	
Acenaphthene	5.5	ug/sample	--	
Fluorene	25	ug/sample	--	
Phenanthrene	82	ug/sample	--	
Anthracene	4.2	ug/sample	--	
Fluoranthene	7.8	ug/sample	--	
Pyrene	7.1	ug/sample	--	
Benzo(a)anthracene	1.4	ug/sample	--	
Chrysene	3.3	ug/sample	--	
Benzo(b)fluoranthene	2.8	ug/sample	--	
Benzo(k)fluoranthene	ND	ug/sample	0.17	
Benzo(a)pyrene	ND	ug/sample	0.56	
Dibenz(a,h)anthracene	ND	ug/sample	0.68	
Benzo(g,h,i)perylene	MPC	ug/sample	1.2	w
Indeno(1,2,3-cd)pyrene	ND	ug/sample	0.95	

Surrogate	Recovery	
Biphenyl-d10	NA	%
Naphthalene-d8	86	%
Acenaphthylene-d8	85	%
Acenaphthene-d10	110	%
Fluorene-d10	104	%
Phenanthrene-d10	78	%
Anthracene-d10	89	%
Fluoranthene-d10	76	%
Pyrene-d10	90	%
Benzo(a)anthracene-d12	72	%
Chrysene-d12	80	%
Benzo(b)fluoranthene-d12	66	%
Benzo(k)fluoranthene-d12	76	%
Benzo(a)pyrene-d12	61	%
Benzo(g,h,i)perylene-d12	46	%
Dibenzo(a,h)anthracene-d14	45	%

Note w : MPC - Maximum Possible Concentration.

ND = Not detected
NA = Not applicable

Polynuclear Aromatic Hydrocarbons, SIM

EPA 8270/SIM

Client Name: ENSR Consulting & Engineering
Client ID: 7230 007 DDD 429 (A-E,XAD91G)
Lab ID: 054880-0004-SA
Matrix: GAS Sampled: 18 SEP 90 Received: 20 SEP 90
Authorized: 21 SEP 90 Prepared: 25 SEP 90 Analyzed: 10 OCT 90

Parameter	Result	Wet wt. Units	Reporting Limit
Naphthalene	29	ug/sample	--
Acenaphthylene	ND	ug/sample	0.0012
Acenaphthene	0.016	ug/sample	--
Fluorene	0.021	ug/sample	--
Phenanthrene	0.093	ug/sample	--
Anthracene	ND	ug/sample	0.0042
Fluoranthene	0.022	ug/sample	--
Pyrene	0.013	ug/sample	--
Benzo(a)anthracene	0.0022	ug/sample	--
Chrysene	ND	ug/sample	0.0055
Benzo(b)fluoranthene	0.0025	ug/sample	--
Benzo(k)fluoranthene	ND	ug/sample	0.00043
Benzo(a)pyrene	ND	ug/sample	0.0051
Dibenz(a,h)anthracene	ND	ug/sample	0.013
Benzo(g,h,i)perylene	ND	ug/sample	0.0079
Indeno(1,2,3-cd)pyrene	ND	ug/sample	0.0065

Surrogate	Recovery	
Biphenyl-d10	NA	%
Naphthalene-d8	50	%
Acenaphthylene-d8	53	%
Acenaphthene-d10	79	%
Fluorene-d10	87	%
Phenanthrene-d10	87	%
Anthracene-d10	83	%
Fluoranthene-d10	89	%
Pyrene-d10	105	%
Benzo(a)anthracene-d12	75	%
Chrysene-d12	91	%
Benzo(b)fluoranthene-d12	75	%
Benzo(k)fluoranthene-d12	ND	%
Benzo(a)pyrene-d12	38	%
Benzo(g,h,i)perylene-d12	35	%
Dibenzo(a,h)anthracene-d14	15	%

ND = Not detected
NA = Not applicable

Polynuclear Aromatic Hydrocarbons, SIM

EPA 8270/SIM

Client Name: ENSR Consulting & Engineering
Client ID: 7230007CGA
Lab ID: 055009-0001-SA
Matrix: GAS Sampled: 26 SEP 90 Received: 28 SEP 90
Authorized: 28 SEP 90 Prepared: 01 OCT 90 Analyzed: 12 OCT 90

Parameter	Result	Wet wt. Units	Reporting Limit
Naphthalene	34	UG/sample	--
Acenaphthylene	0.021	UG/sample	--
Acenaphthene	0.074	UG/sample	--
Fluorene	0.15	UG/sample	--
Phenanthrene	0.49	UG/sample	--
Anthracene	0.051	UG/sample	--
Fluoranthene	0.25	UG/sample	--
Pyrene	0.13	UG/sample	--
Benzo(a)anthracene	0.099	UG/sample	--
Chrysene	0.091	UG/sample	--
Benzo(b)fluoranthene	ND	UG/sample	0.091
Benzo(k)fluoranthene	ND	UG/sample	0.019
Benzo(a)pyrene	0.081	UG/sample	--
Dibenz(a,h)anthracene	ND	UG/sample	0.064
Benzo(g,h,i)perylene	0.067	UG/sample	--
Indeno(1,2,3-cd)pyrene	0.055	UG/sample	--

Surrogate	Recovery	
Biphenyl-d10	NA	%
Naphthalene-d8	57	%
Acenaphthylene-d8	53	%
Acenaphthene-d10	84	%
Fluorene-d10	86	%
Phenanthrene-d10	78	%
Anthracene-d10	78	%
Fluoranthene-d10	89	%
Pyrene-d10	105	%
Benzo(a)anthracene-d12	83	%
Chrysene-d12	108	%
Benzo(b)fluoranthene-d12	75	%
Benzo(k)fluoranthene-d12	ND	%
Benzo(a)pyrene-d12	44	%
Benzo(g,h,i)perylene-d12	37	%
Dibenzo(a,h)anthracene-d14	9.0	%

ND = Not detected
NA = Not applicable

Polynuclear Aromatic Hydrocarbons, SIM

EPA 8270/SIM

Client Name: ENSR Consulting & Engineering
Client ID: 7230007CGB
Lab ID: 055009-0002-SA
Matrix: GAS
Authorized: 28 SEP 90
Sampled: 26 SEP 90
Prepared: 01 OCT 90
Received: 28 SEP 90
Analyzed: 12 OCT 90

Parameter	Result	Wet wt. Units	Reporting Limit
Naphthalene	31	UG/sample	--
Acenaphthylene	0.077	UG/sample	--
Acenaphthene	0.51	UG/sample	--
Fluorene	0.88	UG/sample	--
Phenanthrene	3.1	UG/sample	--
Anthracene	0.45	UG/sample	--
Fluoranthene	1.0	UG/sample	--
Pyrene	0.54	UG/sample	--
Benzo(a)anthracene	0.29	UG/sample	--
Chrysene	0.35	UG/sample	--
Benzo(b)fluoranthene	ND	UG/sample	0.30
Benzo(k)fluoranthene	ND	UG/sample	0.010
Benzo(a)pyrene	0.15	UG/sample	--
Dibenz(a,h)anthracene	ND	UG/sample	0.14
Benzo(g,h,i)perylene	0.12	UG/sample	--
Indeno(1,2,3-cd)pyrene	0.17	UG/sample	--

Surrogate	Recovery	
Biphenyl-d10	NA	%
Naphthalene-d8	80	%
Acenaphthylene-d8	70	%
Acenaphthene-d10	192	%
Fluorene-d10	109	%
Phenanthrene-d10	93	%
Anthracene-d10	102	%
Fluoranthene-d10	106	%
Pyrene-d10	131	%
Benzo(a)anthracene-d12	120	%
Chrysene-d12	144	%
Benzo(b)fluoranthene-d12	93	%
Benzo(k)fluoranthene-d12	ND	%
Benzo(a)pyrene-d12	56	%
Benzo(g,h,i)perylene-d12	26	%
Dibenzo(a,h)anthracene-d14	11	%

ND = Not detected
NA = Not applicable

Polynuclear Aromatic Hydrocarbons, SIM

EPA 8270/SIM

Client Name: ENSR Consulting & Engineering
Client ID: 7230007CGC
Lab ID: 055009-0003-SA
Matrix: GAS Sampled: 26 SEP 90 Received: 28 SEP 90
Authorized: 28 SEP 90 Prepared: 01 OCT 90 Analyzed: 12 OCT 90

Parameter	Result	Wet wt. Units	Reporting Limit
Naphthalene	34	UG/sample	--
Acenaphthylene	0.0047	UG/sample	--
Acenaphthene	0.014	UG/sample	--
Fluorene	0.033	UG/sample	--
Phenanthrene	0.094	UG/sample	--
Anthracene	0.0065	UG/sample	--
Fluoranthene	0.035	UG/sample	--
Pyrene	0.017	UG/sample	--
Benzo(a)anthracene	0.012	UG/sample	--
Chrysene	0.028	UG/sample	--
Benzo(b)fluoranthene	ND	UG/sample	0.014
Benzo(k)fluoranthene	ND	UG/sample	0.0045
Benzo(a)pyrene	ND	UG/sample	0.012
Dibenz(a,h)anthracene	ND	UG/sample	0.036
Benzo(g,h,i)perylene	ND	UG/sample	0.016
Indeno(1,2,3-cd)pyrene	ND	UG/sample	0.014

Surrogate	Recovery	
Biphenyl-d10	NA	%
Naphthalene-d8	57	%
Acenaphthylene-d8	50	%
Acenaphthene-d10	84	%
Fluorene-d10	80	%
Phenanthrene-d10	75	%
Anthracene-d10	78	%
Fluoranthene-d10	97	%
Pyrene-d10	126	%
Benzo(a)anthracene-d12	106	%
Chrysene-d12	116	%
Benzo(b)fluoranthene-d12	83	%
Benzo(k)fluoranthene-d12	ND	%
Benzo(a)pyrene-d12	46	%
Benzo(g,h,i)perylene-d12	26	%
Dibenzo(a,h)anthracene-d14	9.0	%

ND = Not detected
NA = Not applicable

Polynuclear Aromatic Hydrocarbons, SIM

EPA 8270/SIM

Client Name: ENSR Consulting & Engineering
Client ID: 7230007CGD
Lab ID: 055009-0004-SA
Matrix: GAS Sampled: 26 SEP 90 Received: 28 SEP 90
Authorized: 28 SEP 90 Prepared: 01 OCT 90 Analyzed: 12 OCT 90

Parameter	Result	Wet wt. Units	Reporting Limit
Naphthalene	33	UG/sample	--
Acenaphthylene	0.028	UG/sample	--
Acenaphthene	0.059	UG/sample	--
Fluorene	0.14	UG/sample	--
Phenanthrene	0.61	UG/sample	--
Anthracene	ND	UG/sample	0.011
Fluoranthene	0.11	UG/sample	--
Pyrene	0.072	UG/sample	--
Benzo(a)anthracene	0.017	UG/sample	--
Chrysene	0.018	UG/sample	--
Benzo(b)fluoranthene	ND	UG/sample	0.0076
Benzo(k)fluoranthene	ND	UG/sample	0.0022
Benzo(a)pyrene	0.0052	UG/sample	--
Dibenz(a,h)anthracene	ND	UG/sample	0.042
Benzo(g,h,i)perylene	ND	UG/sample	0.013
Indeno(1,2,3-cd)pyrene	ND	UG/sample	0.012

Surrogate	Recovery	
Biphenyl-d10	NA	%
Naphthalene-d8	73	%
Acenaphthylene-d8	72	%
Acenaphthene-d10	113	%
Fluorene-d10	105	%
Phenanthrene-d10	83	%
Anthracene-d10	91	%
Fluoranthene-d10	107	%
Pyrene-d10	131	%
Benzo(a)anthracene-d12	93	%
Chrysene-d12	118	%
Benzo(b)fluoranthene-d12	93	%
Benzo(k)fluoranthene-d12	ND	%
Benzo(a)pyrene-d12	54	%
Benzo(g,h,i)perylene-d12	37	%
Dibenzo(a,h)anthracene-d14	10	%

ND = Not detected
NA = Not applicable

Polynuclear Aromatic Hydrocarbons, SIM

EPA 8270/SIM

Client Name: ENSR Consulting & Engineering
Client ID: 7230007DWA429
Lab ID: 054822-0001-SA
Matrix: GAS Sampled: 14 SEP 90 Received: 18 SEP 90
Authorized: 18 SEP 90 Prepared: 20 SEP 90 Analyzed: 10 OCT 90

Parameter	Result	Wet wt. Units	Reporting Limit	
Naphthalene	150	UG/sample	--	D
Acenaphthylene	8.5	UG/sample	--	D
Acenaphthene	3.4	UG/sample	--	D
Fluorene	5.8	UG/sample	--	D
Phenanthrene	14	UG/sample	--	D
Anthracene	1.5	UG/sample	--	
Fluoranthene	3.0	UG/sample	--	
Pyrene	5.0	UG/sample	--	
Benzo(a)anthracene	1.2	UG/sample	--	
Chrysene	0.25	UG/sample	--	
Benzo(b)fluoranthene	0.19	UG/sample	--	D
Benzo(k)fluoranthene	0.31	UG/sample	--	D
Benzo(a)pyrene	ND	UG/sample	0.28	D
Dibenz(a,h)anthracene	ND	UG/sample	0.60	D
Benzo(g,h,i)perylene	ND	UG/sample	0.056	
Indeno(1,2,3-cd)pyrene	ND	UG/sample	0.032	

Surrogate	Recovery	
Biphenyl-d10	NA	%
Naphthalene-d8	75	%
Acenaphthylene-d8	76	%
Acenaphthene-d10	92	%
Fluorene-d10	88	%
Phenanthrene-d10	65	%
Anthracene-d10	72	%
Fluoranthene-d10	60	%
Pyrene-d10	74	%
Benzo(a)anthracene-d12	56	%
Chrysene-d12	61	%
Benzo(b)fluoranthene-d12	48	%
Benzo(k)fluoranthene-d12	59	%
Benzo(a)pyrene-d12	48	%
Benzo(g,h,i)perylene-d12	36	%
Dibenzo(a,h)anthracene-d14	35	%

Note D : Compound identified at a secondary dilution.

ND = Not detected
NA = Not applicable

Polynuclear Aromatic Hydrocarbons, SIM

EPA 8270/SIM

Client Name: ENSR Consulting & Engineering
Client ID: 7230007DWB429
Lab ID: 054822-0002-SA
Matrix: GAS
Authorized: 18 SEP 90
Sampled: 14 SEP 90
Prepared: 20 SEP 90
Received: 18 SEP 90
Analyzed: 11 OCT 90

Parameter	Result	Wet wt. Units	Reporting Limit	
Naphthalene	27	UG/sample	--	D
Acenaphthylene	8.5	UG/sample	--	D
Acenaphthene	1.2	UG/sample	--	D
Fluorene	5.2	UG/sample	--	D
Phenanthrene	11	UG/sample	--	D
Anthracene	1.2	UG/sample	--	
Fluoranthene	1.7	UG/sample	--	
Pyrene	2.9	UG/sample	--	D
Benzo(a)anthracene	0.072	UG/sample	--	
Chrysene	0.12	UG/sample	--	
Benzo(b)fluoranthene	ND	UG/sample	0.054	
Benzo(k)fluoranthene	ND	UG/sample	0.20	D
Benzo(a)pyrene	ND	UG/sample	0.27	D
Dibenz(a,h)anthracene	ND	UG/sample	0.65	D
Benzo(g,h,i)perylene	ND	UG/sample	0.71	D
Indeno(1,2,3-cd)pyrene	ND	UG/sample	0.61	D

Surrogate	Recovery	
Biphenyl-d10	NA	%
Naphthalene-d8	98	%
Acenaphthylene-d8	91	%
Acenaphthene-d10	106	%
Fluorene-d10	113	%
Phenanthrene-d10	105	%
Anthracene-d10	78	%
Fluoranthene-d10	114	%
Pyrene-d10	140	%
Benzo(a)anthracene-d12	73	%
Chrysene-d12	88	%
Benzo(b)fluoranthene-d12	32	%
Benzo(k)fluoranthene-d12	140	%
Benzo(a)pyrene-d12	108	%
Benzo(g,h,i)perylene-d12	79	%
Dibenzo(a,h)anthracene-d14	77	%

Note D : Compound identified at a secondary dilution.

ND = Not detected
NA = Not applicable

Polynuclear Aromatic Hydrocarbons, SIM

EPA 8270/SIM

Client Name: ENSR Consulting & Engineering
Client ID: 7230007DWC429
Lab ID: 054822-0003-SA
Matrix: GAS Sampled: 14 SEP 90 Received: 18 SEP 90
Authorized: 18 SEP 90 Prepared: 20 SEP 90 Analyzed: 11 OCT 90

Parameter	Result	Wet wt. Units	Reporting Limit	
Naphthalene	120	UG/sample	--	D
Acenaphthylene	6.0	UG/sample	--	D
Acenaphthene	2.2	UG/sample	--	D
Fluorene	ND	UG/sample	2.0	D
Phenanthrene	3.0	UG/sample	--	D
Anthracene	0.31	UG/sample	--	D
Fluoranthene	0.66	UG/sample	--	D
Pyrene	1.1	UG/sample	--	D
Benzo(a)anthracene	0.17	UG/sample	--	D
Chrysene	0.31	UG/sample	--	D
Benzo(b)fluoranthene	ND	UG/sample	0.27	D
Benzo(k)fluoranthene	ND	UG/sample	0.18	D
Benzo(a)pyrene	ND	UG/sample	0.35	D
Dibenz(a,h)anthracene	ND	UG/sample	0.48	D
Benzo(g,h,i)perylene	ND	UG/sample	0.65	D
Indeno(1,2,3-cd)pyrene	ND	UG/sample	0.56	D

Surrogate	Recovery	
Biphenyl-d10	NA	%
Naphthalene-d8	84	%
Acenaphthylene-d8	85	%
Acenaphthene-d10	109	%
Fluorene-d10	104	%
Phenanthrene-d10	90	%
Anthracene-d10	101	%
Fluoranthene-d10	89	%
Pyrene-d10	106	%
Benzo(a)anthracene-d12	83	%
Chrysene-d12	96	%
Benzo(b)fluoranthene-d12	83	%
Benzo(k)fluoranthene-d12	95	%
Benzo(a)pyrene-d12	79	%
Benzo(g,h,i)perylene-d12	60	%
Dibenzo(a,h)anthracene-d14	57	%

Note D : Compound identified at a secondary dilution.

ND = Not detected
NA = Not applicable

APPENDIX B.4

VOC LABORATORY REPORTS

ENSR
Air Analysis Laboratory

LABORATORY ANALYSIS REPORT

Air Contaminants
Analysis in Tedlar Bag Samples

Client:	WSPA
Project No.:	8501-089-380/7230-007
Site :	Santa Fe, Kern Co
Date Received:	September 20, 1990
Date Analyzed:	September 21 and 22, 1990

ENSR Lab No.:	92640-8	92640-9
Sample I.D. No.:	D-410	E-410
Component:	(Concentration in ppbv)	
Benzene	3	3
Toluene	<5	<5
m-&p-Xylene	<5	<5
o-Xylene	<5	<5
Propene	<10	<10

Lily C. Tomlin
Laboratory Operations Manager

ENSR
Air Analysis Laboratory

LABORATORY ANALYSIS REPORT

Air Contaminants
Analysis in Tedlar Bag Samples

Client:	WSPA
Project No.:	8501-089-380/7230-007
Site :	Santa Fe, Kern Co
Date Received:	September 20, 1990
Date Analyzed:	September 21 and 22, 1990

ENSR Lab No.:	92640-5	92640-6	92640-7
Sample I.D. No.:	A-410	B-410	C-410
Component:	(Concentration in ppbv)		
Benzene	3	3	<2
Toluene	5	5	<5
m-&p-Xylene	<5	<5	<5
o-Xylene	<5	<5	<5
Propene	<10	<10	<10

Lily C. Tomlin
Laboratory Operations Manager

ENSR

Air Analysis Laboratory

QUALITY ASSURANCE SUMMARY
(Duplicates Analyses)

Client: WSPA
Project #: 7230-007
ENSR Project #: 8501-089-380
Site: Santa Fe, Kern Co

Air Analysis in Tedlar Bag Samples

Date Received: September 20, 1990
Date Analyzed: September 21 and 22, 1990

Duplicates Analyses

Component	Run #1	Run #2	Mean Conc.	% Diff. from mean
	(Concentration, ppbv)			
Benzene	<2	3	---	---
Toluene	5.4	5.0	5.2	3.8
m-&p-Xylene	<5	<5	---	---
o-Xylene	<5	<5	---	---
Propene	<10	<10	---	---

A set of 5 samples, laboratory numbers 92640(5-9), was analyzed for air contaminants. Agreement between duplicate analyses is a measure of precision and is shown above in the column "% Difference from Mean." Duplicate analyses are an important part of ENSR's quality assurance program. The average % Difference from Mean for 5 duplicate measurements from the sample set of 5 air samples is 3.8 %.

ENSR

Air Analysis Laboratory

LABORATORY ANALYSIS REPORT

Air Contaminants
Analysis in Tedlar Bag Samples

Client:	WSPA
Project No.:	8501-089-380/7230-007
Site :	Swepi, Ventura
Date Received:	September 19, 1990
Date Analyzed:	September 19, 1990

ENSR Lab No.:	92620-1	92620-2	92620-3
Sample I.D. No.:	DDD Tb	DDE Tb	DDA Tb
Component:	(Concentration in ppbv)		
Benzene	6	<2	220
Toluene	<5	6	62
m-&p-Xylene	<5	12	22
o-Xylene	<5	9	18
Propene	9	<10	1300

Lily C. Tomlin
Laboratory Operations Manager

ENSR
Air Analysis Laboratory

LABORATORY ANALYSIS REPORT

Air Contaminants
Analysis in Tedlar Bag Samples

Client:	WSPA
Project No.:	8501-089-380/7230-007
Site :	Swepi, Ventura
Date Received:	September 19, 1990
Date Analyzed:	September 19, 1990

ENSR Lab No.:	92620-4	92620-5
Sample I.D. No.:	DDB Tb	DDC Tb
Component:	(Concentration in ppbv)	
Benzene	210	210
Toluene	66	63
m-&p-Xylene	23	24
o-Xylene	18	14
Propene	1500	1500

Lily C. Tomlin
Laboratory Operations Manager

ENSR
Air Analysis Laboratory

QUALITY ASSURANCE SUMMARY
(Duplicates Analyses)

Client: WSPA
Project #: 7230-007
ENSR Project #: 8501-089-380
Site: Swepi, Ventura

Air Analysis in Tedlar Bag Samples

Date Received: September 19, 1990
Date Analyzed: September 19, 1990

Duplicates Analyses

Component	Run #1	Run #2	Mean Conc.	% Diff. from mean
	(Concentration in ppbv)			
Benzene	216	213	214.5	0.7
Toluene	65	62	63.5	2.4
m-&p-Xylene	23	25	24	4.2
o-Xylene	14	15	14.5	3.4
Propene	1509	1542	1525.5	1.1

A set of 5 samples, laboratory numbers 92620(1-5), was analyzed for air contaminants. Agreement between duplicate analyses is a measure of precision and is shown above in the column "% Difference from Mean." Duplicate analyses are an important part of ENSR's quality assurance program. The average % Difference from Mean for 5 duplicate measurements from the sample set of 5 air samples is 2.4 %.

ENSR
Air Analysis Laboratory

LABORATORY ANALYSIS REPORT

Air Contaminants
Analysis in Tedlar Bag Samples

Client:	WSPA
Project No.:	7230-007/8501-089-380
Site :	Unocal, Fillmore
Date Received:	September 15, 1990
Date Analyzed:	September 15, 1990

ENSR Lab No.:	92590-1	92590-2	92590-3
Sample I.D. No.:	DWN2 Blank	DWA Blank	DWA 410
Component:	(Concentration in ppbv)		
Benzene	<2	4	130
Toluene	<5	<5	50
m-&p-Xylenes	<5	<5	14
o-Xylene	<5	<5	12
Propene	<10	<10	680

Lily C. Tomlin
Laboratory Operations Manager

ENSR

Air Analysis Laboratory

LABORATORY ANALYSIS REPORT

Air Contaminants
Analysis in Tedlar Bag Samples

Client:	WSPA
Project No.:	7230-007/8501-089-380
Site :	Unocal, Fillmore
Date Received:	September 15, 1990
Date Analyzed:	September 15, 1990

ENSR Lab No.:	92590-4	92590-5
Sample I.D. No.:	DWB 410	DWC 410
Component:	(Concentration in ppbv)	
Benzene	160	150
Toluene	49	51
m-&p-Xylenes	11	16
o-Xylene	<5	10
Propene	840	860

Lily C. Tomlin
Laboratory Operations Manager

ENSR

Air Analysis Laboratory

QUALITY ASSURANCE SUMMARY
(Duplicates Analyses)

Client: WSPA
Project #: 7230-007
ENSR Project #: 8501-089-380
Site: Unocal, Fillmore

Air Analysis in Tedlar Bag Samples

Date Received: September 15, 1990
Date Analyzed: September 15, 1990

Duplicates Analyses

Component	Run #1	Run #2	Mean Conc.	% Diff. from mean
	(Concentration in ppbv)			
Benzene	153	152	152.5	0.33
Toluene	48	53	50.5	5.0
m-&p-Xylenes	16	16	16	0.0
o-Xylene	13	10	11.5	13
Propene	854	833	844	1.2

A set of 5 samples, laboratory numbers 92590(1-5), was analyzed for air contaminants. Agreement between duplicate analyses is a measure of precision and is shown above in the column "% Difference from Mean." Duplicate analyses are an important part of ENSR's quality assurance program. The average % Difference from Mean for 5 duplicate measurements from the sample set of 5 air samples is 3.9 %.

ENSR

Air Analysis Laboratory

LABORATORY ANALYSIS REPORT

Air Contaminants
Analysis in Tedlar Bag Samples

Client:	WSPA
Project No.:	8501-089-380/7230-007
Site :	Santa Fe Energy, North Midway
Date Received:	September 27, 1990
Date Analyzed:	September 27, 1990

ENSR Lab No.:	92700-1	92700-2	92700-3
Sample I.D. No.:	ATB1	BTB2	CTB3
Component:	(Concentration in ppbv)		
Benzene	<2	<2	<2
Toluene	<5	<5	<5
m-&p-Xylene	<5	<5	<5
o-Xylene	<5	<5	<5
Propene	<10	<10	<10

Lily C. Tomlin
Laboratory Operations Manager

ENSR

Air Analysis Laboratory

LABORATORY ANALYSIS REPORT

Air Contaminants
Analysis in Tedlar Bag Samples

Client:	WSPA
Project No.:	8501-089-380/7230-007
Site :	Santa Fe Energy, North Midway
Date Received:	September 27, 1990
Date Analyzed:	September 27, 1990

ENSR Lab No.:	92700-4	92700-5
Sample I.D. No.:	DTB4	ETB5
Component:	(Concentration in ppbv)	
Benzene	<2	<2
Toluene	<5	<5
m-&p-Xylene	<5	<5
o-Xylene	<5	<5
Propene	<10	<10

Lily C. Tomlin
Laboratory Operations Manager

ENSR

Air Analysis Laboratory

QUALITY ASSURANCE SUMMARY
(Duplicates Analyses)

Client: WSPA
Project #: 7230-007
ENSR Project #: 8501-089-380
Site: Santa Fe Energy, North Midway

Air Analysis in Tedlar Bag Samples

Date Received: September 27, 1990
Date Analyzed: September 27, 1990

Duplicates Analyses

Component	Run #1	Run #2	Mean Conc.	% Diff. from mean
	(Concentration in ppbv)			
Benzene	<2	<2	---	---
Toluene	<5	<5	---	---
m-&p-Xylene	<5	<5	---	---
o-Xylene	<5	<5	---	---
Propene	<10	<10	---	---

A set of 5 samples, laboratory numbers 92700(1-5), was analyzed for air contaminants. Agreement between duplicate analyses is a measure of precision and is shown above in the column "% Difference from Mean." Duplicate analyses are an important part of ENSR's quality assurance program. The average % Difference from Mean for 5 duplicate measurements from the sample set of 5 air samples is less than 10 %.

ENSR

Air Analysis Laboratory

LABORATORY ANALYSIS REPORT

Air Contaminants
Analysis in Tedlar Bag Samples

Client:	WSPA
Project No.:	8501-089-380/7230-007
Site :	Swepi, Coalinga
Date Received:	September 28, 1990
Date Analyzed:	September 28, 1990

ENSR Lab No.:	92710-1	92710-2	92710-3
Sample I.D. No.:	ATBA	BTBA	CTBA
Component:	(Concentration in ppbv)		
Benzene	<2	<2	<2
Toluene	<5	<5	<5
m-&p-Xylene	<5	<5	<5
o-Xylene	<5	<5	<5

Lily C. Tomlin
Laboratory Operations Manager

ENSR

Air Analysis Laboratory

LABORATORY ANALYSIS REPORT

Air Contaminants
Analysis in Tedlar Bag Samples

Client:	WSPA
Project No.:	8501-089-380/7230-007
Site :	Swepi, Coalinga
Date Received:	September 28, 1990
Date Analyzed:	September 28, 1990

ENSR Lab No.:	92710-4	92710-5
Sample I.D. No.:	DTBA	ETBA
Component:	(Concentration in ppbv)	
Benzene	<2	<2
Toluene	<5	<5
m-&p-Xylene	<5	<5
o-Xylene	<5	<5

Lily C. Tomlin
Laboratory Operations Manager

ENSR

Air Analysis Laboratory

QUALITY ASSURANCE SUMMARY
(Duplicates Analyses)

Client: WSPA
Project #: 7230-007
ENSR Project #: 8501-089-380
Site: Swepi, Coalinga

Air Analysis in Tedlar Bag Samples

Date Received: September 28, 1990
Date Analyzed: September 28, 1990

Duplicates Analyses

Component	Run #1	Run #2	Mean Conc.	% Diff. from mean
	(Concentration in ppbv)			
Benzene	<2	<2	---	---
Toluene	<5	<5	---	---
m-&p-Xylene	<5	<5	---	---
o-Xylene	<5	<5	---	---

A set of 5 samples, laboratory numbers 92710(1-5), was analyzed for air contaminants. Agreement between duplicate analyses is a measure of precision and is shown above in the column "% Difference from Mean." Duplicate analyses are an important part of ENSR's quality assurance program. The average % Difference from Mean for 4 duplicate measurements from the sample set of 5 air samples is less than 10 %.

APPENDIX B.5

ALDEHYDES
LABORATORY REPORTS

SEPT,.90)

DATA SOURCE: ENSR (formerly ERT)

CARBONYLS (uncorrected for field blanks)

Sample Number	Site	Date Sampling Began	Total Volume liters	Impinger Volume (mL)	C1 ppbv	C2 ppbv	C3A ppbv
7230 007							
DW430ABA	FILLMORE	09/14/90	28.22	8.4	7.0	5.8	B.D.
DW430ABAD	FILLMORE	09/14/90	28.22	9.4	7.4	6.0	B.D.
DW430AB8	FILLMORE	09/14/90	28.22	9.2	5.2	4.1	B.D.
DW430N2BA	FILLMORE	09/14/90	22.53	6.9	5.6	4.2	B.D.
DW430N2BAD	FILLMORE	09/14/90	22.53	6.8	5.9	4.2	B.D.
DW430N2B8	FILLMORE	09/14/90	22.53	9.1	7.3	5.1	B.D.
DWA430A	FILLMORE	09/14/90	25.72	12.6	388.3	92.2	35.0
DWA430B	FILLMORE	09/14/90	25.72	8.8	5.4	4.3	B.D.
DWB430A	FILLMORE	09/14/90	24.86	8.6	277.2	77.5	9.5
DWB430B	FILLMORE	09/14/90	24.86	9.2	6.0	4.0	B.D.
DWC430A	FILLMORE	09/14/90	26.50	8.8	168.6	90.6	16.5
DWC430B	FILLMORE	09/14/90	26.50	9.2	6.0	4.3	B.D.
DDADNA	VENTURA	09/18/90	31.72	12.8	4.7	5.9	4.5
DDADNB	VENTURA	09/18/90	31.72	9.5	4.7	16.8	B.D.
DDBDNA	VENTURA	09/18/90	30.40	10.0	19.5	5.0	B.D.
DDBDNB	VENTURA	09/18/90	30.40	9.6	4.7	3.4	B.D.
DDCDNA	VENTURA	09/18/90	35.20	9.9	141.0	B.D.	B.D.
DDCDNAD	VENTURA	09/18/90	35.20	9.9	123.4	B.D.	B.D.
DDCDNB	VENTURA	09/18/90	35.20	9.5	3.8	6.0	B.D.
DDCDNBD	VENTURA	09/18/90	35.20	9.5	4.7	5.9	B.D.
DDDDNA	VENTURA	09/18/90	29.61	9.0	6.3	11.2	B.D.
DDDDNB	VENTURA	09/18/90	29.61	9.2	5.3	4.1	B.D.
DDEDNA	VENTURA	09/18/90	35.73	9.3	6.2	3.4	B.D.
DDEDNB	VENTURA	09/18/90	35.73	7.0	5.3	3.3	B.D.
CGA430A	KERN COUNTY	09/20/90	28.66	8.5	2.9	23.0	B.D.
CGA430B	KERN COUNTY	09/20/90	28.66	9.2	3.5	3.0	B.D.
CGB430A	KERN COUNTY	09/20/90	28.66	8.4	B.D.	7.6	B.D.
CGB430B	KERN COUNTY	09/20/90	28.66	9.2	3.1	3.6	B.D.
CGC430A	KERN COUNTY	09/20/90	28.66	8.6	B.D.	5.7	B.D.
CGC430B	KERN COUNTY	09/20/90	28.66	9.2	4.6	3.0	B.D.
CGD430A	KERN COUNTY	09/20/90	28.66	7.2	4.2	B.D.	B.D.
CGD430B	KERN COUNTY	09/20/90	28.66	8.8	3.8	2.7	B.D.
CGE430A	KERN COUNTY	09/20/90	28.66	7.6	7.3	5.2	B.D.
CGE430B	KERN COUNTY	09/20/90	28.66	9.2	4.9	3.1	B.D.
CGADN1	NORTH MIDWAY	09/26/90	28.37	9.4	5.8	4.1	B.D.
CGADN1D	NORTH MIDWAY	09/26/90	28.37	9.4	5.2	4.2	B.D.
GDADN2	NORTH MIDWAY	09/26/90	28.37	9.5	B.D.	2.9	B.D.
CGADN2D	NORTH MIDWAY	09/26/90	28.37	9.5	B.D.	3.1	B.D.
CGBDN1	NORTH MIDWAY	09/26/90	28.47	10.2	4.7	3.3	B.D.
CGBDN2	NORTH MIDWAY	09/26/90	28.47	9.4	B.D.	3.1	B.D.
CGCDN1	NORTH MIDWAY	09/26/90	28.74	9.4	2.9	3.8	B.D.
CGCDN2	NORTH MIDWAY	09/26/90	28.74	9.6	B.D.	3.3	B.D.
CGDDN1	NORTH MIDWAY	09/26/90	28.37	8.6	4.5	4.0	B.D.
CGDDN2	NORTH MIDWAY	09/26/90	28.37	9.6	B.D.	2.8	B.D.
CGEDN1	NORTH MIDWAY	09/26/90	28.37	6.8	B.D.	2.7	B.D.
CGEDN2	NORTH MIDWAY	09/26/90	28.37	8.9	3.2	3.2	B.D.
GFGADN1	COALINGA	09/27/90	29.33	8.8	3.4	---	---
GFGADN1D	COALINGA	09/27/90	29.33	8.8	3.6	---	---
GFGADN2	COALINGA	09/27/90	29.33	9.2	4.7	---	---
GFGADN2D	COALINGA	09/27/90	29.33	9.2	4.5	---	---
GFGBDN1	COALINGA	09/27/90	29.33	10.2	B.D.	---	---
GFGBDN2	COALINGA	09/27/90	29.33	9.2	4.8	---	---
GFGCDN1	COALINGA	09/27/90	29.50	10.5	2.9	---	---
GFGCDN2	COALINGA	09/27/90	29.50	9.3	4.3	---	---
GFGDDN1	COALINGA	09/27/90	29.83	8.1	5.5	---	---
GFGDDN2	COALINGA	09/27/90	29.83	9.2	4.0	---	---
GFGEDN1	COALINGA	09/27/90	29.83	8.8	4.3	---	---
GFGEDN2	COALINGA	09/27/90	29.83	9.2	4.5	---	---

C1 = FORMALDEHYDE
C2 = ACETALDEHYDE
C3A = ACROLEIN
B.D. = BELOW DETECTION LIMIT

AVG. IMPINGER VOL. = 9.1 mL

DETECTION LIMIT : FORMALDEHYDE = 2.8 ppbv
ACETALDEHYDE = 2.7 ppbv
ACROLEIN = 2.3 ppbv

L Tom

APPENDIX C.1

CARB 104/EPA MMT/CARB 425
FIELD DATA SHEETS

MTD. 425 – CHROME RUN A

LG [redacted] : 0.000 cfm at 5 in Hg

TRAV. A.

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility SANTA FE ENERGY – MIDWAY CRUDE-FIRED
Location STEAM GENERATOR STACK
Operator PRETORIUS, HAMMON, TORRES, SHORT
Date 9-22-90
Run No. A
Sample Box No. 1
Meter Box No. 2-RAC
Pitot Tube Coefficient Cp 0.84
Meter Box Correction Factor 4°c 1.01657

Diagram of Stack

Ambient Temperature (°F) 75
Barometric Pressure (in. Hg) 29.5
Probe Length, (ft) 8
Nozzle Identification No. 0.375
Avg. Calibrated Nozzle Dia., (in.) 0.380
Probe Heater Setting LO
Leak Rate, (cfm) 0.018 @ 15 in Hg
Probe Liner Material GLASS
Static Pressure, (in. H_2O) 0.09
Filter No. –

TRAVERSE POINT	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
1	0 / 3	3	140	0.03	0.48	941.57 / 942.33	76	74	–	174	75
2	6	3	140	0.03	0.48	944.02	77	74	–	206	73
3	9	4	137	0.05	0.80	945.22	80	75	–	235	73
4	12	4	137	0.05	0.80	946.76	82	75	–	238	73
5	15	5	135	0.05	0.80	949.26	83	76	–	248	72
6	18	5	134	0.05	0.80	949.78	84	76	–	245	73
7	21	5	128	0.05	0.80	951.18	85	77	–	259	73
8	24	5	129	0.05	0.80	952.67	84	76	–	248	73
9	27	5	129	0.05	0.80	959.11	84	77	–	281	73
10	30	4	125	0.04	0.62	955.67	84	77	–	269	73
11	33	4	125	0.04	0.62	956.89	85	78	–	266	73
12	36	4	125	0.03	0.48	959.36	84	79	–	269	73

TRAV. B.

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility _____
Location _____
Operator _____
Date _____
Run No. _____
Sample Box No. _____
Meter Box No. _____
Pitot Tube Coefficient Cp _____
Meter Box Correction Factor 4°_{c} _____

Diagram of Stack

Ambient Temperature (°F) _____
Barometric Pressure (in. Hg) _____
Probe Length, (ft) _____
Nozzle Identification No. _____
Avg. Calibrated Nozzle Dia., (in.) _____
Probe Heater Setting _____
Leak Rate, (cfm) _____
Probe Liner Material _____
Static Pressure, (in. Hg) _____
Filter No. _____

TRAVERSE POINT	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (T_s) °F s	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
1	36 / 39	5	99	0.04	0.62 corrected Ts to 100	958.36 / 959.71	80	78	–	285	69
2	42	5	100	0.05	0.82	961.39	81	77	–	286	68
3	45	4	100	0.04	0.68	962.91	82	78	–	287	68
4	48	4	100	0.04	0.68	964.39	84	79	–	286	68
5	51	4	98	0.04	0.68	965.66	84	79	–	280	68
6	54	5	96	0.04	0.68	967.08	86	80	–	289	69
7	57	4	142	0.03	corrected Ts. to 140 0.48	969.53	86	80	–	291	68
8	60	4	139	0.04	0.68	972.91	81	80	–	296	68
9	63	5	142	0.05	0.80	972.81	91	80	–	295	68
10	66	4	141	0.04	0.68	*	82	80	–	294	69
11	69	4	140	0.04	0.68	*	82	80	–	296	68
12	72	3	140	0.03	0.48	973.34	82	80		295	68

K-Factor ~~0.84~~ 14.5 BERYLLIUM RUN A

LC: INITIAL 0.02 cfm at 17 in Hg.
FINAL 0.04 cfm at 13 in Hg.
0.012 cfm at 5 in Hg.

TRAVERSE B PERFORMED FIRST

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility SANTA FE ENERGY
Location COFSC
Operator FRED PRETORIUS
Date 9/22/90
Run No. BERYLLIUM
Sample Box No. 1
Meter Box No. 2
Pitot Tube Coefficient Cp 0.84
Meter Box Correction Factor 4°_{C} 1.01657
$\Delta H@$ 1.80724

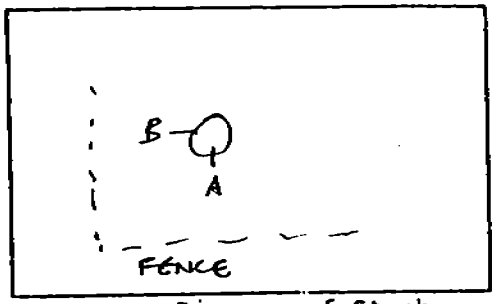


Diagram of Stack

Ambient Temperature (°F) 75
Barometric Pressure (in. Hg) 29.5
Probe Length, (ft) 8
Nozzle Identification No. 0.575
Avg. Calibrated Nozzle Dia., (in.) 0.380
Probe Heater Setting LO
Leak Rate, (cfm)
Probe Liner Material GLASS
Static Pressure, (in. Hg) 0.04 in. H_2O
Filter No. —

TRAVERSE POINT	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
1	0 / 5	5	140	0.06	0.92	973.85 / 976.51	75	77	—	300	65
2	10	5	142	0.07	1.10	979.21	78	77	—	303	62
3	15	5	142	0.07	1.10	982.14	80	77	—	291	62
4	20	5	142	0.07	1.10	985.09	81	76	—	245	62
5	25	5	142	0.07	1.10	987.98	83	76	—	258	63
6	30	5	142	0.07	1.10	990.77	83	77	—	272	65
7	35	5	143	0.08	1.20	993.64	84	77	—	270	66
8	40	6	141	0.07	1.10	996.55	83	77	—	335	66
9	45	8	142	0.07	1.10	999.41	82	77	—	250	65
10	50	8	142	0.06	0.86	1002.11	81	77	—	289	65
11	55	10	142	0.06	0.86	1004.52	80	76	—	297	65
12	60	12	142	0.06	0.86	1007.10	81	76	—	296	65

NOZZLE WAS BROKEN ON REMOVAL FROM STACK - TRAIN WAS RECOVERED EVEN THOUGH DISCONNECTION OF SAMPLE LINE WAS REQUIRED TO BRING APPARATUS DOWN FROM STACK - FINAL LEAK CHECK WAS PERFORMED FROM FILTER INLET BACK. TWO LEAK CHECKS WERE DONE TO

TRAVERSE A

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility _____
Location _____
Operator _____
Date _____
Run No. _____
Sample Box No. _____
Meter Box No. _____
Pitot Tube Coefficient Cp _____
Meter Box Correction Factor 4°_{c} _____

Diagram of Stack

Ambient Temperature (°F) _____
Barometric Pressure (in. Hg) _____
Probe Length, (ft) _____
Nozzle Identification No. _____
Avg. Calibrated Nozzle Dia., (in.) _____
Probe Heater Setting _____
Leak Rate, (cfm) _____
Probe Liner Material _____
Static Pressure, (in. Hg) _____
Filter No. _____

TRAVERSE POINT	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
1	60 / 65	5	142	0.06	0.86	1007.10 / 1009.72	65	68	—	299	63
2	70	5	142	0.06	0.86	1012.30	69	67	—	290	63
3	75	5	143	0.07	1.00	1015.06	70	68	—	295	63
4	80	6	144	0.08	1.20	1018.09	72	68	—	295	63
5	85	6	144	0.08	1.20	1021.12	73	68	—	296	63
6	90	6	141	0.08	1.20	1024.17	74	69	—	298	63
7	95	6	142	0.07	1.05	1027.00	75	70	—	297	63
8	100	6	142	0.07	1.05	*	76	69	—	296	63
9	105	5	142	0.06	0.91	*	76	69	—	300	62
10	110	5	142	0.06	0.91	1035.28	75	69	—	301	62
11	115	5	142	0.05	0.76	*	75	69	—	298	62
12	120	5	142	0.04	0.60	1039.92	75	69	—	300	62
AVG											

BERYLLIUM RUN A

Run Set Up Sheet

Client : WSPA
Site : SANTA FE - MIDWAY
Unit: CRUDE FIRED STEAM GEN. STACK

Date : 9-22-90
Job #: 7230002
Lab #: —

Method#: ARB 104
Run#: A
Hot box#:

Probe#:
Stack box#:
Cold box#:

Pryo#:
Nozzle#:
Pitot#:

Imp. #1: 100 ml DI H_2O	gross	887.9
	tare	578.6
	final	[illegible]
Imp. #2: 100 ml DI H_2O	gross	618.0
	tare	609.4
	final	9.6
Imp. #3: EMPTY	gross	464.9
	tare	462.0
	final	2.9
Imp. #4: SILICA GEL	gross	699.6
	tare	686.1
	final	[illegible]
	Total	334.30

Probe rinse 119.5 ml

Solution blank 100 ml each Acetone DI water.

Filter No: —
Filter Tare wt. —

	#	date
Solution Container		

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse _____ ml

Comments:

Recovery: Filter was blackened & burned too badly to remove intact. The broken, partial filter was recovered, and the filter-frit was rinsed into the 2nd container

BERYLLIUM RUN B

K-FACTOR 16.2 TRAVERSE A

LEAK CHECK.
INITIAL: 0.015 at 17 in Hg
FINAL: 0 at 6 in Hg.

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility SANTA FE ENERGY
Location COFSG SCRUBBER
Operator FRED PRETORIUS
Date 9/23/90
Run No. B
Sample Box No. 3
Meter Box No. 2
Pitot Tube Coefficient Cp 0.84
Meter Box Correction Factor $4°_c$ 1.01657
ΔH@ 1.80724

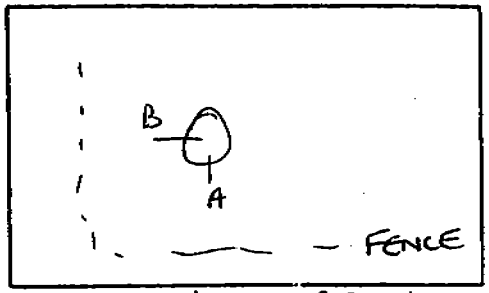


Diagram of Stack

Ambient Temperature (°F) 75
Barometric Pressure (in. Hg) 30.00
Probe Length, (ft) 8
Nozzle Identification No. 0.375
Avg. Calibrated Nozzle Dia., (in.) 0.383
Probe Heater Setting 1
Leak Rate, (cfm)
Probe Liner Material GLASS
Static Pressure, (in. Hg)
Filter No. —

TRAVERSE POINT	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
1	0 / 5	4	142	0.035	0.56	1041.67 / 43.78	73	72	—	181	64
2	10	4	143	0.04	0.64	45.96	73	72	—	147	61
3	15	8	142	0.13	2.10	49.68	78	73	—	196	58
4	~~20~~	5	143	0.05	0.80	52.12	74	71	—	159	58
5	25	7	143	0.1~~4~~3	~~2.10~~	56.31	77	72	—	181	58
6	30	10	143	0.24	3.90	61.43	79	72	—	210	58
7	35	4	143	0.05	0.80	*	75	72	—	161	58
8	40	4	143	0.05	0.80	66.43	76	73	—	188	58
9	45	4	143	0.05	0.80	*	77	72	—	178	60
10	50	4	143	0.05	0.80	71.41	80	73	—	190	60
11	55	4	143	0.04	0.64	73.62	82	73	—	200	60
12	60	4	143	0.04	0.64	75.86	81	74	—	184	60
			143	~~0.26~~	1.215	34.19		~~75~~			
			603	0.07				625			

8:10

TRAVERSE B

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility _____
Location _____
Operator _____
Date _____
Run No. _____
Sample Box No. _____
Meter Box No. _____
Pitot Tube Coefficient Cp _____
Meter Box Correction Factor 4°_{c} _____

Diagram of Stack

Ambient Temperature (°F) _____
Barometric Pressure (in. Hg) _____
Probe Length, (ft) _____
Nozzle Identification No. _____
Avg. Calibrated Nozzle Dia., (in.) _____
Probe Heater Setting _____
Leak Rate, (cfm) _____
Probe Liner Material _____
Static Pressure, (in. Hg) _____
Filter No. _____

TRAVERSE POINT	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
1	~~60~~ 65	4	142	0.02	0.34	~~75.96~~ 77.55	80	77	–	197	70
2	70	5	142	0.07	1.10	80.35	79	75	–	198	64
3	75	5	142	0.05	0.80	*	80	76	–	199	62
4	80	5	142	0.05	0.80	84.90	82	76	–	199	62
5	85	5	142	0.05	0.80	87.25	86	79	–	199	62
6	90	5	142	0.05	0.80	89.45	86	80	–	165	60
7	95	5	142	0.05	0.80	92.01	87	81	–	219	60
8	100	5	142	0.05	0.80	*	87	80	–	192	60
9	105	5	142	0.05	0.80	97.03	86	80	–	217	60
10	110	5	142	0.05	0.80	*	88	82	–	183	61
11	115	5	142	0.04	0.64	101.82	89	82	–	185	61
12	120	5	142	0.04	0.64	1104.17	86	80	–	209	62

BERYLLIUM RUN B

Run Set Up Sheet

Client : WSPA
Site : SANTA FE ENERGY, MOJAVE
Unit: CRUDE FIRED ST. GEN. STACK

Date : 9-23-90
Job #: 7230-007
Lab #: _____

Method#: ARB 104
Run#: B
Hot box#: _____

Probe#: _____
Stack box#: _____
Cold box#: _____

Pryo#: _____
Nozzle#: _____
Pitot#: _____

Imp. #1: 100 ml DDI H_2O	gross	895.4
	tare	601.1
	final	294.3
Imp. #2: 100 ml DDI H_2O	gross	585.8
	tare	578.6
	final	7.2
Imp. #3: EMPTY	gross	504.5
	tare	502.2
	final	2.3
Imp. #4: SILICA GEL	gross	653.4
	tare	640.0
	final	13.4
Total		317.2

Probe rinse _____ ml

Solution blank _____ ml

Filter No: _____
Filter Tare wt. _____

Solution Container # _____ date _____

Sample Vol: Imp#1 — start _____ ml; finsh _____ ml
Amount Gained: _____ ml

Sample Vol: Imp #2 — start _____ ml; finsh _____ ml
Amount Gained: _____ ml

Sample Vol: Imp #3 — start _____ ml; finsh _____ ml
Amount Gained: _____ ml

Total Vol #1 #2 & Rinse _____ ml

Comments:

Sample Recovery: 250 ml acetone used to rinse probe & front half
- Filter appeared blackened by heat, but was intact upon recovery

LEAK CHECK BETWEEN TRAVERSES : 0 at 8 in Hg.

FINAL PITOT TUBE LEAK CHECK: GOOD

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility _____
Location _____
Operator _____
Date _____
Run No. _____
Sample Box No. _____
Meter Box No. _____
Pitot Tube Coefficient Cp _____
Meter Box Correction Factor 4°_{C} _____

Diagram of Stack

Ambient Temperature (°F) _____
Barometric Pressure (in. Hg) _____
Probe Length, (ft) _____
Nozzle Identification No. _____
Avg. Calibrated Nozzle Dia., (in.) _____
Probe Heater Setting _____
Leak Rate, (cfm) _____
Probe Liner Material _____
Static Pressure, (in. Hg) _____
Filter No. _____

TRAVERSE POINT	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
1	48 / 52	4	142	0.04	0.58	130.48 / 131.39	93.	84	–	206	63
2	56	5	142	0.04	0.58	133.09	83.	84	–	200	63
3	60	5.5	142	0.06	0.87	✱	93.	86	–	166	62
4	64	5.5	142	0.06	0.87	137.12	84.	83	–	200	55
5	68	5	142	0.07	1.00	139.21	86.	83	–	181	55
6	72	5	142	0.06	0.87	141.28	84.	83	–	214	55
7	76	5	142	0.06	0.87	143.36	85.	83	–	191	56
8	80	5	142	0.06	0.87	145.44	85.	83	–	213	57
9	84	5	142	0.06	0.87	147.52	84.	83	–	183	58
10	88	5	142	0.06	0.87	✱	85.	83	–	179	58
11	92	5	142	0.05	0.72	151.43	85.	83	–	198	58
12	96	4	142	0.04	0.58	152.60	85.	83	–	173	58

LEAK CHECK BETWEEN TRAVERSES : 0 at 8 in Hg.

FINAL PITOT TUBE LEAK CHECK: GOOD

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility _____
Location _____
Operator _____
Date _____
Run No. _____
Sample Box No. _____
Meter Box No. _____
Pitot Tube Coefficient Cp _____
Meter Box Correction Factor 4°_{c} _____

Diagram of Stack

Ambient Temperature (°F) _____
Barometric Pressure (in. Hg) _____
Probe Length, (ft) _____
Nozzle Identification No. _____
Avg. Calibrated Nozzle Dia., (in.) _____
Probe Heater Setting _____
Leak Rate, (cfm) _____
Probe Liner Material _____
Static Pressure, (in. Hg) _____
Filter No. _____

TRAVERSE POINT	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
1	~~48~~ 52	4	142	0.04	0.58	130.48 / 131.39	93	84	—	206	63
2	56	5	142	0.04	0.58	133.09	83	84	—	200	63
3	60	5.5	142	0.06	0.88	*	83	86	—	166	62
4	64	5.5	142	0.06	0.87	137.12	84	83	—	200	55
5	68	5	142	0.07	1.00	139.21	86	83	—	181	55
6	72	5	142	0.06	0.87	141.28	84	83	—	214	55
7	76	5	142	0.06	0.87	143.36	85	83	—	191	56
8	80	5	142	0.06	0.87	145.44	85	83	—	213	57
9	84	5	142	0.06	0.87	147.52	84	83	—	183	58
10	88	5	142	0.06	0.87	*	85	83	—	179	58
11	92	5	142	0.05	0.72	151.43	85	83	—	198	58
12	96	4	142	0.04	0.58	152.60	85	83	—	173	58

Run Set Up Sheet

Client : WSPA
Site : SANTA FE MIDWAY
Unit: CRUDE FIRED STM. GEN. STACK

Date : 9-23-90
Job #: 7230.07
Lab #: --

Method#: ARB 104
Run#: C
Hot box#:

Probe#:
Stack box#:
Cold box#:

Pryo#:
Nozzle#:
Pitot#:

Imp. #1: 100 ml DI H2O	gross	797.2
	tare	597.6
	final	199.6
Imp. #2: 100 ml DI H2O	gross	575.1
	tare	570.1
	final	5.0
Imp. #3: EMPTY	gross	476.6
	tare	474.6
	final	2.0
Imp. #4: SILICA GEL	gross	639.0
	tare	624.3
	final	14.70
Total		231.3

Probe rinse [ ] ml

Solution blank [ ] ml

Filter No: [ ]
Filter Tare wt. [ ]

Solution Container	#	date

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse [ ] ml

Comments: SAMPLE RECOVERY: total vol. acetone rinse = 100 ml
FILTER WAS INTACT W/NO CRACKS OR HOLES - BLACK IN APPEARANCE

Run Set Up Sheet

Client : WSRI
Site : CFSG - SANTA FE
Unit: _____

Date : 9/21/90
Job #: _____
Lab #: _____

Method#: 425 Probe#: _____ Pryo#: _____
Run#: A Stack box#: _____ Nozzle#: _____
Hot box#: _____ Cold box#: _____ Pitot#: _____

Imp. #1:	gross	
	tare	
	final	
Imp. #2:	gross	
	tare	
	final	
Imp. #3:	gross	
	tare	
	final	
Imp. #4:	gross	
	tare	
	final	
	Total	

Probe rinse _____ ml

Solution blank _____ ml

Filter No: _____
Filter Tare wt. _____

	#	date
Solution Container		

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse _____ ml

Comments: 100 ml Acetone &
100 mL DDI H2O used for rinse: Probe to back half of 3rd Impinger
- each rinse added to Sample Bottle B, along with impinger contents

CHROMIUM RUN #3

TRAVERSE A

NOMOGRAPH IDEAL NOZZLES : 0.360 in

USED D_n : 0.382

LEAK CHECK : INITIAL 0.015 cfm @ 15 in. Hg

FINAL 0 at 4 in. Hg.

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility [redacted] FE ENERGY

Location COAL SCRUBBER STACK

Operator [redacted] PRETORIUS

Date 9/24/90

Run No. A - CHROMIUM ARB 425

Sample Box No. 4

Meter Box No. 2

Pitot Tube Coefficient Cp 0.84

Meter Box Correction Factor $4°_C$ 1.01652

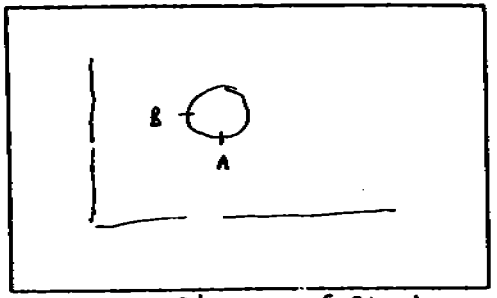


Diagram of Stack

Ambient Temperature (°F) 93

Barometric Pressure (in. Hg) 29.5

Probe Length, (ft) 8

Nozzle Identification No. 0.375

Avg. Calibrated Nozzle Dia., (in.) 0.382

Probe Heater Setting LO

Leak Rate, (cfm) 0.015 cfm

Probe Liner Material GLASS

Static Pressure, (inches) 0.03 in. H_2O

Filter No. —

TRAVERSE POINT	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEM LVG LAS IMPINGE (°F)
							Inlet	Outlet			
1	0 / 3	4	135	0.04	0.61	906.81 / 907.74	76	80	—	179	60
2	6	4	133	0.05	0.78	909.09	76	80	—	190	60
3	9	4	131	0.05	0.76 (corrected temp. stack)	910.48	77	79	—	202	60
4	12	4	126	0.05	0.76	911.98	77	79	—	198	60
5	15	4	127	0.05	0.76	913.11	78	79	—	195	60
6	18	4	124	0.04	0.61	914.87	78	77	—	189	60
7	21	4	126	0.04	0.61	916.19	78	77	—	195	60
8	24	4	126	0.03	0.46	917.44	79	76	—	186	60
9	27	4	127	0.03	0.46	918.69	79	76	—	185	60
10	30	4	124	0.03	0.46	919.81	78	76	—	185	60
11	33	4	119	0.03	0.46	920.92	76	75	—	186	65
12	36	4	119	0.03	0.46	922.07	76	75	—	186	65

CR Run B
TRAVERSE B

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility _____
Location _____
Operator _____
Date _____
Run No. _____
Sample Box No. _____
Meter Box No. _____
Pitot Tube Coefficient Cp _____
Meter Box Correction Factor 4°_{c} _____

Diagram of Stack

Ambient Temperature (°F) _____
Barometric Pressure (in. Hg) _____
Probe Length, (ft) _____
Nozzle Identification No. _____
Avg. Calibrated Nozzle Dia., (in.) _____
Probe Heater Setting _____
Leak Rate, (cfm) _____
Probe Liner Material _____
Static Pressure, (in. Hg) _____
Filter No. _____

SHUTDOWN FOR FIVE MIN. DUE TO BROKEN SAMPLE LINE.

TRAVERSE POINT	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
1	36 / 39	4	120	0.06	0.86	922.07 / 923.27	69	70	–	185	63
2	42	4	120	0.07	1.00	924.67	71	70	–	179	62
3	45	4	121	0.06	0.86	926.31	70	69	–	178	62
4	48	4	122	0.07	1.00	927.96	72	70	–	176	63
5	51	4	122	0.07	1.00	929.50	72	69	–	179	63
6	54	4	121	0.07	1.00	931.17	73	69	–	182	62
7	57	4	124	0.07	1.00	932.75	68	68	–	193	63
8	60	4	123	0.07	1.00	934.67	69	68	–	181	63
9	[illegible]3	4	122	0.07	1.00	936.28	70	68	–	181	63
10	[illegible]6	4	122	0.07	1.00	937.81	70	68	–	180	63
11	[illegible]9	4	120	0.06	0.86	939.96	71	68	–	182	63
12	[illegible]2	4	120	0.06	0.86	941.09	71	68	–	182	63
	[illegible]										

Run Set Up Sheet

Client : WSPA
Site : SANTA FE, KERN
Unit: CRUDE-FIRED STEAM GENERATOR STACK

Date : 9/21
Job #: 7230007
Lab #: _____

Method#: 425
Run#: B
Hot box#: _____

Probe#: _____
Stack box#: _____
Cold box#: _____

Pryo#: _____
Nozzle#: _____
Pitot#: _____

Imp. #1: 100 mL 0.1 N NaOH	gross	758.9
	tare	603.8
	final	155.1
Imp. #2: 100 mL 0.1 N NaOH	gross	609.2
	tare	605.1
	final	4.1
Imp. #3: EMPTY	gross	488.8
	tare	487.4
	final	1.4
Imp. #4: SILICA GEL	gross	656.8
	tare	646.5
	final	10.3

Total 170.9

Probe rinse [redacted] ml 394.5 g − 277.3 g = 117.2 g

Solution blank 100 ml

Filter No: [redacted]
Filter Tare wt: [redacted]

Solution Container # _____ date _____

Sample Vol: Imp#1 — start _____ ml; finsh _____ ml; Amount Gained: _____ ml

Sample Vol: Imp #2 — start _____ ml; finsh _____ ml; Amount Gained: _____ ml

Sample Vol: Imp #3 — start _____ ml; finsh _____ ml; Amount Gained: _____ ml

Total Vol #1 #2 & Rinse _____ ml

Comments: PROBE RINSE = 117.2 g NaOH (0.1N) * condensate

Chromium Run 3C

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility SANTA FE ENERGY, KERN CO
Location CRUDE FIRED STEAM GENERATOR STACK
Operator MB
Date 9-21
Run No. C
Sample Box No. 1
Meter Box No. 3-RAC
Pitot Tube Coefficient Cp
Meter Box Correction Factor 4°_{c} 1.0131

Diagram of Stack

Ambient Temperature (°F) 83
Barometric Pressure (in. Hg) 29.45
Probe Length, (ft) 8
Nozzle Identification No.
Avg. Calibrated Nozzle Dia., (in.) 0.380
Probe Heater Setting
Leak Rate, (cfm) 0.019
Probe Liner Material GLASS
Static Pressure, (in. Hg) 0.03
Filter No.

TRAVERSE POINT	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
1	0 / 3	2.0	144	0.04	0.63	569.901 / 571.30	77	80		177	74
2	6	3.0	145	0.05	0.80	573.1	76	80		192	74
3	9	3.0	144	0.06	0.95	574.5	77	79		199	76
4	12	3.0	144	0.07	1.10	576.9	77	78		200	75
5	15	3.5	141	0.07	1.10	578.2	77	78		202	75
6	18	3.5	143	0.07	1.10	579.8	77	77		210	74
7	21	3.5	142	0.065	1.02	580.9	78	77		204	75
8	24	3.5	142	0.07	1.10	583.2	78	77		209	72
9	27	3.5	141	0.07	1.10	584.9	78	77		209	71
10	30	3.5	141	0.065	1.05	586.8	78	76		209	70
11	33	3.5	139	0.06	0.95	588.5	78	76		211	68
12	36	3.0	135	0.05	0.80	589.900	77	75		213	68

Initial leak ck: 0.019 cfm at 15 in. Hg

CHROMIUM

RUN C (continued)

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility _____

Location _____
Operator _____
Date _____
Run No. _____
Sample Box No. _____
Meter Box No. _____
Pitot Tube Coefficient Cp _____
Meter Box Correction Factor 4°_{c} _____

Diagram of Stack

Ambient Temperature (°F) _____
Barometric Pressure (in. Hg) _____
Probe Length, (ft) _____
Nozzle Identification No. _____
Avg. Calibrated Nozzle Dia., (in.) _____
Probe Heater Setting _____
Leak Rate, (cfm) 0 at 4.0 in Hg
Probe Liner Material _____
Static Pressure, (in. Hg) _____
Filter No. _____

TRAVERSE POINT	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
				0.01	0.16		[illegible]				[illegible]
13	39	1.5	140	[illegible]	[illegible]	590.73	73	74		230	65
14	42	2.0	136	0.02	0.32	591.72	70	71		210	64
15	45	2.5	136	0.025	0.39	592.90	71	71		209	63
16	48	2.5	137	0.03	0.45	593.95	72	71		208	64
17	51	3.0	136	0.03	0.45	595.25	73	71		209	64
18	54	3.0	137	0.035	0.53	596.55	74	71		209	64
19	57	3.0	137	0.05	0.76	598.02	74	71		208	64
20	60	3.2	135	0.05	0.76	600.1	69	70		216	62
21	63	3.2	134	0.065	0.99	601.6	71	70		215	62
22	66	3.5	136	0.06	0.92	603.2	71	70		215	62
23	69	3.0	135	0.05	0.76	604.7	71	70		215	62
24	72	3.0	135	0.045	0.69	606.172	72	70		215	62

Final leak check: 0 cfm at 4.0 in Hg

Run Set Up Sheet

Client : WSPA
Site : SANTA FE ENERGY, KERN
Unit: CRUDE - FIRED STEAM GENERATOR STACK

Date : 9-21-90
Job #: 7220.007
Lab #:

Method#: 425
Run#: C
Hot box#:

Probe#:
Stack box#:
Cold box#:

Pryo#:
Nozzle#:
Pitot#:

Imp. #1: 100 mL 0.1N NaOH	gross	914.7
	tare	589.6
	final	125.1
Imp. #2: 100 mL 0.1 N NaOH	gross	576.5
	tare	573.6
	final	2.9
Imp. #3: EMPTY	gross	477.7
	tare	476.0
	final	1.7
Imp. #4: SILICA GEL	gross	686.4
	tare	676.3
	final	10.1

Total 140.4 g

471.7 g
252.6 g
219.1 g

Probe rinse [ ] ml

Solution blank [ ] ml

Filter No: [ ]
Filter Tare wt. [ ]

Solution Container	#	date

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse [ ] ml

Comments: PROBE RINSE CONTAINER - 219.1 g 0.1N NaOH + condensate

MULTI METALS RUN A

K FACTOR = 16.5

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility _____

Location _____
Operator B.P. / J.T.
Date 9/22/[illegible]
Run No. A MM-A
Sample Box No. 3
Meter Box No. 3
Pitot Tube Coefficient Cp 0.84
Meter Box Correction Factor 4°_{c} 1.01310

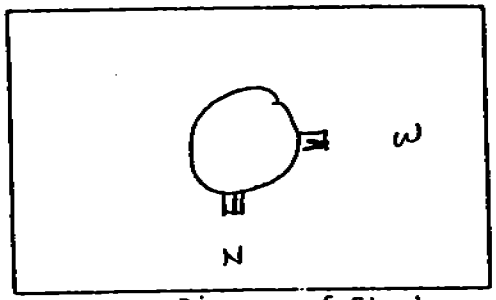


Diagram of Stack

Ambient Temperature (°F) 80°F
Barometric Pressure (in. Hg) 29.5
Probe Length, (ft) 8 FT.
Nozzle Identification No. —\
Avg. Calibrated Nozzle Dia., (in.) .383
Probe Heater Setting _____
Leak Rate, (cfm) .02 @ 18 "Hg
Probe Liner Material _____
Static Pressure, (in. Hg) _____
Filter No. _____

TRAVERSE POINT	SAMPLING TIME (θ) min. 1:10 TM	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
PLOT W 1	0 / 5	2	140°F	.01	.16	606.54 / 608.0	78	80		237	68°F
2	10	3	140°F	.02	.33	609.8	79	79		242	65°F
3	15	3	142°F	.025	.41	611.4	81	80		257	65°F
4	20	3	142	.03	.49	613.7	81	78		259	64
5	25	3.5	142	.035	.57	616.0	82	78		263	64
6	30	3.5	143	.04	.66	618.7	83	77		262	64
7	35	4.0	138	.045	.74	621.2	84	78		266	66
8	40	4.5	142	.06	.98	624.2	84	78		262	66
9	45	4.5	142	.06	.98	627.3	82	78		258	64
10	50	4.5	142	.055	.90	630.4	80	78		286	64
11	55	4.0	142	.04	.66	632.7	80	78		250	64
12	60	4.0	142	.035	.57	635.0	80	77		248	64
END											

PRETEST PITOT TUBE LEAK: #2 NO LEAK

PROBE HEATER TEMP.: 200 - 250°

MMT - A cont.

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility Santa Fe / Midway Sunset
Location
Operator B.P. / J.T.
Date
Run No.
Sample Box No.
Meter Box No.
Pitot Tube Coefficient Cp
Meter Box Correction Factor, 4^{o}_{c}

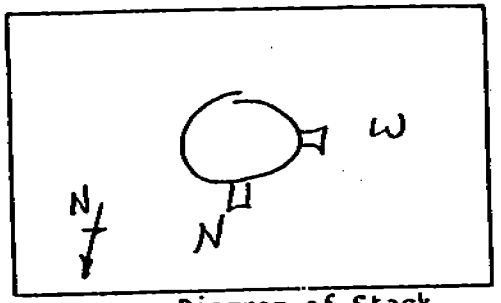


Diagram of Stack

Ambient Temperature (°F)
Barometric Pressure (in. Hg)
Probe Length, (ft)
Nozzle Identification No.
Avg. Calibrated Nozzle Dia., (in.)
Probe Heater Setting
Leak Rate, (cfm)
Probe Liner Material
Static Pressure, (in. Hg)
Filter No.

TRAVERSE POINT	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
1	0 / 5	3.5	142	.04	.066	635.36 / 637.4	65	66		260	62
2	10	4.0	142	.05	.82	640.2	68	67		247	60
3	15	4.0	143	.06	.98	642.9	71	66		243	60
4	20	4.5	144	.065	1.05	645.7	73	67		248	61
5	25	4.5	142	.065	1.05	648.8	74	67		250	61
6	30	4.5	142	.065	1.05	651.25	75	67		252	62
7	35	5.0	142	.065	1.05	654.1	72	68		253	62
8	40	3.5	142	.06	.98	656.1	73	68		256	62
9	45	3.5	142	.055	.90	657.6	74	68		254	63
10	50	3.5	142	.055	.90	658.7	74	69		255	64
11	55	3.0	142	.045	.73	659.7	74	69		259	64
12	60	3.0	143	.035	.57	660.61	73	69		256	65
						FINAL					

FINAL LEAK CHECK: .016 @ 5" Hg
" " TOT TIMES: #2 GOOD

Run Set Up Sheet

Client : WSPA
Site : SANTA FE, MIDWAY
Unit: CRUDE OIL FIRED STEAM GEN. STACK

Date : 9-22-90
Job #: 7230CF
Lab #: _____

Method#: Prop. ARB 436 Probe#: _____ Pryo#: _____
Run#: A Stack box#: _____ Nozzle#: _____
Hot box#: _____ Cold box#: _____ Pitot#: _____

Imp. #1: EMPTY	gross	716.1	g
	tare	499.6	
	final	216.5	
Imp. #2: 100 mL HNO_3/H_2O_2	gross	615.8	
	tare	608.8	
	final	7.0	
Imp. #3: 100 mL HNO_3/H_2O_2	gross	573.8	
	tare	573.4	
	final	0.4	
Imp. #4: 100 mL $KMnO_4/H_2SO_4$	gross	608.9	
	tare	608.8	
	final	0.1	
~~Imp #5~~ ~~Silica Gel~~	~~GROSS~~ ~~TARE~~ ~~FINAL~~		
	Total		

Probe rinse _____ ml

Solution blank _____ ml

Filter No: _____
Filter Tare wt. _____

Solution Container	#	date

Sample Vol: Imp#1	start		ml
	finsh	214.0	ml
Amount Gained:			ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse _____ ml

Comments:

Impinger #5 (100ml $KMnO_4/H_2SO_4$)

GROSS	576.1	
TARE	576.2	
FINAL	-0.1	-.1

Impinger #6 (Silica Gel)

GROSS	728.3	
TARE	715.2	
FINAL	13.1	13.1

216.5
7.0
-.1
13.1
237.2

Silica Gel appeared about 40% spent after test

Total H_2O condensed = 237.0 g

LEAK CHECK: INITIAL 0.018 at 17 in Hg P_B @ TAFT AIRPORT = 30.1 @ 875'

FINAL P_B = 30.0 @ 1000'

PITOT TUBES: GOOD
LEAKCHECK

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

$\Delta H_@$ 1.6950 ΔH_{NE} = 1.0

Facility SANTA FE / MIDWAY SUNSET

Location 113, 112, 105
Operator B.P. / J.T.
Date 9/23/98
Run No. B
Sample Box No. 4
Meter Box No. 4
Pitot Tube Coefficient Cp 0.84
Meter Box Correction Factor 4° c 0.99954

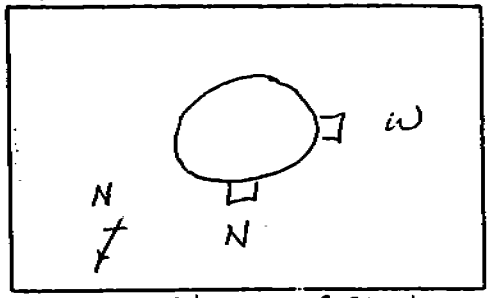


Diagram of Stack

Ambient Temperature (°F)
Barometric Pressure (in. Hg)
Probe Length, (ft)
Nozzle Identification No.
Avg. Calibrated Nozzle Dia., (in.) 0.381
Probe Heater Setting
Leak Rate, (cfm)
Probe Liner Material
Static Pressure, (in. Hg)
Filter No.

K_{FACTOR} = 14.8

TRAVERSE POINT	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
1	0 / 5	3.0	141	.04	.58	172.42 / 174.5	77	77		252	~~252~~ 59
2	10	4.0	143	.05	.73	177.0	78	77		258	59
3	15	5.0	142	.06	.88	179.8	82	79		268	59
4	20	5.0	145	.065	.94	182.5	79	77		271	60
5	25	5.0	143	.065	.94	185.4	79	77		288	60
6	30	5.5	144	.07	1.01	188.3	80	77		290	60
7	35	5.5	144	.07	1.01	191.2	80	79		275	60
8	~~35~~ 40	6.0	144	.08	1.16	194.2	77	76		240	59
9	45	5.5	143	.075	1.10	197.[illegible]	78	76		230	59
10	50	5.0	144	.065	0.95	200.1	82	79		256	59
11	55	5.0	143	.06	.88	202.9	80	77		260	59
12	60	5.0	143	.055	.80	205.5	80	77		271	61

PORT N
10 AM

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility SANTA FE / MIDWAY SUNSET
Location 113, 112, 105
Operator B.P.
Date 9/23/90
Run No. 2-2 / MULTI-METALS
Sample Box No. 4
Meter Box No. 4
Pitot Tube Coefficient Cp 0.84
Meter Box Correction Factor $4°_c$

Diagram of Stack

Ambient Temperature (°F)
Barometric Pressure (in. Hg) 30.0
Probe Length, (ft) 8 FT.
Nozzle Identification No.
Avg. Calibrated Nozzle Dia., (in.) .381
Probe Heater Setting
Leak Rate, (cfm)
Probe Liner Material
Static Pressure, (in. Hg)
Filter No.

TRAVERSE POINT	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
PORT W 11:50 AM 1	0 / 5	4.5	143	.05	0.73	205.5 / 208.0	76	76		239	60
2	10	4.5	143	.05	0.73	210.5	76	76		238	59
3	15	5.5	143	.07	1.02	213.4	78	76		231	59
4	20	5.5	144	.065	.94	216.2	78	77		235	60
5	25	5.5	141	.06	.88	218.9	80	78		243	63
6	30	5.5	144	.065	.94	221.8	81	79		243	61
7	35	5.5	142	.065	.94	224.5	82	80		240	62
8	40	5.5	143	.07	1.02	227.6	83	81		241	61
9	45	5.5	144	.065	.94	230.3	83	81		254	61
10	50	5.5	144	.06	.88	233.0	85	82		260	62
11	55	4.5	143	.045	.65	235.4	87	84		264	63
12	60	4.0	144	.03	.44	237.41	87	84		265	

POST LEAK CHECK: .004 @ 5.5 "Hg PITOT TUBES: #2 GOOD ISO ≅ 99.8 %

MULTI METALS RUN B

Run Set Up Sheet

Client : WSPA
Site : SANTA FE - MIDWAY
Unit: CRUDE FIRED STEAM GEN. STACK

Date : 9-27-90
Job #: 7230-007
Lab #: _____

Method#: ARB 104
Run#: B
Hot box#: _____

Probe#: _____
Stack box#: _____
Cold box#: _____

Pryo#: _____
Nozzle#: _____
Pitot#: _____

Imp. #1: EMPTY	gross	802.7	
	tare	493.1	
	final	309.6	
Imp. #2: HNO_3/H_2O_2	gross	596.0	
	tare	589.3	
	final	6.7	
Imp. #3: HNO_3/H_2O_2	gross	598.1	
	tare	597.9	
	final	0.2	
Imp. #4: $KMnO_4/H_2SO_4$	gross	609.9	
	tare	609.4	
	final	0.5	

Total 329.7
IMPINGERS 5 & 6 BELOW

Probe rinse _____ ml

Solution blank _____ ml

Filter No: _____
Filter Tare wt. _____

Solution Container	#	date

Sample Vol:	start		ml
Imp#1	finsh		ml
Amount Gained:			ml
Sample Vol:	start		ml
Imp #2	finsh		ml
Amount Gained:			ml
Sample Vol:	start		ml
Imp #3	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse _____ ml

Comments:

Imp. #5 — $KMnO_4/H_2SO_4$
GROSS 614.6
TARE 614.9
FINAL −0.7

Imp. #6 — SILICA GEL
GROSS 686.1
TARE 672.7
FINAL 13.4

Filter Recovery: filter was intact, with no visible cracks or holes - surface was light gray in color

IMPINGERS 4 & 5 - No Acidic permanganate solution left for rinse - method required 800 ml for 3 trains, plus 300 ml

BOX BALANCED & ZEROED BEFORE TEST

MULTI-METALS - RUN C

F-FACTOR: 14.8

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility SANTA FE / MIDWAY SUNSET

Location

Operator B.P.

Date 9/23/90

Run No. C

Sample Box No. 4

Meter Box No. 4

Pitot Tube Coefficient Cp 0.84

Meter Box Correction Factor 4°_{c}

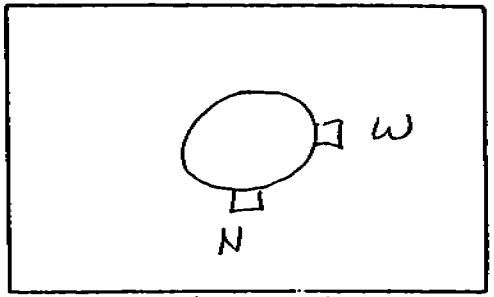


Diagram of Stack

Ambient Temperature (°F) 75

Barometric Pressure (in. Hg) 30.00

Probe Length, (ft) 8

Nozzle Identification No.

Avg. Calibrated Nozzle Dia., (in.) 0.381

Probe Heater Setting

Leak Rate, (cfm)

Probe Liner Material

Static Pressure, (in. Hg)

Filter No.

2:20 PM PRETEST LEAKCHECK: .008 @ 17" Hg PRE-PITOT TUBE LEAKCHECKS: GOOD $\Delta H@ = 1.695$ $\gamma =$

2:33 PM PORT N

TRAVERSE POINT	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEM LVG LAS IMPINGE (°F)
							Inlet	Outlet			
1	~~0~~ ~~4~~	3.0	139	.035	.51	~~237.80~~ ~~240.0~~	88	89		248	65
2	~~4~~ 8	3.0	142	.04	.58	241.3	89	89		250	65
3	~~8~~ 12	3.0	143	.045	.65	243.4	90	90		250	65
4	~~12~~ 16	4.0	142	.06	.88	245.6	93	91		256	64
5	~~16~~ 20	4.0	143	.065	.94	247.8	91	90		257	62
6	~~20~~ 24	4.0	143	.06	.88	250.1	90	89		258	63
7	~~24~~ 28	4.0	143	.065	.94	252.3	91	89		264	63
8	~~28~~ 32	4.0	143	.065	.94	254.6	91	90		258	64
9	~~32~~ 36	4.0	143	.06	.88	257.	91	89		258	63
10	~~36~~ 40	3.5	141	.055	.75	259.	91	89		258	63
11	~~40~~ 44	3.5	140	.055	.75	260.6	91	89		262	63
12	~~44~~ 48	3.5	143	.045	.61	262.51	90	89		264	63

ENSR CORPORATION
ISOKINETIC TEST LOG SHEET

Facility: Santa Fe / Midway Sunset
Location:
Operator: B.P.
Date: 9/23/90
Run No.: 3
Sample Box No.: 4
Meter Box No.: 4
Pitot Tube Coefficient Cp:
Meter Box Correction Factor 4°_{c}:

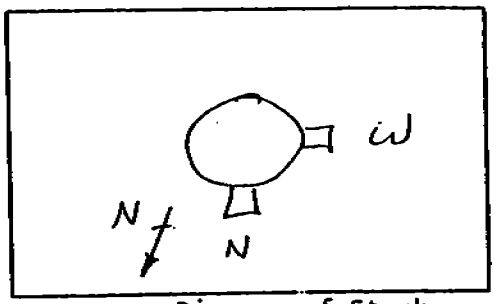


Diagram of Stack

Ambient Temperature (°F):
Barometric Pressure (in. Hg):
Probe Length, (ft):
Nozzle Identification No.:
Avg. Calibrated Nozzle Dia., (in.):
Probe Heater Setting:
Leak Rate, (cfm):
Probe Liner Material:
Static Pressure, (in. Hg):
Filter No.:

3:35 PM
Port W

TRAVERSE POINT	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP) in H_2O	PRESSURE DIFF. (ΔH) in H_2O	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP. AT DRY GAS METER (T_m) °F		O_2 (%)	FILTER HOLDER TEMP (°F)	GAS TEMP LVG LAST IMPINGER (°F)
							Inlet	Outlet			
1	0 / 4	3.0	143	.045	.62	262.51 / 266.3	86	86		266	58
2	8	3.0	140	.05	.68	266.2	86	86		264	58
3	12	4.0	143	.055	.75	268.3	85	85		254	55
4	16	4.0	143	.065	.89	270.4	86	84		249	54
5	20	4.0	143	.07	.96	272.6	85	84		246	53
6	24	4.0	142	.07	.96	274.8	85	84		255	53
7	28	4.0	141	.065	.89	277.0	84	83		254	54
8	32	4.0	140	.07	.96	279.4	84	83		250	54
9	36	4.0	140	.06	.83	281.4	84	82		253	56
10	40	4.0	143	.065	.89	283.4	84	82		245	54
11	44	3.5	143	.055	.75	285.3	84	82		244	54
12	48	3.5	139	.045	.62	287.07	84	82		249	54

TEST END: 1:25 PM

PITOT TUBE FINAL LEAKCHECK: BOTH GOOD

FINAL LEAK CHECK: 0.003 @ 6 in/Hg

MULTIHEADS RUN C

Run Set Up Sheet

Client : WSPA
Site : SANTA FE MIDWAY
Unit: CRUDE FIRED STEAM GENERATOR STACK

Date : 9-23-90
Job #: 7230-007
Lab #: _____

Method#: EPA M6LT
Run#: C
Hot box#: _____

Probe#: _____
Stack box#: _____
Cold box#: _____

Pryo#: _____
Nozzle#: _____
Pitot#: _____

Imp. #1: EMPTY	gross	687.0
	tare	469.5
	final	217.5
Imp. #2: HNO_3/H_2O_2 100 ml	gross	611.2
	tare	601.9
	final	9.3
Imp. #3: HNO_3/H_2O_2 100 ml	gross	590.7
	tare	588.2
	final	2.5
Imp. #4: $KMnO_4/H_2SO_4$ 100 ml	gross	589.2
	tare	588.6
	final	0.6

Total _____

Probe rinse _____ ml

Solution blank _____ ml

Filter No: _____
Filter Tare wt. _____

	#	date
Solution Container		

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:		_____	ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:		_____	ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:		_____	ml

Total Vol #1 #2 & Rinse _____ ml

Comments:

IMP.#5 $KMnO_4/H_2SO_4$ 100 ml	GROSS	597.9
	TARE	597.3
	FINAL	0.6
IMP.#6 SILICA GEL	GROSS	681.2
	TARE	671.1
	FINAL	10.1
TOTAL		240.6

APPENDIX C.2

CARB 429

FIELD DATA SHEETS

Run Set Up Sheet

Client : USPA
Site : UNOCAL ~~[illegible]~~ WORKOVER RIG
Unit: WORKOVER RIG DIESEL IC ENGINE

Date : 9/14/90
Job #: 723c-007
Lab #: —

Method#: 429
Run#: 1
Hot box#: 1

Probe#: —
Stack box#: —
Cold box#: 1

Pryo#: —
Nozzle#: —
Pitot#: —

Imp. #1: DRY	gross	533.7	
	tare	509.5	
	final		
Imp. #2: 100ml H_2O	gross	590.8	
	tare	597.0	
	final		
Imp. #3: Silica Gel	gross	691.3	
	tare	669.1	
	final		
Imp. #4: NA	gross		
	tare		
	final		
Total			

Probe rinse [ ] ml

Solution blank [ ] ml

Filter No: —
Filter Tare wt. —

Solution Container	#	date

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse _____ ml

Comments: NON-ISOKINETIC PAH's — ARB 429
XAD CARTRIDGE : 91P

Run Set Up Sheet

Client : _____
Site : _____
Unit: _____

Date : _____
Job #: _____
Lab #: _____

Method#: 429 Probe#: _____ Pryo#: _____
Run#: 2 Stack box#: _____ Nozzle#: _____
Hot box#: _____ Cold box#: _____ Pitot#: _____

Imp. #1: DRY	gross	520.7	
	tare	492.9	
	final		
Imp. #2: 100 ml H_2O	gross	591.1	
	tare	661.0	
	final		
Imp. #3: Silica gel	gross	734.0	
	tare	705.9	
	final		
Imp. #4: NA	gross		
	tare		
	final		
Total			

Probe rinse _____ ml

Solution blank _____ ml

Filter No: _____
Filter Tare wt. _____

Solution Container	#	date

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse _____ ml

Comments: XAD CARTRIDGE 91 X

Run Set Up Sheet

Client : WSPA
Site : UNOCAL
Unit: DIESEL WORKOVER Rig

Date : 9/14/90
Job #: 7230-007
Lab #: —

Method#: 429
Run#: BLANK
Hot box#: 2

Probe#: —
Stack box#: —
Cold box#: 4

Pryo#: —
Nozzle#: —
Pitot#: —

Imp. #1: DRY	gross	488.1
	tare	488.1
	final	
Imp. #2: 100 ml H_2O	gross	596.9
	tare	596.9
	final	
Imp. #3: Silica Gel	gross	659.2
	tare	659.2
	final	
Imp. #4: NA	gross	
	tare	
	final	

Total

Probe rinse ml

Solution blank ml

Filter No:
Filter Tare wt.

Solution Container	#	date

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse ml

Comments: BLANK TRAIN — ARB 429
XAD CARTRIDGE 91 T

Run Set Up Sheet

Client : WSPA
Site : UNOCAL
Unit: DIESEL WORKOVER Rig

Date : 9/14/90
Job #: 7230-007
Lab #: —

Method#: 429
Run#: BLANK
Hot box#: 2

Probe#: —
Stack box#: —
Cold box#: 4

Pryo#: —
Nozzle#: —
Pitot#: —

Imp. #1: DRY	gross	488.1	
	tare	488.1	
	final		
Imp. #2: 100 ml H_2O	gross	596.9	
	tare	596.9	
	final		
Imp. #3: Silica Gel	gross	659.2	
	tare	659.2	
	final		
Imp. #4: NA	gross		
	tare		
	final		
Total			

Probe rinse [ ] ml

Solution blank [ ] ml

Filter No: [ ]
Filter Tare wt. [ ]

Solution Container	#	date

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse _____ ml

Comments: BLANK TRAIN — ARB 429
XAD CARTRIDGE 91 T

SAMPLE DATA SHEETS

DATE: 9-14-90 LOCATION: UNOCAL PIRU

CLIENT: WSPA AMBIENT TEMP: 79 F

PROJECT NO.: 7230-007 OPERATOR: MS

WORKOVER RIG - WELL 96 ARB 429

SORBENT TYPE	RUN NO.	PUMP NO.	VACUUM ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)	Meter Temp °F
XAD	A	1-RAC	18 in Hg	1140		0		387.328	92
			18			10		395.00	92
			19			20		403.95	95
			19			30		411.35	97
			20			40		418.410	100
			21			50		425.80	104
			21			60		432.90	104
			21			70		439.35	103
			21			80		—	103
			20			90		452.42	103
REMARKS:			21		1320	100		458.490	99

GAS METER: 1-RAC

LEAK CHECK: INITIAL 387.276 } at 15 in Hg
after 1 min 387.287 } 0.011 cfm

FINAL: 0.010 cu. ft. in/min. at 21 in. Hg.

FORM NO. 91-001

SAMPLE ID NO.

7230 007 - [redacted] - DW[A 429] - A, B, C ...

ENSR

SAMPLE DATA SHEETS

DATE: 9-14-90 LOCATION: UNOCAL VENTURA

CLIENT: WSPA AMBIENT TEMP: 88.2

PROJECT NO.: 7230-007 OPERATOR: MS

WORKOVER RIG at WELL #9C ARB MTD.429

SORBENT TYPE	RUN NO.	PUMP NO.	VACUUM ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)	Me- Te
XAD	B	V-111	in Hg 19	1430		0		459.05	97
			21			10		466.26	95
			21			20		472.865	9(
			21			30		479.58	9←
			21			40		—	7=
			20			50		493.19	9.
			21			60		499.85	94
			21			70		506.71	94
			21			80		512.75	9'
			21			90		518.50	9
			21	cu.ft	1610	100		524.395	9

REMARKS:

LEAK CHECK INITIAL - 0.014 cu.ft. at 15 in. Hg in 1 minute

FINAL - 0.020 cu.ft. at 21 in Hg in 1 minute

PULLING PIPE UP - FROM HOLE

FORM NO. 91-001

ENSR

7:06

SAMPLE DATA SHEETS

DATE: 9-14-90 LOCATION: UNOCAL

CLIENT: WSPA AMBIENT TEMP: 81°

PROJECT NO.: 7230 007 OPERATOR: MS

WORKOVER RIG @ WELL #96 ARB MTD 429

SORBENT TYPE	RUN NO.	PUMP NO.	VAC. in Hg ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)	
XAD	C	V-111	5	1714		0		550.235	93
			5			10		—	96
			5			20		569.55	96
			4			30		594.41	84
			4			40		617.13	87
			4			50		639.97	87
			4		1814	60		662.294	87
						~~60~~			
						~~60~~			
						~~60~~			

REMARKS:

1-RAC

LEAK CHECK INITIAL 15 in Hg / 0.009 cu ft in

FINAL 5 in Hg / 1 min

Changed to larger diameter probe - vacuum dropped to 5 in. Hg (compared to ~ 20 in.) → Max. sampling rate increased → dropped sample time to 1 hour.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 9-18-90

LOCATION: SWEPT - TAYLOR RANCH

CLIENT: WSPA

AMBIENT TEMP: 73.8 °F

PROJECT NO.: 7230 -007

OPERATOR: MJ

DRILLING RIG Mfd. 429

SORBENT TYPE	RUN NO.	PUMP NO.	VACUUM in. Hg ~~ORIFICE NUMBER~~	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)	Meter Temp
XAD	A	2-RAC	21	11:18		0		666.310	87
			22			10		673.52	86
			22			20		680.84	87
			22			30		687.90	86
			22			40		695.12	88
			22			50		702.27	89
			22			60		709.33	89
			22			70			89
			22			80		723.60	88
			22			90		730.50	89
			22		13:07	100		737.225	88

REMARKS:

2-RAC = GAS METER

OXNARD : BAR PRESS = 30.00 (uncorrected for site

11:18 STACK TEMP = 446 °F

12:35 " " 785 °F

LEAK CHECK : INITIAL : 0.007 cfm @ 15 in. Hg

- CHECK FROM END OF NOZZLE CONNECTION ONLY: GLASS NOZZLE FIXED TO STACK.

LOST POWER FOR ~2 MINUTES DURING RUN - STOPWATCH WAS STOPPED DURING POWER LOSS

FORM NO. 91-001

SAMPLE ID NOS.:

7230007 - DD-A-429-A,B,C,D,E

ENSR

FINAL LEAK CHECK : 0.015 cfm @ 22 in. Hg

Run Set Up Sheet

Client : WSPA
Site : SWEPI DRILLING RIG
Unit: TAYLOR RANCH

Date : 9-18-90
Job #:
Lab #:

Method#: 4Z9
Run#: B
Hot box#:

Probe#:
Stack box#:
Cold box#:

Pryo#:
Nozzle#:
Pitot#:

Imp. #1: (empty)	gross	543.7
	tare	524.0
	final	
Imp. #2: (100mL H2O)	gross	579.9
	tare	592.7
	final	
Imp. #3: (silicagel)	gross	720.6
	tare	693.5
	final	
Imp. #4:	gross	
	tare	
	final	
Total		

Probe rinse [ ] ml

Solution blank [ ] ml

Filter No: [ ]
Filter Tare wt. [ ]

Solution Container # [ ] date [ ]

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse _____ ml

Comments:

SAMPLE DATA SHEETS

DATE: 9-18-90 LOCATION: SWEPI - TAYLOR RANCH

CLIENT: WSPA AMBIENT TEMP: 72 F

PROJECT NO.: 7230 007 OPERATOR: MS

DRILLING RIG

DIESEL IC ENGINE METHOD 429

SORBENT TYPE	RUN NO.	PUMP NO.	VAC. (in Hg) ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)	Meter Temp °F
XAD	C	2-RAC	20.5	1630		0		800.62	79
			21			10			77
			27			23		818.60	77
			21	1704	1657 / [illegible]	27 / 50	[illegible]	819.55 / 822.4	73
			21			40		830.57	75
			21			50		838.98	75
			21			60		847.50	74
			21			70		855.58	72
			21			80		863.83	71
			21			90		872.04	71
			21			100		880.205	71

REMARKS:

GAS METER # 2-RAC

LEAK CHK: INITIAL 0.009 cfm @ 15 in Hg

FINAL 0.003 cfm @ 27 in Hg

At 20 minutes, ~~Vacuum~~ increased rapidly from 21 to 27 in Hg - Flow rate decreased - Suspected filter blinding - Changed filter at 27 minutes - leak checked per method 429 - stopwatch off during filter change

FORM NO. 91-001

ENSR

Run Set Up Sheet

Client : WSPA
Site : SWEPI - DRILLING RIG
Unit: TAYLOR RANCH

Date : 9-18-90
Job #:
Lab #:

Method#: 429
Run#: C
Hot box#:

Probe#:
Stack box#:
Cold box#:

Pryo#:
Nozzle#:
Pitot#:

Imp. #1: (empty)	gross	531.7
	tare	502.2
	final	
Imp. #2: (100 mL H2O)	gross	590.5
	tare	595.4
	final	
Imp. #3: (silicagel)	gross	711.6
	tare	680.9
	final	
Imp. #4:	gross	
	tare	
	final	

Total

Probe rinse ml

Solution blank ml

Filter No:
Filter Tare wt.

Solution Container # date

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse ml

Comments:

Run Set Up Sheet

Client : WSPA
Site : SANTA FE ENERGY
Unit: COFSG SCRUBBER

Date : 9/26/90
Job #: 7230007
Lab #: —

Method#: 429
Run#: 2
Hot box#: —

Probe#: _____
Stack box#: _____
Cold box#: 2

Pryo#: _____
Nozzle#: _____
Pitot#: _____

Imp. #2 (100ml H_2O)	gross	591.1
	tare	592.5
	final	
Imp. #1 (Dry)	gross	532.4
	tare	501.6
	final	
Imp. #3: (Silica gel)	gross	736.5
	tare	719.4
	final	
Imp. #4:	gross	
	tare	
	final	
Total		

Probe rinse _____ ml

Solution blank _____ ml

Filter No: _____
Filter Tare wt. _____

Solution Container	#	date

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse _____ ml

Comments: _____

SAMPLE DATA SHEETS

DATE: 9/26/90 LOCATION: SANTA FE ENERGY

CLIENT: WSPA AMBIENT TEMP:

PROJECT NO.: 7230 007 OPERATOR: FRED PRETORIUS

AST IMP TEMP	SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	Tm (°F) FLOWRATE (cc/min) IN	OUT	SAMPLE VOLUME (DSCF)	HEAT R
62	XAD RESIN	C	RAC 1	RAC4	8:10 PM		0	78	75	450.01	300
—							15	—	—	—	—
58							30	78	78	474.13	32
52							45	78	78	480.90	32
52							60	78	77	493.78	29
52							75	78	77	507.11	28
—							90	—	—	—	—
54							105	77	76	530.00	284
54						10:10	120	77	76	540.46	279

REMARKS:

XAD CARTRIDGE #: 91 Q

PBAR : 28.99

STACK TEMP. : 142°F

LEAK CHECK : INITIAL : 0.015 cfm at 17 in Hg.
FINAL 0.005 cfm at 15 in Hg.

LARGE IMPINGER USED AS KNOCKOUT BEFORE FILTER — RECOVERED AS PART OF PROBE WASH.

FORM NO. 91-001

ENSR

Run Set Up Sheet

Client : WSPA
Site : SANTA FE ENERGY
Unit: COFSE, SCRUBBER

Date : 9/26/96
Job #: 7220607
Lab #: —

Method#: 421
Run#: 3
Hot box#: —

Probe#: _____
Stack box#: _____
Cold box#: 3

Pryo#: _____
Nozzle#: _____
Pitot#: _____

Imp. #2: 100ml H_2O	gross	588.7
	tare	589.5
	final	
Imp. #1: Dry	gross	533.8
	tare	503.9
	final	
Imp. #3: Silica gel	gross	724.4
	tare	702.2
	final	
Imp. #4:	gross	
	tare	
	final	
Total		

Probe rinse _____ ml

Solution blank _____ ml

Filter No: _____
Filter Tare wt. _____

	#	date
Solution Container		

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse _____ ml

Comments: _____

SAMPLE DATA SHEETS

DATE: 9/26/90

CLIENT: WSPA

PROJECT NO.: 7230 007

LOCATION: SANTA FE ENERGY

AMBIENT TEMP: 78

OPERATOR: FRED PRETORIUS

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	T_m (°F) FLOWRATE (cc/min)		SAMPLE VOLUME (DSCF)
							IN	OUT	
XAD RESIN	D	RAC1	RAC4						

REMARKS:

BLANK TRAIN → 11:00 AM – 4:00 PM

XAD CARTRIDGE #:

PBAR 28.99

FORM NO. 91-001

ENSR

Run Set Up Sheet

Client : USPA
Site : SANTA FE ENERGY
Unit: COFSS SCRUBBER

Date : 9/26/90
Job #: 7230 007
Lab #: _____

Method#: 429 | Probe#: _____ | Pryo#: _____
Run#: 4 | Stack box#: _____ | Nozzle#: _____
Hot box#: _____ | Cold box#: 4 | Pitot#: _____

Imp. #2: 100ml H_2O	gross	598.1	
	tare	598.1	
	final		
Imp. #1: Dry	gross	494.1	
	tare	494.1	
	final		
Imp. #3: Silica gel	gross	718.6	
	tare	718.6	
	final		
Imp. #4:	gross		
	tare		
	final		
Total			

Probe rinse _____ ml

Solution blank _____ ml

Filter No: _____
Filter Tare wt. _____

Solution Container	#	date

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:			ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:			ml

Total Vol #1 #2 & Rinse _____ ml

Comments: _____

Run Set Up Sheet

Client : WSPA
Site : SWEPI DRILLING RIG
Unit: TAYLOR RANCH

Date : _____
Job #: _____
Lab #: _____

Method#: 429
Run#: D - BLANK
Hot box#: _____

Probe#: _____
Stack box#: _____
Cold box#: _____

Pryo#: _____
Nozzle#: _____
Pitot#: _____

Imp. #1: DRY	gross	509 0
	tare	509 0
	final	_____
Imp. #2: 1EO and H_2O	gross	597.7
	tare	597.7
	final	_____
Imp. #3: Silica gels	gross	698.5
	tare	698.5
	final	_____
Imp. #4:	gross	
	tare	
	final	_____

Total _____

Probe rinse [ ] ml

Solution blank [ ] ml

Filter No: [ ]
Filter Tare wt. [ ]

	#	date
Solution Container		

Sample Vol: Imp#1	start		ml
	finsh		ml
Amount Gained:		_____	ml
Sample Vol: Imp #2	start		ml
	finsh		ml
Amount Gained:		_____	ml
Sample Vol: Imp #3	start		ml
	finsh		ml
Amount Gained:		_____	ml

Total Vol #1 #2 & Rinse _____ ml

Comments: _____

SAMPLE DATA SHEETS

DATE: 7/26/90 LOCATION: SANTA FE ENERGY

CLIENT: USPA AMBIENT TEMP: 78+

PROJECT NO.: 7230 007 OPERATOR: FRED PRETORIUS

CEFSG SCRUBBER

Temp Last Impinger	SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	T_{in}(°F) FLOWRATE (cc/min) IN	OUT	SAMPLE VOLUME (DSCF)	Hose ID Temp
61	XAD RESIN	A	RAC1	RAC4	2·25	—	0	84	85	257.68	2
62					—	—	15	83	83	279.75	25
62					—	—	30	83	83	311.91	2
63					—	—	45	84	83	322.60	26
63					—	—	60	84	83	334.45	25
64					—	—	75	84	83	345.40	25
61					—	3·55	90	85	83	356.82	25
60					—	4·10	105	85	83	365.60	25
60					—	4·25	120	85	83	372.86	25

REMARKS:

XAD CARTRIDGE: 91R.

PBAR : 29.49 uncorrected (Bakersfield sea level local) 28.99 corr.

STACK TEMP: 141°F

LEAK CHECK: INITIAL : 0 cfm at 19 in Hg
FINAL : 0 cfm at 19 in Hg

RAC 4 $Y_i = 0.99954$ $\Delta H@_i = 1.73590$

FORM NO. 91-001

INCORRECT : 1ST IMP HAD H_2O — labeled 2nd imp. AND labeled 1st imp. — 2ND IMP WAS DRY.

MASSIVE WATER BUILDUP IN FLASK + CYCLONE + SOME IN FILTER HOUSING

ENSR

APPENDIX C.3

CARB 430

FIELD DATA SHEETS

SAMPLE DATA SHEETS

PRESS = 30.00 at Camarillo

DATE: 9-14-90 LOCATION: UNOCAL

CLIENT: USEPA AMBIENT TEMP: 88.8

PROJECT NO.: 7230 007 OPERATOR: MS

WORKOVER RIG #96 ARB METHOD 430

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
DNPH	B			1315		0	600	
						10	400	
						20	500	
						30	400	
						40	400	
						50	450	
						64	400	
						~~80~~		
ave								

REMARKS:

Leak Check: zero flow indicated for 1 minute (ball resting on bottom).

FORM NO. 91-001

SAMPLE ID NOs

7230007-DW-B-430-A #B

ENSR

SAMPLE DATA SHEETS

pBar 30.00 in Hg (Camari! (correct to ~900 ft)

DATE: 9-14-90 LOCATION: UNOCAL PIRG

CLIENT: WSPA AMBIENT TEMP: 79

PROJECT NO.: 7230 007 OPERATOR: MS

WORKOVER RIG - WELL 96 ARB METHOD 430

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
DNPH	A	V111		1150		0	500	
						10	500	
						20	450	
						30	400	
						40	400	
						50	400	
					1250	60	500	
amb							450	

REMARKS:

ROTAMETER NO. 1000 - 2

LEAK check: Rotameter indicates no flow - ball resting at bottom - 1 minute

12:20 - REACHED BOTTOM OF HOLE

12:30 - IDLE (CLARK)

FORM NO. 91-001

SAMPLE ID NOs.

7230007 - [redacted] - DW - A - 430 - A, B

ENSR

SAMPLE DATA SHEETS

DATE: 9-14-96 LOCATION: UNOCAL

CLIENT: WSPA AMBIENT TEMP: 89.2

PROJECT NO.: 7230007 OPERATOR: MS

WORKOVER RIG - WELL 96 ARB MTD. 430

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
DNPH	C			1510		0	500	
						10	450	
						20	500	
						30	450	
						40	450	
						50	500	
					1610	60	480	
ave								

REMARKS:

ROTAMETER # ENSR-1000-1

Leak Check: Zero flow indicated for 1 min

FORM NO. 91-001

ENSR

SAMPLE ID NOs.

7230007 - DW - C - 430 A & B

SAMPLE DATA SHEETS

P_{bar} =

DATE: 9-18-90 LOCATION: SWEPI TAYLOR RANCH

CLIENT: USPA AMBIENT TEMP: 75

PROJECT NO.: 7230 007 OPERATOR: MS

DRILLING RIG Method 430
DIESEL ENGINE

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
DNPH	A	U-111		1122		0	550	
						10	550	
						20	550	
						30	550	
						40	500	
						50	550	
					1228	60	500	
ave								

REMARKS:
Rotameter # 1000-2
Leak check: zero flow on rotameter for 60 sec. prior to test

11:20 "constant load" on engine - drilling only
1146 load pumped up due to lifting of Kelly
1155 drilling again → end of test
→ 3 POWER LOSSES DURING TEST: STOPWATCH WAS STOPPED WHILE POWER WAS OFF.

SAMPLE ID - NW.S

7230007 - DDA - 430 - A, B

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 9-18-90 LOCATION: SWEPI - TAYLOR RANCH

CLIENT: WSPA AMBIENT TEMP: 76 F

PROJECT NO.: 7230 007 OPERATOR: MS

DRILLING RIG

DIESEL ENGINE METHOD 430

SORBENT TYPE	RUN NO.	PUMP NO.	~~ORIFICE~~ NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
DNPH	B	V-111		1302		0	550	
						10	500	
						20	~~500~~	
						30	~~550~~	
						40	~~500~~	
						50	550	
					1402	60	500	

REMARKS:

ROTAMETER #1000-2

Leak check : Rotameter indicates zero flow for 60 sec.

same Teflon sample-line & ss Probe used for runs A, B & C — sample line rinsed w/ DI H_2O ~~between~~ after runs (rinse to first impinger)

SAMPLE I.D. NOS.

7230007-DDB-430-A,B

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 18SEPT90 LOCATION: SWEPI TAYLOR RANCH

CLIENT: WSPA AMBIENT TEMP: 80°F

PROJECT NO.: 7230-007 OPERATOR: JHET

DRILLING RIG
DIESEL ENGINE

SORBENT TYPE	RUN NO.	PUMP NO.	VAC ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
SNPH	C	VIII	28"	2:40		0	600	
			28"	2:50		10	600	
			27"	3:00		20	600	
			27"	3:10		30	600	
			27"	3:20		40	600	
			27"	3:30		50	600	
			27"		3:40	60	600	

REMARKS:

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 18SEP90 LOCATION: SWEPI TAYLOR RANCH

CLIENT: WSPA AMBIENT TEMP: 75°F

PROJECT NO.: 7230-007 OPERATOR: JHET

DRILLING RIG
DIESEL ENGINE METHOD 430A

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
DNPH BLANK	DN	4		~~1:00~~		0	~~500~~	
				~~1:10~~		10	~~500~~	
				~~1:20~~		20	~~500~~	
				~~1:30~~		30	~~500~~	
				~~1:40~~		40	~~500~~	
				~~1:50~~		50	~~500~~	
					~~2:00~~	60	~~500~~	

REMARKS:

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 18SEPT90 LOCATION: SWEPI TAYLOR RANCH

CLIENT: WSPA AMBIENT TEMP: 72°F

PROJECT NO.: 7230-007 OPERATOR: JHET

DRILLING RIG DIESEL ENGINE METHOD 430

SORBENT TYPE	RUN NO.	PUMP NO.	VACUUM ~~ORIFICE NUMBER~~	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
AMBIENT ANPM	E	VIII	27"	3:45		0	600	
			27"	3:55		10		
			27"	4:05		20		
			27"	4:15		30		
			27"	4:25		40		
			27"	4:35		50		
			27"		4:45	60		

REMARKS:

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 20 SEPT 90

LOCATION: SANTA FE ENERGY, KERN

CLIENT: ~~7~~ WSPA

AMBIENT TEMP: 85°F

PROJECT NO.: 7230-007

OPERATOR: JHET

CRUDE FIRED
STEAMED GEN. STACK

VAC.

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	~~SAMPLE VOLUME (DSCF)~~
ONPH	A	VIII	ENSR 1000-2	4:20		0	500	15
				4:30		10		15
				4:40		20		15
				4:50		30		15
				5:00		40		15
				5:10		50		
					5:20	60		

REMARKS:

~~LEAK CHECK BALL HELD STEADY - AP OK~~

7230007-CG-A-430A & B

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 20SEPT90

LOCATION: SANTA FE ENERGY, KERN

CLIENT: WSPA

AMBIENT TEMP: 85°F

PROJECT NO.: 7230-007

OPERATOR: JHET

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	~~SAMPLE VOLUME (DSCF)~~ VACUUM
ONPH	B	VIII		5:30		0	500	
				5:40		10		
				5:50		20		
				6:00		30		
				6:10		40		
				6:20		50		
					6:30	60		

REMARKS:

~~LEAK CHECK [illegible] HELD STEADY [illegible]~~

~~7230~~ 7230007-CG-B-430 A&B

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 20 SEPT 90

LOCATION: SANTA FE ENERGY, KERN

CLIENT: WSPA

AMBIENT TEMP: 85°F

PROJECT NO.: 7230-007

OPERATOR: JHZT

CRUDE

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	VACUUM SAMPLE VOLUME (DSCF)
DNPH	C	VIII		6:40		0	500	15
				6:50		10	500	15
				7:00		20	500	15
				7:10		30	500	15
				7:20		40	500	15
				7:30		50	500	15
					7:40	60	500	15

REMARKS:

~~[illegible]~~

7230007-CG-C-430 A&B

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 20SEPT90 LOCATION: SANTA FE ENERGY, ICEKI

CLIENT: ~~B~~ 7230-002 WSPA AMBIENT TEMP: 85°F

PROJECT NO.: ~~66~~ 7230007 OPERATOR: JHET

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
ONPH N_2	D			4:55		0	500	
				5:05		10	500	
				5:15		20	500	
				5:25		30	500	
				5:35		40	500	
				5:45		50		
					5:55	60		

REMARKS:

5:35 STOPPED RUN DUE NO FLOW FROM N_2 CYLINDER

7230007-CG-D-430-A&B

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

9-20-95

WSPA

: NO.: 7230 007

FIRED

M GENERATOR

LOCATION: SANTA FE ENERGY - MIDL.

AMBIENT TEMP: 85

OPERATOR: JHET

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
PH	E	V.119		500p		0	500	
						10		
						20		
						30		
						40		
						50		
					600p	60	↓	

ARKS:

SAMPLE ID # 7230007 - CR-5-430 A, B

D. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 26SEPT90

CLIENT: WSPA

PROJECT NO.: 7230 007

CRUDE OIL STEAM FIRED GENERATOR

LOCATION: SANTA FE ENERGY

AMBIENT TEMP: 81°F

OPERATOR: JHET

SORBENT TYPE	RUN NO.	PUMP NO.	VACUUM ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
DNPH	A	VIII	VI 15"	4:20		0	500	
				4:30		10		
				4:40		20		
				4:50		30		
				5:00		40		
				5:10		50		
					5:20	60		

REMARKS:

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 26SEPT90

CLIENT: WSDA

PROJECT NO.: 7230 007

LOCATION: SANTA FE ENERGY

AMBIENT TEMP: 79 °F

OPERATOR: JHET

SORBENT TYPE	RUN NO.	PUMP NO.	VACUUM ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
DNPH	B	V119	15"	5:30		0	500	
				5:40		10		
				5:50		20		
				6:00		30		
				6:10		40		
				6:20		50		
			15"		6:30	60		

REMARKS:

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 26SEPT90

CLIENT: WSPA

PROJECT NO.: 7230 007

LOCATION: SANTA FE ENERGY

AMBIENT TEMP: 74°F

OPERATOR: JHET

SORBENT TYPE	RUN NO.	PUMP NO.	VACUUM ~~ORIFICE NUMBER~~	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
ANPH	C	VIII	15"	6:29		0	500	
				6:35		10		
				6:45		20		
				6:55		30		
				7:05		40		
				7:15		50		
					7:25	60		

REMARKS:

B. Powers took over during last 20 minutes of test. Flow was maintained at 500 cc ± 30 cc and a final leak check was performed. No leaks - good leakcheck. Test ended at exactly 7:25 PM

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 26SEPT90 LOCATION: SANTA FE ENERGY

CLIENT: WSPA AMBIENT TEMP: 81°F

PROJECT NO.: 7230 007 OPERATOR: JHET

SORBENT TYPE	RUN NO.	PUMP NO.	VAC ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
AMBIENT DNDH	D		15"	2:00		0	500	
			↓	2:10		10	↓	
				2:20		20		
				2:30		30		
				2:40		40		
			↓	2:50		50		
			15"		3:00	60	↓	

REMARKS:

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 26SEPT90

CLIENT: WSPA

PROJECT NO.: 7230 007

LOCATION: SANTA FE ENERGY

AMBIENT TEMP: 81°F

OPERATOR: JHET

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
DNPH N_2 BLANK	E			2:30		0	500	
				2:40		10		
				3:00		20		
				3:10		30		
				3:20		40		
				3:30		50		
					3:40	60		

REMARKS:

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 27SEPT90

LOCATION: SUEDI, COALINGA

CLIENT: USPA

AMBIENT TEMP: 80°F

PROJECT NO.: 7230007

OPERATOR: JHET

GAS FIRED
STEAM GENERATOR

SORBENT TYPE	RUN NO.	PUMP NO.	LAC ~~ORIFICE~~ NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
DNPH	A	VIII	15"	11:20		0	800	
				11:30		10		
				11:40		20		
				11:50		30		
				12:00		40		
				12:10		50		
					12:20	60		

REMARKS:
LEAK CHECK O.K.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 27 SEPT

LOCATION: SWEPI, COALINGA

CLIENT: WSPA

AMBIENT TEMP: 80°F

PROJECT NO.: 7230-007

OPERATOR: JHLT

~~STEAM~~ GAS FIRED STEAM GENERATOR

SORBENT TYPE	RUN NO.	PUMP NO.	VAC ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
JNPH	B	VIII	15"	12.20		0	500	
				12:30		10		
				12:40		20		
				12:50		30		
				1:00		40		
				1:10		50		
				K	1:20	60		
						7		

REMARKS:

LEAK CHECK OK.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 27SEPT90 LOCATION: SWEPI CAALINGA

CLIENT: WSPA AMBIENT TEMP: 77-

PROJECT NO.: 7230 007 OPERATOR: JMET

JAS FIRED STEAM GENERATOR

SORBENT TYPE	RUN NO.	PUMP NO.	VAC ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
DNPH	C	VIII				0	500	
						10		
						20		
						30		
						40		
						50		
						60		

REMARKS:

LEAK CHECK O.K

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 27SEPT90

LOCATION: SWEPI COALINGA

CLIENT: WSPA

AMBIENT TEMP: 71 °F

PROJECT NO.: 7230 007

OPERATOR: JHC T

GAS FIRED
STEAM GENERATOR

SORBENT TYPE	RUN NO.	PUMP NO.	START ~~ORIFICE NUMBER~~	STOP ~~START TIME~~	VAC ~~STOP TIME~~	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
AMBIENT DNPH	D		10:00		15"	0	500	
			10:10			10		
			10:20			20		
			10:30			30		
			10:40			40		
			10:50			50		
				11:00		60		

REMARKS:

LEAK CHECK O.K.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEET

LOCATION: SWEPI, COALINGA

AMBIENT TEMP: 71 °F

OPERATOR: JHET

CH790

A

230-007

KED GENERATOR

	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
	E			1050		0	500	
						10	500	
						20	500	
						30	500	
						40	500	
						50	500	
					1150	60	500	

S:

ENSR

NO. 91-001

APPENDIX C.4

CARB 410A

FIELD DATA SHEETS

SAMPLE DATA SHEETS

DATE: 14SEPT90 LOCATION: UNOCAL PIRU

CLIENT: WSPA AMBIENT TEMP: 86°F

PROJECT NO.: 7230-007 OPERATOR: JHET

ARB METHOD 410A

SORBENT TYPE	RUN NO.	PUMP NO.	VACUUM ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
AMBIENT TEDLAR BAG		V119	1"	3:40		0	300	
			1"	3:45		5	300	
			1"	3:50		10	300	
			1"	3:55		15	300	
			1"	4:00		20	300	
			1"	4:05		25	300	
			1"		4:10	30	300	

REMARKS:

LEAK CHECK 6" VACUUM IN CAN HELD STEADY FOR 1 MIN.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 9-14-90

LOCATION: UNOCAL - AIRG

CLIENT: WSPA

AMBIENT TEMP: 79 F

PROJECT NO.: 7230 -007

OPERATOR: MS

WORKOVER RIG - WELL 96 ARB METHOD 410 A

SORBENT TYPE	RUN NO.	PUMP NO.	VAS ~~ORIFICE NUMBER~~	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLAR BAG	A	V119	1"	11:40		0	350	
			2"	11:45		5	350	
			2"	11:50		10	350	
			3"	11:55		15	350	
			3"	12:00		20	350	
			3"	12:05		25	350	
			3.5"		12:10	30	350	

REMARKS:

~~LEAK CHECK: 0 cc/min for 1 min (no flow indication in Rotameter~~

LEAK CHECK - 6" H_2O held in can for 1 minute

7230 007 . 0~~[illegible]~~ DW-A-410

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 14 SEPT 90 LOCATION: UNOCAL PIRU

CLIENT: WSPA AMBIENT TEMP: 87 °F

PROJECT NO.: 7230-007 OPERATOR: JHET

WORKOVER RIG - WELL 96 ARB METHOD 410 A

SORBENT TYPE	RUN NO.	PUMP NO.	VACUUM ~~ORIFICE~~ NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLAR BAG	B	V119	1"	12:50		0	350	
			1"	12:55		5	350	
			1"	1:00		10	350	
			1"	1:05		15	350	
			1"	1:10		20	350	
			1"	1:15		25	350	
			1"	~~1:20~~	1:20	30	350	

REMARKS:

LEAK CHE~~C~~K PULLED 6" ~~VACUUM~~ VACUUM ~~H2O~~ HELD STEADY FOR 1 MINUTE

FORM NO. 91-001 7230 007 DW-B-410 ENSR

SAMPLE DATA SHEETS

DATE: 14 SEPT

LOCATION: UNICAL PIRU

CLIENT: WSPA

AMBIENT TEMP: 90°F

PROJECT NO.: 7230-007

OPERATOR: JHET

WORK OVER RIG WELL 96 ARB METHOD 410A

SORBENT TYPE	RUN NO.	PUMP NO.	VACUUM ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLAR BAG	C	V119	11	1:40		0	300	
			1"	1:45		5	300	
			1"	1:50		10	300	
			1"	1:55		15	300	
			1"	2:00		20	300	
			1"	2:05		25	300	
					2:10	30		
			1"		2:14	34	300	

REMARKS:

LEAK CHECK PULLED 6" VACUUM IN CAN.. HELD STEADY FOR 1 MIN.

7230 007 DW C-410

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 18SEPT90 LOCATION: SWEPI TAYLOR RANCH

CLIENT: WSPA AMBIENT TEMP: 75°F

PROJECT NO.: 7230-007 OPERATOR: JHET

DRILLING RIG METHOD ~~SVE~~ A

DIESEL ENGINE

SORBENT TYPE	RUN NO.	PUMP NO.	VACUUM ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLAR BAG	A	VIG	1"	11:50		0	300	
			1"	11:55		5	300	
				12:00		10	300	
				12:05		15	300	
				12:10		20	300	
			↓	12:15		25	300	
					12:20	30	300	

REMARKS:

LEAK CHECK PULLED 6" OF VACUUM IN CAN HOLD STEADY FOR A MINUTE.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 18SEP90 LOCATION: SWEPI TAYLOR RANCH

CLIENT: @ WSPA AMBIENT TEMP: 76°F

PROJECT NO.: 7230-007 OPERATOR: JHET

DRILLING RIG METHOD 40 ~~50~~ A
DIESEL ENGINE

SORBENT TYPE	RUN NO.	PUMP NO.	VACUUM ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLAR BAG	B	V119	1"	130		0	300	
				1:35		5	300	
				1:40		10	300	
				1:45		15	300	
				1:50		20	300	
				1:55		25	300	
					2:00	30	300	

REMARKS:

LEAK CHECK PULLED 6" OF VACUUM IN CAN HELD STEAY FOR 1 MIN.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 18SEPT90 LOCATION: SWEPI TAYLOR RANCH

CLIENT: WSPA AMBIENT TEMP: 80°F

PROJECT NO.: 7230-007 OPERATOR: JITET

DRILLING RIG. DIESEL ENGINE

SORBENT TYPE	RUN NO.	PUMP NO.	VACUUM/ ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLAR BAG	C	V119	1"	2:20		0	300	
				2:25		5	300	
				2:30		10	300	
				2:35		15	300	
				2:40		20	300	
				2:45		25	300	
			▼		2:50	30		

REMARKS:

LEAK CHECKED PULLED 6" OF VACUUM IN CAN HELD STEADY FOR 1 MIN.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 18SEPT90 LOCATION: SWEPI TAYLOR RANCH

CLIENT: WSPA AMBIENT TEMP: 75°F

PROJECT NO.: 7230-007 OPERATOR: JHET

DRILLING RIG
DIESEL ENGINE

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
AMBIENT TEDLAR BAG	B	V119	1"	3:00		~~0~~	~~300~~ 250	
				3:05		5	300	
				3:10		10	300	
				3:15		15	300	
				3:20		20	300	
				3:25		25	300	
			↓		5:30	~~330~~ 300	300	

REMARKS:
LEAK CHECKED GOOD (SAME)

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: _____ LOCATION: _____

CLIENT: _____ AMBIENT TEMP: _____

PROJECT NO.: _____ OPERATOR: _____

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
BLANK TEDLAR BAG	E			11:00	11:00			

REMARKS:

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 20SEPT90

LOCATION: SANTA FE ENERGY, ICEKN

CLIENT: WSPA

AMBIENT TEMP: 85°F

PROJECT NO.: 7230-007

OPERATOR: JHET

CRUDE-FIRED STEAM GENERATOR STACK

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	VACUUM ~~SAMPLE VOLUME~~ (DSCFT)
TEDLAR BAG	A	V119	ENSR 1000-1	4:00		0	300	1"
				4:05		5	300	
				4:10		10	300	
				4:15		15	300	
				4:20		20	300	
				4:25		25	300	
				~~4:30~~	4:30	30	300	

REMARKS:

LEAK CHECK ~~0000~~ PULLED 6" OF VACUUM W CAN HELD STEADY FOR 1 MIN.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 20 SEPT 90 LOCATION: SANTA FE ENERGY, KERN

CLIENT: WSPA AMBIENT TEMP: 85°F

PROJECT NO.: 7230 - 007 OPERATOR: JHET

CRUDE FIRED STEAMED GENERATOR STACK

VACUUM

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLARBAG	B	V119		4:40		0	300	17
				4:45		5	300	|
				4:50		10	300	|
				4:55		15	300	|
				5:00		20	300	|
				5:05		25	300	|
					5:10	30	300	V

REMARKS:

LEAK CHECK PULLED 6" OF VACUUM IN CAN HELD FOR 1 MIN.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 20 SEPT 90 LOCATION: SANTA FE ENERGY, KERN

CLIENT: USPA AMBIENT TEMP: 85°F

PROJECT NO.: 7230-007 OPERATOR: JHET

CRUDE - FIXED

STEAMED - GENERATOR STACK

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (~~SCF~~) VACUUM
TEDLAR BAG	~~5~~ B	V119		5:15		0	300	1"
				5:20		5		1"
				5:25		10		1"
				5:30		15		1"
				5:35		20		1"
				5:40		25		1"
					5:45	30		1"

REMARKS:

LEAK CHECKED PULLED 6" OF VACUUM IN CAN HELD STEADY FOR 1 MIN.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 20SEPT90

LOCATION: SANTA FE ENERGY, CERN

CLIENT: WSPA

AMBIENT TEMP: 85°F

PROJECT NO.: 7230-007

OPERATOR: JHET

CRUDE FIRED

STEAMED GENERATOR STACK

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
AMBIENT TEDLAR BAG	D	V119		5:55		0	500	1" Vacuum
				~~6:00~~ ~~6:05~~		5		
				6:05 ~~6:15~~		10		
				6:10		15		
				6:15		20		
				6:20		25		
					6:25	30	↓	↓

REMARKS:

LEAK CHECK PULLED 6" OF VACUUM IN CAN HELD STEADY FOR 1 MIN

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: _____ LOCATION: _____

CLIENT: _____ AMBIENT TEMP: _____

PROJECT NO.: _____ OPERATOR: _____

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
ONPH AMBIENT	E	V119		6:50		0	500	
				7:00		10		
				7:10		20		
				7:20		30		
				7:30		40		
				7:40		50		
					7:50	60		

REMARKS:

LEAK CHECKED BALL HELD STEADY AT 0

7230007-CG-E-430 A & B

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 26SEPT90 LOCATION: SANTA FE ENERGY

CLIENT: WSPA AMBIENT TEMP: 81 °F

PROJECT NO.: 7230-007 OPERATOR: JHET

CRUDE OIL FIRED STEAM ~~PIPE~~ GENERATOR

SORBENT TYPE	RUN NO.	PUMP NO.	VAC ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLAR BAG	A	V119	1"	4:15	"	0	300	
			↓	4:20		5	↓	
				4:25		10		
				4:30		15		
				4:35		20		
			↓	4:40		25		
					4:45	30	↓	
					4:49	34		

REMARKS:

LEAK CHECK ___ PULLED 6" OF VAC. IN CAN HELD STEADY FOR 1 ~~MIN~~ MINUTE.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 26SEPT90 LOCATION: SANTA FE ENERGY

CLIENT: WSPA AMBIENT TEMP: 79°F

PROJECT NO.: 7230-007 OPERATOR: JHET

CRUDE OIL FIRED

STEAM FIRED GENERATOR

SORBENT TYPE	RUN NO.	PUMP NO.	VAC. ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLAR BAG	B	V119	1"	5:20		0	500	
				5:25		5		
				5:30		10		
				5:35		15		
				5:40		20		
				5:45		25		
					5:50	30		

REMARKS:

LEAK CHECK PULLED 6" VACUUM IN CAN HELD STEADY FOR 1 MINUTE.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 26SEPT90 LOCATION: SANTA FE ENERGY

CLIENT: USPA AMBIENT TEMP: 79°F

PROJECT NO.: 7230-007 OPERATOR: JHET

CRUDE OIL

STEAM FIRED GENERATOR

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLAR BAG	C	V119		6:00		0	300	
				6:05		5		
				6:10		10		
				6:15		15		
				6:20		20		
				6:25		25		
					6:30	30	↓	

REMARKS:

LEAK CHECK PULLED 6" OF VAC IN CAN HELD STEADY FOR 1 MIN.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 26SEPT90 LOCATION: SANTA FE ENERGY

CLIENT: WSPA AMBIENT TEMP: 81°F

PROJECT NO.: 7230-007 OPERATOR: JHET

CRUDE OIL

STEAM FIRED GENERATOR

	SORBENT TYPE	RUN NO.	PUMP NO.	VACUUM ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
AMBIENT BLANK	TEDLAR BAG	D	V119	1"	2:00		0	300	
				1"	2:05		5		
				1"	2:10		10		
				1"	2:15		15		
				1"	2:20		20		
				1"	2:25		25		
				1"		2:30	30		
				[illegible]					

REMARKS:

LEAK CHECK PULLED 6" VAC. IN CAN HELD STEADY FOR 1 MIN.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 26SEPT90 LOCATION: SANTA FE ENERGY

CLIENT: WSPA AMBIENT TEMP:

PROJECT NO.: 7230007 OPERATOR: JHET

CRUDE OIL
STEAM FIRED GENERATOR

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLAR BAG	E					0		
						5		
						10		
						15		
						20		
						25		
						30		

N2 BLANK

REMARKS:

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 27SEP90 LOCATION: SWEDI, COALINGA

CLIENT: USDA AMBIENT TEMP: 81°F

PROJECT NO.: 7230.007 OPERATOR: JHET

GAS FIRED STEAM GENERATOR

SORBENT TYPE	RUN NO.	PUMP NO.	ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLAR BAG	F							

NOW BLANK

REMARKS:

ENSR

SAMPLE DATA SHEETS

DATE: 27SEPT 90 LOCATION: SWEPI COALINGA

CLIENT: WSPA AMBIENT TEMP: 71 °F

PROJECT NO.: 7230 007 OPERATOR: JIM E T

GAS FIRED
STEAM GENERATOR

SORBENT TYPE	RUN NO.	PUMP NO.	VAC ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
AMBIENT BLANK TEDLAR BAG	1)	V119	1"	10.00		0	300	
				10:05		5		
				10:10		10		
				10.15		15		
				10:20		20		
				10:25		25		
					10:30	30		

REMARKS:

LEAK CHECK PULLED 6" ~~OF~~ VACUUM IN CAN HELD STEADY FOR 1 MIN.

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 27SEPT90 LOCATION: SUPA, CARLINGA

CLIENT: USPA AMBIENT TEMP: 76°F

PROJECT NO.: 7230.007 OPERATOR: JHET

GAS FIRED STEAM GENERATOR

SORBENT TYPE	RUN NO.	PUMP NO.	VAC ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLAR BAG	C	V119	1"	1:35		0	300	
				1:40		5		
				1:45		10		
				1:50		15		
				1:55		20		
					2:00	25		
					2:05	30		

REMARKS:

PULLED 6" OF VACUUM IN CAN & HELD STEADY FOR 1 MIN.

SAMPLE DATA SHEETS

DATE: 27SEPT90 LOCATION: SILVA, COALINGA

CLIENT: WSPA AMBIENT TEMP: 76°F

PROJECT NO.: 7230 007 OPERATOR: JHET

GAS FIRED STEAM GENERATOR

SORBENT TYPE	RUN NO.	PUMP NO.	VAC ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLAR BAG	15	V119	1	1:00		0	300	
				1:05		5		
				1:10		10		
				1:15		15		
				1:20		20		
				1:25		25		
					1:30	30	↓	

REMARKS: PULLED 6" OF VAC IN CAN HELD STEADY FOR 1 MIN

FORM NO. 91-001

ENSR

SAMPLE DATA SHEETS

DATE: 28SEPT90 LOCATION: SWEPI COALINGA

CLIENT: USPA AMBIENT TEMP: 71°F

PROJECT NO.: 7230-007 OPERATOR: JHET

GAS FIRED STEAM GENERATOR

SORBENT TYPE	RUN NO.	PUMP NO.	VAC ORIFICE NUMBER	START TIME	STOP TIME	ELAPSED TIME (min)	FLOWRATE (cc/min)	SAMPLE VOLUME (DSCF)
TEDLAR BAG	A	V119	1"	~~12:15~~		0	300	
			3/4"	~~12:20~~		5		
				~~12:25~~		10		
				~~12:30~~		15		
				~~12:35~~		20		
				~~12:40~~		25		
			↓		~~12:45~~ 12:45	30	↓	

REMARKS:

PULLED 6" OF VACUUM IN CAN HELD STEADY IN 1 MIN

FORM NO. 91-001

ENSR

APPENDIX D

CALCULATIONS

Sample Calculations

Calculation of lb/MMBtu: Benzene emissions, Diesel-fired workover rig IC engine

Average benzene concentration	0.147 ppmv
Fuel F-factor	9,194 dscf/MMBtu
Oxygen in stack gas	16.6%

$$\frac{lb\text{-}benzene}{dscf} = \frac{\left(0.147 \times 10^{-6} \frac{ft^3\ benzene}{ft^3\ gas}\right)}{\left(385.5 \frac{dscf}{lb\text{-}mol}\right)} \times \left(78 \frac{lb}{lb\text{-}mol}\right) \quad (1)$$

$$= 2.97 \times 10^{-6} \frac{lb}{dscf}$$

$$\frac{lb\ -\ benzene}{MMBtu} = \left(2.97 \times 10^{-6} \frac{lb}{dscf}\right)\left(9{,}194 \frac{dscf}{MMBtu}\right)\left(\frac{20.9}{20.9\ -\ 16.6}\right) \quad (2)$$

$$= 1.33 \times 10^{-3} \frac{lb}{MMBtu}$$

Sample Calculations

Calculation of average stack exhaust flow rate: Crude oil-fired steam generator bank

Average stack velocity	14.24 fps
Average stack temperature	600 R
Average stack pressure	29.75 in Hg
Average stack moisture	18.7%
Stack diameter	50.3 ft^2

$$Qa = (14.24\ fps)\ (60\ sec/min)\ (50.3\ ft^2)$$

$$= 42{,}976\ acfm \tag{3}$$

$$Q_{std} = (42{,}976\ acfm)\ (528/600)\ (29.75/29.92)\ (1 - 0.187)$$

$$= 30{,}572\ dscfm \tag{4}$$

WSPA - TRACE METALS RESULTS
EPA DRAFT MULTMETALS TRAIN METHOD AND CARB METHOD 104

DATE		SEPT.22 1990	SEPT.23 1990	SEPT.23 1990				
TEST		RUN A	RUN B	RUN C	AVERAGE	AVERAGE	AVERAGE	AVERAGE
SPECIES	MW	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ppmv)	(lb/Mgal)	(lb/MMBtu)
ANTIMONY	121.75	2.66	1.66 *	2.22 *	2.18 *	0.0004	*0.001089	*1.55E-06 *
ARSENIC	74.92	3.32	3.87	4.45	3.88	0.0012	0.001089	2.76E-06
BARIUM	137.33	57.10	55.35	64.47	58.97	0.0103	0.001089	4.19E-05
BERYLLIUM BY MULTIMETALS	9.01	2.66 *	2.21 *	2.96 *	2.61 *	0.0070	*0.001089 0.001089	*1.85E-06 * 0.00E+00
BERYLLIUM BY CARB 104	9.01	2.15 *	0.45	1.04	1.22 *	0.0032	*0.001089 0.001089	*8.63E-07 * 0.00E+00
CADMIUM	112.41	5.05	0.77	1.78	2.53	0.0005	0.001089	1.80E-06
CHROMIUM	52	16.60	12.73	14.82	14.72	0.0068	0.001089	1.05E-05
HEX CHROME	52	CALC. FROM FUEL ANALYSIS			0.118 *	0.00005	0.001089	8.38E-08
COPPER	63.55	8.63	6.09	7.41	7.38	0.0028	0.001089	5.24E-06
LEAD	207.2	1.99	1.66 *	2.22 *	1.96 *	0.0002	*0.001089	*1.39E-06 *
MANGANESE	54.94	53.12	22.14	29.64	34.97	0.0153	0.001089	2.48E-05
MERCURY	200.59	0.48	0.08	0.37	0.31	0.00004	*0.001089	*2.21E-07 *
NICKEL	58.69	3519.12	3210.07	3334.70	3354.63	1.3740	0.001089	2.38E-03
SELENIUM	78.96	1.99 *	1.66 *	2.96	2.21 *	0.0007	*0.001089	*1.57E-06 *
SILVER	107.87	21.25	2.77	17.79	13.93	0.0031	0.001089	9.90E-06
PHOSPHORUS	30.97	132.80 *	110.69 *	148.21 *	130.57 *	0.1013	*0.001089	*9.27E-05 *
ZINC	65.38	66.40	149.43	118.57 *	111.47	0.0410	0.001089 0.001089	7.92E-05 0.00E+00
(BROMIDE BY CARB 104)	79.9	CALCULATED FROM FUEL ANALYSIS			0.12	0.0000	*0.001089	*8.38E-08 *

* COMPOUND NOT DETECTED. VALUE SHOWN IS BASED ON THE DETECTION LIMIT OF THE ANALYTICAL METHOD

AVE GAL/HR = 1050

CRUDE OIL-FIRED STEAM GENERATOR, SANAT FE ENERGY, KERN
EPA MMT RESULTS

TEST	9/22/90 RUN A			9/23/90 RUN B			9/23/90 RUN C		
********** SPECIES	ug	dscf	ug/m3	ug	dscf	ug/m3	ug	dscf	ug/m3
ANTIMONY	4	53.18	2.66	3	63.8	1.66	3	47.65	2.22
ARSENIC	5	53.18	3.32	7	63.8	3.87	6	47.65	4.45
BARIUM	86	53.18	57.10	100	63.8	55.35	87	47.65	64.47
BERYLLIUM BY MULTIMETALS	4	53.18	2.66	4	63.8	2.21	4	47.65	2.96
BERYLLIUM BY CARB 104	4	65.61	2.15	0.8	62.3	0.45	1.4	47.58	1.04
CADMIUM	7.6	53.18	5.05	1.4	63.8	0.77	2.4	47.65	1.78
CHROMIUM	25	53.18	16.60	23	63.8	12.73	20	47.65	14.82
COPPER	13	53.18	8.63	11	63.8	6.09	10	47.65	7.41
LEAD	3	53.18	1.99	3	63.8	1.66	3	47.65	2.22
MANGANESE	80	53.18	53.12	40	63.8	22.14	40	47.65	29.64
MERCURY	0.73	53.18	0.48	0.14	63.8	0.08	0.5	47.65	0.37
NICKEL	5300	53.18	3519.12	5800	63.8	3210.07	4500	47.65	3334.70
SELENIUM	3	53.18	1.99	3	63.8	1.66	4	47.65	2.96
SILVER	32	53.18	21.25	5	63.8	2.77	24	47.65	17.79
PHOSPHORUS	200	53.18	132.80	200	63.8	110.69	200	47.65	148.21
ZINC	100	53.18	66.40	270	63.8	149.43	160	47.65	118.57
(BROMIDE BY CARB 104)	4000	65.61	2152.77	5000	62.3	2833.93	4000	47.58	2968.54

Sample Calculations

Calculation of lb/Mgal based on stack flow and fuel use

Benzene

Crude oil-fired steam generator bank

Average benzene concentrations (9/20/90)	0.003 ppmv
Average fuel usage rate (9/21/90-9/23/90)	1026 gal/hr
Average stack flow rate	30,572 dscfm

$$\frac{lb\text{ - }benzene}{dscf} = \frac{\left(0.003 \times 10^{-6}\ \frac{ft^3}{ft^3}\right)\left(78\ \frac{lb}{lb\text{-}mol}\right)}{385.5\ \frac{dscf}{lb\text{-}mol}}$$

$$= 6.07 \times 10^{-10}\ \frac{lb}{dscf} \qquad (5)$$

$$\frac{lb\text{-}benzene}{Mgal\text{-}fuel} = \frac{(6.07 \times 10^{-10}\ lb/dscf)\ (30{,}572\ dscfm)\ (60\ min/hr)}{1.026\ Mgal/hr}$$

$$= 0.0011\ lb/Mgal \qquad (6)$$

Sample Calculations

Bromide emission concentration using fuel analysis
Crude Oil-Fired Steam Generator Bank

Bromide concentration in fuel	<2 mg/kg
Fuel usage rate	1050 gal/hr
Stack exhaust flowrate	30,572 dscfm
Fuel specific gravity	0.994

$$\frac{lb\text{-}bromide}{gal\text{-}fuel} = \left(2\ \frac{mg}{kg}\right)\left(\frac{1\ kg}{2.2\ lb}\right)(0.994)\left(8.34\ \frac{lb}{gal}\right)\left(\frac{1\ g}{1000\ mg}\right)\left(\frac{1\ lb}{454\ g}\right)$$

$$= 1.66 \times 10^{-5}\ \frac{lb}{gal} \tag{7}$$

$$\frac{lb\text{-}bromide}{hr\text{-}fuel\ input} = \left(1.66 \times 10^{-5}\ \frac{lb}{gal}\right)\left(1050\ \frac{gal}{hr}\right)$$

$$= 0.0174\ \frac{lb}{hr} \tag{8}$$

$$\frac{lb\text{-}bromide}{dscf\text{-}exhaust} = \frac{0.0174\ lb/hr}{(30{,}572\ dscfm)(60\ min/hr)}$$

$$= 9.50 \times 10^{-9}\ lb/dscf \tag{9}$$

$$\frac{ug}{m^3} = \left(9.50 \times 10^{-9}\ \frac{lb}{dscf}\right)\left(454 \times 10^{6}\ \frac{ug}{lb}\right)\left(35.31\ \frac{dscf}{dscm}\right)$$

$$= 152\ ug/m^3 \tag{10}$$

WSPA - CHROMIUM RESULTS
PROPOSED CARB METHOD 425

DATE		SEPT.22 1990	SEPT.21 1990	SEPT.21 1990			based on fuel/flow AVERAGE	based on F-factor AVERAGE
TEST		RUN A	RUN B	RUN C	AVERAGE	AVERAGE		
SPECIES	MW	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ppmv)	(lb/Mgal)	(lb/MMBtu)
TOTAL CHROMIUM	52	5.34	5.30	5.79	5.48	0.0025	0.000597	3.89E-06
HEXAVALENT CHROMIUM	52	2.27 *	2.08 *	1.93 *	2.09 *	0.0010 *	0.000228 *	1.49E-06 *
HEXAVALENT CHROMIUM	52	CALCULATED FROM TOTAL Cr IN FUEL			0.12	0.0001	0.000013	8.52E-08

* COMPOUND NOT DETECTED. VALUE SHOWN IS BASED ON THE HEX-CHROME DETECTION LIMIT OF 2 ug/sample

	RUN A			RUN B			RUN C		
	(ug)	(dscf)	(ug/m3)	(ug)	(dscf)	(ug/m3)	(ug)	(dscf)	(ug/m3)
TOTAL CHROMIUM	4.7	31.06	5.34	5.1	33.97	5.30	6	36.56	5.79
HEXAVALENT CHROMIUM	2	31.06	2.27	2	33.97	2.08	2	36.56	1.93

TEST	SITE DW 9/14/90 RUN A			9/14/90 RUN B			9/14/90 RUN C		
********** SPECIES	ug	dscf	ug/m3	ug	dscf	ug/m3	ug	dscf	ug/m3
NAPHTHALENE	150	67.67	78.27117	27	62.59	15.23230	120	131.65	32.18601
ACENAPHTHYLENE	8.5	67.67	4.43537	8.5	62.59	4.79535	6	131.65	1.60930
ACENAPHTHENE	3.4	67.67	1.77415	1.2	62.59	0.67699	2.2	131.65	0.59008
FLUORENE	5.8	67.67	3.02649	5.2	62.59	2.93363	2	131.65	0.53643
PHENANTHRENE	14	67.67	7.30531	11	62.59	6.20575	3	131.65	0.80465
ANTHRACENE	1.5	67.67	0.78271	1.2	62.59	0.67699	0.31	131.65	0.08315
FLUORANTHENE	3	67.67	1.56542	1.7	62.59	0.95907	0.66	131.65	0.17702
PYRENE	5	67.67	2.60904	2.9	62.59	1.63606	1.1	131.65	0.29504
BENZO(a)ANTHRACENE	1.2	67.67	0.62617	0.072	62.59	0.04062	0.17	131.65	0.04560
CHRYSENE	0.25	67.67	0.13045	0.12	62.59	0.06770	0.31	131.65	0.08315
BENZO(b)FLUORANTHENE*	0.19	67.67	0.09914	0.054	62.59	0.03046	0.27	131.65	0.07242
BENZO(K)FLUORANTHENE*	0.31	67.67	0.16176	0.2	62.59	0.11283	0.18	131.65	0.04828
BENZO(a)PYRENE	0.28	67.67	0.14611	0.27	62.59	0.15232	0.35	131.65	0.09388
DIBENZ(a,h)ANTHRACENE*	0.6	67.67	0.31308	0.65	62.59	0.36670	0.48	131.65	0.12874
BENZO(g,h,i)PERYLENE	0.056	67.67	0.02922	0.71	62.59	0.40055	0.65	131.65	0.17434
IDENO(1,2,3-c,d)PYRENE	0.032	67.67	0.01670	0.61	62.59	0.34414	0.56	131.65	0.15020

TEST	SITE DD 9/18/90 RUN A			9/18/90 RUN B			9/18/90 RUN C		
********** SPECIES	ug	dscf	ug/m3	ug	dscf	ug/m3	ug	dscf	ug/m3
NAPHTHALENE	230	68.84	117.98	210	61.55	120.48	250	78.84	111.97
ACENAPHTHYLENE	15	68.84	7.69	15	61.55	8.61	19	78.84	8.51
ACENAPHTHENE	11	68.84	5.64	7.8	61.55	4.47	5.5	78.84	2.46
FLUORENE	23	68.84	11.80	20	61.55	11.47	25	78.84	11.20
PHENANTHRENE	73	68.84	37.44	62	61.55	35.57	82	78.84	36.73
ANTHRACENE	1.7	68.84	0.87	0.98	61.55	0.56	4.2	78.84	1.88
FLUORANTHENE	7.4	68.84	3.80	6.2	61.55	3.56	7.8	78.84	3.49
PYRENE	7.1	68.84	3.64	5.5	61.55	3.16	7.1	78.84	3.18
BENZO(a)ANTHRACENE	1	68.84	0.51	0.93	61.55	0.53	1.4	78.84	0.63
CHRYSENE	2.8	68.84	1.44	2.1	61.55	1.20	3.3	78.84	1.48
BENZO(b)FLUORANTHENE*	1.6	68.84	0.82	1.6	61.55	0.92	2.8	78.84	1.25
BENZO(K)FLUORANTHENE*	0.87	68.84	0.45	0.11	61.55	0.06	0.17	78.84	0.08
BENZO(a)PYRENE	0.6	68.84	0.31	0.23	61.55	0.13	0.56	78.84	0.25
DIBENZ(a,h)ANTHRACENE*	0.64	68.84	0.33	0.52	61.55	0.30	0.68	78.84	0.30
BENZO(g,h,i)PERYLENE	0.87	68.84	0.45	0.89	61.55	0.51	1.2	78.84	0.54
IDENO(1,2,3-c,d)PYRENE	0.59	68.84	0.30	0.67	61.55	0.38	0.95	78.84	0.43

DIESEL-FIRED DRILLING RIG IC ENGINE

DATE	SEPT.18 1990	SEPT.18 1990	SEPT.18 1990				
TEST	RUN A	RUN B	RUN C	AVERAGE	AVERAGE	AVERAGE	AVERAGE
SPECIES	MW (ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ppmv)	(lb/Mgal)	(lb/MMBtu)
NAPHTHALENE	117.98	120.48	111.97	116.81	ERR	1.38E-02	1.30E-04
ACENAPHTHYLENE	7.69	8.61	8.51	8.27	ERR	9.78E-04	9.23E-06
ACENAPHTHENE	5.64	4.47	2.46	4.19	ERR	4.96E-04	4.68E-06
FLUORENE	11.80	11.47	11.20	11.49	ERR	1.36E-03	1.28E-05
PHENANTHRENE	37.44	35.57	36.73	36.58	ERR	4.32E-03	4.08E-05
ANTHRACENE	0.87 w	0.56 w	1.88	1.11	ERR	1.31E-04	1.23E-06
FLUORANTHENE	3.80	3.56	3.49	3.62	ERR	4.27E-04	4.03E-06
PYRENE	3.64	3.16	3.18	3.33	ERR	3.93E-04	3.71E-06
BENZO(a)ANTHRACENE	0.51	0.53	0.63	0.56	ERR	6.59E-05	6.22E-07
CHRYSENE	1.44	1.20	1.48	1.37	ERR	1.62E-04	1.53E-06
BENZO(b)FLUORANTHENE	0.82	0.92 *	1.25 *	1.00	ERR	1.18E-04	1.11E-06
BENZO(K)FLUORANTHENE	0.45 w	0.06 *	0.08 *	0.20	ERR	2.31E-05	2.18E-07
BENZO(a)PYRENE	0.31 w	0.13 *	0.25 *	0.23	ERR	2.72E-05	2.57E-07
DIBENZ(a,h)ANTHRACENE	0.33 *	0.30 *	0.30 *	0.31 *	ERR *	3.67E-05	*3.46E-07 *
BENZO(g,h,i)PERYLENE	0.45 w	0.51 w	0.54 w	0.50 w	ERR	5.89E-05	5.56E-07
IDENO(1,2,3-c,d)PYRENE	0.30 *	0.38 w	0.43 *	0.37	ERR	4.38E-05	4.14E-07
TOTAL PAH	193.47	191.92	184.37	189.92		2.24E-02	2.12E-04

CRUDE OIL-FIRED STEAM GENERATOR, SANAT FE ENERGY, KERN

ARB 429 RESULTS	SITE CG 9/26/90			9/26/90			9/26/90		
TEST	RUN A			RUN B			RUN C		
SPECIES	ug	dscf	ug/m3	ug	dscf	ug/m3	ug	dscf	ug/m3
NAPHTHALENE	34	80.04	14.99956	31	72.24	15.15272	34	85.94	13.96980
ACENAPHTHYLENE	0.021	80.04	0.00926	0.077	72.24	0.03764	0.0047	85.94	0.00193
ACENAPHTHENE	0.074	80.04	0.03265	0.51	72.24	0.24929	0.014	85.94	0.00575
FLUORENE	0.15	80.04	0.06617	0.88	72.24	0.43014	0.033	85.94	0.01356
PHENANTHRENE	0.49	80.04	0.21617	3.1	72.24	1.51527	0.094	85.94	0.03862
ANTHRACENE	0.051	80.04	0.02250	0.45	72.24	0.21996	0.0065	85.94	0.00267
FLUORANTHENE	0.25	80.04	0.11029	1	72.24	0.48880	0.035	85.94	0.01438
PYRENE	0.13	80.04	0.05735	0.54	72.24	0.26395	0.017	85.94	0.00698
BENZO(a)ANTHRACENE	0.099	80.04	0.04368	0.29	72.24	0.14175	0.012	85.94	0.00493
CHRYSENE	0.091	80.04	0.04015	0.35	72.24	0.17108	0.028	85.94	0.01150
BENZO(b)FLUORANTHENE*	0.091	80.04	0.04015	0.3	72.24	0.14664	0.014	85.94	0.00575
BENZO(K)FLUORANTHENE*	0.019	80.04	0.00838	0.01	72.24	0.00489	0.0045	85.94	0.00185
BENZO(a)PYRENE	0.081	80.04	0.03573	0.15	72.24	0.07332	0.012	85.94	0.00493
DIBENZ(a,h)ANTHRACENE*	0.064	80.04	0.02823	0.14	72.24	0.06843	0.036	85.94	0.01479
BENZO(g,h,i)PERYLENE	0.067	80.04	0.02956	0.12	72.24	0.05866	0.016	85.94	0.00657
IDENO(1,2,3-c,d)PYRENE	0.055	80.04	0.02426	0.17	72.24	0.08310	0.014	85.94	0.00575

WSPA - PAH RESULTS - CRUDE FIRED STEAM GENERATOR
CARB METHOD 429

DATE		SEPT.26 1990	SEPT.26 1990	SEPT.26 1990			based on flow/fuel	based on F-factor
TEST		RUN A	RUN B	RUN C	AVERAGE	AVERAGE	AVERAGE	AVERAGE
SPECIES	MW	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ppmv)	(lb/Mgal)	(lb/MMBtu)
NAPHTHALENE	15.00	15.15	13.97	14.71	ERR	1.74E-03	1.04E-05
ACENAPHTHYLENE	0.01	0.04	0.00	0.02	ERR	1.92E-06	1.15E-08
ACENAPHTHENE	0.03	0.25	0.01	0.10	ERR	1.13E-05	6.77E-08
FLUORENE	0.07	0.43	0.01	0.17	ERR	2.01E-05	1.20E-07
PHENANTHRENE	0.22	1.52	0.04	0.59	ERR	6.97E-05	4.17E-07
ANTHRACENE	0.02	0.22	0.00	0.08	ERR	9.66E-06	5.77E-08
FLUORANTHENE	0.11	0.49	0.01	0.20	ERR	2.42E-05	1.44E-07
PYRENE	0.06	0.26	0.01	0.11	ERR	1.29E-05	7.73E-08
BENZO(a)ANTHRACENE	0.04	0.14	0.00	0.06	ERR	7.50E-06	4.48E-08
CHRYSENE	0.04	0.17	0.01	0.07	ERR	8.78E-06	5.24E-08
BENZO(b)FLUORANTHENE	0.04 *	0.15 *	0.01 *	0.06 *	ERR *	7.59E-06	*4.53E-08 *
BENZO(K)FLUORANTHENE	0.01 *	0.00 *	0.00 *	0.01 *	ERR *	5.96E-07	*3.56E-09 *
BENZO(a)PYRENE	0.04	0.07	0.00 *	0.04	ERR *	4.49E-06	2.68E-08
DIBENZ(a,h)ANTHRACENE	0.03 *	0.07 *	0.01 *	0.04 *	ERR *	4.39E-06	*2.62E-08 *
BENZO(g,h,i)PERYLENE	0.03	0.06	0.01 *	0.03	ERR *	3.73E-06	2.23E-08
IDENO(1,2,3-c,d)PYRENE	0.02	0.08	0.01 *	0.04	ERR *	4.46E-06	2.66E-08
TOTAL PAH	15.76	19.11	14.11	16.33		1.93E-03	1.15E-05

DIESEL-FIRED WORKOVER RIG IC ENGINE

DATE		SEPT.14 1990	SEPT.14 1990	SEPT.14 1990			based on flow/fuel	
TEST		RUN A	RUN B	RUN C	AVERAGE	AVERAGE	AVERAGE	AVERAGE
SPECIES	MW	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ppmv)	(lb/Mgal)	(lb/MMBtu)
NAPHTHALENE	78.27	15.23	32.19	41.90	ERR	4.95E-03	1.17E-04
ACENAPHTHYLENE	4.44	4.80	1.61	3.61	ERR	4.27E-04	1.01E-05
ACENAPHTHENE	1.77	0.68	0.59	1.01	ERR	1.20E-04	2.83E-06
FLUORENE	3.03	2.93	0.54 *	2.17	ERR	2.56E-04	6.04E-06
PHENANTHRENE	7.31	6.21	0.80	4.77	ERR	5.64E-04	1.33E-05
ANTHRACENE	0.78	0.68	0.08	0.51	ERR	6.08E-05	1.43E-06
FLUORANTHENE	1.57	0.96	0.18	0.90	ERR	1.06E-04	2.51E-06
PYRENE	2.61	1.64	0.30	1.51	ERR	1.79E-04	4.22E-06
BENZO(a)ANTHRACENE	0.63	0.04	0.05	0.24	ERR	2.81E-05	6.62E-07
CHRYSENE	0.13	0.07	0.08	0.09	ERR	1.11E-05	2.61E-07
BENZO(b)FLUORANTHENE	0.10	0.03 *	0.07 *	0.07	ERR	7.96E-06	1.88E-07
BENZO(K)FLUORANTHENE	0.16	0.11 *	0.05 *	0.11	ERR	1.27E-05	3.00E-07
BENZO(a)PYRENE	0.15 *	0.15 *	0.09 *	0.13 *	ERR *	1.55E-05	*3.65E-07 *
DIBENZ(a,h)ANTHRACENE	0.31 *	0.37 *	0.13 *	0.27 *	ERR *	3.19E-05	*7.51E-07 *
BENZO(g,h,i)PERYLENE	0.03 *	0.40 *	0.17 *	0.20 *	ERR *	2.38E-05	*5.61E-07 *
IDENO(1,2,3-c,d)PYRENE	0.02 *	0.34 *	0.15 *	0.17 *	ERR *	2.01E-05	*4.75E-07 *
TOTAL PAH	101.29	34.63	37.08	57.67		6.82E-03	1.61E-04

WSPA - VOC RESULTS
CARB METHOD 410A
DIESEL WORKOVER RIG

DATE		SEPT.14 1990	SEPT.14 1990	SEPT 14 1990				
TEST		RUN A	RUN B	RUN C	AVERAGE	AVERAGE	AVERAGE	WT FRACTI
SPECIES	MW	(ppbv)	(ppbv)	(ppbv)	(ppbv)	(lb/Mgal)	(lb/MMBtu)	
THC	44				22600	16.3453902	1.15E-01	1
BENZENE	78	130	160	150	147	0.18804431	1.33E-03	0.011504
TOLUENE	96	50	49	51	50	0.07889971	5.56E-04	0.004827
XYLENES	106	26	11	26	21	0.03658974	2.58E-04	0.002238
PROPYLENE	42	680	840	860	793	0.54769549	3.86E-03	0.033507

AVE GAL/HR= 5

CARB METHOD 410A
DIESEL DRILLING RIG

DATE		SEPT.18 1990	SEPT.18 1990	SEPT 18 1990			
TEST		RUN A	RUN B	RUN C	AVERAGE	AVERAGE	AVERAGE
SPECIES	MW	(ppbv)	(ppbv)	(ppbv)	(ppbv)	(lb/Mgal)	(lb/MMBtu)
THC	44				11500	3.24686354	2.35E-02	1
BENZENE	78	220	210	213	214	0.10727483	7.76E-04	0.033039
TOLUENE	96	62	63	64	63	0.03880836	2.81E-04	0.011952
XYLENES	106	40	38	40	39	0.02675347	1.93E-04	0.008239
PROPYLENE	42	1300	1500	1500	1433	0.38628692	2.79E-03	0.118972

AVE GAL/HR=

CARB METHOD 410A
CRUDE FIRED STEAM GENERATOR

DATE		SEPT.20 1990	SEPT.20 1990	SEPT 20 1990			AVERAGE based on	
TEST		RUN A	RUN B	RUN C	AVERAGE	AVERAGE	F-factor	WT FRAC
SPECIES	MW	(ppbv)	(ppbv)	(ppbv)	(ppbv)	(lb/Mgal)	(lb/MMBtu)	
THC	16				1200	0.08904	5.67E-04	1
BENZENE	78	3	3	2 *	3	0.00096	6.14E-06	0.010833
TOLUENE	96	5	5	5 *	5	0.00223	5.56E-05	0.025
XYLENES	106	10 *	10 *	10 *	10 *	0.00492	*1.23E-04	*0.055208
PROPYLENE	42	10 *	10 *	10 *	10 *	0.00195	*4.87E-05	*0.021875

AVE GAL/HR= 1048
* COMPOUND NOT DETECTED. VALUES ARE BASED
ON THE DETECTION LIMITS OF THE ANALYTICAL METHOD

CARB METHOD 410A
CRUDE FIRED STEAM GENERATOR

DATE		SEPT.26 1990	SEPT.26 1990	SEPT 26 1990			AVERAGE based on	
TEST		RUN A	RUN B	RUN C	AVERAGE	AVERAGE	fuel usage	
SPECIES	MW	(ppbv)	(ppbv)	(ppbv)	(ppbv)	(lb/Mgal)	(lb/MMBtu)	
THC	16				1200	0.09438	1.40E-04	1
BENZENE	78	2 *	2 *	2 *	2 *	0.00077	*1.14E-06	*0.008125
TOLUENE	96	5 *	5 *	5 *	5 *	0.00236	*3.49E-06	* 0.025
XYLENES	106	10 *	10 *	10 *	7 *	0.00347	*5.14E-06	*0.036805
PROPYLENE	42	10 *	10 *	10 *	10 *	0.00206	*3.06E-06	*0.021875

AVE GAL/HR= 968
* COMPOUND NOT DETECTED. VALUES ARE BASED
ON THE DETECTION LIMITS OF THE ANALYTICAL METHOD

CARB METHOD 410A
GAS FIRED STEAM GENERATOR

DATE		SEPT.27 1990	SEPT.27 1990	SEPT 27 1990			
SPECIES	MW	(ppbv)	(ppbv)	(ppbv)	(ppbv)	(lb/Mcf)	(lb/MMBtu)
THC	16				900	0.000377	3.68E-04	1
BENZENE	78	2 *	2 *	2 *	2 *	0.000004	*3.99E-06	0.010833
TOLUENE	96	5 *	5 *	5 *	5 *	0.00001	*1.23E-05	0.033333
XYLENES	106	10 *	10 *	10 *	7 *	0.00002	*1.81E-05	0.049074

AVE FT3/HR =
* COMPOUND NOT DETECTED. VALUES ARE BASED
ON THE DETECTION LIMITS OF THE ANALYTICAL METHOD

- VOC RESULTS
ARB METHOD 410A
IESEL WORKOVER RIG

ES	MW	SEPT.14 1990 RUN A (ppbv)	SEPT.14 1990 RUN B (ppbv)	SEPT 14 1990 RUN C (ppbv)	AVERAGE (ppbv)	AVERAGE (lb/Mgal)	AVERAGE (lb/MMBtu)	WT FRACTI
	44							
NE	78	130	160	150	22600	16.3453902	1.15E-01	1
E	96	50	49	51	147	0.18804431	1.33E-03	0.011504
	106	26	11	26	50	0.07889971	5.56E-04	0.004827
LNE	42	680	840	860	21	0.03658974	2.58E-04	0.002238
					793	0.54769549	3.86E-03	0.033507

L/HR= 5

METHOD 410A
EL DRILLING RIG

	MW	SEPT.18 1990 RUN A (ppbv)	SEPT.18 1990 RUN B (ppbv)	SEPT 18 1990 RUN C (ppbv)	AVERAGE (ppbv)	AVERAGE (lb/Mgal)	AVERAGE (lb/MMBtu)	
	44							
	78	220	210	213	11500	3.24686354	2.35E-02	1
	96	62	63	64	214	0.10727483	7.76E-04	0.033039
	106	40	38	40	63	0.03880836	2.81E-04	0.011952
E	42	1300	1500	1500	39	0.02675347	1.93E-04	0.008239
					1433	0.38628692	2.79E-03	0.118972

R=

ETHOD 410A
FIRED STEAM GENERATOR

	MW	SEPT.20 1990 RUN A (ppbv)	SEPT.20 1990 RUN B (ppbv)	SEPT 20 1990 RUN C (ppbv)	AVERAGE (ppbv)	AVERAGE (lb/Mgal)	AVERAGE based on F-factor (lb/MMBtu)	WT FRAC
	16							
	78	3	3	2 *	1200	0.08904	5.67E-04	1
	96	5	5	5 *	3	0.00096	6.14E-06	0.010833
	106	10 *	10 *	10 *	5	0.00223	5.56E-05	0.025
	42	10 *	10 *	10 *	10 *	0.00492	*1.23E-04	*0.055208
					10 *	0.00195	*4.87E-05	*0.021875

1048
NOT DETECTED. VALUES ARE BASED
ETECTION LIMITS OF THE ANALYTICAL METHOD

METHOD 410A
E FIRED STEAM GENERATOR

ES	MW	SEPT.26 1990 RUN A (ppbv)	SEPT.26 1990 RUN B (ppbv)	SEPT 26 1990 RUN C (ppbv)	AVERAGE (ppbv)	AVERAGE (lb/Mgal)	based on fuel usage (lb/MMBtu)	
					1200	0.09438	1.40E-04	1
	16	2 *	2 *	2 *	2 *	0.00077	*1.14E-06	*0.008125
ENE	78	5 *	5 *	5 *	5 *	0.00236	*3.49E-06	* 0.025
ENE	96	10 *	10 *	10 *	7 *	0.00347	*5.14E-06	*0.036805
NES	106	10 *	10 *	10 *	10 *	0.00206	*3.06E-06	*0.021875
YLENE	42							

GAL/HR= 968
COMPOUND NOT DETECTED. VALUES ARE BASED
ON THE DETECTION LIMITS OF THE ANALYTICAL METHOD

CARB METHOD 410A
GAS FIRED STEAM GENERATOR

DATE		SEPT.27 1990	SEPT.27 1990	SEPT 27 1990				
SPECIES	MW	(ppbv)	(ppbv)	(ppbv)		(lb/Mcf)	(lb/MMBtu)	
					900	0.000377	3.68E-04	1
THC	16	2 *	2 *	2 *	2 *	0.000004	*3.99E-06	0.010833
BENZENE	78	5 *	5 *	5 *	5 *	0.00001	*1.23E-05	0.033333
TOLUENE	96	10 *	10 *	10 *	7 *	0.00002	*1.81E-05	0.049074
XYLENES	106							

AVE FT3/HR =
* COMPOUND NOT DETECTED. VALUES ARE BASED
ON THE DETECTION LIMITS OF THE ANALYTICAL METHOD

WSPA - ALDEHYDE RESULTS
CARB METHOD 430
DIESEL WORKOVER RIG

DATE		SEPT.14 1990	SEPT.14 1990	SEPT 14 1990				
TEST		RUN A	RUN B	RUN C	AVERAGE	AVERAGE	AVERAGE	
SPECIES	MW	(ppbv)	(ppbv)	(ppbv)	(ppbv)	(lb/Mgal)	(lb/MMBtu)	
THC	44				22600	16.34539	1.15E-01	1
FORMALDEHYDE	30	393.7	283.2	174.6	283.8	0.13996	9.87E-04	0.008562
ACETALDEHYDE	44	96.5	81.5	94.9	91.0	0.06579	4.64E-04	0.004025
ACROLEIN	56	35.0	9.5	16.5	20.3	0.01872	1.32E-04	0.001145

DIESEL DRILLING RIG

DATE		SEPT.18 1990	SEPT.18 1990	SEPT 18 1990				
TEST		RUN A	RUN B	RUN C	AVERAGE	AVERAGE	AVERAGE	
SPECIES	MW	(ppbv)	(ppbv)	(ppbv)	(ppbv)	(lb/Mgal)	(lb/MMBtu)	
THC	44				11500	3.2468635	2.35E-02	1
FORMALDEHYDE	30	9.4	24.2	136.4	56.7	0.0109084	7.89E-05	0.003359
ACETALDEHYDE	44	22.7	8.4	6.0	12.4	0.0034915	2.52E-05	0.001075
ACROLEIN	56	4.5	2.3 *	2.3 *	3.0	0.0010899	7.88E-06	0.000335

AVE GAL/HR=

* COMPOUND NOT DETECTED. VALUES ARE BASED ON THE DETECTION LIMITS OF THE ANALYTICAL METHOD

CRUDE FIRED STEAM GENERATOR

DATE		SEPT.20 1990	SEPT.20 1990	SEPT 20 1990		AVERAGE BASED ON	AVERAGE based on
TEST		RUN A	RUN B	RUN C	AVERAGE	FUEL ANAL	F-factor
SPECIES	MW	(ppbv)	(ppbv)	(ppbv)	(ppbv)	(lb/Mgal)	(lb/MMBtu)
THC	16				1200	0.08904	5.67E-04 1
FORMALDEHYDE	30	6.4	3.1	4.6	4.7	0.00065	4.16E-06 0.007343
ACETALDEHYDE	44	26.0	11.2	8.7	15.3	0.00312	7.80E-05 0.035062
ACROLEIN	56	2.3 *	2.3 *	2.3 *	2.3 *	0.00060	*1.49E-05 *0.006708

AVE GAL/HR= 1048

* COMPOUND NOT DETECTED. VALUES ARE BASED ON THE DETECTION LIMITS OF THE ANALYTICAL METHOD

CRUDE FIRED STEAM GENERATOR

DATE		SEPT.26 1990	SEPT.26 1990	SEPT 26 1990		based on flow rate fuel use	AVERAGE based on
TEST		RUN A	RUN B	RUN C	AVERAGE	AVERAGE	fuel usage
SPECIES	MW	(ppbv)	(ppbv)	(ppbv)	(ppbv)	(lb/Mgal)	(lb/MMBtu)
THC	16				1200	0.094240	1.21E-03 1
FORMALDEHYDE	30	5.5	4.7	2.9	4.4	0.000643	8.28E-06 0.006822
ACETALDEHYDE	44	7.1	6.4	7.1	6.9	0.001483	1.91E-05 0.015736
ACROLEIN	56	2.3 *	2.3 *	2.3 *	2.3 *	0.000632	*8.15E-06 *0.006708

AVE GAL/HR= 1048

* COMPOUND NOT DETECTED. VALUES ARE BASED ON THE DETECTION LIMITS OF THE ANALYTICAL METHOD

GAS FIRED STEAM GENERATOR

DATE		SEPT.27 1990	SEPT.27 1990	SEPT 27 1990			
TEST		RUN A	RUN B	RUN C	AVERAGE	AVERAGE	AVERAGE
SPECIES	MW	(ppbv)	(ppbv)	(ppbv)	(ppbv)	(lb/Mcf)	(lb/MMBtu)
THC	16				900	0.00038	3.68E-04 1
FORMALDEHYDE	30	8.1	4.8	19.8	10.9	0.00001	8.36E-06 0.022708
ACETALDEHYDE	44	10.1	8.3	7.2	8.5	0.00001	9.60E-06 0.026074
ACROLEIN	56	2.3 *	2.3 *	2.3 *	2.3 *	0.000003	*3.29E-06 *0.008944

AVE FT3/HR =

* COMPOUND NOT DETECTED. VALUES ARE BASED ON THE DETECTION LIMITS OF THE ANALYTICAL METHOD

ISOKINETIC SAMPLING EQUATIONS

Beryllium Run A

CG RUN ~~[illegible]~~ A-104 SITE COFSG DATE 9-22-90

Sampling Time (θ) = 120 min. T_S = 602 °R ΔP_{RMS} = .07

ΔH = 1.00 in. WG V_M = 6607 ft.^{3} T_M = ~~[illegible]~~ 554 °R Y_I = 1.01657

P_{br} = 29.5 in. Hg P_S = 30 in. Hg V_{IC} = 3393 ml C_p = .84

O_2 = 3.7 % N_2 = 83 % CO_2 = 13.2 % CO = _____ %

A_N = .00979 ft^2 A_S = _____ ft^2

$$V_{m(Std)} = 17.64(V_m)(Y_I)\left(\frac{P_{br} + \frac{\Delta H}{13.6}}{T_m}\right) = 65.61 \text{ ft}^3 \quad (1)$$

$$V_{w(Std)} = 0.0474\ (V_{IC}) = [illegible] \text{ ft}^3 \quad (2)$$

$$B_{WS} = \left(\frac{V_{W(Std)}}{V_{M(Std)} + V_{W(Std)}}\right) = [illegible] \% \quad (3)$$

$$M_d = 0.44\ (\%\ CO_2) + 0.32\ (\%\ O_2) + 0.28\ (\%\ N_2) = 30 \frac{lb}{lb\text{-}mole} \quad (4)$$

$$M_S = M_d\left(1 - \frac{B_{ws}}{100}\right) + 18\left(\frac{B_{ws}}{100}\right) = 28 \left(\frac{lb}{lb\text{-}mole}\right) \quad (5)$$

$$V_S = 85.48\ (C_P)\ (\Delta P_{RMS})^{1/2}\left(\frac{T_S}{M_S \times P_S}\right)^{1/2} = 16.12 \frac{ft}{sec} \quad (6)$$

$$I = 1.667\left(\frac{(0.00267)(V_{IC}) + \frac{(Y_I)(V_m)}{T_M}\left(P_{br} + \frac{\Delta H}{13.6}\right)}{\theta \times V_S \times P_S \times A_N}\right) T_S = 100.95 \% \quad (7)$$

ENSR

ISOKINETIC SAMPLING EQUATIONS

7230-007-CG-

RUN B-104 Beryllium SITE Crude Oil Fired S.G. DATE 9/23/80

Sampling Time (θ) = 120 min. T_S = 602 °R ΔP_{RMS} = 0.06

ΔH = 0.99 in. WG V_M = 62.5 ft.³ T_M = 541 °R Y_I = 1.01657

P_{br} = 30.00 in. Hg P_S = 30.00 in. Hg V_{IC} = 317.2 ml C_p = 0.84

O_2 = 3.7 % N_2 = 83 % CO_2 = 13.2 % CO = ____ %

A_N = .0079 ft² A_S = ____ ft²

$$V_{m(Std)} = 17.64(V_m)(Y_I)\left(\frac{P_{br} + \frac{\Delta H}{13.6}}{T_m}\right) = \underline{62.30}\ ft^3 \quad (1)$$

$$V_{w(Std)} = 0.0474\ (V_{IC}) = \underline{15.035}\ ft^3 \quad (2)$$

$$B_{WS} = \left(\frac{V_{W(Std)}}{V_{M(Std)} + V_{W(Std)}}\right)_{/100} = \underline{19.4}\ \% \quad (3)$$

$$M_d = 0.44\ (\%\ CO_2) + 0.32\ (\%\ O_2) + 0.28\ (\%\ N_2) = \underline{30.2}\ \frac{lb}{lb\text{-}mole} \quad (4)$$

$$M_S = M_d\left(1 - \frac{B_{ws}}{100}\right) + 18\left(\frac{B_{ws}}{100}\right) = \underline{27.8}\ \frac{lb}{lb\text{-}mole} \quad (5)$$

$$V_S = 85.48\ (C_P)\ (\Delta P_{RMS})^{1/2}\left(\frac{T_S}{M_S \times P_S}\right)^{1/2} = \underline{14.52}\ \frac{ft}{sec} \quad (6)$$

$$I = 1.667\left(\frac{(0.00267)(V_{IC}) + \frac{(Y_I)(V_m)}{T_M}\left(P_{br} + \frac{\Delta H}{13.6}\right)}{\theta \times V_S \times P_S \times A_N}\right) T_S = \underline{106.4}\ \% \quad (7)$$

ISOKINETIC SAMPLING EQUATIONS

RUN C - 104 SITE _____ DATE 9/23

Sampling Time (θ) = 96 min. T_S = 602 °R ΔP_{RMS} = .06

ΔH = 0.84 in. WG V_M = 48.28 ft.^{3} T_M = 547 °R Y_I = 1.01657

P_{br} = 30.00 in. Hg P_S = 30 in. Hg V_{IC} = 231.3 ml C_p = .84

O_2 = 3.7 % N_2 = [illegible] % CO_2 = [illegible] % CO = _____ %

A_N = .00079 ft^2 A_S = _____ ft^2

$$V_{m(Std)} = 17.64(V_m)(Y_I)\left(\frac{P_{br} + \frac{\Delta H}{13.6}}{T_m}\right) = 47.58 \ ft^3 \quad (1)$$

$$V_{w(Std)} = 0.0474\ (V_{IC}) = 10.96 \ ft^3 \quad (2)$$

$$B_{WS} = \left(\frac{V_{W(Std)}^{10.96}}{V_{M(Std)} + V_{W(Std)}}\right) = 18.7\ \% \quad (3)$$

47.58 10.96
58.5

$$M_d = 0.44\ (\%\ CO_2) + 0.32\ (\%\ O_2) + 0.28\ (\%\ N_2) = 30.2 \ \frac{lb}{lb\text{-}mole} \quad (4)$$

$$M_S = M_d\left(1 - \frac{B_{ws}}{100}\right) + 18\left(\frac{B_{ws}}{100}\right) = 28 \ \left(\frac{lb}{lb\text{-}mole}\right) \quad (5)$$

$$V_S = 85.48\ (C_P)\ (\Delta P_{RMS})^{1/2}\left(\frac{T_S}{M_S \times P_S}\right)^{1/2} = 14.90 \ \frac{ft}{sec} \quad (6)$$

$$I = 1.667\left(\frac{(0.00267)(V_{IC}) + \frac{(Y_I)(V_m)}{T_M}\left(P_{br} + \frac{\Delta H}{13.6}\right)}{\theta \times V_S \times P_S \times A_N}\right) T_S = 98.15\ \% \quad (7)$$

ISOKINETIC SAMPLING EQUATIONS

RUN B-425 SITE _____ DATE 9/21

Sampling Time (θ) = 72 min. T_S = 524 °R ΔP_{RMS} = .05

ΔH = 0.78 in. WG V_M = 34.28 ft.^{3} T_M = 534 °R Y_I = 1.01657

P_{br} = 29.5 in. Hg P_S = 30 in. Hg V_{IC} = 170.9 ml C_p = 84

O_2 = 3.7 % N_2 = 83 % CO_2 = 13.2 % CO = _____ %

A_N = .00079 ft^2 A_S = _____ ft^2

$$V_{m(Std)} = 17.64(V_m)(Y_I)\left(\frac{P_{br} + \frac{\Delta H}{13.6}}{T_m}\right) = 34.03 \text{ ft}^3 \quad (1)$$

$$V_{w(Std)} = 0.0474\ (V_{IC}) = 8.1 \text{ ft}^3 \quad (2)$$

$$B_{WS} = \left(\frac{V_{W(Std)}}{V_{M(Std)} + V_{W(Std)}}\right) = 19.2 \% \quad (3)$$

$$M_d = 0.44\ (\%\ CO_2) + 0.32\ (\%\ O_2) + 0.28\ (\%\ N_2) = 30 \frac{lb}{lb\text{-}mole} \quad (4)$$

$$M_S = M_d\left(1 - \frac{B_{ws}}{100}\right) + 18\left(\frac{B_{ws}}{100}\right) = 28 \left(\frac{lb}{lb\text{-}mole}\right) \quad (5)$$

$$V_S = 85.48\ (C_p)\ (\Delta P_{RMS})^{1/2}\left(\frac{T_S}{M_S \times P_S}\right)^{1/2} = 13.35 \frac{ft}{sec} \quad (6)$$

$$I = 1.667\left(\frac{(0.00267)(V_{IC}) + \frac{(Y_I)(V_m)}{T_M}\left(P_{br} + \frac{\Delta H}{13.6}\right)}{\theta \times V_S \times P_S \times A_N}\right) T_S = 101.58 \% \quad (7)$$

File	Date	Dwg.	Project	Proposal
WSPA	9/21/90		7230 007	

Chromium RUN B

1. Moisture Content

$V_{lc} = 170.9$ ml

std. Vol. $(H_2O)_v = (170.9)(0.0474 \frac{scf}{ml}) = 8.10$ scf

$V_M = 34.28$ ft^3

$(T_m)_{ave} = 74°F = 534$ R

$P_{bar} = 29.50$ in Hg

$(V_M)_{std} = (34.28)(\frac{528}{534})(\frac{29.50}{29.92}) = 33.42$ dscf $\times 1.01657 = 33.97$

% Moisture $= \frac{8.10}{8.10 + 33.42} \times 100 = 19.5$ %

ISOKINETIC CALC.

$\theta = 72$ min $T_s = 584$ $(\Delta p)_{rms} = 0.05$

$\Delta H = 0.78$ in H_2O $V_m = 34.28$ ft^3 $T_m = 534$ R $Y_i = 1.01657$

$P_{br} = 29.5$ in Hg $P_s = 29.5$ in Hg $V_{lc} = 170.9$ ml $C_p = 0.84$

$A_n = 0.00079$ ft^2 $A_s = 50.3$ ft^2

$O_2 = 3.6$ % $N_2 = 83$ % $CO_2 = 13.2$ %

$V_s = 13.73$ ft/s

$$I = 1.667\left[\frac{(0.00267)(V_{lc}) + \frac{(Y_i)(V_m)}{T_m}\left[P_{br} + \frac{\Delta H}{13.6}\right]}{\theta \cdot V_s \cdot P_s \cdot A_n}\right] T_s$$

$I = 100.8$ %

ISOKINETIC SAMPLING EQUATIONS

RUN CHROME-C SITE SANTA FE-MIDWAY SG. SCRUBBER DATE 9-26-90

Sampling Time (θ) = 72 min. T_S = 599 °R ΔP_{RMS} = 0.05

ΔH = 0.79 in. WG V_M = 36.819 ft.^{3} T_M = 532 °R Y_I = 1.0131

P_{br} = 29.5 in. Hg P_S = 29.5 in. Hg V_{IC} = 140.4 ml C_p = 0.84

O_2 = 3.6 % N_2 = 83 % CO_2 = 13.2 % CO = ____ %

A_N = 0.00079 ft^2 A_S = 50.3 ft^2

$$V_{m(Std)} = 17.64(V_m)(Y_I)\left(\frac{P_{br} + \frac{\Delta H}{13.6}}{T_m}\right) = \underline{36.56}\ ft^3 \quad (1)$$

$$V_{w(Std)} = 0.0474\ (V_{IC}) = \underline{6.655}\ ft^3 \quad (2)$$

$$B_{WS} = \left(\frac{V_{W(Std)}}{V_{M(Std)} + V_{W(Std)}}\right)_{X100} = \underline{15.4}\ \% \quad (3)$$

$$M_d = 0.44\ (\%\ CO_2) + 0.32\ (\%\ O_2) + 0.28\ (\%\ N_2) = \underline{30.2}\ \frac{lb}{lb\text{-}mole} \quad (4)$$

$$M_S = M_d\left(1 - \frac{B_{ws}}{100}\right) + 18\left(\frac{B_{ws}}{100}\right) = \underline{28.3}\ \frac{lb}{lb\text{-}mole} \quad (5)$$

$$V_S = 85.48\ (C_P)\ (\Delta P_{RMS})^{1/2}\left(\frac{T_S}{M_S \times P_S}\right)^{1/2} = \underline{13.47}\ \frac{ft}{sec} \quad (6)$$

$$I = 1.667\left(\frac{(0.00267)(V_{IC}) + \frac{(Y_I)(V_m)}{T_M}\left(P_{br} + \frac{\Delta H}{13.6}\right)}{\theta \times V_S \times P_S \times A_N}\right) T_S = \underline{108.12}\ \% \quad (7)$$

ENSR

ISOKINETIC SAMPLING EQUATIONS

RUN A-MMT SITE _____ DATE _____

Sampling Time (θ) = 1[illegible] min. T_S = 602 °R ΔP_{RMS} = .64

ΔH = 0.76 in. WG V_M = 5407 ft.^{3} T_M = 537 °R Y_I = 1.013/0

P_{br} = 29.50 in. Hg P_S = 30 in. Hg V_{IC} = 237 ml C_p = .84

O_2 = 3.7 % N_2 = 82 % CO_2 = 13.2 % CO = _____ %

A_N = .00079 ft^2 A_S = _____ ft^2

$$V_{m(Std)} = 17.64(V_m)(Y_I)\left(\frac{P_{br} + \frac{\Delta H}{13.6}}{T_m}\right) = 53.18 \text{ ft}^3 \quad (1)$$

$$V_{w(Std)} = 0.0474\ (V_{IC}) = 11.23 \text{ ft}^3 \quad (2)$$

$$B_{WS} = \left(\frac{V_{W(Std)}}{V_{M(Std)} + V_{W(Std)}}\right) = 17.4 \% \quad (3)$$

11.23
53.18 11.23
64.41

$$M_d = 0.44\ (\%\ CO_2) + 0.32\ (\%\ O_2) + 0.28\ (\%\ N_2) = 30.2 \frac{lb}{lb\text{-}mole} \quad (4)$$

$$M_s = M_d\left(1 - \frac{B_{ws}}{100}\right) + 18\left(\frac{B_{ws}}{100}\right) = 28 \left(\frac{lb}{lb\text{-}mole}\right) \quad (5)$$

$$V_S = 85.48\ (C_p)\ (\Delta P_{RMS})^{1/2}\left(\frac{T_S}{M_S \times P_S}\right)^{1/2} = 12.16 \frac{ft}{sec} \quad WK \quad (6)$$

$$I = 1.667\left(\frac{(0.00267)(V_{IC}) + \frac{(Y_I)(V_m)}{T_M}\left(P_{br} + \frac{\Delta H}{13.6}\right)}{\theta \times V_S \times P_S \times A_N}\right) T_S = 105.87 \% \quad (7)$$

ISOKINETIC SAMPLING EQUATIONS

RUN MMT - B SITE SANTA FE CFSGS DATE 9/23/90

Sampling Time (θ) = 120 min. T_s = 603 °R ΔP_{RMS} = 0.06

ΔH = 0.98 in. WG V_M = 64.99 ft.³ T_M = 540 °R Y_I = 0.99954

P_{br} = 30.00 in. Hg P_s = 30.00 in. Hg V_{IC} = 329.7 ml C_p = 0.84

O_2 = 3.7 % N_2 = 83 % CO_2 = 13.2 % CO = ____ %

A_N = 0.0079 ft² A_S = 50.3 ft²

$$V_{m(Std)} = 17.64(V_m)(Y_I)\left(\frac{P_{br} + \frac{\Delta H}{13.6}}{T_m}\right) = \frac{63.80}{63.80}\ ft^3 \quad (1)$$

$$V_{w(Std)} = 0.0474\ (V_{IC}) = 15.63\ ft^3 \quad (2)$$

$$B_{WS} = \left(\frac{V_{W(Std)}}{V_{M(Std)} + V_{W(Std)}}\right) = 19.7\ \% \quad (3)$$

× 100

$$M_d = 0.44\ (\%\ CO_2) + 0.32\ (\%\ O_2) + 0.28\ (\%\ N_2) = 30.2\ \frac{lb}{lb\text{-}mole} \quad (4)$$

$$M_S = M_d\left(1 - \frac{B_{ws}}{100}\right) + 18\left(\frac{B_{ws}}{100}\right) = 27.8\ \frac{lb}{lb\text{-}mole} \quad (5)$$

$$V_S = 85.48\ (C_P)\ (\Delta P_{RMS})^{1/2}\left(\frac{T_S}{M_S \times P_S}\right)^{1/2} = 14.94\ \frac{ft}{sec} \quad (6)$$

$$I = 1.667\left(\frac{(0.00267)(V_{IC}) + \frac{(Y_I)(V_m)}{T_M}\left(P_{br} + \frac{\Delta H}{13.6}\right)}{\theta \times V_S \times P_S \times A_N}\right) T_S = 106.4\ \% \quad (7)$$

ISOKINETIC SAMPLING EQUATIONS

RUN C-MMT SITE _____ DATE 9/23

Sampling Time (θ) = 7- min. T_S = 602 °R ΔP_{RMS} = .06

ΔH = 0.80 in. WG V_M = 49.27 ft.³ T_M = 548 °R Y_I = 0.99954

P_{br} = 30.00 in. Hg P_S = 30 in. Hg V_{IC} = 2[illegible] ml C_p = .84

O_2 = 7 % N_2 = 83 % CO_2 = 12.2 % CO = _____ %

A_N = _____ ft² A_S = _____ ft²

$$V_{m(Std)} = 17.64(V_m)(Y_I)\left(\frac{P_{br} + \frac{\Delta H}{13.6}}{T_m}\right) = 47.65 \text{ ft}^3 \quad (1)$$

$$V_{w(Std)} = 0.0474\ (V_{IC}) = \text{[illegible]} \text{ ft}^3 \quad (2)$$

$$B_{WS} = \left(\frac{V_{W(Std)}}{V_{M(Std)} + V_{W(Std)}}\right) = 19.3 \% \quad (3)$$

11.40

$$M_d = 0.44\ (\%\ CO_2) + 0.32\ (\%\ O_2) + 0.28\ (\%\ N_2) = \text{[illegible]} \frac{lb}{lb\text{-}mole} \quad (4)$$

$$M_S = M_d\left(1 - \frac{B_{ws}}{100}\right) + 18\left(\frac{B_{ws}}{100}\right) = \text{[illegible]} \left(\frac{lb}{lb\text{-}mole}\right) \quad (5)$$

$$V_S = 85.48\ (C_p)\ (\Delta P_{RMS})^{1/2}\left(\frac{T_S}{M_S \times P_S}\right)^{1/2} = 14.90 \frac{ft}{sec} \quad (6)$$

$$I = 1.667\left(\frac{(0.00267)(V_{IC}) + \frac{(Y_I)(V_m)}{T_M}\left(P_{br} + \frac{\Delta H}{13.6}\right)}{\theta \times V_S \times P_S \times A_N}\right) T_S = 99.05\% \quad (7)$$

APPENDIX E

STRIP CHART RECORDS

Site: Unocal

Source: Workover Rig

Date: September 14, 1990

NON FUNCTIONAL

CLIENT: USPA

PROJECT: 7230-007

SITE: UNOCAL-BAKERSFIELD

DATE: 9/14/90

SOURCE: WORKOVER RIG [H&H]

-B.P.

1000 ppm

CO

0 ppm

20%

EACH ANALYZER 25+ POINT SPAN/ZERO TEST BEGAN BEFORE 11:30 AM -SS

CO_2 0.0%

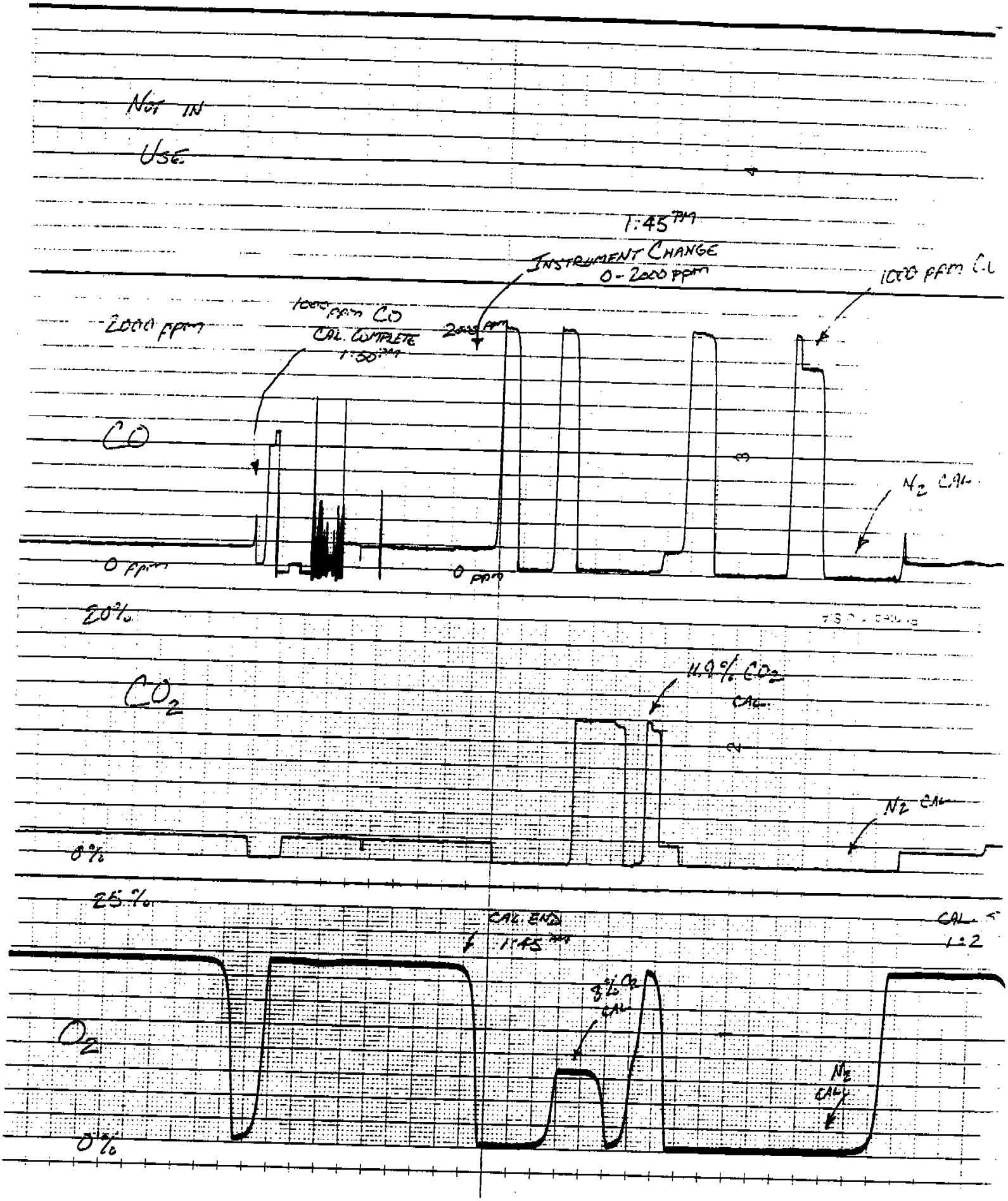
25%

O_2

0.0%

11:55 AM 9/14

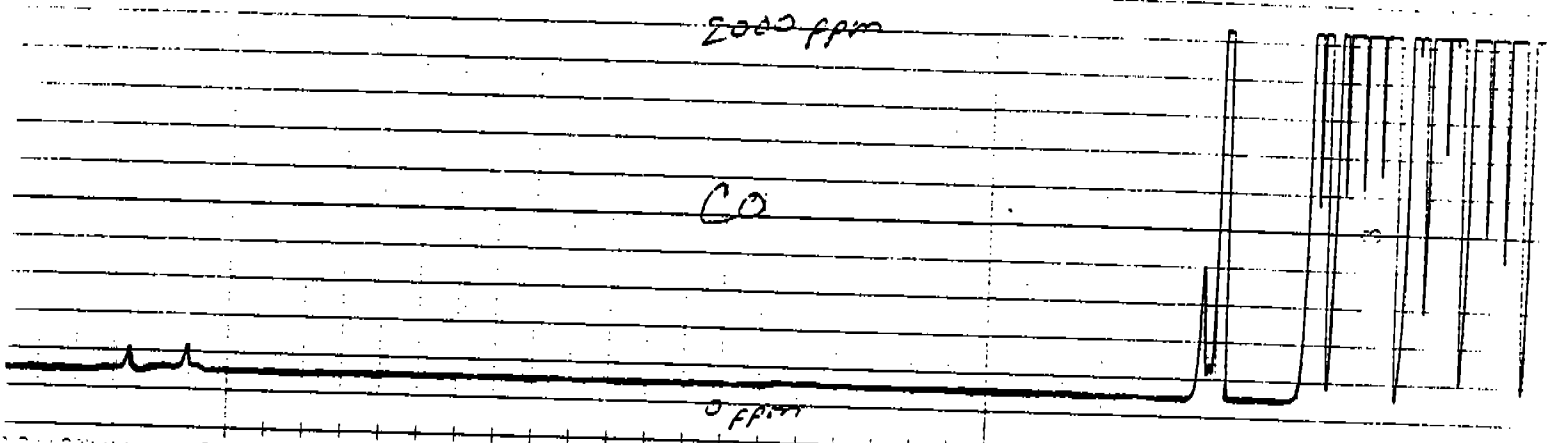
CHART SPEED: 360mm/HR



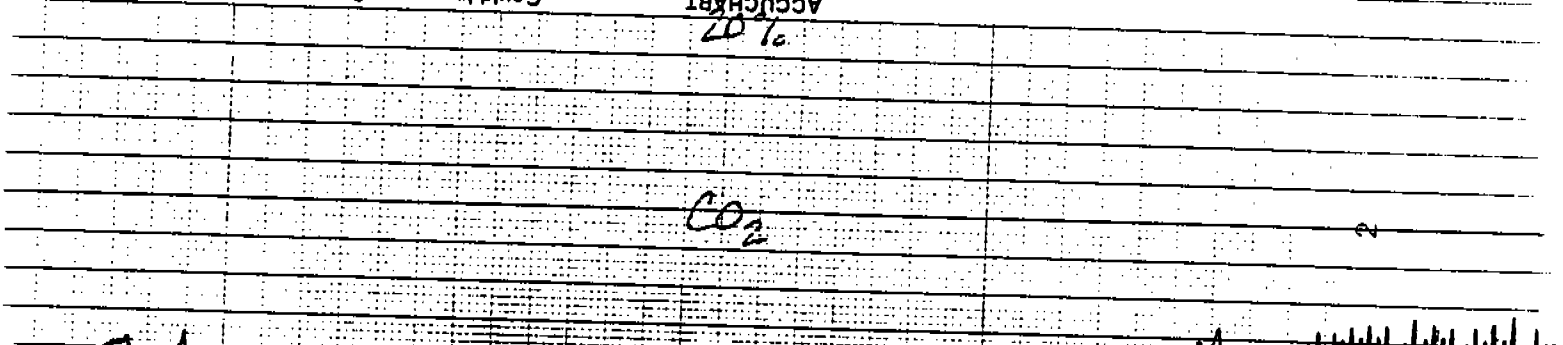
Not IN
Use
1:45 PM
INSTRUMENT CHANGE
0-2000 ppm
1000 ppm CO
CAL. COMPLETE
1:50 PM
2000 ppm
2000 ppm
1000 ppm CO
CO
N2 CAL
0 ppm
0 ppm
20%
CO2
11.9% CO2
CAL.
N2 CAL
0%
25%
CAL. END
1:45 PM
CAL
1:2
O2
3% O2
CAL
N2
CAL
0%

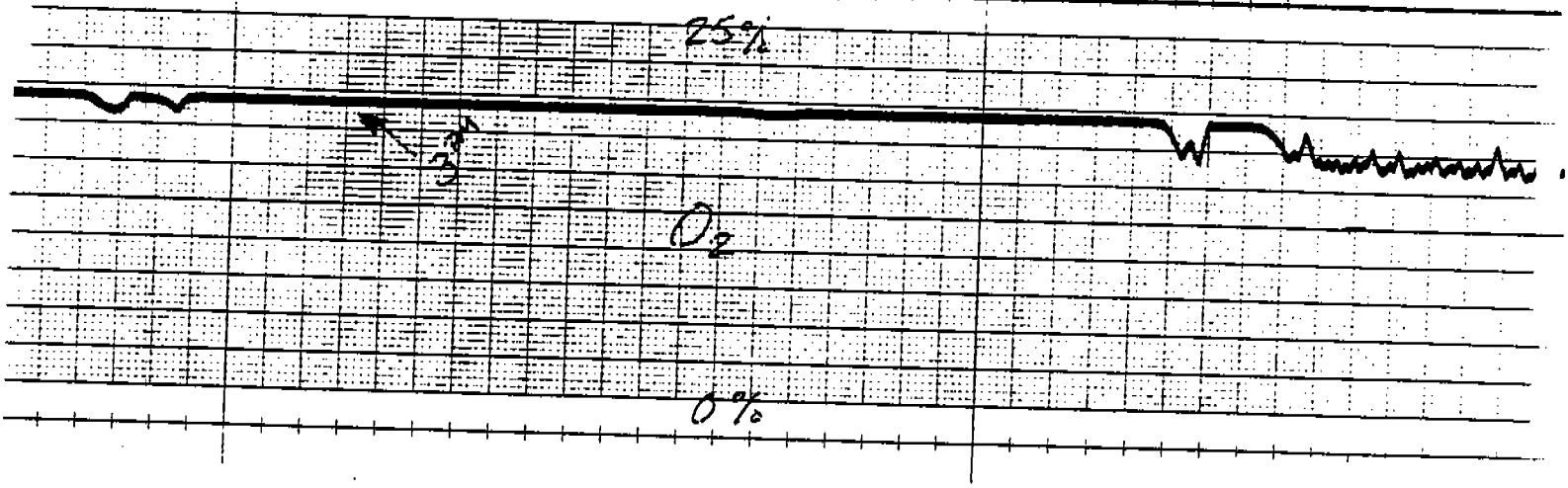
O_2 SWITCHED TO
CHANNEL 4
3:20 PM
3:25 PM
CALIBRATION
ALL INSTRUMENTS

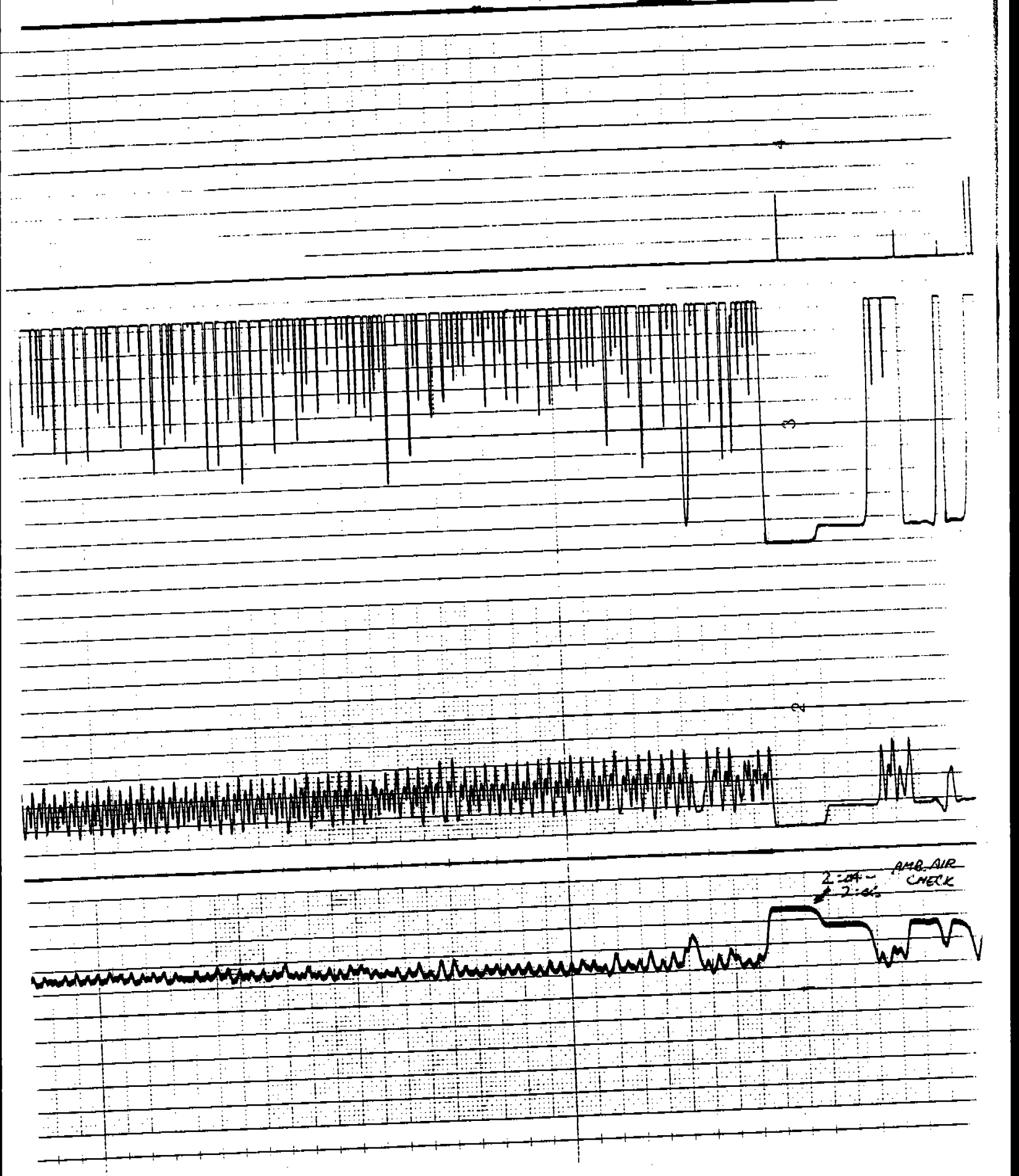
NOT
IN
USE

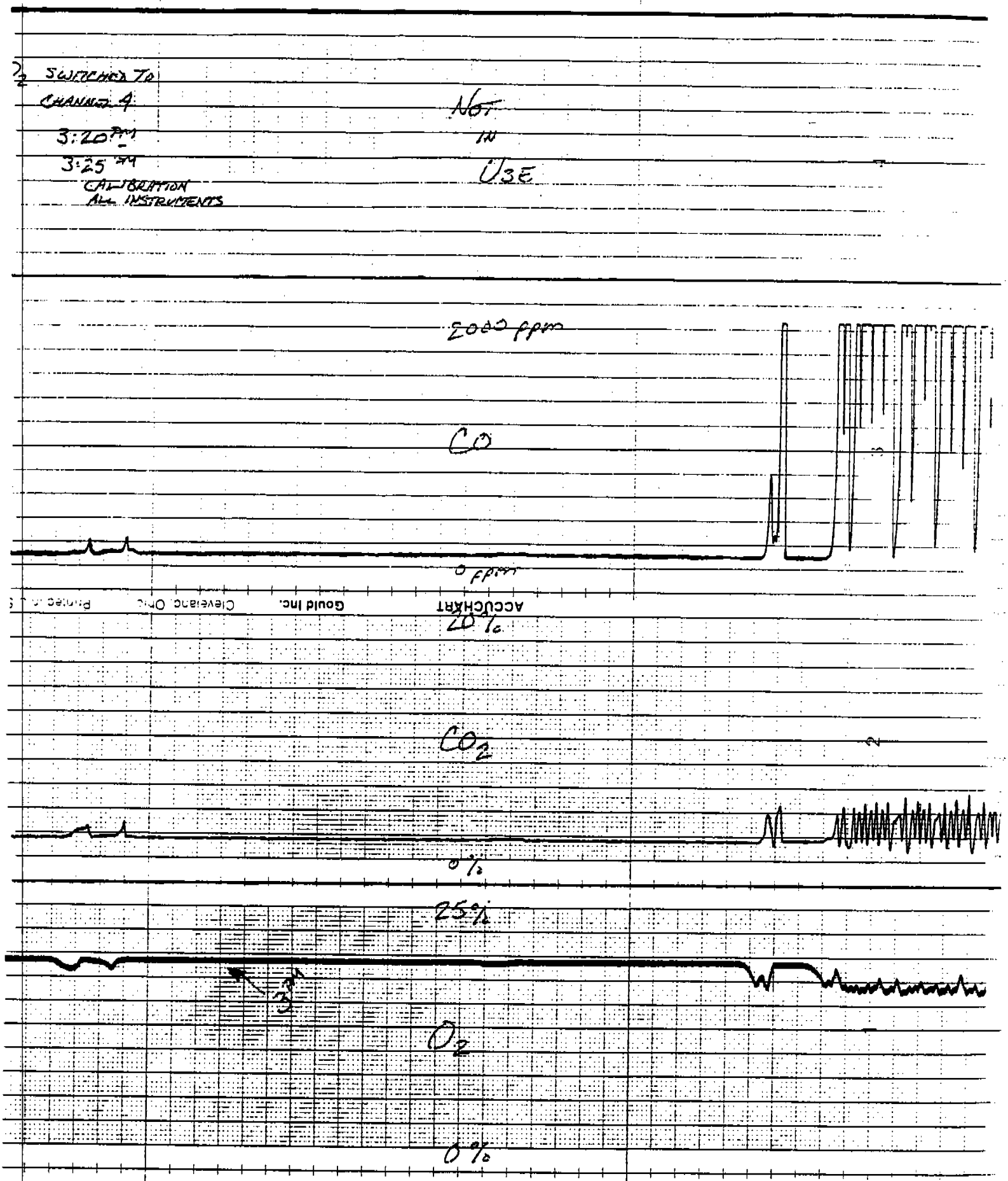


ACCUCHART Gould Inc. Cleveland, Ohio Printed

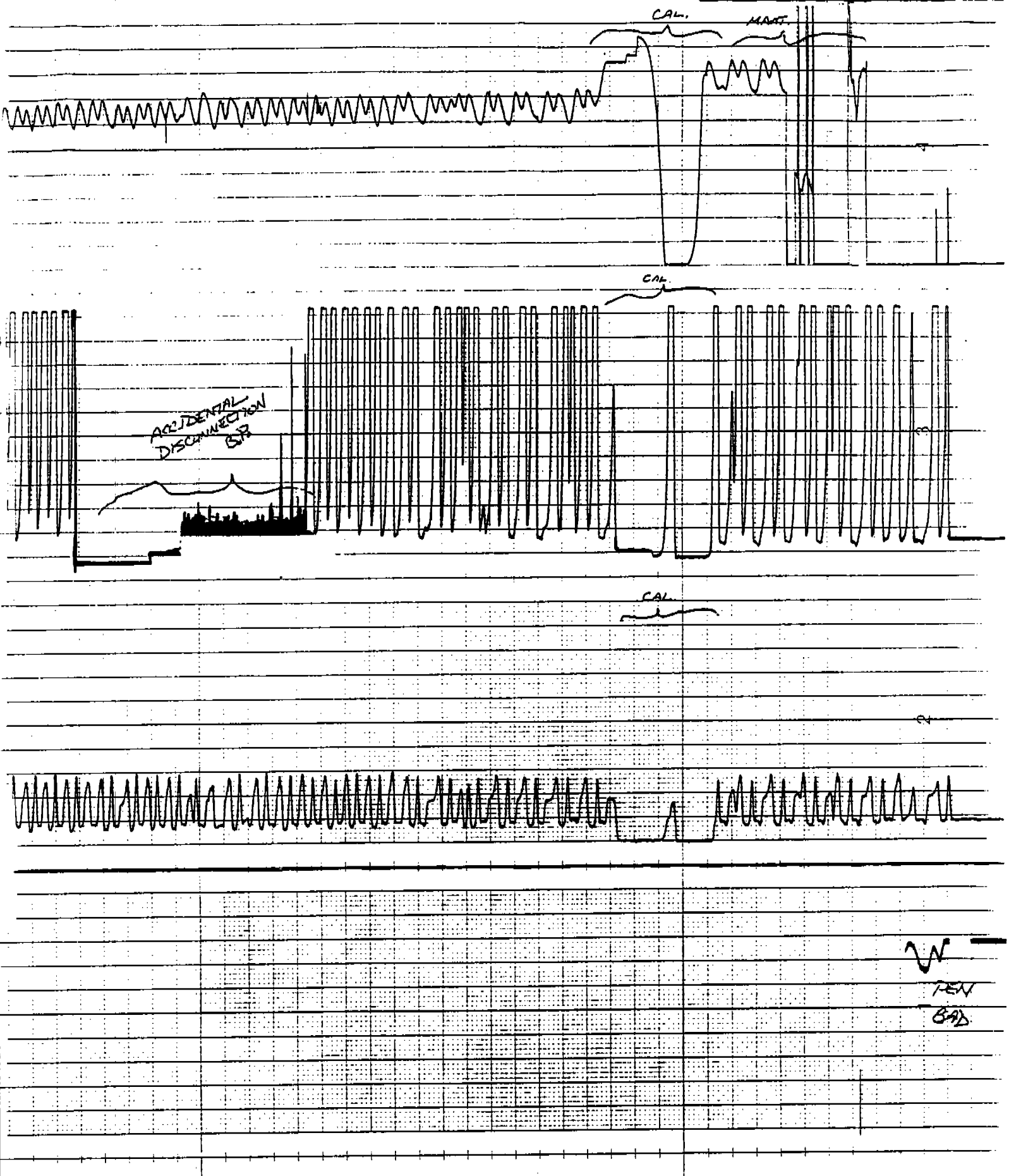





2:04
2:04
AMB. AIR
CHECK

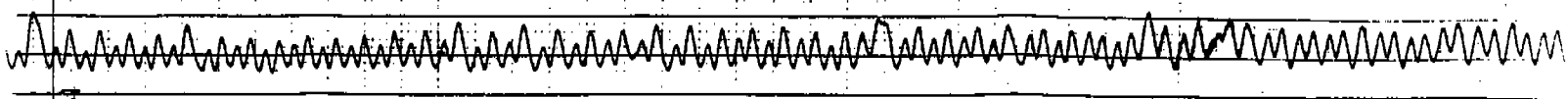


O_2 SWITCHED TO
CHANNEL 4
3:20 PM
3:25 PM
CALIBRATION
ALL INSTRUMENTS
NOT
IN
USE
2000 ppm
CO
0 ppm
ACCUCHART
Gould Inc.
Cleveland, Ohio
20%
CO_2
0%
25%
3 PM
O_2
0%


CAL.
MAT.
CAL.
ACCIDENTAL DISCONNECTION BY
CAL.
TEN
BAD

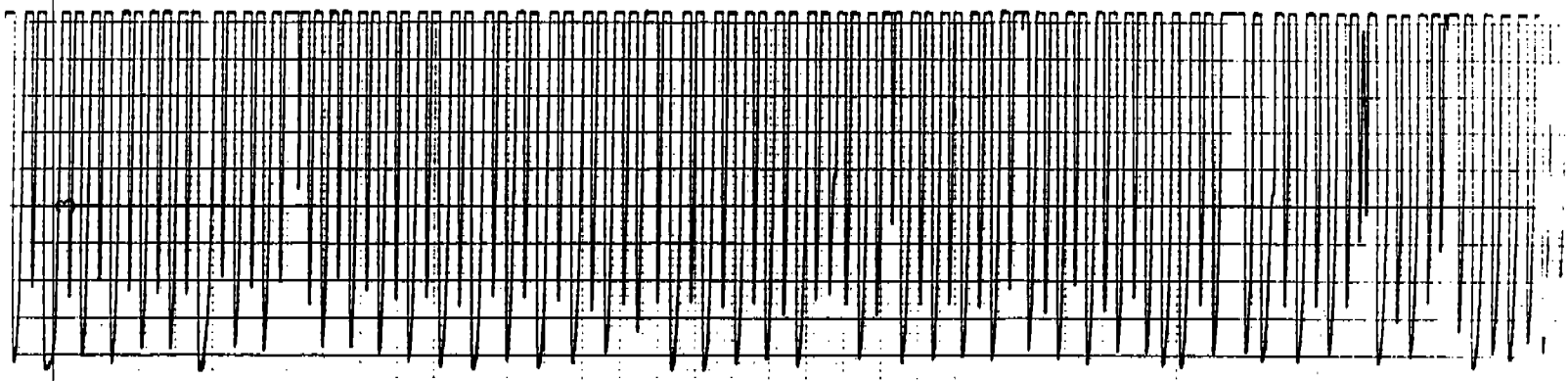
25%

O_2



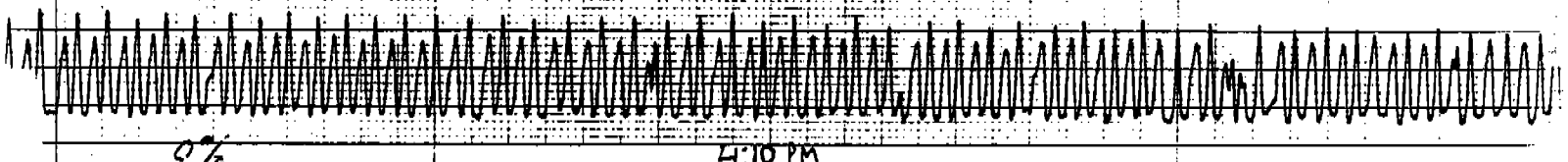
O_2

0 %



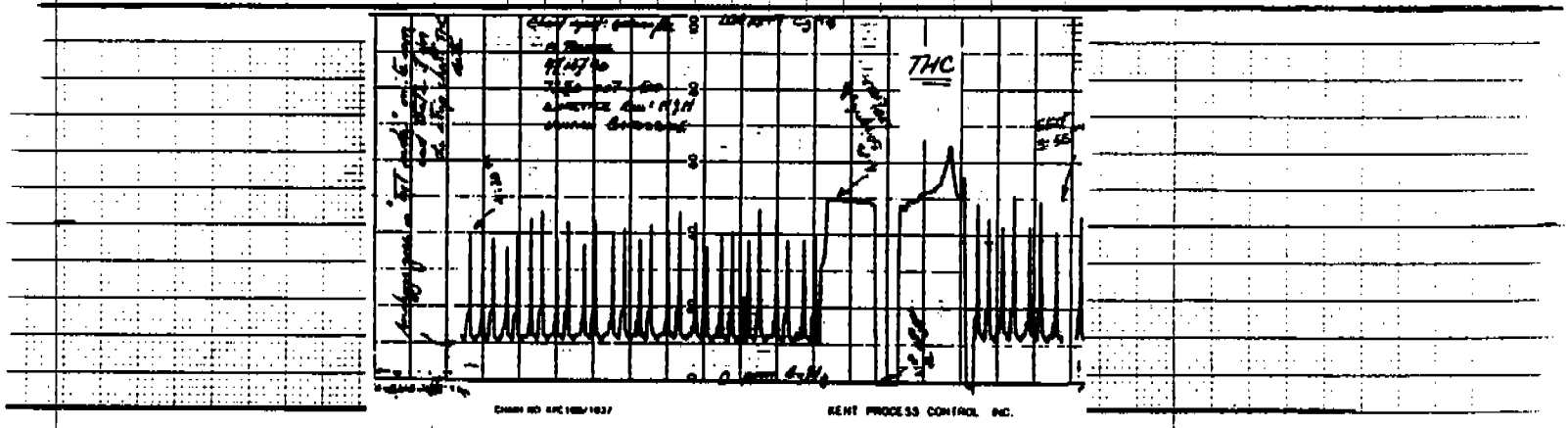
20%

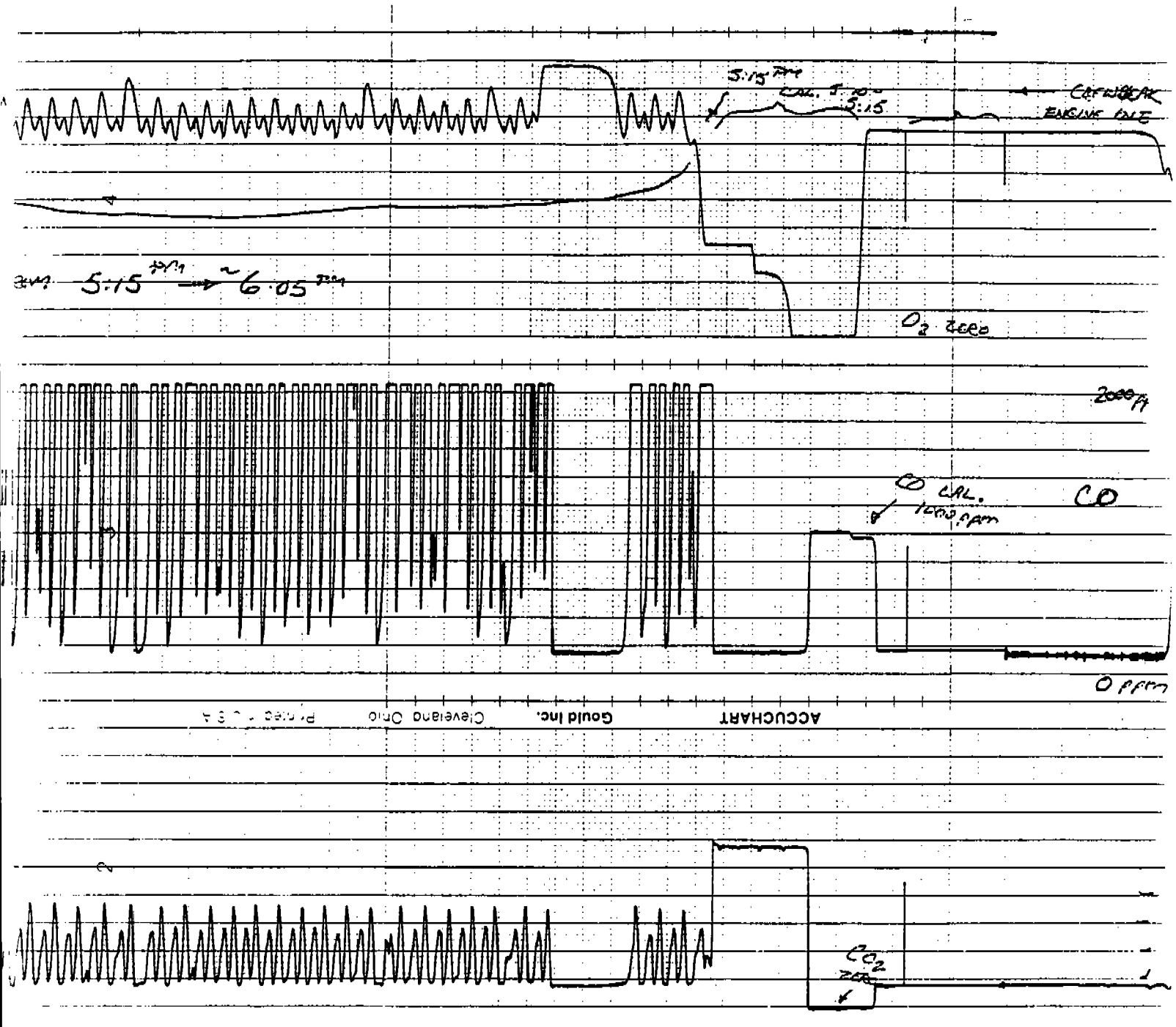
CO_2

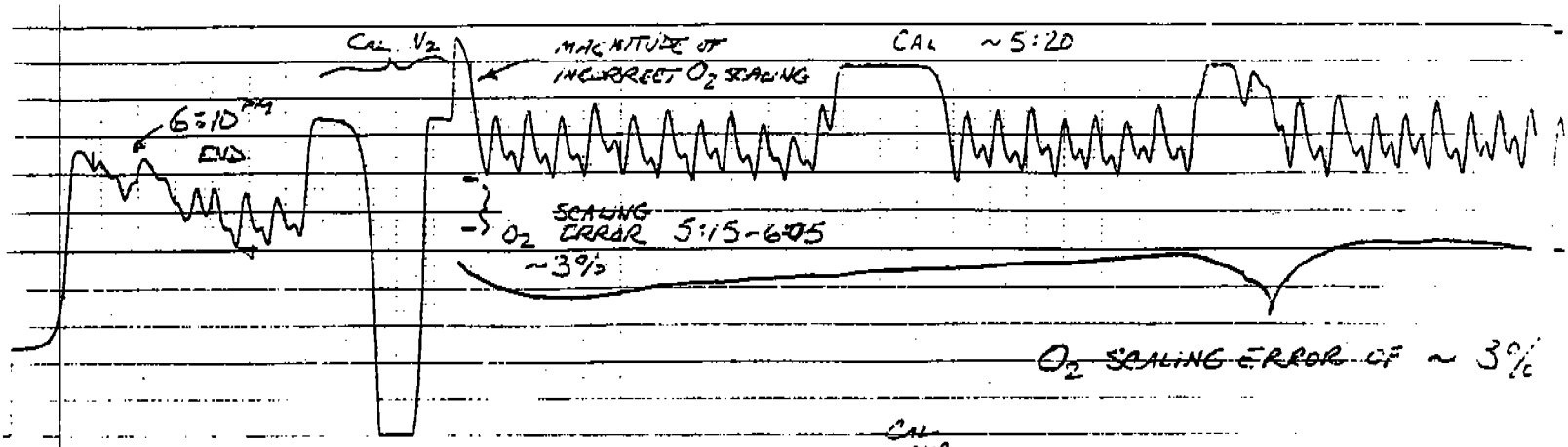


0%

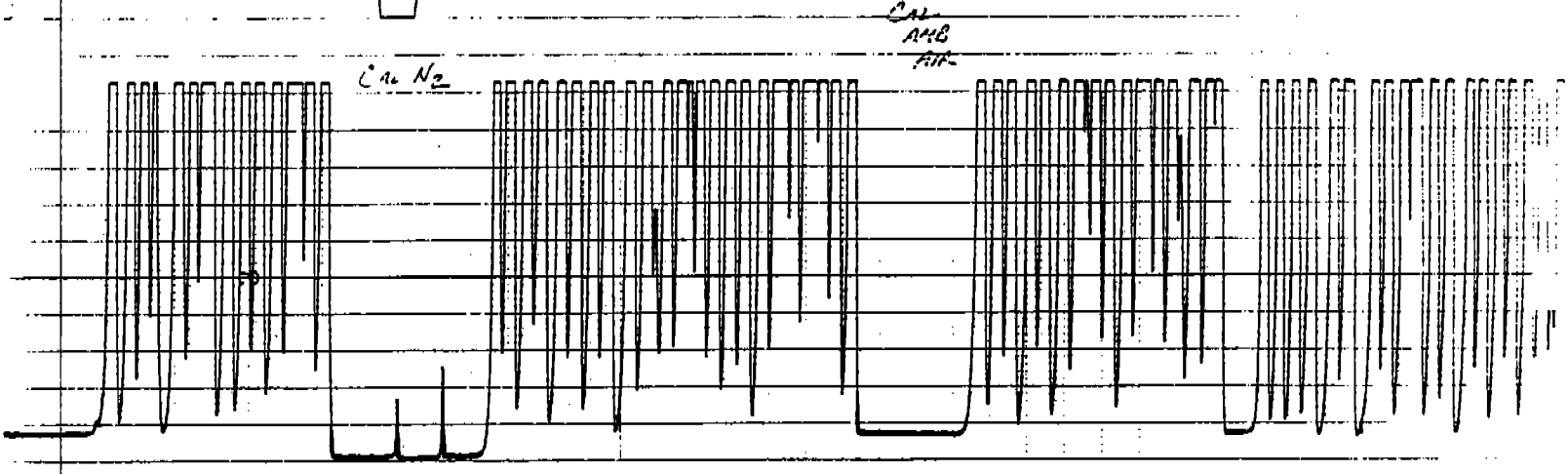
4:10 PM

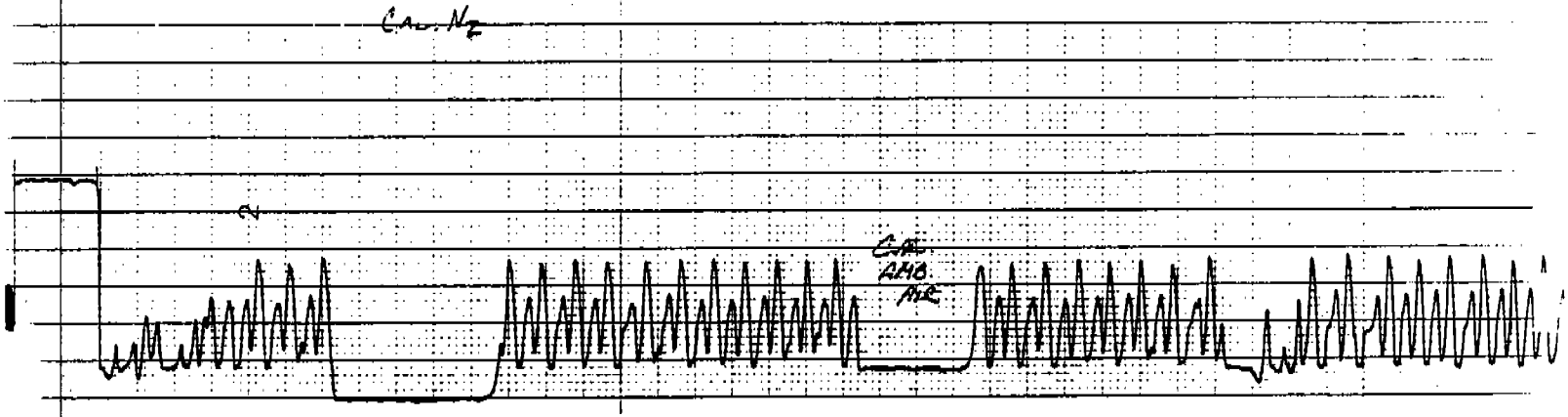



5:15 PM
CAL. 5:10 - 5:15
CREWBREAK
ENGINE IDLE
5:15 PM → ~6:05 PM
O_2 ZERO
2000 ft
CO CAL. 1000 ppm
CO
0 ppm
ACCUCHART
Gould Inc.
Cleveland Ohio
CO_2 ZERO



O_2 SCALING ERROR OF ~ 3%





H & H

Workover Rig CO_2, O_2 & CO

9/14/90

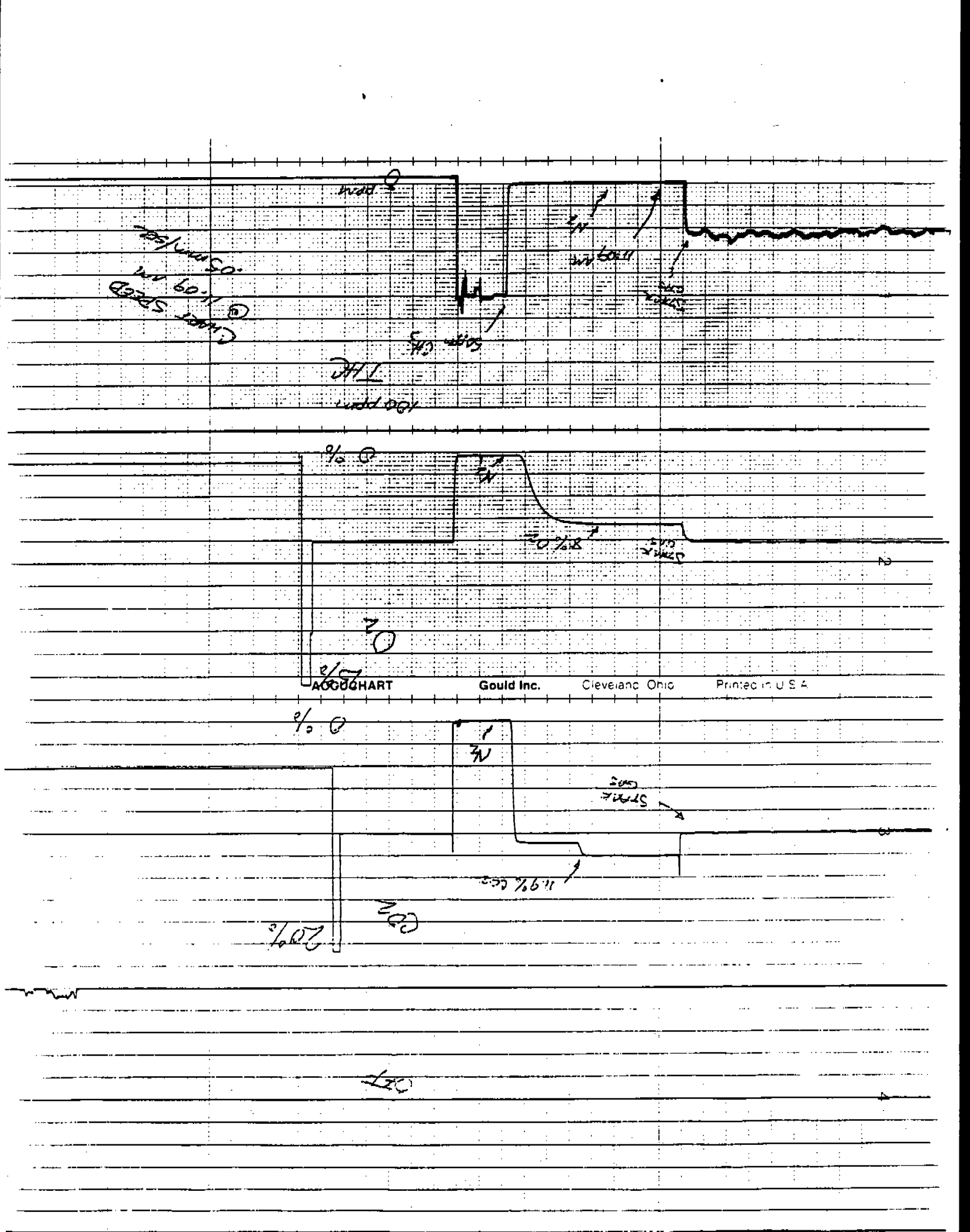
B. Rogers

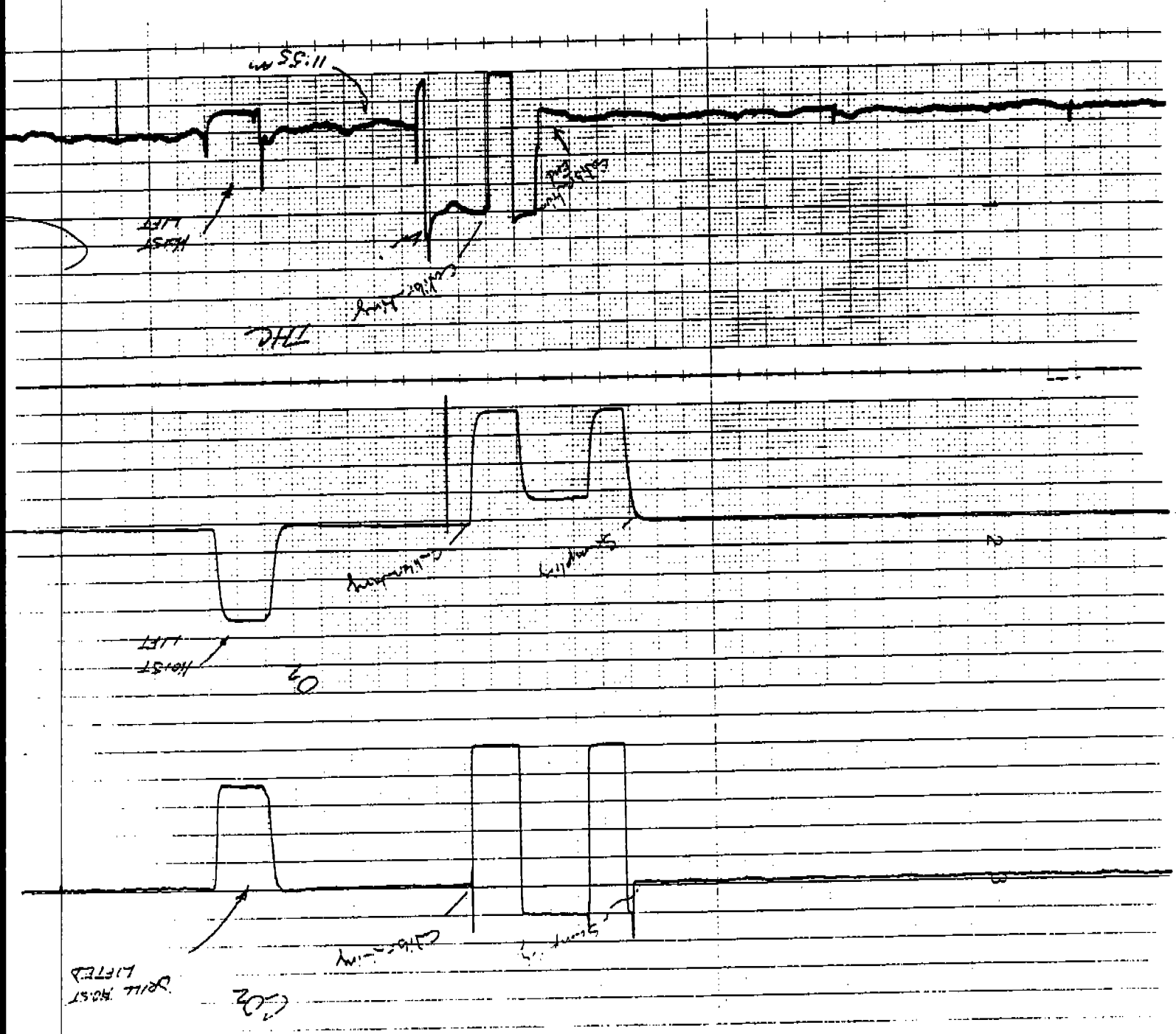
Project 7230-007-400

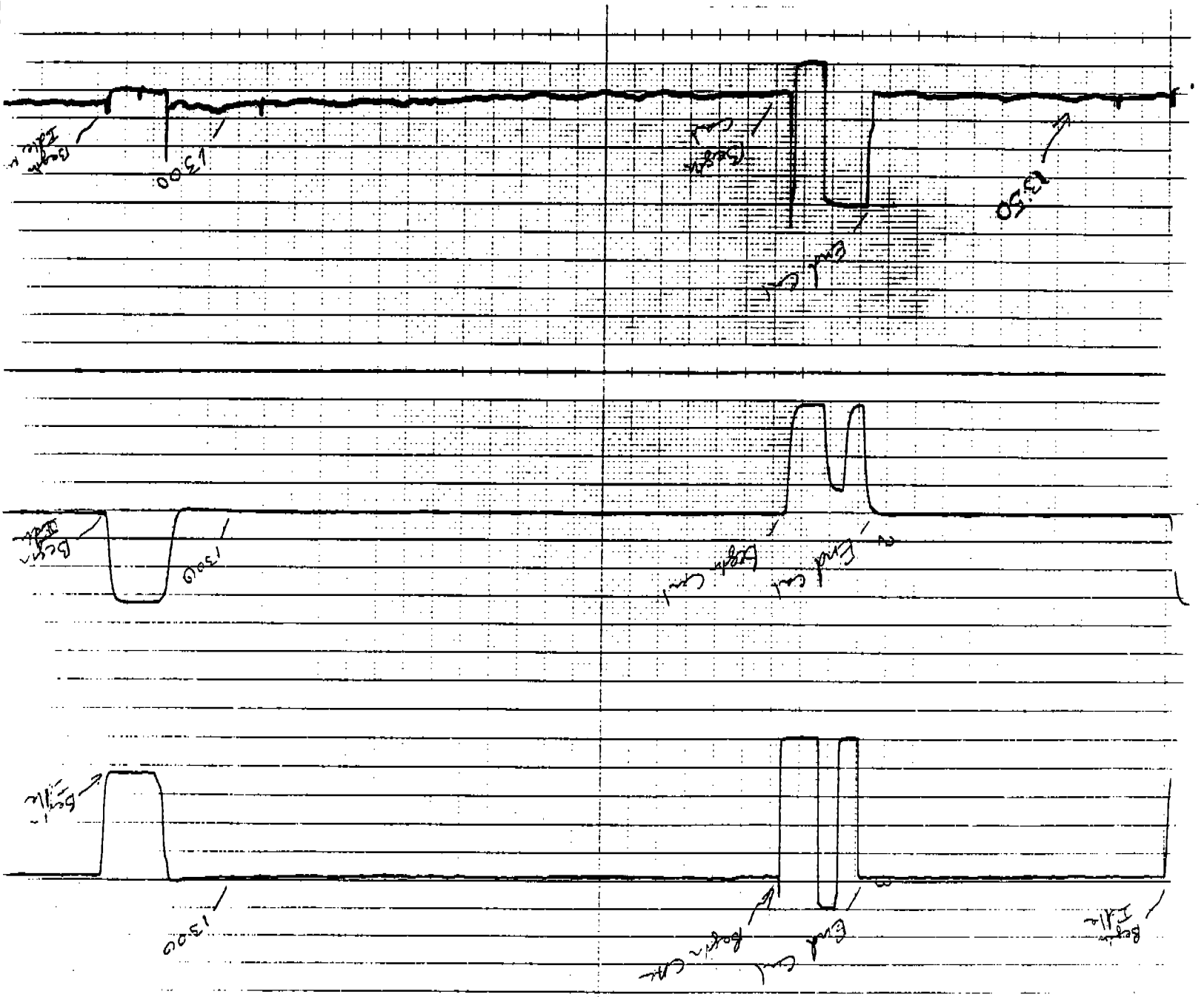
Site: SWEPI

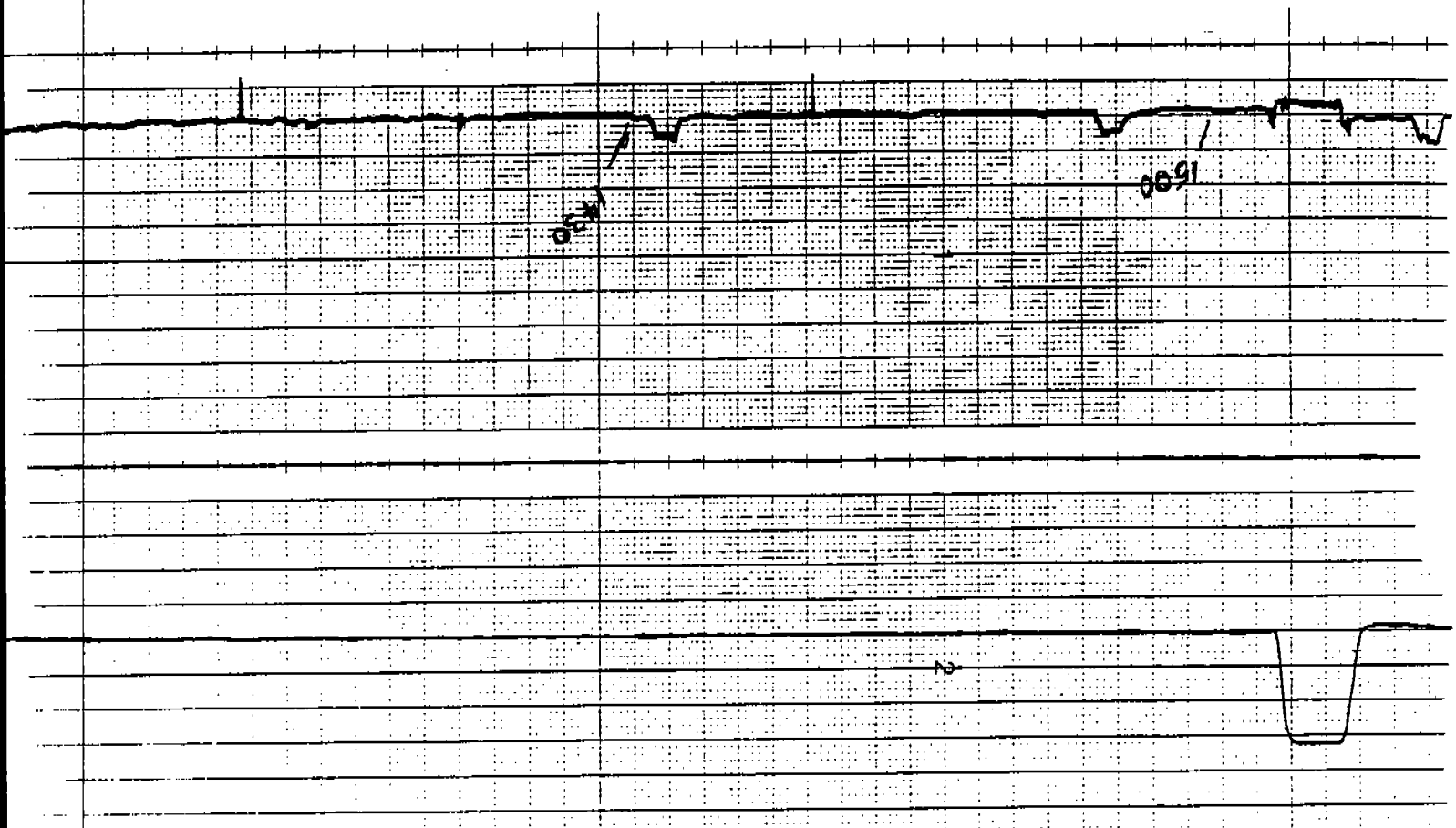
Source: Diesel Drilling Rig

Date: September 18, 1990

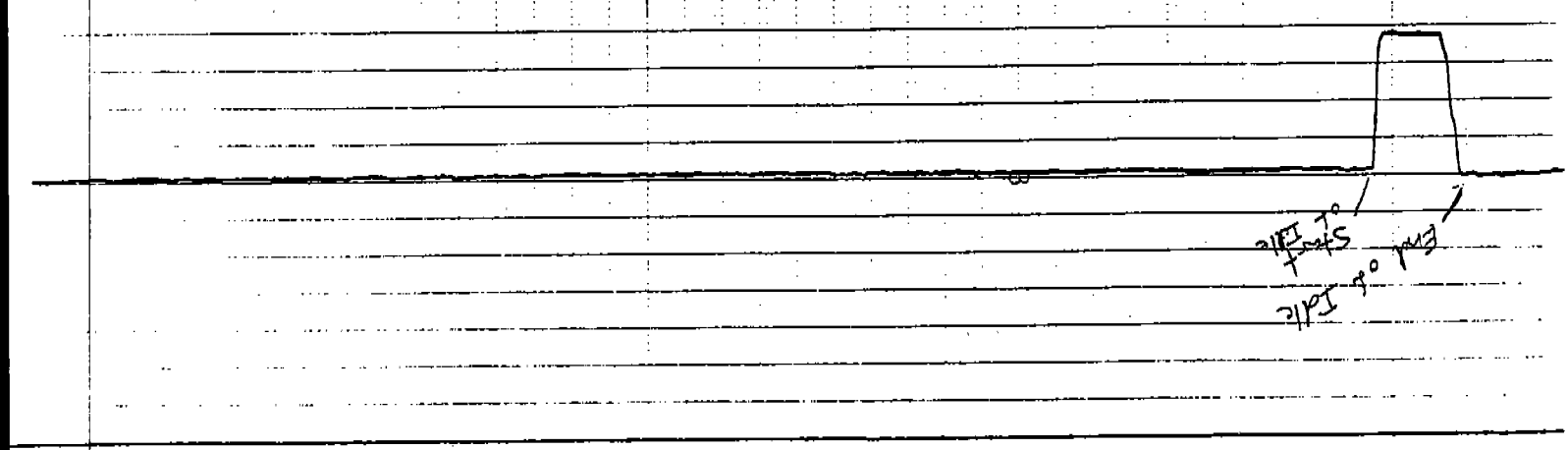

ACCUCHART
Gould Inc.
Cleveland Ohio
Printed in U.S.A.

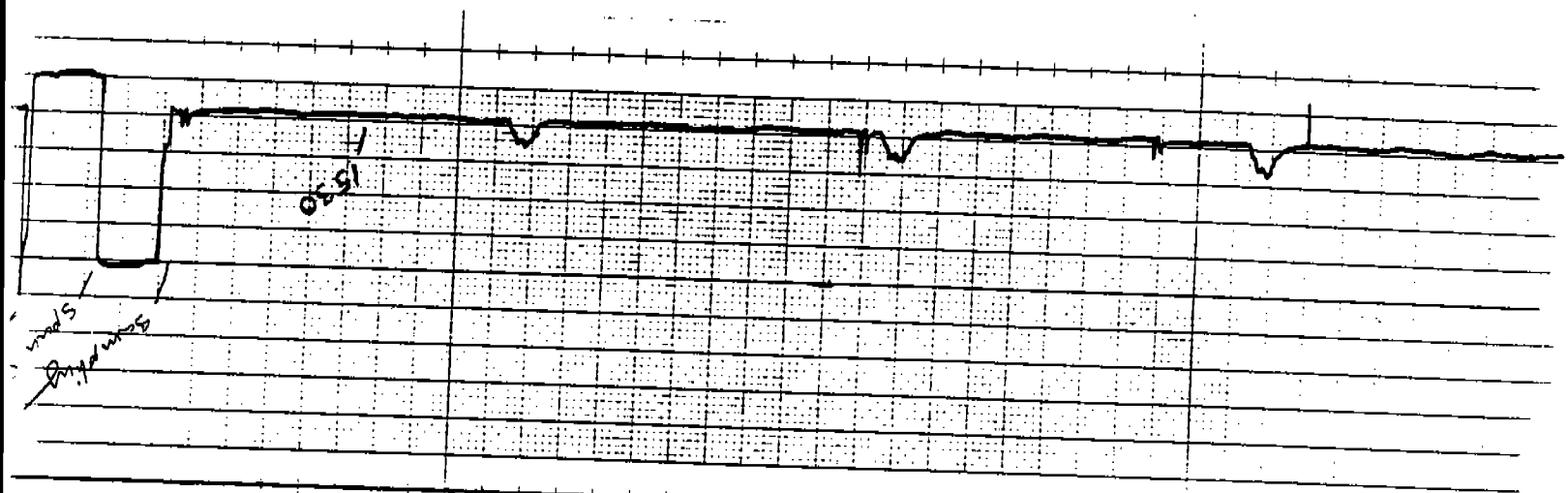


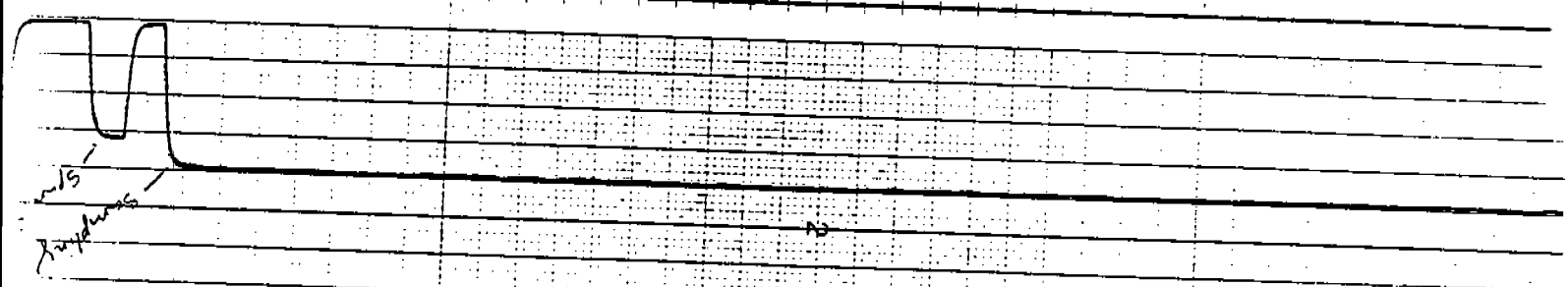


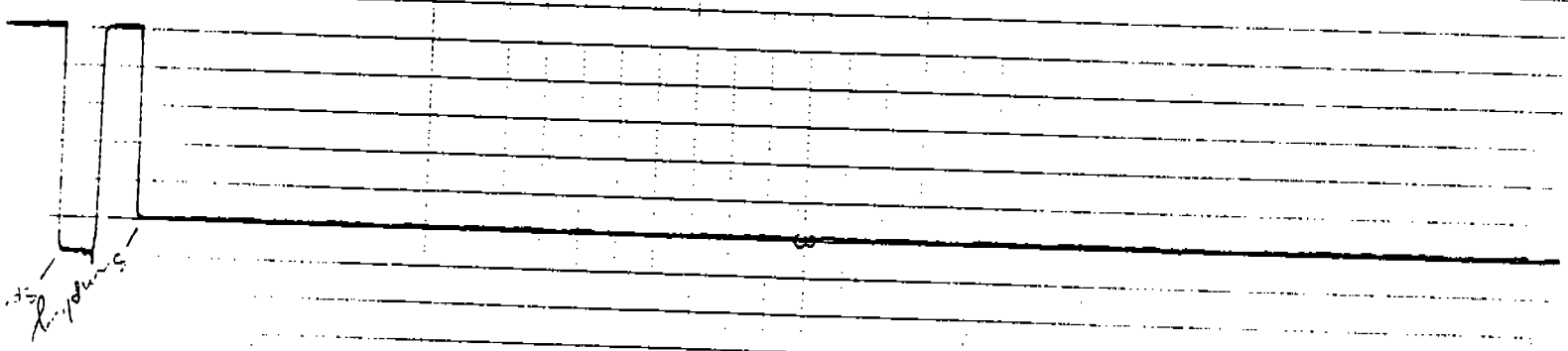


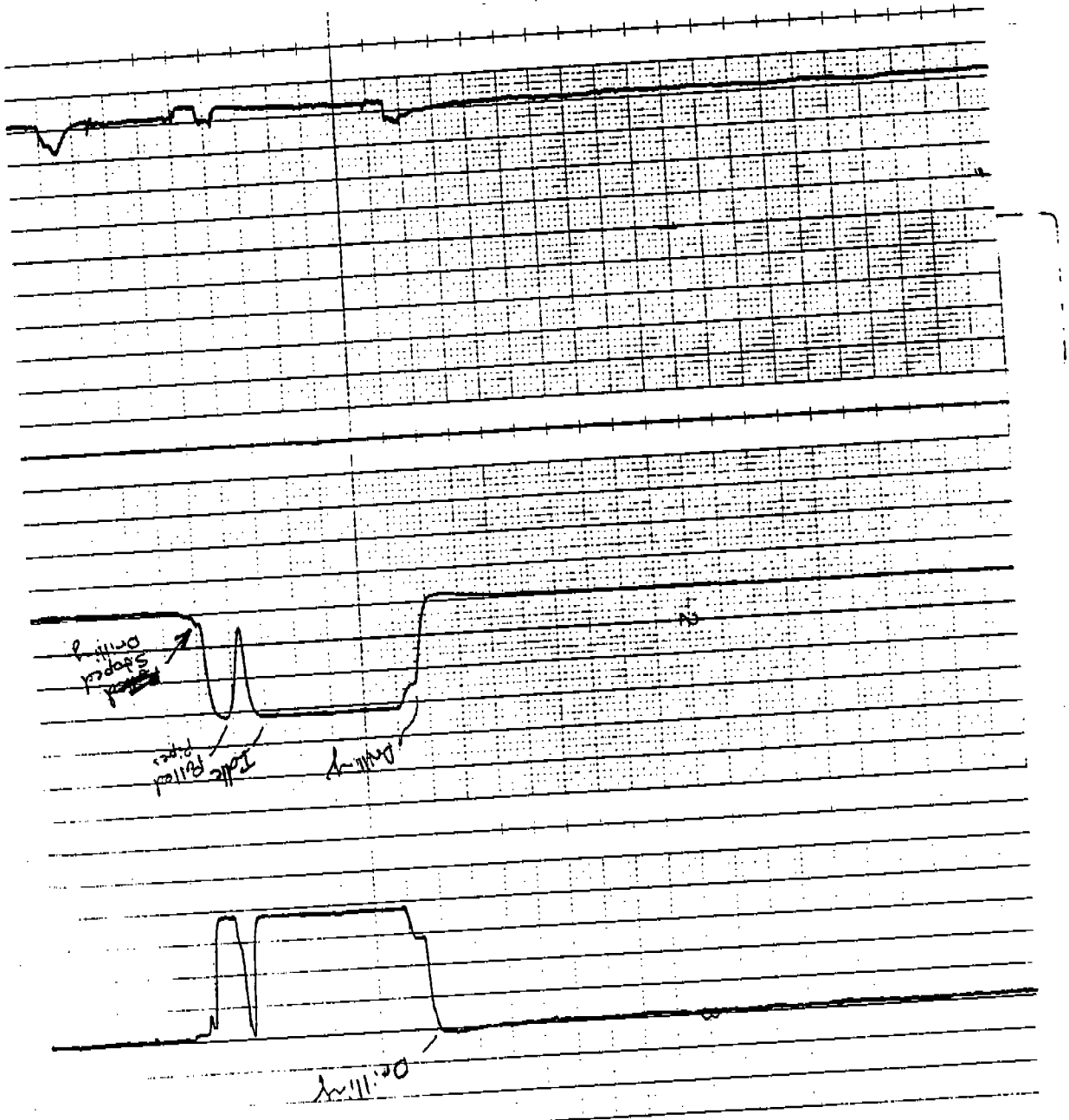
ACCUCHART Gould Inc. Cleveland, Ohio Printed in U S A

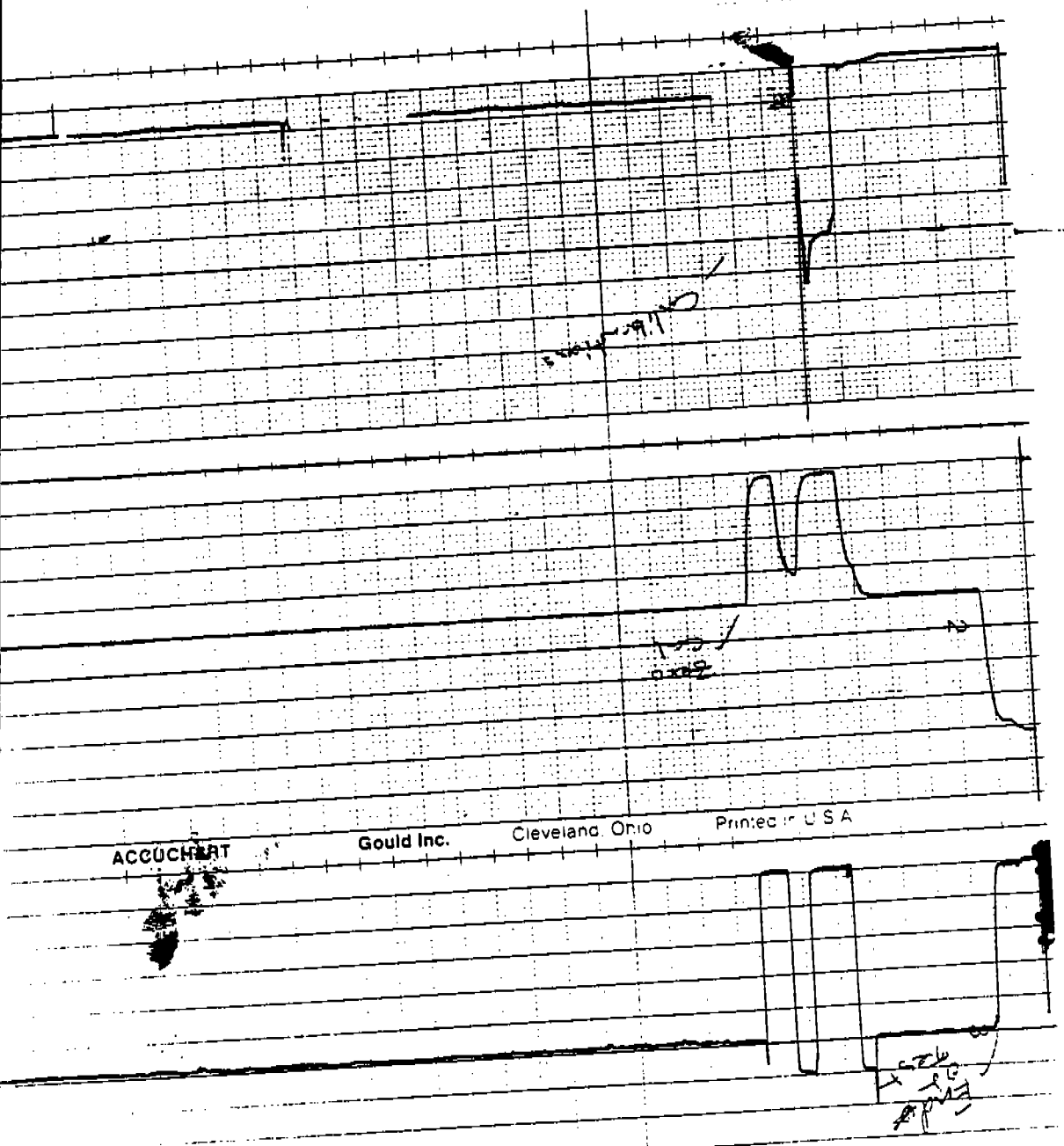



1530






Stopped Drilling
Idle Pulled Pipes
Drilling
Drilling


ACCUCHART
Gould Inc.
Cleveland, Ohio
Printed in U.S.A.

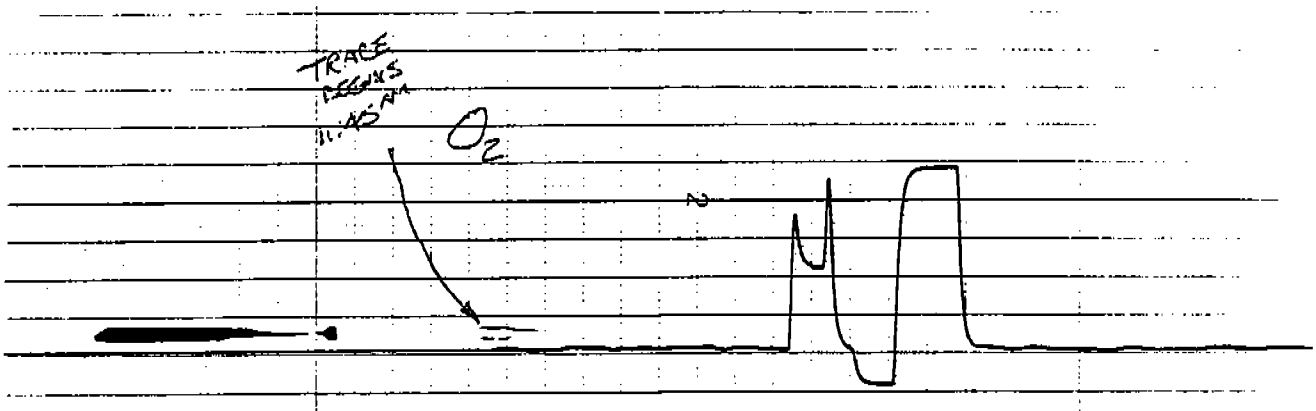
Site: SWEPI

Source: Natural Gas-Fired Steam Generator

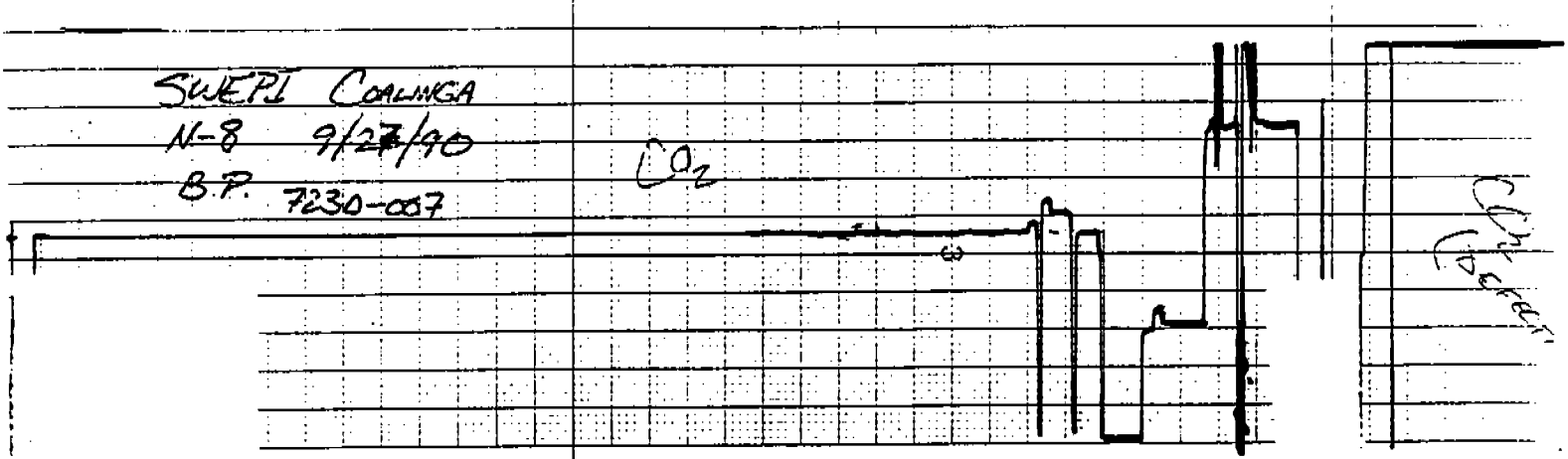
Date: September 27, 1990

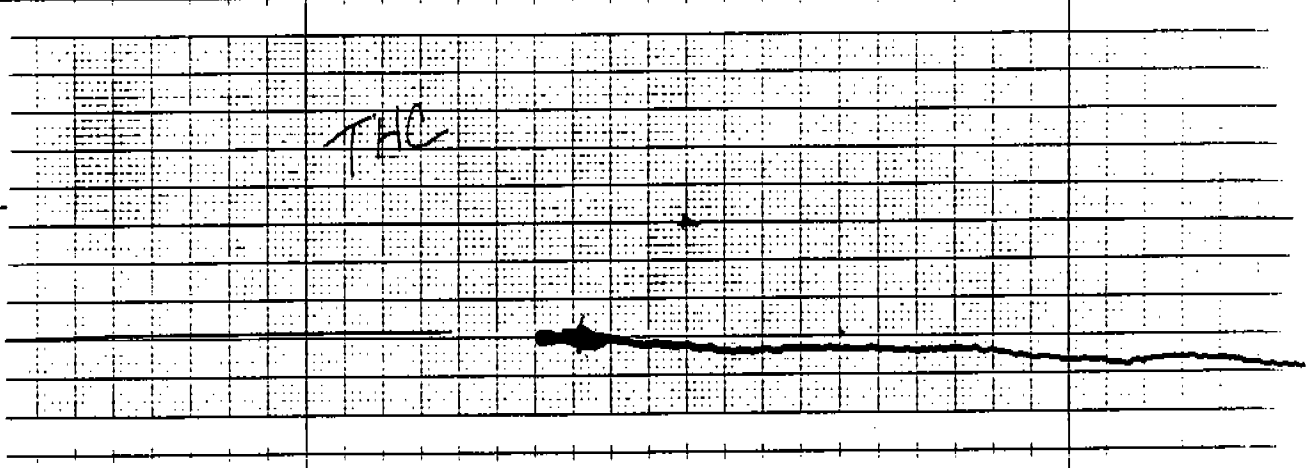
NO INK ON THIS CHART; NO CO DATA RECORDED

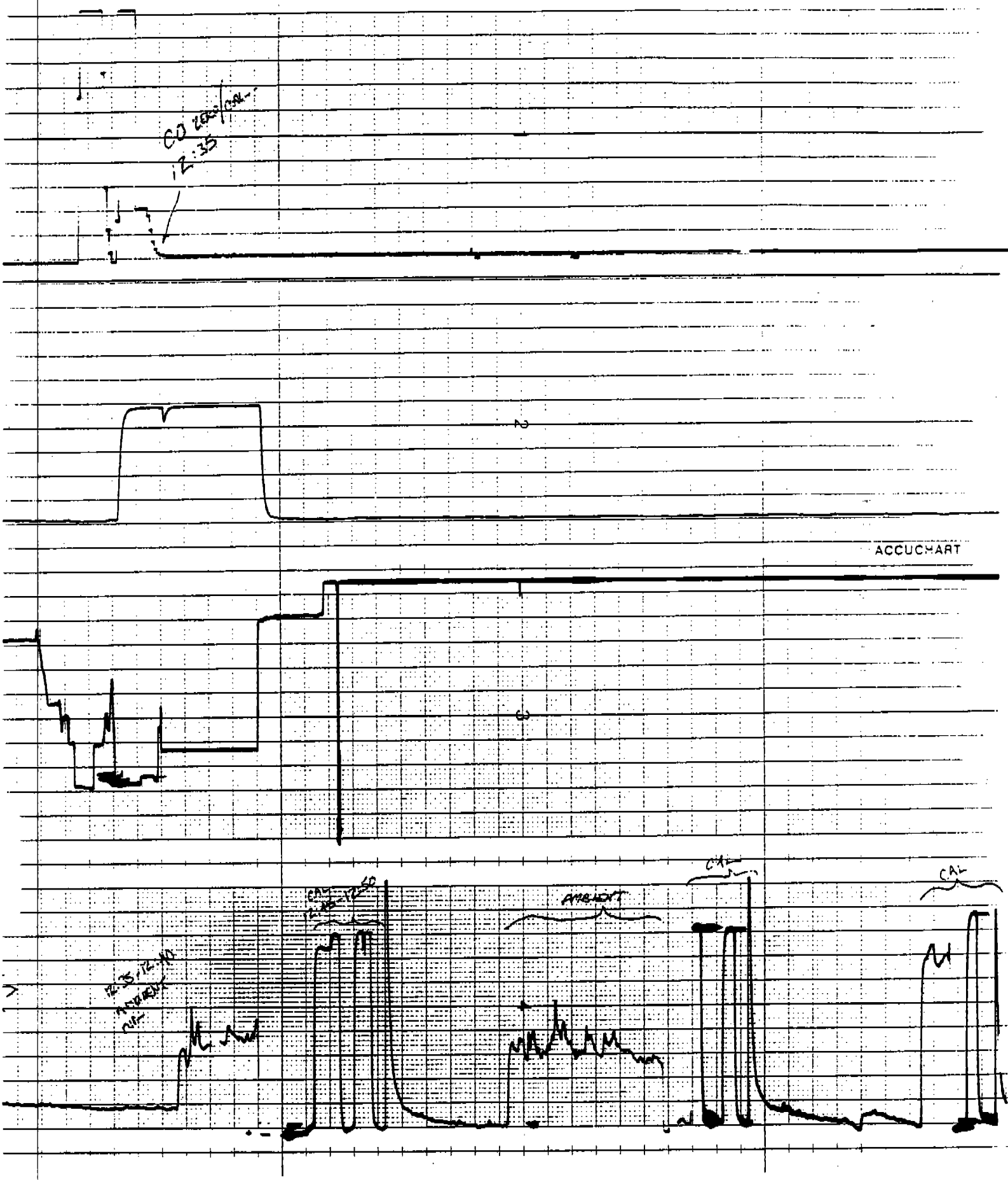
BP

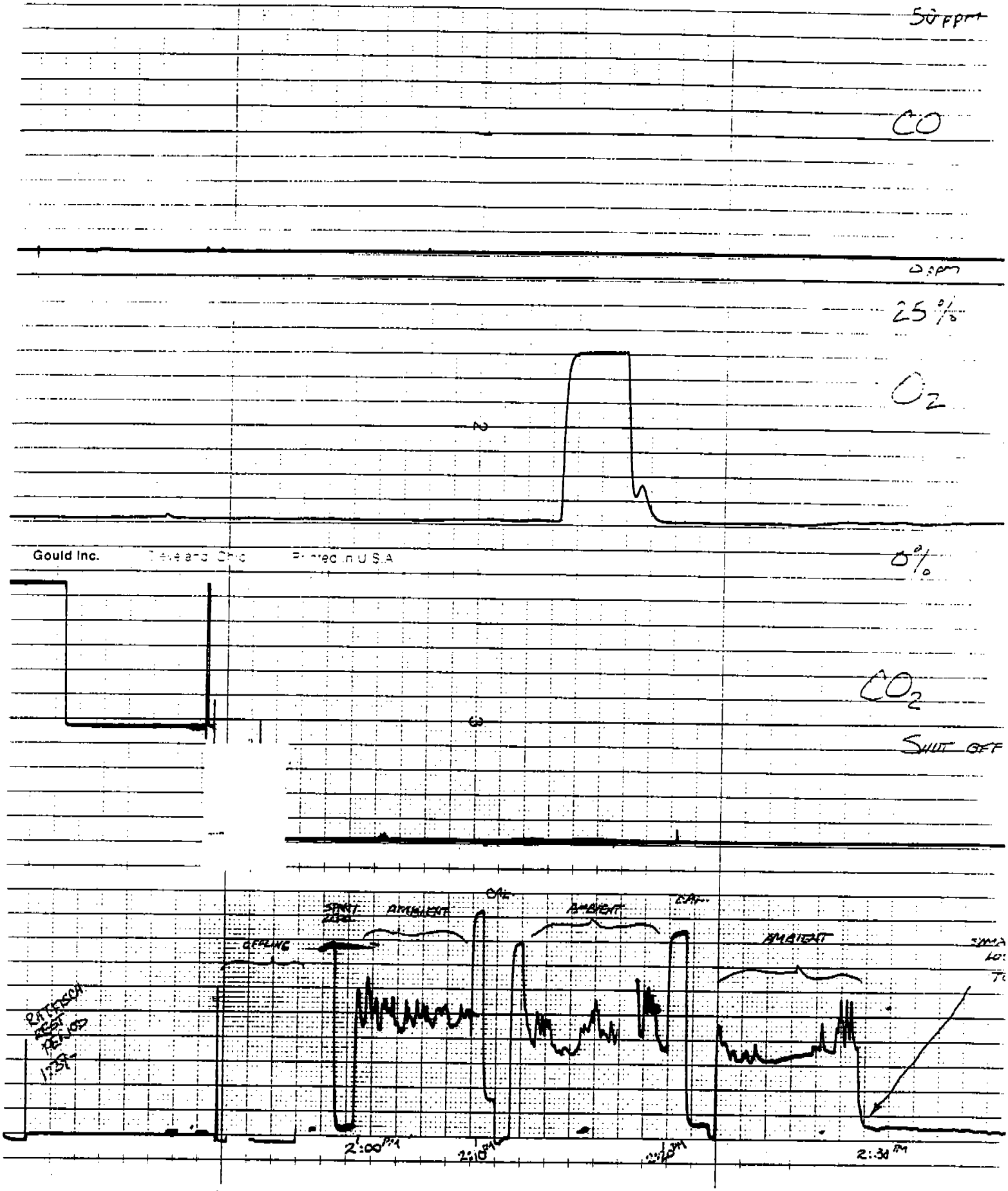


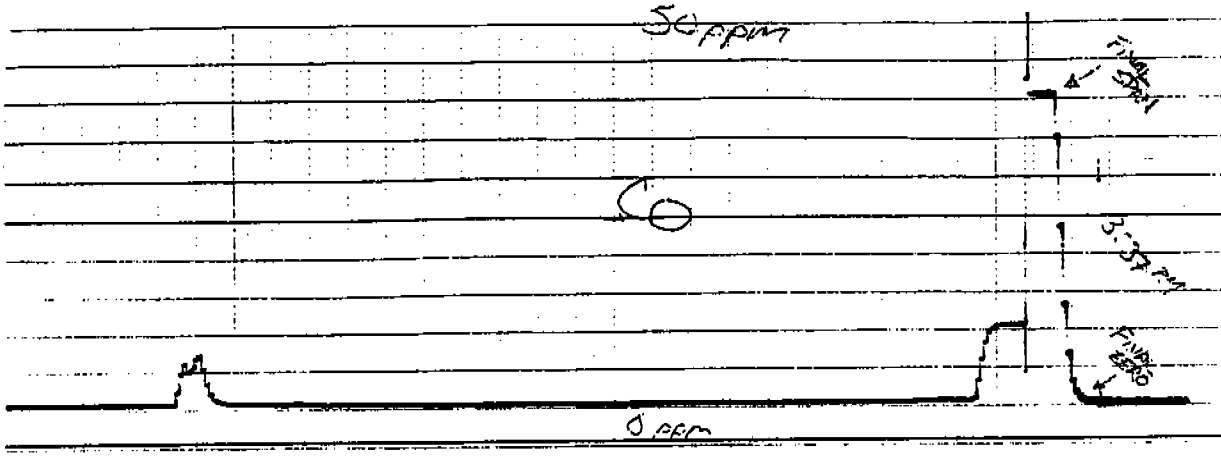
SWEPI COALINGA
N-8 9/27/90
B.P. 7230-007

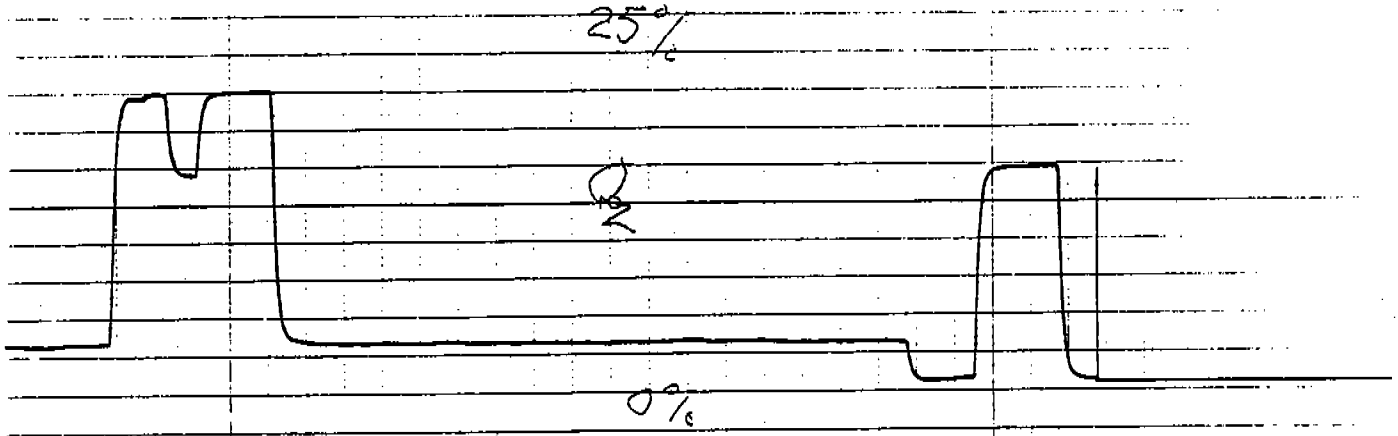


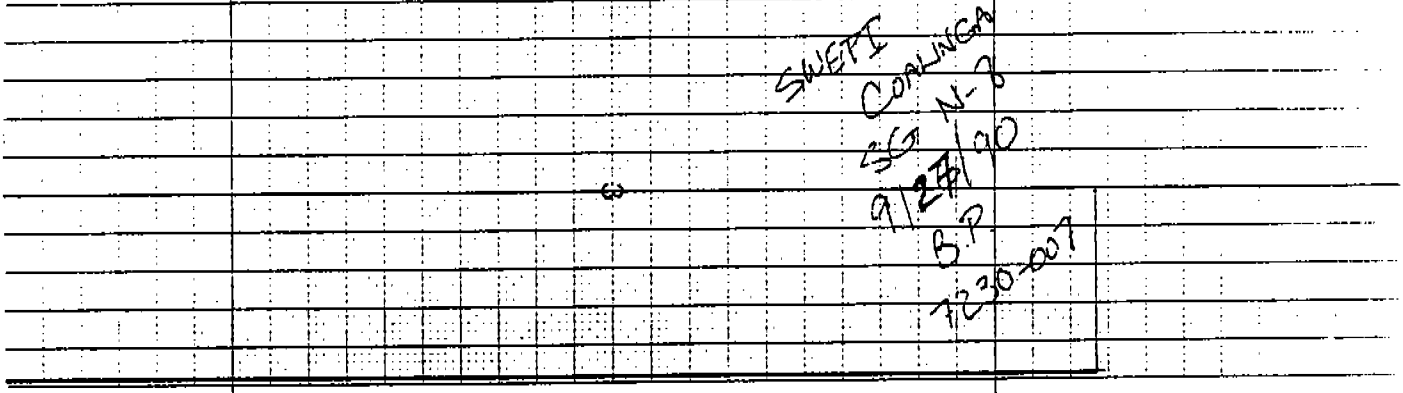


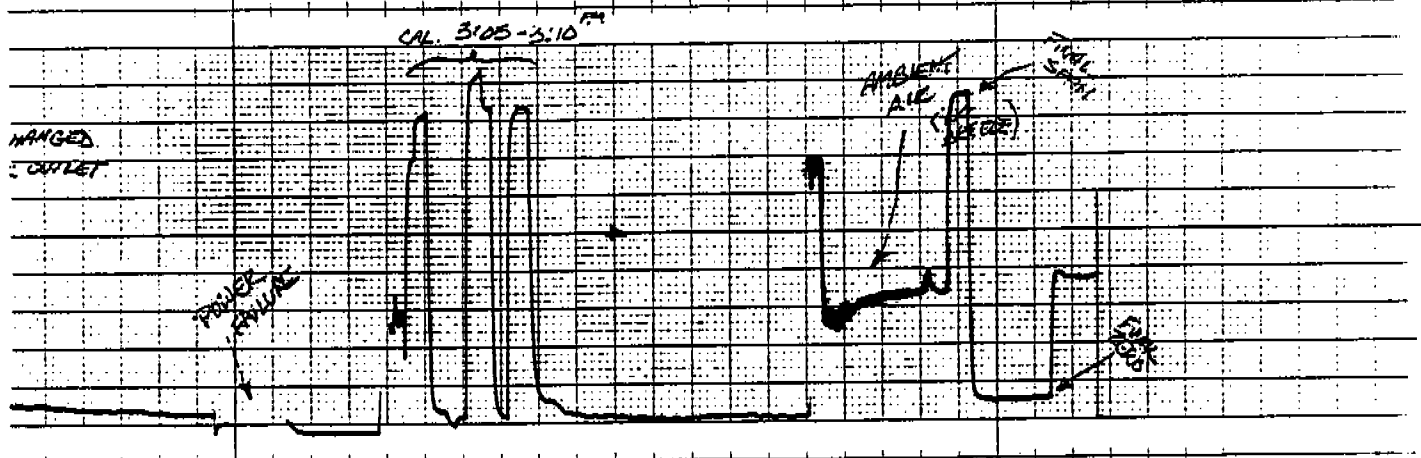

CO ZERO | CAL
12:35
ACCUCHART
AMBIENT
CAL
CAL


50 ppm
CO
0 ppm
25 %
O2
Gould Inc.
0 %
CO2
SHUT OFF
START ZERO
AMBIENT
CAL
AMBIENT
CAL
AMBIENT
2:00 PM
2:30 PM


50 ppm
3:37 PM
0 ppm


25% O2
0%


SWEPT
COMLINCO
N-2
9/27/90
BP
7230-007


CAL. 3:05 - 3:10 PM
AMBIENT AIR

Site: Santa Fe

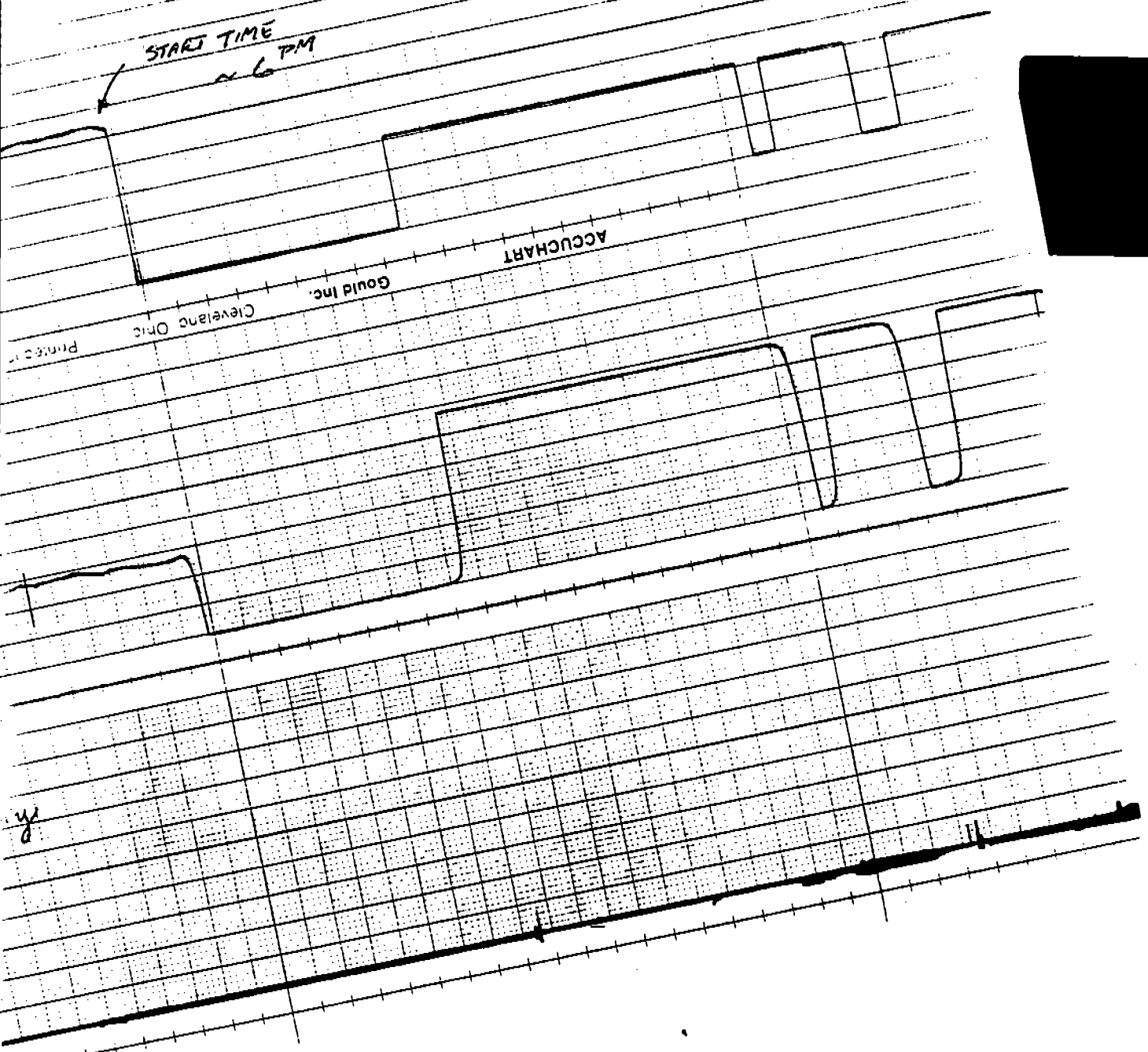
Source: Crude Oil-Fired Steam Generator

Date: September 20, 1990

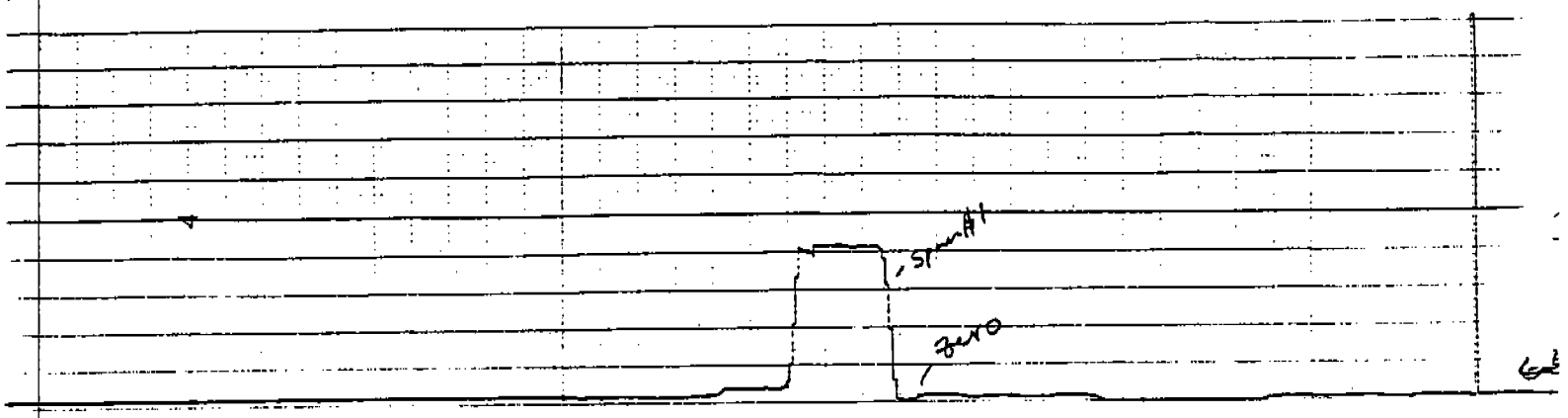
dt: TR30-0107
Fe Midway Sunset
-20-90

CHART SPEED: .05 mm/s

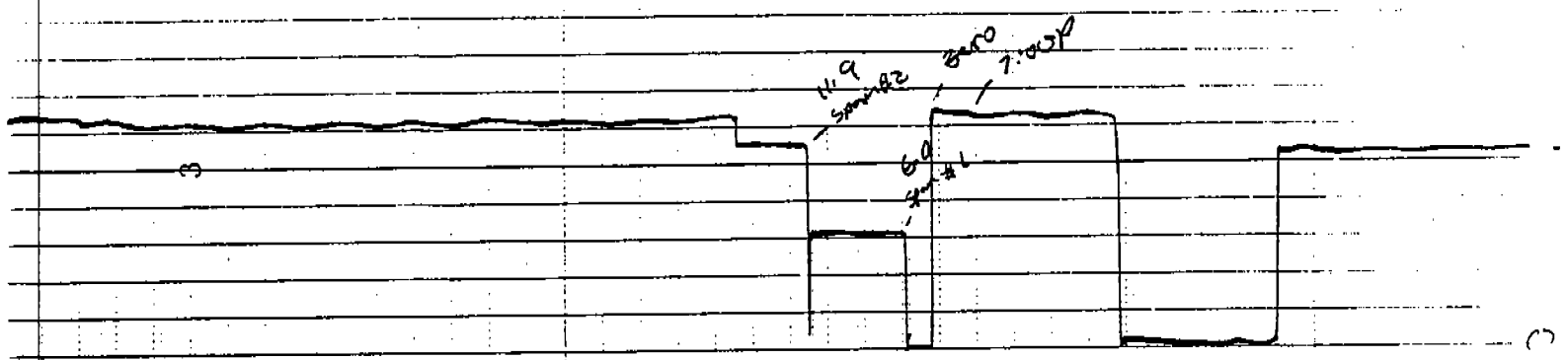
START TIME
~ 6 PM

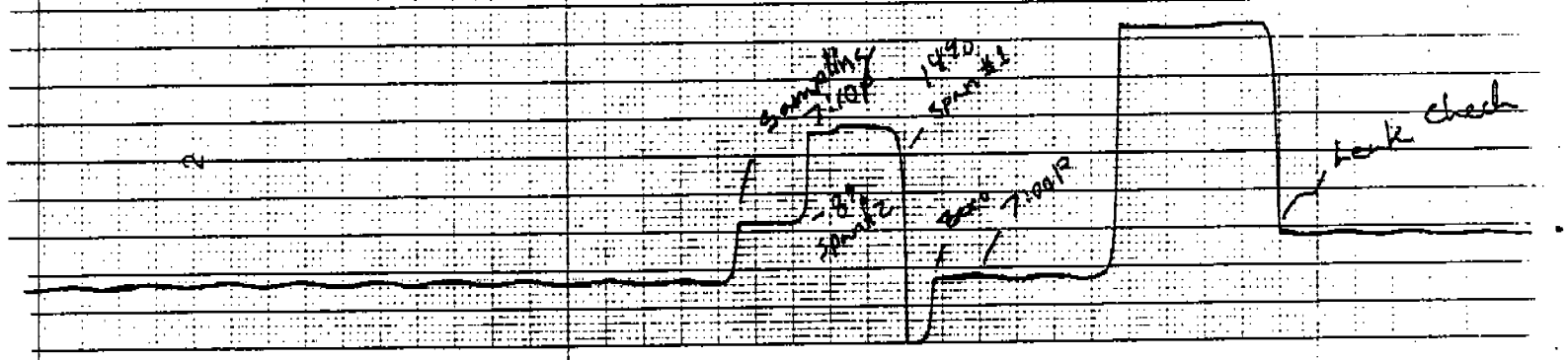


[redacted]

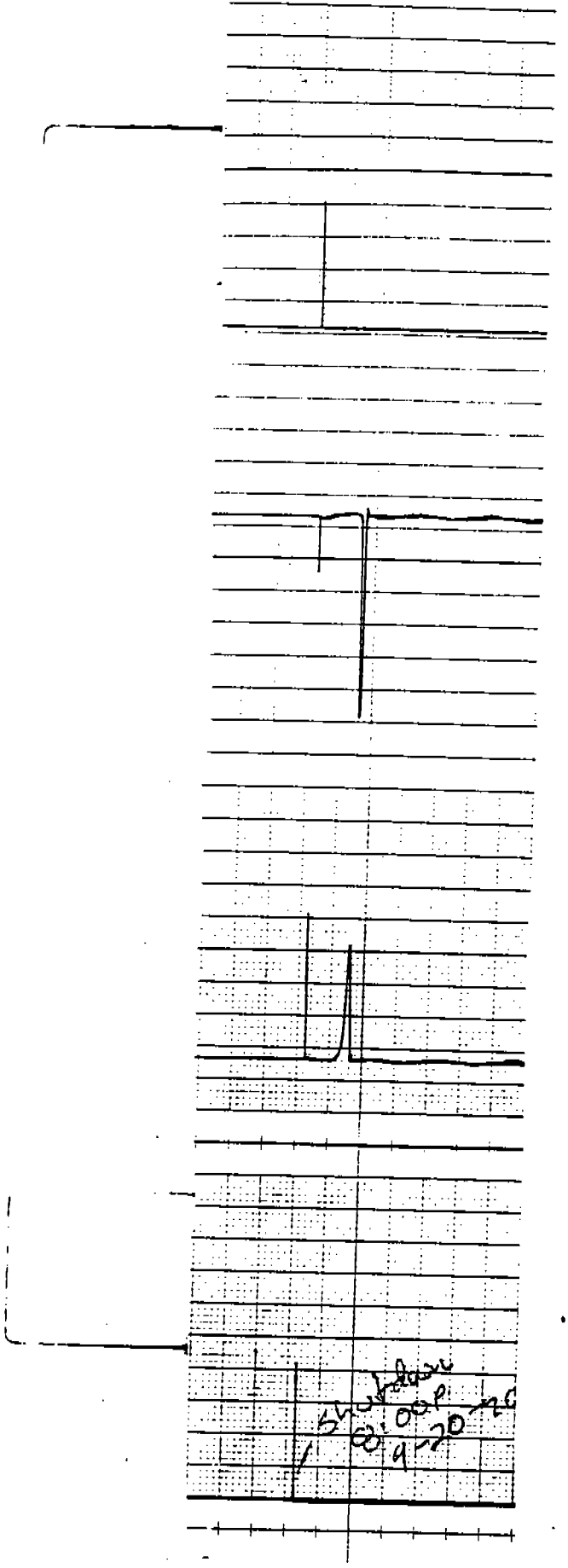

4
span #1
zero

2


3
11.9
span #2
zero
7:00P
6.0
span #1


2
sampling
7:10P
14.90
span #1
8.9
span #2
zero
7:00P
Leak check

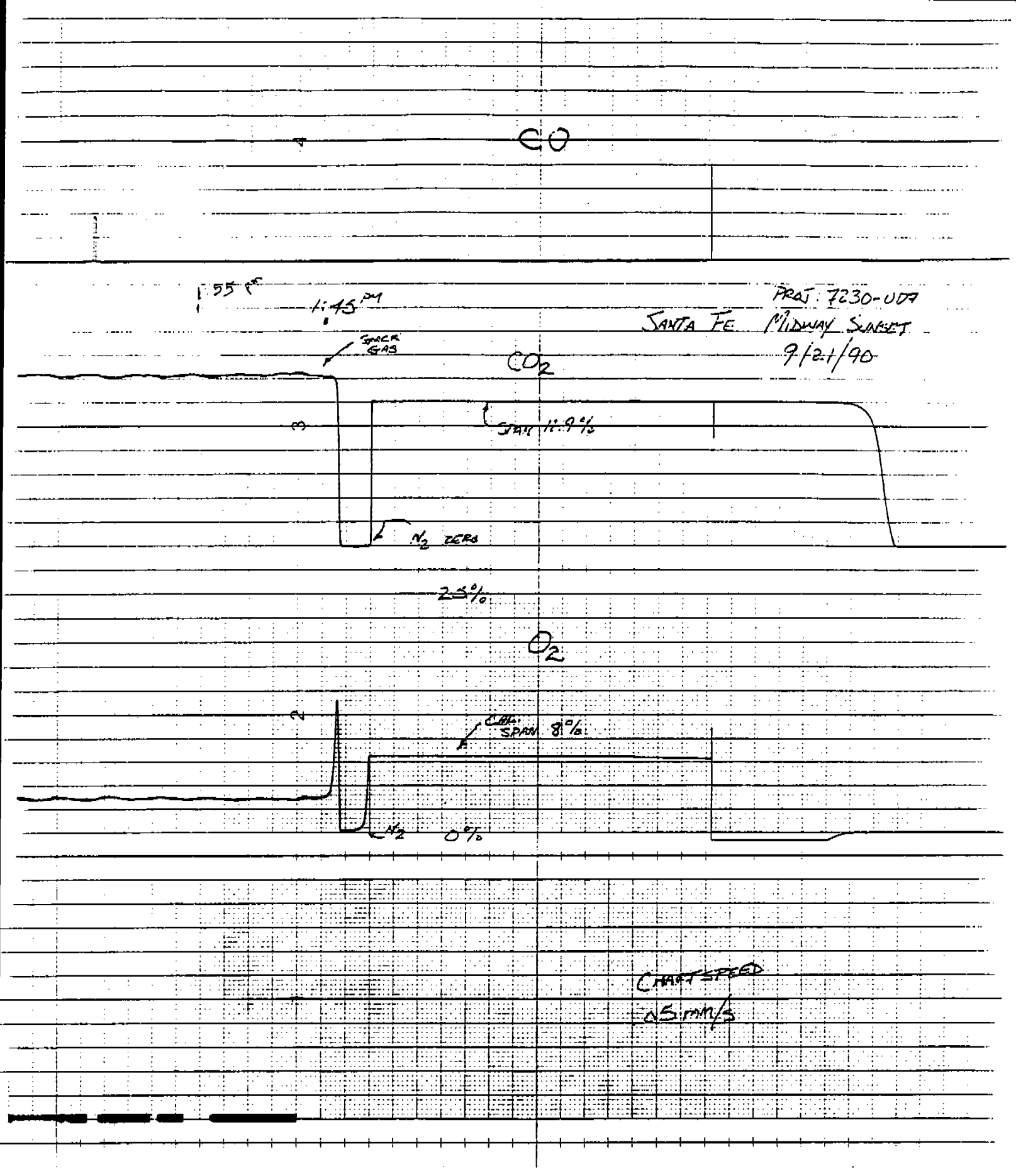
TH

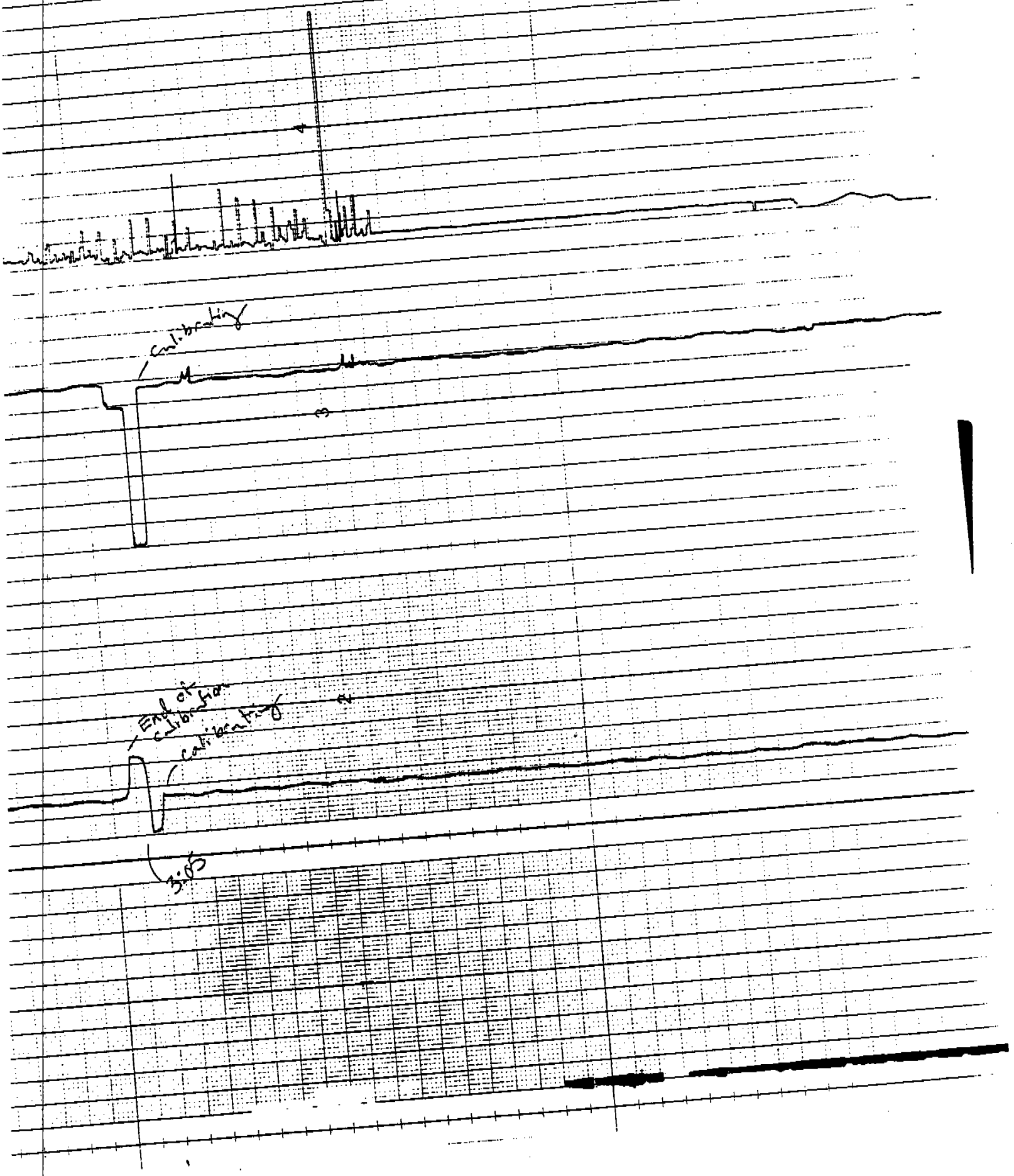


Site: Santa Fe

Source: Crude Oil-Fired Steam Generator

Date: September 21, 1990


CO
1:55 PM
1:45 PM
PROJ. 7230-007
SANTA FE MIDWAY SUMMIT
9/21/90
TRACK GAS
CO2
SPAN 11.9%
N2 ZERO
2.5%
O2
CAL. SPAN 8%
N2 0%
CHART SPEED
25 mm/s


calibrating
End of calibration
calibrating
3:05

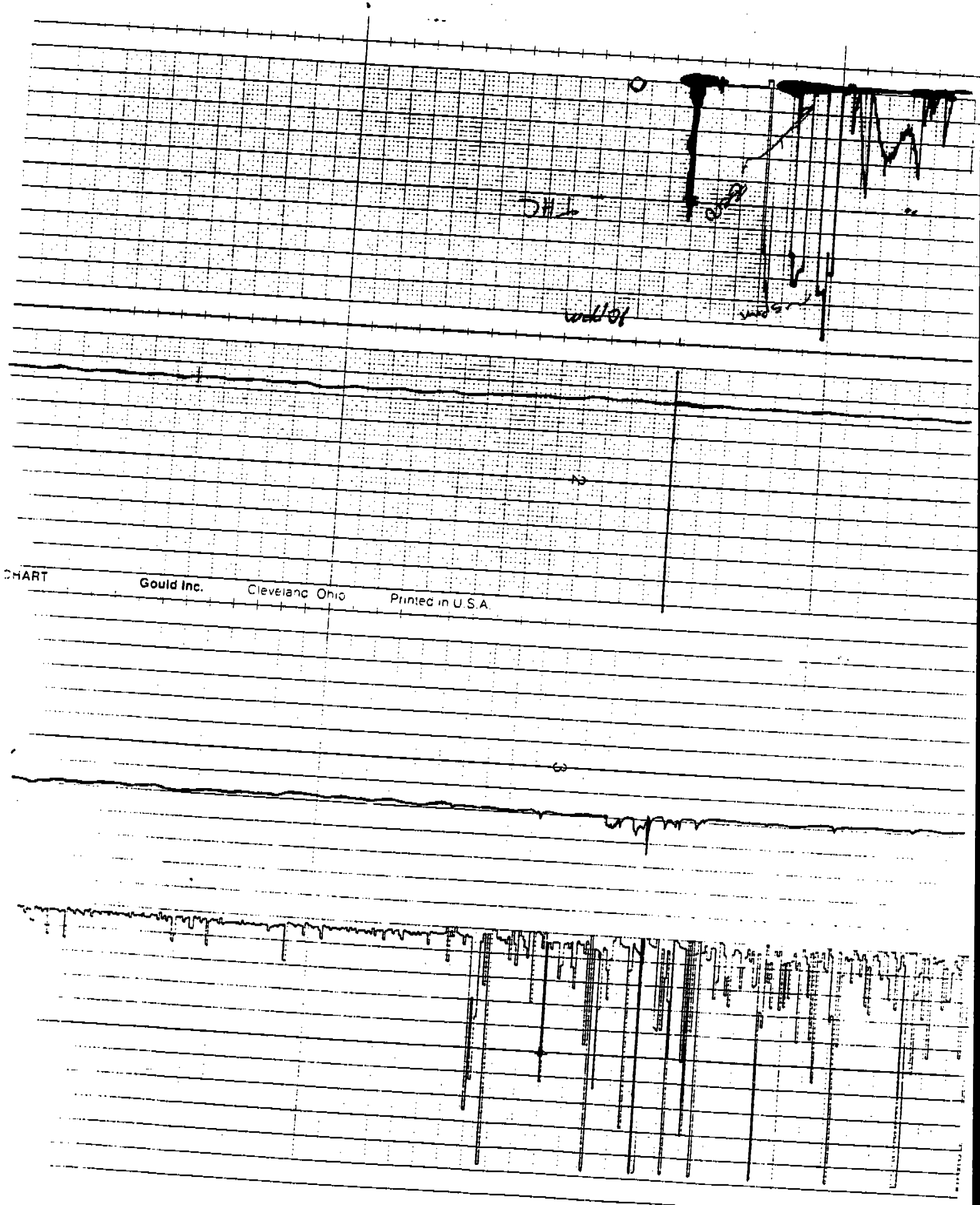
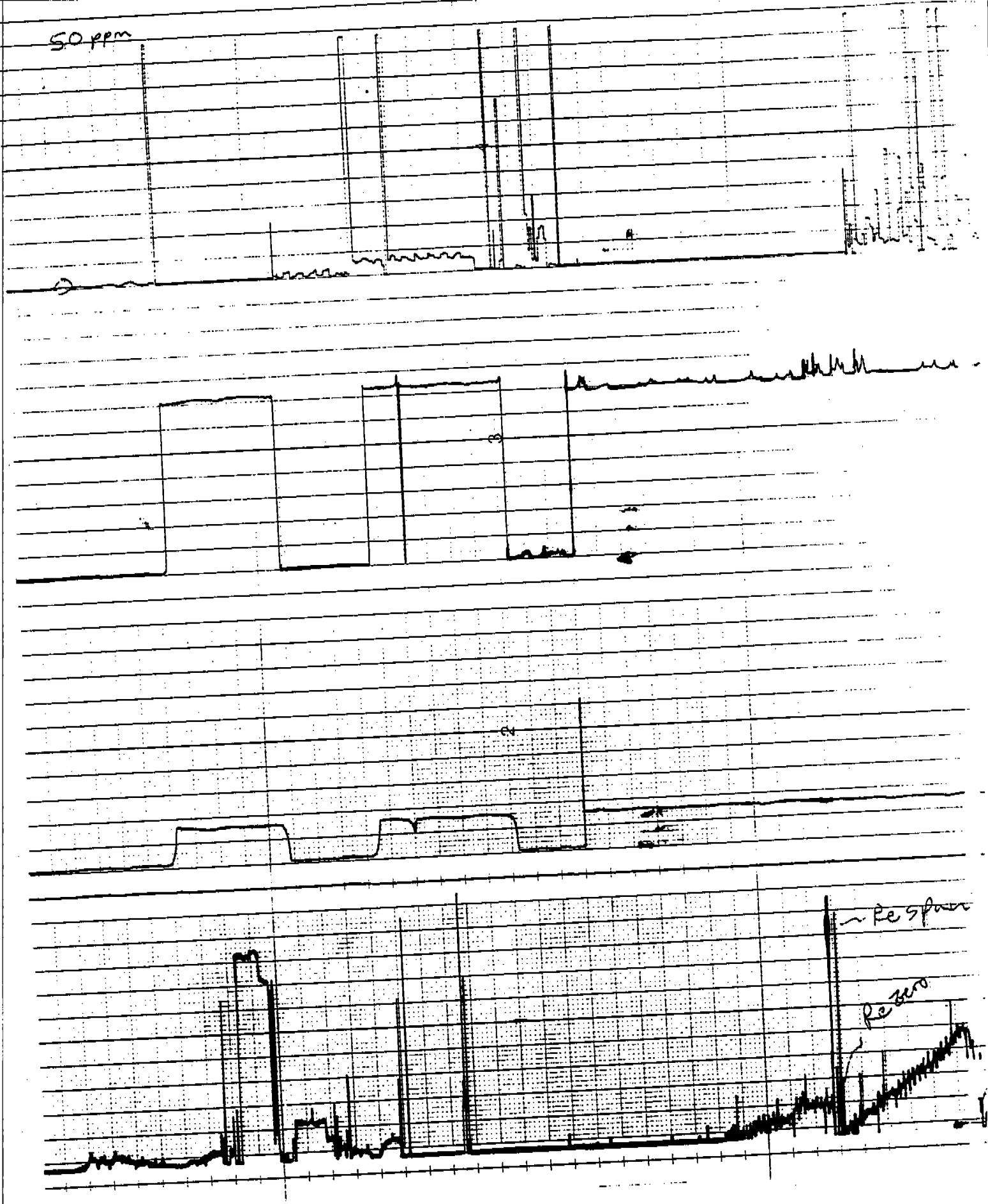
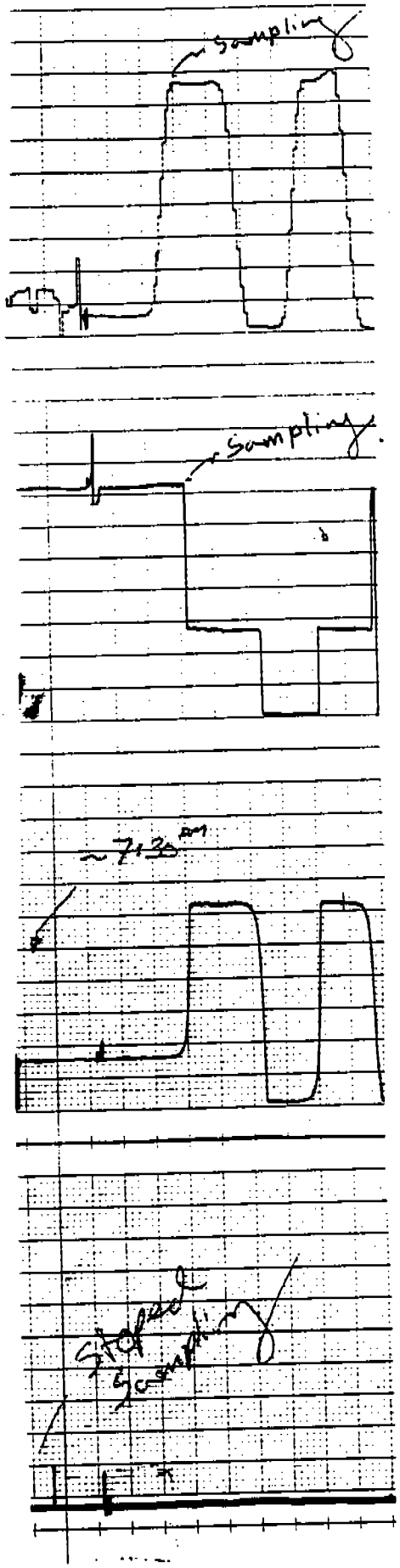
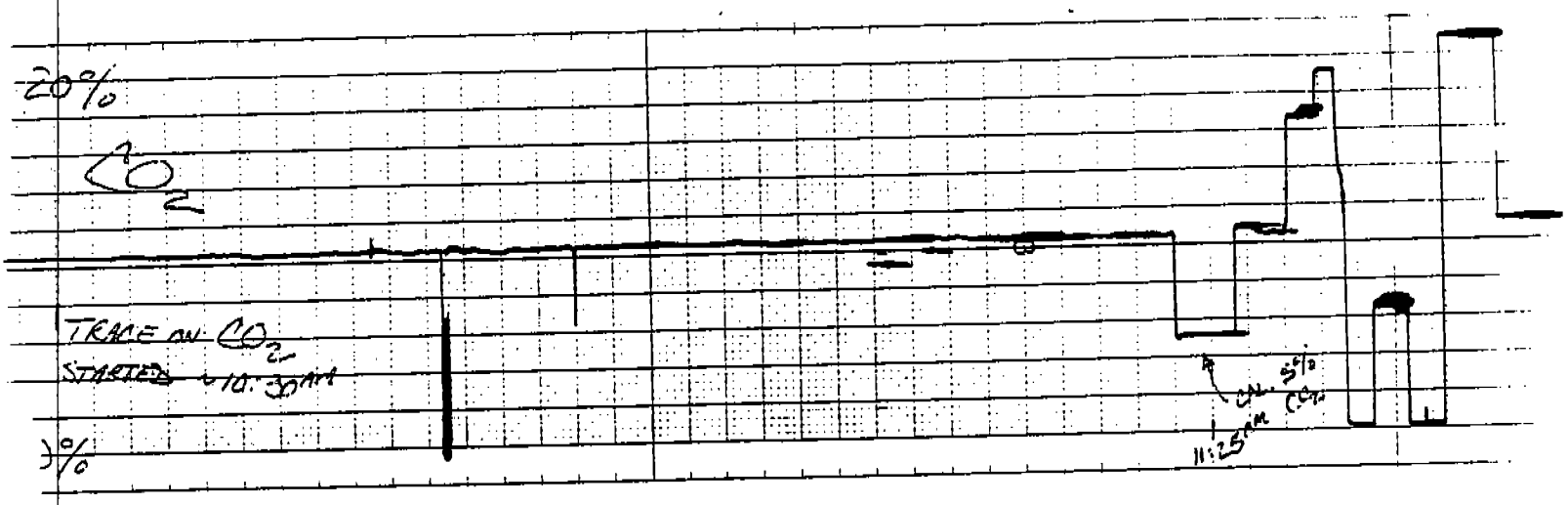


CHART
Gould Inc.
Cleveland Ohio
Printed in U.S.A.


50 ppm
Respon
Re zero

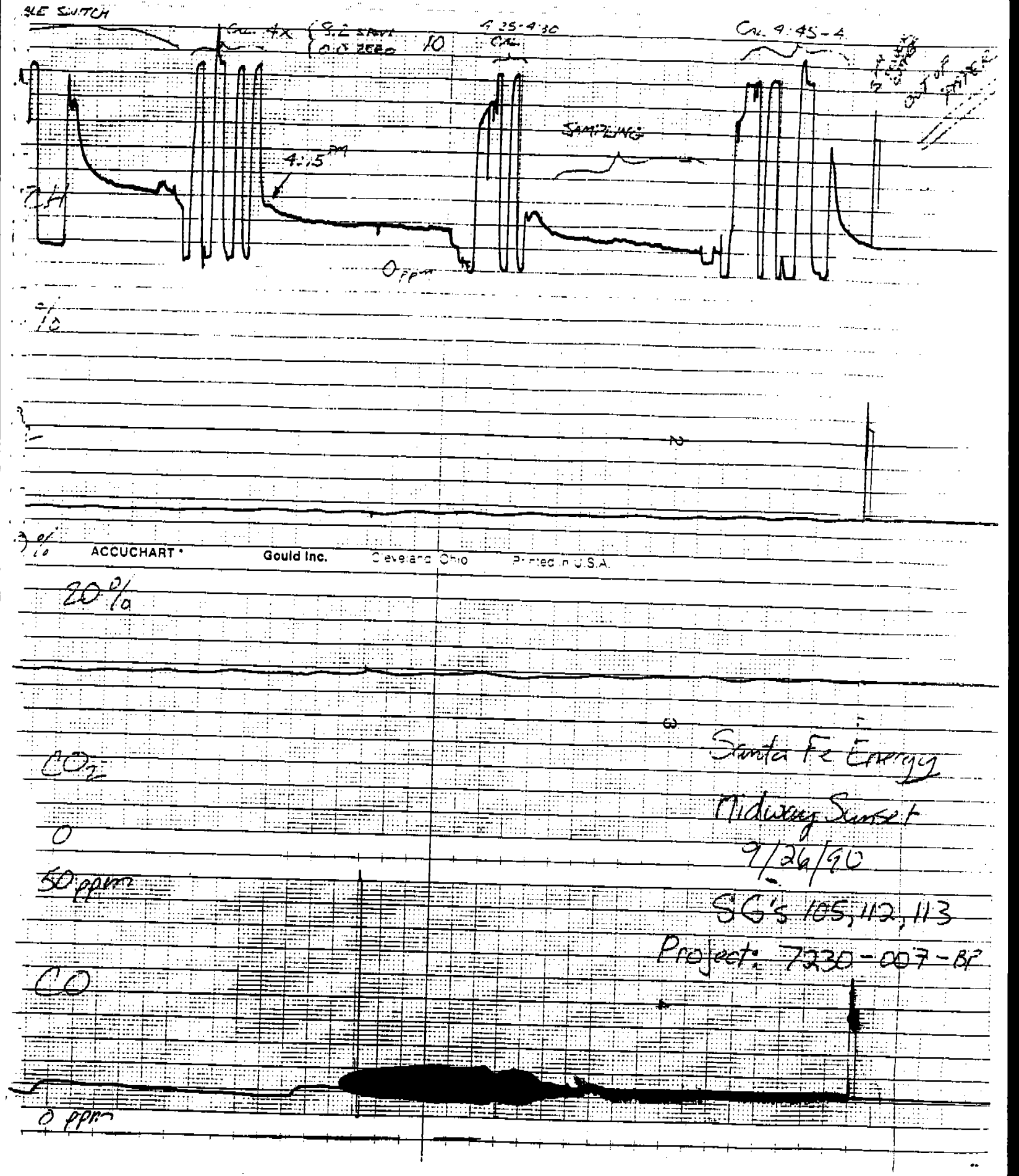

sampling
sampling
~7:35 PM


20%
CO_2
TRACE OF CO_2
STARTED @ 10:30AM
0%
11:25AM
5% CO_2

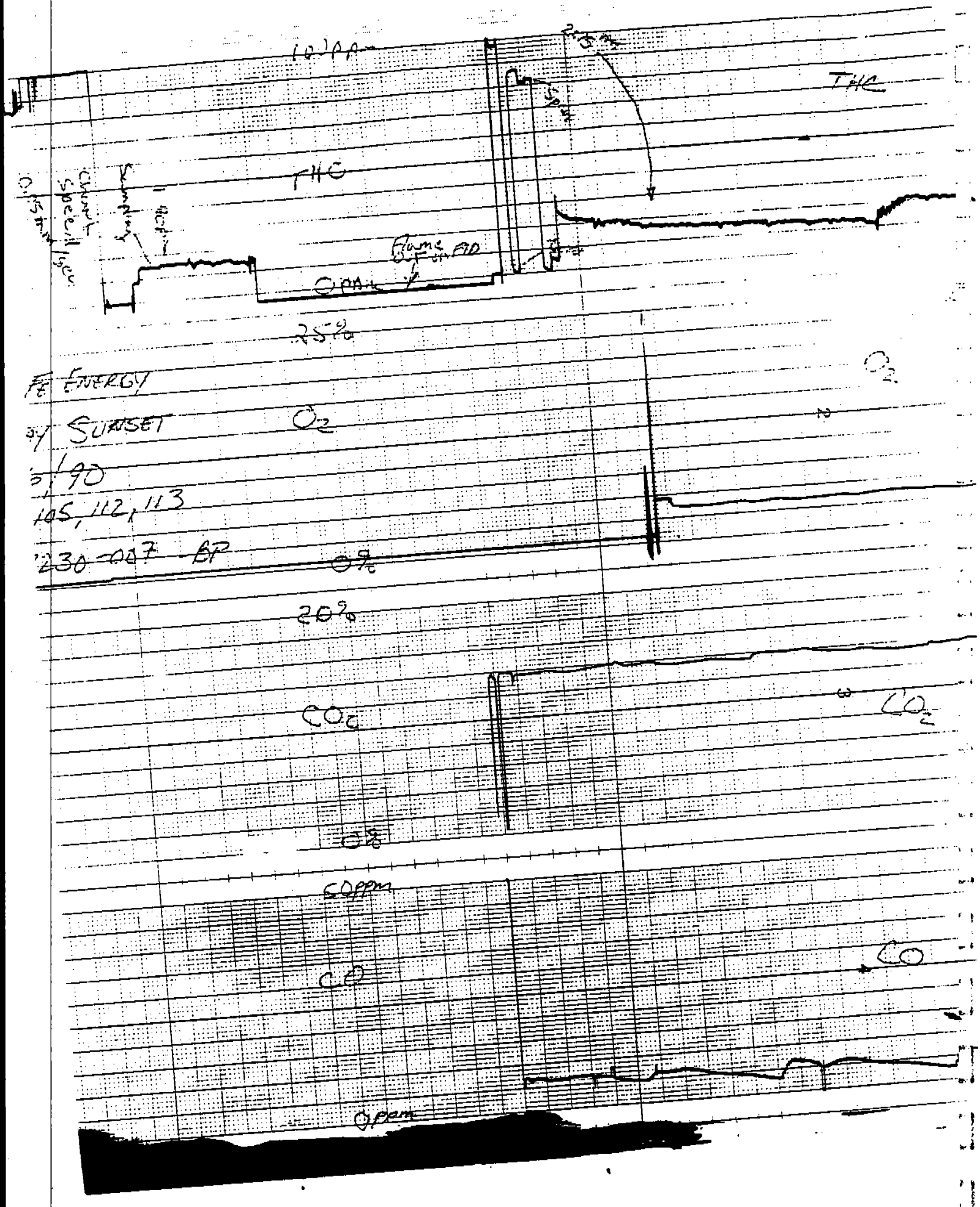
Site: Santa Fe

Source: Crude Oil-Fired Steam Generator

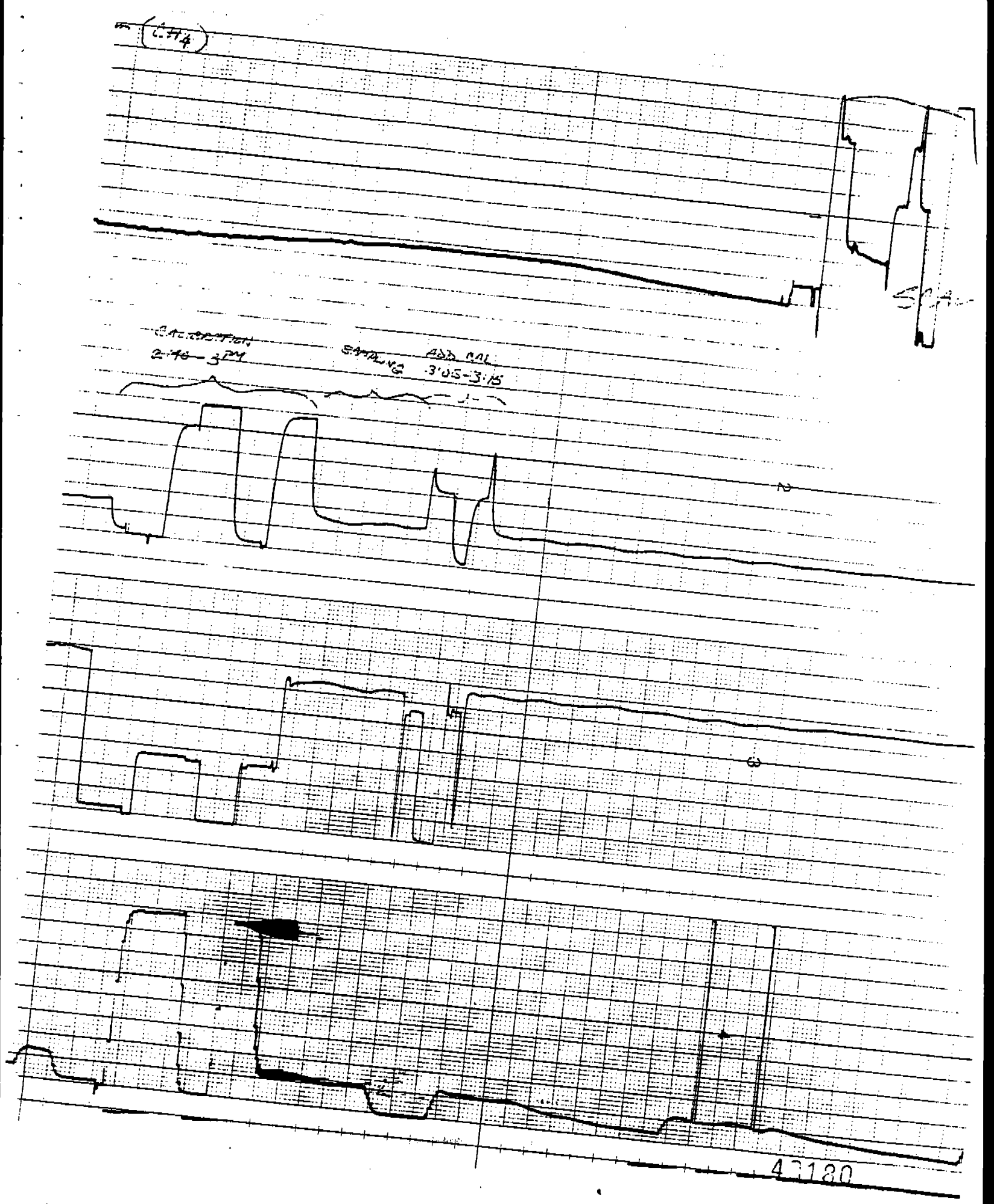
Date: September 26, 1990



SWITCH
Cal. 4x
10
4:25-4:30
Cal.
Cal. 4:45-4
SAMPLING
4:15 PM
0 ppm
ACCUCHART
Gould Inc.
Cleveland Ohio
Printed in U.S.A.
20%
CO_2
0
50 ppm
CO
0 ppm
Santa Fe Energy
Midway Sunset
9/26/90
SG's 105, 112, 113
Project: 7230-007-BP



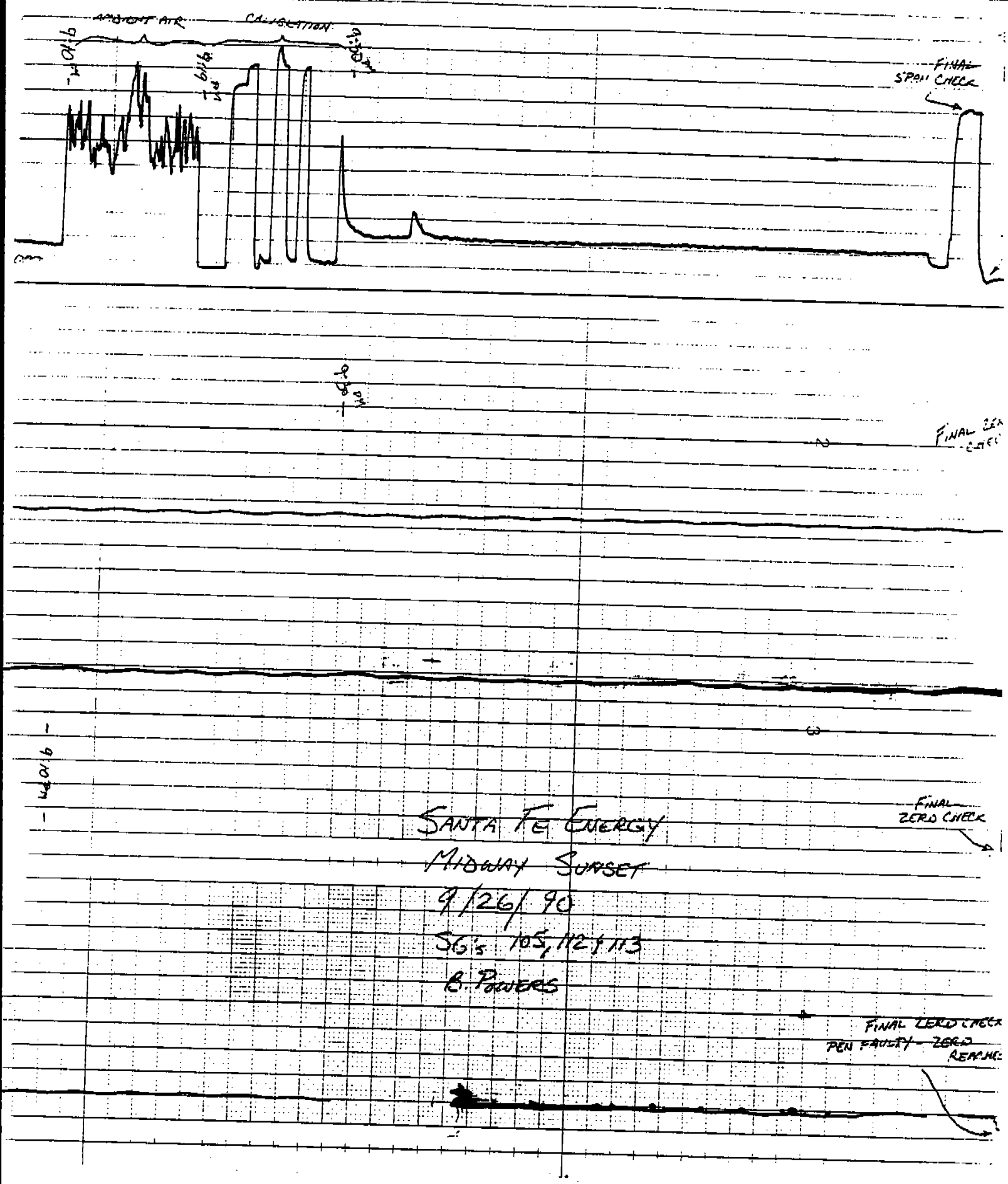
FE ENERGY
SUNSET
/90
105, 112, 113
230-007 BP

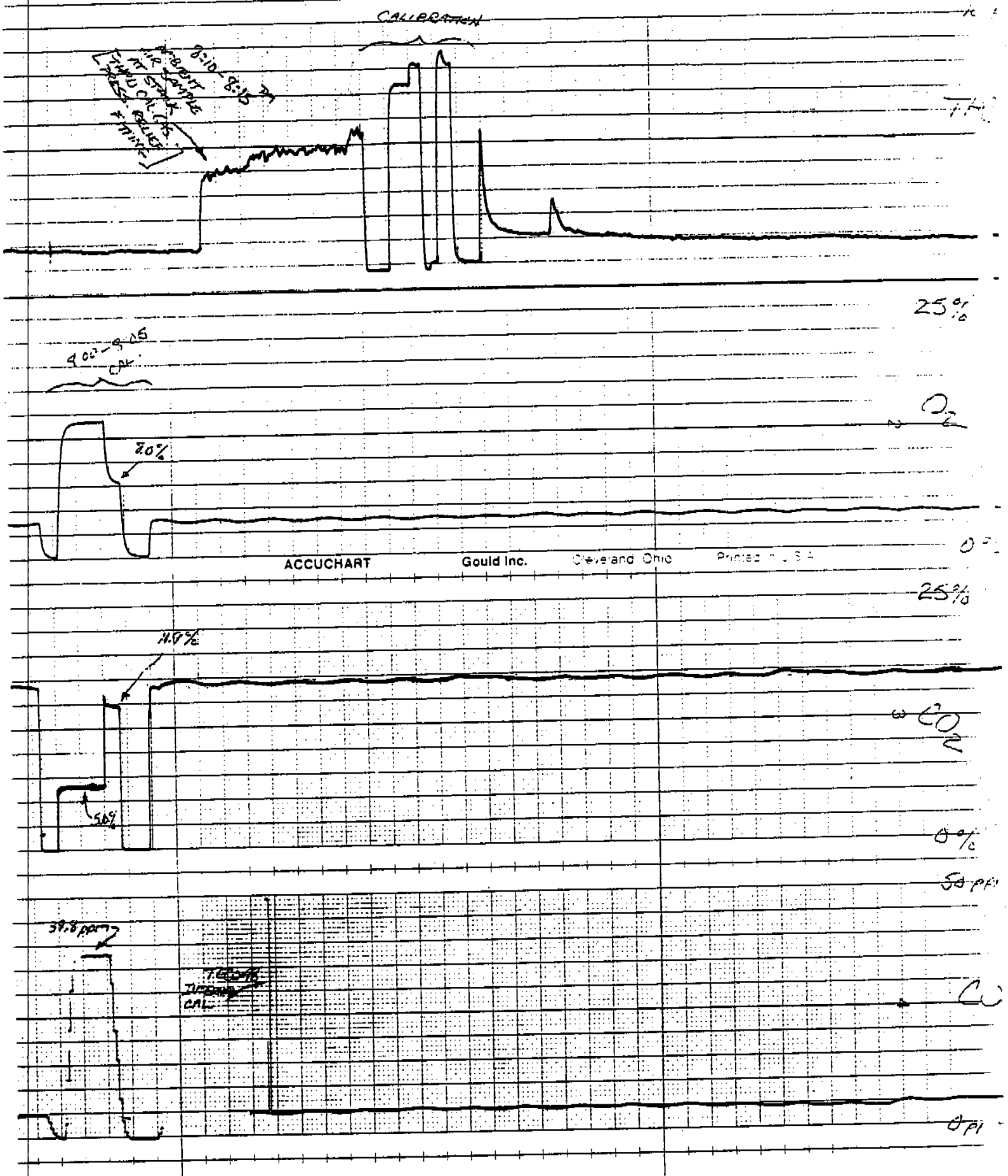

(CH4)
CALIBRATION
2:40 - 3PM
SAMPLING
ADD CAL
3:05-3:15
2
3
4
4 3180

Site: Santa Fe

Source: Crude Oil-Fired Steam Generator

Date: September 26, 1990


AMBIENT AIR
CALIBRATION
FINAL SPAN CHECK
FINAL ZERO CHECK
SANTA FE ENERGY
MIDWAY SUNSET
9/26/90
SG's 105, 112 & 113
B. POWERS
FINAL ZERO CHECK
PEN FAULTY - ZERO


CALIBRATION
8:10-8:15 PM
AMBIENT AIR SAMPLE AT STACK THRU CAL GAS PRESS. RELIEF FITTING
25%
9:00-9:05 CAL
8.0%
O2
ACCUCHART
Gould Inc.
Cleveland Ohio
25%
11.9%
CO2
5.0%
0%
50 ppm
39.8 ppm
CAL
CO
0 ppm

THC

0 ppm

25 %

O_2

0 %

20 %

CO_2

0 %

50 ppm

CO

0 ppm