M E M O R A N D U M

TO: Texasgulf Soda Ash, Inc. File

THROUGH: Chuck A. Collins, Administrator
Bernard J. Dailey, Air Quality Engineering Supervisor
Lee Gribovicz, Air Quality Engineer (copy sent 10/20/89

FROM: Chad Schlichtemeier, Air Quality Associate Engineer

SUBJECT: Evaluation of Performance Test

DATE: October 13, 1989

On June 8, 1989, a compliance test for particulates was conducted on the Mine Headframe Collector located at the Tg Soda Ash Refinery. The results of the test indicated a particulate emission rate which was approximately 3 times the allowable. Since then, the rubber seals between the bags and the plenum have been replaced and the filter bags, which were improperly installed prior to testing, have been re-installed correctly. On August 29, 1989, WEST, Inc. retested this unit according to EPA approved Methods 1-5.

The stack consists of two sampling ports located approximately 11 feet downstream of the stack inlet. The traverse points were located according to Method 1, resulting in 12 traverse points at each port. Prior to testing, a velocity traverse was conducted to obtain a flow profile in the stack. Three 60 minute runs were performed during this testing period.

The raw data from each run has been included with the report. Emission rates were calculated and compared against results submitted in the report. Results of the evaluation are summarized below and are included as attachments to this memorandum.

Test Results
Mine Headframe Collector

Avg. Emission Rates (lb/hr)		Allowable (lb/hr)
WEST	Div.	
0.896	0.904	1.33

In conclusion, the test procedures were conducted according to EPA approved methods and the calculated results determined by the Division and WEST, Inc. are within the allowable set forth in MD-69.

METHOD 5 STACK TEST CALCULATIONS

Company: TEXASGULF SODA ASH, INC.
Testing Firm: WEST, INC.
Date Tested: AUGUST 29, 1989
Test Observed By:
Test Evaluated By: CHAD SCHLICHTEMEIER
Location: GRANGER, WYOMING
Tests Conducted By: ALAN ROYLANCE AND MICHAEL REYNOLDS

STACK DATA
Stack Height (ft):
Stack Diameter (ft):
Source Name: MINE HEADFRAME BAGHOUSE STACK

INPUT DATA

	Test 1	Test 2	Test 3
Barometric Pressure (in Hg)	23.82	23.82	23.82
Absolute Stack Gas Pressure (in Hg)	23.85	23.85	23.85
Absolute Average Stack Gas Temperature (R)	528	537	544
Absolute Average Dry Gas Meter Temperature (R)	548	555	563
Total Volume of Water Collected (ml)	11.50	7.50	8.20
Volume of Gas through Dry Gas Meter (ft3)	48.822	50.647	49.548
Average Pressure Drop Across Orifice (in H2O)	1.33	1.42	1.35
Pitot Tube Coefficient	0.814	0.814	0.814
Average Velocity Head of Stack Gas (in H2O)	0.757	0.778	0.76
X-Sect. Area of Stack (ft2)	4.83	4.83	4.83
Total Amount of Particulate Collected (g)	0.026	0.021	0.026
Total Sampling Time (min)	60	60	60
X-Sect. Area of Nozzle (ft2)	2.81E-04	2.81E-04	2.81E-04

ORSAT ANALYSIS

	Test 1	Test 2	Test 3
% CO2	0.0	0.0	0.0
% O2	21.0	21.0	21.0
% CO	0.0	0.0	0.0
% N2	79.0	79.0	79.0

CALCULATIONS:	Test 1	Test 2	Test 3
Vol. H2O Vapor in Gas @ STP (ft3)	0.54	0.35	0.39
Vol. of Gas through Dry Gas Meter @STP (ft3)	37.59	38.51	37.13
Proportion by Vol. of H2O Vapor in Gas Stream	0.01	0.01	0.01
Dry Molecular Weight (lb/lb mole)	28.84	28.84	28.84
Molecular Weight (lb/lb mole)	28.69	28.74	28.73
Stack Gas Velocity (ft/sec)	46.27	47.91	47.12
Volumetric Flow Rate, Dry Basis, @ STP (ft3/min)	10537	10784	10456
Concentration (lb/ft3)	1.53E-06	1.20E-06	1.54E-06
Emission Rates - lb/hr	0.964	0.778	0.969
- grains/dscf	0.0107	0.0084	0.0108
% Isokinetic	102.25	102.37	101.80

AVERAGE PARTICULATE EMISSION RATES FOR RUNS #1,2,3

LB/HR	0.904
GRAINS/DSCF	0.0100

Tg Soda Ash, Inc.
P.O. Box 100 Granger, Wyoming 82934
(307) 875-2700

Otto C. Schnauber
Senior Environment Engineer
(307) 875-2700 ext. 228

September 20, 1989

Mr. Lee Gribovicz
District Engineer
Air Quality Division
Wyoming Department of Environmental Quality
210 Lincoln Street
Lander, WY 82520

Dear Mr. Gribovicz:

Enclosed is the compliance test report for our Mine Headframe dust collector (Source I.D. #18). The emission rate averaged 0.896 lbs/hr for the test series. This source has a permitted emission rate limit of 1.33 lbs/hr.

If you have any questions, please advise.

Sincerely,

Otto C. Schnauber
Sr. Environmental Engineer

Enclosures (1)

cc: Mr. Bernard Dailey
Engineering Supervisor
Air Quality Division
Wyoming Dept. of Environmental Quality
122 W. 25th Street
Cheyenne, WY 82002

RECEIVED
SEP 22 1989
AIR QUALITY DIVISION
LANDER WYOMING

(10/4/89) telephone conversation
Cheyenne will review w/ Bernie Dailey

STACK EMISSIONS SURVEY
TG SODA ASH, INC.
SODA ASH PLANT
GRANGER, WYOMING

AUGUST 1989

FILE NUMBER 8910-160

Prepared By:

Western Environmental Services and Testing, Inc.
6756 West Uranium Road
Casper, Wyoming 82604
(307)234-5511

TABLE OF CONTENTS

STACK EMISSIONS SURVEY
TG SODA ASH, INC.
SODA ASH PLANT
GRANGER, WYOMING

INTRODUCTION

Western Environmental Services and Testing, Inc. (WEST, Inc.) of Casper, Wyoming, conducted a Stack Emissions Survey at TG Soda Ash, Inc.'s Soda Ash Plant located near Granger, Wyoming, on August 29, 1989. The purpose of this test was to determine the emissions of particulate matter from the Mine Headframe baghouse stack.

The sampling followed the procedures set forth in the "Wyoming Air Quality Standards and Regulations", Wyoming Department of Environmental Quality, revised as of 1985; and the Code of Federal Regulations, Title 40, Chapter I, Part 60, revised July 1 1988.

SUMMARY OF RESULTS

The principal conclusions are:

1. The emission of particulate matter from the stack were 0.0099 grains per dry standard cubic foot (0.896 pounds per hour), based on averaging the three tests using the front-half collections of the EPA-type sampling train.

SUMMARY OF RESULTS

Run Number		1	2	3
Stack Flow Rate - ACFM		13366	13865	13635
Stack Flow Rate - DSCFM*		10537	10802	10477
% Water Vapor - % Volume		1.42	0.91	1.03
% CO_2 - % Volume		0.0	0.0	0.0
% O_2 - % Volume		21.0	21.0	21.0
% Excess Air At Sampling Point		---	---	---
Particulates				
Probe, Cyclone & Filter Catch grains/dscf*	(C_{an})	0.0105	0.0083	0.0108
grains/cf at Stack Conditions	(C_{at})	0.0083	0.0065	0.0083
lbs/hr	(C_{aw})	0.950	0.770	0.968
Total Catch grains/dscf*	(C_{ao})	---	---	---
grains/cf at Stack Conditions	(C_{au})	---	---	---
lbs/hr	(C_{ax})	---	---	---

* 68 Deg. F., 29.92 "Hg (20 Deg. C., 760 mm Hg)

DISCUSSION OF RESULTS

The three tests for particulates taken on the stack appeared to be valid representations of the actual emissions during the testing. The indicative parameters calculated from the field data were in close agreement. The moisture percentages were within 26.8 percent of the mean value. The measured flow rates (Qs) were within 1.9 percent of the mean value. The rates of sampling for the three tests were within the specified limits of the isokinetic rate, the greatest deviation being 2.6 percent.

The calculated front-half and back-half emissions (pound per hour) of particulate from the three tests showed a range of + 8.0 percent to -14.1 percent variation from the mean value.

DESCRIPTION OF PROCESS OPERATION

The Mine Headframe baghouse collects dust generated during the unloading of ore transported to the surface by the mine skips. Additional dust collection occurs at the tail pulley of the ore conveying system.

DESCRIPTION OF SAMPLING LOCATION

The sampling ports are located on both circular Dryer Exhaust Stacks approximately 200 feet above the ground. The sampling was done from two ports on the circular stacks located 10 feet 11 inches (4.4 stack diameters) downstream of the stack inlet, and 56 feet (22.6 stack diameters) upstream of the stack outlet. The area of the stack is 695 square inches. Port and wall thickness is 2-1/2 inches.

SAMPLING AND ANALYTICAL PROCEDURES

The sampling and analytical procedures used followed the procedures outlined in the "Wyoming Air Quality Standards and Regulations", Wyoming Department of Environmental Quality, 1985; and the Code of Federal Regulations, Title 40, Volume I, Part 60, revised as of July 1, 1988.

A preliminary velocity traverse was made at each of the two ports in order to determine the uniformity of flow in the stack. Particulate samples of 2-1/2 minute duration at each of the 12 traverse points were taken from the two ports using an EPA-type, heated, glass lined probe. A total of 24 points were sampled.

Before each test, the sampling train was leak-checked at 15 inches of mercury at the nozzle. After each test, the train was again leak-checked at the highest recorded vacuum reading during the test. Final leak-checking was performed in order to predetermine the possibility of a diluted sample.

Before and after each test period, the pitot tubes were checked for leaks under both a vacuum and pressure. Also, the lines were checked for clearance and the zero manometer reading verified before and after each test.

The particulate emissions were calculated from gravimetric analysis using the front-half collections of the EPA-type sampling train, in accordance with the EPA "New Source Performance Standards".

DESCRIPTION OF TESTS

Personnel from WEST, Inc. arrived at the plant at 1530 hours on Monday, August 28, 1989. After meeting with plant personnel the equipment was set upon the Mine Headframe stack and secured for the night.

On Tuesday, August 29, WEST, Inc. personnel arrived at the plant at 0730 hours. The equipment was readied for testing by 0925 hours. Testing began at 0927.5 hours and continued until the completion of the three tests at 1300 hours.

The equipment was moved off the stack and loaded into the mobile laboratory. All of the samples, which had been recovered immediately after each test, were taken to WEST, Inc.'s laboratory in Casper for further analysis and evaluation.

Testing at Texas Gulf's Soda Ash Plant located near Granger, Wyoming was completed at 1500 hours on Tuesday, August 29, 1989.

James E. Meador, Jr.
Vice President

Alan D. Roylance
Manager of Operations

APPENDICES

A. Location of Sampling Points

B. Source Emission Calculations

C. Calibration of Equipment

D. Field Testing Data

E. Analytical Data

F. Plant Operational Data

G. Chain of Custody & Analysis Request

H. Resumes of Test Personnel

APPENDIX A

Location of Sampling Points

APPENDIX A

Location of Sampling Points

The sampling ports on the Mine Headframe baghouse are located approximately 200 feet above the ground. The sampling was performed from two ports on the circular stacks located 10 feet 11 inches (4.4 stack diameters downstream of a flow disturbance and 56 feet (22.6 stack diameters) upstream of the stack outlet. The area of the stack is 695 square inches. The location of the sampling points was calculated as follows:

Port and Wall Thickness = 2-1/2 inches

Inside Diameter = 29-3/4 inches

Velocity Point Number	Percent Diameter From Wall	Distance From Wall (inches)
1	2.1	1 *
2	6.7	2
3	11.8	3-1/2
4	17.7	5-1/4
5	25.0	7-7/16
6	35.5	10-9/16
7	64.5	19-5/16
8	75.0	22-5/16
9	82.3	24-1/2
10	88.2	26-1/4
11	93.3	27-3/4
12	97.9	28-3/4*

*Due to their proximity to the stack wall points 1 & 12 were moved to 1 inch from the stack wall.

APPENDIX B

Source Emission Calculations

Nomenclature for Particulate Calculations

Symbol	English Units	Metric Units	Description
A_s	$in.^2$	m^2	Stack Area
C_{an}	gr/dscf	g/dscm	Particulate - Probe, Cyclone and Filter
C_{ao}	gr/dscf	g/dscm	Particulate - Total
C_{at}	gr/CF @ Stack Conditions	g/m^3	Particulate - Probe, Cyclone and Filter
C_{au}	gr/CF @ Stack Conditions	g/m^3	Particulate - Total
C_{aw}	lbs/hr	kg/hr	Particulate - Probe, Cyclone and Filter
C_{ax}	lbs/hr	kg/hr	Particulate - Total
C_p			Pitot Tube Calibration Factor
D_n	in.	m	Sampling Nozzle Diameter
%EA			Percent Excess Air At Sampling Point
g	32.2 ft/sec^2		Acceleration of Gravity
%I			Percent Isokinetic
%M			Percent Moisture in the Stack Gas by Volume

* 528° R, 29.92 "Hg (20°C, 760 mm Hg)

Symbol	English Units	Metric Units	Description
M_d			Mole Fraction of Dry Gas
mf	mg	mg	Particulate - Probe, Cyclone and Filter
M_{H_2O}	18 lb/lb-mole		Molecular Weight of Water
m_t	mg	mg	Particulate - Total
MW_{air}	lb/lb-mole	g/g-mole	Molecular Weight Of Stack Gas
MW	28.95 lb/ lb-mole		Molecular Weight Of Air
MW_d	lb/lb-mole	g/g-mole	Molecular Weight Of Dry Stack Gas
P_b	"Hg Absolute	mm Hg	Barometric Pressure
P_m	"H_2O	mm H_2O	Orifice Pressure Drop
P_s	"Hg Absolute	mm Hg	Stack Pressure
ΔP_s	"H_2O	mm H_2O	Velocity Head of Stack Gas
P_{std}	29.92 "Hg	760 mm Hg	Standard Barometric Pressure
Q_a	ACFM	m^3/hr	Stack Gas Volume At Actual Stack Conditions
Q_s	DSCFM	dscm/hr	Stack Gas Volume At 29.92 "Hg, 528°R, Dry
R	21.83 "Hg ft^3/lb-mole-°R		Universal Gas Constant

* 528°R, 29.92 "Hg (20°C, 760 mm Hg)

Symbol	English Units	Metric Units	Description
T_m	°F	°C	Average Gas Meter Temperature
T_t	min	min	Net Time of Test
T_s	°F	°C	Stack Temperature
T_{std}	528°R	293°K	Standard Temperature
V_m	ft^3	m^3	Volume of Dry Gas Sampled @ Meter Conditions
$V_{m_{std}}$	dscf	dscm	Volume of Dry Gas Sampled @ Standard Conditions
V_s	fpm	m/sec	Stack Velocity @ Stack Conditions
V_w	ml	ml	Total water Collected in Impingers And Silica Gel
$V_{w_{gas}}$	scf	scm	Volume of Water Vapor Collected @ Standard Conditions
ρ_{air}	0.0748 lbs/ft^3		Density of Air
ρ_{H_2O}	1 g/ml		Density of Water
ρ_{man}	51.63 lbs/ft^3		Density of Manometer Oil

Standard Conditions: 68°F, 29.92 "Hg (20°C, 760 mm Hg)

Example Particulate Calculations

1. Volume of Dry Gas Sampled At Standard Conditions.*

$$V_{m_{std}} = V_m \left[\frac{T_{std}}{T_m + 460} \right] \left[\frac{P_b + \frac{P_m}{13.6}}{P_{std}} \right]$$

$$V_{m_{std}} = 17.65\ V_m \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = \text{dscf}$$

$$V_{m_{std}} = \text{dscf} \times 0.028317 - \text{dscm}$$

2. Volume of Water Vapor Collected At Standard Conditions.*

$$V_{w_{gas}} = \frac{(V_w - \text{gms } SO_2 - \text{gms } H_2S)\ \rho_{H_2O}\ R\ T_{std}}{P_{std}\ M_{H_2O}\ 453.6}$$

$$V_{w_{gas}} = 0.0472\ (V_w - \text{gms } SO_2 - \text{gms } H_2S) = \text{scf}$$

$$V_{w_{gas}} = \text{scf} \times 0.028317 = \text{scm}$$

3. Percent Moisture in Stack Gas.

$$\%M = \frac{V_{w_{gas}}}{V_{m_{std}} + V_{w_{gas}}} \times 100 = \%$$

* 528°R, 29.92 "Hg (20°C, 760 mm Hg)

4. Mole Fraction of Dry Gas.

$$M_d = \frac{100 - \%M}{100}$$

5. Average Molecular Weight of Dry Stack Gas.

$$MW_d = \left(\%CO_2 \times \frac{44}{100}\right) + \left(\%O_2 \times \frac{32}{100}\right) + \left(\%N_2 \times \frac{28}{100}\right) + \left(\%CO \times \frac{28}{100}\right) = \text{lb/lb-mole}$$

$$= \text{g/g-mole}$$

6. Molecular Weight of Stack Gas.

$$MW = MW_d \times M_d + 18\ (1-M_d) = \frac{\text{lb}}{\text{lb-mole}} = \text{g/g-mole}$$

7. Percent Excess Air At Sampling Point.

$$\%EA = \frac{100\ (\%O_2 - 0.5\%\ CO)}{0.265\ (\%N_2) - (\%O_2) + 0.5\ (\%CO)}$$

8. Stack Pressure.

$$P_s = P_b + \frac{\text{stack pressure "}H_2O}{13.6} = \text{"Hg Absolute}$$

$$P_s = \text{"Hg Abs.} \times 25.4 = \text{mm Hg}$$

* 528°R, 29.92 "Hg (20°C, 760 mm Hg)

9. Stack Velocity At Stack Conditions.

$$V_s = C_p\ 60 \left[\frac{2g \times \rho_{man} \times P_{std} \times MW_{air} \times (T_s + 460) \times \Delta P_s}{12 \times \rho_{air} \times P_s \times MW \times T_{std}} \right]^{1/2}$$

$$V_s = 5123.8\ C_p \left[\frac{(T_s + 460)}{P_s \times MW} \right]^{\frac{1}{2}} \times \text{Average} \left[(\Delta P)^{\frac{1}{2}} \right] = \text{fpm}$$

$$V_s = \text{fpm} \times 0.00508 = \text{m/sec}$$

10. Dry Stack Gas Volume At Standard Conditions.*

$$Q_s = \frac{1}{144} V_s \times A_s \times M_d \times \frac{T_{std}}{T_s + 460} \times \frac{P_s}{P_{std}}$$

$$= Q_s = \frac{0.123\ V_s \times A_s \times M_d \times P_s}{T_s + 460} = \text{DSCFM}$$

$$Q_s = \text{DSCFM} \times 1.6990 = \text{dscm/hr}$$

11. Actual Stack Gas Volume At Stack Conditions.

$$Q_a = \frac{V_s \times A_s}{144} = \text{ACFM}$$

$$Q_a = \text{ACFM} \times 1.6990 = m^3/hr$$

* 528°R, 29.92 "Hg (20°C, 760 mm Hg)

12. Percent Isokinetic

$$\%I = \frac{V_{m_{std}} \times (T_s + 460) \times P_{std} \times 100 \times 144}{M_d \times T_{std} \times P_s \times T_t \times V_s \times \frac{\pi D_n^2}{4}}$$

$$\%I = \frac{1039\ V_{m_{std}} \times (T_s + 460)}{M_d \times P_s \times T_t \times V_s\ D_n^2}$$

13. Particulate - Probe, Cyclone, and Filter.

$$C_{an} = \frac{m_f}{V_{m_{std}}} \times \frac{1\ gr}{64.8\ mg}$$

$$C_{an} = 0.0154\ \frac{m_f}{V_{m_{std}}} = gr/dscf$$

$$C_{an} = gr/dscf \times 2.290 = g/dscm$$

14. Particulate - Total.

$$C_{ao} = 0.0154 \times \frac{m_t}{V_{m_{std}}} = gr/dscf$$

$$C_{ao} = gr/dscf \times 2.290 = g/dscm$$

* 528°R, 29.92 "Hg (20°C, 760 mm Hg)

15. Particulate - Probe, Cyclone, and Filter At Stack Conditions.

$$C_{at} = C_{an} \times \frac{P_s}{P_{std}} \times \frac{(T_{std})}{(T_s + 460)} \times M_d$$

$$C_{at} = \frac{17.65 \times C_{an} \times P_s \times M_d}{T_s + 460} = gr/CF$$

$$C_{at} = gr/CF \times 2.290 = g/m^3$$

16. Particulate - Total, At Stack Conditions.

$$C_{au} = \frac{17.65 \times C_{ao} \times P_s \times M_d}{T_s + 460} = gr/CF$$

$$C_{au} = gr/CF \times 2.290 = g/m^3$$

17. Particulate - Probe, Cyclone, and Filter.

$$C_{aw} = C_{an} \times Q_s \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{1 \text{ lb}}{7000 \text{ gr}}$$

$$C_{aw} = 0.00857 \times C_{an} \times Q_s = lbs/hr$$

$$C_{aw} = lbs/hr \times 0.4536 = kg/hr$$

18. Particulate - Total.

$$C_{ax} = 0.00857 \times C_{ao} \times Q_s = lbs/hr$$

$$C_{ax} = lbs/hr \times 0.4536 = kg/hr$$

* 528°R, 29.92 "Hg (20°C, 760 mm Hg)

Tg SODA ASH
GRANGER, WYOMING
STACK EMISSIONS SURVEY

AUGUST 1989

FILE NUMBER 8910-160

SOURCE EMISSION CALCULATIONS

Symbol	Description	Units	HEADFRAME	HEADFRAME	HEADFRAME
Run No.			1	2	3
Date			08/29/89	08/29/89	08/29/89
Begin			0927.5 MDT	1102.5 MDT	1227.5 MDT
End			1030.0 MDT	1205 MDT	1330.0 MDT
Pb	barometric pressure	"Hg Abs.	23.82	23.82	23.82
		(mm Hg)	605.03	605.03	605.03
Pm	orifice pressure drop	"H2O	1.33	1.42	1.35
		(mm H2O)	33.76	36.15	34.29
Vm	volume dry gas sampled	cu. ft.	48.822	50.647	49.548
	@ meter conditions	(cu. m.)	1.382	1.434	1.403
Tm	avg. gas meter temp	deg. F	88	95	103
		(deg. C)	31	35	40
Vmstd	volume dry gas sampled	dscf	37.640	38.525	37.134
	@ standard conditions*	(dscm)	1.066	1.091	1.052
Vw	total H2O collected, impingers & silica gel	ml	11.5	7.5	8.2
Vwgas	volume water vapor	scf	.543	.354	.387
	collected @ standard conditions*	(scm)	.015	.010	.011
%M	moisture in stack gas by volume	%	1.42	.91	1.03

* 68 deg. F., 29.92 "Hg (20 deg. C., 760 mm Hg)

Source Emission Calculations

Tg SODA ASH
FILE NUMBER 8910-160

Symbol	Description	Units	HEADFRAME	HEADFRAME	HEADFRAME
Run No.			1	2	3
Md	mole fraction of dry gas	-------	.9858	.9909	.9897
CO2		%	.0	.0	.0
O2		%	21.0	21.0	21.0
N2		%	79.0	79.0	79.0
%EA	excess air @ sampling point	%	---	---	---
MWd	molecular weight of dry stack gas	lb/lb-mole (g/g-mole)	28.84 28.84	28.84 28.84	28.84 28.84
MW	molecular weight of stack gas	lb/lb-mole (g/g-mole)	28.69 28.69	28.74 28.74	28.73 28.73
dP's	velocity head of stack gas	"H2O (mm H2O)	.575 14.61	.608 15.45	.580 14.72
Ts	stack temperature	deg. F (deg. C)	68 20	77 25	84 29
Ps	stack pressure	"Hg Abs. (mm Hg)	23.85 605.66	23.85 605.66	23.85 605.66
Vs	stack velocity @ stack conditions	fpm (m/sec)	2769 14.07	2873 14.59	2825 14.35
As	stack area	sq. in. (sq. met.)	695 .45	695 .45	695 .45
Qs	dry stack volume @ standard conditions*	DSCFM (dscm/hr)	10537 17902.27	10802 18352.54	10477 17800.68
Qa	actual stack gas volume @ stack conditions	ACFM (cu.m./hr)	13366 22709.00	13865 23556.61	13635 23165.43

* 68 deg. F., 29.92 "Hg (20 deg. C., 760 mm Hg)

Source Emission Calculations

Tg SODA ASH
FILE NUMBER 8910-160

Symbol	Description	Units	HEADFRAME	HEADFRAME	HEADFRAME
Run No.			1	2	3
Tt	net time of test	min.	60	60	60
Dn	sampling nozzle diameter	in. (m)	.227 .006	.227 .006	.227 .006
%I	percent isokinetic	%	102.62	102.46	101.82
mf	particulate - probe, cyclone and filter	mg	25.7	20.8	26.0
mt	particulate - total	mg	---	--	---
Can	particulate - probe, cyclone and filter	gr/dscf* (g/dscm)	.0105 .0241	.0083 .0190	.0108 .0247
Cao	particulate - total	gr/dscf* (g/dscm)	--- ---	--- ---	--- ---
Cat	particulate - probe, cyclone and filter @ stack conditions	gr/cf (g/cu.m.)	.0083 .0189	.0065 .0148	.0083 .0189
Cau	particulate - total @ stack conditions	gr/cf (g/cu.m.)	--- ---	--- ---	--- ---
Caw	particulate - probe, cyclone and filter	lbs/hr (kg/hr)	.950 .431	.770 .349	.968 .439
Cax	particulate - total	lbs/hr (kg/hr)	--- ---	--- ---	--- ---

* 68 deg. F., 29.92 "Hg (20 deg. C., 760 mm Hg)

APPENDIX C

Calibration of Equipment

APPENDIX C

Calibration Data

July 19, 1989

DRY GAS METERS

Unit Number	Calibration Factor
1	1.028
2	1.034
3	1.068
4	1.011

APPENDIX C

Calibration Data

July 19, 1989

PITOT TUBES

Pitot Length (effective length)	Calibration Factor	Pitot Length (effective length)	Calibration Factor
		122-1	High 0.823 Low 0.822
32-1	High 0.833 Low 0.831	128-1	High 0.823 Low 0.821
32-2	High 0.834 Low 0.831	132-1	High 0.822 Low 0.821
46-1	High 0.817 Low 0.818	132-2	High 0.820 Low 0.823
49-1	High 0.814 Low 0.812		
49-3	High 0.821 Low 0.821		
73-1	High 0.828 Low 0.824		
74-1	High 0.820 Low 0.822		
96-1	High 0.828 Low 0.822		

APPENDIX C

Calibration Data

July 18, 1989

NOZZLES

Set A

Nozzle No.	Diameter (inches)
1A	MIA
2A	0.227
3A	0.253
4A	0.321
5A	0.359
6A	0.378
7A	0.446
8A	0.500
9A	0.499
10A	0.576

Set B

Nozzle No.	Diameter (inches)
1B	0.130
2B	0.178
3B	0.239
4B	0.306
5B	0.358
6B	0.366
7B	0.501

Set I

Nozzle No.	Diameter (inches)
I-1	0.130
I-2	0.195
I-3	0.245
I-4	0.310
I-5	0.371
I-6	0.417
I-7	0.488
I-8	0.565
I-9	0.614

Set II

Nozzle No.	Diameter (inches)
II-1	0.123
II-2	0.192
II-3	0.253
II-4	0.312
II-5	0.376
II-6	0.435
II-7	0.496
II-8	0.561
II-9	0.609

Set III

Nozzle No.	Diameter (inches)
III-1	0.130
III-2	0.180
III-3	0.246
III-4	0.369
III-5	0.367
III-6	0.429
III-7	0.500
III-8	0.558
III-9	0.611

APPENDIX D

Field Testing Data

Job No. 8910-160 — Point — FIELD DATA

Job Name TC Scale Ash

Run No. 1

Location Mine head frame

Date 8/29/89

Operator Reynolds / McCullough

Sample Box No. 4 — Meter Box No. 4

Read and Record at the Start of Each Test Point.

Nomograph Setting ΔP — ΔH —

Ambient Temp. °F 63

Assumed Moisture % 1.5

Probe Length 5'

Pitot Tube Leak Check Before / After

Initial Leak @ 15.0 "Hg = 0.000 cfm

Final Leak @ 7.0 "Hg = 0.000 cfm

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O	Orifice ΔH in. H_2O Desired	Orifice ΔH in. H_2O Actual	Pump Vacuum In. Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp °F Inlet	Dry Gas Temp °F Outlet	Remarks
		ΔPs	Pm				Ts						K=2.3
A-12	0927.5	76.518	0.53	1.20	1.20	2.5	65	270	269	61	81	77	
11	0930	78.45	0.57	1.35	1.35	2.5	65	267	263	58	83	78	
10	0932.5	80.44	0.62	1.40	1.40	3.0	65	259	259	54	83	79	
9	0935	82.47	0.64	1.45	1.45	3.0	65	254	255	58	85	20	
8	0937.5	84.54	0.64	1.45	1.45	3.0	65	249	257	60	85	20	
7	0940	86.64	0.65	1.45	1.45	3.0	66	253	257	61	86	81	
6	0942.5	88.75	0.72	1.65	1.65	3.5	67	261	255	63	88	82	2.35
5	0945	90.97	0.71	1.70	1.70	3.5	67	255	260	65	90	83	
4	0947.5	93.22	0.55	1.30	1.30	3.0	67	259	262	65	91	84	
3	0950	95.29	0.60	1.40	1.40	3.0	68	259	262	66	92	85	
2	0952.5	97.34	0.58	1.35	1.35	3.0	68	259	264	67	93	85	
1	0955	99.39	0.58	1.35	1.35	3.0	68	257	265	68	93	85	
END	0957.5	101.413	—	—	—	—	—	—	—	—	—	—	
B-12	1000	101.413	0.54	1.25	1.25	3.0	68	255	265	68	92	87	
11	1002.5	103.30	0.54	1.25	1.25	3.0	69	249	271	67	92	87	
10	1005	105.28	0.58	1.35	1.35	3.0	70	245	265	67	92	88	
9	1007.5	107.30	0.63	1.45	1.45	3.0	70	244	257	65	92	89	
8	1010	109.90	0.64	1.50	1.50	3.0	70	245	255	61	92	89	

Pitot Tube Calibration Factor C_p 0.814 — Pitot Tube No. 4E-1

Volume Collected V_m 48.822 ft³ — %CO_2 0.0 — %CO 0.0

Water Collected V_w 11.5 ml — %O_2 21.0 — %N_2 79.0

Time of Test T_t 60 min — Area Stack A_2 695 in²

Baro. Press. P_b 23.82 "Hg — Stack Press. +0.34 in. H_2O

Sample Purge: Initial — Final —

Probe Tip No. A-2 — Probe Tip Dia. 0.227 in

V_m = Dry Gas Meter Calibration Factor 1.011 X 48.291

Dry Gas Meter Reading ____ ft³ − (T_t ____ min x Leak Rate ____ cfm)

M_F = 25.9 — M_T = —

Run No. 1

Location Mine headframe

Date 8/28/89

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O	Orifice ΔH in. H_2O		Pump Vacuum In. Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp. °F	Dry Gas Temp °F		Remarks
				Desired	Actual						Inlet	Outlet	
B-7	1012.5	111.54	0.63	1.45	1.45	3.0	70	253	252	65	92	89	
6	1015	113.67	0.58	1.35	1.35	3.0	70	260	250	65	92	89	
5	1017.5	115.73	0.54	1.25	1.25	3.0	70	261	249	63	92	90	
4	1020	117.73	0.54	1.25	1.25	3.0	70	257	245	63	92	90	
3	1022.5	119.73	0.40	0.84	0.84	2.5	70	265	247	63	92	90	
2	1025	121.44	0.47	1.10	1.10	2.5	71	265	248	65	92	90	
1	1027.5	123.28	0.30	0.71	0.71	2.0	71	269	248	67	91	90	
END	1030	124.809	—	—	—	—	—	—	—	—	—	—	
ALL													

revised 4/85

IMPINGER CATCH

SAMPLE NO. 1

IMPINGER NO.	SOLUTION USED	AMOUNT OF SOLUTION (ml)	IMP. TIP CONFIGURATION	WEIGHT (grams)
1	D.I.	100	modif.	Final 592.7 Initial 596.6 Wt. Gain -3.9
2	D.I.	100	G.Smith	Final 555.2 Initial 551.8 Wt. Gain 3.4
3	Dry	—	modif.	Final 491.2 Initial 489.0 Wt. Gain 2.2
4	Silica Gel	—	modif.	Final 643.4 Initial 633.6 Wt. Gain 9.8
5				Final Initial Wt. Gain
6				Final Initial Wt. Gain
Flask	ϕ			Final Initial Wt. Gain

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 11.5

DATE: 8-29-89

SIGNATURE: Michael C. Reynolds

ORSAT ANALYSIS RESULTS
Gas Fractional Part

CO_2 _____

O_2 _____

CO _____

N_2 _____

Ambient Air

DATE: _____

SIGNATURE: _____

TIME: _____

Job No. 8510-160 | Part. FIELD DATA | Nomograph Setting ΔP — ΔH —

Job Name TG Soda Ash | Ambient Temp. °F 75

Run No. 2 | Assumed Moisture % 1.5

Location Mine head frame | Read and Record at the Start of Each Test Point. | Probe Length 5'

Date 8/25/89 | Pitot Tube Leak Check Before Test Ok / After Test Ok

Operator Reynolds / McCullough | Initial Leak @ 15.0 "Hg = 0.000 cfm

Sample Box No. 5 | Meter Box No. 4 | Final Leak @ 7.0 "Hg = 0.000 cfm

ΔPs | Pm | Ts | Tm

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O	Orifice ΔH in. H_2O Desired	Orifice ΔH in. H_2O Actual	Pump Vacuum In. Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp °F Inlet	Dry Gas Temp °F Outlet	Remarks K=2.35
A-12	1102.5	123.163	0.53	1.25	1.25	3.0	77	271	245	67	95	97	
11	1105	127.14	0.54	1.25	1.25	3.0	76	269	249	67	94	95	
10	1107.5	129.12	0.62	1.45	1.45	3.0	77	260	242	64	92	95	
9	1110	131.20	0.67	1.60	1.60	3.5	76	253	247	64	91	95	
8	1112.5	135.37	0.69	1.60	1.60	3.5	76	247	265	63	91	94	
7	1115	135.61	0.67	1.60	1.60	3.5	76	248	264	63	92	94	
6	1117.5	137.81	0.60	1.40	1.40	3.0	76	252	269	62	92	94	
5	1120	139.88	0.57	1.35	1.35	3.0	76	265	267	63	93	95	
4	1122.5	141.91	0.57	1.35	1.35	3.0	76	263	264	63	94	95	
3	1125	143.95	0.52	1.20	1.20	3.0	76	265	259	65	95	95	
2	1127.5	145.91	0.52	1.20	1.20	3.0	76	261	255	65	95	95	
1	1130	147.85	0.41	0.96	0.96	2.5	76	262	253	66	95	95	
END	1132.5	149.539	—	—	—	—	—	—	—	—	—	—	
A-12	1135	149.539	0.47	1.10	1.10	2.5	77	247	245	69	95	97	
11	1137.5	151.41	0.59	1.35	1.35	3.0	77	245	245	65	95	97	
10	1140	153.43	0.62	1.45	1.45	3.5	77	252	243	62	95	97	
9	1142.5	155.52	0.62	1.45	1.45	3.5	77	249	245	61	95	97	
8	1145	157.61	0.62	1.45	1.45	3.5	78	247	244	59	95	96	

Pitot Tube Calibration Factor C_p 0.814 | Pitot Tube No. 49-1

Volume Collected V_m 50.647 ft³ | %CO_2 0.0 | %CO 0.0

Water Collected V_w 7.5 ml | %O_2 21.0 | %N_2 79.0

Time of Test T_t 60 min | Area Stack A_2 695 in²

Baro. Press. P_b 23.82 "Hg | Stack Press. +0.34 in. H_2O

Sample Purge: Initial — Final —

Probe Tip No. A-2 | Probe Tip Dia. 0.227 in

V_m = Dry Gas Meter Calibration Factor 1.011 × 50.096

Dry Gas Meter Reading ____ ft³ − (T_t ____ min × Leak Rate ____ cfm)

M_F = 20.8 | M_T = —

Run No. 2

Location Mine head frame

Date 8/29/89

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O	Orifice ΔH in. H_2O		Pump Vacuum In. Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp. °F	Dry Gas Temp °F		Remarks
				Desired	Actual						Inlet	Outlet	
A-7	1147.5	159.73	0.64	1.50	1.50	3.5	78	271	254	59	95	96	
6	1150	161.85	0.68	1.60	1.60	3.5	79	269	264	57	95	96	
5	1152.5	163.91	0.73	1.70	1.70	3.5	79	269	267	57	95	96	
4	1155	166.35	0.73	1.70	1.70	3.5	79	270	269	56	97	95	
3	1157.5	168.65	0.75	1.75	1.75	4.0	79	260	269	55	97	96	
2	1200	170.97	0.70	1.65	1.65	3.5	79	253	269	55	99	97	
1	1202.5	173.25	0.54	1.25	1.25	3.0	79	253	265	57	99	97	
END	1205	175.259	—	—	—	—	—	—	—	—	—	—	
ALL													

revised 4/85

IMPINGER CATCH

SAMPLE NO. 2

IMPINGER NO.	SOLUTION USED	AMOUNT OF SOLUTION (ml)	IMP. TIP CONFIGURATION	WEIGHT (grams)
1	D.I.	100	modif.	Final 587.5 Initial 591.8 Wt. Gain -4.3
2	D.I.	100	G. Smith	Final 584.9 Initial 581.5 Wt. Gain 3.4
3	Dry	-	modif.	Final 469.2 Initial 468.5 Wt. Gain 0.7
4	Silica Gel	-	modif.	Final 677.6 Initial 669.9 Wt. Gain 7.7
5				Final Initial Wt. Gain
6				Final Initial Wt. Gain
Flask	ϕ			Final Initial Wt. Gain

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 7.5

DATE: 8-29-89

SIGNATURE: Michael E. Reynolds

ORSAT ANALYSIS RESULTS

Gas Fractional Part

CO_2 _____

O_2 _____

CO _____

N_2 _____

Ambient Air

DATE: _____

SIGNATURE: _____

TIME: _____

Job No. 8910-160 — Part. FIELD DATA — Nomograph Setting ΔP — ΔH —

Job Name TG Soda Ash — Ambient Temp. °F 80

Run No. 3 — Assumed Moisture % 1.5

Location Mine Head frame — Read and Record at the Start of Each Test Point. — Probe Length 5'

Date 8/29/89 — Pitot Tube Leak Check Before/after ok/ok

Operator Reynolds/McCullough — Initial Leak @ 15.000 "Hg = 0.000 cfm

Sample Box No. 6 — Meter Box No. 4 — Final Leak @ 7.000 "Hg = 0.000 cfm

ΔPs — Pm — Ts — Tm

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O	Orifice ΔH in. H_2O Desired	Orifice ΔH in. H_2O Actual	Pump Vacuum In. Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp °F Inlet	Dry Gas Temp °F Outlet	Remarks
A-12	12275	175.502	0.54	1.25	1.25	3.0	83	270	275	75	100	101	
11	1230	177.50	0.56	1.30	1.30	3.0	83	265	270	67	100	100	
10	1232.5	179.42	0.59	1.35	1.35	3.0	83	263	260	65	100	100	
9	1235	181.43	0.60	1.40	1.40	3.0	83	260	265	64	101	100	
8	12375	183.49	0.61	1.45	1.45	3.0	83	265	270	64	102	101	
7	1240	185.59	0.61	1.45	1.45	3.0	83	270	275	65	103	101	
6	1242.5	187.70	0.64	1.50	1.50	3.0	83	275	277	65	104	101	
5	1245	189.84	0.67	1.60	1.60	3.0	83	277	275	65	104	102	
4	12475	192.64	0.68	1.60	1.60	3.5	83	274	271	66	105	102	
3	1250	194.27	0.68	1.60	1.60	3.5	83	275	269	66	105	102	
2	1252.5	196.48	0.68	1.60	1.60	3.5	83	275	266	67	107	102	
1	1255	198.73	0.60	1.40	1.40	3.5	83	275	269	67	107	103	
END	12575	200.816	—	—	—	—	—	—	—	—	—	—	
B-12	1300	200.816	0.49	1.15	1.15	3.0	84	270	269	68	105	103	
11	1302.5	202.66	0.52	1.20	1.20	3.0	85	272	268	68	105	103	
10	1305	204.57	0.58	1.35	1.35	3.0	85	270	273	67	104	104	
9	1307.5	206.59	0.59	1.35	1.35	3.0	85	269	275	65	105	104	
8	1310	208.67	0.64	1.45	1.45		85	270	275	65	105	104	

Pitot Tube Calibration Factor C_p 0.814 — Pitot Tube No. 49-1

Volume Collected V_m 49.548 ft³ — %CO_2 0.0 — %CO 0.0

Water Collected V_w 8.2 ml — %O_2 21.0 — %N_2 79.0

Time of Test T_t 60 min — Area Stack A_2 695 in²

Baro. Press. P_b 23.82 "Hg — Stack Press. ± 0.54 in. H_2O

Sample Purge: Initial — Final —

Probe Tip No. A-2 — Probe Tip Dia. 0.227 in

V_m = Dry Gas Meter Calibration Factor 1.011 X 49.009

Dry Gas Meter Reading ft³ − (T_t min x Leak Rate cfm)

M_F = 26.0 — M_T =

Run No. L-3

Location Mine head frame

Date 8/29/89

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O	Orifice ΔH in. H_2O		Pump Vacuum In. Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp. °F	Dry Gas Temp °F		Remarks
				Desired	Actual						Inlet	Outlet	
3-7	1312.5	210.81	0.62	1.45	1.45	3.0	85	273	275	65	105	104	
6	1315	212.96	0.54	1.25	1.25	3.0	85	271	275	65	105	104	
5	1317.5	214.96	0.52	1.20	1.20	3.0	85	269	274	65	105	104	
4	1320	216.92	0.50	1.15	1.15	3.0	85	268	273	65	105	104	
3	1322.5	218.84	0.51	1.15	1.15	3.0	85	273	274	65	105	104	
2	1325	220.75	0.51	1.15	1.15	3.0	85	271	275	65	105	104	
1	1327.5	222.66	0.45	1.05	1.05	3.0	85	275	275	65	105	104	
END	1330	224.511	—	—	—	—	—	—	—	—	—	—	
Avg													

revised 4/85

IMPINGER CATCH

SAMPLE NO. 3

IMPINGER NO.	SOLUTION USED	AMOUNT OF SOLUTION (ml)	IMP. TIP CONFIGURATION	WEIGHT (grams)
1	D.I.	100	modif.	Final 544.8 Initial 548.3 Wt. Gain -3.5
2	D.I.	100	G.Smith	Final 616.3 Initial 616.3 Wt. Gain 0.0
3	Dry	—	modif.	Final 466.3 Initial 465.4 Wt. Gain 0.9
4	Silica Gel	—	modif.	Final 683.9 Initial 673.1 Wt. Gain 10.8
5				Final Initial Wt. Gain
6				Final Initial Wt. Gain
Flask	ϕ			Final Initial Wt. Gain

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 8.2

DATE: 8-29-89

SIGNATURE: Michael F. Reynolds

ORSAT ANALYSIS RESULTS
Gas Fractional Part

CO_2 _____

O_2 _____

CO _____

N_2 _____

Ambient Air

SIGNATURE: _____

DATE: _____

TIME: _____

APPENDIX E

Analytical Data

WEST, Inc.

PARTICULATE ANALYSIS

Date 8-29-89

Job No. 8910-160

Name TG Soda Ash

Location Mine Headframe

Run No. 1

Filter No. R-216 Front Wash 345 ml Impinger 1 Impinger 2

Final	0.6787	108.1919		
Initial	0.6753	108.1674		
	0.0034 = 3.4	0.0245 = 24.5		
		− 2.2 Blanks		
		22.3		

MF 25.7 mg MT — mg

Run No. 2

Filter No. R-217 Front Wash 360 ml Impinger 1 Impinger 2

Final	0.6833	97.1907		
Initial	0.6799	97.1710		
	0.0034 = 3.4	0.0197 = 19.7		
		− 2.3 Blanks		
		17.4		

MF 20.8 mg MT _____ mg

Run No. 3

Filter No. R-218 Front Wash 260 ml Impinger 1 Impinger 2

Final	0.6782	99.9936		
Initial	0.6760	99.9681		
	0.0022 = 2.2	0.0255 = 25.5		
		1.7 Blank		
		23.8		

MF 26.0 mg MT _____ mg

Acetone Blank:

Volume 200 ml Final 100.1085 Initial 100.1072 = 0.0013

Blank: 0.0065 mg/ml Total Weight 1.3 mg

D.I. Water Blank

Volume _____ ml Final _____ Initial _____

Blank: _____ mg/ml Total Weight _____

APPENDIX F

Plant Operational Data

PRODUCTION DATA

During the test period, the ore throughput serviced by the Mine Headframe dust collector averaged 278 tons/hr.

APPENDIX G

Chain of Custody
and
Analysis Request

WESTERN ENVIRONMENTAL SERVICES AND TESTING, INC.

Chain of Custody and Analysis Request

Job Number 8910-160 Date(s) Sampled 8-29-89

Job Name Tg Soda Ash Number of Runs 3

Source Location Granger, Wyoming

Unit Tested Mine Headframe

Absorbing Solution/Analysis For

Run	Filter Number	Imp 1	Imp 2	Imp 3	Imp 4	Probe Wash
1	R-216	D.I. / moist.	D.I. / moist.	Dry / moist.	Silica gel / moist.	Acetone / Particulates
2	R-217	"	"	"	"	"
3	R-218	"	"	"	"	"
4						

No_x: _____

Other _____

Total Number of Sample Bottles: 4

Total Number of Filters: 3

Comments: _____

Person Responsible for Samples: Michael E. Reynolds

Sample No.	Recovered by	Date	Time	Location
1	Michael E. Reynolds	8-29-89	1045	On site
2	Michael E. Reynolds	8-29-89	1215	on site
3	Michael E. Reynolds	8-29-89	1340	On site
4				

Samples Received By Michael E. Reynolds for transport Date: 8/29/89 Time: 1500

Samples Received at Lab by Michael E. Reynolds Date: 9/1/89 Time: 1800

Samples Analyzed by Alan D. Rayburn Date: 8-29-89 Time: —

4/85

APPENDIX H

Resumes of Test Personnel

ALAN D. ROYLANCE

CURRENT: 04/18/86 to present	Manager of Operations, Western Environmental Services and Testing, Inc., Casper, WY, and Beaumont, TX; an environmental monitoring and consulting firm.
PROFESSIONAL: 10/24/86 to 04/17/86	Air Quality Supervisor, Western Environmental Services Western Environmental Services and Testing, Inc.
03/04/85 to 10/23/86	Laboratory Supervisor, Western Environmental Services and Testing, Inc.
06/08/84 to 03/03/85	Field Testing Supervisor, Western Environmental Services and Testing, Inc.
02/01/83 to 06/07/84	Senior Technician, Western Environmental Services and Testing, Inc.
10/01/78 to 06/07/81	Surveyor, Pioneer Nuclear, Inc., Casper, WY; a uranium exploration firm
EDUCATION:	Bachelor of Science in Wildlife Science - Utah State University, Logan, UT, 1977
TECHNICAL EXPERIENCE:	Assisted in over 180 source emission surveys in the western and southwestern United States; assisted in the set up and maintenance of over 15 ambient air networks.
CERTIFICATIONS:	Visible Emissions Evaluator
PROFESSIONAL MEMBERSHIPS:	Air Pollution Control Association Society of Mining Engineers of A.I.M.E.

MICHAEL E. REYNOLDS

CURRENT: 04/03/89 to present	Senior Technician, Western Environmental Services and Testing, Inc., Casper, Wyoming, and Beaumont, Texas; an environmental monitoring and consulting firm.
PROFESSIONAL:	
05/88 to 04/89	Downhole Surveyor, Scientific Drilling International, Casper, Wyoming
11/86 to04/88	Contract Sample Catcher, Exploration Logging, Houston, Texas
06/81 to 09/86 (summers)	Partner, Custom Contract Haying, Glenrock, Wyoming
05/80 to 01/81	Laborer, Lower and Company, Inc., Casper, Wyoming
05/79 to 09/79	Laborer, Lower and Company, Inc., Casper, Wyoming
06/78 to 09/78	Roustabout, Thatcher and Sons, Inc., Casper, Wyoming
EDUCATION:	South Dakota School of Mines and Technology, Mining Engineering, 09/78 to 5/80
	University of Wyoming, Laramie, Undergraduate business courses consistent with M.B.A. program
	B.S. Petroleum Engineering, 12/83

TECHNICAL EXPERIENCE:

Name DP/TK

ANALYSIS REQUEST

Sample Date: 11/14/83

	Front	Back
Time Sample Received		
Time Sample Completed		
% T.A. as Na_2CO_3		
% Na_2SO_4		
% NaCl		
% Volatile		
ppm Fe		
ppm SiO_2		
ppm Ca		
ppm Mg		
% H_2O Insol		
ppm C.O.D.		
Total Solids	.0053g.	.0024g.
APHA Pad		
Char Reflect.		
Reflection		
Bulk Density		
+ 16		
- 16 + 20		
- 20 + 30		
- 30 + 40		
- 40 + 50		
- 50 + 70		
- 70 +100		
-100 +140		
-140 +200		
-200		

Comments:

BF-8 particulate, Run #3

11/14/83

Plant Chemist: _____