

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.

Tenneco Minerals
A Tenneco Company

P. O. Box 1167
Green River, Wyoming 82935
(307) 875-6500



November 8, 1983



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

Dear Mr. Gribovicz:

Enclosed, please find the Compliance Test Reports for the product silos bag filters, BF-31 and BF-33, which jointly comprise Permit Source No. 6.

The average emission rate for BF-33 using EPA Method 5 (front half particulate only) was .29 lb/hr, while the total emission rate (including impinger particulates) was .49 lb/hr. The average emission rate for BF-31 using EPA Method 5 was .21 lb/hr, while the total emission rate was .23 lb/hr.

Thus, the average actual emission rate for Source No. 6 was .72 lb/hr, as compared with an allowable rate of 1.8 lb/hr (DEQ) and 2.06 lb/hr (EPA). Test data and results are enclosed. Please let me know if you have any questions or require additional information.

Sincerely,

TENNECO MINERALS COMPANY

M. S. Litus
M. S. Litus
Environmental Engineer

MSL:drf

cc: Mr. Randolph Wood, Administrator, DEQ/AQD
Mr. Fred Longenberger, U.S. EPA

OVERVIEW OF COMPLIANCE TEST REPORT

PRODUCT SILOS BAG FILTER - TOP
BF-31
POINT SOURCE NO. 6*

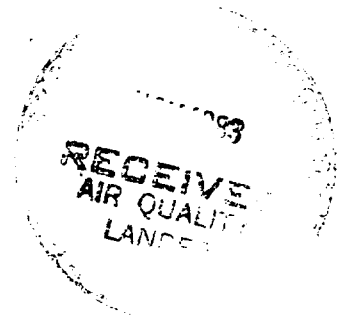


Exhibit 1 shows the location of the sampling ports in relation to the bag filter and fan. Dust collection ductwork is also shown.

Exhibit 2 presents test results and data relevant to sampling point selection.

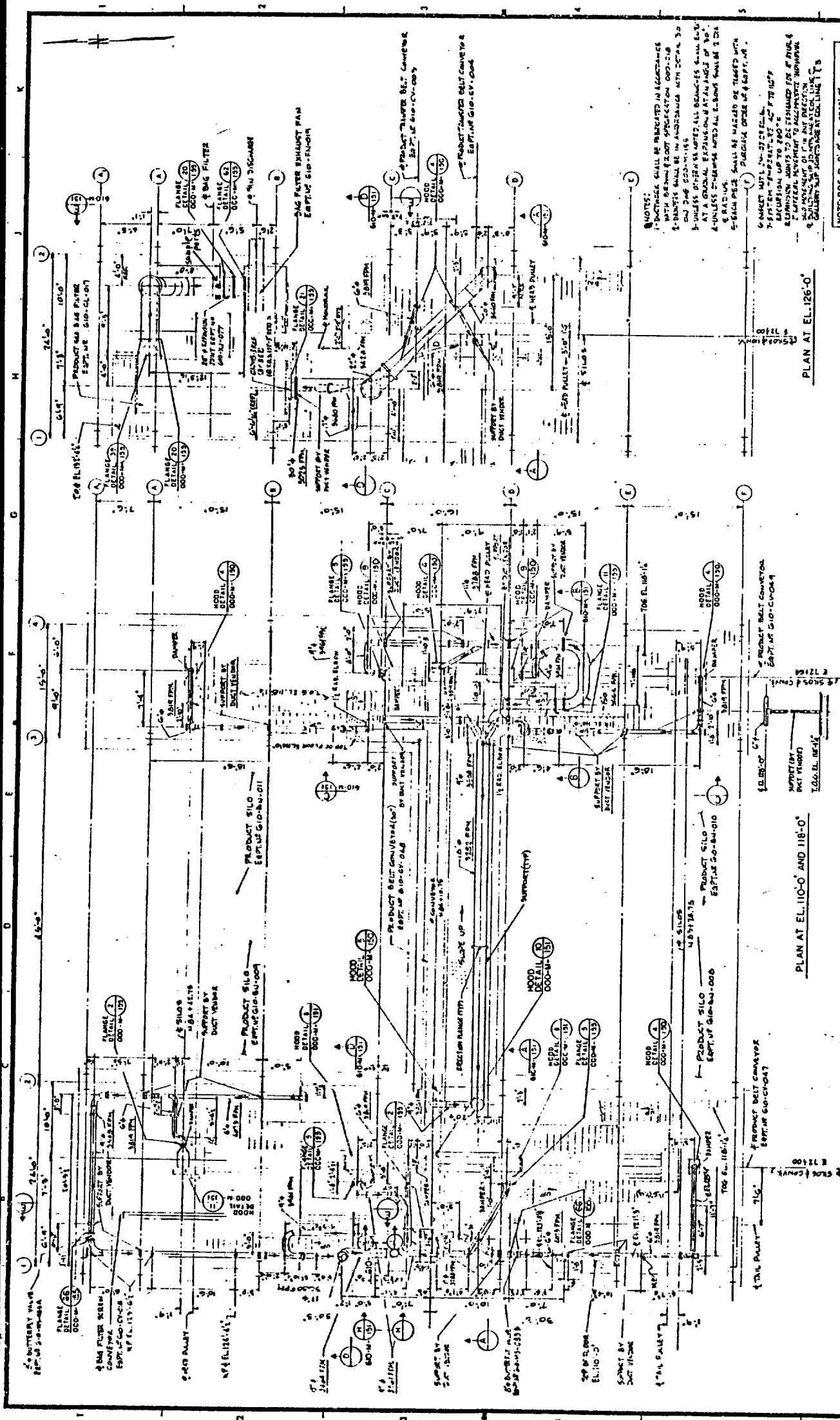
Exhibit 3 presents the raw data and data reduction for the test runs. All calculations were performed on a programmed HP-41C calculator. Information in Exhibit 3 includes field data, laboratory analyses, a key to input and output of the HP-41C program, and operating conditions during each of the test runs.

Please note that only two out of the required three test runs have been completed. BF-31 is currently out of service until certain essential repairs and modifications to the bag filter discharge screw conveyor can be made. These modifications will not affect the performance of the bag filter; however, if the Air Quality Division determines that an additional test is required, it will be run in early 1984, after the modifications have been completed. Tenneco believes the two test runs submitted in this report adequately prove compliance with the State and Federal emission limits.

*Reference: Wyoming DEQ/AQD Permit No. CT-234

EXHIBIT 1

PRODUCT SILOS BAG FILTER - TOP
EQUIPMENT CONFIGURATION



NOTES:
 1. DIMENSIONS SHALL BE INDICATED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS. DIMENSIONS SHALL BE IN INCHES UNLESS OTHERWISE NOTED.
 2. UNLESS OTHERWISE NOTED, ALL DIMENSIONS SHALL BE AT A GRADE EXISTING ON DATE OF PROJECT.
 3. UNLESS OTHERWISE NOTED, ALL DIMENSIONS SHALL BE 2 IN. RADIUS.
 4. EACH PIECE SHALL BE MAILED OR TACKLED WITH PLUGGING ORDER OF 4 EIGHTS.
 5. GASKET MATERIAL SHALL BE 1/2\"/>

PLAN AT EL. 126'-0"

PLAN AT EL. 110'-0" AND 118'-0"

EQPT. NO. 610-BK-020B NOTE: B.S. EL. 0'-0" EL. 623'-0" PPG. NO. 1150-01 SHEET 1 OF 2		Tenneco Oil Company SODA ASH PROJECT - WYOMING DUST COLLECTION DUCTWORK (UPPER) PLAN AT EL. 110'-0", 118'-0" AND 126'-0"		CR-C-91 610-M-150 1	
PROJECT NO. 1150-01 SHEET NO. 1150-01 DATE: 10-10-50 DRAWN BY: J. E. GALEY CHECKED BY: J. E. GALEY APPROVED BY: J. E. GALEY		Brown & Root, Inc. Engineers - Constructors HOUSTON, TEXAS		PROJECT NO. 1150-01 SHEET NO. 1150-01 DATE: 10-10-50 DRAWN BY: J. E. GALEY CHECKED BY: J. E. GALEY APPROVED BY: J. E. GALEY	

EXHIBIT 2

Product Silos Bag Filter - Top
Point Source No. 6
Tenneco Equipment No. BF-31
Brown & Root Equipment No. 610-CL-017

Test Results:

Run No. 1	Isokinetic	107.26%
	Emission Rate (front of filter)	0.19 lb/hr
	Emission Rate (total)	0.20 lb/hr
	Grain Loading	.0017 gr/SCF
Run No. 2	Isokinetic	96.00%
	Emission Rate (front of filter)	0.23 lb/hr
	Emission Rate (total)	0.25 lb/hr
	Grain Loading	.0025 gr/SCF

Stack Height:

132' 11 3/8"

Duct Diameter:

27.25"

Pollution Control Equipment Vented:

Peabody Bag Filter

Traverse Points:

The sampling ports are located .55 stack diameters upstream and 2.06 stack diameters downstream of any flow disturbance. Therefore, 48 traverse points are required.

Circular Duct, 27.25" I.D.

Two sampling ports, 24 points at each port.

Distance from stack wall:

Point 1	.3"	Point 9	6.3"	Point 17	22.0"
Point 2	.9"	Point 10	7.4"	Point 18	22.9"
Point 3	1.5"	Point 11	8.8"	Point 19	23.7"
Point 4	2.2"	Point 12	10.8"	Point 20	24.4"
Point 5	2.9"	Point 13	16.4"	Point 21	25.1"
Point 6	3.6"	Point 14	18.4"	Point 22	25.8"
Point 7	4.4"	Point 15	19.8"	Point 23	26.4"
Point 8	5.3"	Point 16	21.0"	Point 24	27.0"

EXHIBIT 3

TEST RUN NO. 1

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft ³	VELOCITY HEAD (p_s), in. H ₂ O	ORIFICE PRESSURE (H), in. H ₂ O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET (T_{m1}), °F OUTLET (T_{m2}), °F		PUMP VACUUM in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE °F
					DESIRED	ACTUAL						
Top 20	39			1.55	6.10	6.12		110	78	7	65	73
21	36			1.60	6.20	6.18		114	81	8		
22	38			1.60	6.20	6.19		114	81	8	65	74
23	40			1.55	6.10	6.10		117	82	7		
24	42		854.180	1.50	5.90	5.85		118	84	7	65	73
Side 1	X											
2	X											
3	X											
4	X											
5	2			1.15	4.50	4.55		74	76	6	60	52
6	4			1.10	4.30	4.35		83	78	5		
7	6			1.15	4.50	4.50		90	77	5		
8	8			1.20	4.70	4.72		97	77	6	61	63
9	10			1.30	5.10	5.10		102	78	6		
10	12			1.35	5.30	5.30		106	79	6		
11	14			1.30	5.10	5.15		108	79	6	60	66
12	16			1.30	5.10	5.10		110	80	6		
13	18			1.30	5.10	5.10		111	81	6		
14	20			1.30	5.10	5.10		113	82	6	60	66
15	22			1.30	5.10	5.13		114	84	6		
16	24			1.40	5.50	5.49		116	84	6		
17	26			1.40	5.50	5.50		116	85	6	60	66
18	28			1.50	5.90	5.90		117	85	6		
19	30			1.45	5.70	5.75		118	86	6		
20	32			1.50	5.90	5.90		120	87	6	60	66
21	34			1.55	6.10	6.10		120	88	7		
22	36			1.60	6.30	6.25		120	89	7		
23	38			1.55	6.10	6.10		120	90	7	60	66
24	40		917.999	1.40	5.50	5.55	64°	121	90	6		

Analysis RequestSample Date: 4-19-83

Comments

BF-31 4/18/83 Run #1

	Front	Back
Time Sample Arrived		
Time Sample Completed		
% T.A. as Na ₂ CO ₃		
% Na ₂ SO ₄		
% NaCl		
% Volatile		
ppm Fe		
ppm SiO ₂		
ppm Ca		
ppm Mg		
% H ₂ O Insol		
ppm C.O.D.	✓	✓
Total Solids	.0108 grams	.0003 grams
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		

Plant Chemist: _____

Key to Storage Registers: HP-41C Program "Stack"

Data Entered

00 Molecular Weight of Stack Gas (Dry)
 01 Volume Metered (ACF)
 02 $\sqrt{\Delta P}$ Average ($\sqrt{\text{in H}_2\text{O}}$)
 03 Volume Liquid Collected (mls)
 04 ΔH Average (in H₂O)
 05 Barometric Pressure (in Hg a)
 06 Average Metering Temperature °R
 07 Average Stack Temperature °R
 08 Stack Pressure (in Hg a)
 09 Total Sampling Time, Minutes
 10 Area of Probe Nozzle (ft²)
 20 Area of Stack (ft²)
 23 Particulate Weight, Front (g)
 24 Particulate Weight, Behind Filter (g)

BF-31

4-18-83

Run 1

Data Generated By Program

11 Volume Water Vapor, (SCF)
 12 Volume Dry Gas Metered, (SCF)
 13 Total Volume Metered, (SCF)
 14 % H₂O
 15 % Dry
 16 Molecular Weight of Stack Gas (Actual)
 17 Velocity of Stack Gas (ft/min)
 18 N/A
 19 Grain Loading (grains/SCF)
 21 Volume of Stack Gas, ACFM
 22 Volume of Stack Gas, SCFM Dry
 25 Emission Rate, Front (lb/hr)

EXHIBIT 3

TEST RUN NO. 2

Date 9-22-83
Sampling Location BF-31
Sampling Type Method 5
Run Number 2
Operator T. Kalivas, D. Phillips
Probe Length & Type 3', Phillips
Filter Number 45
Nozzle I.D., (In) 0.25
Cp Factor 0.83
Ambient Temperature, (°F) _____
Wet Bulb Temperature, (°F) _____
Dry Bulb Temperature, (°F) _____
Moisture Fraction, (B_{ws}) _____
Assumed Moisture _____
K Factor 4.18
Time: Start 11:47 PM Stop 3:50 PM

Volume Metered, (V_m) 94.9040
Average V_{ap} 9575
H₂O Collected, mls, (V₁) 4.9
Average Pressure Diff., (ΔH) 3.7445
Barometric Pressure (P_b) 24.05
Avg. Meter Temp., (T_m) 572.025
Avg. Stack Temp., (T_s) 577.0
Stack Pressure, (Ps) 24.05
Minutes Sampled 80
Area of Nozzle I.D., ft², (An) 0.003409
Area of Stack (A_s) 4.0501
Wt. of Particulate (g) Front, 0.098 ± 0.0016
Tot. Dissolved Solids, TDS, (g) Back = 0.0007

Impingers:	H ₂ O (mls)		Wt (g)	
	No. 1	No. 2	No. 3	No. 4
Final	82	105	3.4	573.5
Initial	100	100	0	559.0
Net	-18	+5	+3.4	+14.5
Filters:	Fiber		Thinble	
Final wt. (g)	.6679			
Initial wt. (g)	.6663			
Net wt. (g)	.0016			

Conditions: Production Rate Magnesium
Initial 121 TPH 2.6 "H₂O
Final 118 TPH 2.6 "H₂O

SCHEMATIC OF TRAVERSE POINT LAYOUT
READ AND RECORD ALL DATA EVERY 2 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V _m), ft ³	VELOCITY HEAD (ΔP _s), in. H ₂ O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H ₂ O	STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE INLET (T _{min}), °F	DRY GAS METER TEMPERATURE OUTLET (T _{out}), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	INLET TEMPERATURE, °F
1	X		596.958	.60	2.49	2.48	85	84	4.5	207	56
2	X			.61	2.52	2.53	91	84	4.5		
3	X			.96	3.95	3.95	98	85	6.0	225	46
4	2			.55	2.27	2.26	100	85	4.5		
5	4			.51	2.10	2.10	103	86	4.0	217	46
6	6			.66	2.73	2.72	106	86	5.0		
7	8			.71	2.91	2.92	110	87	5.0	217	46
8	10			.75	3.10	3.10	113	89	5.0		
9	12			.72	2.96	2.95	104	92	5.0	230	40
10	14			.96	3.96	3.96	111	92	5.0	237	
11	16			.78	4.02	4.02	115	93	6.0		
12	18			1.00	4.06	4.05	120	94	6.0	232	40
13	20			1.04	4.15	4.05	123	96	6.0		
14	22			1.08	4.24	4.25	126	96	6.5	220	45
15	24			1.06	4.20	4.20	128	98	6.5		
16	26			1.06	4.20	4.20	130	99	6.5	237	48
17	28										
18	30										
19	32										

[illegible]

Name T. KALIVAS Equiline Request
 Sample Date: 9-22-83

Comments
BF-31 Run #4
(Valid Run 2)

	FRONT	BACK
Time Sample		
Time Sample		
Complete		
% T.A. as Na ₂ CO ₃		
% Na ₂ SO ₄		
% NaCl		
% Volatile		
ppm Fe		
ppm SiO ₂		
ppm Ca		
ppm Mg		
% H ₂ O Insol		
ppm C.O.D.		
TOTAL SOLIDS (g)	.0093	.0007
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		

Plant Chemist: _____

Key to Storage Registers: HP-41C Program "Stack"

Data Entered

- 00 Molecular Weight of Stack Gas (Dry)
- 01 Volume Metered (ACF)
- 02 $\sqrt{\Delta P}$ Average ($\sqrt{\text{in H}_2\text{O}}$)
- 03 Volume Liquid Collected (mls)
- 04 ΔH Average (in H₂O)
- 05 Barometric Pressure (in Hg a)
- 06 Average Metering Temperature °R
- 07 Average Stack Temperature °R
- 08 Stack Pressure (in Hg a)
- 09 Total Sampling Time, Minutes
- 10 Area of Probe Nozzle (ft²)
- 20 Area of Stack (ft²)
- 23 Particulate Weight, Front (g)
- 24 Particulate Weight, Behind Filter (g)

BF-31

9-22-83

Run 2.

Data Generated By Program

- 11 Volume Water Vapor, (SCF)
- 12 Volume Dry Gas Metered, (SCF)
- 13 Total Volume Metered, (SCF)
- 14 % H₂O
- 15 % Dry
- 16 Molecular Weight of Stack Gas (Actual)
- 17 Velocity of Stack Gas (ft/min)
- 18 N/A
- 19 Grain Loading (grains/SCF)
- 21 Volume of Stack Gas, ACFM
- 22 Volume of Stack Gas, SCFM Dry
- 25 Emission Rate, Front (lb/hr)

OVERVIEW OF COMPLIANCE TEST REPORT

PRODUCT SILOS BAG FILTER - BOTTOM
BF-33

POINT SOURCE NO. 6*

RECEIVED
AIR QUALITY
LANDER

Exhibit 1 shows the location of the sampling ports in relation to the bag filter and fan. Dust collection ductwork is also shown.

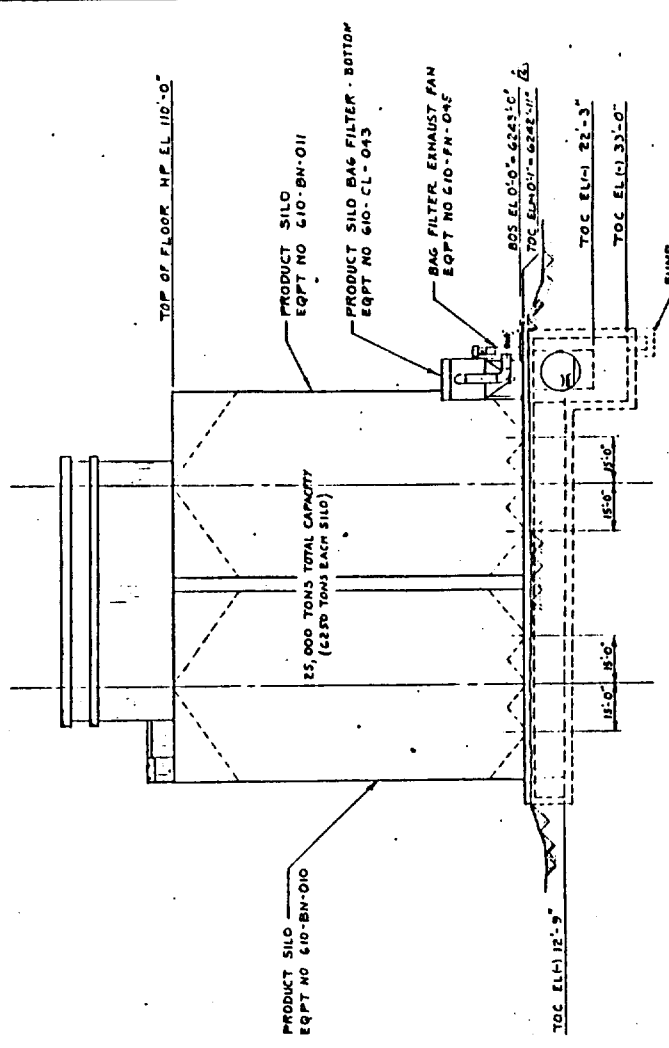
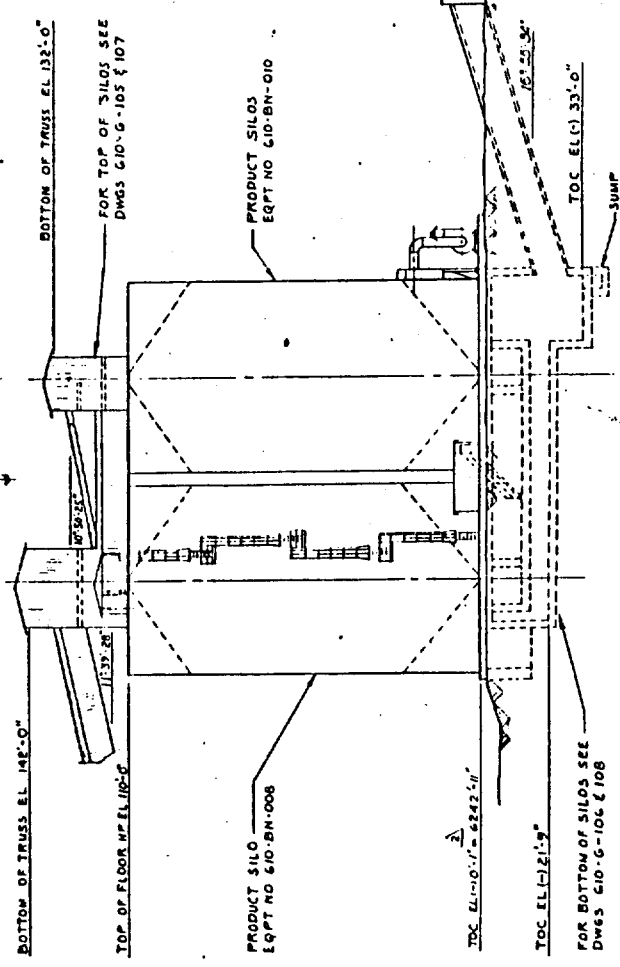
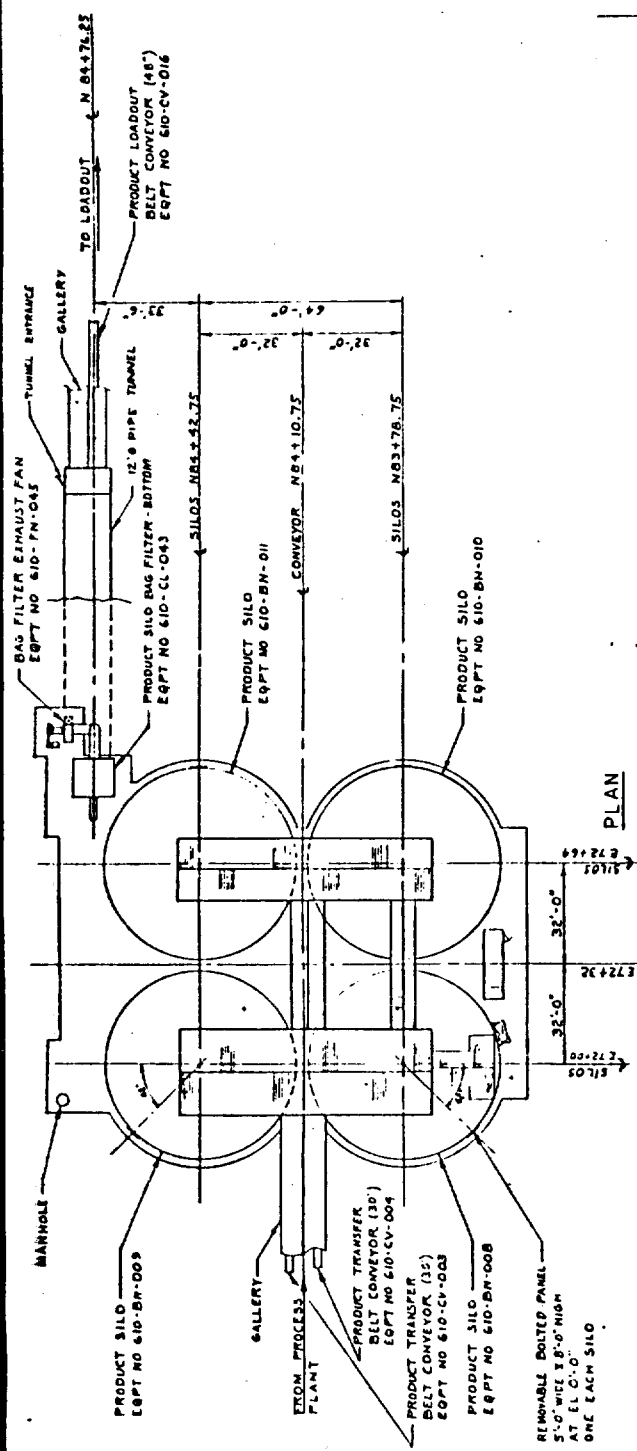
Exhibit 2 presents test results and data relevant to sampling point selection.

Exhibit 3 presents the raw data and data reduction for the three test runs. All calculations were performed on a programmed HP-41C calculator. Information in Exhibit 3 includes field data, laboratory analyses, a key to input and output of the HP-41C program, and operating conditions during each of the test runs.

*Reference: Wyoming DEQ/AQD Permit No. CT-234

EXHIBIT 1

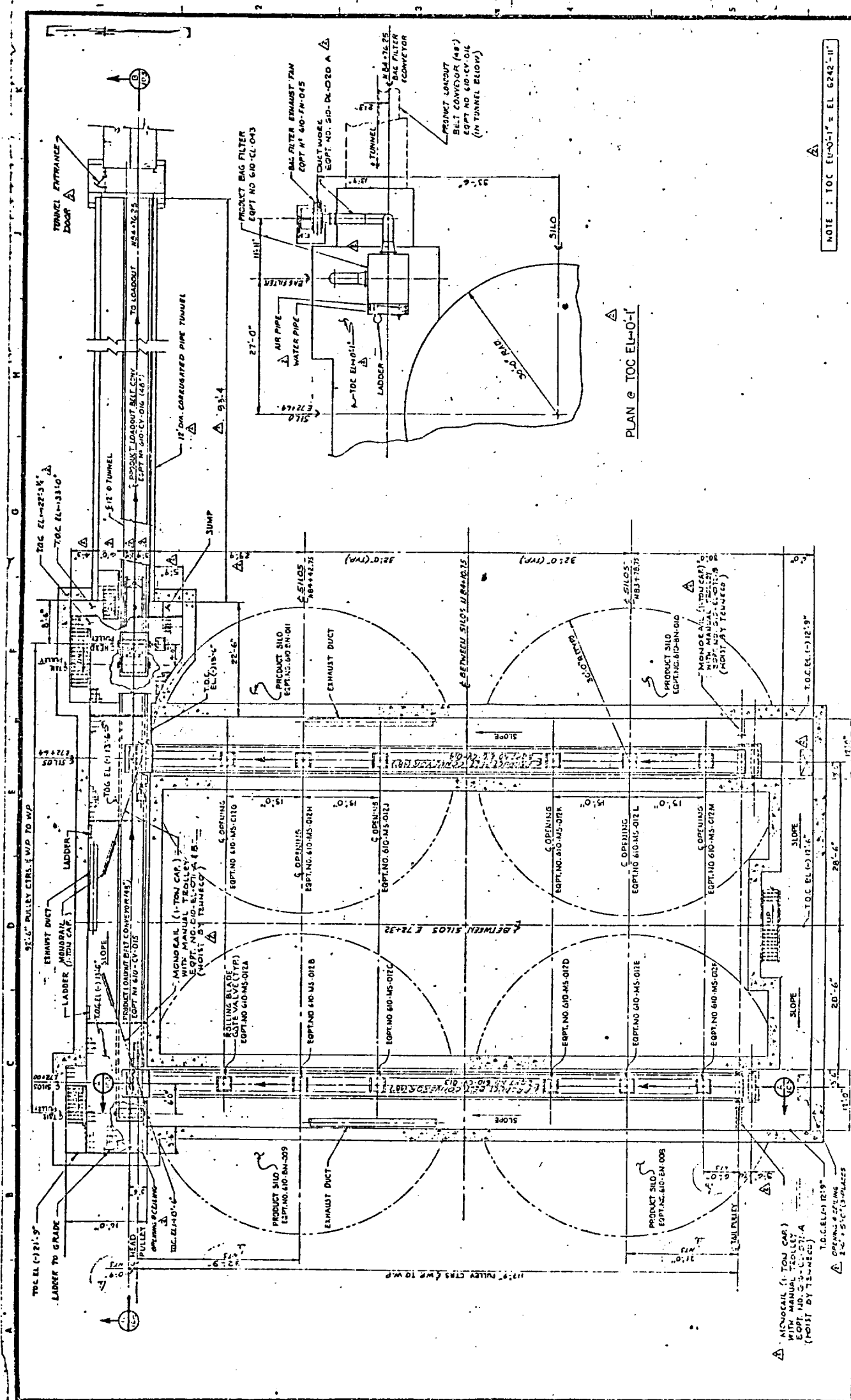
PRODUCT SILOS BAG FILTER - BOTTOM
EQUIPMENT CONFIGURATION



ELEVATION LOOKING NORTH

ELEVATION LOOKING WEST

Brown & Root Inc. Engineers - Constructors HOUSTON, TEXAS		Tenneco Oil Company SODA ASH PROJECT - WYOMING MILLING PRODUCT CONVEYORS, STORAGE & LOADOUT PRODUCT SILOS - GENERAL ARR'GT PLAN & ELEVATIONS		CR-049
PROJECT NO. 610-001 SHEET NO. 610-001 DATE 6-28-79 DRAWN BY J.P. 61 CHECKED BY J.P. 61 DATE 7-10-79		PROJECT NO. 610-001 SHEET NO. 610-001 DATE 6-28-79 DRAWN BY J.P. 61 CHECKED BY J.P. 61 DATE 7-10-79		610-G-104 1



NOTE : TOC EL-0'-1" = EL 6242'-11"

CR-0490

610-G-106



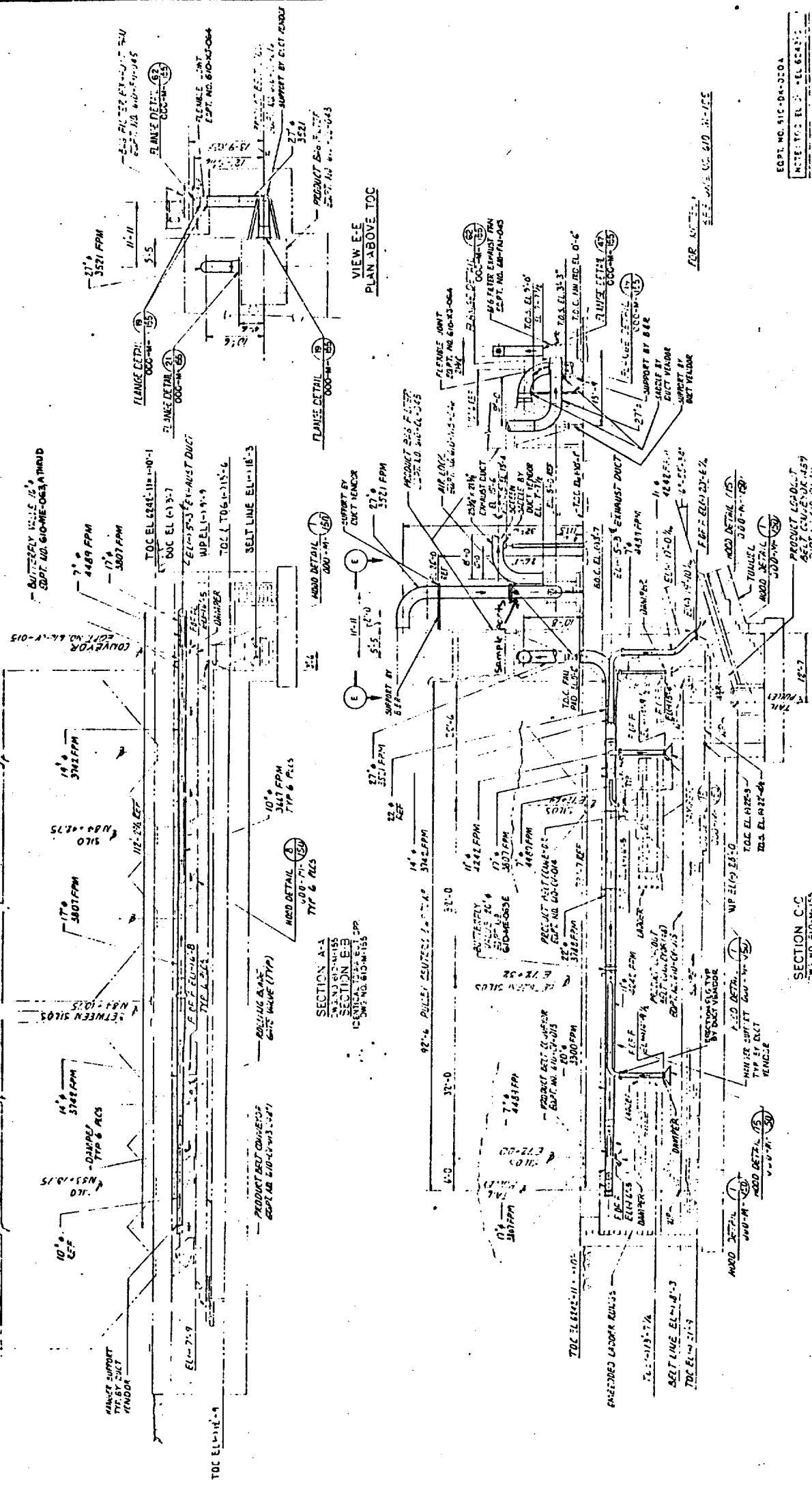
Tenneco Oil Company
 SODA ASH PROJECT • WYOMING
 ORDER OF PRODUCT CONVEYORS, STORAGE & LOADOUT
 PRODUCT SILOS
 PLAN @ BOTTOM OF SILOS

R S. MCODI DATE 01-23-72	APPROVED [Signature] 1/27/72
[Signature] 1/27/72	[Signature] 1/27/72

Brown & Root, Inc.

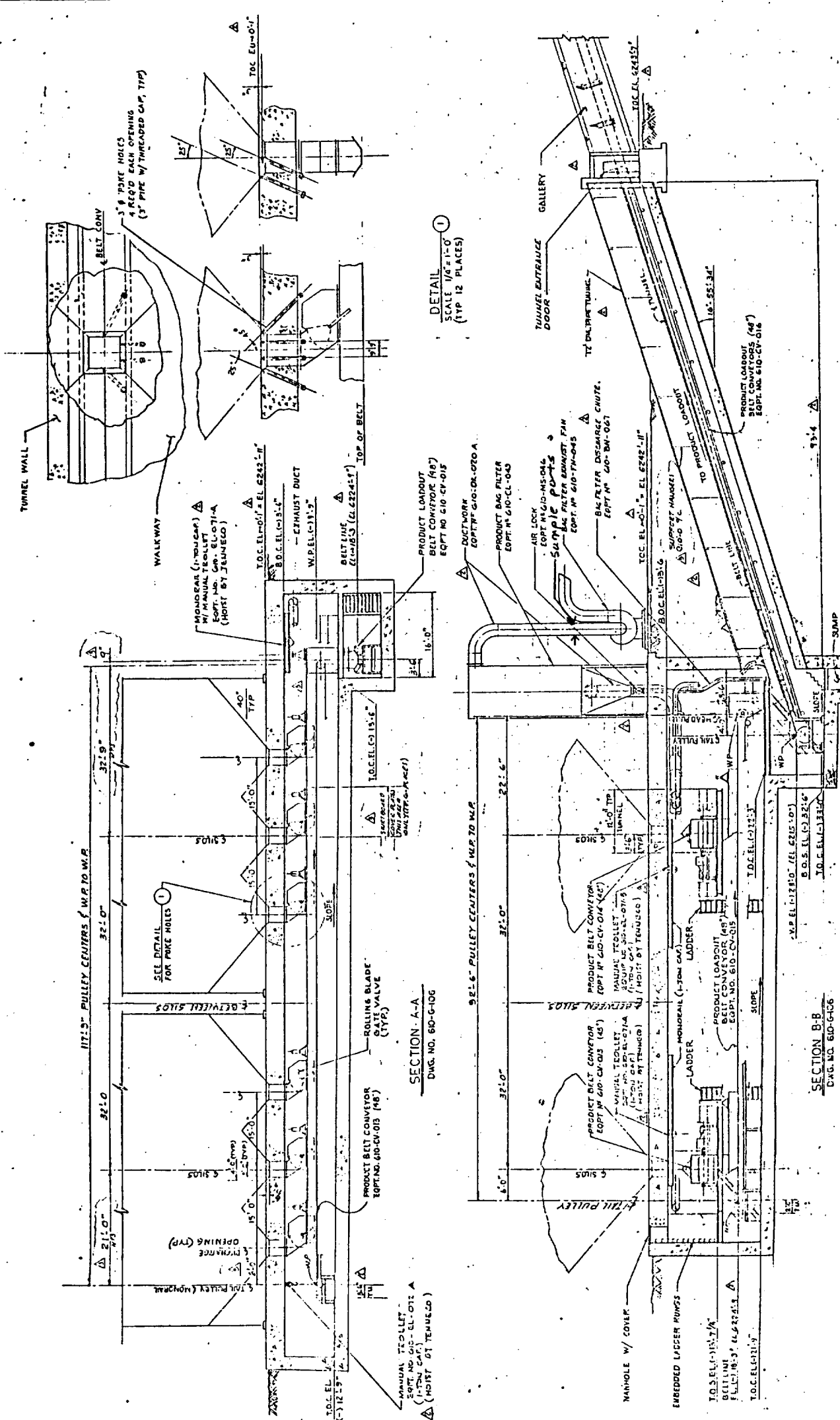
Engineers • Constructors
HOUSTON, TEXAS

[illegible]



EQPT. NO. 510-06-000A
 NOTE: TOC EL. 5' - 0" EL. 6' 0" 1/2"
 SEE PAGE 100-00-000A

Tenneco Oil Company SODA ASH PROJECT - WYOMING PRODUCT STORAGE SILO DUST COLLECTION DUTYWORK LOG		Brown & Root, Inc. Engineers & Constructors HOUSTON, TEXAS	
PROJECT NO. 100-00-000A DRAWING NO. 100-00-000A SHEET NO. 1 OF 1	DATE: 10-1-57 DESIGNED BY: [Signature] CHECKED BY: [Signature]	PROJECT NO. 100-00-000A DRAWING NO. 100-00-000A SHEET NO. 1 OF 1	DATE: 10-1-57 DESIGNED BY: [Signature] CHECKED BY: [Signature]



Tenneco Oil Company SODA ASH PROJECT - WYOMING PRODUCT CONVEYORS, STORAGE & LOADOUT PRODUCT SILOS SECTIONS @ BOTTOM OF SILOS		CR-0490
610-G-106		
Brown & Root Inc. Engineers & Constructors HOUSTON, TEXAS		
R.S. MODI DATE: 01-11-72 R.P.P. 18 DATE: 02-25-72	J. L. Lutz 01/11/72 J. L. Lutz 02/25/72	APPROVED DATE: 01-11-72 DATE: 02-25-72
REVISIONS NO. DATE DESCRIPTION 1 01-11-72 AS SHOWN 2 02-25-72 CORRECTIONS TO FOUNDATION 3 03-01-72 CORRECTIONS TO FOUNDATION 4 03-01-72 CORRECTIONS TO FOUNDATION 5 03-01-72 CORRECTIONS TO FOUNDATION 6 03-01-72 CORRECTIONS TO FOUNDATION 7 03-01-72 CORRECTIONS TO FOUNDATION 8 03-01-72 CORRECTIONS TO FOUNDATION 9 03-01-72 CORRECTIONS TO FOUNDATION 10 03-01-72 CORRECTIONS TO FOUNDATION		

EXHIBIT 2

Product Silos Bag Filter - Bottom
Point Source No. 6
Tenneco Equipment No. BF-33
Brown & Root Equipment No. 610-CL-043

Test Results:

Run No. 1	Isokinetic	90.23%
	Emission Rate (front of filter)	0.57 lb/hr
	Emission Rate (total)	1.14 lb/hr
	Grain Loading	.0107 gr/SCF
Run No. 2	Isokinetic	97.37%
	Emission Rate (front of filter)	0.26 lb/hr
	Emission Rate (total)	0.26 lb/hr
	Grain Loading	.0059 gr/SCF
Run No. 3	Isokinetic	92.55%
	Emission Rate (front of filter)	0.04 lb/hr
	Emission Rate (total)	0.07 lb/hr
	Grain Loading	.0008 gr/SCF

Stack Height:

15'6"

Duct Diameter:

27"

Pollution Control Equipment Vented:

Peabody Bag Filter

Traverse Points:

The sampling ports are located 1.8 stack diameters upstream and 7 stack diameters downstream of any flow disturbance. According to EPA Method 1, 20 sampling points are required. As a result of an inadvertent error in calculating the minimum number of traverse points, only 12 sampling points were used. Six points were sampled at each of the two ports. The sampling points were as follows:

Distance from stack wall:

Point 1	1.2"
Point 2	3.9"
Point 3	8.0"
Point 4	19.0"
Point 5	23.1"
Point 6	25.8"

EXHIBIT 3

TEST RUN NO. 1

Date 10-7-82
Sampling Location BF-33
Sampling Type Method 5
Run Number 1
Operator T. D'Epagnier, T. Kalivas
Probe Length & Type 3"
Filter Number 09
Nozzle I.D., (Dn) 1/4"
Cp Factor .83
Ambient Temperature, (°F)
Wet Bulb Temperature, (°F)
Dry Bulb Temperature, (°F)
Moisture Fraction, (B_{ws}) 0%
Assumed Moisture
K Factor 3.22
Time: Start Stop

Volume Metered, (V) 36.336
Average $\sqrt{AP}$.5320
H₂O Collected, mls, (V₁) 5.0
Average Pressure Diff., (ΔH) .9908
Barometric Pressure (P_{Bar}) 23.80
Avg. Meter Temp., (T_m°R) 530.875
Avg. Stack Temp., (T_s°R) 530°
Stack Pressure, (Ps) 23.80
Minutes Sampled 60
Area of Nozzle I.D., ft², (An) .0003409
Area of Stack (A) ft² 3.976
Wt. of Particulate (g) Hydant = .0200
Tot. Dissolved Solids, TDS, (g) Rock = .0200

Impingers:	H₂O (mls) Impinger Wt (g)			
	No. 1	No. 2	No. 3	No. 4
Final	427.2	446.9	323.8	586.2
Initial	430.5	446.1	322.7	579.8
Net <u>5.0</u>	-3.3	+0.8	+1.1	+6.4
Filters:	Fiber		Thimble	
	Final wt. (g)		N/A	
	Initial wt. (g)			
	Net wt. (g)			

Conditions:

407.7 tons Na₂CO₃/hr.
reclaimed from bottom of silos

Schematic of Traverse Point Layout
Read and Record All Data Every 5 Minutes

Traverse Point Number	Sampling Time, min. (Clock)	Clock Time (24-hr)	Gas Meter Reading (V _m), ft ³	Velocity Head (ΔP _s), in. H ₂ O	Orifice Pressure Differential (ΔH), in. H ₂ O		Stack Temperature (T _s), °F	Dry Gas Meter Temperature (T _{inlet}), °F (T _{min}), °F (T _{outlet}), °F		Pump Vacuum, in. Hg	Sample Box Temperature, °F	Impinger Temperature, °F
					Desired	Actual						
1	5		601.900	.55	1.75	1.75	70	50	48	5		62
2	10			.62	2.0	2.0		62	48	5.5		
3	15			.22	.70	.70		68	50	3.5		
4	20			.18	.58	.58		73	54	3.0		
5	25			.17	.54	.54		78	57	3.0		
6	30			.15	.48	.48		81	60	3.0		
1	35			.69	2.15	2.15		80	68	5.5		
2	40			.47	1.5	1.5		87	69	5.0		
3	45			.14	.45	.45		90	71	3.0		
4	50			.19	.61	.61		92	72	3.0		
5	55			.16	.52	.52	70	94	77	3.2		
6	60			.19	.61	.61		95	77	3.0		
			638.236									
			36.336 ft ³									

ANALYSIS REQUEST

Date Submitted: 10/8/82

Date Required: _____

Dept. Tech Project

Name D'Geyne Extension 370

Place a check (✓) below the analysis

required.

Other

Sample #	Sample Description	Save Sample	A	B	C	D	E	F	G	H	I	J	Comments*
			T.A. as Na ₂ CO ₃ %	Na ₂ CO ₃ %	NaHCO ₃ %	Trona %	L.O.I. %	H ₂ O Insol. %	NaCl PPM	TOTAL SOLIDS mg/g			
1	FRONT									29			
2	BACK									20			
3	Dist. H ₂ O									0			
4													
5													
6													
7													

Note:

Evaporate the entire 1000ml sample for each Total Solids Test. Also, evaporate 1000mls dist. water for a blank.

used 2 pure distilled water

*Comments may relate to sample origin, preparation, results expected, etc.

Key to Storage Registers: HP-41C Program "Stack"

Data Entered

- 00 Molecular Weight of Stack Gas (Dry)
- 01 Volume Metered (ACF)
- 02 $\sqrt{\Delta P}$ Average ($\sqrt{\text{in H}_2\text{O}}$)
- 03 Volume Liquid Collected (mls)
- 04 ΔH Average (in H₂O)
- 05 Barometric Pressure (in Hg a)
- 06 Average Metering Temperature °R
- 07 Average Stack Temperature °R
- 08 Stack Pressure (in Hg a)
- 09 Total Sampling Time, Minutes
- 10 Area of Probe Nozzle (ft²)
- 20 Area of Stack (ft²)
- 23 Particulate Weight, Front (g)
- 24 Particulate Weight, Behind Filter (g)

BF-33

Run #1

10-7-82

NEW "STACK"

ISO KINETIC =
96.2295 ***

EMISSION RATE
FRONT OF FILTER
0.5691 ***

EMISSION RATE
BEHIND FILTER
0.5691 ***

TOTAL RATE =
1.1382 ***

Data Generated By Program

- 11 Volume Water Vapor, (SCF)
- 12 Volume Dry Gas Metered, (SCF)
- 13 Total Volume Metered, (SCF)
- 14 % H₂O
- 15 % Dry
- 16 Molecular Weight of Stack Gas (Actual)
- 17 Velocity of Stack Gas (ft/min)
- 18 N/A
- 19 Grain Loading (grains/SCF)
- 21 Volume of Stack Gas, ACFM
- 22 Volume of Stack Gas, SCFM Dry
- 25 Emission Rate, Front (lb/hr)

R00= 29.0000
R01= 36.3360
R02= 0.5320
R03= 5.0000
R04= 0.9500
R05= 23.8000
R06= 530.8750
R07= 530.0000
R08= 23.8000
R09= 60.0000
R10= 0.0003
R11= 0.2354
R12= 20.8351
R13= 29.0705
R14= 0.0096
R15= 99.1904
R16= 20.9109
R17= 1.987.8000
R18= 0.0000
R19= 0.0107
R20= 3.9761
R21= 7.903.6031
R22= 6.212.5093
R23= 0.0200
R24= 0.0200
R25= 0.5691

EXHIBIT 3

TEST RUN NO. 2

197

For Lab Use Only

ANALYSIS REQUEST

Date Submitted: 10-11-82

Date Required: _____

Dept. Tech Project

Name Kalinas Extension

Place a check (✓) below the analysis

Sample #	Sample Description	required.							Other		
		A	B	C	D	E	F	G	H	I	J
		T.A. as Na_2CO_3 %	Na_2CO_3 %	NaHCO_3 %	Trona %	L.O.I. %	H_2O Insol. %	NaCl PPM	Total Solids %		
		Save Sample									
1	FRONT										
2	BACK										
3	DIST H_2O										
4											
5											
6											
7											

Evaporate the entire 1000 ml sample for total solids test. Also, evaporate 1000ml distilled H₂O for a blank

unweighed 2 =
dried 1.0 g
dried 0.9 g

Key to Storage Registers: HP-41C Program "Stack"

Data Entered

00 Molecular Weight of Stack Gas (Dry)
 01 Volume Metered (ACF)
 02 $\sqrt{\Delta P}$ Average ($\sqrt{\text{in H}_2\text{O}}$)
 03 Volume Liquid Collected (mls)
 04 ΔH Average (in H_2O)
 05 Barometric Pressure (in Hg a)
 06 Average Metering Temperature °R
 07 Average Stack Temperature °R
 08 Stack Pressure (in Hg a)
 09 Total Sampling Time, Minutes
 10 Area of Probe Nozzle (ft^2)
 20 Area of Stack (ft^2)
 23 Particulate Weight, Front (g)
 24 Particulate Weight, Behind Filter (g)

BF-33 Run #2

10-8-82

ISO KINETIC =
 97.3694 ***
 EMISSION RATE
 FRONT OF FILTER
 0.2637 ***
 EMISSION RATE
 BEHIND FILTER
 0.0000 ***
 TOTAL RATE =
 0.2637 ***

Data Generated By Program

11 Volume Water Vapor, (SCF)
 12 Volume Dry Gas Metered, (SCF)
 13 Total Volume Metered, (SCF)
 14 % H_2O
 15 % Dry
 16 Molecular Weight of Stack Gas (Actual)
 17 Velocity of Stack Gas (ft/min)
 18 N/A
 19 Grain Loading (grains/SCF)
 21 Volume of Stack Gas, ACFM
 22 Volume of Stack Gas, SCFM Dry
 25 Emission Rate, Front (lb/hr)

R00= 29.0000
 R01= 31.9450
 R02= 0.4623
 R03= 18.7000
 R04= 0.7042
 R05= 24.1600
 R06= 517.8333
 R07= 544.0000
 R08= 24.1600
 R09= 60.0000
 R10= 0.0003
 R11= 0.0002
 R12= 26.3500
 R13= 27.2302
 R14= 3.2315
 R15= 96.7685
 R16= 20.6445
 R17= 1.7451815
 R18= 0.0000
 R19= 0.0059
 R20= 3.9761
 R21= 6.938.9779
 R22= 5.262.5927
 R23= 0.0100
 R24= 0.0000
 R25= 0.2637

EXHIBIT 3

TEST RUN NO. 3

Date 10-12-82
Sampling Location BF-33
Sampling Type Method 5
Run Number 3
Operator T. Kalivas, T.D. Leppanier
Probe Length & Type 3'
Filter Number 11
Nozzle I.D., (Dn) 1/4"
Cp Factor .83
Ambient Temperature, (°F) 58°F
Wet Bulb Temperature, (°F) _____
Dry Bulb Temperature, (°F) _____
Moisture Fraction, (B_{ws}) _____
Assumed Moisture _____
K Factor 3.35
Time: Start 1:20PM Stop _____

Volume Metered, (V)_m 36.603
Average $\sqrt{\Delta P}$.5260
H₂O Collected, mls, (V₁) 3.3
Average Pressure Diff., (ΔH) .9596
Barometric Pressure (P_{Bar}) 24.21
Avg. Meter Temp., (T_m°R) 530.458
Avg. Stack Temp., (T_s°R) 530
Stack Pressure, (Ps) 24.21
Minutes Sampled 60
Area of Nozzle I.D., ft², (An) .0003409
Area of Stack (A) ft² 3.9761
Wt. of Particulate (g) .0015
Tot. Dissolved Solids, TDS, (g) .0011

Impingers:	H ₂ O (mls) - Imp. - Wt (g)			
	No. 1	No. 2	No. 3	No. 4
Final	429.4	440.5	339.3	503.0
Initial	436.7	440.8	338.7	492.7
Net + 3.3	-7.3	-0.3	+0.6	+10.3
Filters:	Fiber			
Final wt. (g)	.6530			
Initial wt. (g)	.6540			
Net wt. (g)	-0-			
Thimble	N/A			

Conditions:

407.7 tons Na₂CO₃/hr
reclaimed from bottom of silos

SCHEMATIC OF TRAVERSE POINT LAYOUT
READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME SAMPLING TIME, min	GAS METER READING (V _m), ft ³	VELOCITY HEAD (ΔP _s), in. H ₂ O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE INLET (T _{min}), °F	OUTLET (T _{out}), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
				DESIRED	ACTUAL						
E 1	5	672.155	.37	1.23	1.25	70°	63	61	4.0		64
2	10		.27	.90	.91		67	61	4.0		
3	15		.29	.97	.98		75	61	4.0		
4	20		.25	.83	.84		80	62	3.5		
5	25		.23	.77	.77		83	64	3.5		
6	30		.20	.67	.68		86	66	3.0		
S 1	35	690.278									
2	40	690.403	.65	2.17	2.19		71	64	5.0		
3	45		.23	.77	.78		74	64	3.5		58
4	50		.29	.97	.98		77	63	3.5		
5	55		.24	.80	.81		81	64	3.5		
6	60	708.883	.22	.73	.74	70°	85	65	3.5		
			.19	.64	.65		87	67	3.0		

ANALYSIS REQUEST

Date Submitted: 10-12-82
Date Required: _____

Dept. Tech Project _____
Name Kalivas Extension _____

Place a check (✓) below the analysis

Sample	Sample Description	required.							Other		
		A	B	C	D	E	F	G	H	I	J
		T.A. as Na_2CO_3 %	Na_2CO_3 %	NaHCO_3 %	Trona %	L.O.I. %	H_2O in sol. %	NaCl PPM	Total Solids mg		
		Save Sample									
1	FRONT								2.1		
2	BACK								1.7		
3	BLANK								0.6		
4											
5											
6											
7											

*Comments may relate to sample origin, preparation, results expected, etc.

Key to Storage Registers: HP-41C Program "Stack"

Data Entered

00 Molecular Weight of Stack Gas (Dry)
 01 Volume Metered (ACF)
 02 $\sqrt{\Delta P}$ Average ($\sqrt{\text{in H}_2\text{O}}$)
 03 Volume Liquid Collected (mls)
 04 ΔH Average (in H_2O)
 05 Barometric Pressure (in Hg a)
 06 Average Metering Temperature $^{\circ}\text{R}$
 07 Average Stack Temperature $^{\circ}\text{R}$
 08 Stack Pressure (in Hg a)
 09 Total Sampling Time, Minutes
 10 Area of Probe Nozzle (ft^2)
 20 Area of Stack (ft^2)
 23 Particulate Weight, Front (g)
 24 Particulate Weight, Behind Filter (g)

BF-33

Run#3

10-12-82

NEP "STACK"

ISO KINETIC =
 92.5344 ***
 EMISSION RATE
 FRONT OF FILTER
 0.0416 ***
 EMISSION RATE
 BEHIND FILTER
 0.0305 ***
 TOTAL RATE =
 0.0721 ***

Data Generated By Program

11 Volume Water Vapor, (SCF)
 12 Volume Dry Gas Metered, (SCF)
 13 Total Volume Metered, (SCF)
 14 % H_2O
 15 % Dry
 16 Molecular Weight of Stack Gas (Actual)
 17 Velocity of Stack Gas (ft/min)
 18 N/A
 19 Grain Loading (grains/SCF)
 21 Volume of Stack Gas, ACFM
 22 Volume of Stack Gas, SCFM Dry
 25 Emission Rate, Front (lb/hr)

R00= 29.0000
 R01= 36.6030
 R02= 0.5260
 R03= 3.3000
 R04= 0.9596
 R05= 24.2100
 R06= 530.4583
 R07= 530.0000
 R08= 24.2100
 R09= 60.0000
 R10= 0.0003
 R11= 0.1553
 R12= 29.5663
 R13= 29.7216
 R14= 0.5226
 R15= 99.4774
 R16= 28.9425
 R17= 1.947.7247
 R18= 0.0000
 R19= 0.0000
 R20= 3.9761
 R21= 7.744.3057
 R22= 6.210.0927
 R23= 0.0015
 R24= 0.0011
 R25= 0.0416