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/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

Background Report Reference

AP-42 Section Number: 11.23

Background Chapter: 4

Reference Number: 41

Title: Results of the January 7-9, 1992 Engineering Scrubber Performance Tests at the Cyprus Northshore Mining Facility in Silver Bay, MN

Interpoll Laboratories, IncInterpoll Laboratories, Inc

Interpoll Laboratories, IncInterpoll Laboratories, Inc

February 1992

AP-42 Section 11.23
Reference —
Report Sect. 4
Reference 41

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020
FAX: (612) 786-7854

RESULTS OF THE JANUARY 7 - 9, 1992 ENGINEERING SCRUBBER PERFORMANCE TESTS AT THE CYPRUS NORTHSHORE MINING FACILITY IN SILVER BAY, MINNESOTA

Submitted to:

CYPRUS NORTHSHORE MINING
10 Outer Drive
Silver Bay, Minnesota 55614

Attention:

Dennis Wagner

Approved by:

Daniel Despen
Manager
Field Testing Support Group

Report Number 2-3480
February 6, 1992
KE/kce

REF : BL 4-41

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020
FAX: (612) 786-7854

RESULTS OF THE JANUARY 7 - 9, 1992 ENGINEERING SCRUBBER PERFORMANCE TESTS AT THE CYPRUS NORTHSHORE MINING FACILITY IN SILVER BAY, MINNESOTA

Submitted to:

CYPRUS NORTHSHORE MINING
10 Outer Drive
Silver Bay, Minnesota 55614

Attention:

Dennis Wagner

Approved by:

Daniel Despen
Manager
Field Testing Support Group

Report Number 2-3480
February 6, 1992
KE/kce

TABLE OF CONTENTS

ABBREVIATIONS

ACFM	actual cubic feet per minute
cc (ml)	cubic centimeter (milliliter)
DSCFM	standard cubic foot of dry gas per minute
DSML	dry standard milliliter
DEG-F (^{0}F)	degrees Fahrenheit
DIA.	diameter
FP	finished product for plant
FT/SEC	feet per second
g	gram
GPM	gallons per minute
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g/dscm	grams per dry standard cubic meter
HP	horsepower
HRS	hours
IN.	inches
IN.HG.	inches of mercury
IN.WC.	inches of water
LB	pound
LB/DSCF	pounds per dry standard cubic foot
LB/HR	pounds per hour
LB/10^6BTU	pounds per million British Thermal Units heat input
LB/MMBTU	pounds per million British Thermal Units heat input
LTPD	long tons per day
MW	megawatt
mg/DSCM	milligrams per dry standard cubic meter
microns (um)	micrometer
MIN.	minutes
ng	nanograms
ohm-cm	ohm-centimeter
PM	particulate matter
PPH	pounds per hour
PPM	parts per million
ppmC	parts per million carbon
ppm,d	parts per million, dry
ppm,w	parts per million, wet
ppt	parts per trillion
PSI	pounds per square inch
SQ.FT.	square feet
ug	micrograms
v/v	percent by volume
w/w	percent by weight
<	$\leq$ (when following a number)

Standard conditions are defined as 68 ^{0}F (20 ^{0}C) and 29.92 IN. of mercury pressure.

1 INTRODUCTION

During the Period January 7 - 9, 1992 Interpoll Laboratories personnel conducted engineering removal efficiency tests on two pelletizer wet ESPs at the Cyprus Northshore Mining facility in Silver Bay, Minnesota. On-site testing was performed by D. Van Hoever, D. Brennan, B. Aschenbach and J. Bergstrom. Coordination between testing activities and plant operation was provided by Dennis Wagner.

Evaluations were performed simultaneously at the Inlet and Outlet of each ESP in accordance with EPA Methods 2, 4, 6 and 7, CFR Title 40, Part 60, Appendix A (revised July 1, 1991). The sulfur dioxide, hydrogen chloride and hydrogen fluoride determinations were conducted using a modified version of EPA Method 6 with 1 N NaOH for sample collection at 0.75 cfm with analysis for sulfate, chloride and fluoride after peroxidation by ion chromatography as per EPA Method 300.0.

The oxides of nitrogen samples were also collected simultaneously at the ESP Inlet and Outlet using an all-glass Method 7 sampling train. A heated stainless steel probe was used to extract the samples from the exhaust stream. A plug of glass-wool was used in the end of the probe to remove particulate material.

The NO_x samples were collected in volume-calibrated two-liter all-glass flasks. An aliquot of 25 cc of absorbing solution was added to each flask on-site; the flask was closed; inserted into the sampling train; and evacuated. The probe was then purged and the sample collected over a 15 second interval. The flask was then closed; the flask removed from the sampling train; shook for two minutes and then secured for transport to the laboratory.

Upon arrival at the laboratory, the NO_x samples are logged in, placed in a designated area and maintained at 72 ^0F for 24 hours to allow

completion of the conversion of NO to NO_2 and absorption in the acidified peroxide reagent. The flasks are then shook to complete absorption; attached to a mercury manometer and the static pressure and temperature recorded. The samples are then recovered and analyzed by ion chromatography.

An integrated flue gas sample was extracted simultaneously with each sulfur dioxide and oxides of nitrogen sample using a specially designed gas sampling system. Integrated flue gas samples were collected in 44-liter Tedlar bags housed in a protective aluminum container. After sampling was complete, the bags were sealed and returned to the laboratory for Orsat analysis. Prior to sampling, the Tedlar bags are leak checked at 15 IN.HG. vacuum with an in-line rotameter. Bags with any detectable inleakage are discarded.

Testing on the Hood Exhaust ESP Inlet was conducted from a set of four test ports situated horizontally on a vertical section of rectangular ducting. Testing on the Hood Exhaust Stack was conducted from two test ports oriented at 90 degrees. A 24-point traverse was used to conduct the volumetric flow rate determinations at each test site. A 3-point traverse was used at each test site to perform the acid gas determinations. Each traverse point was sampled for 20 minutes for a total of 60 minutes per run.

Testing on the Waste Gas ESP Inlet was conducted from a set of five test ports situated horizontally on a vertical section of rectangular ducting. Testing on the Waste Gas Stack was conducted from two test ports oriented at 90 degrees. A 25-point traverse was used at the Inlet test site and a 24-point traverse was used at the Outlet to conduct the volumetric flow rate determinations. A 3-point traverse was used at each test site to perform the acid gas determinations. Each traverse point was sampled for 20 minutes for a total of 60 minutes per run.

The important results of the test are summarized in Section 2. Detailed results are presented in Section 3. Field data and all other supporting information are presented in the appendices.

2 SUMMARY AND DISCUSSION

The results of the engineering removal efficiency tests are summarized in Tables 1 - 4 of this section.

No difficulties were encountered in the field or in the laboratory evaluation of the samples. On the basis of this fact and a complete review of the entire data and results, it is our opinion that the results reported herein are accurate and closely reflect the actual values which existed at the time the test was performed.

Table 1. Summary of the January 7 - 9, 1992 Sulfur Dioxide Determinations at the Cyprus Northshore Mining Facility in Silver Bay, Minnesota.

Run	Concentration (ppm,d) Inlet	Stack	Mass Rate (LB/HR) Inlet	Stack	Removal Efficiency(%)
(Hood Exhaust - January 7)					
1	17	1	9.9	0.77	92.2
2	5	1	3.0	0.60	80.0
3	3	1	1.9	0.60	68.4
Avg.	8	1	4.9	0.66	80.2
(Hood Exhaust - January 9)					
1	6	1	3.8	0.62	83.7
2	5	2	3.0	1.37	54.3
3	6	2	3.7	1.38	62.7
Avg.	6	2	3.5	1.12	66.9
(No. 12 Waste Gas)					
1	3	1	1.8	0.59	67.2
2	2	1	1.3	0.59	54.6
3	2	1	1.1	0.59	46.4
Avg.	2	1	1.4	0.59	56.1

Table 2. Summary of the January 7 - 9, 1992 Hydrogen Chloride Determinations at the Cyprus Northshore Mining Facility in Silver Bay, Minnesota.

Run	Concentration (ppm,d) Inlet	Stack	Mass Rate (LB/HR) Inlet	Stack	Removal Efficiency(%)
(Hood Exhaust - January 7)					
1	67	4.4	23	1.5	93.4
2	16	3.7	5.4	0.9	83.3
3	10	3.6	3.5	0.9	74.3
Avg.	31	3.9	11	1.1	83.7
(Hood Exhaust - January 9)					
1	6.7	0.3	2.4	0.1	95.8
2	6.9	0.4	2.5	0.1	96.0
3	6.6	0.5	2.4	0.1	95.8
Avg.	6.7	0.4	2.4	0.1	95.9
(No. 12 Waste Gas)					
1	21	0.6	7.1	0.2	97.2
2	21	0.6	6.9	0.2	97.1
3	21	0.6	6.9	0.2	97.1
Avg.	21	0.6	7.0	0.2	97.1

Table 3. Summary of the January 7 - 9, 1992 Hydrogen Fluoride Determinations at the Cyprus Northshore Mining Facility in Silver Bay, Minnesota.

Run	Concentration (ppm,d) Inlet	Stack	Mass Rate (LB/HR) Inlet	Stack	Removal Efficiency(%)
(Hood Exhaust - January 7)					
1	12	0.72	2.2	0.14	93.6
2	16	1.4	3.1	0.27	91.3
3	18	1.9	3.4	0.35	89.7
Avg.	15	1.3	2.9	0.25	91.5
(Hood Exhaust - January 9)					
1	9.4	1.1	1.8	0.22	87.8
2	14	1.9	2.7	0.36	86.7
3	15	2.1	2.9	0.40	86.2
Avg.	13	1.7	2.5	0.33	86.9
(No. 12 Waste Gas)					
1	16	1.9	3.0	0.36	88.0
2	15	1.4	2.8	0.25	91.1
3	12	3.1	2.2	0.57	74.1
Avg.	14	2.1	7.0	0.39	84.4

Table 4. Summary of the January 7 - 9, 1992 Oxides of Nitrogen Determinations at the Cyprus Northshore Mining Facility in Silver Bay, Minnesota.

Run	Concentration (ppm,d) Inlet	Stack	Mass Rate (LB/HR) Inlet	Stack	Removal Efficiency(%)
(Hood Exhaust - January 7)					
1	19	20	8.2	8.8	(7.3)
2	18	20	7.8	8.6	(10.2)
3	19	20	8.0	8.5	(6.25)
Avg.	19	20	8.0	8.6	(7.9)
(Hood Exhaust - January 9)					
1	20	21	8.8	9.3	(5.7)
2	20	23	8.8	10	(13.6)
3	21	23	9.3	10	(7.5)
Avg.	20	22	9.0	9.8	(8.9)
(No. 12 Waste Gas)					
1	89	90	37	38	(2.7)
2	90	89	37	37	0
3	85	94	36	39	(8.3)
Avg.	88	91	96	38	(3.7)

3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas composition (Orsat and moisture) is presented first followed by the computer printouts of the sulfur dioxide, hydrogen chloride, hydrogen fluoride and oxides of nitrogen determinations.

The results have been calculated on an IBM personal computer using programs written in Extended BASIC specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these programs. The emission rates have been calculated using the product of the concentration times flow method.

3.1 Results of Orsat and Moisture Analysis

Test No. 1
Hood Exhaust Inlet

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

Date of run	Run 1 01-07-92	Run 2 01-07-92	Run 3 01-07-92
Dry basis (orsat)			
carbon dioxide.....	0.30	0.30	0.30
oxygen.....	19.70	19.80	19.80
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	80.00	79.90	79.90
Wet basis (orsat)			
carbon dioxide.....	0.28	0.28	0.28
oxygen.....	18.10	18.57	18.59
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	73.49	74.95	75.01
water vapor.....	8.14	6.19	6.12
Dry molecular weight.....	28.84	28.84	28.84
Wet molecular weight.....	27.95	28.17	28.18
Specific gravity.....	0.966	0.973	0.973
FO	4.000	3.667	3.667

Test No. 1
Hood Exhaust Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	01-07-92	01-07-92	01-07-92
Dry basis (orsat)			
carbon dioxide.....	0.30	0.30	0.30
oxygen.....	19.80	19.80	19.80
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	79.90	79.90	79.90
Wet basis (orsat)			
carbon dioxide.....	0.27	0.27	0.27
oxygen.....	17.75	17.74	17.67
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	71.65	71.58	71.29
water vapor.....	10.33	10.41	10.77
Dry molecular weight.....	28.84	28.84	28.84
Wet molecular weight.....	27.72	27.71	27.67
Specific gravity.....	0.958	0.957	0.956
FO	3.667	3.667	3.667

Test No. 2
Waste Gas Inlet

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	01-08-92	01-08-92	01-08-92
Dry basis (orsat)			
carbon dioxide.....	1.40	1.50	1.50
oxygen.....	17.30	17.30	17.30
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	81.30	81.20	81.20
Wet basis (orsat)			
carbon dioxide.....	1.29	1.39	1.37
oxygen.....	15.88	16.08	15.78
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	74.65	75.47	74.05
water vapor.....	8.18	7.06	8.81
Dry molecular weight.....	28.92	28.93	28.93
Wet molecular weight.....	28.02	28.16	27.97
Specific gravity.....	0.968	0.973	0.966
FO	2.571	2.400	2.400

Test No. 2
No. 12 Waste Gas Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	01-08-92	01-08-92	01-08-92
Dry basis (orsat)			
carbon dioxide.....	1.40	1.50	1.50
oxygen.....	17.30	17.30	17.30
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	81.30	81.20	81.20
Wet basis (orsat)			
carbon dioxide.....	1.16	1.24	1.23
oxygen.....	14.29	14.33	14.21
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	67.18	67.28	66.70
water vapor.....	17.37	17.14	17.86
Dry molecular weight.....	28.92	28.93	28.93
Wet molecular weight.....	27.02	27.06	26.98
Specific gravity.....	0.933	0.935	0.932
FO	2.571	2.400	2.400

Test No. 3
Hood Exhaust Inlet

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

Date of run	Run 1 01-09-92	Run 2 01-09-92	Run 3 01-09-92
Dry basis (orsat)			
carbon dioxide.....	0.30	0.30	0.30
oxygen.....	19.60	19.60	19.60
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	80.10	80.10	80.10
Wet basis (orsat)			
carbon dioxide.....	0.28	0.27	0.27
oxygen.....	18.00	17.93	17.92
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	73.56	73.27	73.25
water vapor.....	8.16	8.53	8.55
Dry molecular weight.....	28.83	28.83	28.83
Wet molecular weight.....	27.95	27.91	27.91
Specific gravity.....	0.965	0.964	0.964
FO	4.333	4.333	4.333

Test No. 3
Hood Exhaust Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	01-09-92	01-09-92	01-09-92
Dry basis (orsat)			
carbon dioxide.....	0.30	0.40	0.40
oxygen.....	19.70	19.60	19.60
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	80.00	80.00	80.00
Wet basis (orsat)			
carbon dioxide.....	0.27	0.36	0.35
oxygen.....	17.48	17.53	17.37
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	70.99	71.57	70.89
water vapor.....	11.26	10.54	11.39
Dry molecular weight.....	28.84	28.85	28.85
Wet molecular weight.....	27.62	27.70	27.61
Specific gravity.....	0.954	0.957	0.954
FO	4.000	3.250	3.250

3.2 Results of Sulfur Dioxide Determinations

Test No. 1
Hood Exhaust Inlet

Results of Sulfur Dioxide Determinations----------Method 6

	Run 1	Run 2	Run 3
Date of run	01-07-91	01-07-91	01-07-91
Time run start/end.....(HRS)	815/ 915	930/1030	1045/1145
Barometric pressure..(IN.HG)	29.71	29.71	29.71
Meter temperature....(DEG-F)	85.33	89.09	89.94
Meter correction coefficient	0.9981	0.9981	0.9981
Volume through gas meter....			
at meter conditions...(CF)	45.640	46.200	46.110
standard conditions..(SCF)	43.974	44.205	44.051
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	8.26	6.20	6.13
Volumetric flow rate (DSCFM)	60200	60200	60200
Oxygen content....(%V/V DRY)	0.00	0.00	0.00
Milliequivalents of SO4 in..			
gas sample.....	1.71	0.53	0.32
Sulfur dioxide concentration			
(GR/DSCF).....	0.0192	0.0059	0.0036
(MG/DSCM).....	44	13	8
(PPM-DRY).....	17	5	3
(PPM-WET).....	15	5	3
SO2 Emission rate....(LB/HR)	9.92	3.03	1.85

Test No. 1
Hood Exhaust Stack

Results of Sulfur Dioxide Determinations----------Method 6

	Run 1	Run 2	Run 3
Date of run	01-07-92	01-07-92	01-07-92
Time run start/end.....(HRS)	815/ 915	930/1030	1045/1145
Barometric pressure..(IN.HG)	29.39	29.39	29.39
Meter temperature....(DEG-F)	64.20	68.83	69.83
Meter correction coefficient	0.9920	0.9920	0.9920
Volume through gas meter....			
at meter conditions...(CF)	44.450	44.840	44.850
standard conditions..(SCF)	43.806	43.804	43.731
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	10.33	10.41	10.77
Volumetric flow rate (DSCFM)	60200	60200	60200
Oxygen content....(%V/V DRY)	0.00	0.00	0.00
Milliequivalents of SO4 in..			
gas sample.....	0.13	0.09	0.07
Sulfur dioxide concentration			
(GR/DSCF).....	0.0015	0.0012	0.0012
(MG/DSCM).....	3	3	3
(PPM-DRY).....	1	1	1
(PPM-WET).....	1	1	1
SO2 Emission rate....(LB/HR)	0.77	0.60	0.60

Test No. 2
No. 12 Waste Gas Inlet

Results of Sulfur Dioxide Determinations----------Method 6

	Run 1	Run 2	Run 3
Date of run	01-08-92	01-08-92	01-08-92
Time run start/end.....(HRS)	800/ 900	915/1015	1030/1130
Barometric pressure..(IN.HG)	29.28	29.28	29.28
Meter temperature....(DEG-F)	114.10	117.10	118.40
Meter correction coefficient	0.9981	0.9981	0.9981
Volume through gas meter....			
at meter conditions...(CF)	46.885	46.981	47.375
standard conditions..(SCF)	42.291	42.157	42.415
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	8.19	7.07	8.82
Volumetric flow rate (DSCFM)	58700	58700	58700
Oxygen content....(%V/V DRY)	0.00	0.00	0.00
Milliequivalents of SO4 in..			
gas sample.....	0.30	0.22	0.18
Sulfur dioxide concentration			
(GR/DSCF).....	0.0036	0.0025	0.0021
(MG/DSCM).....	8	6	5
(PPM-DRY).....	3	2	2
(PPM-WET).....	3	2	2
SO2 Emission rate....(LB/HR)	1.79	1.27	1.06

Test No. 2
No. 12 Waste Gas Stack

Results of Sulfur Dioxide Determinations----------Method 6

	Run 1	Run 2	Run 3
Date of run	01-08-92	01-08-92	01-08-92
Time run start/end.....(HRS)	800/ 900	915/1015	1030/1130
Barometric pressure..(IN.HG)	29.10	29.10	29.10
Meter temperature....(DEG-F)	95.58	90.33	93.54
Meter correction coefficient	0.9920	0.9920	0.9920
Volume through gas meter....			
at meter conditions...(CF)	46.300	46.350	46.240
standard conditions..(SCF)	42.629	43.082	42.731
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	17.37	17.14	17.86
Volumetric flow rate (DSCFM)	58700	58700	58700
Oxygen content....(%V/V DRY)	0.00	0.00	0.00
Milliequivalents of SO4 in..			
gas sample.....	0.00	0.00	0.00
Sulfur dioxide concentration			
(GR/DSCF).....	0.0012	0.0012	0.0012
(MG/DSCM).....	3	3	3
(PPM-DRY).....	1	1	1
(PPM-WET).....	1	1	1
SO2 Emission rate....(LB/HR)	0.59	0.59	0.59

Test No. 3
Hood Exhaust Inlet

Results of Sulfur Dioxide Determinations----------Method 6

	Run 1	Run 2	Run 3
Date of run	01-09-92	01-09-92	01-09-92
Time run start/end.....(HRS)	800/ 900	915/1015	1030/1130
Barometric pressure..(IN.HG)	29.20	29.20	29.20
Meter temperature....(DEG-F)	108.30	108.75	108.75
Meter correction coefficient	0.9981	0.9981	0.9981
Volume through gas meter....			
at meter conditions...(CF)	46.722	46.753	46.668
standard conditions..(SCF)	42.458	42.453	42.376
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	8.16	8.53	8.55
Volumetric flow rate (DSCFM)	62500	62500	62500
Oxygen content....(%V/V DRY)	0.00	0.00	0.00
Milliequivalents of SO4 in..			
gas sample.....	0.61	0.48	0.60
Sulfur dioxide concentration			
(GR/DSCF).....	0.0070	0.0056	0.0070
(MG/DSCM).....	16	13	16
(PPM-DRY).....	6	5	6
(PPM-WET).....	6	4	5
SO2 Emission rate....(LB/HR)	3.77	3.01	3.73

Test No. 3
Hood Exhaust Stack

Results of Sulfur Dioxide Determinations----------Method 6

	Run 1	Run 2	Run 3
Date of run	01-09-92	01-09-92	01-09-92
Time run start/end.....(HRS)	800/ 900	915/1015	1030/1130
Barometric pressure..(IN.HG)	29.08	29.08	29.08
Meter temperature....(DEG-F)	76.79	84.00	89.50
Meter correction coefficient	0.9920	0.9920	0.9920
Volume through gas meter....			
at meter conditions...(CF)	46.030	45.990	46.520
standard conditions..(SCF)	43.834	43.216	43.276
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	11.26	10.54	11.39
Volumetric flow rate (DSCFM)	62500	62500	62500
Oxygen content....(%V/V DRY)	0.00	0.00	0.00
Milliequivalents of SO4 in..			
gas sample.....	0.00	0.22	0.23
Sulfur dioxide concentration			
(GR/DSCF).....	0.0012	0.0026	0.0026
(MG/DSCM).....	3	6	6
(PPM-DRY).....	1	2	2
(PPM-WET).....	1	2	2
SO2 Emission rate....(LB/HR)	0.62	1.37	1.38

3.3 Results of Hydrogen Chloride Determinations

Interpoll Labs Report No. 2-3480
Cyprus Northshore Mining
Silver Bay, Minnesota

Test No. 1
Hood Exhaust Inlet

Results of HCl Determinations ----------

	Run 1	Run 2	Run 3
Date of run	01-07-92	01-07-92	01-07-92
Time run start/end.....(HRS)	0815-0915	0930-1030	1045-1145
Barometric pressure..(IN.HG)	29.71	29.71	29.71
Meter temperature....(DEG-F)	85.33	89.08	89.94
Meter correction coefficient	0.9981	0.9981	0.9981
Volume through gas meter.... at meter conditions...(CF)	46.340	46.200	46.110
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	8.14	6.19	6.12
Volumetric flow rate (DSCFM)	60200	60200	60200
HCl in sample.....(mG)	127.5	30.0	19.1
HCl concentration.....			
(GR/DSCF).....	0.0442	0.0105	0.0067
(MG/DSCM).....	101.3	24.1	15.4
(PPM-WET).....	61.4	14.9	9.5
(PPM-DRY).....	66.8	15.9	10.2
(PPM-DRY @ 7% O2).....	779.9	202.3	129.3
HCl emission rate....(LB/HR)	22.8	5.4	3.5

HCl = Hydrogen chloride

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 1
Hood Exhaust Stack

Results of HCl Determinations ----------

	Run 1	Run 2	Run 3
Date of run	01-07-92	01-07-92	01-07-92
Time run start/end.....(HRS)	0815-0915	0930-1030	1045-1145
Barometric pressure..(IN.HG)	29.39	29.39	29.39
Meter temperature....(DEG-F)	64.20	68.83	69.83
Meter correction coefficient	0.9920	0.9920	0.9920
Volume through gas meter.... at meter conditions...(CF)	44.450	44.840	44.850
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	10.33	10.41	10.77
Volumetric flow rate (DSCFM)	60200	60200	60200
HCl in sample.....(uG)	8227.45	4987.89	4782.20
HCl concentration.....			
(GR/DSCF).....	0.0029	0.0018	0.0017
(MG/DSCM).....	6.7	4.0	3.9
(PPM-WET).....	3.9	2.4	2.3
(PPM-DRY).....	4.4	2.7	2.6
(PPM-DRY @ 7% O2).....	55.9	33.9	32.6
HCl emission rate....(LB/HR)	1.5	0.9	0.9

HCl = Hydrogen chloride

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 2
No. 12 Waste Gas Inlet

Results of HCl Determinations

	Run 1	Run 2	Run 3
Date of run	01-08-92	01-08-92	01-08-92
Time run start/end.....(HRS)	0800-0900	0915-1015	1030-1130
Barometric pressure..(IN.HG)	29.28	29.28	29.28
Meter temperature....(DEG-F)	114.10	117.10	118.40
Meter correction coefficient	0.9981	0.9981	0.9981
Volume through gas meter.... at meter conditions...(CF)	46.885	46.981	47.375
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	8.18	7.06	8.81
Volumetric flow rate (DSCFM)	58700	58700	58700
HCl in sample.....(mG)	38.6	37.2	37.7
HCl concentration.....			
(GR/DSCF).....	0.0141	0.0137	0.0138
(MG/DSCM).....	32.4	31.3	31.6
(PPM-WET).....	19.6	19.2	19.0
(PPM-DRY).....	21.3	20.7	20.8
(PPM-DRY @ 7% O2).....	83.0	80.4	81.0
HCl emission rate....(LB/HR)	7.1	6.9	6.9

HCl = Hydrogen chloride

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 2
No. 12 Waste Gas Stack

Results of HCl Determinations ----------

	Run 1	Run 2	Run 3
Date of run	01-08-92	01-08-92	01-08-92
Time run start/end.....(HRS)	0800-0900	0915-1015	1030-1130
Barometric pressure..(IN.HG)	29.10	29.10	29.10
Meter temperature....(DEG-F)	95.58	90.33	93.54
Meter correction coefficient	0.9920	0.9920	0.9920
Volume through gas meter.... at meter conditions...(CF)	46.300	46.350	46.240
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	17.37	17.14	17.86
Volumetric flow rate (DSCFM)	58700	58700	58700
HCl in sample.....(uG)	1141.56	1100.42	1141.56
HCl concentration.....			
(GR/DSCF).....	0.0004	0.0004	0.0004
(MG/DSCM).....	1.0	0.9	0.9
(PPM-WET).....	0.5	0.5	0.5
(PPM-DRY).....	0.6	0.6	0.6
(PPM-DRY @ 7% O2).....	2.4	2.3	2.4
HCl emission rate....(LB/HR)	0.2	0.2	0.2

HCl = Hydrogen chloride

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 3
Hood Exhaust Inlet

Results of HCl Determinations

	Run 1	Run 2	Run 3
Date of run	01-09-92	01-09-92	01-09-92
Time run start/end.....(HRS)	0800-0900	0915-1015	1030-1130
Barometric pressure..(IN.HG)	29.20	29.20	29.20
Meter temperature....(DEG-F)	108.30	108.75	108.75
Meter correction coefficient	0.9981	0.9981	0.9981
Volume through gas meter.... at meter conditions...(CF)	46.722	46.753	46.668
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	8.16	8.53	8.55
Volumetric flow rate (DSCFM)	62500	62500	62500
HCl in sample.....(mG)	12.2	12.5	12.0
HCl concentration.....			
(GR/DSCF).....	0.0045	0.0046	0.0044
(MG/DSCM).....	10.2	10.5	10.1
(PPM-WET).....	6.2	6.3	6.1
(PPM-DRY).....	6.7	6.9	6.6
(PPM-DRY @ 7% O2).....	72.7	74.5	71.6
HCl emission rate....(LB/HR)	2.4	2.5	2.4

HCl = Hydrogen chloride

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 3
Hood Exhaust Stack

Results of HCl Determinations ----------

	Run 1	Run 2	Run 3
Date of run	01-09-92	01-09-92	01-09-92
Time run start/end.....(HRS)	0800-0900	0915-1015	1030-1130
Barometric pressure..(IN.HG)	29.08	29.08	29.08
Meter temperature....(DEG-F)	76.79	84.00	89.50
Meter correction coefficient	0.9920	0.9920	0.9920
Volume through gas meter.... at meter conditions...(CF)	46.030	45.990	46.520
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	11.26	10.54	11.39
Volumetric flow rate (DSCFM)	62500	62500	62500
HCl in sample.....(uG)	492.62	683.91	858.74
HCl concentration.....			
(GR/DSCF).....	0.0002	0.0002	0.0003
(MG/DSCM).....	0.4	0.6	0.7
(PPM-WET).....	0.2	0.3	0.4
(PPM-DRY).....	0.3	0.4	0.5
(PPM-DRY @ 7% O2).....	3.1	4.0	5.0
HCl emission rate....(LB/HR)	0.1	0.1	0.2

HCl = Hydrogen chloride

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

3.4 Results of Hydrogen Fluoride Determinations

Test No. 1
Hood Exhaust Inlet

Results of HF Determinations ----------

	Run 1	Run 2	Run 3
Date of run	01-07-92	01-07-92	01-07-92
Time run start/end.....(HRS)	0815-0915	0930-1030	1045-1145
Barometric pressure..(IN.HG)	29.71	29.71	29.71
Meter temperature....(DEG-F)	85.33	89.08	89.94
Meter correction coefficient	0.9981	0.9981	0.9981
Volume through gas meter.... at meter conditions...(CF)	46.340	46.200	46.110
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	8.14	6.19	6.12
Volumetric flow rate (DSCFM)	60200	60200	60200
HF in sample.....(mG)	12.34	17.08	18.66
HF concentration.....			
(GR/DSCF).....	0.0043	0.0060	0.0066
(MG/DSCM).....	9.81	13.71	15.03
(PPM-DRY).....	11.79	16.48	18.07
(PPM-WET).....	10.83	15.46	16.96
HF emission rate.....(LB/HR)	2.210	3.088	3.386

HF = Hydrogen fluoride

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 1
Hood Exhaust Stack

Results of HF Determinations ----------

	Run 1	Run 2	Run 3
Date of run	01-07-92	01-07-92	1-07-92
Time run start/end.....(HRS)	0815-0915	0930-1030	045-1145
Barometric pressure..(IN.HG)	29.39	29.39	29.39
Meter temperature....(DEG-F)	64.20	68.83	69.83
Meter correction coefficient	0.9920	0.9920	0.9920
Volume through gas meter.... at meter conditions...(CF)	44.450	44.840	44.850
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	10.33	10.41	10.77
Volumetric flow rate (DSCFM)	60200	60200	60200
HF in sample.....(uG)	737.10	1463.67	1937.52
HF concentration.....			
(GR/DSCF).....	0.0003	0.0005	0.0007
(MG/DSCM).....	0.60	1.19	1.57
(PPM-DRY).....	0.72	1.43	1.89
(PPM-WET).....	0.64	1.28	1.69
HF emission rate.....(LB/HR)	0.135	0.267	0.354

HF = Hydrogen fluoride

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 2
No. 12 Waste Gas Inlet

Results of HF Determinations ----------

	Run 1	Run 2	Run 3
Date of run	01-08-92	01-08-92	01-08-92
Time run start/end.....(HRS)	0800-0900	0915-1015	1030-1130
Barometric pressure..(IN.HG)	29.28	29.28	29.28
Meter temperature....(DEG-F)	114.10	117.10	118.40
Meter correction coefficient	0.9981	0.9981	0.9981
Volume through gas meter.... at meter conditions...(CF)	46.885	46.981	47.375
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	8.18	7.06	8.81
Volumetric flow rate (DSCFM)	58700	58700	58700
HF in sample.....(mG)	16.32	15.16	12.21
HF concentration.....			
(GR/DSCF).....	0.0060	0.0056	0.0045
(MG/DSCM).....	13.69	12.76	10.22
(PPM-DRY).....	16.46	15.34	12.28
(PPM-WET).....	15.12	14.26	11.20
HF emission rate.....(LB/HR)	3.008	2.804	2.245

HF = *Hydrogen fluoride*

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 2
No. 12 Waste Gas Stack

Results of HF Determinations ----------

	Run 1	Run 2	Run 3
Date of run	01-08-92	01-08-92	01-08-92
Time run start/end.....(HRS)	0800-0900	0915-1015	11030-1130
Barometric pressure..(IN.HG)	29.10	29.10	29.10
Meter temperature....(DEG-F)	95.58	90.33	93.54
Meter correction coefficient	0.9920	0.9920	0.9920
Volume through gas meter.... at meter conditions...(CF)	46.300	46.350	46.240
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	17.37	17.14	17.86
Volumetric flow rate (DSCFM)	58700	58700	58700
HF in sample.....(uG)	1948.05	1368.90	3106.35
HF concentration.....			
(GR/DSCF).....	0.0007	0.0005	0.0011
(MG/DSCM).....	1.62	1.13	2.58
(PPM-DRY).....	1.95	1.36	3.10
(PPM-WET).....	1.61	1.12	2.55
HF emission rate.....(LB/HR)	0.356	0.248	0.567

HF = Hydrogen fluoride

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 3
Hood Exhaust Inlet

Results of HF Determinations ----------

	Run 1	Run 2	Run 3
Date of run	01-09-92	01-09-92	01-09-92
Time run start/end.....(HRS)	0800-0900	0915-1015	1030-1130
Barometric pressure..(IN.HG)	29.20	29.20	29.20
Meter temperature....(DEG-F)	108.30	108.75	108.50
Meter correction coefficient	0.9981	0.9981	0.9981
Volume through gas meter.... at meter conditions...(CF)	46.722	46.751	46.668
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	8.16	8.53	8.55
Volumetric flow rate (DSCFM)	62500	62500	62500
HF in sample.....(uG)	9371.70	%13689.00	%14952.60
HF concentration.....			
(GR/DSCF).....	0.0034	0.0050	0.0055
(MG/DSCM).....	7.83	11.44	12.52
(PPM-DRY).....	9.42	13.75	15.04
(PPM-WET).....	8.65	12.58	13.76
HF emission rate.....(LB/HR)	1.832	2.676	2.927

HF = Hydrogen fluoride

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 3
Hood Exhaust Stack

Results of HF Determinations ----------

	Run 1	Run 2	Run 3
Date of run	01-09-92	01-09-92	01-09-92
Time run start/end.....(HRS)	0800-0900	0915-1015	1030-1130
Barometric pressure..(IN.HG)	29.08	29.08	29.08
Meter temperature....(DEG-F)	76.79	84.00	89.50
Meter correction coefficient	0.9920	0.9920	0.9920
Volume through gas meter.... at meter conditions...(CF)	46.030	45.990	46.520
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	11.26	10.54	11.39
Volumetric flow rate (DSCFM)	62500	62500	62500
HF in sample.....(uG)	1158.30	1895.40	2106.00
HF concentration.....			
(GR/DSCF).....	0.0004	0.0007	0.0008
(MG/DSCM).....	0.94	1.56	1.73
(PPM-DRY).....	1.13	1.87	2.08
(PPM-WET).....	1.00	1.67	1.84
HF emission rate.....(LB/HR)	0.219	0.364	0.404

HF = Hydrogen fluoride

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

3.5 Results of Oxides of Nitrogen Determinations

Test No. 1
Hood Exhaust Inlet

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	01-07-91	01-07-91	01-07-91	01-07-91
Time of run.....(HRS)	822	835	850	905
Flask number.....	1	2	3	4
Volume of flask.....(ML)	2086	2063	2055	2116
Data: time of sampling				
flask temperature..(DEG-F)	80.00	80.00	79.00	78.00
bar. press.....(IN.HG)	29.71	29.71	29.71	29.71
flask vacuum.....(IN.HG)	28.87	28.88	28.87	28.89
flask abs. press...(IN.HG)	0.84	0.83	0.84	0.82
Data: Time of Flask Opening				
flask temperature..(DEG-F)	74.00	74.00	74.00	74.00
lab. bar. press....(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	-0.40	-0.50	0.20	-0.20
flask abs. press...(IN.HG)	28.71	28.61	29.31	28.91
Volume gas sampled....(DSML)	1898	1871	1910	1941
Moisture content.....(%V/V)	8.26	8.26	8.26	8.26
Nitrate in gas sample...(JG)	98.5	103.0	80.5	92.0
NO2 in gas sample.....(JG)	73.1	76.4	59.7	68.3
NOx Concentration				
(GR/DSCF).....	0.0168	0.0179	0.0137	0.0154
(MG/DSCM).....	39	41	31	35
(PPM-DRY).....	20	21	16	18
(PPM-WET).....	18	20	15	17
NOX Emission rate....(LB/HR)	8.68	9.21	7.05	7.93

Test No. 1
Hood Exhaust Inlet

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	01-07-91	01-07-91	01-07-91	01-07-91
Time of run.....(HRS)	935	950	1005	1020
Flask number.....	5	6	7	8
Volume of flask.....(ML)	2057	2100	2081	2088
Data: time of sampling				
flask temperature..(DEG-F)	78.00	78.00	79.00	79.00
bar. press.....(IN.HG)	29.71	29.71	29.71	29.71
flask vacuum.....(IN.HG)	28.90	28.92	28.92	29.20
flask abs. press...(IN.HG)	0.81	0.79	0.79	0.51
Data: Time of Flask Opening				
flask temperature..(DEG-F)	74.00	74.00	74.00	74.00
lab. bar. press....(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	-0.20	-0.10	0.60	-0.10
flask abs. press...(IN.HG)	28.91	29.01	29.71	29.01
Volume gas sampled....(DSML)	1887	1935	1965	1943
Moisture content.....(%V/V)	6.20	6.20	6.20	6.20
Nitrate in gas sample...(JG)	93.5	81.0	93.0	94.0
NO2 in gas sample.....(JG)	69.4	60.1	69.0	69.7
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0161	0.0136	0.0153	0.0157
(MG/DSCM).....	37	31	35	36
(PPM-DRY).....	19	16	18	19
(PPM-WET).....	18	15	17	18
NOX Emission rate....(LB/HR)	8.29	7.00	7.92	8.10

Test No. 1
Hood Exhaust Inlet

Results of Oxides of Nitrogen (NOx) Determinations----------Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	01-07-91	01-07-91	01-07-91	01-07-91
Time of run.....(HRS)	1050	1105	1120	1135
Flask number.....	9	10	11	12
Volume of flask.....(ML)	2080	2063	2062	2111
Data: time of sampling				
flask temperature..(DEG-F)	78.00	74.00	72.00	72.00
bar. press.....(IN.HG)	29.71	29.71	29.71	29.71
flask vacuum.....(IN.HG)	29.40	29.35	29.50	29.20
flask abs. press...(IN.HG)	0.31	0.36	0.21	0.51
Data: Time of Flask Opening				
flask temperature..(DEG-F)	74.00	74.00	74.00	74.00
lab. bar. press....(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	0.00	-0.10	0.10	0.00
flask abs. press...(IN.HG)	29.11	29.01	29.21	29.11
Volume gas sampled....(DSML)	1955	1929	1951	1971
Moisture content.....(%V/V)	6.13	6.13	6.13	6.13
Nitrate in gas sample...(JG)	89.5	86.5	92.0	107.0
NO2 in gas sample.....(JG)	66.4	64.2	68.3	79.4
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0148	0.0145	0.0153	0.0176
(MG/DSCM).....	34	33	35	40
(PPM-DRY).....	18	17	18	21
(PPM-WET).....	17	16	17	20
NOX Emission rate....(LB/HR)	7.66	7.50	7.89	9.08

Test No. 1
Hood Exhaust Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	01-07-92	01-07-92	01-07-92	01-07-92
Time of run.....(HRS)	830	845	900	915
Flask number.....	13	14	15	16
Volume of flask.....(ML)	2060	2048	2045	2067
Data: time of sampling				
flask temperature..(DEG-F)	49.00	49.00	49.00	49.00
bar. press.....(IN.HG)	29.39	29.39	29.39	29.39
flask vacuum.....(IN.HG)	27.20	27.25	27.30	27.25
flask abs. press...(IN.HG)	2.19	2.14	2.09	2.14
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press....(IN.HG)	29.03	29.03	29.03	29.03
flask static press.(IN.HG)	1.30	1.00	0.90	1.00
flask abs. press...(IN.HG)	30.33	30.03	29.93	30.03
Volume gas sampled....(DSML)	1892	1864	1858	1882
Moisture content.....(%V/V)	10.33	10.33	10.33	10.33
Nitrate in gas sample...(UG)	99.5	97.5	99.5	99.0
NO2 in gas sample.....(UG)	73.8	72.3	73.8	73.5
NOx Concentration				
(GR/DSCF).....	0.0171	0.0170	0.0174	0.0171
(MG/DSCM).....	39	39	40	39
(PPM-DRY).....	20	20	21	20
(PPM-WET).....	18	18	19	18
NOX Emission rate....(LB/HR)	8.80	8.75	8.96	8.80

Test No. 1
Hood Exhaust Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	01-07-92	01-07-92	01-07-92	01-07-92
Time of run.....(HRS)	930	945	1000	1015
Flask number.....	17	18	19	20
Volume of flask.....(ML)	2054	2045	2069	2060
Data: time of sampling				
flask temperature..(DEG-F)	49.00	50.00	50.00	50.00
bar. press.....(IN.HG)	29.39	29.39	29.39	29.39
flask vacuum.....(IN.HG)	27.20	27.30	27.30	27.30
flask abs. press...(IN.HG)	2.19	2.09	2.09	2.09
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press....(IN.HG)	29.03	29.03	29.03	29.03
flask static press.(IN.HG)	1.40	1.40	1.00	1.20
flask abs. press...(IN.HG)	30.43	30.43	30.03	30.23
Volume gas sampled....(DSML)	1893	1892	1888	1893
Moisture content.....(%V/V)	10.41	10.41	10.41	10.41
Nitrate in gas sample...(µG)	104.0	103.0	92.0	89.5
NO2 in gas sample.....(µG)	77.2	76.4	68.3	66.4
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0178	0.0177	0.0158	0.0153
(MG/DSCM).....	41	40	36	35
(PPM-DRY).....	21	21	19	18
(PPM-WET).....	19	19	17	16
NOX Emission rate....(LB/HR)	9.19	9.11	8.16	7.91

Test No. 1
Hood Exhaust Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	01-07-92	01-07-92	01-07-92	01-07-92
Time of run.....(HRS)	1045	1100	1115	1135
Flask number.....	21	22	23	24
Volume of flask.....(ML)	2068	2031	2056	2031
Data: time of sampling				
flask temperature..(DEG-F)	50.00	50.00	50.00	50.00
bar. press.....(IN.HG)	29.39	29.39	29.39	29.39
flask vacuum.....(IN.HG)	27.30	27.30	27.30	27.25
flask abs. press...(IN.HG)	2.09	2.09	2.09	2.14
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press....(IN.HG)	29.03	29.03	29.03	29.03
flask static press.(IN.HG)	1.00	1.20	1.10	0.90
flask abs. press...(IN.HG)	30.03	30.23	30.13	29.93
Volume gas sampled....(DSML)	1887	1866	1882	1842
Moisture content.....(%V/V)	10.77	10.77	10.77	10.77
Nitrate in gas sample...(JG)	97.0	98.0	98.5	88.5
NO2 in gas sample.....(JG)	72.0	72.7	73.1	65.7
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0167	0.0170	0.0170	0.0156
(MG/DSCM).....	38	39	39	36
(PPM-DRY).....	20	20	20	19
(PPM-WET).....	18	18	18	17
NOX Emission rate....(LB/HR)	8.60	8.79	8.76	8.04

Test No. 2
No. 12 Waste Gas Inlet

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	01-08-92	01-08-92	01-08-92	01-08-92
Time of run.....(HRS)	800	815	830	845
Flask number.....	34	37	38	40
Volume of flask.....(ML)	2071	2054	2056	2093
Data: time of sampling				
flask temperature..(DEG-F)	86.00	86.00	86.00	86.00
bar. press.....(IN.HG)	29.28	29.28	29.28	29.28
flask vacuum.....(IN.HG)	28.20	28.05	28.35	28.40
flask abs. press...(IN.HG)	1.08	1.23	0.93	0.88
Data: Time of Flask Opening				
flask temperature..(DEG-F)	74.00	74.00	74.00	74.00
lab. bar. press....(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	-1.30	1.00	-0.70	-1.40
flask abs. press...(IN.HG)	27.81	30.11	28.41	27.71
Volume gas sampled....(DSML)	1808	1938	1845	1834
Moisture content.....(%V/V)	8.19	8.19	8.19	8.19
Nitrate in gas sample...(JG)	430.0	408.0	417.0	439.0
NO2 in gas sample.....(JG)	319.1	302.7	309.4	325.7
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0771	0.0683	0.0733	0.0776
(MG/DSCM).....	176	156	168	178
(PPM-DRY).....	92	82	88	93
(PPM-WET).....	85	75	81	85
NOX Emission rate....(LB/HR)	38.80	34.36	36.87	39.05

Test No. 2
No. 12 Waste Gas Inlet

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	01-08-92	01-08-92	01-08-92	01-08-92
Time of run.....(HRS)	915	930	945	1000
Flask number.....	41	42	55	56
Volume of flask.....(ML)	2076	2094	2086	2069
Data: time of sampling				
flask temperature..(DEG-F)	86.00	86.00	86.00	86.00
bar. press.....(IN.HG)	29.28	29.28	29.28	29.28
flask vacuum.....(IN.HG)	28.30	28.25	28.45	28.35
flask abs. press...(IN.HG)	0.98	1.03	0.83	0.93
Data: Time of Flask Opening				
flask temperature..(DEG-F)	74.00	74.00	74.00	74.00
lab. bar. press....(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	-1.40	-1.40	-1.50	-1.50
flask abs. press...(IN.HG)	27.71	27.71	27.61	27.61
Volume gas sampled....(DSML)	1812	1825	1824	1803
Moisture content.....(%V/V)	7.07	7.07	7.07	7.07
Nitrate in gas sample...(JG)	414.0	415.0	431.0	415.0
NO2 in gas sample.....(JG)	307.2	307.9	319.8	307.9
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0741	0.0737	0.0766	0.0746
(MG/DSCM).....	169	169	175	171
(PPM-DRY).....	89	88	92	89
(PPM-WET).....	82	82	85	83
NOX Emission rate....(LB/HR)	37.27	37.10	38.54	37.55

Test No. 2
No. 12 Waste Gas Inlet

Results of Oxides of Nitrogen (NOx) Determinations----------Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	01-08-92	01-08-92	01-08-92	01-08-92
Time of run.....(HRS)	1030	1045	1100	1115
Flask number.....	57	58	59	60
Volume of flask.....(ML)	2062	2085	2077	2066
Data: time of sampling				
flask temperature..(DEG-F)	86.00	86.00	86.00	86.00
bar. press.....(IN.HG)	29.28	29.28	29.28	29.28
flask vacuum.....(IN.HG)	28.25	28.40	28.80	28.75
flask abs. press...(IN.HG)	1.03	0.88	0.48	0.53
Data: Time of Flask Opening				
flask temperature..(DEG-F)	74.00	74.00	74.00	74.00
lab. bar. press....(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	-1.90	-0.20	0.00	-1.30
flask abs. press...(IN.HG)	27.21	28.91	29.11	27.81
Volume gas sampled....(DSML)	1763	1909	1941	1840
Moisture content.....(%V/V)	8.82	8.82	8.82	8.82
Nitrate in gas sample...(JG)	398.0	413.0	409.0	412.0
NO2 in gas sample.....(JG)	295.3	306.4	303.5	305.7
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0732	0.0702	0.0683	0.0726
(MG/DSCM).....	167	161	156	166
(PPM-DRY).....	88	84	82	87
(PPM-WET).....	80	77	75	79
NOX Emission rate....(LB/HR)	36.83	35.30	34.37	36.53

Test No. 2
No. 12 Waste Gas Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	01-08-92	01-08-92	01-08-92	01-08-92
Time of run.....(HRS)	805	820	835	850
Flask number.....	43	44	45	46
Volume of flask.....(ML)	2088	2090	2086	2090
Data: time of sampling				
flask temperature..(DEG-F)	92.00	92.00	92.00	92.00
bar. press.....(IN.HG)	29.10	29.10	29.10	29.10
flask vacuum.....(IN.HG)	26.70	26.75	26.70	26.70
flask abs. press...(IN.HG)	2.40	2.35	2.40	2.40
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press....(IN.HG)	29.03	29.03	29.03	29.03
flask static press.(IN.HG)	-2.40	-2.60	-2.40	-2.10
flask abs. press...(IN.HG)	26.63	26.43	26.63	26.93
Volume gas sampled....(DSML)	1663	1655	1662	1686
Moisture content.....(%V/V)	17.37	17.37	17.37	17.37
Nitrate in gas sample...(JG)	392.0	385.0	378.0	391.0
NO2 in gas sample.....(JG)	290.9	285.7	280.5	290.1
NOx Concentration				
(GR/DSCF).....	0.0764	0.0754	0.0738	0.0752
(MG/DSCM).....	175	173	169	172
(PPM-DRY).....	91	90	88	90
(PPM-WET).....	76	75	73	74
NOX Emission rate....(LB/HR)	38.45	37.96	37.11	37.85

Test No. 2
No. 12 Waste Gas Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	01-08-92	01-08-92	01-08-92	01-08-92
Time of run.....(HRS)	915	930	945	1000
Flask number.....	48	35	49	50
Volume of flask.....(ML)	2102	2089	2088	2084
Data: time of sampling				
flask temperature..(DEG-F)	84.00	83.00	82.00	81.00
bar. press.....(IN.HG)	29.10	29.10	29.10	29.10
flask vacuum.....(IN.HG)	26.75	26.70	26.70	26.75
flask abs. press...(IN.HG)	2.35	2.40	2.40	2.35
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press....(IN.HG)	29.03	29.03	29.03	29.03
flask static press.(IN.HG)	-2.00	-1.90	0.70	-2.40
flask abs. press...(IN.HG)	27.03	27.13	29.73	26.63
Volume gas sampled....(DSML)	1703	1696	1873	1660
Moisture content.....(%V/V)	17.14	17.14	17.14	17.14
Nitrate in gas sample...(JG)	398.0	396.0	401.0	391.0
NO2 in gas sample.....(JG)	295.3	293.8	297.5	290.1
NOx Concentration				
(GR/DSCF).....	0.0758	0.0757	0.0694	0.0764
(MG/DSCM).....	173	173	159	175
(PPM-DRY).....	91	91	83	91
(PPM-WET).....	75	75	69	76
NOX Emission rate....(LB/HR)	38.12	38.10	34.94	38.42

Test No. 2
No. 12 Waste Gas Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	01-08-92	01-08-92	01-08-92	01-08-92
Time of run.....(HRS)	1030	1045	1100	1115
Flask number.....	51	52	53	54
Volume of flask.....(ML)	2064	2071	2083	2064
Data: time of sampling				
flask temperature..(DEG-F)	81.00	81.00	81.00	81.00
bar. press.....(IN.HG)	29.10	29.10	29.10	29.10
flask vacuum.....(IN.HG)	26.70	26.70	26.75	26.70
flask abs. press...(IN.HG)	2.40	2.40	2.35	2.40
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press....(IN.HG)	29.03	29.03	29.03	29.03
flask static press.(IN.HG)	-1.90	-2.00	-0.70	-0.90
flask abs. press...(IN.HG)	27.13	27.03	28.33	28.13
Volume gas sampled....(DSML)	1675	1674	1776	1742
Moisture content.....(%V/V)	17.86	17.86	17.86	17.86
Nitrate in gas sample...(JG)	423.0	413.0	406.0	408.0
NO2 in gas sample.....(JG)	313.9	306.4	301.2	302.7
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0819	0.0800	0.0741	0.0759
(MG/DSCM).....	187	183	170	174
(PPM-DRY).....	98	96	89	91
(PPM-WET).....	80	79	73	75
NOX Emission rate....(LB/HR)	41.21	40.26	37.31	38.20

Test No. 3
Hood Exhaust Inlet

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	01-09-92	01-09-92	01-09-92	01-09-92
Time of run.....(HRS)	805	820	835	850
Flask number.....	61	62	63	64
Volume of flask.....(ML)	2100	2079	2067	2087
Data: time of sampling				
flask temperature..(DEG-F)	80.00	76.00	78.00	77.00
bar. press.....(IN.HG)	29.20	29.20	29.20	29.20
flask vacuum.....(IN.HG)	26.80	26.75	26.80	26.70
flask abs. press...(IN.HG)	2.40	2.45	2.40	2.50
Data: Time of Flask Opening				
flask temperature..(DEG-F)	74.00	74.00	74.00	74.00
lab. bar. press....(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	0.60	0.70	0.60	-0.30
flask abs. press...(IN.HG)	29.71	29.81	29.71	28.81
Volume gas sampled....(DSML)	1874	1857	1843	1793
Moisture content.....(%V/V)	8.16	8.16	8.16	8.16
Nitrate in gas sample...(JG)	86.5	91.0	95.5	99.5
NO2 in gas sample.....(JG)	64.2	67.5	70.9	73.8
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0150	0.0159	0.0168	0.0180
(MG/DSCM).....	34	36	38	41
(PPM-DRY).....	18	19	20	22
(PPM-WET).....	16	17	18	20
NOX Emission rate....(LB/HR)	8.02	8.51	9.00	9.64

Test No. 3
Hood Exhaust Inlet

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	01-09-92	01-09-92	01-09-92	01-09-92
Time of run.....(HRS)	920	935	950	1005
Flask number.....	65	66	33	67
Volume of flask.....(ML)	2068	2096	2088	2073
Data: time of sampling				
flask temperature..(DEG-F)	74.00	72.00	76.00	74.00
bar. press.....(IN.HG)	29.20	29.20	29.20	29.20
flask vacuum.....(IN.HG)	26.70	26.70	26.70	26.70
flask abs. press...(IN.HG)	2.50	2.50	2.50	2.50
Data: Time of Flask Opening				
flask temperature..(DEG-F)	74.00	74.00	74.00	74.00
lab. bar. press....(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	-0.10	-0.30	0.00	-0.40
flask abs. press...(IN.HG)	29.01	28.81	29.11	28.71
Volume gas sampled....(DSML)	1789	1799	1814	1773
Moisture content.....(%V/V)	8.53	8.53	8.53	8.53
Nitrate in gas sample...(JG)	91.5	100.0	94.5	79.5
NO2 in gas sample.....(JG)	67.9	74.2	70.1	59.0
NOx Concentration				
(GR/DSCF).....	0.0166	0.0180	0.0169	0.0145
(MG/DSCM).....	38	41	39	33
(PPM-DRY).....	20	22	20	17
(PPM-WET).....	18	20	18	16
NOX Emission rate....(LB/HR)	8.88	9.65	9.05	7.79

Test No. 3
Hood Exhaust Inlet

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	01-09-92	01-09-92	01-09-92	01-09-92
Time of run.....(HRS)	1035	1050	1110	1120
Flask number.....	68	69	71	72
Volume of flask.....(ML)	2101	2069	2038	2092
Data: time of sampling				
flask temperature..(DEG-F)	77.00	78.00	75.00	76.00
bar. press.....(IN.HG)	29.20	29.20	29.20	29.20
flask vacuum.....(IN.HG)	26.80	26.80	26.90	26.75
flask abs. press...(IN.HG)	2.40	2.40	2.30	2.45
Data: Time of Flask Opening				
flask temperature..(DEG-F)	74.00	74.00	74.00	74.00
lab. bar. press....(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	-0.60	-0.50	-0.30	-0.60
flask abs. press...(IN.HG)	28.51	28.61	28.81	28.51
Volume gas sampled....(DSML)	1791	1771	1763	1780
Moisture content.....(%V/V)	8.55	8.55	8.55	8.55
Nitrate in gas sample...(JG)	99.5	97.0	89.5	93.5
NO2 in gas sample.....(JG)	73.8	72.0	66.4	69.4
NOx Concentration				
(GR/DSCF).....	0.0180	0.0178	0.0165	0.0170
(MG/DSCM).....	41	41	38	39
(PPM-DRY).....	22	21	20	20
(PPM-WET).....	20	19	18	19
NOX Emission rate....(LB/HR)	9.65	9.51	8.82	9.12

Test No. 3
Hood Exhaust Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	01-09-92	01-09-92	01-09-92	01-09-92
Time of run.....(HRS)	819	830	841	857
Flask number.....	73	74	75	76
Volume of flask.....(ML)	2065	2071	2066	2093
Data: time of sampling				
flask temperature..(DEG-F)	68.00	68.00	68.00	68.00
bar. press.....(IN.HG)	29.08	29.08	29.08	29.08
flask vacuum.....(IN.HG)	26.60	26.60	26.30	26.50
flask abs. press...(IN.HG)	2.48	2.48	2.78	2.58
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press....(IN.HG)	29.03	29.03	29.03	29.03
flask static press.(IN.HG)	-0.80	-1.10	-1.90	-0.90
flask abs. press...(IN.HG)	28.23	27.93	27.13	28.13
Volume gas sampled....(DSML)	1741	1725	1646	1751
Moisture content.....(%V/V)	11.26	11.26	11.26	11.26
Nitrate in gas sample...(JG)	88.5	93.5	91.5	92.0
NO2 in gas sample.....(JG)	65.7	69.4	67.9	68.3
NOx Concentration				
(GR/DSCF).....	0.0165	0.0176	0.0180	0.0170
(MG/DSCM).....	38	40	41	39
(PPM-DRY).....	20	21	22	20
(PPM-WET).....	18	19	19	18
NOX Emission rate....(LB/HR)	8.83	9.41	9.65	9.13

Test No. 3
Hood Exhaust Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	01-09-92	01-09-92	01-09-92	01-09-92
Time of run.....(HRS)	916	930	945	1000
Flask number.....	77	78	79	80
Volume of flask.....(ML)	2104	2077	2085	2105
Data: time of sampling				
flask temperature..(DEG-F)	68.00	68.00	68.00	68.00
bar. press.....(IN.HG)	29.08	29.08	29.08	29.08
flask vacuum.....(IN.HG)	26.45	26.50	26.55	26.60
flask abs. press...(IN.HG)	2.63	2.58	2.53	2.48
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press....(IN.HG)	29.03	29.03	29.03	29.03
flask static press.(IN.HG)	-1.50	-0.50	-0.20	-0.10
flask abs. press...(IN.HG)	27.53	28.53	28.83	28.93
Volume gas sampled....(DSML)	1715	1764	1795	1823
Moisture content.....(%V/V)	10.54	10.54	10.54	10.54
Nitrate in gas sample...(JG)	101.0	101.0	113.0	109.0
NO2 in gas sample.....(JG)	74.9	74.9	83.8	80.9
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0191	0.0186	0.0204	0.0194
(MG/DSCM).....	44	42	47	44
(PPM-DRY).....	23	22	24	23
(PPM-WET).....	20	20	22	21
NOX Emission rate....(LB/HR)	10.23	9.94	10.93	10.39

Test No. 3
Hood Exhaust Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	01-09-92	01-09-92	01-09-92	01-09-92
Time of run.....(HRS)	1030	1045	1100	1115
Flask number.....	81	82	83	84
Volume of flask.....(ML)	2093	2090	2060	2089
Data: time of sampling				
flask temperature..(DEG-F)	68.00	68.00	69.00	69.00
bar. press.....(IN.HG)	29.08	29.08	29.08	29.08
flask vacuum.....(IN.HG)	26.60	26.50	26.50	26.50
flask abs. press...(IN.HG)	2.48	2.58	2.58	2.58
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press....(IN.HG)	29.03	29.03	29.03	29.03
flask static press.(IN.HG)	-0.40	-0.20	-0.40	-0.40
flask abs. press...(IN.HG)	28.63	28.83	28.63	28.63
Volume gas sampled....(DSML)	1792	1796	1757	1782
Moisture content.....(%V/V)	11.39	11.39	11.39	11.39
Nitrate in gas sample...(JG)	108.0	104.0	102.0	109.0
NO2 in gas sample.....(JG)	80.1	77.2	75.7	80.9
NOx Concentration				
(GR/DSCF).....	0.0195	0.0188	0.0188	0.0198
(MG/DSCM).....	45	43	43	45
(PPM-DRY).....	23	22	23	24
(PPM-WET).....	21	20	20	21
NOX Emission rate....(LB/HR)	10.47	10.06	10.09	10.63

APPENDIX A

VOLUMETRIC FLOW RATE DETERMINATIONS

Interpoll Labs Report No. 2-3480
Cyprus Northshore
Silver Bay, Minnesota

Test No. 1
Hood Exhaust Inlet

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	01-07-92
Time of Determination.....(HRS)	735
Barometric pressure.....(IN.HG)	29.71
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Rectangular
Duct width.....(IN)	84
Duct length.....(IN)	113
Duct area.....(SQ.FT)	65.92
Direction of flow.....	UP
Static pressure.....(IN.WC)	1.45
Avg. gas temp.....(DEG-F)	237
Moisture content.....(% V/V)	8.26
Avg. linear velocity.....(FT/SEC)	78.9
Gas density.....(LB/ACF)	.05478
Molecular weight.....(LB/LBMOLE)	28.84
Mass flow of gas.....(LB/HR)	1025298
Volumetric flow rate.....	
actual.....(ACFM)	311966
dry standard.....(DSCFM)	216055

Test No. 1
Hood Exhaust Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	01-07-92
Time of Determination.....(HRS)	1200
Barometric pressure.....(IN.HG)	29.39
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	70
Duct area.....(SQ.FT)	26.73
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.38
Avg. gas temp.....(DEG-F)	130
Moisture content.....(% V/V)	10.77
Avg. linear velocity.....(FT/SEC)	47.9
Gas density.....(LB/ACF)	.06311
Molecular weight.....(LB/LBMOLE)	28.84
Mass flow of gas.....(LB/HR)	290680
Volumetric flow rate.....	
actual.....(ACFM)	76764
dry standard.....(DSCFM)	60155

Interpoll Labs Report No. 2-3480
Cyprus Northshore Mining
Silver Bay, Minnesota

Test No. 2
No. 12 Waste Gas Inlet

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	01-08-92
Time of Determination.....(HRS)	1152
Barometric pressure.....(IN.HG)	29.28
Pitot tube coefficient.....	.84
Number of sampling ports.....	5
Total number of points.....	25
Shape of duct.....	Rectangular
Duct width.....(IN)	92
Duct length.....(IN)	92
Duct area.....(SQ.FT)	58.78
Direction of flow.....	UP
Static pressure.....(IN.WC)	1.3
Avg. gas temp.....(DEG-F)	516
Moisture content.....(% V/V)	8.82
Avg. linear velocity.....(FT/SEC)	88.7
Gas density.....(LB/ACF)	.03855
Molecular weight.....(LB/LBMOLE)	28.92
Mass flow of gas.....(LB/HR)	723933
Volumetric flow rate.....	
actual.....(ACFM)	312960
dry standard.....(DSCFM)	151552

Interpoll Labs Report No. 2-3480
Cyprus Northshore Mining
Silver Bay, Minnesota

Test No. 2
No. 12 Waste Gas Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	01-08-92
Time of Determination.....(HRS)	1117
Barometric pressure.....(IN.HG)	29.1
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	71
Duct area.....(SQ.FT)	27.49
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.38
Avg. gas temp.....(DEG-F)	133
Moisture content.....(% V/V)	17.86
Avg. linear velocity.....(FT/SEC)	50.1
Gas density.....(LB/ACF)	.06059
Molecular weight.....(LB/LBMOLE)	28.92
Mass flow of gas.....(LB/HR)	300311
Volumetric flow rate.....	
actual.....(ACFM)	82613
dry standard.....(DSCFM)	58708

Interpoll Labs Report No. 2-3480
Cyprus Northshore Mining
Silver Bay, Minnesota

Test No. 3
Hood Exhaust Inlet

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	01-09-92
Time of Determination.....(HRS)	1145
Barometric pressure.....(IN.HG)	29.2
Pitot tube coefficient.....	.84
Number of sampling ports.....	4
Total number of points.....	24
Shape of duct.....	Rectangular
Duct width.....(IN)	84
Duct length.....(IN)	113
Duct area.....(SQ.FT)	65.92
Direction of flow.....	UP
Static pressure.....(IN.WC)	1.5
Avg. gas temp.....(DEG-F)	238
Moisture content.....(% V/V)	8.55
Avg. linear velocity.....(FT/SEC)	80.0
Gas density.....(LB/ACF)	.05367
Molecular weight.....(LB/LBMOLE)	28.83
Mass flow of gas.....(LB/HR)	1018900
Volumetric flow rate.....	
actual.....(ACFM)	316394
dry standard.....(DSCFM)	214297

Interpoll Labs Report No. 2-3480
Cyprus Northshore Mining
Silver Bay, Minnesota

Test No. 3
Hood Exhaust Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	01-09-92
Time of Determination.....(HRS)	1127
Barometric pressure.....(IN.HG)	29.08
Pitot tube coefficient.....	.84
Number of sampling ports.....	1
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	70
Duct area.....(SQ.FT)	26.73
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.21
Avg. gas temp.....(DEG-F)	131
Moisture content.....(% V/V)	11.39
Avg. linear velocity.....(FT/SEC)	50.7
Gas density.....(LB/ACF)	.06221
Molecular weight.....(LB/LBMOLE)	28.84
Mass flow of gas.....(LB/HR)	303333
Volumetric flow rate.....	
actual.....(ACFM)	81270
dry standard.....(DSCFM)	62497

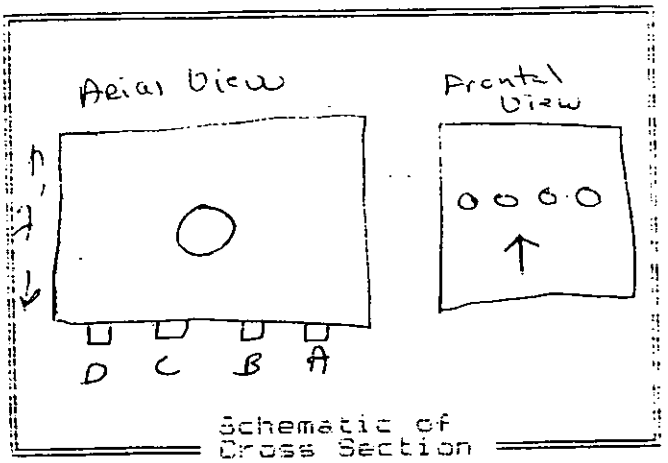
APPENDIX B

FIELD DATA SHEETS

TABLE OF CONTENTS

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Plant Cyprus Northshore Mining
Source Hood Exhaust Inlet
Test 1 Run (1-3) Date 1-7-92
Stack dimen. 84 x 113 IN.
Dry bulb ____ °F Wet bulb ____ °F
Manometer: ☐ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 29.71 in Hg
Static pressure +1.45 in WC
Operators D.B.
Pitot No. 24-8 Cp .84



Traverse Point No.		Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
			Port length: 17 in.		Time start: 0735 hrs	
A	1	Reactivation Duct	9.0	24.0	1.40	237
	2		24.0	~~38.0~~ 38.0	1.20	
	3		36.0	~~52.0~~ 52.0	1.30	
	4		49.0	~~66.0~~ 66.0	1.45	
	5		63.0	~~80.0~~ 80.0	1.60	
	6		77.0	~~94.0~~ 94.0	1.75	
B	1				1.60	236
	2				1.50	
	3				1.45	
	4				1.75	
	5				1.70	
	6				1.90	
C	1				1.55	237
	2				1.60	
	3				1.80	
	4				1.75	
	5				1.40	
	6				1.50	
D	1				1.15	237
	2				1.20	
	3				1.05	
	4				.85	
	5				.94	
	6				1.55	

Temp. meas. tool & S/N: Dwyer
Time end: 0756 hrs

R or nothing= reg. manometer; E= expanded; E = electronic S-392.1

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cyprus Northshore Mentone
Source Hood Exhaust Inlet
Method M-5 M-6 Filter holder: Glass

Date 1-7-92 Test 1 Run 1
No. of traverse points (24) 3
Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.0 cfm at 8 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: ( ) / 1

Recovery solvent(s)
☐ acetone
☐ other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	565	503	
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1435	1413	
Total			

Integrated Gas Sampling Data:

Bag Pump No. B7 Box No. 8 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 6.0 cc/min at 15 in. Hg.
Time start: 0815 (HRS) Time end: 0915 (HRS)
Sampling rate: 400 cc/min Operator: Bob
S/N of O_2 Analyzer used to monitor train outlet: 6

CF-023

S-0046RR

EPA Method 4 and 6 Field Data Sheet

Job Cyprus Northshore Mining Operator(s) D.B. & B.A

Source Hood Exhaust Duct Meter Box No. 9 Gasmeter coef. .9981

Date 1-7-92 Test 1 Run 1 ΔH@ 1.77 in.WC Bar. press 29.71 in.Hg

Mod. Met. 6

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg.

Posttest: 0.0 cfm at 8 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F) Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	0815	543.70								
B-1	5	547.48	1.8	3	242	250	46	79	78	20.1
1	10	551.25		3				84	81	20.1
1	15	555.04		3.5	245	257	45	87	81	20.2
1	20	558.84		4.0				88	81	20.1
B-2	25	562.62		4.0	247	260	43	89	82	20.1
2	30	566.42		4.0				89	82	20.0
2	35	570.23		4.0	250	258	42	89	83	19.9
2	40	574.03		4.0				90	83	19.9
B-3	45	577.86		4.0	246	255	41	91	84	19.9
3	50	581.78		4.0				91	84	19.9
3	55	585.50		4.0	249	258	41	91	85	19.8
3	60	589.34	↓	4.0				91	85	19.8
	0915									
	θ=60	V_m=46.34	$(\Delta H)_{avg}$=1.8					$(t_m)_{avg}$=85.33		

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers	565	503	62
Condenser			
Desiccant	1435	1413	22
		Total	84

Preliminary results of SO_2 concentration determination
V_{mstd} 44.64 DSCF
Moisture = 8.14 %v/v
SO_2, dry = ppm
SO_2, wet = ppm
LB/MMBtu =

S-297 al

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cyprus North Shore Mining Date 1-7-92 Test 1 Run 2
Source Hood Exhaust Outlet No. of traverse points (24) 3
Method Mod M6 Filter holder: Glass Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.0 cfm at 8 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: ( )

Recovery solvent(s)
☐ acetone
☐ other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1	548	497	51
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1408	1393	11
Total			62

Integrated Gas Sampling Data:

Bag Pump No. B7 Box No. 8 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0.0 cc/min at 15 in. Hg.
Time start: 0930 (HRS) Time end: 1030 (HRS)
Sampling rate: 400 cc/min Operator: Bob
S/N of O_2 Analyzer used to monitor train outlet: 6

CF-023

S-0046RR

EPA Method 4 and 5 Field Data Sheet

Job Cyprus Northshore Mining
Source Hood Exhaust Inlet
Date 1-2-92 Test 1 Run 2

Operator(s) D.R B.A
Meter Box No. 9 Gasmeter coef. .9981
ΔH@ 1.77 in.WC Bar. press 29.71 in.Hg

MOD. MET. 6 (Acid Gases)

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: 0.0 cfm at 8 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	0930	589.70								
B-1	5	593.51	1.97	3.5	245	255	43	89	83	20.0
1	10	597.36		4.0				90	86	20.0
1	15	601.21		4.0	247	258	43	90	85	20.0
1	20	605.07		4.0				91	87	20.0
B-2	25	608.94		4.0	250	258	42	92	86	20.0
2	30	612.79		4.0				92	87	20.0
2	35	616.67		4.0	247	260	41	92	87	20.0
2	40	620.51		4.0				92	88	19.9
B-3	45	624.36		4.0	245	256	40	93	87	20.0
3	50	628.21		4.0				93	87	20.0
3	55	632.05		4.0	248	258	40	94	87	20.0
3	60	635.90		4.0				93	87	20.1
	1030									
	θ = 60	V_m = 46.20	(ΔH)avg = 1.77					$(t_m)_{avg}$ = 89.08		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	548	497	51
Condenser			
Desiccant	1408	1393	11
		Total	62

Preliminary results of SO_2 concentration determination		
V_{std}	44.20	DSCF
Moisture =	6.19	%v/v
SO_2, dry =		ppm
SO_2, wet =		ppm
LB/MMBtu =		

S-387 al

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cypress Northshore Heights Date 1-7-92 Test 1 Run 3
Source Hood Exhaust Inlet No. of traverse points (24) 3
Method Mod. M6 Filter holder: Glass Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
Postest: ____ cfm at ____ in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: ( ) 1

Recovery solvent(s)
☐ acetone
☐ other(s)

No. of probe wash bottles: ____
Sample recovered by: ____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		499	
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. B7 Box No. 8 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0.0 cc/min at 15 in. Hg.
Time start: 1045 (HRS) Time end: 1145 (HRS)
Sampling rate: 400 cc/min Operator: BOB
S/N of O_2 Analyzer used to monitor train outlet: 6

CF-023

EPA Method 4 and 6 Field Data Sheet

Job CYPRESS NORTHSHORE MEDICAL Operator(s) D.B. B.A.
Source HOOD EXHAUST DUCT Meter Box No. 9 Gasmeter coef. .9981
Date 1-7-92 Test 1 Run 3 ΔH@ 1.77 in.WC Bar. press 29.71 in.Hg

MOD. METH 6 (ACID GASES)

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: .00 cfm at 10 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen
					Probe	Oven	Impg.	Gas/In	Gas/Out	(%v/v)
	1045	636.20								
B-1	5	640.02	1.77	3.5	246	258	43	90	86	20.2
1	10	643.87		3.5				91	86	19.7
1	15	647.71		4.0	250	260	42	92	87	19.6
1	20	651.53		4.0				93	86	19.6
B-2	25	655.35		4.0	249	257	41	93	87	19.6
2	30	659.19		4.0				93	88	19.6
2	35	663.04		4.0	246	260	40	93	87	19.6
2	40	666.90		4.0				93	87	19.6
B-3	45	670.74		4.0	247	258	39	94	88	19.6
3	50	674.60		4.0				93	88	19.7
3	55	678.44		4.0	248	258	37	94	88	19.6
3	60	682.31		4.0				93	88	19.6
	1145									
	θ=60	V_m=46.11	(ΔH)avg=1.77					(tm)avg.=89.91		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	559	499	60
Condenser			
Desiccant	1409	1408	1
		Total	61

Preliminary results of SO_2 concentration determination	
V_{std}	44.05 DSCF
Moisture	6.12 %v/v
SO_2, dry =	ppm
SO_2, wet =	ppm
LB/MMBtu =	

S-287 al

Interpoll Laboratories
(612)786-6020

EPA Method 7 Sample Collection
Field Data Sheet

Job Cyprus Mining Date 1/7/92 Bar. Pressure 29.71 IN.HG.

Test Location Hood Fuel Type ____ Sample Train No. B/US

Exhaust Inlet Technician D. Bilenniln Pump No. 5 & 7 (2 pumps)

No.	Test Run Point	Flask No.	Time (HRS)	Vacuum (IN.HG.)	Flask Temp. (°F)	Leak Rate <0.4 IN.HG./MIN.
1	1-1	1	822	28.87	80°	☒ Yes ☐ No
2	1-2	2	835	28.88	80°	☒ Yes ☐ No
3	1-3	3	850	28.87	79°	☒ Yes ☐ No
4	1-4	4	905	28.89	79°	☒ Yes ☐ No
5	2-1	5	935	28.90	78°	☒ Yes ☐ No
6	2-2	6	950	28.92	78°	☒ Yes ☐ No
7	2-3	7	1005	28.92	79°	☒ Yes ☐ No
8	2-4	8	1020	29.20	79°	☒ Yes ☐ No
9	3-1	9	1050	29.40	78°	☒ Yes ☐ No
10	3-2	10	1105	29.35	74°	☒ Yes ☐ No
11	3-3	11	1120	29.50	72°	☒ Yes ☐ No
12	3-4	12	1135	29.20	72°	☒ Yes ☐ No
13						☐ Yes ☐ No
14						☐ Yes ☐ No
15						☐ Yes ☐ No
16						☐ Yes ☐ No
17						☐ Yes ☐ No
18						☐ Yes ☐ No
19						☐ Yes ☐ No
20						☐ Yes ☐ No
21						☐ Yes ☐ No
22						☐ Yes ☐ No
23						☐ Yes ☐ No
24						☐ Yes ☐ No
25						☐ Yes ☐ No
26						☐ Yes ☐ No
27						☐ Yes ☐ No

S-263R

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job Cyprus Minerals

Source Hood Vent Stack

Test 1 Run 0 Date 1/7/92

Stack dimen. 72 IN.

Dry bulb ____ °F Wet bulb ____ °F

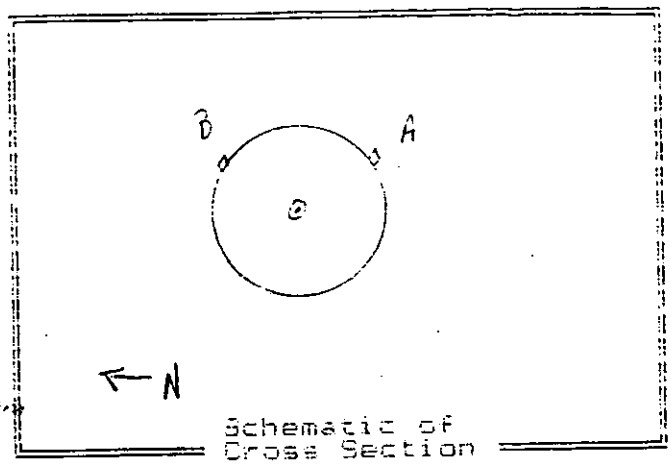
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 29.39 in Hg

Static pressure -.38 in WC

Operators D. Van Hoover & T. Boystra

Pitot No. V23-6 Cp .84



Schematic of Cross Section

Traverse Point No.	Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
		Port length: 9 in.		Time start: 1200 hrs	
A 1	.021	1.47	10.47	.49	130
2	.067	4.69	13.69	.51	130
3	.118	8.26	17.26	.61	130
4	.177	12.39	21.39	.63	131
5	.250	17.5	26.5	.64	130
6	.356	24.92	33.92	.68	130
7	.644	45.08	54.08	.68	130
8	.750	52.5	61.5	.69	130
9	.823	57.61	66.61	.68	130
10	.882	61.74	70.74	.65	130
11	.933	65.31	74.31	.53	130
12	.979	68.53	77.53	.48	130
B 1				.50	130
2				.53	130
3				.64	130
4				.69	130
5				.72	130
6				.71	130
7				.72	130
8				.72	130
9				.67	130
10				.58	130
11				.53	130
12				.48	130
Temp. meas. tool & S/N: PDT # 18				Time end: 1211 hrs	

R or nothing=(reg.) manometer; S= expanded; E = electronic

S-392.1

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cyprus Minerals Date 11/7/92 Test 1 Run 1
Source Hood Exhaust Stack No. of traverse points 3
Method 6 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: ☒ 0.02 cfm at 15 in. Hg. (vac) ☐
Postest: ____ cfm at ____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)

☐ acetone
☐ other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		200	
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. B5 Box No. 18 Bag No. 1

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: 0 cc/min at 15 in. Hg.

Time start: 0820 (HRS) Time end: 0915 (HRS)

Sampling rate: 400 cc/min Operator: DLH

S/N of O_2 Analyzer used to monitor train outlet: 4

CF-023

S-0046RR

EPA Method 4 and 5 Field Data Sheet

Job Cyprus Minerals
Source Mid Vent Stack
Date 1/7/92 Test 1 Run 1

Operator(s) Dirt + T.B
Meter Box No. 6 Gasmeter coef. .9920
ΔH@ 1.77 in.WC Bar. press 24.39 in.Hg

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: 0 cfm at 6 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen
					Probe	Oven	Impg.	Gas/In	Gas/Out	(%v/v)
	0815	255.40								
3	5	259.23	1.80	4	261	258	40	54	54	20.1
3	10	262.81	1.50	4				61	57	20.1
3	15	266.45	1.80	4	263	257	39	65	59	20.1
3	20	270.20	1.80	4				67	61	20.0
2	25	273.82	1.80	4	264	256	38	68	62	20
1	30	277.53	1.80	4				67	63	18.4
2	35	281.26	1.80	4	263	257	38	67	64	20.1
2	40	285.0	1.80	4				67	64	20.1
1	45	288.68	1.80	4	264	259	38	68	65	20.0
1	50	292.40	1.80	4				69	65	19.8
1	55	296.15	1.80	4	265	259	38	71	66	19.9
1	60	299.85	1.80	4				71	67	19.9
	0915									
	θ = 60	V_m = 44.45	(ΔH)avg = 1.80					$(t_m)_{avg.}$ = 64.20		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	292	200	92
Condenser			
Desiccant	1279	1264	15
		Total	107

Preliminary results of SO_2 concentration determination	
V_{std} =	DSCF
Moisture =	%v/v
SO_2, dry =	ppm
SO_2, wet =	ppm
LB/MMBtu =	

S-287 81

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cyprus Minerals — Date 1/7/91 — Test 1 — Run 2
Source Hood Vent Stack — No. of traverse points 3
Method 6 — Filter holder: Glass — Filter type: Glass fiber

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☐
Postest: ____ cfm at ____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: ____

Recovery solvent(s)
☐ acetone ____
☐ other(s) ____

No. of probe wash bottles: ____
Sample recovered by: ____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. B5 — Box No. 18 — Bag No. 2
Bag Material: 5-layer Aluminized Tedlar — Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 0935 (HRS) — Time end: 1030 (HRS)
Sampling rate: 400 cc/min — Operator: DcH
S/N of O_2 Analyzer used to monitor train outlet: 4

CF-023

S-0046RR

EPA Method 4 and 5 Field Data Sheet

Job Cyprus Minerals
Source Hood Vent Stack
Date 11/7/92 Test 1 Run 2

Operator(s) Duff & J.B.
Meter Box No. 6 Gasmeter coef. .9920
ΔH@ 1.77 in.WC Bar. press 29.39 in.Hg

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg. ~~OK~~
Posttest: _____ cfm at 6 in. Hg. ~~OK~~

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen
					Probe	Oven	Impg.	Gas/In	Gas/Out	(%v/v)
	0930	300.10								
A 3	5	303.80	1.80	4	259	258	42	66	66	20.0
3	10	307.50	1.80	4				69	66	19.6
3	15	311.29	1.80	4	260	259	40	70	66	19.7
3	20	315.02	1.80	4				71	66	19.6
2	25	318.74	1.80	4	258	260	39	71	66	19.7
2	30	322.50	1.80	4				72	66	19.7
2	35	326.25	1.80	4	260	258	39	72	66	19.7
2	40	330.00	1.80	4				72	66	19.8
1	45	333.74	1.80	4	262	259	39	73	66	19.9
1	50	337.46	1.80	4				73	67	19.9
1	55	341.19	1.80	4	264	260	40	73	67	20.0
1	60	344.94	1.80	4				74	68	20.0
	(1030)									
	θ=60	V_m=4484	$(\Delta H)_{avg}$=1.80					$(t_m)_{avg.}$=68.83		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	292	200	92
Condenser			
Desiccant	1289	1276	16
		Total	108

Preliminary results of SO_2 concentration determination	
V_{std} =	DSCF
Moisture =	%v/v
SO_2, dry =	ppm
SO_2, wet =	ppm
LB/MMBtu =	

S-287 al

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cyprus Minerals — Date 1/7/92 — Test 1 — Run 3
Source Hood Lower Stack — No. of traverse points 3
Method 5 — Filter holder: 9455 — Filter type: 9455 fiber

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☐
Postest: ____ cfm at ____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: _____ _____

Recovery solvent(s)
☐ acetone _____
☐ other(s) _____

No. of probe wash bottles: _____
Sample recovered by: _____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. B5 Box No. 18 Bag No. 3

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: 0 cc/min at 15 in. Hg.

Time start: 1048 (HRS) Time end: 1145 (HRS)

Sampling rate: 400 cc/min Operator: Dutt

S/N of O_2 Analyzer used to monitor train outlet: 4

CF-023

EPA Method 4 and 5 Field Data Sheet

Job Cyprus Minerals
Source Hood Vent Stack
Date 1/7/93 Test 1 Run 3

Operator(s) DeW-T.B
Meter Box No. 6 Gasmeter coef. .9920
ΔH@ 1.77 in.WC Bar. press 29.39 in.Hg

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: 0 cfm at 7 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen
					Probe	Oven	Impg.	Gas/In	Gas/Out	(%v/v)
	1045	345.20								
A3	5	348.91	1.80	4	260	259	39	68	66	20.0
3	10	352.69	1.80	4				68	66	20.0
3	15	356.44	1.80	4	263	259	39	70	66	20.0
3	20	360.17	1.80	4				71	66	20.0
2	25	363.91	1.80	4	264	258	39	72	67	20.0
2	30	367.64	1.80	4				73	67	20.1
2	35	371.37	1.80	4	263	259	37	73	68	20.0
2	40	375.10	1.80	4				74	68	20.0
1	45	378.91	1.80	4	261	257	38	74	68	20.0
1	50	382.57	1.80	4				74	69	19.9
1	55	386.28	1.80	4	261	258	39	74	69	20.3
1	60	390.05	1.80	4				76	69	20.0
	1145									
	θ=60	V_m=44.85	(ΔH)avg=1.80					(tm)avg.=69.83		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	298	200	98
Condenser			
Desiccant	1293	1279	14
		Total	112

Preliminary results of SO_2 concentration determination	
V_{std} =	DSCF
Moisture =	%v/v
SO_2, dry =	ppm
SO_2, wet =	ppm
LB/MMBtu =	

S-287 al

Interpoll Laboratories
(612)786-6020

EPA Method 7 Sample Collection
Field Data Sheet

Job Cyprus Minerals Date 1-7-92 Bar. Pressure 29.39 IN.HG.

Test Location Hood Vent Stack Fuel Type _____ Sample Train No. 1

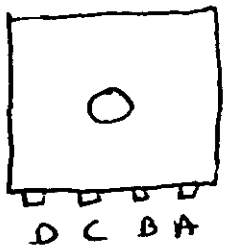
_____ Technician DVH, JB Pump No. 4

No.	Test Run Point	Flask No.	Time (HRS)	Vacuum (IN.HG.)	Flask Temp. (°F)	Leak Rate <0.4 IN.HG./MIN.
1	1-1-1	13	0830	27.20	49	☑ Yes ☐ No
2	1-1-2	14	0845	27.25	49	☑ Yes ☐ No
3	1-1-3	15	0900	27.30	49	☑ Yes ☐ No
4	1-1-1	16	0915	27.25	49	☑ Yes ☐ No
5	1-2-2	17	0930	27.20	50	☑ Yes ☐ No
6	1-2-3	18	0945	27.30	50	☑ Yes ☐ No
7	1-2-1	19	1000	27.30	50	☑ Yes ☐ No
8	1-2-2	20	1015	27.30	50	☑ Yes ☐ No
9	1-3-3	21	1045	27.30	50	☑ Yes ☐ No
10	1-3-1	22	1100	27.30	50	☑ Yes ☐ No
11	1-3-2	23	1115	27.30	50	☑ Yes ☐ No
12	1-3-3	24	1135	27.25	50	☑ Yes ☐ No
13	Blank	34				☐ Yes ☐ No
14						☐ Yes ☐ No
15						☐ Yes ☐ No
16						☐ Yes ☐ No
17						☐ Yes ☐ No
18						☐ Yes ☐ No
19						☐ Yes ☐ No
20						☐ Yes ☐ No
21						☐ Yes ☐ No
22						☐ Yes ☐ No
23						☐ Yes ☐ No
24						☐ Yes ☐ No
25						☐ Yes ☐ No
26						☐ Yes ☐ No
27						☐ Yes ☐ No

S-263R

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job Cypress Knollcrest Manor
Source Hood Exhaust Inlet
Test 3 Run (1-3) Date 1-9-92
Stack dimen. 84 x 113 IN.
Dry bulb ____ °F Wet bulb ____ °F
Manometer: ☐ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 29.20 in Hg
Static pressure +1.5 in WC
Operators (DB) - BA
Pitot No. 27-8 Cp .84



Schematic of Cross Section

Traverse Point No.	Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
		Port length: 17.0 in.		Time start: 1145 hrs	
A 1		7.0	24.0	1.50	239
2		21.0	38.0	1.10	
3		35.0	52.0	1.30	240
4		49.0	66.0	1.50	
5		63.0	80.0	1.70	238
6		77.0	94.0	1.70	
B 1				1.55	239
2				1.50	
3				1.50	240
4				1.80	
5				1.70	240
6				1.70	
C 1				1.80	238
2				1.65	
3				1.80	239
4				1.85	
5				1.50	239
6				1.50	
D 1				1.10	237
2				1.20	
3				1.10	236
4				.90	
5				.97	236
6				1.30	
Temp. meas. tool & S/N: DALES				Time end: 1200 hrs	

R or nothing= reg. manometer; S= expanded; E = electronic S-392.1

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cypress Northshore Marina
Source Hood Exhaust Inlet
Method Do Not Filter holder: Glass
6 (Acid 60525)

Date 1-9-92 Test 3 Run 1
No. of traverse points 24 (3)
Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac)
Postest: .00 cfm at 10 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: 1

Recovery solvent(s)
☐ acetone
☐ other(s)

No. of probe wash bottles: ~
Sample recovered by:

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		500	
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. B7 Box No. 25 Bag No. 1

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: 0.0 cc/min at 15 in. Hg.

Time start: 0800 (HRS) Time end: 0900 (HRS)

Sampling rate: 400 cc/min Operator: D.B.

S/N of O_2 Analyzer used to monitor train outlet: 6

CF-023

S-0046RR

INTERPOLL LABORATORIES

EPA Method 4 and 6 Field Data Sheet

Job CYPRUS NORTHSHORE MINERALS Operator(s) DB BA

Source HOOD EXHAUST INLET Meter Box No. 9 Gasmeter coef. .9851

Date 1-9-92 Test 3 Run 1 ΔH@ 1.77 in.WC Bar. press 29.20 in.Hg

MOD. METH. 6 ACID GASES

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: .00 cfm at 10 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen
					Probe	Oven	Impg.	Gas/In	Gas/Out	(%v/v)
	0900	834.85								
A-1	5	838.73	1.8	3.5	240	253	63	107	104	19.6
1	10	842.62	1.8	3.5	241	252	63	108	104	19.5
1	15	846.52	1.8	3.5	241	253	62	110	105	19.8
1	20	850.43	1.8	3.5	241	251	62	111	106	19.9
B-2	25	854.32	1.8	3.5	243	252	60	111	106	19.9
2	30	858.24	1.8	3.5	245	252	60	111	106	19.9
2	35	862.13	1.8	3.5	244	251	60	111	106	20.0
2	40	866.01	1.8	3.5	244	250	60	111	107	20.3
B-3	45	869.93	1.8	3.5	245	250	60	111	107	20.5
3	50	873.84	1.8	3.5	246	253	61	112	107	20.4
3	55	877.66	1.8	3.5	245	255	61	112	107	20.4
3	60	881.572	1.8	3.5	242	254	61	112	107	20.5
	(0900)									
	0960	V_m= 46.722	(ΔH)avg=1.8					(tm)avg.= 108.3		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	568	500	68.0
Condenser			
Desiccant	1471	1459	12.0
		Total	80.0

Preliminary results of SO_2 concentration determination	
V_{std} =	DSCF
Moisture =	%v/v
SO_2, dry =	ppm
SO_2, wet =	ppm
LB/MMBtu =	

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cyprus Northshore Mining Date 1-9-92 Test 3 Run 2
Source Hood Exhaust Inlet No. of traverse points 24 (3)
Method Mid Met Filter holder: Glass Filter type: 4" G.F.
6

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac)
Postest: .00 cfm at 10 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: (1)

Recovery solvent(s)
☐ acetone
☐ other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. 87 Box No. 25 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0.0 cc/min at 15 in. Hg.
Time start: 0915 (HRS) Time end: 1015 (HRS)
Sampling rate: 400 cc/min Operator: D.B.
S/N of O_2 Analyzer used to monitor train outlet: 6

CF-023

S-0046RR

INTERPOLL LABORATORIES

EPA Method 4 and 6 Field Data Sheet

Job Cyprus Northshore Mining Operator(s) DB BA

Source Hood Exhaust Inlet Meter Box No. 9 Gasmeter coef. .9981

Date 1-7-92 Test 3 Run 2 ΔH@ 1.77 in.WC Bar. press 29.20 in.Hg

Mid Met 6 (Acid Gases)

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: .00 cfm at 10 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen
					Probe	Oven	Impg.	Gas/In	Gas/Out	(%v/v)
	(0915)	881.90								
B-1	5	885.80	1.8	3.5	239	246	56	109	105	19.6
1	10	889.69	1.8	3.5	240	248	54	109	105	20.2
1	15	893.58	1.8	3.5	244	247	54	110	106	20.3
1	20	897.46	1.8	3.5	245	248	53	111	106	20.3
B-2	25	901.30	1.8	3.5	246	249	53	112	107	20.4
2	30	905.21	1.8	3.5	245	250	53	112	107	20.3
2	35	909.10	1.8	3.5	242	251	53	112	107	20.3
2	40	912.98	1.8	3.5	240	250	52	112	107	20.3
B-3	45	916.91	1.8	3.5	241	250	52	112	107	20.3
3	50	920.81	1.8	3.5	242	248	52	111	107	20.2
3	55	924.73	1.8	3.5	242	249	51	111	107	20.2
3	60	928.653	1.8	3.5	242	251	51	111	107	20.1
	(1015)									
	θ=60	V_m=46.753	$(\Delta H)_{avg}$=1.8					$(t_m)_{avg.}$ = 108.75		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	575	505	70
Condenser			
Desiccant	1456	1442	14
		Total	84.0

Preliminary results of SO_2 concentration determination	
V_{std} =	DSCF
Moisture =	%v/v
SO_2, dry =	ppm
SO_2, wet =	ppm
LB/MMBtu =	

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cypress Northshore Mfg Co Date 1-992 Test 3 Run 3
Source Hood Exhaust Inlet No. of traverse points 24 (3)
Method 1460 MET Filter holder: Glass Filter type: 4" G.F.
6 (Acid 66525)

Sample Train Leak Check:

Pretest: ☒ 0.02 cfm at 15 in. Hg. (vac)
Postest: ☐ ____ cfm at ____ in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: (1)

Recovery solvent(s)
☐ acetone
☐ other(s)

No. of probe wash bottles: ____
Sample recovered by: ____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		493	
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. B7 Box No. 25 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0.0 cc/min at 15 in. Hg.
Time start: 1030 (HRS) Time end: 1130 (HRS)
Sampling rate: 400 cc/min Operator: D.B.
S/N of O_2 Analyzer used to monitor train outlet: 6

CF-023

S-0046RR

INTERPOLL LABORATORIES

EPA Method 4 and 6 Field Data Sheet

Job CYPRUS NORTHSTORE MINING Operator(s) DB BA

Source HOOD EXHAUST INLET Meter Box No. 9 Gasmeter coef. .9951

Date 1-9-92 Test 3 Run 5 ΔH@ 1.77 in.WC Bar. press 29.20 in.Hg

MOD. METH. 6 / ACID GASES

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: .00 cfm at 12 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	(1030)	928.90								
B-1	5	932.78	1.8	3.5	255	248	55	109	106	20.2
1	10	936.64	1.8	3.5	257	248	55	110	106	20.2
1	15	940.50	1.8	3.5	257	249	55	111	106	20.1
1	20	944.36	1.8	3.5	256	248	54	111	106	20.2
B-2	25	948.21	1.8	3.5	256	249	54	111	107	20.2
2	30	952.02	1.8	3.5	259	250	52	112	107	20.2
2	35	955.92	1.8	3.5	259	253	52	111	107	20.1
2	40	959.71	1.8	3.5	260	251	52	111	107	20.1
B-3	45	963.58	1.8	3.5	258	252	52	111	107	20.1
3	50	967.69	1.8	3.5	259	246	52	111	107	20.1
3	55	971.61	1.8	3.5	255	248	50	111	107	20.1
3	60	975.568	1.8	3.5	251	245	50	111	107	20.1
	(1130)									
	θ=60	V_m= 46.668	$(\Delta H)_{avg}$=1.8					$(t_m)_{avg.}$ = 108.45		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	561	493	68.0
Condenser			
Desiccant	1487	1471	16.0
		Total	84.0

Preliminary results of SO_2 concentration determination	
V_{std} =	DSCF
Moisture =	%v/v
SO_2, dry =	ppm
SO_2, wet =	ppm
LB/MMBtu =	

Interpoll Laboratories
(612)786-6020

EPA Method 7 Sample Collection
Field Data Sheet

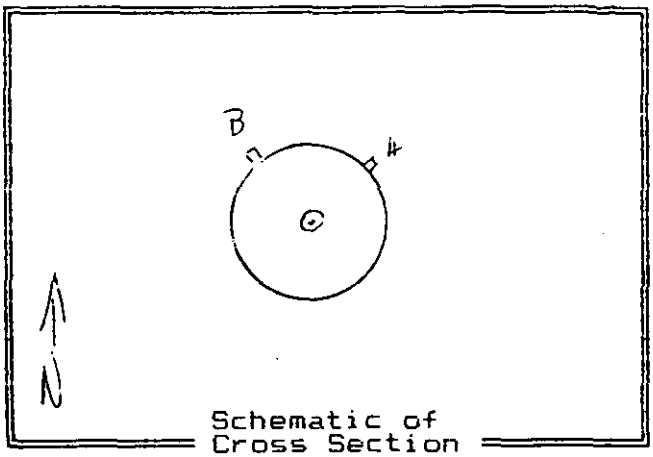
Job Cyprus Mining Date 8-9-92 Bar. Pressure 29.20 IN.HG.
Test Location Hood Fuel Type Sample Train No. S/N 2
Exhaust (Inlet) Technician D. Brenden Pump No. 11

No.	Test Run Point	Flask No.	Time (HRS)	Vacuum (IN.HG.)	Flask Temp. (°F)	Leak Rate <0.4 IN.HG./MIN.
1	3-1	61	805	26.80	80°	☒ Yes ☐ No
2	3-1	62	820	26.75	76°	☒ Yes ☐ No
3	3-1	63	835	26.80	78°	☒ Yes ☐ No
4	3-1	64	850	26.70	77°	☒ Yes ☐ No
5	3-2	65	920	26.70	74°	☒ Yes ☐ No
6	3-2	66	935	26.70	72°	☒ Yes ☐ No
7	3-2	*33	950	26.70	76°	☒ Yes ☐ No
8	3-2	67	1005	26.70	74°	☒ Yes ☐ No
9	3-3	68	1035	26.80	77°	☒ Yes ☐ No
10	3-3	69	1050	26.80	78°	☒ Yes ☐ No
11	3-3	71	1110	26.90	75°	☒ Yes ☐ No
12	3-3	72	1120	26.75	76°	☒ Yes ☐ No
13						☐ Yes ☐ No
14						☐ Yes ☐ No
15						☐ Yes ☐ No
16						☐ Yes ☐ No
17						☐ Yes ☐ No
18						☐ Yes ☐ No
19						☐ Yes ☐ No
20						☐ Yes ☐ No
21						☐ Yes ☐ No
22						☐ Yes ☐ No
23						☐ Yes ☐ No
24						☐ Yes ☐ No
25						☐ Yes ☐ No
26						☐ Yes ☐ No
27						☐ Yes ☐ No

S-263R

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job Cyprus Northshore Mining
Source Hood Vent Stack
Test 3 Run 0 Date 1/9/92
Stack dimen. 70 IN.
Dry bulb ____ °F Wet bulb ____ °F
Manometer: [X] Reg. [ ] Exp. [ ] Elec.
Barometric pressure 29.08 in Hg
Static pressure -.21 in WC
Operators D. Van Hoever & T. Bergstrom
Pitot No. V23-6 Cp .84



Schematic of Cross Section

Traverse Point No.	Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
		Port length: 9 in.		Time start: 1127 hrs	
A 1	.021	1.47	10.47	.52	131
2	.067	4.69	13.69	.58	131
3	.118	8.26	17.26	.63	131
4	.177	12.39	21.39	.64	131
5	.250	17.5	26.5	.71	131
6	.356	24.92	33.92	.77	131
7	.644	45.08	54.08	.78	130
8	.750	52.5	61.5	.78	130
9	.823	57.61	66.61	.78	130
10	.882	61.74	70.74	.77	131
11	.933	65.31	74.31	.70	131
12	.979	68.53	77.53	.50	131
B 1					
2					
3					
4					
5					Emergency Quench WATER OBSTRUCTING Port
6					
7					
8					
9					
10					
11					
12					
Temp. meas. tool & S/N:				Time end:	

R or nothing= reg. manometer; S= expanded; E = electronic

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job *Cyprus Minerals*

Source *Hood Vent Stack*

Test *1/#3* Run *0* Date *1/9/92*

Stack dimen. *70* IN.

Dry bulb ______ °F Wet bulb ______ °F

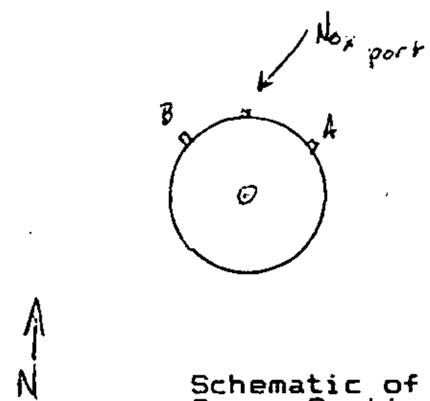
Manometer: ☐ Reg. ☐ Exp. ☐ Elec.

Barometric pressure *29.08* in Hg

Static pressure __________ in WC

Operators *D. Van Hoever & J. Bergstrom*

Pitot No. ________ Cp ________



Schematic of Cross Section

Traverse Point No.	Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
		Port length: *4* in.		Time start: hrs	
A 1	*1/6*	*11.66*	*15.66*		
2	*3/6*	*35*	*39*		
3	*5/6*	*58.33*	*62.33*		
Temp. meas. tool & S/N:				Time end: hrs	

R or nothing= reg. manometer; S= expanded; E = electronic S-392.1

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cyprus Date 1/9/92 Test 3 Run 1
Source Hood Vent Stack No. of traverse points 3
Method 6 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☐
Postest: ____ cfm at ____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)

____ ☐ acetone ____
____ ☐ other(s) ____

No. of probe wash bottles: ____
Sample recovered by: ____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. B5 Box No. 30 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 0804 (HRS) Time end: 0900 (HRS)
Sampling rate: 400 cc/min Operator: Brett
S/N of O_2 Analyzer used to monitor train outlet: 4

CF-023

S-0046RR

INTERPOLL LABORATORIES

EPA Method 4 and 6 Field Data Sheet

Job Cyprus
Source Hood Vent Stack
Date 1/9/92 Test 3 Run 1

Operator(s) Dylan Hoover
Meter Box No. 6 Gasmeter coef. .992
ΔH@ 1.77 in.WC Bar. press 29.08 in.Hg

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: 0 cfm at 6 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	0800	548.05								
3	5	551.86	1.80	4	260	257	42	69	69	19.4
3	10	555.72	1.80	4				73	70	19.6
3	15	559.58	1.80	4	262	256	40	76	71	19.7
3	20	563.41	1.80	4				77	71	19.7
2	25	567.25	1.80	4	261	257	40	79	73	19.8
2	30	571.10	1.80	4				80	74	20.0
2	35	574.92	1.80	4	261	258	40	80	74	20.0
2	40	578.77	1.80	4				82	76	20.1
1	45	582.61	1.80	4	262	257	40	83	77	20.1
1	50	586.47	1.80	4				84	78	19.9
1	55	590.28	1.80	4	260	256	40	84	79	20.0
1	60	594.08	1.80	4				85	79	20.1
	(0900)									
	θ=60	V_m=463	(ΔH)avg=1.80					(tm)avg.=76.79		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	300	200	100
Condenser			
Desiccant	1313	1295	18
		Total	118

Preliminary results of SO_2 concentration determination	
V_{std} =	DSCF
Moisture =	%v/v
SO_2, dry =	ppm
SO_2, wet =	ppm
LB/MMBtu =	

S-287 al

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cyprus Hood Vent Stack Date 1/9/92 Test 3 Run 2
Source No. of traverse points 3
Method 6 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: ☐ 0.02 cfm at 15 in. Hg. (vac) ☐
Postest: ____ cfm at ____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: _____ _____

Recovery solvent(s)
☐ acetone _____
☐ other(s) _____

No. of probe wash bottles: _____
Sample recovered by: _____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. B5 Box No. 30 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 0920 (HRS) Time end: 1015 (HRS)
Sampling rate: 400 cc/min Operator: [illegible]
S/N of O_2 Analyzer used to monitor train outlet: 4

CF-023

S-0046RR

INTERPOLL LABORATORIES

EPA Method 4 and 6 Field Data Sheet

Job Cyprus Minerals — Operator(s) D. M

Source Hood Vent Exhaust Stack — Meter Box No. 6 — Gasmeter coef, 9920

Date 1/9/92 — Test 3 — Run 2 — ^H@ 1.77 in.WC — Bar. press 29.68 in.Hg

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg. ☒
Posttest: 0 cfm at 6 in. Hg. ☒

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	09:15	594.30								
3	5	598.10	1.80	4	262	259	43	80	79	20.0
3	10	601.96	1.80	4				81	79	19.8
3	15	605.81	1.80	4	263	258	41	83	80	19.7
3	20	609.65	1.80	4				84	80	19.7
2	25	613.51	1.80	4	264	260	41	85	81	19.7
2	30	613.31	1.80	4				86	82	19.9
2	35	621.17	1.80	4	264	262	41	87	83	19.7
2	40	625.01	1.80	4				87	83	19.8
1	45	628.82	1.80	4	262	261	41	88	84	19.9
1	50	632.63	1.80	4				89	84	19.7
1	55	636.48	1.80	4	263	260	41	90	85	19.6
1	60	640.29	180	4				90	86	19.8
	(1015)									
	θ=60	V_m=45.99	(^H)$_{avg}$=1.80					(t_m)$_{avg}$. = 84.0		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	288	200	88
Condenser			
Desiccant	1307	1287	20
		Total	108

Preliminary results of SO_2 concentration determination	
V_{std} =	DSCF
Moisture =	%v/v
SO_2, dry =	ppm
SO_2, wet =	ppm
LB/MMBtu =	

S-287 al

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cyprus Date 1/9/92 Test 3 Run 3
Source Hood Vent Stack No. of traverse points 3
Method 6 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☐
Postest: ____ cfm at ____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)

____ ☐ acetone ____
____ ☐ other(s) ____

No. of probe wash bottles: ____
Sample recovered by: ____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. B5 Box No. 30 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1034 (HRS) Time end: 1130 (HRS)
Sampling rate: 400 cc/min Operator: DHH
S/N of O_2 Analyzer used to monitor train outlet: 4

CF-023

S-0046RR

INTERPOLL LABORATORIES

EPA Method 4 and 6 Field Data Sheet

Job Cyprus Minerals
Source Hood Vent Stack
Date 1/9/92 Test 3 Run 3

Operator(s) DSH
Meter Box No. 6 Gasmeter coef. .992
ΔH@ 1.77 in.WC Bar. press 29.08 in.Hg

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: 0 cfm at 6 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	1030	640.50								
3	5	644.40	1.80	4	258	261	44	87	86	20.0
3	10	648.29	1.80	4				88	86	19.6
3	15	652.17	1.80	4	259	262	43	90	87	19.5
3	20	656.05	1.80	4				92	88	19.5
2	25	659.93	1.80	4	260	264	42	93	88	19.6
2	30	663.79	1.80	4				93	89	19.6
2	35	667.68	1.80	4	260	263	42	92	89	19.7
2	40	671.55	1.80	4				92	88	19.7
1	45	675.42	1.80	4	259	262	43	92	88	19.7
1	50	679.29	1.80	4				92	88	19.7
1	55	683.16	1.80	4	258	263	44	92	88	19.7
1	60	687.02	1.80	4				92	88	19.7
	(1130)									
	θ=60	V_m=46.52	$(\Delta H)_{avg}$=1.80					$(t_m)_{avg.}$ = 89.50		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	291	200	91
Condenser			
Desiccant	1330	1313	17
		Total	118

Preliminary results of SO_2 concentration determination	
V_{std} =	DSCF
Moisture =	%v/v
SO_2, dry =	ppm
SO_2, wet =	ppm
LB/MMBtu =	

S-287 e

Interpoll Laboratories
(612)786-6020

EPA Method 7 Sample Collection
Field Data Sheet

Job Cyprus Minerals Date 1-9-92 Bar. Pressure 29.08 IN.HG.
Test Location Hooded Vent Stack Fuel Type _____ Sample Train No. 1
Technician DVH-JB Pump No. 4

No.	Test Run Point	Flask No.	Time (HRS)	Vacuum (IN.HG.)	Flask Temp. (°F)	Leak Rate <0.4 IN.HG./MIN.
1	3-1-1	73	0819	26.60	68	☑ Yes ☐ No
2	3-1-2	74	0830	26.60	68	☑ Yes ☐ No
3	3-1-3	75	0841	26.30	68	☑ Yes ☐ No
4	3-1-1	76	0857	26.50	68	☑ Yes ☐ No
5	3-2-2	77	0916	26.45	68	☑ Yes ☐ No
6	3-2-3	78	0930	26.50	68	☑ Yes ☐ No
7	3-2-1	79	0945	26.55	68	☑ Yes ☐ No
8	3-2-2	80	1000	26.60	68	☑ Yes ☐ No
9	3-3-3	81	1030	26.60	68	☑ Yes ☐ No
10	3-3-1	82	1045	26.50	68	☑ Yes ☐ No
11	3-3-2	83	1100	26.50	69	☑ Yes ☐ No
12	3-3-3	84	1115	26.50	69	☑ Yes ☐ No
13						☐ Yes ☐ No
14						☐ Yes ☐ No
15						☐ Yes ☐ No
16						☐ Yes ☐ No
17						☐ Yes ☐ No
18						☐ Yes ☐ No
19						☐ Yes ☐ No
20						☐ Yes ☐ No
21						☐ Yes ☐ No
22						☐ Yes ☐ No
23						☐ Yes ☐ No
24						☐ Yes ☐ No
25						☐ Yes ☐ No
26						☐ Yes ☐ No
27						☐ Yes ☐ No

Leaked *

Leaked *

S-263R

INTERFOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job Cypress Northshore Heights

Source WASTE GAS UNIT (INLET)

Test 2 Runs (1-3) Date 1-8-92

Stack dimen. 92 x 92 IN.

Dry bulb ____ °F wet bulb ____ °F

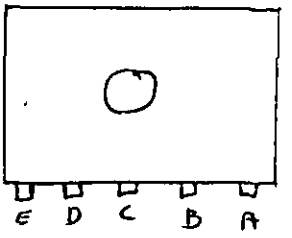
Manometer: ☐ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 29.28 in Hg

Static pressure +1.3 in WC

Operators DB BA

Pitot No. ____ Cp .84



Schematic of Cross Section

Traverse Point No.	Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
		Port length:	19.0 in.	Time start:	1132 hrs
A 1			26.2	3.0	516
2			44.6	3.2	
3			63.0	2.1	515
4			81.4	1.6	
5			99.8	1.7	516
B 1				3.9	
2				3.2	516
3				1.1	
4				.78	517
5				.92	
C 1				4.8	516
2				2.9	
3				.84	516
4				.38	
5				.29	517
D 1				4.5	
2				3.3	518
3				.76	
4				.08	516
5				-.10	
E 1				3.0	516
2				2.5	5
3				.85	515
4				-.15	
5				-.20	514
Temp. meas. tool & S/N:				Time end:	1145 hrs

R or nothing= reg. manometer; S= expanded; E = electronic S-392.1

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cyprus Northshore Mining Date 1-8-92 Test 2 Run 1
Source White Gas Outlet No. of traverse points 25 (3)
Method Mod. Met 6 Filter holder: Glass Filter type: 4" Glass F.

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac)
Postest: .00 cfm at 12 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: 1

Recovery solvent(s)

☐ acetone
☐ other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1	560	502	58.
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1442	1420	22
Total			80

Integrated Gas Sampling Data:

Bag Pump No. B7 Box No. 15 Bag No. 1

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: 0.0 cc/min at 15 in. Hg.

Time start: 800 (HRS) Time end: 900 (HRS)

Sampling rate: 400 cc/min Operator: D.B.

S/N of O_2 Analyzer used to monitor train outlet: 6

CF-023

S-0046RR

EPA Method 4 and 5 Field Data Sheet

Job CYPRUS NORTHSHORE MINING
Source WASTE GAS (INLET)
Date 1-8-92 Test 2 Run 1

Operator(s) DB BA
Meter Box No. 9 Gasmeter coef. .9981
ΔH@ 1.72 in.WC Bar. press 29.28 in.Hg

MOD. METH. 6 (ACID GASES)

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: .00 cfm at 12 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen
					Probe	Oven	Impg.	Gas/In	Gas/Out	(%v/v)
	8:00	692.85								
-1	5	696.69	1.8	4.0	246	253	66	114	112	17.0
1	10	700.57	1.8	4.5	248	255	65	115	112	16.7
1	15	704.45	1.8	4.5	251	257	65	115	112	16.4
1	20	708.36	1.8	4.5	250	258	65	115	112	16.3
-2	25	712.26	1.8	4.5	249	258	65	115	112	16.3
2	30	716.16	1.8	4.5	252	260	65	115	112	16.2
2	35	720.10	1.8	4.5	250	261	65	116	113	16.2
2	40	724.05	1.8	4.5	248	260	65	116	113	16.2
-3	45	727.95	1.8	4.5	249	262	65	116	113	16.1
3	50	731.89	1.8	4.5	250	263	65	117	114	16.2
3	55	735.82	1.8	4.5	253	261	65	116	113	16.3
3	60	739.735	1.8	4.5	255	259	65	116	114	16.2
	(900)									
	θ=60	V_m=41.885	(ΔH)avg=1.8					(tm)avg.=114.1		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	560	502	58.0
Condenser			
Desiccant	1442	1420	22.0
		Total	80.0

Preliminary results of SO_2 concentration determination	
V_{mstd}	42.29 DSCF
Moisture =	8.18 %v/v
SO_2, dry =	ppm
SO_2, wet =	ppm
LB/MMBtu =	

S-287 al

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job CYPRUS NORTHSHORE MINING
Source WASTE GAS INLET
Method MOD MET 6 Filter holder: Glass

Date 1-8-92 Test 2 Run 2
No. of traverse points 25 (3)
Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac)
Postest: .00 cfm at 10 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: 1

Recovery solvent(s)

☐ acetone
☐ other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. B7 Box No. 15 Bag No. 2

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: 0.0 cc/min at 15 in. Hg.

Time start: 915 (HRS) Time end: 1015 (HRS)

Sampling rate: 400 cc/min Operator: D.B.

S/N of O_2 Analyzer used to monitor train outlet: 6

CF-023

EPA Method 4 and 5 Field Data Sheet

Job CYPRUS NORTHSHORE MINING Operator(s) DB BA
Source WASTE GAS UNIT CALCINER Meter Box No. 9 Gasmeter coef. .9981
Date 1-8-92 Test 2 Run 2 ΔH@ 1.77 in.WC Bar. press 29.28 in.Hg

MID. MET. (ACID 6255S)
60

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: .00 cfm at 10 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	(915)	740.01								
-1	5	743.90	1.8	4.0	256	260	64	116	114	17.6
1	10	747.81	1.8	4.0	255	263	64	117	114	17.5
1	15	751.73	1.8	4.0	257	261	62	119	115	17.2
1	20	755.65	1.8	4.0	258	260	62	119	115	16.9
-2	25	759.60	1.8	4.0	259	263	62	119	115	16.9
2	30	763.52	1.8	4.0	260	263	62	119	115	16.8
2	35	767.44	1.8	4.0	257	265	61	120	115	16.6
2	40	771.36	1.8	4.0	256	264	61	120	116	16.5
-3	45	775.27	1.8	4.0	258	264	61	120	116	16.6
3	50	779.18	1.8	4.0	259	261	61	119	116	16.6
3	55	783.10	1.8	4.0	259	257	62	119	116	16.7
3	60	786.991	1.8	4.0	257	255	62	120	116	16.6
	(1015)									
	θ= 60	V_m= 46.981	$(\Delta H)_{avg}$= 1.8					$(t_m)_{avg.}$ = 117.1		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	560	506	54.0
Condenser			
Desiccant	1450	1436	14.0
		Total	68.0

Preliminary results of SO_2 concentration determination	
V_{std} = 46.15	DSCF
Moisture = 7.06	%v/v
SO_2, dry =	ppm
SO_2, wet =	ppm
LB/MMBtu =	

S-287 al

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cyprus Northshore Mining — Date 1-8-92 — Test 2 — Run 3
Source Wash Gas ESP Inlet — No. of traverse points 24 (3)
Method Mod Mot 6 — Filter holder: Glass — Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.0 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 1

Recovery solvent(s)
☐ acetone
☐ other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. 67 Box No. 15 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0.0 cc/min at 15 in. Hg.
Time start: 1030 (HRS) Time end: 1130 (HRS)
Sampling rate: 400 cc/min Operator: D.B.
S/N of O_2 Analyzer used to monitor train outlet: 6

CF-023

S-0046RR

EPA Method 4 and 5 Field Data Sheet

Job Cypress Hawthorne Unit 6 Operator(s) DB BA
Source WASTE GAS UNIT (INLET) Meter Box No. 9 Gasmeter coef. .9981
Date 1-8-92 Test 2 Run 3 ΔH@ 1.77 in.WC Bar. press 29.28 in.Hg

MOD. METH. 6 (ARB 6058S)

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: 0.0 cfm at 10 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen
					Probe	Oven	Impg.	Gas/In	Gas/Out	(%v/v)
	(1030)	787.20								
-1	5	791.08	1.8	4.0	243	262	60	120	115	17.2
-1	10	795.01	1.8	4.0	245	265	60	120	116	17.1
1	15	798.82	1.8	4.0	249	265	60	120	116	17.2
1	20	802.90	1.8	4.0	252	264	58	120	116	17.5
-2	25	806.91	1.8	4.0	251	264	58	120	117	18.3
2	30	810.86	1.8	4.0	253	264	58	120	117	17.7
2	35	814.84	1.8	4.0	255	265	57	120	117	17.7
2	40	818.78	1.8	4.0	254	266	56	120	117	17.6
-3	45	822.72	1.8	4.0	253	265	56	121	117	17.8
3	50	826.65	1.8	4.0	252	263	57	121	117	17.9
3	55	830.60	1.8	4.0	253	262	58	120	117	17.7
3	60	834.575	1.8	4.0	255	259	58	120	117	17.8
	(1130)									
	θ= 60	V_m=47.375	(ΔH)avg= 1.8					(tm)avg.=	118.4	

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	516	500	16
Condenser			
Desiccant	1426	1409	17
		Total	33

Preliminary results of SO_2 concentration determination	
V_{mstd}	=42.41 DSCF
Moisture	=8.81 %v/v
SO_2, dry	= ppm
SO_2, wet	= ppm
LB/MMBtu	=

S-287 al

Interpoll Laboratories
(612)786-6020

EPA Method 7 Sample Collection Field Data Sheet

Job Cyprus Northshore Mining Date 1-8-92 Bar. Pressure 29.25 IN.HG.

Test Location Waste Fuel Type _____ Sample Train No. Blue

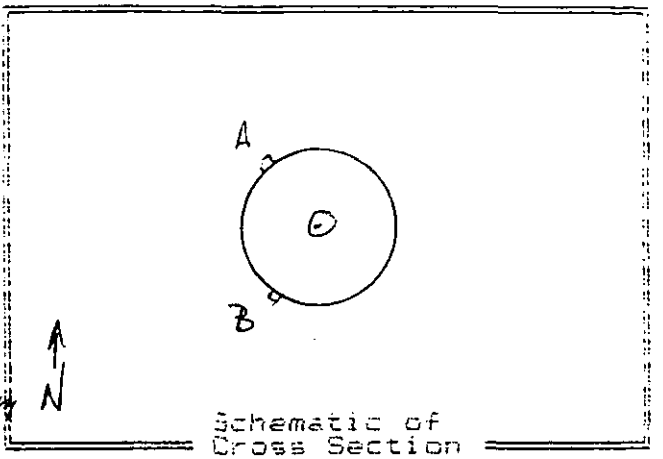
Gas Inlet Technician BAB Pump No. 545

No.	Test Run Point	Flask No.	Time (HRS)	Vacuum (IN.HG.)	Flask Temp. (°F)	Leak Rate <0.4 IN.HG./MIN.
1	2-1	34	0800	28.20	86°	☒ Yes ☐ No
2	2-1	44 37	0815	28.05	86°	☒ Yes ☐ No
3	2-1	42 38	0830	28.35	86°	☒ Yes ☐ No
4	2-1	40	0845	28.40	86°	☒ Yes ☐ No
5	2-2	41	0915	28.30	86°	☒ Yes ☐ No
6	2-2	42	0930	28.25	86°	☒ Yes ☐ No
7	2-2	55	0945	28.45	86°	☒ Yes ☐ No
8	2-2	56	1000	28.35	86°	☒ Yes ☐ No
9	2-3	57	1030	28.25	86°	☒ Yes ☐ No
10	2-3	58	1045	28.40	86°	☒ Yes ☐ No
11	2-3	59	1100	28.80	86°	☒ Yes ☐ No
12	2-4	60	1115	28.75	86°	☒ Yes ☐ No
13						☐ Yes ☐ No
14						☐ Yes ☐ No
15						☐ Yes ☐ No
16						☐ Yes ☐ No
17						☐ Yes ☐ No
18						☐ Yes ☐ No
19						☐ Yes ☐ No
20						☐ Yes ☐ No
21						☐ Yes ☐ No
22						☐ Yes ☐ No
23						☐ Yes ☐ No
24						☐ Yes ☐ No
25						☐ Yes ☐ No
26						☐ Yes ☐ No
27						☐ Yes ☐ No

S-263R

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job Cyprus Minerals
Source #12 Waste Gas Stack
Test 2 Run 0 Date 1/8/92
Stack dimen. 71 IN.
Dry bulb ____ °F Wet bulb ____ °F
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 29.00 in Hg
Static pressure -.38 in WC
Operators D. VanHoeven & T. Bergstrom
Pitot No. V23-6 Cp .84



Schematic of Cross Section

Traverse Point No.	Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
		Port length: 5 in.		Time start: 1117 hrs	
A 1	.021	1.49	6.49	.47	133
2	.067	4.76	9.76	.55	133
3	.118	8.38	13.38	.65	133
4	.177	12.57	17.57	.70	133
5	.250	17.75	22.75	.73	133
6	.356	25.28	30.28	.74	133
7	.644	45.72	50.72	.76	133
8	.750	53.25	58.25	.76	133
9	.823	58.43	63.43	.76	133
10	.882	62.62	67.62	.72	133
11	.933	66.24	71.24	.62	133
12	.979	69.51	74.51	.55	133
B 1				.42	133
2				.52	133
3				.62	133
4				.67	134
5				.71	134
6				.72	133
7				.73	133
8				.73	133
9				.69	133
10				.65	133
11				.58	133
12				.48	133
Temp. meas. tool & S/N: PDT #18				Time end: 1127 hrs	

R or nothing (reg) manometer; E = expanded; E = electronic S-392.1

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job *Cyprus*

Source *#12 Waste Gas Stack*

Test *2* Run *0* Date *1/9/92*

Stack dimen. *71* IN.

Dry bulb ______ °F Wet bulb ______ °F

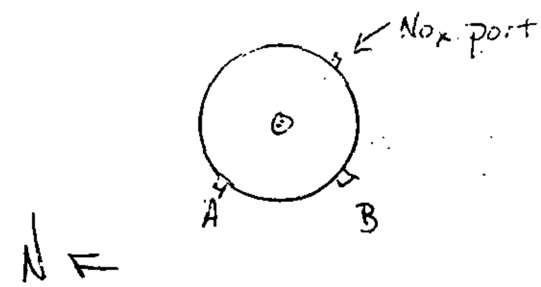
Manometer: ☐ Reg. ☐ Exp. ☐ Elec.

Barometric pressure *29.10* in Hg

Static pressure *-.38* in WC

Operators *D. VanHoever & J. Bergstrom*

Pitot No. ________ Cp ________



Schematic of Cross Section

Traverse Point No.		Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
			Port length: *4 1/2* in.		Time start: hrs	
	A 1	*1/6*	*11.83*	*16.33*		
	2	*3/6*	*35.5*	*40*		
	3	*5/6*	*59.16*	*63.66*		

Temp. meas. tool & S/N: | Time end: hrs

R or nothing= reg. manometer; S= expanded; E = electronic S-392.1

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cyprus Minerals Date 1/8/92 Test 2 Run 1
Source #12 Waste Gas Stack No. of traverse points 3
Method 6 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac) ☐
Postest: ____ cfm at ____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)

____ ☐ acetone ____
____ ☐ other(s) ____

No. of probe wash bottles: ____
Sample recovered by: ____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. B5 Box No. 29 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 0804 (HRS) Time end: 0900 (HRS)
Sampling rate: 400 cc/min Operator: DCH
S/N of O_2 Analyzer used to monitor train outlet: 4

CF-023

S-0046RR

EPA Method 4 and 6 Field Data Sheet

Job Cyprus Minerals
Source #12 Waste Gas Stack
Date 1/8/92 Test 2 Run 1

Operator(s) D. Van Hoever & J. Bergstrom
Meter Box No. 6 Gasmeter coef. .9920
ΔH@ 1.77 in.WC Bar. press 29.10 in.Hg

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: 0 cfm at 6 in. Hg

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	0800	398.30								
A 3	5	402.04	1.80	4	261	257	43	91	91	17.3
3	10	405.89	1.80	4				98	94	17.5
3	15	409.71	1.80	4	263	255	45	100	95	17.5
3	20	413.56	1.80	4				100	95	17.5
2	25	417.42	1.80	4	265	247	45	100	95	17.4
2	30	421.28	1.80	4				99	95	17.2
2	35	425.20	1.80	4	265	249	45	99	95	17.2
2	40	429.07	1.80	4				98	95	17.2
1	45	432.96	1.80	4	264	253	45	97	95	17.1
1	50	436.85	1.80	4				96	94	17.1
1	55	440.71	1.80	4	263	254	46	95	93	17.2
1	60	444.60	1.80	4				93	91	17.1
	(0900)									
	θ= 60	V_m=46.30	(ΔH)avg=1.80					$(t_m)_{avg.}$ = 95.58		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	366	200	166
Condenser			
Desiccant	1313	1289	24
		Total	190

Preliminary results of SO_2 concentration determination		
V_{std}	=	DSCF
Moisture	=	%v/v
SO_2, dry	=	ppm
SO_2, wet	=	ppm
LB/MMBtu	=	

S-287 al

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cyprus Minerals Date 1/8/92 Test 2 Run 3
Source #12 Waste Gas Stack No. of traverse points 3
Method 6 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☐
Postest: ____ cfm at ____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: _____ _____

Recovery solvent(s)
☐ acetone _____
☐ other(s) _____

No. of probe wash bottles: _____
Sample recovered by: _____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. B5 Box No. 6 Bag No. 6
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 0920 (HRS) Time end: 1015 (HRS)
Sampling rate: 400 cc/min Operator: DCH
S/N of O_2 Analyzer used to monitor train outlet: 4

CF-023

S-0046RR

EPA Method 4 and 5 Field Data Sheet

Job Cyprus Minerals
Source #12 Waste Gas Stack
Date 1/8/92 Test 2 Run 2

Operator(s) [illegible] & F.B
Meter Box No. 6 Gasmeter coef. .9920
ΔH@ 1.77 in.WC Bar. press 29.10 in.Hg

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: 0 cfm at 8 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	0915	444.80								
3	5	448.60	1.80	4	261	256	43	88	87	17.4
3	10	452.43	1.80	4				90	87	17.8
3	15	456.30	1.80	4				91	87	17.8
3	20	460.02	1.80	4	260	255	45	92	87	17.8
2	25	463.91	1.80	4				92	87	17.8
2	30	467.79	1.80	4				93	88	17.7
2	35	471.70	1.80	4	262	254	45	93	88	17.6
2	40	475.59	1.80	4				94	88	17.7
1	45	479.47	1.80	4				94	89	17.6
1	50	483.35	1.80	4	263	257	46	94	89	17.6
1	55	487.25	1.80	4				95	90	17.5
1	60	491.15	1.80	4				95	90	17.5
	(1015)									
	θ=60	V_m=46.35	$(\Delta H)_{avg}$=1.80					$(t_m)_{avg}$.=90.33		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	370	200	170
Condenser			
Desiccant	1312	1293	19
		Total	189

Preliminary results of SO_2 concentration determination	
V_{std} =	DSCF
Moisture =	%v/v
SO_2, dry =	ppm
SO_2, wet =	ppm
LB/MMBtu =	

S-287 a1

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Cyprus Minerals Date 1/8/92 Test 2 Run 3
Source #12 Waste Gas Stack No. of traverse points 3
Method 6 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac) ☐
Postest: ____ cfm at ____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)

☐ acetone
☐ other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. B5 Box No. 29 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1035 (HRS) Time end: 1130 (HRS)
Sampling rate: 400 cc/min Operator: DLH
S/N of O_2 Analyzer used to monitor train outlet: 4

CF-023

S-0046RR

EPA Method 4 and 6 Field Data Sheet

Job Cyprus Minerals
Source #12 Waste Gas Stack
Date 1/8/92 Test 2 Run 3

Operator(s) DWH & TB
Meter Box No. 6 Gasmeter coef. .9920
ΔH@ 1.77 in.WC Bar. press 29.10 in.Hg

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: 0 cfm at 5 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen
					Probe	Oven	Impg.	Gas/In	Gas/Out	(%v/v)
	1030	491.40								
A-3	5	495.24	1.80	4	253	260	44	88	88	18.0
3	10	499.08	1.80	4				91	88	17.7
3	15	502.90	1.80	4	256	262	43	94	89	17.8
3	20	506.72	1.80	4				95	89	17.7
2	25	510.52	1.80	4	260	261	44	96	90	17.6
2	30	514.36	1.80	4				97	91	17.6
2	35	518.18	1.80	4	262	261	45	98	92	17.6
2	40	522.03	1.80	4				99	92	17.4
1	45	525.94	1.80	4	261	260	45	100	93	17.4
1	50	529.84	1.80	4				100	94	17.4
1	55	533.75	1.80	4	260	260	45	101	94	17.4
1	60	537.64	1.80	4				101	95	17.5
	(1130)									
	θ=60	V_m=46.24	$(\Delta H)_{avg}$=1.80					$(t_m)_{avg.}$=93.54		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	374	200	174
Condenser			
Desiccant	1287	1264	23
		Total	197

Preliminary results of SO_2 concentration determination	
V_{std} =	DSCF
Moisture =	%v/v
SO_2, dry =	ppm
SO_2, wet =	ppm
LB/MMBtu =	

S-287 a1

Interpoll Laboratories
(612)786-6020

EPA Method 7 Sample Collection
Field Data Sheet

Job Cyprus Minerals Date 1-8-92 Bar. Pressure 29.10 IN.HG.
Test Location NO. 12 Fuel Type _____ Sample Train No. 1
Waste gas Stack Technician DWH SJB Pump No. 4

No.	Test Run Point	Flask No.	Time (HRS)	Vacuum (IN.HG.)	Flask Temp. (°F)	Leak Rate <0.4 IN.HG./MIN.
1	2-1-1	43	0805	26.70	92	☑ Yes ☐ No
2	2-1-2	44	0820	26.75	92	☑ Yes ☐ No
3	2-1-3	45	0835	26.70	92	☑ Yes ☐ No
4	2-1-1	46	0850	26.70	92	☑ Yes ☐ No
5	2-2-2	48	0915	26.75	84	☑ Yes ☐ No
6	2-2-3	35	0930	26.70	83	☑ Yes ☐ No
7	2-2-1	49	0945	26.70	82	☑ Yes ☐ No
8	2-2-2	50	1000	2675	81	☑ Yes ☐ No
9	2-3-3	51	1030	26.70	81	☑ Yes ☐ No
10	2-3-1	52	1045	26.70	81	☑ Yes ☐ No
11	2-3-2	53	1100	26.75	81	☑ Yes ☐ No
12	2-3-3	54	1115	26.70	81	☑ Yes ☐ No
13						☐ Yes ☐ No
14						☐ Yes ☐ No
15						☐ Yes ☐ No
16						☐ Yes ☐ No
17						☐ Yes ☐ No
18						☐ Yes ☐ No
19						☐ Yes ☐ No
20						☐ Yes ☐ No
21						☐ Yes ☐ No
22						☐ Yes ☐ No
23						☐ Yes ☐ No
24						☐ Yes ☐ No
25						☐ Yes ☐ No
26						☐ Yes ☐ No
27						☐ Yes ☐ No

S-263R

APPENDIX C

INTERPOLL LABORATORIES ANALYTICAL DATA

TABLE OF CONTENTS

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job Cyprus Northshore Mining
Team Leader DB BA
Date Submitted 1-9-92
Test No. 1
Date of Analysis 1-10-92

Source Hood Exhaust
Test Site Inlet
Date of Test 1-7-92
No. of Runs Completed 3
Technician R. Glenn

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
1/1	5142-05	1	0.00	.30	20.00	.30	19.70	4.00
		2	0.00	.30	20.00	.30	19.70	4.00
	☑ B ☐ F	Avg				.30	19.70	
1/2	-06	1	0.00	.30	20.10	.30	19.80	3.67
		2	0.00	.30	20.10	.30	19.80	3.67
	☑ B ☐ F	Avg				.30	19.80	
1/3	-07	1	0.00	.30	20.10	.30	19.80	3.67
		2	0.00	.30	20.10	.30	19.80	3.67
	☑ B ☐ F	Avg				.30	19.80	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

LSC-04-BR

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job: Cyprus Minerals
Team Leader: AVH
Date Submitted: 1-9-92
Test No.: 1
Date of Analysis: 1-10-92

Source: Hood Exhauste
Test Site: STACK
Date of Test: 1/7/92
No. of Runs Completed: 3
Technician: R. Glam

Test/Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
1/1		1	0.00	.30	20.10	.30	19.80	3.67
	5142-24	2	0.00	.30	20.10	.30	19.80	3.67
	☑ B ☐ F	Avg				.30	19.80	
1/2		1	0.00	.30	20.10	.30	19.80	3.67
	-25	2	0.00	.30	20.10	.30	19.80	3.67
	☑ B ☐ F	Avg				.30	19.80	
1/3		1	0.00	.30	20.10	.30	19.80	3.67
	-26	2	0.00	.30	20.10	.30	19.80	3.67
	☑ B ☐ F	Avg				.30	19.80	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

LSC-04-BR

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job Cyprus Mining
Team Leader DB
Date Submitted 1-9-92
Test No. 2
Date of Analysis 1-10-92

Source Waste Gas
Test Site Inlet
Date of Test 1-8-92
No. of Runs Completed 3
Technician R. Galum

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
2/1	5142-43	1	0.00	1.40	18.70	1.40	17.30	2.57
		2	0.00	1.40	18.70	1.40	17.30	2.57
	☑ B ☐ F	Avg				1.40	17.30	
2/2	-44	1	0.00	1.50	18.80	1.50	17.30	2.40
		2	0.00	1.50	18.80	1.50	17.30	2.40
	☑ B ☐ F	Avg				1.50	17.30	
2/3	-45	1	0.00	1.50	18.80	1.50	17.30	2.40
		2	0.00	1.50	18.80	1.50	17.30	2.40
	☑ B ☐ F	Avg				1.50	17.30	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

LSC-04-BR

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job: Cyprus Minerals
Team Leader: DJH
Date Submitted: 1-9-92
Test No.: 2
Date of Analysis: 1-10-92

Source: #12 Waste Gas
Test Site: STACK
Date of Test: 1-8-92
No. of Runs Completed: 3
Technician: R. Cohen

Test/Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
2/1	5142-62	1	0.00	1.40	18.70	1.40	17.30	2.57
		2	0.00	1.40	18.70	1.40	17.30	2.57
	☑ B ☐ F	Avg				1.40	17.30	
2/2	-63	1	0.00	1.50	18.80	1.50	17.30	2.40
		2	0.00	1.50	18.80	1.50	17.30	2.40
	☑ B ☐ F	Avg				1.50	17.30	
2/3	-64	1	0.00	1.50	18.80	1.50	17.30	2.40
		2	0.00	1.50	18.80	1.50	17.30	2.40
	☑ B ☐ F	Avg				1.50	17.30	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

LSC-04-RD

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job Cyprus Mining
Team Leader DB
Date Submitted 1-9-92
Test No. 3
Date of Analysis 1-10-92

Source Exhaust Hood
Test Site Inlet
Date of Test 1-9-92
No. of Runs Completed 3
Technician [illegible]

Test/Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
3/1	5142-80	1	0.00	.30	19.90	.30	19.60	4.33
		2	0.00	.30	19.90	.30	19.60	4.33
	☑ B ☐ F	Avg				.30	19.60	
3/2	-81	1	0.00	.30	19.90	.30	19.60	4.33
		2	0.00	.30	19.90	.30	19.60	4.33
	☑ B ☐ F	Avg				.30	19.60	
3/3	-82	1	0.00	.30	19.90	.30	19.60	4.33
		2	0.00	.30	19.90	.30	19.60	4.33
	☑ B ☐ F	Avg				.30	19.60	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

LSC-04-BR

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job: Cyprus
Team Leader: DVH
Date Submitted: 1-9-92
Test No.: 3
Date of Analysis: 1-10-92

Source: Hood Vent
Test Site: STACK
Date of Test: 1-9-92
No. of Runs Completed: 3
Technician: [illegible]

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
3/1	5142-98	1	0.00	.30	20.00	.30	19.70	4.00
		2	0.00	.30	20.00	.30	19.70	4.00
	☑ B ☐ F	Avg				.30	19.70	
3/2	-99	1	0.00	.40	20.00	.40	19.60	3.25
		2	0.00	.40	20.00	.40	19.60	3.25
	☑ B ☐ F	Avg				.40	19.60	
3/3	-100	1	0.00	.40	20.00	.40	19.60	3.25
		2	0.00	.40	20.00	.40	19.60	3.25
	☑ B ☐ F	Avg				.40	19.60	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

LSC-04-BR

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 40001 WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: gms Date of Analysis: 1-22-92

Job Cyprus NorthShore Mining Source: Hood Exhaust Site: Inlet
1-7-92a

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	~~12.5~~ 25 mM Sulfuric Acid
X	AS4A	2 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient (List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Results of Sulfate Determination

Sample Name	Interpoll Log Number	Tot. Sample Volume (ml)	Dilution	Solution Conc.(ug/ml)	Total ug Sulfate	meq of Sulfate
T, R0	5142-01	500	1	0.802	401	8.35×10^{-3}
T, R1	02	500	50	3.29	82300	1.71
T, R2	03	500	20	2.56	25600	0.533
T, R3	04	500	20	1.57	15700	0.327

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)
meq = Total ug / 48000

LSC-08RR

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 4000i WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: SMS Date of Analysis: 1-22-92

Job: Cyprus Northshore Mining 1-7-92 Source: Hood Exhaust Site: Stack

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	~~12.5~~ 25 mM Sulfuric Acid
X	AS4A	2 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Modified EPA Method 6
Impinger Catch

Results of Sulfate Determination

Sample Name	Interpoll Log Number	Tot. Sample Volume (ml)	Dilution	Solution Conc.(ug/ml)	Total ug Sulfate	meq of Sulfate
T_1R_0	5142-20	500	1	<0.025	<125	$<2.6 \times 10^{-4}$
T_1R_1	-21	500	10	1.27	6350	0.132
T_1R_2	-22	500	10	0.900	4500	0.094
T_1R_3	-23	500	10	~~0.640~~	3160	0.066
				0.032		

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)
meq = Total ug / 48000

LSC-08RR

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 4000i WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: SMS Date of Analysis: 1-22-92

Job: Cyprus NorthShore Mn Source: Waste Gas Site: Inlet

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	~~12.5~~ 25 mM Sulfuric Acid
X	AS4A	2 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Results of Sulfate Determination

Sample Name	Interpoll Log Number	Tot. Sample Volume (ml)	Dilution	Solution Conc.(ug/ml)	Total ug Sulfate	meq of Sulfate
T_2R_1	5142-40	500	20	1.46	14600	0.304
T_2R_2	41	500	20	1.03	10300	0.215
T_2R_3	42	500	20	0.864	8640	0.180

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)
meq = Total ug / 48000

LSC-08RR

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 4000i WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: SMS Date of Analysis: 1-22-92

Job: Cyprus Northshore Mining Source: Waste Gas Site: Stack
1-8 92

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	~~12.5~~ 25 mM Sulfuric Acid
X	AS4A	2 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Modified EPA Method 6
Impinger Catch

Results of Sulfate Determination

Sample Name	Interpoll Log Number	Tot. Sample Volume (ml)	Dilution	Solution Conc.(ug/ml)	Total ug Sulfate	meq of Sulfate
T_2R_0	5142-58	500	1	<0.025	<12.5	$<2.6\times10^{-4}$
T_2R_1	-59	500	1	<0.025	<12.5	$<2.6\times10^{-4}$
T_2R_2	-60	500	1	<0.025	<12.5	$<2.6\times10^{-4}$
T_2R_3	-61	500	1	<0.025	<12.5	$<2.6\times10^{-4}$

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)
meq = Total ug / 48000

LSC-08RR

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 4000i WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: SMS Date of Analysis: 1-22-92

Job: Cyprus Northshore Mining 1-9-92 Source: Hood Exhaust Site: Inlet

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	~~12.5~~ 25 mM Sulfuric Acid
X	AS4A	2 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Modified EPA Method 6
Impinger Catch

Results of Sulfate Determination

Sample Name	Interpoll Log Number	Tot. Sample Volume (ml)	Dilution	Solution Conc.(ug/ml)	Total ug Sulfate	meq of Sulfate
T_3R_1	5142-77	500	10	5.81	29100	0.605
T_3R_2	-78	500	10	4.63	23200	0.483
T_3R_3	-79	500	10	5.73	28700	0.597

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)
meq = Total ug / 48000

LSC-08RR

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 4000i WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: SMS Date of Analysis: 1-29-92

Job: Cyprus Northshore Mining Source: Hood Exhaust Site: Stack

Chromatography Conditions

	Column	Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	~~12.5~~ 25 mM Sulfuric Acid
X	AS4A	2 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Modified EPA Method 6
Impinger Catch

Results of Sulfate Determination

Sample Name	Interpoll Log Number	Tot. Sample Volume (ml)	Dilution	Solution Conc.(ug/ml)	Total ug Sulfate	meq of Sulfate
$T_3 R_1$	5142-95	500	1	<0.025	<12.5	2.60×10^{-4}
$T_3 R_2$	-96	500	10	2.15	10800	0.224
$T_3 R_3$	-97	500	10	2.17	10900	0.226

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)
meq = Total ug / 48000

LSC-08RR

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 40001 WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: SMS Date of Analysis: 1-22-92

Job: Cyprus Northshore Mining 1-7-92 Source: Hood Exhaust Site: Inlet

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	25mM Sulfuric Acid
X	AS4A	2 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Modified EPA method 6
Impinger catch

Results of Chloride Determination

Sample Name	Interpoll Log Number	Total Sample Vol. in mls	Dilution	Solution Conc. in ug/ml	Total ug
T_1R_0	5142-01	500	1	<0.010	<5.0
T_1R_1	-02	500	100	2.47	124000
T_1R_2	-03	500	100	0.584	29200
T_1R_3	-04	500	100	0.371	18600

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)

LSC-11R

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 4000i WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: SMB Date of Analysis: 1-20-92

Job: Cyprus Northshore Mining 1-7-92 Source: Head Exhaust Site: Stack

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	25 mM Sulfuric Acid
X	AS4A	2 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Modified EPA Method 6
Impinger catch

Results of Chloride Determination

Sample Name	Interpoll Log Number	Total Sample Vol. in mls	Dilution	Solution Conc. in ug/ml	Total ug
T_1R_0	5142-20	500	1	<0.01	<5.0
T_1R_1	-21	500	100	0.160	8000
T_1R_2	-22	500	100	0.097	4850
T_1R_3	-23	500	100	0.093	4650

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)

LSC-11R

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 40001 WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: SMS Date of Analysis: 1-20-92

Job: Cyprus Northshore Mining 1-8-92 Source: Waste Gas Site: Inlet

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	25 mM Sulfuric Acid
X	AS4A	2 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Modified EPA method 6
Impinger catch

Results of Chloride Determination

Sample Name	Interpoll Log Number	Total Sample Vol. in mls	Dilution	Solution Conc. in ug/ml	Total ug
T2R1	5142-40	500	100	0.750	37500
T2R2	-41	500	100	0.723	36200
T2R3	-42	500	100	0.733	36700

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)

LSC-11R

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 40001 WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: SMS Date of Analysis: 1-20-92

Job: Cyprus Northshore Mining 1-8 92 Source: Waste Gas Site: Stack

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	25 mM Sulfuric Acid
X	AS4A	2 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Modified EPA Method 6
Impinger catch

Results of Chloride Determination

Sample Name	Interpoll Log Number	Total Sample Vol. in mls	Dilution	Solution Conc. in ug/ml	Total ug
T2 R0	5142-58	500	1	<0.010	<5.0
T2 R1	-59	500	10	0.221	1110
T2 R2	-60	500	10	0.213	1070
T2 R3	-61	500	10	0.222	1110

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)

LSC-11R

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 40001 WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: SMS Date of Analysis: 1-29-92

Job: Cyprus Northshore Mining 1-99a Source: Dead Exhaust Site: Inlet

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	25 mM Sulfuric Acid
X	AS4A	2 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Modified EPA Method 6
Impinger Catch

Results of Chloride Determination

Sample Name	Interpoll Log Number	Total Sample Vol. in mls	Dilution	Solution Conc. in ug/ml	Total ug
T_3R_1	5142-77	500	100	0.238	11900
T_3R_2	-78	500	100	0.243	12200
T_3R_3	79	500	100	0.234	11700

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)

LSC-11R

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 4000i WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: BMS Date of Analysis: 1-20-92

Job: Cyprus Northshore Mining Source: Hood Exhaust Site: Stack

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	25 mM Sulfuric Acid
X	AS4A	2 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Modified EPA Method 6
Impinger Catch

Results of Chloride Determination

Sample Name	Interpoll Log Number	Total Sample Vol. in mls	Dilution	Solution Conc. in ug/ml	Total ug
T3 R1	5142-95	500	1	0.958	479
T3 R2	-96	500	10	0.133	665
T3 R3	-97	500	10	0.167	835

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)

LSC-11R

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 40001 WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: SMS Date of Analysis: 1-23-92

Job: Cyprus Northshore Mining Source: Hood Exhaust Site: Inlet

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	25 mM Sulfuric Acid
X	AS4A	2 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH		Isocratic
X	AS4A	2 ml/min	5 to 70 mM Sodium Borate	X	Gradient (List program below)

Gradient Program	Time (Min.)									
Eluent	0.0	2.0	2.1	7.0	7.1	15				
% A 5mM	100	100	0	0	100	100				
% B 70mM	0	0	100	100	0	0				

Modified EPA Method 6
Impinger Catch

Results of Fluoride Determination

Sample Name	Interpoll Log Number	Total Sample Vol. in mls	Dilution	Solution Conc. in ug/ml	Total ug
T1R0	5142-01	500	1	0.156	78
T1R1	-02	500	100	0.236	11800
T1R2	-03	500	100	0.326	16300
T1R3	-04	500	100	0.355	17800

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)

LSC-12R

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 4000I WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: SMS Date of Analysis: 1-23-92

Job: Cyprus Northshore Mining 1-7-92 Source: Hood Exhaust Site: Stack

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	25 mM Sulfuric Acid
	AS4A	ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	~~X~~	Isocratic
X	AS4A	2 ml/min	5:70 mM Sodium Borate	X	Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0	2.0	2.1	7.0	7.1	15.0				
% A 5mM	100	100	0	0	100	100				
% B 70mM	0	0	100	100	0	0				

Modified EPA Method 6
Impinger Catch

Results of Fluoride Determination

Sample Name	Interpoll Log Number	Total Sample Vol. in mls	Dilution	Solution Conc. in ug/ml	Total ug
T1R0	5142-20	500	1 ~~10~~ SMS 1-23-92	<0.015 ~~0.374~~	<7.5 ~~1870~~
T1R1	-21	500	10	0.140	700
T1R2	-22	500	10	0.277	1390
T1R3	-23	500	10	0.368	1840

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)

LSC-12R

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 40001 WITH ANION MICRO MEMBRANE SUPPRESSION

Analyst: SMS Date of Analysis: 1-23-92

Job: Cyprus Northshore Mining Source: Waste Gas Site: Inlet

1-8-92

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	25 mM Sulfuric Acid
	AS4A	ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH		Isocratic
X	AS4A	2 ml/min	5-70mM Sodium Borate	X	Gradient (List program below)

Gradient Program	Time (Min.)									
Eluent	0.0	2.0	2.1	7.0	7.1	15.0				
% A 5 mM	100	100	0	0	100	100				
% B 70mM	0	0	100	100	0	0				

Modified EPA Method 6
Impinger Catch

Results of Fluoride Determination

Sample Name	Interpoll Log Number	Total Sample Vol. in mls	Dilution	Solution Conc. in ug/ml	Total ug
T2 R1	5142-40	500	100	0.309	15500
T2 R2	-41	500	100	0.288	14400
T2 R3	-42	500	100	0.231	11600

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)

LSC-12R

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 40001 WITH ANION MICRO MEMBRANE SUPPRESSION

Analyst: SMS Date of Analysis: 1-23-92

Job: Cyprus Northshore Mining Source: Waste Gas Site: Stack

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	25 mM Sulfuric Acid
	AS4A	ml/min	1.8 mM Na_2CO_3 @ 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH		Isocratic
X	AS4A	2 ml/min	5 - 70mM Sodium Borate	X	Gradient (List program below)

Gradient Program	Time (Min.)									
Eluent	0.0	20	21	30	31	15				
% A 5mM	100	100	0	0	100	100				
% B 70mM	0	0	100	100	0	0				

Modified EPA Method 6
Impinger Catch

Results of Fluoride Determination

Sample Name	Interpoll Log Number	Total Sample Vol. in mls	Dilution	Solution Conc. in ug/ml	Total ug
T2R0	5142-58	500	1 10 50 100	0.787	~~3940~~ 7.5
T2R1	-59	500	100	0.037	1850
T2R2	-60	500	100	0.026	1300
T2R3	-61	500	100	0.059	2950

<0.015

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)

LSC-12R

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 40001 WITH ANION MICRO MEMBRANE SUPPRESSION

Analyst: SMS Date of Analysis: 1-23-92

Job: Cyprus Northshore Mining 1-92 Source: Hood Exhaust Site: Inlet

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	25 mM Sulfuric Acid
	AS4A	ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH		Isocratic
X	ASHA	2 ml/min	5:70mM Sodium Borate	X	Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0	20	21	7.0	7.1	15				
% A 5mM	100	100	0	0	100	100				
% B 70mM	0	0	100	100	0	0				

Modified EPA Method 6
Impinger Catch

Results of Fluoride Determination

Sample Name	Interpoll Log Number	Total Sample Vol. in mls	Dilution	Solution Conc. in ug/ml	Total ug
T3 R1	5142-77	500	100	0.178	8900
T3 R2	-78	500	100	0.259	13000
T3 R3	-79	500	100	0.284	14200

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)

LSC-12R

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 40001 WITH ANION MICRO MEMBRANE SUPPRESSION

Analyst: SMS Date of Analysis: 1-23-92

Job: Cyprus Northshore Mining Source: Hood Exhaust Site: Stack

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	25 mM Sulfuric Acid
	AS4A	ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH		Isocratic
X	AS4A	2 ml/min	5mM ↑ 70mM Sodium Borate	X	Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0	2.0	2.1	7.0	7.1	15				
% A	100	100	0	0	100	100				
% B	0	0	100	100	0	0				

Modified EPA Method 6
Impinger Catch

Results of Fluoride Determination

Sample Name	Interpoll Log Number	Total Sample Vol. in mls	Dilution	Solution Conc. in ug/ml	Total ug
T_3R_1	5142-95	500	100	0.022	1100
T_3R_2	-96	500	100	0.036	1800
T_3R_3	-97	500	100	0.040	2000

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)

LSC-12R

Interpoll Laboratories
(612)786-6020

IPT

EPA Method 7A Recovery and Analysis Data Sheet (1)

**********SOURCE**********	**********RECOVERY**********	**********ANALYTICAL**********
Job Cyprus Mining	Date of Recovery 1-13-92	Date of Analysis 1-15-92
Source Hood Exhaust Inlet	Recovered by C. Helgesor	Analyst SMS
Date of Sampling 1-7-92	Recovery volume 500 ml	Eluent AS4A
Test No(s) 1	Barometric at time 29.11 IN.HG.	Chromatograph: Dionex System 4000i

Samples collected in accordance with EPA Method 7, CFR Title 40, Part 60, Appendix A. Samples analyzed in accordance with EPA Method 7A by ion chromatography. Mercury manometers used to measure flask pressures/vacuums in sampling and in recovery. Thommen Model TX 19 jewel barometer calibrated against laboratory mercury in glass barometer used to measure field barometric pressure. Three field blanks are prepared and the average used to correct measured nitrate concentrations. All samples are analyzed as a batch using a Dionex Model 4270 Chromatograph Data Intergrator. The integrator is programmed to give the actual concentration of the 500 ml recovered sample even if a subsequent dilution was made. The dilution is indicated here as well as on the chromatogram.

$$C_{RS} = DF(C_{DS}) \qquad M_{NO_3} = (C_{RS} - \overline{C}_B)V_R \qquad \overline{C}_B = (C_{B1} + C_{B2} + C_{B3})/3$$

where: C_{RS} = concentration of nitrate in 500 ml recovered sample in ug/ml

DF = dilution factor

C_{DS} = concentration of nitrate of a 500 ml recovered sample which has been diluted by a factor of DF to bring it into the proper range for the ion chromatograph. This value is an intermediate number and is not outputted by the electronic integrator which is programmed to output the concentration of the original undiluted 500 ml recovered sample.

M_{NO_3} = total mass of nitrate in micrograms in the 500 ml recovered sample and/or in the 2L flask.

C_B = average conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

C_{B1}, C_{B2}, C_{B3} = conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

V_R = recovery volume for samples and field blanks in ml

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (2)

	Sample Log ID No.	Flask No.	Test/ Run	Final Flask Conditions t_f (°F)	+	-	ΔP_g (IN.HG.)	Chrom Run No.	DF	Nitrate Concentration (ug/ml) Uncorr. for blank C_{RS}	Corr. for blank ($C_{RS} - C_B$)	Total nitrate in Sample (ug) ($M_{NO_3^-}$)
						✓	0.4			0.226	0.197	98.5
1	5142-08	1	1-1	74		✓	0.5			0.234	0.205	103
2	-09	2	1-1	74		✓	0.2			0.190	0.161	80.5
3	-10	3	1-1	74	✓		0.2			0.213	0.184	92.0
4	-11	4	1-1	74		✓	0.2			0.210	0.187	93.5
5	-12	5	1-2	74		✓	0.2			0.191	0.162	81.0
6	-13	6	1-2	74		✓	0.1			0.215	0.189	94.5
7	-14	7	1-2	74	✓		0.6			0.217	0.188	94.0
8	-15	8	1-2	74		✓	0.1			0.208	0.179	89.5
9	-16	9	1-3	74			0			0.202	0.173	86.5
10	-17	10	1-3	74		✓	0.1			0.213	0.184	92.0
11	-18	11	1-3	74	✓		0.1			0.242	0.213	107
12	-19	12	1-3	74			0					
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
Blank 1	-113	25		74	✓		0.5		1	CB1 0.089		
Blank 2									1	CB2		
Blank 3									1	CB3		

$\bar{C}_B$ = 14.5

S-340(2) R-9/85

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (1)

27F

**********SOURCE**********	**********RECOVERY**********	**********ANALYTICAL**********
Job Cyprus Mining	Date of Recovery 1-13-92	Date of Analysis 1-15-92
Source NA12 Waste Gas Inlet	Recovered by C. Helseson	Analyst SMS
Date of Sampling 1-8-92	Recovery volume 500 ml	Eluent AS4A
Test No(s) 2	Barometric at time 29.11 IN.HG.	Chromatograph: Dionex System 4000i

Samples collected in accordance with EPA Method 7, CFR Title 40, Part 60, Appendix A. Samples analyzed in accordance with EPA Method 7A by ion chromatography. Mercury manometers used to measure flask pressures/vacuums in sampling and in recovery. Thommen Model TX 19 jewel barometer calibrated against laboratory mercury in glass barometer used to measure field barometric pressure. Three field blanks are prepared and the average used to correct measured nitrate concentrations. All samples are analyzed as a batch using a Dionex Model 4270 Chromatograph Data Intergrator. The integrator is programmed to give the actual concentration of the 500 ml recovered sample even if a subsequent dilution was made. The dilution is indicated here as well as on the chromatogram.

$$C_{RS} = DF(C_{DS}) \qquad M_{NO_3} = (C_{RS} - \overline{C}_B)V_R \qquad \overline{C}_B = (C_{B1} + C_{B2} + C_{B3})/3$$

where:

C_{RS} = concentration of nitrate in 500 ml recovered sample in ug/ml

DF = dilution factor

C_{DS} = concentration of nitrate of a 500 ml recovered sample which has been diluted by a factor of DF to bring it into the proper range for the ion chromatograph. This value is an intermediate number and is not outputted by the electronic integrator which is programmed to output the concentration of the original undiluted 500 ml recovered sample.

M_{NO_3} = total mass of nitrate in micrograms in the 500 ml recovered sample and/or in the 2L flask.

C_B = average conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

C_{B1}, C_{B2}, C_{B3} = conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

V_R = recovery volume for samples and field blanks in ml

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (2)

	Sample Log ID No.	Flask No.	Test/ Run	Final Flask Conditions t_f (°F)	+	-	ΔP_g (IN.HG.)	Chrom Run No.	DF	Nitrate Concentration (ug/ml) Uncorr. for blank C_{RS}	Corr. for blank ($C_{RS} - \bar{C}_B$)	Total nitrate in Sample (ug) ($M_{NO_3^-}$)
						✓	1.3			0.888	0.860	430
1	5142-46	36	2-1	74								
2	-47	37	2-1	74	✓		1.0			0.844	0.815	408
3	-48	38	2-1	74		✓	0.7			0.863	0.834	417
4	-49	40	2-1	74		✓	1.4			0.907	0.878	439
5	-50	41	2-2	74		✓	1.4			0.857	0.828	414
6	-51	42	2-2	74		✓	1.4			0.858	0.829	415
7	-52	55	2-2	74		✓	1.5			0.890	0.861	431
8	-53	56	2-2	74		✓	1.5			0.858	0.829	415
9	-54	57	2-3	74		✓	1.9			0.825	0.796	398
10	-55	58	2-3	74		✓	0.2			0.854	0.825	413
11	-56	59	2-3	74			0			0.846	0.817	409
12	-57	60	2-3	74		✓	1.3			0.852	0.823	412
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
Blank 1									1	CB1 0.029	ex.	
Blank 2									1	CB2		
Blank 3									1	CB3		

$\bar{C}_B$ = 14.5

S-340(2) R-9/85

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (1)

3P1

****************SOURCE**************** ****************RECOVERY****************** ****************ANALYTICAL****************

Job Cyprus Mining | Date of Recovery 1-13-92 | Date of Analysis 1-15-92

Source Hood Exhaust Inlet | Recovered by C. Helseth | Analyst SMS

Date of Sampling 1-9-92 | Recovery volume 500 ml | Eluent AS4A

Test No(s) 3 | Barometric at time 29.11 IN.HG. | Chromatograph: Dionex System 4000i

Samples collected in accordance with EPA Method 7, CFR Title 40, Part 60, Appendix A. Samples analyzed in accordance with EPA Method 7A by ion chromatography. Mercury manometers used to measure flask pressures/vacuums in sampling and in recovery. Thommen Model TX 19 jewel barometer calibrated against laboratory mercury in glass barometer used to measure field barometric pressure. Three field blanks are prepared and the average used to correct measured nitrate concentrations. All samples are analyzed as a batch using a Dionex Model 4270 Chromatograph Data Intergrator. The integrator is programmed to give the actual concentration of the 500 ml recovered sample even if a subsequent dilution was made. The dilution is indicated here as well as on the chromatogram.

$$C_{RS} = DF(C_{DS}) \qquad M_{NO_3} = (C_{RS} - \bar{C}_B)V_R \qquad \bar{C}_B = (C_{B1} + C_{B2} + C_{B3})/3$$

where: C_{RS} = concentration of nitrate in 500 ml recovered sample in ug/ml

DF = dilution factor

C_{DS} = concentration of nitrate of a 500 ml recovered sample which has been diluted by a factor of DF to bring it into the proper range for the ion chromatograph. This value is an intermediate number and is not outputted by the electronic integrator which is programmed to output the concentration of the original undiluted 500 ml recovered sample.

M_{NO_3} = total mass of nitrate in micrograms in the 500 ml recovered sample and/or in the 2L flask.

C_B = average conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

C_{B1}, C_{B2}, C_{B3} = conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

V_R = recovery volume for samples and field blanks in ml

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (2)

	Sample Log ID No.	Flask No.	Test/ Run	Final Flask Conditions t_f (°F)	+	-	ΔP_g (IN.HG.)	Chrom Run No.	DF	Nitrate Concentration (ug/ml) Uncorr. for blank C_{RS}	Corr. for blank ($C_{RS} - \bar{C}_B$)	Total nitrate in Sample (ug) ($M_{NO_3^-}$)
1	5142-83	61	3-1	74	✓		0.6			0.202	0.173	86.5
2	-84	62	3-1	74	✓		0.7			0.211	0.182	91.0
3	-85	63	3-1	74	✓		0.6			0.220	0.191	95.5
4	-86	64	3-1	74		✓	0.3			0.228	0.199	99.5
5	-87	65	3-2	74		✓	0.1			0.212	0.183	91.5
6	-88	66	3-2	74		✓	0.3			0.229	0.200	100
7	-89	33	3-2	74			0			0.218	0.189	94.5
8	90	67	3-2	74		✓	0.4			0.188	0.159	79.5
9	-91	68	3-3	74		✓	0.6			0.228	0.199	99.5
10	-92	69	-35	74		✓	0.5			0.223	0.194	97.0
11	-93	71	3-3	74		✓	0.3			0.208	0.179	89.5
12	-94	72	3-3	74		✓	0.6			0.216	0.187	93.5
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
Blank 1									1	CB1 0.089		
Blank 2									1	CB2		
Blank 3									1	CB3		

$\bar{C}_B$ = 14.5

S-340(2) R-9/85

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (1)

125

SOURCE
Job Cyprus Mining
Source Hood Vent Stack
Date of Sampling 1-7-92
Test No(s) 1

RECOVERY
Date of Recovery 1-10-92
Recovered by C. Helgeson
Recovery volume 500 ml
Barometric at time 29.03 IN.HG.

ANALYTICAL
Date of Analysis 1-15-92
Analyst SMS
Eluent AS4A
Chromatograph: Dionex System 4000i

Samples collected in accordance with EPA Method 7, CFR Title 40, Part 60, Appendix A. Samples analyzed in accordance with EPA Method 7A by ion chromatography. Mercury manometers used to measure flask pressures/vacuums in sampling and in recovery. Thommen Model TX 19 jewel barometer calibrated against laboratory mercury in glass barometer used to measure field barometric pressure. Three field blanks are prepared and the average used to correct measured nitrate concentrations. All samples are analyzed as a batch using a Dionex Model 4270 Chromatograph Data Intergrator. The integrator is programmed to give the actual concentration of the 500 ml recovered sample even if a subsequent dilution was made. The dilution is indicated here as well as on the chromatogram.

$$C_{RS} = DF(C_{DS}) \qquad M_{NO_3} = (C_{RS} - \overline{C}_B)V_R \qquad \overline{C}_B = (C_{B1} + C_{B2} + C_{B3})/3$$

where:

C_{RS} = concentration of nitrate in 500 ml recovered sample in ug/ml

DF = dilution factor

C_{DS} = concentration of nitrate of a 500 ml recovered sample which has been diluted by a factor of DF to bring it into the proper range for the ion chromatograph. This value is an intermediate number and is not outputted by the electronic integrator which is programmed to output the concentration of the original undiluted 500 ml recovered sample.

M_{NO_3} = total mass of nitrate in micrograms in the 500 ml recovered sample and/or in the 2L flask.

C_B = average conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

C_{B1}, C_{B2}, C_{B3} = conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

V_R = recovery volume for samples and field blanks in ml

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (2)

	Sample Log ID No.	Flask No.	Test/ Run	Final Flask Conditions t_f (°F)	+	-	Δ Pg (IN.HG.)	Chrom Run No.	DF	Nitrate Concentration (ug/ml) Uncorr. for blank C_{RS}	Corr. for blank (C_{RS} - C_B)	Total nitrate in Sample (ug) ($M_{NO_3^-}$)
1	5142-27	13	1-1-1	72	✓		1.3			0.199	0.199	99.5
2	-28	14	1-1-2	72	✓		1.0			0.195	0.195	97.5
3	-29	15	1-1-3	72	✓		1.9			0.199	0.199	99.5
4	-30	16	1-1-1	72	✓		1.0			0.198 ~~0.207~~	0.198	99.0
5	-31	17	1-2-2	72	✓		1.4			0.207	0.207	104
6	-32	18	1-2-3	72	✓		1.4			0.205	0.205	103
7	-33	19	1-2-1	72	✓		1.0			0.184	0.184	92.0
8	-34	20	1-2-2	72	✓		1.2			0.179	0.179	89.5
9	-35	21	1-3-3	72	✓		1.0			0.194	0.194	97.0
10	-36	22	1-3-1	72	—		1.2			0.196	0.196	98.0
11	-37	23	1-3-2	72	✓		1.1			0.197	0.197	98.5
12	-38	24	1-3-3	72	✓		0.9			0.177	0.172	86.5
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
Blank 1		34					0.0		1	CB1 <0.025		
Blank 2									1	CB2		
Blank 3									1	CB3		

$\bar{C}_B$ = <12.5

S-340(2) R-9/85

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (1)

2PS

****************SOURCE****************
Job Cyprus Mining
Source No. 12 Waste Gas Stack
Date of Sampling 1-8-92
Test No(s) 2

****************RECOVERY*****************
Date of Recovery 1-10-92
Recovered by O. Helgeson
Recovery volume 500 ml
Barometric at time 29.03 IN.HG.

****************ANALYTICAL***************
Date of Analysis 1-15-92
Analyst ~~ASH~~ SMS
Eluent ~~AS4A~~
Chromatograph: Dionex System 4000i

Samples collected in accordance with EPA Method 7, CFR Title 40, Part 60, Appendix A. Samples analyzed in accordance with EPA Method 7A by ion chromatography. Mercury manometers used to measure flask pressures/vacuums in sampling and in recovery. Thommen Model TX 19 jewel barometer calibrated against laboratory mercury in glass barometer used to measure field barometric pressure. Three field blanks are prepared and the average used to correct measured nitrate concentrations. All samples are analyzed as a batch using a Dionex Model 4270 Chromatograph Data Intergrator. The integrator is programmed to give the actual concentration of the 500 ml recovered sample even if a subsequent dilution was made. The dilution is indicated here as well as on the chromatogram.

$$C_{RS} = DF(C_{DS}) \qquad M_{NO_3} = (C_{RS} - \bar{C}_B)V_R \qquad \bar{C}_B = (C_{B1} + C_{B2} + C_{B3})/3$$

where: C_{RS} = concentration of nitrate in 500 ml recovered sample in ug/ml

DF = dilution factor

C_{DS} = concentration of nitrate of a 500 ml recovered sample which has been diluted by a factor of DF to bring it into the proper range for the ion chromatograph. This value is an intermediate number and is not outputted by the electronic integrator which is programmed to output the concentration of the original undiluted 500 ml recovered sample.

M_{NO_3} = total mass of nitrate in micrograms in the 500 ml recovered sample and/or in the 2L flask.

C_B = average conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

C_{B1}, C_{B2}, C_{B3} = conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

V_R = recovery volume for samples and field blanks in ml

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (2)

	Sample Log ID No.	Flask No.	Test/ Run	Final Flask Conditions t_f (°F)	+	-	ΔPg (IN.HG.)	Chrom Run No.	DF	Nitrate Concentration (ug/ml) Uncorr. for blank C_{RS}	Corr. for blank ($C_{RS} - C_B$)	Total nitrate in Sample (ug) ($M_{NO_3^-}$)
1	5142-65	43	2-1-1	72		✓	-2.4			0.783	0.783	392
2	-66	44	2-1-2	72		✓	-2.6			0.770	0.770	385
3	-67	45	2-1-3	72		✓	-2.4			0.755	0.755	378
4	-68	46	2-1-1	72		✓	-2.1			0.782	0.782	391
5	-69	48	2-2-2	72		✓	-2.0			0.795	0.795	398
6	-70	35	2-2-3	72		✓	-1.9			0.791	0.791	396
7	-71	49	2-2-1	72	✓		0.7			0.801	0.801	401
8	-72	50	2-2-2	72		✓	-2.4			0.781	0.781	391
9	-73	51	2-3-3	72		✓	-1.9			0.845	0.845	423
10	-74	52	2-3-1	72		✓	-2.0			0.826	0.826	413
11	-75	53	2-3-2	72		✓	-0.7			0.811	0.811	406
12	-76	54	2-3-3	72		✓	-0.9			0.816	0.816	408
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
Blank 1									1	CB1	<0.025	
Blank 2									1	CB2		
Blank 3									1	CB3		

$\bar{C}_B$ = <125

S-340(2) R-9/85

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (1)

3P S

**********SOURCE**********	**********RECOVERY**********	**********ANALYTICAL**********
Job Cyprus Mining	Date of Recovery 1-10-92	Date of Analysis 1-15-92
Source Hood Vent Stack	Recovered by C. Helgeson	Analyst SMS
Date of Sampling 1-9-92	Recovery volume 500 ml	Eluent AS4A
Test No(s) 3	Barometric at time 29.03 IN.HG.	Chromatograph: Dionex System 4000i

Samples collected in accordance with EPA Method 7, CFR Title 40, Part 60, Appendix A. Samples analyzed in accordance with EPA Method 7A by ion chromatography. Mercury manometers used to measure flask pressures/vacuums in sampling and in recovery. Thommen Model TX 19 jewel barometer calibrated against laboratory mercury in glass barometer used to measure field barometric pressure. Three field blanks are prepared and the average used to correct measured nitrate concentrations. All samples are analyzed as a batch using a Dionex Model 4270 Chromatograph Data Intergrator. The integrator is programmed to give the actual concentration of the 500 ml recovered sample even if a subsequent dilution was made. The dilution is indicated here as well as on the chromatogram.

$$C_{RS} = DF(C_{DS}) \qquad M_{NO_3} = (C_{RS} - \overline{C}_B)V_R \qquad \overline{C}_B = (C_{B1} + C_{B2} + C_{B3})/3$$

where: C_{RS} = concentration of nitrate in 500 ml recovered sample in ug/ml

DF = dilution factor

C_{DS} = concentration of nitrate of a 500 ml recovered sample which has been diluted by a factor of DF to bring it into the proper range for the ion chromatograph. This value is an intermediate number and is not outputted by the electronic integrator which is programmed to output the concentration of the original undiluted 500 ml recovered sample.

M_{NO_3} = total mass of nitrate in micrograms in the 500 ml recovered sample and/or in the 2L flask.

C_B = average conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

C_{B1}, C_{B2}, C_{B3} = conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

V_R = recovery volume for samples and field blanks in ml

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (2)

	Sample Log ID No.	Flask No.	Test/ Run	Final Flask Conditions t_f (°F)	+	-	ΔP_g (IN.HG.)	Chrom Run No.	DF	Nitrate Concentration (ug/ml) Uncorr. for blank C_{RS}	Corr. for blank ($C_{RS} - C_B$)	Total nitrate in Sample (ug) ($M_{NO_3^-}$)
1	5142-101	73	3-1-1	72		✓	0.8			0.177	0.177	88.5
2	-102	74	3-1-2	72		✓	1.1			0.187	0.187	93.5
3	-103	75	3-1-3	72		✓	1.9			0.183	0.183	91.5
4	-104	76	3-1-1	72		✓	0.9			0.184	0.184	92.0
5	-105	77	3-2-2	72		✓	1.5			0.202	0.202	101
6	-106	78	3-2-3	72		✓	0.5			0.201	0.201	101
7	-107	79	3-2-1	72		✓	0.2			0.225	0.225	113
8	-108	80	3-2-2	72		✓	0.1			0.217	0.217	109
9	-104	81	3-3-3	72		✓	0.4			0.215	0.215	108
10	-110	82	3-3-1	72		✓	0.2			0.208	0.208	104
11	-111	83	3-3-2	72		✓	0.4			0.203	0.203	102
12	-112	84	3-3-3	72		✓	0.4			0.217	0.217	109
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
Blank 1									1	CB1 < 0.025		
Blank 2									1	CB2		
Blank 3									1	CB3		

$\bar{C}_B$ = < 12.5

S-340(2) R-9/85

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job Cyprus Northshore Mining
Team Leader Dvit
Date Submitted 1-9-92
Test No. 1

Source Hood Exhaust
Test Site Inlet
Date of Test 1-7-92
No. of Runs Completed 3

No. of Samples	Type of Sample	Analysis Required	Comments
NA	Probe Wash: ☐Acetone ☐D.I. Water	☐As per EPA M-5 ☐Other	
NA	Filter: ☐4" G.F. ☐S.S. Thimble ☐2.5" G.F. ☐47 mm G.F.	☐As per EPA M-5 ☐As per EPA M-17 ☐Other	
3	Impinger Catch: ☐D.I. Water ☐3% H_2O_2 ☐4M5 Hg Only ☐4M5 Metals ☐1.0 N NaOH ☒Other .1N NaOH	☐MN Protocol ☐WI Protocol ☐EPA Mod. M-6 ~~or 8~~ ☒Acid Gases ☐Formaldehyde ☐Metals ☐Other	
3	Integrated Gas sample	☒As per EPA M-3 ☐As per EPA M-10 ☐Other	
12	Oxides of Nitrogen (NO_x)	☒As per EPA M-7A ☐Other	Date 1-7-91 Time (HRS) 1130
	☐ Fuel Sample ☐ Aggregate	☐Attached fuel Form #S-0163RRR	
	Particle Size	☐X-Ray Sedigraph ☐Bahco Method ☐Other	
	Audit Samples ☐Sulfur Dioxide ☐Oxides of Nit. ☐Other	☐As per EPA M-6 ☐As per EPA M-7A ☐Other	

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☐ Dryer ☒ Other Hood Exhaust
2) Fuel: ☐ Coal ☐ Wood ☒ Gas ☐ Oil ☐ RDF ☐ Other
3) Is sample combustible? ☒ No ☐ Yes
4) Does sample need special handling? ☒ No ☐ Yes If yes, explain

S-278RRRR

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job: Cyprus Minerals
Team Leader: DvN
Date Submitted: 1/8/91
Test No.: 1

Source: Hood Exhaust
Test Site: Stack
Date of Test: 1/7/92
No. of Runs Completed: 3

No. of Samples	Type of Sample	Analysis Required	Comments
	Probe Wash: ☐ Acetone ☐ D.I. Water	☐ As per EPA M-5 ☐ Other _____	
	Filter: ☐ 4" G.F. ☐ S.S. Thimble ☐ 2.5" G.F. ☐ 47 mm G.F.	☐ As per EPA M-5 ☐ As per EPA M-17 ☐ Other _____	
4	Impinger Catch: ☐ D.I. Water ☐ 3% H_2O_2 ☐ 4M5 Hg Only ☐ 4M5 Metals ☒ 1.0 N NaOH ☐ Other _____	☐ MN Protocol ☐ WI Protocol ☐ EPA M-6 or 8 ☒ Acid Gases ☐ Formaldehyde ☐ Metals ☐ Other _____	HF, HCl, SO_2
3	Integrated Gas sample	☒ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	
13	Oxides of Nitrogen (NO_x)	☒ As per EPA M-7A ☐ Other _____	Date 1/8/91 Time (HRS) 2000
	☐ Fuel Sample ☐ Aggregate	☐ Attached fuel Form #S-0163RRR	
	Particle Size	☐ X-Ray Sedigraph ☐ Bahco Method ☐ Other _____	
	Audit Samples ☐ Sulfur Dioxide ☐ Oxides of Nit. ☐ Other _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☐ Dryer ☒ Other Vent
2) Fuel: ☐ Coal ☐ Wood ☐ Gas ☐ Oil ☐ RDF ☐ Other _____
3) Is sample combustible? ☒ No ☐ Yes
4) Does sample need special handling? ☒ No ☐ Yes If yes, explain _____

S-278RRRR

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job Cyprus Northshore Mining
Team Leader DVH
Date Submitted 1-9-92
Test No. 2

Source Waste Gas
Test Site Inlet
Date of Test 1-8-92
No. of Runs Completed 3

No. of Samples	Type of Sample	Analysis Required	Comments
1	Probe Wash: ☐Acetone ☐D.I. Water	☐As per EPA M-5 ☐Other	
1	Filter: ☐4" G.F. ☐S.S. Thimble ☐2.5" G.F. ☐47 mm G.F.	☐As per EPA M-5 ☐As per EPA M-17 ☐Other	
3	Impinger Catch: ☐D.I. Water ☐3% H_2O_2 ☐4M5 Hg Only ☐4M5 Metals ☒1.0 N NaOH ☐Other	☐MN Protocol ☐WI Protocol ☐EPA M-6 or 8 ☒Acid Gases ☐Formaldehyde ☐Metals ☐Other	
3	Integrated Gas sample	☒As per EPA M-3 ☐As per EPA M-10 ☐Other	
12	Oxides of Nitrogen (NO_x)	☒As per EPA M-7A ☐Other	Date 1-8-92 Time (HRS) 1130
	☐ Fuel Sample ☐ Aggregate	☐Attached fuel Form #S-0163RRR	
	Particle Size	☐X-Ray Sedigraph ☐Bahco Method ☐Other	
	Audit Samples ☐Sulfur Dioxide ☐Oxides of Nit. ☐Other	☐As per EPA M-6 ☐As per EPA M-7A ☐Other	

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☐ Dryer ☐ Other
2) Fuel: ☐ Coal ☐ Wood ☒ Gas ☐ Oil ☐ RDF ☐ Other
3) Is sample combustible? ☒ No ☐ Yes
4) Does sample need special handling? ☒ No ☐ Yes If yes, explain

S-278RRRR

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job Cyprus Minerals
Team Leader Dutt
Date Submitted 1/9/92
Test No. 2

Source #12 Waste Gas
Test Site Stack
Date of Test 1/8/92
No. of Runs Completed 3

No. of Samples	Type of Sample	Analysis Required	Comments
	Probe Wash: ☐Acetone ☐D.I. Water	☐As per EPA M-5 ☐Other _____	
	Filter: ☐4" G.F. ☐S.S. Thimble ☐2.5" G.F. ☐47 mm G.F.	☐As per EPA M-5 ☐As per EPA M-17 ☐Other _____	
4	Impinger Catch: ☐D.I. Water ☐3% H_2O_2 ☐4M5 Hg Only ☐4M5 Metals ☒1.0 N NaOH ☐Other _____	☐MN Protocol ☐WI Protocol ☐EPA M-6 or 8 ☒Acid Gases ☐Formaldehyde ☐Metals ☐Other _____	
3	Integrated Gas sample	☒As per EPA M-3 ☐As per EPA M-10 ☐Other _____	
12	Oxides of Nitrogen (NO_x)	☒As per EPA M-7A ☐Other _____	Date _____ Time (HRS) _____
	☐ Fuel Sample ☐ Aggregate	☐Attached fuel Form #S-0163RRR	
	Particle Size	☐X-Ray Sedigraph ☐Bahco Method ☐Other _____	
	Audit Samples ☐Sulfur Dioxide ☐Oxides of Nit. ☐Other _____	☐As per EPA M-6 ☐As per EPA M-7A ☐Other _____	

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☐ Dryer ☒ Other vent
2) Fuel: ☐ Coal ☐ Wood ☐ Gas ☐ Oil ☐ RDF ☐ Other _____
3) Is sample combustible? ☒ No ☐ Yes
4) Does sample need special handling? ☒ No ☐ Yes If yes, explain _____

S-278RRRR

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job Cyprus Northshore Mining
Team Leader DVU
Date Submitted 1-9-92
Test No. 3

Source Hood Exhaust Inlet
Test Site 1-9-92
Date of Test 1-9-92
No. of Runs Completed

No. of Samples	Type of Sample	Analysis Required	Comments
X	Probe Wash: ☐Acetone ☐D.I. Water	☐As per EPA M-5 ☐Other	
X	Filter: ☐4" G.F. ☐S.S. Thimble ☐2.5" G.F. ☐47 mm G.F.	☐As per EPA M-5 ☐As per EPA M-17 ☐Other	
3	Impinger Catch: ☐D.I. Water ☐3% H_2O_2 ☐4M5 Hg Only ☐4M5 Metals ☒1.0 N NaOH ☐Other	☐MN Protocol ☐WI Protocol ☐EPA M-6 or 8 ☒Acid Gases ☐Formaldehyde ☐Metals ☐Other	
3	Integrated Gas sample	☒As per EPA M-3 ☐As per EPA M-10 ☐Other	
12	Oxides of Nitrogen (NO_x)	☒As per EPA M-7A ☐Other	Date 1-9-92 Time(HRS) 12:00pm
	☐ Fuel Sample ☐ Aggregate	☐Attached fuel Form #S-0163RRR	
	Particle Size	☐X-Ray Sedigraph ☐Bahco Method ☐Other	
	Audit Samples ☐Sulfur Dioxide ☐Oxides of Nit. ☐Other	☐As per EPA M-6 ☐As per EPA M-7A ☐Other	

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☐ Dryer ☐ Other
2) Fuel: ☐ Coal ☐ Wood ☐ Gas ☐ Oil ☐ RDF ☐ Other
3) Is sample combustible? ☐ No ☐ Yes
4) Does sample need special handling? ☐ No ☐ Yes If yes, explain

S-278RRRR

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job Cyprus
Team Leader Dirt
Date Submitted 1/9/92
Test No. 3

Source Hood Vent
Test Site Stack
Date of Test 1/9/92
No. of Runs Completed 3

No. of Samples	Type of Sample	Analysis Required	Comments
	Probe Wash: ☐Acetone ☐D.I. Water	☐As per EPA M-5 ☐Other _____	
	Filter: ☐4" G.F. ☐S.S. Thimble ☐2.5" G.F. ☐47 mm G.F.	☐As per EPA M-5 ☐As per EPA M-17 ☐Other _____	
3	Impinger Catch: ☐D.I. Water ☐3% H_2O_2 ☐4M5 Hg Only ☐4M5 Metals ☒1.0 N NaOH ☐Other _____	☐MN Protocol ☐WI Protocol ☐EPA M-6 or 8 ☒Acid Gases ☐Formaldehyde ☐Metals ☐Other _____	
3	Integrated Gas sample	☒As per EPA M-3 ☐As per EPA M-10 ☐Other _____	
12	Oxides of Nitrogen (NO_x)	☒As per EPA M-7A ☐Other _____	Date _____ Time(HRS) _____
	☐ Fuel Sample ☐ Aggregate	☐Attached fuel Form #S-0163RRR	
	Particle Size	☐X-Ray Sedigraph ☐Bahco Method ☐Other _____	
	Audit Samples ☐Sulfur Dioxide ☐Oxides of Nit. ☐Other _____	☐As per EPA M-6 ☐As per EPA M-7A ☐Other _____	

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☐ Dryer ☒ Other Vent
2) Fuel: ☐ Coal ☐ Wood ☐ Gas ☐ Oil ☐ RDF ☐ Other _____
3) Is sample combustible? ☒ No ☐ Yes
4) Does sample need special handling? ☒ No ☐ Yes If yes, explain _____

S-278RRRR

APPENDIX D

PROCEDURES

Flow Determination

Flow determinations were carried out in accordance with EPA Method 2, CFR Title 40, Part 60, Appendix A (Revised July 1, 1990). A type S pitot was used to sense velocity pressure and an inclined manometer was used to measure velocity pressures. Gas temperatures were measured using a calibrated Type K thermocouple and digital temperature meter. Gas density (i.e. molecular weight) was calculated from the composition of the gas determined by Orsat.

Acid Gases

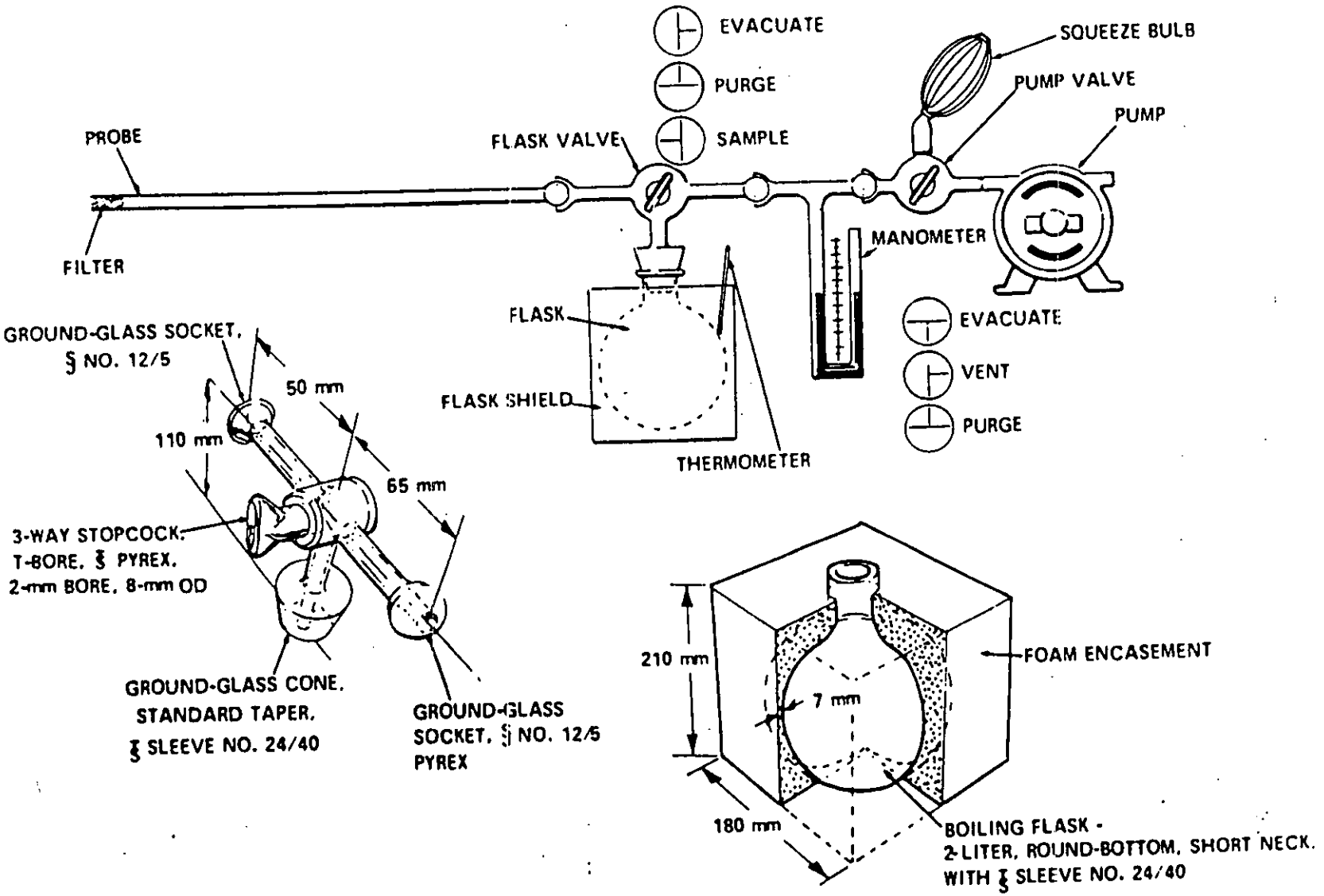
The sulfur dioxide, hydrogen chloride and hydrogen fluoride concentrations in the exhaust gas were determined using a modified M5 sampling train in which the distilled water in the first two impingers is replaced with 1 N NaOH. The samples are normally collected at a constant flow rate over a one-hour period using a three-point traverse (1/3, 3/6, 5/6 stack dia.). Metallic chlorides are removed by the glass fiber filter in the front half of the M5 sampling train. After the sample is collected, the still-alkaline wet catch is quantitatively recovered into all glass sample containers closed with teflon-lined caps. The samples are returned to the laboratory; the pH checked to insure that the absorbing solution is still sufficiently alkaline to prevent breakthrough; treated with hydrogen peroxide to quantitatively convert all sulfite to sulfate; diluted and analyzed by automated ion chromatography (IC) as per EPA Method 300.0 (SW 846). A Dionex Model 4000i Ion Chromatograph equipped with an automatic sampler, a micro membrane suppression system and a temperature-compensated conductivity detector was used in this work. Quantitation is based on peak area using a 5-point external standard curve.

Oxides of Nitrogen

Oxides of nitrogen concentrations were collected in accordance with EPA Method 7 (see above-cited reference) with a specially designed all glass manifold and valving assembly and a heated stainless steel-lined probe. Samples were collected in two-liter evacuated insulated flasks which contained 25 cc of acidified peroxide solution (Method 7 reagent). Nine sets or more of three samples each were collected over a period of 4.5 to 5 hours.

The sampling train was leak checked through the probe at the beginning and end of the test and, in addition, the system leak checked at the time of evacuation of each flask. Before the samples were collected, the probe was purged to eliminate dead volume effects and to raise the temperature of the probe outlet and manifold assembly to minimize condensation of moisture. A plug of microfiber glass wool inserted in the probe inlet was used to prevent particulate material from entering into the flask. The temperature of the flask, vacuum in the flask and barometric pressure at the time of sampling was recorded for each flask. After sampling was complete, as evidenced by the in-line vacuum gauge, the flask valve was closed, the flask assembly disconnected from the manifold/valve assembly and the flask shook for several minutes to promote oxidation and absorption. The recovered oxides of nitrogen samples were returned to the laboratory and analyzed immediately by ion chromatography as per EPA 7A.

The internal volume of each numbered flask assembly has been measured prior to initial use by filling with water, weighing before and after and then converting the weight of water to volume by means of the density of water at room temperature. Flask volumes are stored in the computer and recalled automatically in the computer calculation.



Sampling train, flask valve, and flask.

APPENDIX E

CALCULATION EQUATIONS

CALCULATION EQUATIONS

METHOD 6

$$V_{std} = 17.64 \frac{V_m P_b \gamma}{T_m} \quad \text{(MIDGET IMPINGER VERSION)}$$

$$V_{std} = \frac{17.64\ V_m\ (P_b + \frac{\overline{\Delta H}}{13.6})\gamma}{T_m} \quad \text{(LARGE IMPINGER VERSION)}$$

$$MEQ = (V_t - V_{tb})\ N\ (\frac{V_{soln}}{V_a})\ DF$$

$$C_s = \frac{7.06 \times 10^{-5}\ MEQ}{V_{std}}$$

$$E = \frac{20.90\ C_s F_d}{20.90 - \overline{B}'_{O_2}} = \frac{F_c C_s}{\overline{B}'_{CO_2}}$$

$$C_s\ (MG/DSCM) = 1.60186 \times 10^7\ C_s$$

$$C_s\ (GR/DSCF) = 7000\ C_s$$

$$C_s\ (ppm, dry) = 6.02119 \times 10^6\ C_s$$

$$C_s\ (ppm, wet) = 6.02119 \times 10^6\ C_s\ (1 - \frac{MC}{100})$$

SYMBOLS

$\overline{B}'O_2$	=	Average oxygen content in flue gas, % v/v, dry
$\overline{B}'CO_2$	=	Average carbon dioxide content in flue gas, % v/v, dry
C_s	=	Concentration of sulfur dioxide in flue gas, dry basis, corrected to standard conditions, LB/DSCF
C_s (GR/DSCF)	=	Concentration of sulfur dioxide in flue gas, dry basis, corrected to standard conditions, GR/DSCF
C_s (MG/DSCM)	=	Concentration of sulfur dioxide in flue gas, dry basis, corrected to standard conditions, MG/DSCM
DF	=	Dilution Factor
E	=	Emission factor, LB of $SO_2/10^6$BTU
F_d	=	Dry oxygen F-Factor for given fuel type, DSCF/10^6BTU
F_c	=	Carbon dioxide F-Factor for given fuel type, DSCF/10^6BTU
ΔH	=	Average pressure drop across calibrated orifice, IN. W.C.
γ	=	Dry test meter correction factor, dimensionless
MC	=	Moisture content of flue gas, % v/v
MEQ	=	Total milliequivalents of SO_2 in gas sample
N	=	Normality of barium perchlorate titrant
P_b	=	Barometric pressure at the dry gas meter, IN. HG.

C_s (ppm-dry) = Concentration of sulfur dioxide in flue gas, dry basis, (v/v), ppm

C_s (ppm-wet) = Concentration of sulfur dioxide in flue gas, wet basis, (v/v), ppm

T_m = Absolute average dry gas meter temperature, ^oR

V_a = Volume of sample aliquot titrated, cc

V_m = Dry gas volume as measured by the dry gas meter, DCF

V_{std} = Dry gas volume as measured by the dry gas meter, corrected to standard conditions (at 68 ^oF and 1 atmosphere), DSCF

V_{soln} = Total volume of the solution in which the sulfur dioxide sample is contained, cc

V_t = Volume of barium perchlorate titrant used for the sample, cc (average of replicate titrations)

V_{tb} = Volume of barium perchlorate titrant used for the blank, cc

CALCULATION EQUATIONS

METHOD 7

$$V_{m(std)} = 17.64\ (V_f - 25)\ \left[\frac{P_f}{T_f} - \frac{P_i}{T_i}\right]$$

$$C_s = 6.243 \times 10^{-5}\ \frac{M}{V_{m(std)}}$$

$$E = \frac{2090\ C_s F}{20.9 - \bar{B}'_{O_2}}$$

$$C_s\ (GR/DSCF) = 7000\ C_s$$

$$C_s\ (MG/DSCM) = 1.60186 \times 10^{7}\ C_s$$

$$C_s\ (ppm\text{-}dry) = 8.37552 \times 10^{6}\ C_s$$

$$C_s\ (ppm\text{-}3\%\ O_2) = 8.37552 \times 10^{6}\ C_s \left\{1 + \left[\frac{\bar{B}'_{O_2} - 3}{20.9 - \bar{B}'_{O_2}}\right]\right\}$$

$$C_s\ (ppm\text{-}wet) = 8.37552 \times 10^{6}\ C_s \cdot \left(1 - \frac{MC}{100}\right)$$

CE6-1

SYMBOLS

B'_{O_2} = Average oxygen content in flue gas, % v/v

C_s = Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, LB/DSCF

C_s (GR/DSCF) = Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, GR/DSCF

C_s (MG/DSCM) = Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, MG/DSCM

E = Emission factor, LB/10^6BTU

F = F-Factor for given fuel type, DSCF/10^6BTU

M = Mass of nitrogen oxides as nitrogen dioxide in gas sample, µg

MC = Moisture content of flue gas, %

P_f = Final absolute pressure in flask, IN. HG

P_i = Initial absolute pressure in flask, IN. HG

C_s (ppm-dry) = Concentration of nitrogen oxides in flue gas, dry basis, (v/v), ppm

C_s (ppm-3% O_2) = Concentration of nitrogen oxides in flue gas, dry basis, corrected to 3% O_2 , (v/v) ppm

C_s (ppm-wet) = Concentration of nitrogen oxides in flue gas, wet basis, (v/v), ppm

T_f = Final absolute temperature in flask, ^{o}R

T_i = Initial absolute temperature in flask, ^{o}R

V_f = Volume of flask and valve, cc

$V_{m(std)}$ = Sample volume at standard conditions, dry basis, cc

CALCULATION EQUATIONS

Calculation Equations for Gas Concentrations

Dry Standard Volume (V_{std})

$$V_{std} = \frac{17.65\ V_m\ \gamma\ P_b}{(\bar{t}_m + 460)}$$

where; V_m = volume of gas as recorded on dry test meter in CF

γ = correction coefficient of dry test meter derived from calibration against standard wet test meter, dimensionless

P_b = barometric pressure in IN. HG.

$\bar{t}_m$ = average temperature of gas in dry test meter in ^{o}F

Gas Concentration of Component i (C_i)

$$C_i = \frac{.03531\ m_i\ K_i}{V_{std}}$$

where; C_i = concentration of gas in MG/DSCM

m_i = total amount of corresponding ion in the collected samples as reported by laboratory in µg.

K_i = stoichiometric conversion from ion to gas for component i ($K_{i=HF}$ = 1.05306, $K_{i=HCl}$ = 1.02843, $K_{i=H_2SO_4}$ = 1.02099, $K_{i=NH_3}$ = 0.94412)

Gas Concentration in GR/DSCF

$$GR/DSCF = 4.3705 \times 10^{-4} C_i$$

Gas Concentration in PPM-DRY

$$PPM\text{-}DRY = \frac{24.04\ C_i}{M_i}$$

where: M_i = molecular weight of component or gas i
($M_{i=HF} = 20.006$, $M_{i=HCl} = 36.461$, $M_{i=H_2SO_4} = 98.076$,
$M_{i=NH_3} = 17.031$)

Gas Emission or Mass Rate ($\dot{m}_i$)

$$\dot{m}_i = 8.5714 \times 10^{-3} (GR/DSCF)(Q_{s,d})$$

where: $\dot{m}_i$ = mass or emission rate of gas i in LB/HR

GR/DSCF = concentration of gas i in GR/DSCF, and

$Q_{s,d}$ = dry standard volumetric flow rate at point of concentration measurement in DSCFM

APPENDIX F

SAMPLING TRAIN CALIBRATION DATA

Interpoll Laboratories, Inc.
(812) 786-6060

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job CYPRUS NORTHSHORE MINING Date 1-6-91

Operator BOB Module No. 9

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 29.46 in. Hg. γ = .9981 ^H@ 1.77 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(536.00)	[redacted]	
2.5	537.87	65	61
5.0	539.73	68	62
7.5	541.60	69	64
10	543.48	71	66
[redacted]	V_m=7.48	Avg(t_m)= ~~82.37~~ 65.75 °F	

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\gamma\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(.9981)(7.48)}\left[\frac{65.75 + 460}{(29.46)}\right]^{0.5}$$

Y_{cn} = 1.01

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

Interpoll Laboratories, Inc.
(612) 786-6060

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job Cyprus Mines 1/5 Date 1/7/97

Operator DJH Module No. 6

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 27.39 in. Hg. γ = .9920 ^H@ 1.77 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(249.90)	[redacted]	
2.5	249.81	57	52
5.0	251.64	58	53
7.5	253.47	59	54
10	255.28	61	55
[redacted]	V_m= 7.28	Avg(t_m)=	56.13 °F

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\gamma\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(.9920)(7.28)}\left[\frac{(56.13) + 460}{(27.39)}\right]^{0.5}$$

$$Y_{cn} = 1.02$$

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

Interpoll Laboratories, Inc.
(612) 786-6060

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job Cyprus Northshore Mining Date 1-7-92

Operator Bob Module No. 9

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 29.51 in. Hg. γ = .9981 ^H@ 1.77 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(685.00)	[redacted]	
2.5	684.92	102	99
5.0	688.86	102	99
7.5	690.77	103	99
10	692.72	104	99
[redacted]	V_m=7.72	Avg(t_m)=100.88 °F	

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\gamma\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(.9981)(7.72)}\left[\frac{(100.88) + 460}{(29.51)}\right]^{0.5}$$

$$Y_{cn} = 1.010$$

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

S-432R

Interpoll Laboratories, Inc.
(612) 786-6060

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job Cyprus Minerals Date 4/8/92

Operator D. VanHoever Module No. 6

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 29.46 in. Hg. γ = .9920 ^H@ 1.77 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(390.6)	[redacted]	
2.5	392.47	56	52
5.0	394.32	60	55
7.5	396.20	62	56
10	398.10	63	57
[redacted]	V_m= 7.50	Avg(t_m)= 57.62°F	

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\gamma\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(.992)(7.50)}\left[\frac{(57.62 + 460}{(29.46)}\right]^{0.5}$$

$$Y_{cn} = 1.0062$$

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

S-432R

Interpoll Laboratories, Inc.
(612) 786-6060

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job Cyprus Date 1/8/92

Operator ~~TGT~~ Module No. 6

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 29.10 in. Hg. τ = .9920 ^H@ 1.77 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(538)	[redacted]	
2.5	539.91	70	69
5.0	541.84	70	70
7.5	543.75	71	70
10	545.67	72	70
[redacted]	V_m=7.67	Avg(t_m)=	70.25°F

Calculate Y_{en} as follows:

$$Y_{en} = \frac{1.786}{\tau\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{en} = \frac{1.786}{(.9920)(7.67)}\left[\frac{(70.25) + 460}{(29.10)}\right]^{0.5}$$

$$Y_{en} = 1.002$$

If Y_{en} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

S-432R

Page II

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: January 17, 1992

Meter Box No. : 6 (Rockwell Dry Test Meter Serial No. 64710)

Date of Last Calibration: December 6, 1991
Calibration Technician: E. Trowbridge
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
January 7, 1992	2-3480	247.90	687.02	439.12	439.12

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: January 17, 1992

Meter Box No. : 9 (Rockwell Dry Test Meter Serial No. 949230)

Date of Last Calibration: January 2, 1992
Calibration Technician: E. Trowbridge
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
January 7, 1992	2-3480	543.70	975.56	431.86	431.86

* Total volume through meter since last calibration.

Date 12-6-91

Bar. Press. 29.05 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 6
Serial No. DTM 64710
Wet Test Meter No. AL-20
Technician [signature]

ΔH (in. WC)		Gas Volume Wet Test Meter (ft^3)	* Cal. Index ♦ (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft^3)		Gas temperatures			Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_f
							Wet Test	Dry Test					
nominal	actual				V_{d1}	V_{df}	t_w (°F)	t_{d1} (°F)	t_{do} (°F)				
0.5	.5	2	99.85	0.01	230,500	232,515	64	68	61	4/55	.9907	1.73	
1.2	1.2	3	99.91	0.025	227,000	230,002	64	67	60	4/46	.9943	1.74	
2.0	2.0	3	99.93	0.055	233,000	236,033	64	74	65	3/44	.9936	1.76	
3.3	3.3	5	100.00	0.09	236,500	241,589	64	78	68	4/55	.9908	1.79	
4.7	4.7	5	100.02	0.12	242,500	247,591	64	81	70	4/09	.9906	1.81	
2	3	4	5		6	7	8	9	10	11/12	.9920	1.77	

Positive leak check performed by [signature]
Meter was in tolerance ☒
Meter was not in tolerance ☐; readjusted linkage
Meter was not in tolerance ☐; changed dry test meters

Approved by [signature] Date 12/9/91

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

S0102RR 11/91

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Date 1-2-92

Bar. Press. 29.11 in. Hg

Control Module No. 9

Serial No. DTM 949230

Wet Test Meter No. AL-20

Technician G Trowbridge

ΔH (in. WC)		Gas Volume Wet Test Meter (ft³)	* Cal. Index φ (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft³)		Gas temperatures			Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_f
nominal	actual				V_{di}	V_{df}	Wet Test t_w (°F)	Dry Test t_{di} (°F)	Dry Test t_{do} (°F)				
0.5	.5	2	99.85	0.01	512.500	514.512	72	80	77	4/55	1.0033	1.73	
1.2	1.2	3	99.91	0.025	509.000	512.035	72	79	76	4/48	.9947	1.76	
2.0	2.0	3	99.93	0.055	515.000	518.030	72	84	79	3/44	1.0018	1.76	
3.3	3.3	5	100.00	0.09	518.500	523.584	72	89	80	4/54	.9980	1.79	
4.7	4.7	5	100.02	0.12	524.500	529.608	72	91	81	4/07	.9927	1.80	
											.9981	1.77	

Positive leak check performed by GT

Meter was in tolerance ☒

Meter was not in tolerance ☐; readjusted linkage

Meter was not in tolerance ☐; changed dry test meters

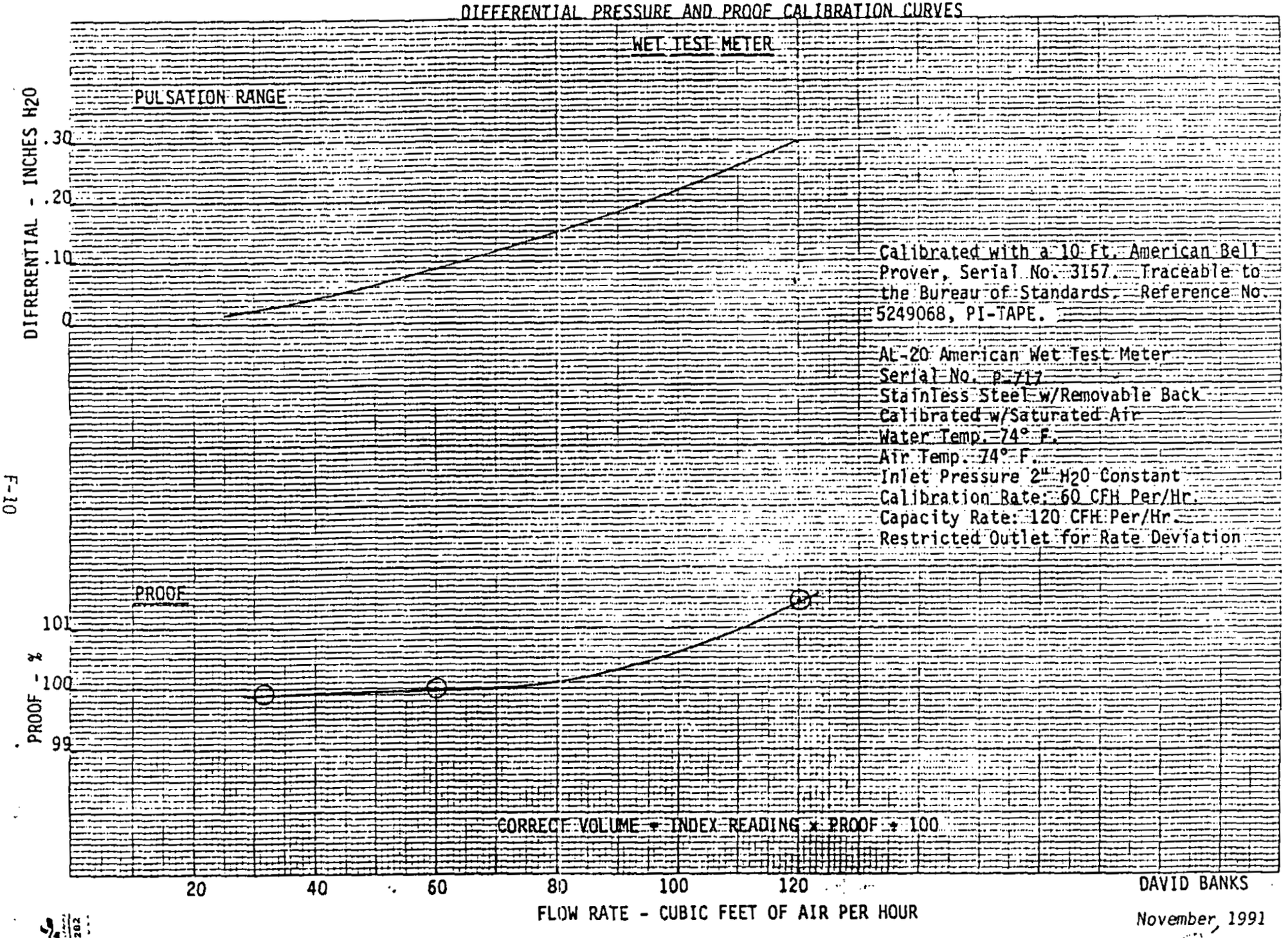
Approved by Daniel J. Dega Date 1/2/92

• Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

S0102RR 11/91

DIFFERENTIAL PRESSURE AND PROOF CALIBRATION CURVES

WET TEST METER



Calibrated with a 10 Ft. American Bell Prover, Serial No. 3157. Traceable to the Bureau of Standards. Reference No. 5249068, PI-TAPE.

AL-20 American Wet Test Meter
Serial No. P-717
Stainless Steel w/Removable Back
Calibrated w/Saturated Air
Water Temp. 74° F.
Air Temp. 74° F.
Inlet Pressure 2" H_2O Constant
Calibration Rate: 60 CFH Per/Hr.
Capacity Rate: 120 CFH Per/Hr.
Restricted Outlet for Rate Deviation

DAVID BANKS

November, 1991

12 282
20 Squares to the Inch

Duke

PDT-16

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

Unit under test:

Vendor Fluke

Model Fluke 51 Serial Number 5220020

Range 0-2100 °F Thermocouple Type K/J

Date of Calibration 7/29/91 Technician DKW

Method of Calibration:

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100 °F) ± 1 degree (for negative temperatures add ± 2 degrees. The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation Δt (°F)	Deviation (%)
0	0	1	1	.22
100	100	98	2	.36
200	200	201	1	.15
300	300	300	0	0
400	400	398	2	.23
500	500	499	1	.10
600	600	601	1	.09
700	700	699	1	.09
800	800	801	1	.08
900	900	899	1	.07
1000	1000	1000	0	0
1100	1100	1100	0	0
1200	1200	1202	2	.12
1300	1300	1300	0	0
1400	1400	1402	2	.11
1500	1500	1500	0	0
1600	1600	1601	1	.05
1700	1700	1700	0	0
1800	1800	1801	1	.04
1900	1900	1899	1	.04
2000	2000	2001	1	.04
2100	2100	2098	2	.08
		Averages:		

OF = off scale response by unit under test (°F)

% dev = 100 Δt / (460 + t)

☒ Unit in tolerance

☐ Unit was not in tolerance; recalibrated - See new calibration sheet.

S-433

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

Unit under test:
Vendor Beckman Industrial
Model HD110 T Serial Number 10507095 (POT #18)
Range -4 to 1999 °F °F Thermocouple Type K
Date of Calibration 9/12/91 Technician DWH

Method of Calibration:

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100 °F) ± 1 degree (for negative temperatures add ± 2 degrees. The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation	
			Δt (°F)	(%)
0	0	0	0	0
100	100	96	4	.71
200	200	200	0	0
300	300	298	2	.39
400	400	395	5	.56
500	500	495	5	.32
600	600	598	2	.18
700	700	699	1	.08
800	800	804	4	.32
900	900	906	6	.44
1000	1000	1011	11	.75
1100	1100	1115	15	.96
1200	1200	1221	21	1.26
1300	1300	1322	22	1.25
1400	1400	1426	26	1.39
1500	1500	1524	24	1.22
1600	1600	1626	26	1.26
1700	1700	1721	21	.97
1800	1800	1819	19	.84
1900	1900	1912	12	.51
2000	—	—	—	—
2100	—	—	—	—
		Averages:		.68

OF = off scale response by unit under test (°F)
% dev = 100 Δt / (460 + t)

☑ Unit in tolerance
☐ Unit was not in tolerance; recalibrated - See new calibration sheet.

S-433

(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 23-6

Pitot tube dimensions:

1. External tubing diameter (D_t) .313 IN.
2. Base to Side A opening plane (P_A) .464 IN.
3. Base to Side B opening plane (P_B) .465 IN.

Alignment:

4. α_1 <10° 0
5. α_2 <10° 0

6. B_1 <5° 2
7. B_2 < 5° 2

8. Z <.125" .03
9. W <.0625" .03

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .758 IN.
11. Pitot to probe sheath 3.00 IN.
12. Pitot to thermocouple (parallel to probe) 3.00 IN.
13. Pitot to thermocouple (perpendicular to probe) .762 IN.

☒ Meets all EPA design criteria thus C_p = 0.84

☐ Does not meet EPA design criteria - thus calibrate in wind tunnel
C_p = _____

Date of Inspection: 3-11-91

Inspected by: [signature]

CFR Title 40 Part 60 Appendix A Method 2

Interpoll Inc.
(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 24-8

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .458 IN.
3. Base to Side B opening plane (P_B) .458 IN.

Alignment:

4. α_1 <10° .01
5. α_2 <10° .01

6. B_1 < 5° 0
7. B_2 < 5° .01

8. Z <.125" .01
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .760 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) _____ IN.
13. Pitot to thermocouple (perpendicular to probe) _____ IN.

Date of Inspection: 6-26-90

Inspected by: E Burdick

S-348(1)

INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 11/4/91

Technician DUKE BRENNAN

Mercury Column Barometer No. LBB

Aneroid Barometer No. 90222001 (Duke's)

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
29.47	69°	.108	29.361	29.37	-.009

Has this barometer shown any consistent problems with calibration? Yes (No) If yes, explain. _____

Has problem been alleviated? Yes/No. How? _____

*Note

Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20-30 minutes before calibrating. Aneriod barometer will be calibrated to the adjusted mercury barometer readings.

S-312

DvH's personal

INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 7/8/91
Technician Duane Van Hoever
Mercury Column Barometer No. 1
Aneroid Barometer No. Ultimeter serial # 8C1216

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
29.27	70	.11	29.16	29.17	-.01

Has this barometer shown any consistent problems with calibration? Yes/No. If yes, explain. No

Has problem been alleviated? Yes/No. How?

*Note

Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20-30 minutes before calibrating. Aneriod barometer will be calibrated to the adjusted mercury barometer readings.

S-312