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A COMPARATIVE STUDY OF EFFLUENTS AND THEIR CONTROL
FROM FOUR DRY ASH LURGI GASIFICATION PLANTS

Supplementary Data

By
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MASTER

July 1978

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Engineering Experiment Station
University of North Dakota
Grand Forks, North Dakota

U. S. DEPARTMENT OF ENERGY

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Grand Forks, North Dakota

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NOTICE

This report consists of three major sections:

- * Executive Summary, A Comparative Study of Effluents and Their Control From Four Dry Ash Lurgi Gasification Plants, Bulletin No. 78-07-EES-01 A
- * A Comparative Study of Effluents and Their Control From Four Dry Ash Lurgi Gasification Plants, Bulletin No. 78-07-EES-01 B
- * Supplementary Data, A Comparative Study of Effluents and Their Control From Four Dry Ash Lurgi Gasification Plants, Bulletin No. 78-07-EES-01 C

The quantity of data collected in the course of this study required that it be handled through the use of a computer program. The data were analyzed utilizing tables formed by this program. On the basis of this analysis, data were selected and reported in the main volume, Bulletin No. 78-07-EES-01 B. The supplementary data volume contains the data that were collected and the computer program used to analyze those data.

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APPENDIX A

EFFLUENT DATA TABLES

- I El Paso
- II Natural
- III WESCO
- IV ANG

APPENDIX A - INTRODUCTION

Contained in this appendix are the raw effluent data tables that were used to formulate the input data used in the computerized information system. The tables are arranged hierarchically according to plant number, division number and effluent number at the lowest level.

SECTION I

EL PASO

DEFINITION OF SYMBOLS USED IN COMPUTER GENERATED TABLES

<u>DIVISION # AND MEANING</u>		<u>BIOLOGICAL HAZARDS</u>	<u>DISPOSITION CODES</u>
1	Coal Storage Area	NK - None Known	1 - to mine
2	Coal Preparation Area	MN - Minor	2 - to atmosphere
3	Raw Water Treatment	PH - Possible Hazard	3 - to surface water
4	Boiler Plant	HZ - Hazard	4 - to deep well disposal
5	Oxygen Plant	TX - Toxic	5 - to Claus unit
6	Gasifiers		6 - to incineration
7	Ash Dewatering and Transfer Facility		7 - to stack gas treatment unit
8	ADIP Plant		8 - to ash handling
9	Claus Sulfur Plant		9 - to boiler
10	Stretford Sulfur Plant		0 - to superheater
11	Claus Incinerator	<u>QUANTITY CODES</u>	
12	Vent Gas Incinerator	SM - Small	
13	Catalytic Incinerator	MIN - Minor	
14	Untreated Stack Gas Vent	NIL - Nil	<u>NATURE CODES</u>
15	Stack Gas Treatment	N - None Emitted	S - Solid
16	Waste Water Concentrator	NR - None Reported	L - Liquid
17	Biological Waste Water Treatment		G - Gas
18	Evaporation and Ash Ponds		SL - Sludge
19	Cooling Towers		
20	Total Emissions		
<u>PLANT IDENTIFICATION</u>		<u>RELIABILITY LEVELS</u>	
Plant #1 - El Paso, New Mexico		A Good Reliability	-A- Refer to Reliability = A
Plant #2 - Natural, North Dakota		B Fair Reliability	-B- Refer to Reliability = B
Plant #3 - WESCO, New Mexico		C Poor Reliability	-C- Refer to Reliability = C
Plant #4 - ANG, North Dakota			

EFFLUENT DATA TABLES

PLANT	El Paso	El Paso
DIVISION	2	2
EFFLUENT	23 (Refuse)	11 (Coal dust)
QUANTITY EMITTED (TPD)	1680 B	Small A
QUANTITY FOOTNOTE	----	----
NATURE	Solid	Solid
BIOLOGICAL HAZARD	Possible Hazard C	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	2	1
STATE	New Mexico	New Mexico
REGULATED CODE	1	2
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To mine ash handling	To atmosphere
PROCESS	Coal Cleaning	Bag filters & water sprays
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	1680 A	Small A
TOTAL QTY. ENTERING (TPD)	1680 A	Small A
INSTALLED COST (\$)	4.3×10^6 A	116,100 B
ELECTRICAL REQ. (KW)	1647 A	35 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	173,000 B	108,030 C
MATERIALS COST (\$/YR)	51,600 B	171,000 C
MAINTENANCE COST (\$/YR)	344,000 B	9,500 C
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	--	--
SOURCE OF COST DATA	Design data	EPA data

EFFLUENT DATA TABLES

PLANT	El Paso	El Paso
DIVISION	20	20
EFFLUENT	11 (Coal Dust)	21 (Particulates)
QUANTITY EMITTED (TPD)	0.1412 C	0.553 C
QUANTITY FOOTNOTE	-----	-----
NATURE	Solid	Solid
BIOLOGICAL HAZARD	Possible Hazard A	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	2	2
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	13.979 C	2.833 C
TOTAL QTY. ENTERING (TPD)	14.12 C	2.862 C
INSTALLED COST (\$)	231,100 B	145,000 B
ELECTRICAL REQ. (KW)	532 B	82 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	237,630 C	43,200 B
MATERIALS COST (\$/YR)	333,000 C	220 C
MAINTENANCE COST (\$/YR)	15,050 C	528 C
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	El Paso	El Paso
DIVISION	20	20
EFFLUENT	39 (CO)	40 (COS)
QUANTITY EMITTED (TPD)	8.009 C	0.0825 C
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Toxic A	Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	2	2
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	52.56 A	1.9814 C
TOTAL QTY. ENTERING (TPD)	53 A	2.064 C
INSTALLED COST (\$)	317,700 B	10,900 B
ELECTRICAL REQ. (KW)	17 B	0.6 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	15,200 C	200 B
MATERIALS COST (\$/YR)	12,490 B	550 B
MAINTENANCE COST (\$/YR)	17,680 B	740 B
LABORATORY CHARGES (\$/YR)	380 B	20 B
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	El Paso	El Paso
DIVISION	20	20
EFFLUENT	41 (CO ₂)	42 (CS ₂)
QUANTITY EMITTED (TPD)	27805 B	0.00288 C
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None Known A	Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	0	2
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Not controlled	Controlled
QUANTITY CONTROLLED (TPD)		0.0691 C
TOTAL QTY. ENTERING (TPD)		0.0720 C
INSTALLED COST (\$)		320 B
ELECTRICAL REQ. (KW)		0.02 B
STEAM REQ. (MM BTU/d)		0
COOLING WATER REQ. (MM BTU/d)		0
FUEL I REQ. (MM BTU/d)		0
FUEL II REQ. (MM BTU/d)		0
FUEL III REQ. (MM BTU/d)		0
LABOR COST (\$/YR)		6 B
MATERIALS COST (\$/YR)		20 B
MAINTENANCE COST (\$/YR)		20 B
LABORATORY CHARGES (\$/YR)		1 B
OTHER MISC. COSTS (\$/YR)		0
MISC. COSTS FOOTNOTE		-----
SOURCE OF COST DATA		-----

EFFLUENT DATA TABLES

PLANT	El Paso	El Paso
DIVISION	20	20
EFFLUENT	43 (Fatty Acids)	44 (HCN)
QUANTITY EMITTED (TPD)	1.0707 C	0.6863 C
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Hazard B	Toxic A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	1	2
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere.
PROCESS	-----	-----
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	El Paso	El Paso
DIVISION	20	20
EFFLUENT	45 (Hydrocarbons)	46 (H ₂)
QUANTITY EMITTED (TPD)	6.777 C	1.104 C
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Minor B	Minor B
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	2	0
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	110.4 B	6.816 B
TOTAL QTY. ENTERING (TPD)	114.8 A	6.975 A
INSTALLED COST (\$)	1,545,000 B	725,000 B
ELECTRICAL REQ. (KW)	82.2 B	38 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	42,500 B	25,600 C
MATERIALS COST (\$/YR)	77,065 B	31,850 B
MAINTENANCE COST (\$/YR)	103,390 B	43,960 B
LABORATORY CHARGES (\$/YR)	2380 B	1000 B
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	El Paso	El Paso
DIVISION	20	20
EFFLUENT	47 (H ₂ O)	48 (H ₂ S)
QUANTITY EMITTED (TPD)	31644 A	0.159 C
QUANTITY FOOTNOTE	-	-
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None Known A	Toxic A
BIOLOGICAL HAZARD FOOTNOTE	-	-
STATE	New Mexico	New Mexico
REGULATED CODE	0	2
SOURCE OF EFF. INFO.	-	-
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-	-
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	23,255 A	0.4582 B
TOTAL QTY. ENTERING (TPD)	972,778 A	0.424 A
INSTALLED COST (\$)	9,240,000 A	1990 B
ELECTRICAL REQ. (KW)	8965 A	0.102 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	97,900 B	117 C
MATERIALS COST (\$/YR)	984,000 B	72 B
MAINTENANCE COST (\$/YR)	532,800 B	100 B
LABORATORY CHARGES (\$/YR)	15,000 B	2 B
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-	-
SOURCE OF COST DATA	-	-

EFFLUENT DATA TABLES

PLANT	El Paso	El Paso
DIVISION	20	20
EFFLUENT	49 (Naphtha)	50 (NH ₃)
QUANTITY EMITTED (TPD)	0.224 C	4.562 C
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Minor B	Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	2	2
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	El Paso	El Paso
DIVISION	20	20
EFFLUENT	51 (NO _x)	52 (N ₂)
QUANTITY EMITTED (TPD)	6.836 C	82,544 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Possible Hazard A	None Known A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	2	0
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	El Paso	El Paso
DIVISION	20	20
EFFLUENT	53 (O ₂)	54 (Phenolics)
QUANTITY EMITTED (TPD)	12539 A	0.11647 C
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None Known A	Hazard B
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	0	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Not controlled	Not Controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	El Paso	El Paso
DIVISION	20	20
EFFLUENT	55 (Pyridines)	56 (SO ₂)
QUANTITY EMITTED (TPD)	0.00665 C	7.105 B
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Hazard A	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	1	2
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	El Paso	
DIVISION	20	
EFFLUENT	57 (Thiocyanates)	
QUANTITY EMITTED (TPD)	0.08933 C	
QUANTITY FOOTNOTE	-----	
NATURE	Gas	
BIOLOGICAL HAZARD	Hazard A	
BIOLOGICAL HAZARD FOOTNOTE	-----	
STATE	New Mexico	
REGULATED CODE	1	
SOURCE OF EFF. INFO.	-----	
DISPOSITION	To atmosphere	
PROCESS	-----	
CONTROLLED CODE	Not controlled	
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	El Paso	El Paso
DIVISION	20	20
EFFLUENT	23 (Refuse)	30 (Unreacted Carbon)
QUANTITY EMITTED (TPD)	1680 A	286 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Solid	Solid
BIOLOGICAL HAZARD	Possible Hazard A	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To mine	To mine
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	1680 A	286 A
TOTAL QTY. ENTERING (TPD)	1680 A	286 A
INSTALLED COST (\$)	308,000 A	378,000 A
ELECTRICAL REQ. (KW)	38 A	68 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	2.4 B	0.486 B
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	28,800 B	14,400 B
MATERIALS COST (\$/YR)	3700 B	4500 B
MAINTENANCE COST (\$/YR)	24,700 B	30,000 B
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	El Paso	El Paso
DIVISION	20	20
EFFLUENT	14 (Gasifier Ash)	34 (H ₂ O)
QUANTITY EMITTED (TPD)	5438.7 A	1147 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Solid	Liquid
BIOLOGICAL HAZARD	Possible Hazard A	Minor A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To mine	To mine
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Not controlled
QUANTITY CONTROLLED (TPD)	5438.7 A	
TOTAL QTY. ENTERING (TPD)	5438.7 A	
INSTALLED COST (\$)	7,182,000 A	
ELECTRICAL REQ. (KW)	1286 B	
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	9.234 B	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	273,600 B	
MATERIALS COST (\$/YR)	85,500 B	
MAINTENANCE COST (\$/YR)	575,000 B	
LABORATORY CHARGES (\$/YR)	0	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	-----	
SOURCE OF COST DATA	-----	

SECTION II

NATURAL

EFFLUENT DATA TABLES

PLANT	Natural	Natural
DIVISION	20	20
EFFLUENT	11 (Coal Dust)	21 (Particulates)
QUANTITY EMITTED (TPD)	0.0473 C	2.177 B
QUANTITY FOOTNOTE	-----	-----
NATURE	Solid	Solid
BIOLOGICAL HAZARD	Possible Hazard A	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	North Dakota	North Dakota
REGULATED CODE	2	2
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	14.031 C	4.626 B
TOTAL QTY. ENTERING (TPD)	14.173 C	4.680 B
INSTALLED COST (\$)	334,000 B	98000 B
ELECTRICAL REQ. (KW)	494 B	32 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	206,000 C	22,000 C
MATERIALS COST (\$/YR)	375,900 C	80 C
MAINTENANCE COST (\$/YR)	14,250 C	250 B
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Natural	Natural
DIVISION	20	20
EFFLUENT	28 (Sulphur)	39 (CO)
QUANTITY EMITTED (TPD)	0 A	0 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Possible Hazard A	Toxic A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	North Dakota	North Dakota
REGULATED CODE	0	2
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	0.238 B	14.8101 A
TOTAL QTY. ENTERING (TPD)	0.238 B	14.8101 A
INSTALLED COST (\$)	46,000 B	82,240 A
ELECTRICAL REQ. (KW)	1 B	5.04 A
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	3900 C	2390 B
MATERIALS COST (\$/YR)	100 C	655 B
MAINTENANCE COST (\$/YR)	700 B	4535 A
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Natural	Natural
DIVISION	20	20
EFFLUENT	40 (COS)	41 (CO ₂)
QUANTITY EMITTED (TPD)	0.00136 C	34171 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Hazard A	None Known A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	North Dakota	North Dakota
REGULATED CODE	1	0
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Not controlled
QUANTITY CONTROLLED (TPD)	4.358 B	
TOTAL QTY. ENTERING (TPD)	4.358 B	
INSTALLED COST (\$)	45,000 B	
ELECTRICAL REQ. (KW)	1.7 A	
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	3280 C	
MATERIALS COST (\$/YR)	160 B	
MAINTENANCE COST (\$/YR)	1080 A	
LABORATORY CHARGES (\$/YR)	0	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	-----	
SOURCE OF COST DATA	-----	

EFFLUENT DATA TABLES

PLANT	Natural	Natural
DIVISION	20	20
EFFLUENT	42 (CS ₂)	43 (Fatty Acids)
QUANTITY EMITTED (TPD)	0 A	0.7626 C
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Hazard A	Hazard B
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	North Dakota	North Dakota
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Not controlled
QUANTITY CONTROLLED (TPD)	0.0456 B	
TOTAL QTY. ENTERING (TPD)	0.0456 B	
INSTALLED COST (\$)	3700 B	
ELECTRICAL REQ. (KW)	0.1 B	3
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	300 C	
MATERIALS COST (\$/YR)	10 C	
MAINTENANCE COST (\$/YR)	60 B	
LABORATORY CHARGES (\$/YR)	0	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	-----	
SOURCE OF COST DATA	-----	

EFFLUENT DATA TABLES

PLANT	Natural	Natural
DIVISION	20	20
EFFLUENT	45 (Hydrocarbons)	46 (H ₂)
QUANTITY EMITTED (TPD)	0.294 C	0 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Minor B	Minor B
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	North Dakota	North Dakota
REGULATED CODE	2	0
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	252 A	2.255 A
TOTAL QTY. ENTERING (TPD)	252 A	2.255 A
INSTALLED COST (\$)	1,286,000 A	183,300 A
ELECTRICAL REQ. (KW)	86 A	11.3 A
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	36,000 B	6000 B
MATERIALS COST (\$/YR)	10,500 B	1435 B
MAINTENANCE COST (\$/YR)	70,000 A	9430 A
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Natural	Natural
DIVISION	20	20
EFFLUENT	47 (H ₂ O)	48 (H ₂ S)
QUANTITY EMITTED (TPD)	39968 A	0.0005 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None Known A	Toxic A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	North Dakota	North Dakota
REGULATED CODE	0	2
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	29,149 A	1.216 A
TOTAL QTY. ENTERING (TPD)	29,149 A	1.216 A
INSTALLED COST (\$)	8,426,000 B	153,700 B
ELECTRICAL REQ. (KW)	16,622 B	3.1 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	86,000 B	13,050 C
MATERIALS COST (\$/YR)	9,460,000 B	360 C
MAINTENANCE COST (\$/YR)	674,000 B	2,400 B
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Natural	Natural
DIVISION	20	20
EFFLUENT	50 (NH ₃)	51 (NO _x)
QUANTITY EMITTED (TPD)	9.16 C	34.62 B
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Hazard A	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	North Dakota	North Dakota
REGULATED CODE	1	2
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	Natural	Natural
DIVISION	20	20
EFFLUENT	52 (N ₂)	53 (O ₂)
QUANTITY EMITTED (TPD)	60,148 A	2391 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None Known A	None Known A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	North Dakota	North Dakota
REGULATED CODE	0	0
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	Natural	Natural
DIVISION	20	20
EFFLUENT	54 (Phenolics)	56 (SO ₂)
QUANTITY EMITTED (TPD)	0.3648 C	34.71 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Hazard B	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	North Dakota	North Dakota
REGULATED CODE	1	2
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Not controlled	Controlled
QUANTITY CONTROLLED (TPD)		75.58 A
TOTAL QTY. ENTERING (TPD)		83.87 A
INSTALLED COST (\$)		27,100,000 A
ELECTRICAL REQ. (KW)		8043 A
STEAM REQ. (MM BTU/d)		0
COOLING WATER REQ. (MM BTU/d)		0
FUEL I REQ. (MM BTU/d)		0
FUEL II REQ. (MM BTU/d)		0
FUEL III REQ. (MM BTU/d)		0
LABOR COST (\$/YR)		17,300 B
MATERIALS COST (\$/YR)		2,064,000 A
MAINTENANCE COST (\$/YR)		271,000 A
LABORATORY CHARGES (\$/YR)		1500 B
OTHER MISC. COSTS (\$/YR)		0
MISC. COSTS FOOTNOTE		-----
SOURCE OF COST DATA		-----

EFFLUENT DATA TABLES

PLANT	Natural	
DIVISION	20	
EFFLUENT	57 (Thiocyanates)	
QUANTITY EMITTED (TPD)	0.179 C	
QUANTITY FOOTNOTE	-----	
NATURE	Gas	
BIOLOGICAL HAZARD	Hazard A	
BIOLOGICAL HAZARD FOOTNOTE	-----	
STATE	North Dakota	
REGULATED CODE	1	
SOURCE OF EFF. INFO.	-----	
DISPOSITION	To atmosphere	
PROCESS	-----	
CONTROLLED CODE	Not controlled	
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	Natural	Natural
DIVISION	20	20
EFFLUENT	58 (Sludge)	34 (H ₂ O)
QUANTITY EMITTED (TPD)	32.1 A	1032 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Sludge	Liquid
BIOLOGICAL HAZARD	Possible Hazard A	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	North Dakota	North Dakota
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To mine	To mine
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	32.1 A	42 A
TOTAL QTY. ENTERING (TPD)	32.1 A	42 A
INSTALLED COST (\$)	13,700 B	0
ELECTRICAL REQ. (KW)	15 B	0
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0.066 B	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	1500 C	0
MATERIALS COST (\$/YR)	170 C	0
MAINTENANCE COST (\$/YR)	1100 B	0
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Natural	Natural
DIVISION	20	20
EFFLUENT	5 (Boiler ash)	13 (Fly ash)
QUANTITY EMITTED (TPD)	151 A	361 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Solid	Solid
BIOLOGICAL HAZARD	Possible Hazard A	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	North Dakota	North Dakota
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To mine	To mine
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	151 A	361 A
TOTAL QTY. ENTERING (TPD)	151 A	361 A
INSTALLED COST (\$)	254,000 B	612,000 B
ELECTRICAL REQ. (KW)	101 B	243 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0.32 B	0.78 B
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	21,000 C	50,000 C
MATERIALS COST (\$/YR)	2,500 B	6,000 B
MAINTENANCE COST (\$/YR)	16,600 B	40,000 B
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Natural	Natural
DIVISION	20	20
EFFLUENT	14 (Gasifier ash)	29 (Susp. solids)
QUANTITY EMITTED (TPD)	2159 A	52 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Solid	Solid
BIOLOGICAL HAZARD	Possible Hazard A	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	North Dakota	North Dakota
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To mine	To mine
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	2159 A	52 B
TOTAL QTY. ENTERING (TPD)	2159 A	52 B
INSTALLED COST (\$)	3,645,000 B	88,000 B
ELECTRICAL REQ. (KW)	1448 B	35 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	4.6 B	0.11 B
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	299,000 C	7200 C
MATERIALS COST (\$/YR)	36,000 B	900 B
MAINTENANCE COST (\$/YR)	238,000 B	5800 B
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Natural	Natural
DIVISION	20	20
EFFLUENT	8 ($\text{CaSO}_3 \cdot 2\text{H}_2\text{O}$)	18 (Na_2SO_3)
QUANTITY EMITTED (TPD)	178.9 A	2.5 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Solid	Solid
BIOLOGICAL HAZARD	Possible Hazard A	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	North Dakota	North Dakota
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To mine	To mine
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	178.9 A	2.5 A
TOTAL QTY. ENTERING (TPD)	178.9 A	2.5 A
INSTALLED COST (\$)	85,000 B	0
ELECTRICAL REQ. (KW)	92 B	0
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0.409 B	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	9000 C	0
MATERIALS COST (\$/YR)	1000 C	0
MAINTENANCE COST (\$/YR)	7000 B	0
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Natural	Natural
DIVISION	20	20
EFFLUENT	19 (Na ₂ SO ₄)	59 (Sludge)
QUANTITY EMITTED (TPD)	9.6 A	108 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Solid	Sludge
BIOLOGICAL HAZARD	Possible Hazard A	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	North Dakota	North Dakota
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To mine	To mine
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	9.6 A	108 A
TOTAL QTY. ENTERING (TPD)	9.6 A	108 A
INSTALLED COST (\$)	0	48,000 B
ELECTRICAL REQ. (KW)	0	52 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0.231 B
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	0	5000 B
MATERIALS COST (\$/YR)	0	580 B
MAINTENANCE COST (\$/YR)	0	3900 B
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Natural	
DIVISION	20	
EFFLUENT	60 (Sludge)	
QUANTITY EMITTED (TPD)	12.5 A	
QUANTITY FOOTNOTE	-----	
NATURE	Sludge	
BIOLOGICAL HAZARD	Possible Hazard A	
BIOLOGICAL HAZARD FOOTNOTE	-----	
STATE	North Dakota	
REGULATED CODE	1	
SOURCE OF EFF. INFO.	-----	
DISPOSITION	To mine	
PROCESS	-----	
CONTROLLED CODE	Controlled	
QUANTITY CONTROLLED (TPD)	12.5 A	
TOTAL QTY. ENTERING (TPD)	12.5 A	
INSTALLED COST (\$)	550 B	
ELECTRICAL REQ. (KW)	0.6 B	
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0.003 C	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	58 C	
MATERIALS COST (\$/YR)	10 C	
MAINTENANCE COST (\$/YR)	45 C	
LABORATORY CHARGES (\$/YR)	0	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	-----	
SOURCE OF COST DATA	-----	

NATURAL FOOTNOTES

1. OSHA standards do not permit prolonged exposure of an employee to a concentration greater than $10\text{mg}/\text{m}^3$ in the environment.
2. Sludge consists of 13.5 tpd Ca CO_3 , 0.42 t/d Mg (OH)_2 , 0.77 tpd $\text{Al}_2 (\text{SO}_4)_3$ and 17.4 tpd suspended solids.
3. Potentially hazardous since it contains salts and other water treatment chemicals.
4. Consists of 14.4% $\text{Al}_2 \text{O}_3$, 25.9% Ca O , 11.8% Hg O , 3.6% $\text{Na}_2 \text{O}$, 5.2% SO_3 , 26.9% Si O_2 , 1.5% Sr O_2 , 1.2% $\text{K}_2 \text{O}$.
5. Potentially hazardous due to some elements and components present which can be leached by water.
6. Consists of 32.8% Si O_2 , 27.7% Ca O , 17.0% $\text{Al}_2 \text{O}_3$, 5.1% $\text{Na}_2 \text{O}$, 10.0% Mg O , 1.0% $\text{K}_2 \text{O}$, 5.3% $\text{Fe}_2 \text{O}_3$ and 1.1% Ti O_2 .
7. Particulates are fly ash particles.
8. OSHA standards do not permit prolonged exposure of an employee to a concentration greater than 5 ppm in the environment. Federal and North Dakota State air quality and federal emission standards are also applicable.
9. Estimated as NO_2 .
10. Part of the coal lock gas incinerated in the boiler.
11. OSHA standards do not permit prolonged exposure of an employee to a concentration greater than 20 ppm in the environment. Federal and North Dakota State air quality and federal emission standards are also applicable.
12. An additional 4823 tpd of H_2O vapor is emitted to the Stack gas treatment unit.
13. Consists of leaks and steam vents to the atmosphere from the steam line.
14. Consists mainly of gasifier ash particles.
15. From ash quench.
16. Emission due to lock gas displaced from coal locks by coal during charging of coal locks.

SECTION III

WESCO

EFFLUENT DATA TABLES

PLANT	Wesco	Wesco
DIVISION	19	19
EFFLUENT	47 (H ₂ O)	43 (Fatty acids)
QUANTITY EMITTED (TPD)	23,477 A	0.3867 C
QUANTITY FOOTNOTE	32	32.33
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None known A	Hazard B
BIOLOGICAL HAZARD FOOTNOTE	---	34
STATE	New Mexico	New Mexico
REGULATED CODE	0	1
SOURCE OF EFF. INFO.	Design data	Theoretical data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	Cooling tower evaporation	---
CONTROLLED CODE	Controlled	Not controlled
QUANTITY CONTROLLED (TPD)	23,437 A	
TOTAL QTY. ENTERING (TPD)	23,437 A	
INSTALLED COST (\$)	2,657,000 B	
ELECTRICAL REQ. (KW)	2430 B	
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	86,400 B	
MATERIALS COST (\$/YR)	3,700,000 B	
MAINTENANCE COST (\$/YR)	212,600 B	
LABORATORY CHARGES (\$/YR)	8000 B	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	---	
SOURCE OF COST DATA	Other sources	

EFFLUENT DATA TABLES

PLANT	Wesco	Wesco
DIVISION	20	20
EFFLUENT	11 (Coal Dust)	21 (Particulates)
QUANTITY EMITTED (TPD)	0.0124 C	1.216 B
QUANTITY FOOTNOTE	-----	-----
NATURE	Solid	Solid
BIOLOGICAL HAZARD	Possible Hazard A	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	2	2
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	12.41 C	8.234 B
TOTAL QTY. ENTERING (TPD)	12.422 C	9.086 B
INSTALLED COST (\$)	289.100 B	79.000 B
ELECTRICAL REQ. (KW)	306 B	55 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	216,000 C	21,600 C
MATERIALS COST (\$/YR)	375,580 C	130 C
MAINTENANCE COST (\$/YR)	13,350 C	370 B
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Wesco	Wesco
DIVISION	20	20
EFFLUENT	40 (COS)	41 (CO ₂)
QUANTITY EMITTED (TPD)	0.0431 B	30399 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Hazard A	None Known A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	2	0
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Not Controlled
QUANTITY CONTROLLED (TPD)	0.194 C	
TOTAL QTY. ENTERING (TPD)	0.194 C	
INSTALLED COST (\$)	0	
ELECTRICAL REQ. (KW)	0	
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	0	
MATERIALS COST (\$/YR)	0	
MAINTENANCE COST (\$/YR)	0	
LABORATORY CHARGES (\$/YR)	0	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	-----	
SOURCE OF COST DATA	-----	

EFFLUENT DATA TABLES

PLANT	Wesco	Wesco
DIVISION	20	20
EFFLUENT	42 (CS ₂)	43 (Fatty Acids)
QUANTITY EMITTED (TPD)	0 A	0.3867 C
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Hazard A	Hazard B
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	2	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Not Controlled
QUANTITY CONTROLLED (TPD)	Minor A	
TOTAL QTY. ENTERING (TPD)	Minor A	
INSTALLED COST (\$)	0	
ELECTRICAL REQ. (KW)	0	
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	0	
MATERIALS COST (\$/YR)	0	
MAINTENANCE COST (\$/YR)	0	
LABORATORY CHARGES (\$/YR)	0	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	-----	
SOURCE OF COST DATA	-----	

EFFLUENT DATA TABLES

PLANT	Wesco	Wesco
DIVISION	20	20
EFFLUENT	45 (Hydrocarbons)	47 (H ₂ O)
QUANTITY EMITTED (TPD)	9.48 A	29712 B
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Minor B	None Known A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	2	0
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	41.88 A	23,437 A
TOTAL QTY. ENTERING (TPD)	41.88 A	23,437 A
INSTALLED COST (\$)	0	2,657,000 B
ELECTRICAL REQ. (KW)	0	2430 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	0	86,400 B
MATERIALS COST (\$/YR)	0	3,700,000 B
MAINTENANCE COST (\$/YR)	0	212,600 B
LABORATORY CHARGES (\$/YR)	0	8000 B
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Wesco	Wesco
DIVISION	20	20
EFFLUENT	48 (H ₂ S)	50 (NH ₃)
QUANTITY EMITTED (TPD)	0.0198 A	2.544 C
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Toxic A	Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	2	2
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Not Controlled
QUANTITY CONTROLLED (TPD)	0.071 C	
TOTAL QTY. ENTERING (TPD)	0.071 C	
INSTALLED COST (\$)	0	
ELECTRICAL REQ. (KW)	0	
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	0	
MATERIALS COST (\$/YR)	0	
MAINTENANCE COST (\$/YR)	0	
LABORATORY CHARGES (\$/YR)	0	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	-----	
SOURCE OF COST DATA	-----	

EFFLUENT DATA TABLES

PLANT	Wesco	Wesco
DIVISION	20	20
EFFLUENT	51 (NO _x)	52 (N ₂)
QUANTITY EMITTED (TPD)	18.66 C	53135 B
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Possible Hazard A	None Known A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	2	0
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	Wesco	Wesco
DIVISION	20	20
EFFLUENT	53 (O ₂)	54 (Phenolics)
QUANTITY EMITTED (TPD)	1723 B	0.0033 C
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None Known A	Hazard B
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	0	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Not Controlled	Not Controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	Wesco	Wesco
DIVISION	20	20
EFFLUENT	56 (SO ₂)	57 (Thiocyanates)
QUANTITY EMITTED (TPD)	9.79 A	0.0032 C
QUANTITY FOOTNOTE	-----	-----
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Possible Hazard A	Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	2	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To atmosphere	To atmosphere
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Not controlled
QUANTITY CONTROLLED (TPD)	81.45 A	
TOTAL QTY. ENTERING (TPD)	90.5 A	
INSTALLED COST (\$)	78,243,000 A	
ELECTRICAL REQ. (KW)	10,250 A	
STEAM REQ. (MM BTU/d)	14.17 A	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	86,000 B	
MATERIALS COST (\$/YR)	1,676,000 B	
MAINTENANCE COST (\$/YR)	1,950,000 A	
LABORATORY CHARGES (\$/YR)	13,000 B	
OTHER MISC. COSTS (\$/YR)	364,000 B	
MISC. COSTS FOOTNOTE	-----	
SOURCE OF COST DATA	-----	

EFFLUENT DATA TABLES

PLANT	Wesco	Wesco
DIVISION	20	20
EFFLUENT	34 (H ₂ O)	13 (Fly Ash)
QUANTITY EMITTED (TPD)	1414.4 A	411 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Liquid	Solid
BIOLOGICAL HAZARD	Possible Hazard A	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To mine	To mine
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	64.4 B	411 A
TOTAL QTY. ENTERING (TPD)	64.4 B	411 A
INSTALLED COST (\$)	0	484,000 B
ELECTRICAL REQ. (KW)	0	106 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0.59 B
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	0	23,000 C
MATERIALS COST (\$/YR)	0	5800 B
MAINTENANCE COST (\$/YR)	0	39,000 B
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Wesco	Wesco
DIVISION	20	20
EFFLUENT	6 (CaCO ₃)	23 (Refuse)
QUANTITY EMITTED (TPD)	53 B	2263 B
QUANTITY FOOTNOTE	-----	-----
NATURE	Solid	Solid
BIOLOGICAL HAZARD	Possible Hazard A	Possible Hazard C
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To mine	To mine
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	53 B	2263 B
TOTAL QTY. ENTERING (TPD)	53 B	2263 B
INSTALLED COST (\$)	12,000 B	335,000 B
ELECTRICAL REQ. (KW)	2 B	52 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0.0885 B	2.48 B
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	1100 C	29,500 C
MATERIALS COST (\$/YR)	150 C	4,000 C
MAINTENANCE COST (\$/YR)	1000 B	26,800 B
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Wesco	Wesco
DIVISION	20	20
EFFLUENT	58 (Sludge)	14 (Gasifier ash)
QUANTITY EMITTED (TPD)	24 B	6534 A
QUANTITY FOOTNOTE	-----	-----
NATURE	Solid	Solid
BIOLOGICAL HAZARD	Possible Hazard A	Possible Hazard A
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To mine	To mine
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	24 B	6534 A
TOTAL QTY. ENTERING (TPD)	24 B	6534 A
INSTALLED COST (\$)	7100 C	6,918,000 B
ELECTRICAL REQ. (KW)	2 C	1518 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0.052 C	8.43 B
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	620 C	329,000 C
MATERIALS COST (\$/YR)	90 C	83,000 B
MAINTENANCE COST (\$/YR)	600 C	554,000 B
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Wesco	Wesco
DIVISION	20	20
EFFLUENT	5 (Boiler ash)	9 (CaSO ₄ .2H ₂ O)
QUANTITY EMITTED (TPD)	135 A	215 B
QUANTITY FOOTNOTE	-----	-----
NATURE	Solid	Solid
BIOLOGICAL HAZARD	Possible Hazard A	Possible Hazard B
BIOLOGICAL HAZARD FOOTNOTE	-----	-----
STATE	New Mexico	New Mexico
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	-----	-----
DISPOSITION	To mine	To mine
PROCESS	-----	-----
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	135 A	215 B
TOTAL QTY. ENTERING (TPD)	135 A	215 B
INSTALLED COST (\$)	161,000 B	39,000 B
ELECTRICAL REQ. (KW)	35 B	6 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0.196 B	0.288 B
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	7700 C	3500 C
MATERIALS COST (\$/YR)	2000 B	470 C
MAINTENANCE COST (\$/YR)	1300 B	3200 B
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	-----	-----
SOURCE OF COST DATA	-----	-----

EFFLUENT DATA TABLES

PLANT	Wesco	
DIVISION	20	
EFFLUENT	59 (Sludge)	
QUANTITY EMITTED (TPD)	6.7 B	
QUANTITY FOOTNOTE	-----	
NATURE	Sludge	
BIOLOGICAL HAZARD	Possible Hazard	
BIOLOGICAL HAZARD FOOTNOTE	-----	
STATE	New Mexico	
REGULATED CODE	1	
SOURCE OF EFF. INFO.	-----	
DISPOSITION	To mine	
PROCESS	-----	
CONTROLLED CODE	Controlled	
QUANTITY CONTROLLED (TPD)	6.7 B	
TOTAL QTY. ENTERING (TPD)	6.7 B	
INSTALLED COST (\$)	0	
ELECTRICAL REQ. (KW)	0	
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	0	
MATERIALS COST (\$/YR)	0	
MAINTENANCE COST (\$/YR)	0	
LABORATORY CHARGES (\$/YR)	0	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	-----	
SOURCE OF COST DATA	-----	

ANG Costs

Cost of electrical power = \$0.014/KWhr

Cost of Steam = \$0.580/MMBtu*

Cost of fuel I = \$3.339/MMBtu

Direct operating costs = \$49,330,000 (includes cost of coal)

Direct operating costs = \$27,460,000 (does not include cost of coal)

Capital investment = \$340,230,000

* Assumed same as Natural & Cost, since steam is purchased from Basin Electric.

ANG Footnotes

1. OSHA standards do not permit prolonged exposures of an employee to a concentration greater than 10 mg/m³ in the environment.
2. Potentially hazardous due to water treatment chemicals that may be present.
3. Potentially hazardous due to elements or compounds present which can be leached by water.
4. OSHA standards do not permit prolonged exposure of an employee to a concentration greater than 50 ppm in the environment. Federal and North Dakota state air quality standards are also applicable.
5. OSHA standards do not permit prolonged exposure of an employee to a concentration greater than 5 ppm in the environment. Federal and North Dakota state air quality and federal emission standards are also applicable.
6. Estimated as NO₂.
7. Estimated using emission factors.
8. Emission due to lock gas displaced from coal locks by coal during charging of coal locks.
9. OSHA standards do not permit prolonged exposure of an employee to a concentration greater than 20 ppm in the environment. Federal and North Dakota state air quality and federal emission standards are also applicable.
10. Consists mainly of gasifier ash particles. Estimated using emission factors.
11. Potentially hazardous due to elements and compounds which may be leached from ash.
12. Direct operating cost for waste liquid disposal:
13. An additional 1.3 tpd of CO₂ is emitted to the atmosphere in the Stretford bleed stream.
14. Reported by ANG as organic sulfur.
15. OSHA standards do not permit prolonged exposure of an employee to a concentration greater than 20 ppm in the environment.

16. Stretford bleed stream.
17. Incineration is done in a steam superheater with tar oil, naphtha, and phenolics as fuel.
18. Emitted as Stretford oxidizer effluent.
19. Potentially hazardous since it contains high concentrations of dissolved salts and other chemicals.
20. May contain fatty acids, ammonia, phenolics, other volatile contaminants and dissolved solids which are emitted along with the drift.
21. Potentially hazardous since it contains fatty acids, ammonia, etc.

SECTION IV

ANG

EFFLUENT DATA TABLES

PLANT	ANG	
DIVISION	1	
EFFLUENT	11 (Coal dust)	
QUANTITY EMITTED (TPD)	Small A	
QUANTITY FOOTNOTE	-	
NATURE	Solid	
BIOLOGICAL HAZARD	Possible hazard A	
BIOLOGICAL HAZARD FOOTNOTE	1	
STATE	North Dakota	
REGULATED CODE	2	
SOURCE OF EFF. INFO.	Design data	
DISPOSITION	To Atmosphere	
PROCESS	Water spray	
CONTROLLED CODE	Controlled	
QUANTITY CONTROLLED (TPD)	Small A	
TOTAL QTY. ENTERING (TPD)	Small A	
INSTALLED COST (\$)	29,000 C	
ELECTRICAL REQ. (KW)	15 C	
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	86,400 C	
MATERIALS COST (\$/YR)	132,000 C	
MAINTENANCE COST (\$/YR)	2400 C	
LABORATORY CHARGES (\$/YR)	0	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	---	
SOURCE OF COST DATA	Theoretical data	

EFFLUENT DATA TABLES

PLANT	ANG	
DIVISION	2	
EFFLUENT	11 (Coal dust)	
QUANTITY EMITTED (TPD)	1.085 B	
QUANTITY FOOTNOTE	--	
NATURE	Solid	
BIOLOGICAL HAZARD	Possible hazard A	
BIOLOGICAL HAZARD FOOTNOTE	1	
STATE	North Dakota	
REGULATED CODE	2	
SOURCE OF EFF. INFO.	Design data	
DISPOSITION	To atmosphere	
PROCESS	Bag filters & water sprays	
CONTROLLED CODE	Controlled	
QUANTITY CONTROLLED (TPD)	Small A	
TOTAL QTY. ENTERING (TPD)	Small A	
INSTALLED COST (\$)	1,027,000 B	
ELECTRICAL REQ. (KW)	533 B	
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	216,000 C	
MATERIALS COST (\$/YR)	137,000 C	
MAINTENANCE COST (\$/YR)	36,000 C	
LABORATORY CHARGES (\$/YR)	0	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	--	
SOURCE OF COST DATA	Design data	

EFFLUENT DATA TABLES

PLANT	ANG	
DIVISION	3	
EFFLUENT	58 (Sludge)	
QUANTITY EMITTED (TPD)	510.8 A	
QUANTITY FOOTNOTE	--	
NATURE	Sludge	
BIOLOGICAL HAZARD	Possible hazard B	
BIOLOGICAL HAZARD FOOTNOTE	2	
STATE	North Dakota	
REGULATED CODE	1	
SOURCE OF EFF. INFO.	Design data	
DISPOSITION	To ash handling	
PROCESS	--	
CONTROLLED CODE	Not controlled	
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	4	4
EFFLUENT	13 (Fly Ash)	21 (Particulates)
QUANTITY EMITTED (TPD)	6.24 A	1.56 A
QUANTITY FOOTNOTE	--	--
NATURE	Solid	Solid
BIOLOGICAL HAZARD	Possible hazard A	Possible hazard A
BIOLOGICAL HAZARD FOOTNOTE	3	3
STATE	North Dakota	North Dakota
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To ash handling	To atmosphere
PROCESS	--	Electrostatic precipitators
CONTROLLED CODE	Not controlled	Controlled
QUANTITY CONTROLLED (TPD)		6.24 A
TOTAL QTY. ENTERING (TPD)		7.80 A
INSTALLED COST (\$)		2,708,000 B
ELECTRICAL REQ. (KW)		266 B
STEAM REQ. (MM BTU/d)		0
COOLING WATER REQ. (MM BTU/d)		0
FUEL I REQ. (MM BTU/d)		0
FUEL II REQ. (MM BTU/d)		0
FUEL III REQ. (MM BTU/d)		0
LABOR COST (\$/YR)		86,400 C
MATERIALS COST (\$/YR)		4,400 C
MAINTENANCE COST (\$/YR)		29,000 B
LABORATORY CHARGES (\$/YR)		0
OTHER MISC. COSTS (\$/YR)		0
MISC. COSTS FOOTNOTE		--
SOURCE OF COST DATA		EPA data

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	4	4
EFFLUENT	39 (CO)	41 (CO ₂)
QUANTITY EMITTED (TPD)	1.344 B	2897 A
QUANTITY FOOTNOTE	---	---
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Toxic A	None known A
BIOLOGICAL HAZARD-FOOTNOTE	4	--
STATE	North Dakota	North Dakota
REGULATED CODE	2	0
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	---	---
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	4	4
EFFLUENT	45 (Hydrocarbons)	52 (N ₂)
QUANTITY EMITTED (TPD)	0.8 A	10,218 A
QUANTITY FOOTNOTE	--	--
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Minor B	None known A
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	1	0
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	4	4
EFFLUENT	53 (O ₂)	56 (SO ₂)
QUANTITY EMITTED (TPD)	405 A	12.1 A
QUANTITY FOOTNOTE	--	--
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None known A	Possible hazard A
BIOLOGICAL HAZARD FOOTNOTE	--	5
STATE	North Dakota	North Dakota
REGULATED CODE	0	2
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	4	4
EFFLUENT	47 (H ₂ O)	51 (NO _x)
QUANTITY EMITTED (TPD)	904 A	9.4 B
QUANTITY FOOTNOTE	---	6
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None known A	Possible hazard A
BIOLOGICAL HAZARD FOOTNOTE	--	5
STATE	North Dakota	North Dakota
REGULATED CODE	0	2
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD) _r		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	5	5
EFFLUENT	53 (O ₂)	52 (N ₂)
QUANTITY EMITTED (TPD)	104 A	18075 A
QUANTITY FOOTNOTE	--	--
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None known A	None known A
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	0	0
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	6	6
EFFLUENT	14 (Gasifier Ash)	11 (Coal dust)
QUANTITY EMITTED (TPD)	1763 A	0.1342 C
QUANTITY FOOTNOTE	---	7
NATURE	Gas	Solid
BIOLOGICAL HAZARD	Possible hazard A	Possible hazard A
BIOLOGICAL HAZARD FOOTNOTE	3	1
STATE	North Dakota	North Dakota
REGULATED CODE	1	2
SOURCE OF EFF. INFO.	Design data	Theoretical data
DISPOSITION	To ash handling	To atmosphere
PROCESS	---	Coal lock wet cyclones
CONTROLLED CODE	Not controlled	Controlled
QUANTITY CONTROLLED (TPD)		13.286 C
TOTAL QTY. ENTERING (TPD)		13.42 C
INSTALLED COST (\$)		189,000
ELECTRICAL REQ. (KW)		393 C
STEAM REQ. (MM BTU/d)		0
COOLING WATER REQ. (MM BTU/d)		0
FUEL I REQ. (MM BTU/d)		0
FUEL II REQ. (MM BTU/d)		0
FUEL III REQ. (MM BTU/d)		0
LABOR COST (\$/YR)		21,600 C
MATERIALS COST (\$/YR)		800 C
MAINTENANCE COST (\$/YR)		2400 C
LABORATORY CHARGES (\$/YR)		0
OTHER MISC. COSTS (\$/YR)		0
MISC. COSTS FOOTNOTE		--
SOURCE OF COST DATA		EPA data

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	6	6
EFFLUENT	46 (H ₂)	39 (CO)
QUANTITY EMITTED (TPD)	0.7502 C	4.2409 C
QUANTITY FOOTNOTE	8	8
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Minor B	Toxic A
BIOLOGICAL HAZARD FOOTNOTE	--	4
STATE	North Dakota	North Dakota
REGULATED CODE	0	2
SOURCE OF EFF. INFO.	Theoretical data	Theoretical data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	6	6
EFFLUENT	41 (CO ₂)	45 (Hydrocarbons)
QUANTITY EMITTED (TPD)	13.848 C	1.8698 C
QUANTITY FOOTNOTE	8	8
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None known A	Minor B
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	0	1
SOURCE OF EFF. INFO.	Theoretical data	Theoretical data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	6	6
EFFLUENT	48 (H ₂ S)	47 (H ₂ O)
QUANTITY EMITTED (TPD)	0.1508 C	4.9409 C
QUANTITY FOOTNOTE	8	8
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Toxic A	None known A
BIOLOGICAL HAZARD FOOTNOTE	9	--
STATE	North Dakota	North Dakota
REGULATED CODE	2	0
SOURCE OF EFF. INFO.	Theoretical data	Theoretical data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	---	---
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	
DIVISION	6	
EFFLUENT	21 (Particulates)	
QUANTITY EMITTED (TPD)	0.0088 C	
QUANTITY FOOTNOTE	10	
NATURE	Solid	
BIOLOGICAL HAZARD	Possible hazard A	
BIOLOGICAL HAZARD FOOTNOTE	--	
STATE	North Dakota	
REGULATED CODE	1	
SOURCE OF EFF. INFO.	Theoretical data	
DISPOSITION	To atmosphere	
PROCESS	Ash lock wet cyclones	
CONTROLLED CODE	Controlled	
QUANTITY CONTROLLED (TPD)	0.8732 C	
TOTAL QTY. ENTERING (TPD)	0.882 C	
INSTALLED COST (\$)	98,000 C	
ELECTRICAL REQ. (KW)	32 C	
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	21,600 C	
MATERIALS COST (\$/YR)	60 C	
MAINTENANCE COST (\$/YR)	250 C	
LABORATORY CHARGES (\$/YR)	0	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	--	
SOURCE OF COST DATA	EPA data	

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	7	7
EFFLUENT	14 (Gasifier ash)	13 (Fly Ash)
QUANTITY EMITTED (TPD)	1763 A	6.24 A
QUANTITY FOOTNOTE	--	--
NATURE	Solid	Solid
BIOLOGICAL HAZARD	Possible hazard A	Possible hazard A
BIOLOGICAL HAZARD FOOTNOTE	3	3
STATE	North Dakota	North Dakota
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To mine	To mine
PROCESS	Ash dewatering & Transfer	Ash dewatering & Transfer
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	1763 A	6.24 A
TOTAL QTY. ENTERING (TPD)	1763 A	6.24 A
INSTALLED COST (\$)	3,327,000 A	11,500 A
ELECTRICAL REQ. (KW)	944 B	3 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	2.812 B	0.01 B
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	195,000 C	700 C
MATERIALS COST (\$/YR)	31,800 B	100 B
MAINTENANCE COST (\$/YR)	212,000 B	800 B
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	--	--
SOURCE OF COST DATA	Design data	Design data

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	7	7
EFFLUENT	34 (H ₂ O)	47 (H ₂ O)
QUANTITY EMITTED (TPD)	318.5 A	192.3 A
QUANTITY FOOTNOTE	--	--
NATURE	Liquid	Gas
BIOLOGICAL HAZARD	Possible hazard A	None known A
BIOLOGICAL HAZARD FOOTNOTE	11	--
STATE	North Dakota	North Dakota
REGULATED CODE	1	0
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To mine	To atmosphere
PROCESS	Ash dewatering & Transfer	---
CONTROLLED CODE	Controlled	Not controlled
QUANTITY CONTROLLED (TPD)	318.5 A	
TOTAL QTY. ENTERING (TPD)	510.8 A	
INSTALLED COST (\$)	583,600 A	
ELECTRICAL REQ. (KW)	170 B	
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0.51 B	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	35,100 C	
MATERIALS COST (\$/YR)	5700 B	
MAINTENANCE COST (\$/YR)	38,000 B	
LABORATORY CHARGES (\$/YR)	0	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	--	
SOURCE OF COST DATA	Design data	

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	10	10
EFFLUENT	48 (H ₂ S)	46 (H ₂)
QUANTITY EMITTED (TPD)	1.807 A	0.749 A
QUANTITY FOOTNOTE	--	1
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Toxic A	Minor B
BIOLOGICAL HAZARD FOOTNOTE	9	--
STATE	North Dakota	North Dakota
REGULATED CODE	2	0
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To incineration	To incineration
PROCESS	Stretford process	--
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	234.7 A	
TOTAL QTY. ENTERING (TPD)	236.5 A	
INSTALLED COST (\$)	22,241,000 A	
ELECTRICAL REQ. (KW)	11,117 A	
STEAM REQ. (MM BTU/d)	348.57 A	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	86,400 B	
MATERIALS COST (\$/YR)	491,000 A	
MAINTENANCE COST (\$/YR)	403,000 A	
LABORATORY CHARGES (\$/YR)	7500 B	
OTHER MISC. COSTS (\$/YR)	1,947,000 A	
MISC. COSTS FOOTNOTE	12	
SOURCE OF COST DATA	EPA data	

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	10	10
EFFLUENT	39 (CO)	41 (CO ₂)
QUANTITY EMITTED (TPD)	9.744 A	21,500 A
QUANTITY FOOTNOTE	---	13
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Toxic A	None known A
BIOLOGICAL HAZARD FOOTNOTE	4	--
STATE	North Dakota	North Dakota
REGULATED CODE	2	0
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To incineration	To incineration
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	10	10
EFFLUENT	45 (Hydrocarbons)	52 (N ₂)
QUANTITY EMITTED (TPD)	267.1 A	16.027 A
QUANTITY FOOTNOTE	--	--
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Minor B	None known A
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	1	0
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To incineration	To incineration
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	10	10
EFFLUENT	40 (COS)	42 (CS ₂)
QUANTITY EMITTED (TPD)	6.185 B	2.444 C
QUANTITY FOOTNOTE	---	14
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Hazard A	Hazard A
BIOLOGICAL HAZARD FOOTNOTE	--	15
STATE	North Dakota	North Dakota
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To incineration	To incineration
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	10	10
EFFLUENT	47 (H ₂ O)	56 (SO ₂)
QUANTITY EMITTED (TPD)	539 A	1.3 A
QUANTITY FOOTNOTE	---	16
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None known A	Possible hazard A
BIOLOGICAL HAZARD FOOTNOTE	--	5
STATE	North Dakota	North Dakota
REGULATED CODE	0	2
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To incineration	To atmosphere
PROCESS	---	---
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	
DIVISION	12	
EFFLUENT	42 (CS ₂)	
QUANTITY EMITTED (TPD)	0 A	
QUANTITY FOOTNOTE	--	
NATURE	Gas	
BIOLOGICAL HAZARD	Hazard A	
BIOLOGICAL HAZARD FOOTNOTE	15	
STATE	North Dakota	
REGULATED CODE	1	
SOURCE OF EFF. INFO.	Design data	
DISPOSITION	To atmosphere	
PROCESS	Incineration in open heater	
CONTROLLED CODE	Controlled	
QUANTITY CONTROLLED (TPD)	2.444 A	
TOTAL QTY. ENTERING (TPD)	2.444 A	
INSTALLED COST (\$)	0	
ELECTRICAL REQ. (KW)	0	
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	0	
MATERIALS COST (\$/YR)	0	
MAINTENANCE COST (\$/YR)	0	
LABORATORY CHARGES (\$/YR)	0	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	-	
SOURCE OF COST DATA	-	

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	12	12
EFFLUENT	48 (H ₂ S)	40 (COS)
QUANTITY EMITTED (TPD)	0 A	0 A
QUANTITY FOOTNOTE	--	--
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Toxic A	Hazard A
BIOLOGICAL HAZARD FOOTNOTE	9	--
STATE	North Dakota	North Dakota
REGULATED CODE	2	1
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	Incineration in open heater	
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	1.807 A	6.185 A
TOTAL QTY. ENTERING (TPD)	1.807 A	6.185 A
INSTALLED COST (\$)	0	0
ELECTRICAL REQ. (KW)	0	0
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	0	0
MATERIALS COST (\$/YR)	0	0
MAINTENANCE COST (\$/YR)	0	0
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	--	--
SOURCE OF COST DATA	--	--

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	12	12
EFFLUENT	46 (H ₂)	39 (CO)
QUANTITY EMITTED (TPD)	0 A	3.024 A
QUANTITY FOOTNOTE	17	17
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Minor B	Toxic A
BIOLOGICAL HAZARD FOOTNOTE	--	4
STATE	North Dakota	North Dakota
REGULATED CODE	0	2
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	Incineration in superheater	Incineration in superheater
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	0.749 A	6.720 A
TOTAL QTY. ENTERING (TPD)	0.749 A	9.744 A
INSTALLED COST (\$)	0	0
ELECTRICAL REQ. (KW)	0	0
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	0	0
MATERIALS COST (\$/YR)	0	0
MAINTENANCE COST (\$/YR)	0	0
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	--	--
SOURCE OF COST DATA	--	--

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	12	12
EFFLUENT	41 (CO ₂)	45 (Hydrocarbons)
QUANTITY EMITTED (TPD)	23,747 A	0.534 A
QUANTITY FOOTNOTE	17	17
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None known A	Minor B
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	0	1
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	---	Incineration in superheater
CONTROLLED CODE	Not controlled	Controlled
QUANTITY CONTROLLED (TPD)		266.566 A
TOTAL QTY. ENTERING (TPD)		267.1 A
INSTALLED COST (\$)		0
ELECTRICAL REQ. (KW)		0
STEAM REQ. (MM BTU/d)		0
COOLING WATER REQ. (MM BTU/d)		0
FUEL I REQ. (MM BTU/d)		0
FUEL II REQ. (MM BTU/d)		0
FUEL III REQ. (MM BTU/d)		0
LABOR COST (\$/YR)		0
MATERIALS COST (\$/YR)		0
MAINTENANCE COST (\$/YR)		0
LABORATORY CHARGES (\$/YR)		0
OTHER MISC. COSTS (\$/YR)		0
MISC. COSTS FOOTNOTE		--
SOURCE OF COST DATA		--

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	12	12
EFFLUENT	52 (N ₂)	53 (O ₂)
QUANTITY EMITTED (TPD)	10,865 A	668 A
QUANTITY FOOTNOTE	17	17
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None known A	None known A
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	0	0
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	12	12
EFFLUENT	56 (SO ₂)	47 (H ₂ O)
QUANTITY EMITTED (TPD)	19.4 A	1704 A
QUANTITY FOOTNOTE	17	17
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Possible hazard A	None known A
BIOLOGICAL HAZARD FOOTNOTE	5	--
STATE	North Dakota	North Dakota
REGULATED CODE	2	0
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	
DIVISION	12	
EFFLUENT	51 (NO _x)	
QUANTITY EMITTED (TPD)	0.48 B	
QUANTITY FOOTNOTE	6, 17	
NATURE	Gas	
BIOLOGICAL HAZARD	Possible hazard A	
BIOLOGICAL HAZARD FOOTNOTE	5	
STATE	North Dakota	
REGULATED CODE	2	
SOURCE OF EFF. INFO.	Design data	
DISPOSITION	To atmosphere	
PROCESS	--	
CONTROLLED CODE	Not controlled	
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	14	14
EFFLUENT	41 (CO ₂)	52 (N ₂)
QUANTITY EMITTED (TPD)	287 A	1682 A
QUANTITY FOOTNOTE	18	18
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None known A	None known A
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	0	0
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	14	14
EFFLUENT	53 (O ₂)	47 (H ₂ O)
QUANTITY EMITTED (TPD)	584 A	110 A
QUANTITY FOOTNOTE	18	18
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None known A	None known A
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	0	0
SOURCE OF EFF. INFO.	Design data	Design data
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	
DIVISION	16	
EFFLUENT	34 (H ₂ O)	
QUANTITY EMITTED (TPD)	421 A	
QUANTITY FOOTNOTE	--	
NATURE	Liquid	
BIOLOGICAL HAZARD	Possible hazard A	
BIOLOGICAL HAZARD FOOTNOTE	19	
STATE	North Dakota	
REGULATED CODE	1	
SOURCE OF EFF. INFO.	Design data	
DISPOSITION	To mine	
PROCESS	--	
CONTROLLED CODE	Not controlled	
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I. REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	
DIVISION	17	
EFFLUENT	59 (Sludge)	
QUANTITY EMITTED (TPD)	3052 A	
QUANTITY FOOTNOTE	--	
NATURE	Sludge	
BIOLOGICAL HAZARD	Possible hazard A	
BIOLOGICAL HAZARD FOOTNOTE	19	
STATE	North Dakota	
REGULATED CODE	1	
SOURCE OF EFF. INFO.	Design data	
DISPOSITION	To deep well injection	
PROCESS	--	
CONTROLLED CODE	Not controlled	
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	
DIVISION	19	
EFFLUENT	47 (H ₂ O)	
QUANTITY EMITTED (TPD)	27484 A	
QUANTITY FOOTNOTE	20	
NATURE	Gas	
BIOLOGICAL HAZARD	Possible hazard B	
BIOLOGICAL HAZARD FOOTNOTE	21	
STATE	North Dakota	
REGULATED CODE	0	
SOURCE OF EFF. INFO.	Design data	
DISPOSITION	To atmosphere	
PROCESS	Vaporization	
CONTROLLED CODE	Controlled	
QUANTITY CONTROLLED (TPD)	27,280 A	
TOTAL QTY. ENTERING (TPD)	27,280 A	
INSTALLED COST (\$)	10,325,000 A	
ELECTRICAL REQ. (KW)	8280 A	
STEAM REQ. (MM BTU/d)	0	
COOLING WATER REQ. (MM BTU/d)	0	
FUEL I REQ. (MM BTU/d)	0	
FUEL II REQ. (MM BTU/d)	0	
FUEL III REQ. (MM BTU/d)	0	
LABOR COST (\$/YR)	86,400 B	
MATERIALS COST (\$/YR)	1,362,000 B	
MAINTENANCE COST (\$/YR)	826,000 A	
LABORATORY CHARGES (\$/YR)	7500 B	
OTHER MISC. COSTS (\$/YR)	0	
MISC. COSTS FOOTNOTE	--	
SOURCE OF COST DATA	Design data	

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	20	20
EFFLUENT	11 (Coal dust)	21 (Particulates)
QUANTITY EMITTED (TPD)	1.2192 B	1.5688 A
QUANTITY FOOTNOTE	--	--
NATURE	Solid	Solid
BIOLOGICAL HAZARD	Possible hazard A	Possible hazard A
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	2	1
SOURCE OF EFF. INFO.	--	--
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	13.286 C	7.1132 A
TOTAL QTY. ENTERING (TPD)	13.42 C	8.682 A
INSTALLED COST (\$)	1,245,000 B	2,806,000 B
ELECTRICAL REQ. (KW)	941 B	298 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	324,000 C	108,000 C
MATERIALS COST (\$/YR)	269,800C	4460 C
MAINTENANCE COST (\$/YR)	40,800 C	29,250 B
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE.	--	--
SOURCE OF COST DATA	--	--

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	20	20
EFFLUENT	59 (Sludge)	39 (CO)
QUANTITY EMITTED (TPD)	3052 A	8.6089 B
QUANTITY FOOTNOTE	--	--
NATURE	Sludge	Gas
BIOLOGICAL HAZARD	Possible hazard	Toxic A
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	1	2
SOURCE OF EFF. INFO.	--	--
DISPOSITION	To deep well disposal	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Not controlled	Controlled
QUANTITY CONTROLLED (TPD)		6.720 A
TOTAL QTY. ENTERING (TPD)		9.744 A
INSTALLED COST (\$)		0
ELECTRICAL REQ. (KW)		0
STEAM REQ. (MM BTU/d)		0
COOLING WATER REQ. (MM BTU/d)		0
FUEL I REQ. (MM BTU/d)		0
FUEL II REQ. (MM BTU/d)		0
FUEL III REQ. (MM BTU/d)		0
LABOR COST (\$/YR)		0
MATERIALS COST (\$/YR)		0
MAINTENANCE COST (\$/YR)		0
LABORATORY CHARGES (\$/YR)		0
OTHER MISC. COSTS (\$/YR)		0
MISC. COSTS FOOTNOTE		--
SOURCE OF COST DATA		--

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	20	20
EFFLUENT	41 (CO ₂)	45 (Hydrocarbons)
QUANTITY EMITTED (TPD)	26,945 A	3.2038 B
QUANTITY FOOTNOTE	--	--
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None known A	Minor B
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	0	1
SOURCE OF EFF. INFO.	--	--
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Not controlled	Controlled
QUANTITY CONTROLLED (TPD)		266.566 A
TOTAL QTY. ENTERING (TPD)		267.1 A
INSTALLED COST (\$)		0
ELECTRICAL REQ. (KW)		0
STEAM REQ. (MM BTU/d)		0
COOLING WATER REQ. (MM BTU/d)		0
FUEL I REQ. (MM BTU/d)		0
FUEL II REQ. (MM BTU/d)		0
FUEL III REQ. (MM BTU/d)		0
LABOR COST (\$/YR)		0
MATERIALS COST (\$/YR)		0
MAINTENANCE COST (\$/YR)		0
LABORATORY CHARGES (\$/YR)		0
OTHER MISC. COSTS (\$/YR)		0
MISC. COSTS FOOTNOTE		--
SOURCE OF COST DATA		--

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	20	20
EFFLUENT	46 (H ₂)	47 (H ₂ O)
QUANTITY EMITTED (TPD)	0.7502 C	30,399 A
QUANTITY FOOTNOTE	--	--
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Minor B	Possible hazard B
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	0	0
SOURCE OF EFF. INFO.	--	--
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	0.749 A	27,280 A
TOTAL QTY. ENTERING (TPD)	0.749 A	27,280 A
INSTALLED COST (\$)	0	10,325,000 A
ELECTRICAL REQ. (KW)	0	8280 A
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	0	0
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	0	86,400 B
MATERIALS COST (\$/YR)	0	1,362,000 B
MAINTENANCE COST (\$/YR)	0	826,000 A
LABORATORY CHARGES (\$/YR)	0	7500 B
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	--	--
SOURCE OF COST DATA	--	--

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	20	20
EFFLUENT	48 (H ₂ S)	51 (NO _x)
QUANTITY EMITTED (TPD)	0.1508 C	9.88 B
QUANTITY FOOTNOTE	--	--
NATURE	Gas	Gas
BIOLOGICAL HAZARD	Toxic A	Possible hazard A
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	2	2
SOURCE OF EFF. INFO.	--	--
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	20	20
EFFLUENT	52 (N ₂)	53 (O ₂)
QUANTITY EMITTED (TPD)	40840 A	1761 A
QUANTITY FOOTNOTE	--	--
NATURE	Gas	Gas
BIOLOGICAL HAZARD	None known A	None known A
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	0	0
SOURCE OF EFF. INFO.	--	--
DISPOSITION	To atmosphere	To atmosphere
PROCESS	--	--
CONTROLLED CODE	Not controlled	Not controlled
QUANTITY CONTROLLED (TPD)		
TOTAL QTY. ENTERING (TPD)		
INSTALLED COST (\$)		
ELECTRICAL REQ. (KW)		
STEAM REQ. (MM BTU/d)		
COOLING WATER REQ. (MM BTU/d)		
FUEL I REQ. (MM BTU/d)		
FUEL II REQ. (MM BTU/d)		
FUEL III REQ. (MM BTU/d)		
LABOR COST (\$/YR)		
MATERIALS COST (\$/YR)		
MAINTENANCE COST (\$/YR)		
LABORATORY CHARGES (\$/YR)		
OTHER MISC. COSTS (\$/YR)		
MISC. COSTS FOOTNOTE		
SOURCE OF COST DATA		

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	20	20
EFFLUENT	56 (SO ₂)	13 (Fly Ash)
QUANTITY EMITTED (TPD)	32.8 A	6.24 A
QUANTITY FOOTNOTE	--	--
NATURE	Gas	Solid
BIOLOGICAL HAZARD	Possible hazard A	Possible hazard A
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	2	1
SOURCE OF EFF. INFO.	--	--
DISPOSITION	To atmosphere	To mine
PROCESS	--	--
CONTROLLED CODE	Not controlled	Controlled
QUANTITY CONTROLLED (TPD)		6.24 A
TOTAL QTY. ENTERING (TPD)		6.24 A
INSTALLED COST (\$)		11,500 A
ELECTRICAL REQ. (KW)		3 B
STEAM REQ. (MM BTU/d)		0
COOLING WATER REQ. (MM BTU/d)		0
FUEL I REQ. (MM BTU/d)		0.01 B
FUEL II REQ. (MM BTU/d)		0
FUEL III REQ. (MM BTU/d)		0
LABOR COST (\$/YR)		700 C
MATERIALS COST (\$/YR)		100 B
MAINTENANCE COST (\$/YR)		800 B
LABORATORY CHARGES (\$/YR)		0
OTHER MISC. COSTS (\$/YR)		0
MISC. COSTS FOOTNOTE		--
SOURCE OF COST DATA		--

EFFLUENT DATA TABLES

PLANT	ANG	ANG
DIVISION	20	20
EFFLUENT	14 (Gasifier Ash)	34 (H ₂ O)
QUANTITY EMITTED (TPD)	1763 A	613.3 A
QUANTITY FOOTNOTE	--	--
NATURE	Solid	Liquid
BIOLOGICAL HAZARD	Possible hazard A	Possible hazard A
BIOLOGICAL HAZARD FOOTNOTE	--	--
STATE	North Dakota	North Dakota
REGULATED CODE	1	1
SOURCE OF EFF. INFO.	--	--
DISPOSITION	To mine	To mine
PROCESS	--	--
CONTROLLED CODE	Controlled	Controlled
QUANTITY CONTROLLED (TPD)	1763 A	318.5 A
TOTAL QTY. ENTERING (TPD)	1763 A	510.8 A
INSTALLED COST (\$)	3,327,000 A	583,600 A
ELECTRICAL REQ. (KW)	944 B	170 B
STEAM REQ. (MM BTU/d)	0	0
COOLING WATER REQ. (MM BTU/d)	0	0
FUEL I REQ. (MM BTU/d)	2.812 B	0.51 B
FUEL II REQ. (MM BTU/d)	0	0
FUEL III REQ. (MM BTU/d)	0	0
LABOR COST (\$/YR)	195,000 C	35,100 C
MATERIALS COST (\$/YR)	31,800 B	5700 B
MAINTENANCE COST (\$/YR)	212,000 B	38,000 B
LABORATORY CHARGES (\$/YR)	0	0
OTHER MISC. COSTS (\$/YR)	0	0
MISC. COSTS FOOTNOTE	--	--
SOURCE OF COST DATA	--	--

APPENDIX B

COMPUTER PROGRAM DESCRIPTIONS FOR COMPARATIVE EFFLUENT ANALYSIS

- I OVERVIEW
- II PROGRAM 1 - FILE CREATION PROGRAM
- III PROGRAM 2 - EFFLUENT QUANTITY MATRIX LISTING
- IV PROGRAM 3 - COMPARATIVE MATRIX FOR EFFLUENT QUANTITIES
FROM EACH GASIFICATION FACILITY
- V PROGRAM 4 - COMPARATIVE EFFLUENT CONTROL COST
AND ENERGY CONSUMPTION
- VI PROGRAMS 5, 6, 7, 8 - RELIABILITY BREAKOUT LISTINGS
- VII PROGRAM 9 - SELECTIVE EXTRACTION PROGRAM

APPENDIX B - INTRODUCTION

Contained in this appendix are the data base creation program description, flowchart, listing, input card formats, and output file formats.

Also contained in this appendix are the program descriptions, listings, flowcharts (if needed), and input card formats for each of the programs which generate tables containing selected information.

DEFINITION OF SYMBOLS USED IN COMPUTER GENERATED TABLES

<u>DIVISION # AND MEANING</u>		<u>BIOLOGICAL HAZARDS</u>	<u>DISPOSITION CODES</u>
1	Coal Storage Area	NK - None Known	1 - to mine
2	Coal Preparation Area	MN - Minor	2 - to atmosphere
3	Raw Water Treatment	PH - Possible Hazard	3 - to surface water
4	Boiler Plant	HZ - Hazard	4 - to deep well disposal
5	Oxygen Plant	TX - Toxic	5 - to Claus unit
6	Gasifiers		6 - to incineration
7	Ash Dewatering and Transfer Facility		7 - to stack gas treatment unit
8	ADIP Plant		8 - to ash handling
9	Claus Sulfur Plant		9 - to boiler
10	Stretford Sulfur Plant		0 - to superheater
11	Claus Incinerator		
12	Vent Gas Incinerator		
13	Catalytic Incinerator		
14	Untreated Stack Gas Vent		
15	Stack Gas Treatment		
16	Waste Water Concentrator		
17	Biological Waste Water Treatment		
18	Evaporation and Ash Ponds		
19	Cooling Towers		
20	Total Emissions		
		<u>QUANTITY CODES</u>	<u>NATURE CODES</u>
		SM - Small	S - Solid
		MIN - Minor	L - Liquid
		NIL - Nil	G - Gas
		N - None Emitted	SL - Sludge
		NR - None Reported	
<u>PLANT IDENTIFICATION</u>		<u>RELIABILITY LEVELS</u>	
Plant #1 - El Paso, New Mexico		A Good Reliability	-A- Refer to Reliability = A
Plant #2 - Natural, North Dakota		B Fair Reliability	-B- Refer to Reliability = B
Plant #3 - WESCO, New Mexico		C Poor Reliability	-C- Refer to Reliability = C
Plant #4 - ANG, North Dakota			

SECTION I

OVERVIEW

- a) Introduction
- b) General Data Handling Flowchart

INTRODUCTION

A computerized information system was decided upon for the following reasons:

- (A) First of all, the effluent data which was being gathered together contained many plant-to-plant irregularities and inconsistencies. Data tables, which lent themselves to usage in a computerized system, were designed so that the data could be arranged for easier analysis and interpretation.
- (B) Secondly, the job of using these raw data tables to produce the comparison type tables required for the final report would be tedious, time-consuming work if done by hand. In addition, the likelihood of many revisions, owing to the unstable nature of the data, also pointed toward a computerized table-producing system.
- (C) Finally was the fact that such a system could be written while the data was still being gathered. This would mean a savings in time, since the production of tables by hand could not begin before all the data was collected.

GENERAL DATA HANDLING FLOWCHART

FILE
CREATION
PROGRAM

LISTING
PROGRAM
(GENERAL)

SECTION II

PROGRAM 1 - FILE CREATION PROGRAM

- a) Description
- b) Effluent Data Card Formats (Table B-1)
- c) Effluent Data File Format (Table B-2)
- d) Creation Program Flowchart
- e) Listing

PROGRAM #1 (File Creation Program)

Purpose: To read in the effluent and cost information off of data cards. determine valid and reasonable data, and to create the data base to be used by the listing program.

Input Cards: Two decks will be required. First the footnote deck which will contain all the footnotes referenced by the listing programs. This will be used to check that all footnote keys given on the effluent input cards have a corresponding entry in the footnote file. Second will be the deck of effluent data input cards.

Printed Output: Records entered onto the file will be printed for checking and future reference purposes; in addition, cards read in that contain invalid data which will be listed along with the appropriate error messages.

Manipulation of the Data Base: This program creates the data base by taking the file of all valid records and sorting it in the following order:

- a) First by plant number (1-4) in ascending order
- b) then by major plant division (1-20) in ascending order
- c) finally by effluent number (1-60) in ascending order

The sorted file is then stored on magnetic tape. This sort provides for a naturally ordered data base, but one which will not be, in most cases, the best arrangement of the data records for a particular listing program. Those arrangements will be discussed in more detail in the 'Data Manipulation' sections of the listing programs. The order given above, though, does lend itself toward the listing of records for one plant, one or more divisions within a particular plant, effluents from one division of one plant, and so on.

EXPLANATION OF FORMAT TABLES

Following is Table B-1, explaining the input format of the data cards for the file creation program. These input cards (cards A, B, and C) were required for each effluent emission reported from each division of each plant.

Table B-2 explains the output format of the data on magnetic tape. The tape generated by this program is used as a data base for the remainder of the programs.

TABLE B-1

EFFLUENT DATA CARD FORMATS

<u>Variable</u>	<u>Columns Required</u>	<u>Card Columns</u>	<u>Possible Value (s)</u>
<u>CARD A</u>			
CARD_KEY	1	1	'A'
PLANT_NUMBER	1	2	1,2,3,4
DIVISION_NUMBER	2	3-4	1-20 (Total = 20)
EFFLUENT_NUMBER	2	5-6	1-60
QUANTITY_EMITTED	10	7-16	123456.789, SM, MIN, NIL
QUANTITY_FOOTNOTE	2	17-18	A0-Z9
QTY_RELIABILITY	1	19	A,B,C
NATURE	2	20-21	S,L,G,SL
BIOLOGICAL_HAZARD	2	22-23	TX,HZ,PH,MN,NK
BIOHAZ_FOOTNOTE	2	24-25	A0-Z9
BIOHAZ_RELIABILITY	1	26	A,B,C
STATE_CODE	1	27	1,2
REG_EFF_KEY	1	28	0,1,2
SOURCE_EFF	3	29-31	LAB,DES,VEN,EXP,EPA,THE,OTH
DISPOSITION_CODE	1	32	0-9
PROCESS	40	33-72	STRETFORD-CLAUS, INCINERATION, etc.
CONTR_EFF_KEY	1	73	Y,N
FILLER	4	74-77	blank
UPDATE_CODE	3	78-80	ADD,REP,DEL
<u>CARD B</u>			
INPUT_CARD_KEY	1	1	'B'
QUANTITY_CONTROLLED	8	2-9	12345.67, SM, MIN, NIL
QTY_CONTR_RELIABILITY	1	10	A,B,C
TOT_QTY_ENTERRING	8	11-18	123456.7, SM, MIN, NIL
TOT_QTY_RELIABILITY	1	19	A,B,C
INSTALLED_COST	9	20-28	100,000,000
IC_RELIABILITY	1	29	A,B,C
ELECTRICAL_REQ	4	30-34	1000
ER_RELIABILITY	1	35	A,B,C
STEAM_WATER_REQ	8	36-43	1000.000
SWR_RELIABILITY	1	44	A,B,C
COOLING_WATER_REQ	8	45-52	1000.000
CWR_RELIABILITY	1	53	A,B,C
FUEL_1_REQ	8	54-61	1000.000
FIR_RELIABILITY	1	62	A,B,C
FUEL_2_REQ	8	63-70	1000.000
F2R_RELIABILITY	1	71	A,B,C
FUEL_3_REQ	8	72-79	1000.000
F3R_RELIABILITY	1	80	A,B,C

TABLE B-1 (Continued)

CARD C

INPUT	1	1	'C'
LABOR_COST	6	2-7	100,000
LC_RELIABILITY	1	8	A,B,C
MATERIAL_COST	7	9-15	1,000,000
MATRC_RELIABILITY	1	16	A,B,C
MAINTENANCE_COST	7	17-23	1,000,000
MAINC_RELIABILITY	1	24	A,B,C
LABORATORY_CHARGES	6	25-30	100,000
LABCH_RELIABILITY	1	31	A,B,C
OTHER_MISC_COSTS	7	32-38	1,000,000
OTHMC_RELIABILITY	1	39	A,B,C
SOURCE_COST	3	40-42	LAB,DES,YEN,EXP,EPA,THE,OTH
FILLER	39	43	blank

FOOTNOTE DATA CARD FORMAT

<u>Variable</u>	<u>Columns Required</u>	<u>Card Columns</u>	<u>Possible Value(s)</u>
Key	2	1-2	A0-29
Contents	78	3-80	Any Valid Character String 78 bytes long

TABLE B-2

EFFLUENT DATA FILE FORMAT

<u>Field Name</u>	<u>Field Length (in bytes)</u>	<u>Starting field pos.</u>	<u>Possible Value (s)</u>
PL_NUM	1	1	1,2,3,4
DIV_NUM	2	2	1-20 (Total = 20)
EFF_NUM	2	4	1-60
EFF_DESCRIPTION	12	6	NAPTHA, HCN, etc.
QTY_EMITTED	10	18	123456.789
QTY_EMITTED_FTNOTE	2	28	A0-Z9
QE_REL	1	30	A,B,C
NATURE_EFF	2	31	S,L,G,SL
BIOLOGICAL_HAZ	2	33	TX,HZ,PH,MN,NK
BIOHAZ_FTNOTE	2	35	A0-Z9
BIOHAZ_REL	1	37	A,B,C
STATE_KEY	1	38	1,2
REGULATED_EFF_KEY	1	39	0,1,2
SOURCE_EFF_INFO	3	40	LAB,DES,VEN,EXP,EPA,THE,OTH
DISP_CODE	1	43	0-9
PROCESS_DESC	40	44	STRETFORD-CLAUS,INCINERATION,etc
CONTROLLED_EFF_KEY	1	84	Y,N
QTY_CONTROLLED	8	85	12345.67
QC_REL	1	93	A,B,C
TOTAL_QTY_INPUT	8	94	123456.7
TOT_QTY_REL	1	102	A,B,C
INSTALLED_CAP_COST	9	103	100,000,000
ICC_REL	1	112	A,B,C
TOT_ENERGY_REQ	6	113	12345 A
TOT_ENERGY_COST	8	119	1234567 B
TOT_OPER_COST	8	127	1234567 C
TOT_ENERGY_PER_QTY_CONTR	6	135	12345 A
ENERGY_COST_PER_QTY_CONTR	6	141	12345 B
ENERGY_COST_PER_QTY_EMITTED	6	147	12345 C
SOURCE_COST_INFO	3	153	LAB,DES,VEN,EXP,EPA,THE,OTH
FILLER	45	156	blank

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//STEP2 EXEC PL11FCLG.PARY=X,A,SM=(7,72,1).LINECNT=800.TIME=60=5
//PL11.SYSIN DD *
/* FILE CREATION & MAINTENANCE PROGRAM */
EFFDATA: PROCEDURE OPTIONS(MAIN) ;
-DECLARE
  SYSIN      FILE RECORD INPUT .
  EFFIN      FILE RECORD SEQUENTIAL .
  EFFOUT     FILE RECORD KEYED ENV(INDEXED) .
  SORTIN     FILE RECORD SEQUENTIAL .
  SORTOUT    FILE RECORD SEQUENTIAL OUTPUT ;
-DCL 01 EFFLUENT OUTPUT RECORD .
  02 SUBGRID A .
    03 FILE KEY .
      04 FL NUM          CHAR(1) .
      04 DIV NUM        CHAR(2) .
      04 EFF NUM        CHAR(2) .
    03 EFF DESCRIPTION  CHAR(12) .
    03 QTY EMITTED      CHAR(10) .
    03 QTY EMITTED FTIME CHAR(2) .
    03 OE PFL          CHAR(1) .
    03 NATURE EFF       CHAR(2) .
    03 BIOLOGICAL HAZ   CHAR(2) .
    03 BIOHAZ FTIME     CHAR(2) .
    03 BIOHAZ REL       CHAR(1) .
    03 STATE KEY        CHAR(1) .
    03 REGULATED EFF KEY CHAR(1) .
    03 SOURCE EFF INFO  CHAR(3) .
    03 DISP CODE        CHAR(1) .
    03 PROCESS DESC     CHAR(40) .
    03 CONTROLLED EFF KEY CHAR(1) .
  02 SUBGRID B .
    03 QTY CONTROLLED    CHAR(8) .
    03 OC PFL           CHAR(1) .
    03 TOTAL QTY INPUT   CHAR(8) .
    03 TOT QTY REL       CHAR(1) .
    03 INSTALLED CAP COST CHAR(9) .
    03 ICC ASL          CHAR(1) .
    03 TOT ENERGY REQ.  CHAR(5) .
    03 TOT ENERGY COST  CHAR(8) .
    03 TOT PPLR COST     CHAR(8) .
    03 TOT ENERGY PER QTY CONTR CHAR(6) .
    03 ENERGY COST PER QTY CONTR CHAR(6) .
    03 ENERGY COST PER QTY EMITTED CHAR(6) .
    03 SOURCE COST INFO  CHAR(3) .
    02 FILLER
  -DCL 01 REPLACE RECORD .
    02 PARTA          CHAR(24) .
    02 PARTB          CHAR(71) .
    02 FILLER         CHAR(45) ;
10DCL 01 CARD A BASED(CARDIN) .
  02 CARD KEY          CHAR(1) .
  02 PLANT NUMBER      CHAR(1) .
  02 DIVISION NUMBER   CHAR(2) .
  02 EFFLUENT NUMBER    CHAR(2) .
  02 QUANTITY EMITTED   CHAR(10) .
  02 QTY FOOTNOTE       CHAR(2) .
  02 QTY RELIABILITY    CHAR(1) .
  02 NATURE             CHAR(2) .
  02 BIOLOGICAL HAZARD  CHAR(2) .
  02 BIOHAZ FOOTNOTE    CHAR(2) .
  02 BIOHAZ RELIABILITY CHAR(1) .
  02 STATE CODE         CHAR(1) .
  02 REG EFF KEY        CHAR(1) .
  02 SOURCE EFF         CHAR(3) .
  02 DISPOSITION CODE   CHAR(1) .
  02 PROCESS            CHAR(40) .
  02 CONTR EFF KEY      CHAR(1) .
  02 FILLER             CHAR(4) .
  02 UPDATE CODE        CHAR(3) ;
00DCL 01 CARD E BASED(CARDIN) .
  02 INPUT CARD KEY     CHAR(1) .
  02 QUANTITY CONTROLLED CHAR(8) .

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02 QTY CONTR RELIABILITY CHAR(1) .
02 TOT QTY ENTERING CHAR(8) .
02 TOT QTY RELIABILITY CHAR(1) .
02 INSTALLED COST CHAR(5) .
02 IC RELIABILITY CHAR(1) .
02 ELECTRICAL REC CHAR(5) .
02 EP RELIABILITY CHAR(1) .
02 STEAM WATER REC CHAR(8) .
02 SWR RELIABILITY CHAR(1) .
02 COOLING WATER REC CHAR(5) .
02 CWP RELIABILITY CHAR(1) .
02 FUEL1 REC CHAR(5) .
02 F1P RELIABILITY CHAR(1) .
02 FUEL2 REC CHAR(5) .
02 F2P RELIABILITY CHAR(1) .
02 FUEL3 REC CHAR(5) .
02 F3P RELIABILITY CHAR(1) .
ODCL 01 CARD C BASED(CARDIN) .
02 INPUT CARD KEY CHAR(1) .
02 LABOR COST CHAR(5) .
02 LC RELIABILITY CHAR(1) .
02 MATERIALS COST CHAR(7) .
02 MATRC RELIABILITY CHAR(1) .
02 MAINTENANCE COST CHAR(7) .
02 MAINC RELIABILITY CHAR(1) .
02 LABORATORY CHARGES CHAR(5) .
02 LABCH RELIABILITY CHAR(1) .
02 OTHER MISC COSTS CHAR(7) .
02 OTHMC RELIABILITY CHAR(1) .
02 SOURCE COST CHAR(5) .
02 FILLER CHAR(35) .
-DCL 01 DELETE CARD IMAGE BASED(CARDIN) .
02 INPUT CARD KEY CHAR(1) .
02 DEL KEY CHAR(5) .
02 FILLER CHAR(74) .
-DCL 01 FOOTNOTE CARD BASED(CARDIN) .
02 KEY CHAR(2) .
02 CONTENTS CHAR(78) .
IDCL CARD IMAGE CHAR(80) BASED(CARDIN) .
-DCL 01 CONTROL CARD IMAGE BASED(CARDIN) .
02 CONTROL CHAR(5) .
02 FILLER CHAR(74) .
-DCL 01 FOOTNOTE CHECK BASED(CARDIN) .
02 FILL1 CHAR(15) .
02 ALPHA KEY CHAR(1) .
02 NUM KEY CHAR(1) .
02 FILL2 CHAR(5) .
02 R1C ALPHA CHAR(1) .
02 R1C NUM CHAR(1) .
02 FILL3 CHAR(55) .
ODECLARE
TOTAL1 FIXED DECIMAL(9,4) .
TOTAL2 FIXED DECIMAL(5,0) .
TOTAL3 FIXED DECIMAL(7,0) .
TOTAL4 FIXED DECIMAL(7,0) .
TOTAL5 FIXED DECIMAL(5,0) .
TOTAL6 FIXED DECIMAL(5,0) .
TOTAL7 FIXED DECIMAL(5,0) .
PNTR FIXED BINARY(15,0) INITIAL(0) .
(1,11,12) FIXED BINARY(15,0) .
NUMADD FIXED BINARY(15,0) INITIAL(0) .
(P NUM,E NUM) FIXED BINARY(15,0) .
(R1,R2,R3,R4,R5,R6,R7,R8) FIXED BINARY(15,0) .
(R9,R10,R11,R12,R13) FIXED BINARY(15,0) .
(R14,R15,R16) FIXED BINARY(15,0) .
(QTY1 CHK,QTY2 CHK) FIXED BINARY(1) INITIAL('0'R) .
ODECLARE
(QTYE,QTYC) FLOAT DECIMAL .
(IC,EP,SWR,CWR,F1P,F2P) FLOAT DECIMAL .
(F3P,LC,MATRC,MAINC) FLOAT DECIMAL .
(LABCH,OTHMC) FLOAT DECIMAL .
REL FLOAT DECIMAL .

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ODECLARE
TOT RFL CHARACTER(1) .
TOT CHAP CHARACTER(12) . VARYING .
FOOTNOTE KEY(260) CHARACTER(12) .
FUNCTION STRING CHARACTER(12) . INITIAL('ADD REP DEL ') .
RM CHARACTER(12) .
S CHARACTER(12) .
STATE CHARACTER(12) .
FILE NUM CHARACTER(12) .
FLOAT STRING CHARACTER(12) . INITIAL(' 0123456789.') .
DEC STRING CHARACTER(11) . INITIAL(' 0123456789') .
ZERO OUT CHARACTER(75) .
ZERO OUT = REPEAT('0',74) .

DECLARE
STACK ENTRY(50) CHARACTER(80) .
STACK IMAGE CHARACTER(80) . VARYING .

DECLARE
CNV CHECK CHARACTER(4) . INITIAL('PASS') .
RECORD CHECK CHARACTER(4) . INITIAL('PASS') .
KEY CHK CHARACTER(4) . INITIAL('PASS') .
CONTROL CHK CHARACTER(6) .
(LABEL1,LABEL2,LABEL3) CHARACTER(30) . VARYING .
LABEL4 CHARACTER(1) .

DECLARE
INSETA ENTRY( CHAR(24),CHAR(28),FIXED BIN(31,0),FIXED BIN(31,0) ) .
RETURN CODE FIXED BINARY(31,0) .

1DECLARE
EFF DESC(60) CHARACTER(12) . INITIAL(
'AL2O3' . 'AL(OH)3' . 'AL2(SO4)3' . 'BICARBONATE' .
'BOILER ASH' . 'CaCO3' . 'CaO' . 'CASO3.2H2O' .
'CASO4.2H2O' . 'CHLORIDE' . 'COAL DUST' . 'Fe2O3' .
'FLY ASH' . 'GASIFIER ASH' . 'K2O' . 'MGO' .
'NA2O' . 'NA2SO3' . 'NA2SO4' . 'P2O3' .
'PARTICULATES' . 'PHOSPHATE' . 'REFUSE' . 'SiO2' .
'SO3' . 'SO4' . 'S7O2' . 'SULPHUR' .
'SUSP. SOLIDS' . 'UNREACTED C' . 'CHLORIDES' . 'FATTY ACIDS' .
'HCl' . 'H2O' . 'NH3' . 'PHENOLICS' .
'SULPHUR' . 'THIOCYANATES' . 'CO' . 'COS' .
'CO2' . 'CS2' . 'FATTY ACIDS' . 'HCN' .
'HYDROCARBONS' . 'H2' . 'H2O' . 'H2S' .
'NAPHTHA' . 'NH3' . 'NIX' . 'N2' .
'O2' . 'PHENOLICS' . 'PYRIDINES' . 'SO2' .
'THIOCYANATES' . 'SLUDGE (RWT)' . 'SLUDGE (3WT)' . 'SLUDGE (CTB)' ) .

-DECLARE
UC(6,4) FIXED DECIMAL(6,4) . INITIAL(
0.0140,0.0140,0.0140,0.0140, / * COST OF ELECTRICAL POWER * /
0.7850,0.5844,0.2217,0.5800, / * COST OF STEAM * /
0.3155,0.6271,0.7104,0.0000, / * COST OF COOLING WATER * /
3.3390,3.3390,3.3390,3.3390, / * COST OF FUEL I * /
0.0000,0.0000,0.0000,0.0000, / * COST OF FUEL II * /
0.0000,0.0000,0.0000,0.0000 ) : / * COST OF FUEL III * /

-DECLARE
QTY ABBREVS(6) CHARACTER(10) . INITIAL( ' SM' .
' MIN' . ' NIL' . ' NEG' . ' ' . ' ' ) .

1 ON CONVERSION BEGIN :
ONSOURCE = '0000000000000000' :
CNV CHECK = 'FAIL' :
END :

- ON KEY(EFFOUT) BEGIN :
IF ONCODE = 52 THEN DO :
STACK IMAGE='**ERROR** RECORD NUMBER ||FILE NUM|| ALREADY EXISTS' :
CALL STACK :
STACK IMAGE = '** RECORD NOT ADDED DUE TO DUPLICATE RECORD #' :
CALL STACK :
END :
ELSE IF ONCODE = 51 THEN DO :
STACK IMAGE='**ERROR** CANNOT PERFORM UPDATE ON NON-EXISTANT RECORD' :
CALL STACK :
IF STATE = 'DEL' THEN DO :
STACK IMAGE = '** RECORD NOT DELETED DUE TO NON-EXISTANT RECORD #' :
|| DEL KEY :
CALL STACK :

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END ;
ELSE IF STATE = 'REP' THEN DO ;
  STACK IMAGE = '***RECORD NOT REPLACED DUE TO NON-EXISTANT RECORD **'
  CALL STACK ;
END ;
ELSE ;
END ;
ELSE DO ;
  STACK IMAGE = '***ERROR***' ***GENERAL KEY ERROR*** ;
  CALL STACK ;
END ;
KEY CHK = 'FAIL' ;
END ;
- ON ENDFILE(SYSIN) BEGIN ;
  CLOSE FILE(SYSIN) ;
  IF STATE = 'ADD' || STATE = 'REP' THEN DO ;
    STACK IMAGE = '***ERROR***INSUFFICIENT DATA TO PERFORM *** || STATE ||
    *** FUNCTION' ;
    CALL STACK ;
    CALL LIST STACK ;
  END ;
  ELSE IF STATE = 'GET' THEN
    PUT PAGE EDIT('** END OF DATA REACHED - SUCCESSFUL TERMINATION') (A);
  ELSE CALL LIST STACK ;
  CALL SORTA ;
  GO TO END OF PROGRAM ;
END ;
1 OPEN FILE(SYSIN) INPUT ;
  READ FILE(SYSIN) SET(CARDIN) ;
  CONTROL CHK = CONTROL ;
  PUT EDIT(CARD IMAGE) (PAGE,A) ;
  IF CONTROL = 'CREATE' THEN DO ;
    OPEN FILE(EFFIN) SEQUENTIAL INPUT, FILE(EFFOUT) SEQUENTIAL OUTPUT ;
    ON ENDFILE(EFFIN) GO TO TWO ;
ONE: DO WHILE('1'B) ;
  READ FILE(EFFIN) INTO (EFFLUENT OUTPUT RECORD) ;
  FILE NUM = PL NUM || DIV NUM || EFF NUM ;
  WRITE FILE(EFFOUT) FROM(EFFLUENT OUTPUT RECORD) KEYFROM(FILE NUM);
END ONE ;
TWO: CLOSE FILE(EFFIN) , FILE(EFFOUT) ;
  OPEN FILE(EFFOUT) DIRECT UPDATE ;
  END ;
  ELSE DO ;
    CLOSE FILE(EFFOUT) ;
    OPEN FILE(EFFIN) SEQUENTIAL OUTPUT ;
  END ;
  READ FILE(SYSIN) SET(CARDIN) ;
  I = 0 ;
0STEP1:
  READ FILE(SYSIN) SET(CARDIN) ;
  FOOTNOTE KEY(I) = KEY ;
  J = 1 ;
  DO WHILE( CARD IMAGE = REPEAT(' ',79) ) ;
    READ FILE(SYSIN) SET(CARDIN) ;
    PUT EDIT(CARD IMAGE) (SKIP,A) ;
    I = I + 1 ;
    IF KEY = FOOTNOTE KEY(J) THEN DO ;
      J = J + 1 ;
      FOOTNOTE KEY(J) = KEY ;
    END ;
  END ;
  PUT SKIP EDIT(I, ' FOOTNOTE CARDS READ IN') (F(4,0),A,SKIP) ;
  PUT PAGE ;
0STEP2:
  DO WHILE('1'B) ;
    STATE = 'GET' ;
    READ FILE(SYSIN) SET(CARDIN) ;
    STACK IMAGE = CARD IMAGE ;
    CALL STACK ;
    I1 = ( INDEX(FUNCTION STRING,UPDATE CODE)+1)/4 ;
    IF I1=1 THEN CALL ADD SECTION ;
  END ;

```



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ELSE IF I1=2 THEN CALL REPLACE SECTION:
ELSE IF I1=3 THEN CALL DELETE SECTION:
ELSE DO:
  STACK IMAGE = **ERROR** INCORRECT UPDATE CODE IN CARD COLS 79-80:
  CALL STACK:
  CALL LIST STACK:
  PUT SKIP(1):
  END:
  PUT PAGE:
  END STEP2:
1DELETE SECTION: PROCEDURE:
  PUT EDIT(' ** DELETE CARD **') (SKIP,A):
  CALL LIST STACK:
  STATE = 'DEL':
  IF PLANT NUMBER < '1' | PLANT NUMBER > '4' |
  DIVISION NUMBER < '01' | DIVISION NUMBER > '20' |
  EFFLUENT NUMBER < '01' | EFFLUENT NUMBER > '60' THEN
  PUT EDIT('**ERROR** INVALID FILE KEY. RECORD NOT DELETED')(SKIP,A):
  ELSE DO:
    READ FILE(EFFOUT) INTO (EFFLUENT OUTPUT RECORD) KEY(DEL KEY):
    IF KEY CHK = 'PASS' THEN DO:
      DELETE FILE(EFFOUT) KEY(DEL KEY):
      PUT EDIT('*** RECORD SUCCESSFULLY DELETED ***. RECORD DELETED:'.
        SUBGRID A.SUBGRID B)
        (SKIP(2).A.SKIP(3).A.SKIP.17 A.SKIP.13 A):
    END:
  ELSE DO:
    CALL LIST STACK:
    KEY CHK = 'PASS':
  END:
  RECORD CHECK = 'PASS':
  CONV CHECK = 'PASS':
  RETURN:
END DELETE SECTION:
1ADD SECTION: PROCEDURE:
  STATE = 'ADD':
  PUT EDIT(' ** EFFLUENT DATA CARDS FOR RECORD TO BE ADDED **')(A):
  PUT SKIP(2):
  CALL COMMON SECTION:
  FILE NUM = PL NUM || DIV NUM || EFF NUM:
  IF RECORD CHECK = 'PASS' THEN DO:
    IF CONTROL CHK = 'CREATE' THEN
      WRITE FILE(EFFIN) FROM (EFFLUENT OUTPUT RECORD):
    ELSE
      WRITE FILE(EFFOUT) FROM (EFFLUENT OUTPUT RECORD) KEYFROM(FILE NUM):
    IF KEY CHK = 'PASS' THEN DO:
      NUMADD = NUMADD + 1:
      CALL LIST STACK:
      PUT EDIT('*** RECORD SUCCESSFULLY ADDED ***') (SKIP,A):
      PUT EDIT('RECORD ADDED:'.SUBGRID A.SUBGRID B)
        (SKIP(3).A.COL(1).17 A.COL(1).13 A):
    END:
  ELSE DO:
    CALL LIST STACK:
    KEY CHK = 'PASS':
  END:
  END:
  ELSE DO:
    CALL LIST STACK:
    PUT SKIP EDIT('** EFFLUENT RECORD ** || FILE NUM || * NOT ADDED *.
      *DUE TO ERRORS LISTED ABOVE.* ** MAKE PROPER *.
      *CORRECTIONS AND RESUBMIT.*') (SKIP,A,A):
    RECORD CHECK = 'PASS':
  END:
  RETURN:
END ADD SECTION:
1REPLACE SECTION: PROCEDURE:
  STATE = 'REP':
  PUT EDIT(' ** EFFLUENT DATA CARDS FOR REPLACEMENT RECORD **') (A):
  PUT SKIP(2):
  CALL COMMON SECTION:

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FILE NUM = PL NUM || DIV NUM || EFF NUM ;
IF RECORD CHECK = 'PASS' THEN DO ;
  READ FILE(EFFOUT) INTO(REPLACE RECORD) KEY(FILE NUM) ;
  IF KEY CHK = 'PASS' THEN DO ;
    REWRITE FILE(EFFOUT) FROM(EFFLUENT OUTPUT RECORD) KEY(FILE NUM) ;
    CALL LIST STACK ;
    PUT EDIT('*** RECORD SUCCESSFULLY REPLACED ***',REPLACED RECORD) ;
    PARTA,PARTB,REPLACEMENT RECORD, SUBGRID A, SUBGRID B) ;
    (SKIP,A,SKIP(3),A,SKIP,A,SKIP,A,SKIP(3),A,SKIP,17 A,SKIP,13 A) ;
  END ;
ELSE DO ;
  KEY CHK = 'PASS' ;
  CALL LIST STACK ;
END ;
ELSE DO ;
  CALL LIST STACK ;
  RECORD CHECK = 'PASS' ;
  PUT SKIP EDIT('*** EFFLUENT RECORD *||FILE NUM|| * NOT REPLACED *',
    'DUE TO ERRORS LISTED ABOVE.', '*** MAKE PROPER *',
    'CORRECTIONS AND RESUBMIT.')(SKIP,A,A) ;
END ;
RETURN ;
END REPLACE SECTION ;
1 COMMON SECTION: PROCEDURE ;
0 IF CARD KEY = 'A' THEN DO ;
  CALL CARD ERR('A') ;
  RETURN ;
END ;
0 IF PLANT NUMBER < '1' ;
  PLANT NUMBER > '4' THEN CALL STR ERR('PLANT NUMBER') ;
ELSE DO ;
  P NUM = PLANT NUMBER ;
  PL NUM = PLANT NUMBER ;
END ;
0 IF DIVISION NUMBER < '01' ;
  DIVISION NUMBER > '20' THEN CALL STR ERR('DIVISION NUMBER') ;
ELSE DIV NUM = DIVISION NUMBER ;
0 IF EFFLUENT NUMBER < '01' ;
  EFFLUENT NUMBER > '80' THEN CALL STR ERR('EFFLUENT NUMBER') ;
ELSE DO ;
  E NUM = EFFLUENT NUMBER ;
  EFF NUM = EFFLUENT NUMBER ;
END ;
0 IF RECORD CHECK = 'PASS' THEN EFF DESCRIPTION = EFF DESC(E NUM) ;
0 IF INDEX( STRING( QTY ABBREVS ), QUANTITY EMITTED ) THEN DO ;
  QTY1 CHK = '1'B ;
  QTY EMITTED = QUANTITY EMITTED ;
END ;
ELSE IF VERIFY( QUANTITY EMITTED, FLOAT STRING ) THEN
  CALL STR ERR('QUANTITY EMITTED') ;
ELSE DO ;
  QTY1 CHK = '0'B ;
  QTYE = QUANTITY EMITTED ;
  IF CONV CHECK = 'FAIL' THEN CALL CONV ERR('QUANTITY EMITTED') ;
  ELSE IF QTYE > 0.0 & QTYE < 100000.0 THEN QTY EMITTED = QUANTITY EMITTED ;
  ELSE CALL RANGE ERR('QUANTITY EMITTED') ;
END ;
0 IF QTY FOOTNOTE = ' ' THEN QTY EMITTED F1NOTE = QTY FOOTNOTE ;
ELSE DO ;
  I2 = INDEX( STRING( FOOTNOTE KEY ), QTY FOOTNOTE ) ;
  IF ( ALPHA KEY < 'A' | ALPHA KEY > 'Z' |
    NUM KEY < '0' | NUM KEY > '9' ) THEN CALL STR ERR('QTY FOOTNOTE') ;
  ELSE IF I2 = 0 THEN DO ;
    STACK IMAGE = '***ERROR*** CANNOT FIND KEY FOR QTY FOOTNOTE * ||
      'IN FOOTNOTE DECK' ;
    CALL STACK ;
    RECORD CHECK = 'FAIL' ;
  END ;
  ELSE QTY EMITTED F1NOTE = QTY FOOTNOTE ;
END ;
0 RI = INDEX( 'CBA', QTY RELIABILITY ) ;

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IF R1 > 0 THEN GO REL = QTY RELIABILITY ;
ELSE CALL STR ERR('QTY RELIABILITY') ;
0 IF NATURE='S' | NATURE='L' | NATURE='G' | NATURE='SL'
  THEN NATURE EFF = NATURE ;
  ELSE CALL STR ERR('NATURE') ;
1 RH = BIOLOGICAL HAZARD ;
  IF (RH='TX') | (RH='H2') | (RH='NN') | (RH='PH') | (RH='NK') THEN
    BIOLOGICAL HAZ = BIOLOGICAL HAZARD ;
  ELSE CALL STR ERR('BIOLOGICAL HAZARD') ;
0 IF BIOHAZ FOOTNOTE = ' ' THEN BIOHAZ FTNGTE = BIOHAZ FOOTNOTE ;
  ELSE DO ;
    I2 = INDEX(STRING(FOOTNOTE KEY),BIOHAZ FOOTNOTE) ;
    IF (BIO ALPHA<'A' | BIO ALPHA>'Z'
      BIO NUM<'0' | BIO NUM>'9') THEN CALL STR ERR('BIOHAZ FOOTNOTE') ;
    ELSE IF I2=0 THEN DO ;
      STACK IMAGE = 'ERROR** CANNOT FIND KEY FOR BIOHAZ FOOTNOTE ' ||
        'IN FOOTNOTE DECK' ;
      CALL STACK ;
      RECCRD CHECK = 'FAIL' ;
      END ;
    ELSE BIOHAZ FTNGTE = BIOHAZ FOOTNOTE ;
  END ;
0 IF INDEX('CBA',BIOHAZ RELIABILITY) THEN
  BIOHAZ REL = BIOHAZ RELIABILITY ;
  ELSE CALL STR ERR('BIOHAZ RELIABILITY') ;
0 IF INDEX('12',STATE CODE) THEN STATE KEY = STATE CODE ;
  ELSE CALL STR ERR('STATE CODE') ;
0 IF INDEX('012',REG EFF KEY) THEN REGULATED EFF KEY = REG EFF KEY ;
  ELSE CALL STR ERR('REG EFF KEY') ;
0 S = SOURCE EFF ;
  IF S='LAB' | S='DES' | S='EXP' | S='VEN' | S='EPA' | S='THE' | S='OTH'
    | S=' ' THEN SOURCE EFF INFO = SOURCE EFF ;
  ELSE CALL STR ERR('SOURCE EFF') ;
0 IF DISPOSITION CODE < '0' | DISPOSITION CODE > '9' THEN
  CALL STR ERR('DISPOSITION CODE') ;
  ELSE DISP CODE = DISPOSITION CODE ;
0 PROCESS DESC = PROCESS ;
0 IF CONTR EFF KEY = 'Y' | CONTR EFF KEY = 'N' THEN
  CONTROLLED EFF KEY = CONTR EFF KEY ;
  ELSE CALL STR ERR('CONTR EFF KEY') ;
1 /* NOW CHECK THE COST DATA IF THE EFFLUENT IS TO BE CONTROLLED */
0 IF CONTR EFF KEY = 'Y' THEN DO ;
  READ FILE(SYSIN) SFT(CARDIN) ;
  STACK IMAGE = CARD IMAGE ;
  CALL STACK ;
  IF CARD KEY = 'B' THEN DO ;
    CALL CARD ERR('B') ;
    RETURN ;
  END ;
0 IF INDEX(STRING(QTY ABBREVS),QUANTITY CONTROLLED) THEN DO ;
  QTY2 CHK = '1'B ;
  QTY CONTROLLED = QUANTITY CONTROLLED ;
  END ;
  ELSE IF VERIFY(QUANTITY CONTROLLED,FLOAT STRING) THEN
    CALL STR ERR('QUANTITY CONTROLLED') ;
  ELSE DO ;
    QTY2 CHK = '0'B ;
    QTYC = QUANTITY CONTROLLED ;
    IF CONV CHECK='FAIL' THEN CALL CONV ERR('QUANTITY CONTROLLED') ;
    ELSE IF QTYC > 0.0 & QTYC < 100000.0 THEN
      QTY CONTROLLED = QUANTITY CONTROLLED ;
      ELSE CALL RANGE ERR('QUANTITY CONTROLLED') ;
    END ;
0 R2 = INDEX('CBA',QTY CONTR RELIABILITY) ;
  IF R2 > 0 THEN GO REL = QTY CONTR RELIABILITY ;
  ELSE CALL STR ERR('QTY CONTR RELIABILITY') ;
0 IF INDEX(STRING(QTY ABBREVS),TOT QTY ENTERRING) THEN
  TOTAL QTY INPUT = TOT QTY ENTERRING ;
  ELSE IF VERIFY(TOT QTY ENTERRING,FLOAT STRING) THEN
    CALL STR ERR('TOT QTY ENTERRING') ;
  ELSE DO ;
    TOTAL1 = TOT QTY ENTERRING ;

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IF CONV CHECK='FAIL' THEN CALL CONV ERR('TOT QTY ENTERING') ;
ELSE IF TOTAL1 > 0.0 & TOTAL1 < 100000.0 THEN
  TOTAL QTY INPUT = TOT QTY ENTERING ;
ELSE CALL RANGE ERR('TOT QTY ENTERING') ;
END ;
0 IF INDEX('CBA',TOT QTY RELIABILITY) THEN
  TOT QTY REL = TOT QTY RELIABILITY ;
ELSE CALL STR ERR('TOT QTY RELIABILITY') ;
0 IF VERIFY(INSTALLED COST,DEC STRING) THEN
  CALL STR ERR('INSTALLED COST') ;
ELSE DO :
  IC = INSTALLED COST ;
  IF CONV CHECK = 'PASS' THEN DO :
    IF IC >= 0 & IC < 1000000000 THEN INSTALLED CAP COST = INSTALLED COST ;
    ELSE CALL RANGE ERR('INSTALLED COST') ;
  END ;
  ELSE CALL CONV ERR('INSTALLED COST') ;
  END ;
0 R3 = INDEX('CBA',IC RELIABILITY) ;
  IF R3 > 0 THEN ICC REL = IC RELIABILITY ;
  ELSE CALL STR ERR('IC RELIABILITY') ;
0 IF VERIFY(ELECTRICAL REQ,FLOAT STRING) THEN
  CALL STR ERR('ELECTRICAL REQ') ;
ELSE DO :
  ER = ELECTRICAL REQ ;
  IF CONV CHECK = 'FAIL' THEN CALL CONV ERR('ELECTRICAL REQ') ;
  IF ER < 0 | ER > 99999 THEN CALL RANGE ERR('ELECTRICAL REQ') ;
  END ;
0 R4 = INDEX('CBA',ER RELIABILITY) ;
  IF R4 = 0 THEN CALL STR ERR('ER RELIABILITY') ;
1 IF VERIFY(STEAM WATER REQ,FLOAT STRING) THEN
  CALL STR ERR('STEAM WATER REQ') ;
ELSE DO :
  SWR = STEAM WATER REQ ;
  IF CONV CHECK='FAIL' THEN CALL CONV ERR('STEAM WATER REQ') ;
  IF SWR < 0.0 | SWR >= 100000.0 THEN
    CALL RANGE ERR('STEAM WATER REQ') ;
  END ;
0 R5 = INDEX('CBA',SWR RELIABILITY) ;
  IF R5 = 0 THEN CALL STR ERR('SWR RELIABILITY') ;
0 IF VERIFY(COOLING WATER REQ,FLOAT STRING) THEN
  CALL STR ERR('COOLING WATER REQ') ;
ELSE DO :
  CWR = COOLING WATER REQ ;
  IF CONV CHECK = 'FAIL' THEN CALL CONV ERR('COOLING WATER REQ') ;
  IF CWR < 0.0 | CWR >= 10000.0 THEN
    CALL RANGE ERR('COOLING WATER REQ') ;
  END ;
0 R6 = INDEX('CBA',CWR RELIABILITY) ;
  IF R6 = 0 THEN CALL STR ERR('CWR RELIABILITY') ;
0 IF VERIFY(FUEL1 REQ,FLOAT STRING) THEN CALL STR ERR('FUEL1 REQ') ;
  ELSE DO :
    F1R = FUEL1 REQ ;
    IF CONV CHECK = 'FAIL' THEN CALL CONV ERR('FUEL1 REQ') ;
    IF F1R < 0.0 | F1R >= 10000.0 THEN CALL RANGE ERR('FUEL1 REQ') ;
    END ;
0 R7 = INDEX('CBA',F1R RELIABILITY) ;
  IF R7 = 0 THEN CALL STR ERR('F1R RELIABILITY') ;
0 IF VERIFY(FUEL2 REQ,FLOAT STRING) THEN CALL STR ERR('FUEL2 REQ') ;
  ELSE DO :
    F2R = FUEL2 REQ ;
    IF CONV CHECK = 'FAIL' THEN CALL CONV ERR('FUEL2 REQ') ;
    IF F2R < 0.0 | F2R >= 10000.0 THEN CALL RANGE ERR('FUEL2 REQ') ;
    END ;
0 R8 = INDEX('CBA',F2R RELIABILITY) ;
  IF R8 = 0 THEN CALL STR ERR('F2R RELIABILITY') ;
0 IF VERIFY(FUEL3 REQ,FLOAT STRING) THEN CALL STR ERR('FUEL3 REQ') ;
  ELSE DO :
    F3R = FUEL3 REQ ;
    IF CONV CHECK = 'FAIL' THEN CALL CONV ERR('FUEL3 REQ') ;
    IF F3R < 0.0 | F3R >= 10000.0 THEN CALL RANGE ERR('FUEL3 REQ') ;
    END ;

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0  P9 = INDEX('CBA',F34 RELIABILITY) ;
   IF R9 = 0 THEN CALL STR ERR('F34 RELIABILITY') ;
1  READ FILE(SYSIN) SFT(CARDIN) ;
   STACK IMAGE = CARD IMAGE ;
   CALL STACK ;
0  IF CARD KEY = 'C' THEN DO ;
   CALL CARD ERR('C') ;
   RETURN ;
   END ;
0  IF VERIFY(LABOR COST,DEC STRING) THEN CALL STR ERR('LABOR COST') ;
   ELSE DO ;
   LC = LABOR COST ;
   IF CONV CHECK='FAIL' THEN CALL CONV ERR('LABOR COST') ;
   IF LC < 0 | LC >= 1000000 THEN CALL RANGE ERR('LABOR COST') ;
   END ;
0  R10 = INDEX('CBA',LC RELIABILITY) ;
   IF R10 = 0 THEN CALL STR ERR('LC RELIABILITY') ;
0  IF VERIFY(MATERIALS COST,DEC STRING) THEN
   CALL STR ERR('MATERIALS COST') ;
   ELSE DO ;
   MATRC = MATERIALS COST ;
   IF CONV CHECK='FAIL' THEN CALL CONV ERR('MATERIALS COST') ;
   IF MATRC < 0 | MATRC >= 1000000 THEN CALL RANGE ERR('MATERIALS COST') ;
   END ;
0  R11 = INDEX('CBA',MATRC RELIABILITY) ;
   IF R11 = 0 THEN CALL STR ERR('MATRC RELIABILITY') ;
0  IF VERIFY(MAINTENANCE COST,DEC STRING) THEN
   CALL STR ERR('MAINTENANCE COST') ;
   ELSE DO ;
   MAINC = MAINTENANCE COST ;
   IF CONV CHECK='FAIL' THEN CALL CONV ERR('MAINTENANCE COST') ;
   IF MAINC < 0 | MAINC >= 1000000 THEN CALL RANGE ERR('MAINTENANCE COST') ;
   END ;
0  R12 = INDEX('CBA',MAINC RELIABILITY) ;
   IF R12 = 0 THEN CALL STR ERR('MAINC RELIABILITY') ;
0  IF VERIFY(LABORATORY CHARGES,DEC STRING) THEN
   CALL STR ERR('LABORATORY CHARGES') ;
   ELSE DO ;
   LABCH = LABORATORY CHARGES ;
   IF CONV CHECK = 'FAIL' THEN
   CALL CONV ERR('LABORATORY CHARGES') ;
   IF LABCH < 0 | LABCH >= 1000000 THEN
   CALL RANGE ERR('LABORATORY CHARGES') ;
   END ;
0  R15 = INDEX('CBA',LABCH RELIABILITY) ;
   IF R15 = 0 THEN CALL STR ERR('LABCH RELIABILITY') ;
0  IF VERIFY(OTHER MISC COSTS,DEC STRING) THEN
   CALL STR ERR('OTHER MISC COSTS') ;
   ELSE DO ;
   OTHMC = OTHER MISC COSTS ;
   IF CONV CHECK='FAIL' THEN CALL CONV ERR('OTHER MISC COSTS') ;
   IF OTHMC < 0 | OTHMC >= 1000000 THEN
   CALL RANGE ERR('OTHER MISC COSTS') ;
   END ;
0  R16 = INDEX('CBA',OTHMC RELIABILITY) ;
   IF R16 = 0 THEN CALL STR ERR('OTHMC RELIABILITY') ;
0  S = SOURCE COST ;
   IF S='LAB' | S='DFS' | S='EXP' | S='VEN' | S='EPA' | S='THE' | S='OTH'
   | S=' ' THEN SOURCE COST INFO = SOURCE COST ;
   ELSE CALL STR ERR('SOURCE COST') ;
1  /* NOW, IF ALL COST DATA WAS OK, COMPUTE OTHER COST INFORMATION */
   IF RECORD CHECK='PASS' THEN DO ;
-  TOTAL2 = (EP*0.031936) + SWR + CWR + FIR + F2R + F3R + 0.5 ;
   IF TOTAL2 = 0 THEN REL = R4 ;
   ELSE
   REL = ((EP*0.021936*R4 + SWR*R5 + CWR*R6 + FIR*R7 + F2R*R8 + F3R*R9)
   / TOTAL2 ;
   IF REL < 1.5 THEN TOT REL = 'C' ;
   ELSE IF REL < 2.5 THEN TOT REL = 'B' ;
   ELSE TOT REL = 'A' ;
   R13 = INDEX('CBA',TOT REL) ;
   TOT CHAR = CHAR(TOTAL2,8) ;

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TOT ENERGY PER = SUBSTR(TOT CHAR,4,5) || TOT_REL ;
TOTAL3 = EC*UC(1,P NUM)*47963 + SW*UC(2,P NUM)*332 +
CWP*UC(3,P NUM)*332 + F1*UC(4,P NUM)*332 +
F2*UC(5,P NUM)*332 + F3*UC(6,P NUM)*332 + 0.5 ;
IF TOTAL3 = 0 THEN REL = R4 ;
ELSE
REL = ( EC*UC(1,P NUM)*7968*R4 + SW*UC(2,P NUM)*332*R5 +
CWP*UC(3,P NUM)*332*R6 + F1*UC(4,P NUM)*332*R7 +
F2*UC(5,P NUM)*332*R8 + F3*UC(6,P NUM)*332*R9 ) / TOTAL3 ;
IF REL < 1.5 THEN TOT_REL = 'C' ;
ELSE IF REL < 2.5 THEN TOT_REL = 'B' ;
ELSE TOT_REL = 'A' ;
R14 = INDEX('CBA',TOT_REL) ;
TOT CHAR = CHAR(TOTAL3,10) ;
TOT ENERGY COST = SUBSTR(TOT CHAR,4,7) || TOT_REL ;
TOTAL4 = TOTAL3 + LC + MATRC + MAINC + LABCH + OTHMC + 0.5 ;
IF TOTAL4 = 0 THEN REL = R4 ;
ELSE
REL = ( TOTAL3*R14 + LC*R10 + MATRC*R11 + MAINC*R12 +
LABCH*R15 + OTHMC*R15 ) / TOTAL4 ;
IF REL < 1.5 THEN TOT_REL = 'C' ;
ELSE IF REL < 2.5 THEN TOT_REL = 'B' ;
ELSE TOT_REL = 'A' ;
TOT CHAR = CHAR(TOTAL4,10) ;
TOT OPER COST = SUBSTR(TOT CHAR,4,7) || TOT_REL ;
1 IF QTY2 CHK THEN TOT ENERGY PER QTY CONTR = ' NCO' || QC_REL ;
ELSE IF QTYC=0 THEN TOT ENERGY PER QTY CONTR = ' NCO' || QC_REL ;
ELSE DO ;
TOTAL5 = TOTAL2 / QTYC ;
REL = ( TOTAL2*R13 + QTYC*R2 ) / ( TOTAL2 + QTYC ) ;
IF REL < 1.5 THEN TOT_REL = 'C' ;
ELSE IF REL < 2.5 THEN TOT_REL = 'B' ;
ELSE TOT_REL = 'A' ;
TOT CHAR = CHAR(TOTAL5,9) ;
TOT ENERGY PER QTY CONTR = SUBSTR(TOT CHAR,4,5) || TOT_REL ;
END ;
- IF QTY2 CHK THEN ENERGY COST PER QTY CONTR = ' NCO' || QE_REL ;
ELSE IF QTYC=0 THEN ENERGY COST PER QTY CONTR = ' NCO' || QE_REL ;
ELSE DO ;
TOTAL6 = TOTAL3 / ( QTYC*332 ) ;
REL = ( TOTAL3*R14 + QTYC*R2*332 ) / ( TOTAL3 + QTYC*332 ) ;
IF REL < 1.5 THEN TOT_REL = 'C' ;
ELSE IF REL < 2.5 THEN TOT_REL = 'B' ;
ELSE TOT_REL = 'A' ;
TOT CHAR = CHAR(TOTAL6,9) ;
ENERGY COST PER QTY CONTR = SUBSTR(TOT CHAR,4,5) || TOT_REL ;
END ;
- IF QTY1 CHK THEN ENERGY COST PER QTY EMITTED = ' NCO' || OE_REL ;
ELSE IF QTYE=0 THEN ENERGY COST PER QTY EMITTED = ' NCO' || OE_REL ;
ELSE DO ;
TOTAL7 = TOTAL3 / ( QTYE*332 ) ;
REL = ( TOTAL3*R14 + QTYE*R1*332 ) / ( TOTAL3 + QTYE*332 ) ;
IF REL < 1.5 THEN TOT_REL = 'C' ;
ELSE IF REL < 2.5 THEN TOT_REL = 'B' ;
ELSE TOT_REL = 'A' ;
TOT CHAR = CHAR(TOTAL7,9) ;
ENERGY COST PER QTY EMITTED = SUBSTR(TOT CHAR,4,5) || TOT_REL ;
END ;
0 END ; /* END OF COMPUTE SECTION FOR ADDITIONAL COST DATA */
ELSE ;
0 END ; /* END OF SUBGRID B CHECKING SECTION */
ELSE SUBGRID B = ZERO OUT ;
RETURN ;
END COMMON SECTION ;
1STR ERR: PROCEDURE(LABEL1) ;
DECLARE LABEL1 CHARACTER(30) VARYING ;
STACK IMAGE='ERROR' || LABEL1 || ' CONTAINS INVALID CHARACTER(S)' ;
CALL STACK ;
RECORD CHECK = 'FAIL' ;
RETURN ;
END 1STR ERR ;
-RANGE ERR: PROCEDURE(LABEL2) ;

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DECLARE LABEL2 CHARACTER(30) VARYING ;
STACK IMAGE = 'ERROR** THE VALUE FOR ' || LABEL2 ||
              ' IS NOT WITHIN ITS ALLOWED RANGE' ;
CALL STACK ;
RECORD CHECK = 'FAIL' ;
RETURN ;
END RANGE ERR ;
-CONV ERR: PROCEDURE(LABEL3) ;
DECLARE LABEL3 CHARACTER(30) VARYING ;
STACK IMAGE = 'ERROR** ' || LABEL3 ||
              ' COULD NOT BE CONVERTED TO A VALID NUMBER' ;
CALL STACK ;
RECORD CHECK = 'FAIL' ;
CONV CHECK = 'PASS' ;
RETURN ;
END CONV ERR ;
-CARD ERR: PROCEDURE(LABEL4) ;
DECLARE LABEL4 CHARACTER(1) ;
STACK IMAGE = 'ERROR** THE LETTER ' || LABEL4 ||
              ' SHOULD APPEAR IN CARD COLUMN #1' ;
CALL STACK ;
RECORD CHECK = 'FAIL' ;
RETURN ;
END CARD ERR ;
1STACK: PROCEDURE ;
IF PNTR=50 THEN RETURN ;
PNTR = PNTR + 1 ;
STACK ENTRY(PNTR) = STACK IMAGE ;
RETURN ;
END STACK ;
-LIST STACK: PROCEDURE ;
IF PNTR>0 THEN DO ;
DO I=1 TO PNTR ;
PUT SKIP EDIT (STACK_ENTRY(I)) (A) ;
END ;
PNTR = 0 ;
END ;
RETURN ;
END LIST STACK ;
1SORTA: PROCEDURE ;
PUT EDIT('GO TO SORT SECTION') (SKIP(3),A,SKIP(3)) ;
IF CONTROL CHK = 'CREATE' THEN DO ;
CLOSE FILE(EFFIN) ;
IF NUMADD = 0 THEN RETURN ;
ELSE ;
OPEN FILE(EFFIN) SEQUENTIAL INPUT, FILE(SORTIN) SEQUENTIAL OUTPUT ;
- ON ENDFILE(EFFIN) BEGIN ;
CLOSE FILE(EFFIN), FILE(SORTIN) ;
CALL INTSRTA(' SORT FIELDS=(1,5,CH-A) ',
              ' RECORD TYPE=F,LENGTH=(200) ',.15000,RETURN_CODE) ;
PUT PAGE ;
IF RETURN CODE = 16 THEN PUT EDIT('** SORT FAILED')(A) ;
ELSE IF RETURN CODE = 0 THEN PUT EDIT('**SORT COMPLETE') (A) ;
ELSE PUT EDIT('INVALID RETURN CODE. CODE =',RETURN_CODE)
      (A,F(4,0)) ;
GO TO SORT_RETURN ;
END ;
MOVE CREATE:
DO WHILE(*1*B) ;
READ FILE(EFFIN) INTO(EFFLUENT OUTPUT RECORD) ;
WRITE FILE(SORTIN) FROM(EFFLUENT OUTPUT RECORD) ;
END MOVE CREATE ;
END ;
ELSE DO ;
CLOSE FILE(EFFOUT) ;
OPEN FILE(EFFOUT) SEQUENTIAL INPUT, FILE(SORTOUT) SEQUENTIAL OUTPUT ;
- ON ENDFILE(EFFOUT) BEGIN ;
CLOSE FILE(EFFOUT), FILE(SORTOUT) ;
GO TO SORT_RETURN ;
END ;
MOVE UPDATE:
DO WHILE(*1*B) ;

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      READ FILE(EFFOUT) INTO(EFFLUENT OUTPUT RECORD) :
      WRITE FILE(SCRTOUT) FROM(EFFLUENT OUTPUT RECORD) :
      END MOVE UPDATE :
    END :
  SORT RETURN:
  RETURN :
  END SORTA :
-END OF PROGRAM:
END FFFDATA :
//GO.EFFIN DD DSN=DATABASE,DISP=(NEW,PASS),UNIT=(3400,DEFF),
//VOL=SER=RESDF1,LADFL=(2,SL),DCB=(RECFM=FB,LRECL=200,HLKSIZE=2000)
//GO.EFFOUT DD UNIT=SYSDA,SPACE=(CYL,1),DCB=(RECFM=FB,HLKSIZE=200,
//DSORG=IS,KEYLEN=5,KKP=0,OPTCD=LIY,CYLOFL=2),DISP=(NEW,PASS),
//DSNAME=@@SCRATCH(INDEX)
//DD UNIT=SYSDA,SPACE=(CYL,1),DCB=(RECFM=FB,HLKSIZE=200,
//DSORG=IS,KEYLEN=5,KKP=0,OPTCD=LIY,CYLOFL=2),DISP=(NEW,PASS),
//DSNAME=@@SCRATCH(PRIME)
//DD UNIT=SYSDA,SPACE=(CYL,1),DCB=(RECFM=FB,HLKSIZE=200,
//DSORG=IS,KEYLEN=5,KKP=0,OPTCD=LIY,CYLOFL=2),DISP=(NEW,PASS),
//DSNAME=@@SCRATCH(OVERFLOW)
//GO.SYSOUT DD SYSOUT=A
//GO.SORTLIB DD DSN=SYS1.SORTLIB,DISP=SHR
//GO.SORTWK01 DD UNIT=3330,SPACE=(TRK,(50,10))
//GO.SORTWK02 DD UNIT=3330,SPACE=(TRK,(50,10))
//GO.SORTWK03 DD UNIT=3330,SPACE=(TRK,(50,10))
//GO.SORTWK04 DD UNIT=3330,SPACE=(TRK,(50,10))
//GO.SORTIN DD DSN=@@SORTIN,UNIT=SYSDA,DISP=(NEW,DELETE),
//SPACE=(TRK,(60,15)),DCB=(LRECL=200,HLKSIZE=2000,RECFM=FB)
//GO.SORTOUT DD DSN=@@SORTOUT,UNIT=SYSDA,DISP=(NEW,PASS),DCB=*,SORTIN,
//SPACE=(TRK,(60,15))
//GO.SYSIN DD *

```

CREATE
 A1 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 A1 CONCENTRATION GREATER THAN 10 MG/M³ IN THE ENVIRONMENT.
 A2 JUDGED TO BE POSSIBLY HAZARDOUS TO VEGETATION IN CASE OF ACID MINE DRAINAGE.
 A3 CONSISTS OF 671 TPD DUE TO EVAPORATION FROM RAW WATER STORAGE AND 210 TPD
 A3 FROM LEGASEP VENTS.
 A4 IN THE FORM OF SLUDGE FROM LIME TREATMENT, DEMINERALIZER AND ZEOLITE SOFTNER.
 A5 POTENTIALLY HAZARDOUS SINCE IT CONTAINS SALTS AND OTHER WATER TREATMENT
 A5 CHEMICALS.
 A6 INCLUDES STEAM LOSSES IN DEAERATOR VENTS, LEAKS AND OTHER LOSSES FROM BOILER
 A6 AND ITS PIPING.
 A7 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRA-
 A7 TION GREATER THAN 5 PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO STATE AIR
 A7 QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
 A8 ESTIMATED AS NO₂.
 A9 EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS.
 B0 POTENTIALLY HAZARDOUS DUE TO SOME ELEMENTS AND COMPOUNDS PRESENT WHICH CAN BE
 B0 LEACHED BY WATER.
 B1 POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN SOME ELEMENTS AND COMPOUNDS
 B1 LEACHED OUT FROM THE ASH.
 B2 ESTIMATED USING EMISSION FACTORS.
 B3 CONSISTS MAINLY OF GASIFIER ASH PARTICLES.
 B4 EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF
 B4 COAL LOCKS.
 B5 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 B5 CONCENTRATION GREATER THAN 20 PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO
 B5 ARE ALSO APPLICABLE.
 B6 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 B6 CONCENTRATION GREATER THAN 50 PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO
 B6 ARE ALSO APPLICABLE.
 B7 GASIFIER ASH, UNREACTION CARBON AND WATER ARE IN THE FORM OF A SLUDGE.
 B8 CONSISTS OF EVAPORATION TO ATMOSPHERE FROM FINE ASH POND.
 B9 EVAPORATED INTO ATMOSPHERE ALONG WITH WATER FROM FINE ASH POND.
 C0 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 C0 CONCENTRATION GREATER THAN 10 PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 C0 EMISSION STANDARDS ARE ALSO APPLICABLE.
 C1 ESTIMATED AS ACETIC ACID.
 C2 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 C2 CONCENTRATION GREATER THAN 10 PPM IN THE ENVIRONMENT.
 C3 ESTIMATED AS PHENOL.
 C4 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A

C4CONCENTRATION GREATER THAN 5 PPM IN THE ENVIRONMENT.
 C5CONSISTS OF 0.144 TPD TO CATALYTIC INCINERATOR AND 0.32 TPD TO VENT GAS INCINERATOR.
 C6CONSISTS 019178 TPD TO CATALYTIC INCINERATOR AND 447 TPD TO VENT GAS INCINERATOR.
 C7TO CATALYTIC INCINERATOR.
 C8OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 20 PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR EMISSIONS STANDARDS ARE ALSO APPLICABLE.
 C9CONSISTS OF 2540TPD TO CATALYTIC INCINERATOR AND 70TPD TO VENT GAS INCINERATOR.
 D0CONSISTS OF 4TPD TO CATALYTIC INCINERATOR AND 3TPD TO VENT GAS INCINERATOR.
 D1CONSISTS OF 21TPD TO CATALYTIC INCINERATOR AND 32TPD TO VENT GAS INCINERATOR.
 D2CONSISTS OF 107.5TPD TO CATALYTIC INCINERATOR AND 6.5TPD TO VENT GAS INCINERATOR.
 D3CONSISTS OF 415TPD TO CATALYTIC INCINERATOR AND 12TPD TO VENT GAS INCINERATOR.
 D4CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 D5IN THE FORM OF SLUDGE.
 D6POTENTIALLY HAZARDOUS DUE TO COOLING TOWER CHEMICALS IN IT.
 D7ESTIMATED AS PYRIDINE.
 D8OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 5 PPM IN THE ENVIRONMENT.
 D9ESTIMATED AS HSCN.
 E0OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 50 PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR EMISSION STANDARDS ARE ALSO APPLICABLE.
 E1CONSISTS OF DISSOLVED SOLIDS IN COOLING WATER WHICH ARE EMITTED IN THE DRIFT. EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS. EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF COAL LOCKS.
 E2EVAPORATED INTO ATMOSPHERE ALONG WITH WATER FROM FINE ASH POND. ESTIMATED AS ACETIC ACID.
 E3EVAPORATED INTO ATMOSPHERE ALONG WITH WATER FROM FINE ASH POND. ESTIMATED AS PHENOL.
 E4ESTIMATED AS ACETIC ACID. CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 E5ESTIMATED AS PHENOL. CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 E6OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 5 PPM IN THE ENVIRONMENT. CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 E7ESTIMATED AS HSCN. CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 E8EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS. ESTIMATED USING EMISSION FACTORS.
 E9EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS. CONSISTS MAINLY OF GASIFIER PARTICLES. ESTIMATED USING EMISSION FACTORS.
 G1OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 10 MG/M3 IN THE ENVIRONMENT.
 G2JUDGED TO BE POSSIBLY HAZARDOUS TO VEGETATION IN CASE OF ACID MINE DRAINAGE.
 G3POTENTIALLY HAZARDOUS SINCE IT CONTAINS SALTS AND OTHER WATER TREATMENT CHEMICALS.
 G4CONSISTS OF EVAPORATION FROM RAW WATER STORAGE.
 G5POTENTIALLY HAZARDOUS DUE TO SOME ELEMENTS AND COMPOUNDS PRESENT WHICH CAN BE LEACHED BY WATER.
 G6CONSISTS OF 44TPD OF WATER ACCOMPANYING THE BOILER ASH AND 132TPD OF WATER ACCOMPANYING THE FLY ASH.
 G7POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN SOME ELEMENTS AND COMPOUNDS LEACHED OUT FROM THE ASH.
 G8CONSISTS OF FLY ASH COLLECTED BY THE ELECTROSTATIC PRECIPITATOR.
 G9CONSISTS OF FLY ASH PARTICLES.
 H0OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO STATE AIR QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
 H1OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO STATE AIR QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
 H2PERFORMED IN BOILER DUE TO COMBUSTION OF COAL, H2S AND COS.
 H3OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO STATE AIR QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
 H4ESTIMATED AS NO2.
 H5ESTIMATED USING EMISSION FACTORS.
 H6CONSISTS OF GASIFIER ASH PARTICLES.
 H7CONSISTS OF WATER VAPOR FROM ASH QUENCHING OPERATION.
 H8EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF COAL LOCKS.
 H9ASH AND WATER ARE IN THE FORM OF A SLUDGE.

1000ES NOT INCLUDE 116.6TPD H₂S IN THE H₂S RICH GAS SENT TO CLAUS PLANT.
 1100ES NOT INCLUDE 26.5TPD CO₂ IN THE H₂S RICH GAS SENT TO THE CLAUS PLANT.
 1200ES NOT INCLUDE 6.4TPD H₂O IN THE H₂S RICH GAS SENT TO THE CLAUS PLANT.
 13ALL THE H₂S IS OXIDIZED TO SO₂. ANY UNCONTROLLED H₂S LEAVES THE CLAUS UNIT AS
 13SO₂.
 14OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 14CONCENTRATION GREATER THAN 10PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 14EMISSION STANDARDS ARE ALSO APPLICABLE.
 15DIRECT OPERATING COST FOR OPERATING WASTE LIQUID DISPOSAL SYSTEM.
 16OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 16CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 16EMISSION STANDARDS ARE ALSO APPLICABLE.
 17IT IS A PART OF THE SLUDGE SENT TO THE MINE. COST IS ONLY ALLOCATED TO
 17CASO₄.2H₂O SINCE IT IS THE MAJOR COMPONENT.
 18POTENTIALLY HAZARDOUS BECAUSE CA IONS MAY BE LEACHED BY WATER.
 19POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN CA IONS LEACHED OUT FROM
 19THE SLUDGE.
 20COST FOR OPERATING LIQUID WASTE DISPOSAL SYSTEM.
 21PART OF THE SLUDGE FROM THE BIOLOGICAL WASTE WATER SLUDGE SENT TO MINE. COST
 21IS ALLOCATED ONLY TO CaCO₃ SINCE IT IS A MAJOR COMPONENT.
 22CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 23ESTIMATED AS ACETIC ACID.
 24OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 24CONCENTRATION GREATER THAN 10PPM IN THE ENVIRONMENT.
 25ESTIMATED AS PHENOL.
 26OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 26CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT.
 27ESTIMATED AS HSCN.
 28OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 28CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 28EMISSION STANDARDS ARE ALSO APPLICABLE.
 29CONSISTS OF DISSOLVED SOLIDS IN COOLING WATER WHICH ARE EMITTED IN THE DRIFT.
 30ESTIMATED USING EMISSION FACTORS. CONSISTS OF GASIFIER ASH PARTICLES.
 31CONSISTS OF DRIFT AND EVAPORATION LOSSES. ESTIMATED AS ACETIC ACID.
 32CONSISTS OF DRIFT AND EVAPORATION LOSSES. ESTIMATED AS PHENOL.
 33CONSISTS OF DRIFT AND EVAPORATION LOSSES. ESTIMATED AS HSCN.
 34OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 34CONCENTRATION GREATER THAN 10 MG/M³ IN THE ENVIRONMENT.
 35SLUDGE CONSISTS OF 13.5TPD CaCO₃, 0.42TPD MG(OH)₂, 0.77TPD AL₂(SO₄)₃ AND
 3517.4TPD SUSPENDED SOLIDS.
 36POTENTIALLY HAZARDOUS SINCE IT CONTAINS SALTS AND OTHER WATER TREATMENT
 36CHEMICALS.
 37CONSISTS OF 14.4% AL₂O₃, 25.9% CaO, 11.8% MgO, 3.6% Na₂O, 5.2% SO₃,
 3726.9% SiO₂, 1.5% Fe₂O₃ AND 1.2% K₂O.
 38POTENTIALLY HAZARDOUS DUE TO SOME ELEMENTS AND COMPOUNDS PRESENT WHICH CAN BE
 38LEACHED BY WATER.
 39CONSISTS OF 32.8% SiO₂, 27.7% CaO, 17.0% AL₂O₃, 5.1% Na₂O, 10.0% MgO,
 3961.0% K₂O, 5.3% Fe₂O₃ AND 1.1% TiO₂.
 40PARTICULATES ARE FLY ASH PARTICLES.
 41OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 41CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 41STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 42ESTIMATED AS NO₂.
 43PART OF THE COAL LOCK GAS INCINERATED IN THE BOILER.
 44OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 44CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 44STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 45AN ADDITIONAL 4823TPD OF H₂O VAPOR IS EMITTED TO THE STACK GAS TREATMENT UNIT.
 46CONSISTS OF LEAKS AND STEAM VENTS TO THE ATMOSPHERE FROM THE STEAM LINE.
 47CONSISTS MAINLY OF GASIFIER ASH PARTICLES.
 48FROM ASH QUENCH.
 49EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING
 49OF COAL LOCKS.
 50CONSISTS OF SOLIDS FROM THE TRIPLE EFFECT EVAPORATOR CONCENTRATOR CONTAINING
 50CYANIDES, PHENOLS, FATTY ACIDS AND METAL IONS.
 51POTENTIALLY HAZARDOUS DUE TO THE PRESENCE OF CYANIDES, PHENOLS, FATTY ACIDS
 51AND METAL IONS THAT COULD BE LEACHED BY WATER.
 52POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN SOME ELEMENTS AND COMPOUNDS
 52LEACHED OUT FROM ASH AND SLUDGE.
 5300ES NOT INCLUDE 149.1TPD H₂S IN THE H₂S RICH GAS SENT TO CLAUS PLANT.
 5400ES NOT INCLUDE 34.05TPD CO₂ IN THE H₂S RICH GAS SENT TO CLAUS UNIT.
 5500ES NOT INCLUDE 8.78TPD H₂O IN THE H₂S RICH GAS SENT TO CLAUS UNIT.

N3SOME OF THE CONTROLLED H2S LEAVES THE CLAUSS UNIT AS SO2.
 N4OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 N4CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 N4STATE AIR QUALITY STANDARDS ARE ALSO APPLICABLE.
 N5AN ADDITIONAL 0.238TPD OF SULPHUR IN THE VAPOR PHASE IS EMITTED FROM THE CLAUSS
 N5PROCESS.
 N6OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 N6CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT.
 N7DIRECT OPERATING COSTS FOR OPERATING WASTE LIQUOR DISPOSAL SYSTEM.
 N8SULPHUR IS IN VAPOR STATE.
 N9OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 N9CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT.
 P0EMITTED AS A SLUDGE.
 P1POTENTIALLY HAZARDOUS SINCE IT MAY BE LEACHED BY WATER.
 P2POTENTIALLY HAZARDOUS SINCE IT MAY CONTAIN SODIUM AND CALCIUM IONS LEACHED OUT
 P2FROM SALTS.
 P3CONSISTS OF 66.7% CaCO3, 15.3% ORGANIC MATTER FOR BIOTREATING, 8.0% CALCIUM
 P3SALTS OF PHENOLS, 5.8% CALCIUM SALTS OF FATTY ACIDS AND 4.2% OTHER INORGANIC
 P3CALCIUM SALTS.
 P4CONSISTS OF EVAPORATION AND DRIFT LOSSES.
 P5ESTIMATED AS ACETIC ACID.
 P6OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 P6CONCENTRATION GREATER THAN 10PPM IN THE ENVIRONMENT.
 P7ESTIMATED AS PHENOL.
 P8OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 P8CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT.
 P9OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 P9CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT.
 Q0ESTIMATED AS HSCN.
 Q1CONSISTS OF DISSOLVED SOLIDS IN COOLING WATER WHICH ARE EMITTED IN THE DRIFT.
 Q2CONSISTS OF 86.4% CaCO3, 9.6% Mg(OH)2 AND 4.0% AL2(SO4)3.
 R1AN ADDITIONAL 4.23TPD OF H2O VAPOR IS EMITTED TO THE STAG GAS TREATMENT UNIT.
 R1CONSISTS OF LEAKS AND STEAM VENTS TO THE ATMOSPHERE FROM THE STEAM LINE.
 R2SOME OF THE UNCONTROLLED H2S LEAVES THE CLAUSS UNIT AS SO2. AN ADDITIONAL
 R20.238TPD OF SULFUR IN THE VAPOR PHASE IS EMITTED FROM THE CLAUSS PROCESS.
 R3OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 R3CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 R3STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 R3ESTIMATED AS NO2.
 R4CONSISTS OF EVAPORATION AND DRIFT LOSSES. ESTIMATED AS ACETIC ACID.
 R5CONSISTS OF EVAPORATION AND DRIFT LOSSES. ESTIMATED AS PHENO..
 R6CONSISTS OF EVAPORATION AND DRIFT LOSSES. ESTIMATED AS HSCN.
 S1OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 S1CONCENTRATION GREATER THAN 10 MG/M3 IN THE ENVIRONMENT.
 S2POTENTIALLY HAZARDOUS DUE TO WATER TREATMENT CHEMICALS THAT MAY BE PRESENT.
 S3POTENTIALLY HAZARDOUS DUE TO ELEMENTS OR COMPOUNDS PRESENT WHICH CAN
 S3BE LEACHED BY WATER.
 S4OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 S4CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 S4STATE AIR QUALITY STANDARDS ARE ALSO APPLICABLE.
 S5OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 S5CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 S5AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 S6ESTIMATED AS NO2.
 S7ESTIMATED USING EMISSION FACTORS.
 S8EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF
 S8COAL LOCKS.
 S9OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 S9CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 S9STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 T0CONSISTS MAINLY OF GASIFIER ASH PARTICLES. ESTIMATED USING EMISSION FACTORS.
 T1POTENTIALLY HAZARDOUS DUE TO ELEMENTS AND COMPOUNDS WHICH MAY BE
 T1LEACHED FROM ASH.
 T2DIRECT OPERATING COST FOR WASTE LIQUID DISPOSAL.
 T3AN ADDITIONAL 1.3TPD OF CO2 IS EMITTED TO THE ATMOSPHERE IN THE STRETFORD
 T3BLEED STREAM.
 T4REPORTED BY ANG AS ORGANIC SULFUR.
 T5OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 T5CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT.
 T6STRETFORD BLEED STREAM.
 T7INCINERATION IS DONE IN A STEAM SUPERHEATER WITH TAP OIL, NAPHTHA AND
 T7PHENOLICS AS FUEL.

TREMITTED AS STRETFORD OXIDIZER EFFLUENT.
 TGPOTENTIALLY HAZARDOUS SINCE IT CONTAINS HIGH CONCENTRATIONS OF DISSOLVED
 T9SALTS AND OTHER CHEMICALS.
 UOMAY CONTAIN FATTY ACIDS, AMMONIA, PHENOLICS, OTHER VOLATILE CONTAMINANTS AND
 UOONISSOLVED SOLIDS WHICH ARE EMITTED ALONG WITH THE DRIFT.
 UOIPOTENTIALLY HAZARDOUS SINCE IT CONTAINS FATTY ACIDS, AMMONIA, ETC.
 UOESTIMATED AS NO2. INCINERATION IS DONE IN A STEAM SUPERHEATER WITH TAR OIL.
 UONAPHTHA AND PHENOLICS AS FUEL.

A10734	1147H7AL	MNB1A11DES1	N	ADD
A10747	907H3AG	NK A10DES2	N	ADD
A10744	0.1143B9CG	TXC0A12THE2	N	ADD
A10743	0.1141F1CG	H7C2H11THE2	N	ADD
A10754	0.000061F2CG	H7C4B11THE2	N	ADD
A11041	19625C6AG	NK A10DES6STRETFORD PROCESS	N	ADD
A11040	2.064C7CG	HZ A12DES6STRETFORD PROCESS	N	ADD
A11042	0.072C7CG	H7C3A12DES6STRETFORD PROCESS	N	ADD
A11052	1610C6AG	NK A10DES6	N	ADD
A11053	373C7AG	NK A10DES6	N	ADD
A11046	730AG	MN B10DES6	N	ADD
A11039	6301AG	TXP6A12DES6	N	ADD
A11045	11402AG	MN B12DES6	N	ADD
A11047	427D3AG	NK A10DES6	N	ADD
A11241	515	AG NK A10THE2	N	ADD
A11252	351	RG NK A10THE2	N	ADD
A11253	17	AG NK A10THE2	N	ADD
A11247	53	AG NK A10THE2	N	ADD
A11256	0.615	BG PHA7A12THE2	N	ADD
A11251	0.096	CG PHA7A12THE2	N	ADD
A11341	19519	RG NK B10THE2	N	ADD
A11353	86	CG NK A10THE2	N	ADD
A11352	2016	RG NK A10THE2	N	ADD
A11347	639	RG NK A10THE2	N	ADD
A10441	7744	AG NK A10DES2	N	ADD
A10452	61444	AG NK A10DES2	N	ADD
A10347	1081A3AG	NK A10DES2	N	ADD
A10334	290FA4AL	PHAS11DES4	N	ADD
A10453	12250	AG NK A10DES2	N	ADD
A10437	5589A6AG	NK A10DES2	N	ADD
A10456	4	BG PHA7A12DES2	N	ADD
A10451	6.74	CG PHA7A12DES2	N	ADD
A10421	MIN	AS PH A12DES2	N	ADD
A10547	114.9	AG NK A10DES2	N	ADD
A10552	18730.4	AG NK A10DES2	N	ADD
A10553	186.6	AG NK A10DES2	N	ADD
A10541	12.6	AG NK A10DES2	N	ADD
A10614	5438.7A9AS	PH A11DES4	N	ADD
A10630	285.0A9AL	MNB1A11DES3	N	ADD
A10634	1147.3ASAL	MNB1A11DES4	N	ADD
A10641	14.646F0CG	NK B10THE2	N	ADD
A1064E	0.1532F0CG	TXH5A12THE2	N	ADD
A10645	2.447F0CG	MN B12THE2	N	ADD
A10639	7.153F0CG	TXB6A12THE2	N	ADD
A10646	0.945F0CG	MN B10THE2	N	ADD
A10652	2.567F0CG	NK A10THE2	N	ADD
A10649	0.224F0CG	MN H12THE2	N	ADD
A10647	0.112F0CG	NK A10THE2	N	ADD
A11356	2.4C	RG PHA7A12THE2	N	ADD
A11843	0.574C1CG	H7C2H11THE2	N	ADD
A11844	0.572	CG TXC0A12THE2	N	ADD
A11854	0.00031C3CG	H7C4H11THE2	N	ADD
A11934	1979D5AL	MNB1A11DES8	N	ADD
A11943	0.3826F3CG	H7C2H11THE2	N	ADD
A11954	0.1161F4CG	H7C3A11THE2	N	ADD
A11955	0.00065F5CG	H7C0A11THE2	N	ADD
A11957	0.08933F6CG	HZ A11THE2	N	ADD
A11950	4.552D4CG	HZE0A12THE2	N	ADD
A11921	0.5244E1CS	PH A12THE2	N	ADD
A10111	SM	AS PHA1A12DES2WATER SPRAYING	Y	ADD
3	SMA	SMA 29000C 15C	OA	OA
C 86400C	1A1000C	2350C	OA	OA
A10723	1680	BS PHA2C11DES8COAL CLEANING	Y	ADD

P	3618	345.48	7040000A	GR5A	0A	0A	0A	0A
C	850008	130008	87000A	0A	0A	0A	0A	0A
A20444		0M0AG	TXM1A22DES7INCINERATION				Y	ADD
H	0.02658	0.02658	0A	0A	0A	0A	0A	0A
C	0A	0A	0A	0A	0A	0A	0A	0A
A20440		0M0AG	FZ A21DES7INCINERATION				Y	ADD
H	0.072C	0.072C	0A	0A	0A	0A	0A	0A
C	0A	0A	0A	0A	0A	0A	0A	0A
A20445		0M0AG	MN B22DES7INCINERATION				Y	ADD
H	15.6A	15.6A	0A	0A	0A	0A	0A	0A
C	0A	0A	0A	0A	0A	0A	0A	0A
A20611		0.1473	CS FHL1A22THERMOT CYCLONES				Y	ADD
H	14.031C	14.173C	1290003	4448	0A	0A	0A	0A
C	11200C	5008	24008	0A	0A	0A	0A	0A
A20621		0.01844CS	PH A22THERMOT CYCLONES				Y	ADD
H	1.062C	1.080C	936003	328	0A	0A	0A	0A
C	22000C	80C	2508	0A	0A	0A	0A	0A
A20705		151L4AS	PHL5A21DES1ASH DEWATERING & TRANSFER				Y	ADD
H	151A	151A	2540003	1019	0A	0A	0A	0A
C	21000C	25008	126008	0A	0A	0.328	0A	0A
A20713		361L6AS	PHL5A21DES1ASH DEWATERING & TRANSFER				Y	ADD
H	361A	361A	120008	2438	0A	0A	0A	0A
C	50000C	60008	400008	0A	0A	0.788	0A	0A
A20714		215L4AS	PHL5A21DES1ASH DEWATERING & TRANSFER				Y	ADD
H	2159A	2159A	36450008	14488	0A	0A	0A	0A
C	259000C	360008	238008	0A	0A	4.68	0A	0A
A20729		5247AS	PHM3A21DES1ASH DEWATERING & TRANSFER				Y	ADD
H	52H	52H	880008	358	0A	0A	0A	0A
C	7200C	9008	54008	0A	0A	0.118	0A	0A
A20848		0.163N0AG	TXM1A22DES6ADIP PROCESS				Y	ADD
H	149.07A	149.23A	4294000A	74A	0A	0A	0A	0A
C	480008	110000A	752508	0A	0A	0A	0A	0A
A20948		0.84N3AG	TXM1A22DES5CLAUS PROCESS				Y	ADD
H	155.22A	156.06A	2302000A	196A	0A	0A	0A	0A
C	480008	106000A	35000A	0A	0A	116.89A	0A	0A
A21048		0.123	AG TXM1A22DES6STRETCH PROCESS				Y	ADD
H	91.734A	91.457A	1022000A	3844A	0A	0A	0A	0A
C	864008	156000A	167000A	7500C	0A	0A	0A	0A
A21139		0	AG TXM4A22DES2INCINERATION				Y	ADD
H	0.0101A	0.0101A	22408	0.048	0A	0A	0A	0A
C	140C	5C	358	0A	0A	0A	0A	0A
A21146		0	AG MN B20DES2INCINERATION				Y	ADD
H	0.005A	0.005A	153008	0.38	0A	0A	0A	0A
C	1300C	35C	2308	0A	0A	0A	0A	0A
A21148		0	AG TXM1A22DES2INCINERATION				Y	ADD
H	0.84A	0.34A	1520008	3R	0A	0A	0A	0A
C	13000C	350C	23008	0A	0A	0A	0A	0A
A21140		0	AG HZ A21DES2INCINERATION				Y	ADD
H	0.3368	0.3388	350003	0.78	0A	0A	0A	0A
C	3000C	80C	5208	0A	0A	0A	0A	0A
A21128		0N3AG	PH A20DES2INCINERATION				Y	ADD
H	0.2388	0.2388	460008	15	0A	0A	0A	0A
C	3000C	100C	7008	0A	0A	0A	0A	0A
A21142		0	AG HZM9A21DES2INCINERATION				Y	ADD
H	0.04568	0.04568	37003	0.18	0A	0A	0A	0A
C	300C	10C	608	0A	0A	0A	0A	0A
A21245		0	AG MN B22DES2INCINERATION				Y	ADD
H	252A	252A	1286000A	86A	0A	0A	0A	0A
C	360008	105008	70000A	0A	0A	0A	0A	0A
A21452		5000	AG NK A20DES2				N	ADD
A21453		224	AG NK A20DES2				N	ADD
A21447		722	AG NK A20DES2				N	ADD
A21456		14.5	AG FHL8A22DES2				N	ADD
A21451		6.02	RG PHR3A22DES2				N	ADD
A21431		1.2	HS FH A22DES2				N	ADD
A21541		12154	AG NK A20DES2				N	ADD
A21552		26372	AG NK A20DES2				N	ADD
A21553		1260	AG NK A20DES2				N	ADD
A21547		6163	AG NK A20DES2				N	ADD
A21551		28.6	RG PHR3A22DES2				N	ADD
A21534		15420AL	PHR3A21DES1				N	ADD
A21629		5247AS	PHM3A21DES1				N	ADD

A21434	210	AL	FHM3A210ES9					N	ADD
A21447	30	BG	NK A20DES2					N	ADD
A21734	150P0AL		FHP2A210ES1					N	ADD
A21943	0.762FR4CG		F7P5R21THE2					N	ADD
A21954	0.364FR3CG		H2P8R21THE2					N	ADD
A21941	18P4CG	NK	A20THE2					N	ADD
A21950	9.16P4CG		H2P9A21THE2					N	ADD
A21957	0.17924CG	F7	A21THE2					N	ADD
A21921	0.92701CS	PH	A22THE2					N	ADD
A21934	24P0AL		FHP2A210ES1					N	ADD
A20941	81.5	AG	NK A20DES5CLAUS	PROCESS				N	ADD
A20952	256.2	AG	NK A20DES5CLAUS	PROCESS				N	ADD
A20953	0.0364	AG	NK A20DES5CLAUS	PROCESS				N	ADD
A20947	92.7	AG	NK A20DES5CLAUS	PROCESS				N	ADD
A20956	0.656R2AG	FHL9A22DES5CLAUS	PROCESS					N	ADD
A20940	0.334	CG	F7 A21DES5CLAUS	PROCESS				N	ADD
A20942	0.0456	CG	H7N5A21DES5CLAUS	PROCESS				N	ADD
A21045	97.8	AG	MN B20DES6					N	ADD
A21041	10090	AG	NK A20DES6					N	ADD
A21039	14.8	AG	TXN4A22DES6					N	ADD
A21046	2.25	AG	MN B20DES6					N	ADD
A21047	169.8	AG	NK A20DES6					N	ADD
A21040	1.94	BG	FZ A21DES6					N	ADD
A21141	267	AG	NK A20DES2					N	ADD
A21152	423	AG	NK A20DES2					N	ADD
A21153	7.3	AG	NK A20DES2					N	ADD
A21147	117.4	AG	NK A20DES2					N	ADD
A21156	3.34	AG	FHL8A22DES2					N	ADD
A21241	19499	AG	NK A20DES2					N	ADD
A21252	5929	AG	NK A20DES2					N	ADD
A21253	267	AG	NK A20DES2					N	ADD
A21247	892	AG	NK A20DES2					N	ADD
A21256	6.56	AG	PHL3A22DES2					N	ADD
A21441	2148	AG	NK A20DES2					N	ADD
A20405	151L4AS		PHL5A21DES8					N	ADD
A20413	361L6AS		FHL5A21DES8					N	ADD
A20441	14259	AG	NK A20DES7					N	ADD
A20452	99203	AG	NK A20DES7					N	ADD
A20453	1484	AG	NK A20DES7					N	ADD
A20456	98.4	AG	FHL8A22DES7					N	ADD
A20451	63.1L9RG		FHL9A22DES7					N	ADD
A20447	1955R1AG	NK	A20DES2					N	ADD
A20552	20464	AG	NK A20THE2					N	ADD
A20553	603	AG	NK A20THE2					N	ADD
A20614	2158L4AS		PHL5A21DES8					N	ADD
A20647	450M5RG	NK	A20DES2					N	ADD
A20641	56.7M6CG	NK	A20THE2					N	ADD
A20648	0.3005M6CG		TXM1A22THE2					N	ADD
A20640	0.0013M6CG	F7	A21THE2					N	ADD
A20645	0.254M6CG	MN	B22THE2					N	ADD
A20734	660	AL	FHM9A21DES1ASH DEWATERING AND TRANSFER					N	ADD
A20747	450	AG	NK A20DES2					N	ADD
A20740	1.93	AG	FZ A21DES6ADIP	PROCESS				N	ADD
A20841	701.7N1AG	NK	A20DES6ADIP	PROCESS				N	ADD
A20845	127.7	AG	MN B21DES6ADIP	PROCESS				N	ADD
A20847	16.8	AG	NK A20DES6ADIP	PROCESS				N	ADD
A20839	0.3101	AG	TXN4A22DES5CLAUS	PROCESS				N	ADD
A20846	0.005	AG	MN B20DES5CLAUS	PROCESS				N	ADD
A21239	0	AG	TXN4A22DES2INCINERATION					Y	ADD
B	14.8A	14.8A	20000A	5A	0A	0A	0A	0A	0A
C	2200H	6508	4500A	0A	0A	0A	0A	0A	0A
A21246	0	AG	MN B20DES2INCINERATION					Y	ADD
B	2.25A	2.25A	163000A	11A	0A	0A	0A	0A	0A
C	4700H	1400H	9200A	0A	0A	0A	0A	0A	0A
A21248	0	AG	TXM1A22DES2INCINERATION					Y	ADD
B	0.376A	0.376A	1700A	0.1A	0A	0A	0A	0A	0A
C	508	108	100A	0A	0A	0A	0A	0A	0A
A21240	0	AG	FZ A21DES2INCINERATION					Y	ADD
B	4.02B	4.02B	10000A	1A	0A	0A	0A	0A	0A
C	2508	304	550A	0A	0A	0A	0A	0A	0A
A21546	8.29	AG	FHL9A22DES2PMC	PROCESS				Y	ADD
B	75.53A	53.97A	27100000A	8043A	0A	0A	0A	0A	0A

B-35

[illegible]

B-36

[illegible]

[illegible]

A12046	1.104	CG MN	R10	2	0A	0A	0A	0A	Y	ADD
H	4.816A	6.975A	725000A	0.8A						0A
C	25600C	31850B	43960B	1030B	0A				Y	ADD
A12047	31644	AG NK	A10	2	0A	0A	0A	0A	Y	ADD
R	23255A	972778A	5240000A	3905A						0A
C	57500B	584000B	532800B	15000B	0A				Y	ADD
A12048	0.155	CG TX	A12	2					Y	ADD
B	0.4582B	0.464A	190080.102B		0A	0A	0A	0A	Y	ADD
C	117C	72B	100B	2B	0A				Y	ADD
A12022	1680	AS PH	A11	1	0A	0A	2.4B	0A	Y	ADD
B	1680A	1630A	308000A	38A	0A				Y	ADD
C	28500B	3700B	24700B	0A	0A				Y	ADD
A12030	286	AS PH	A11	1	0A	0A	0.4PEB	0A	Y	ADD
R	286A	296A	374000A	6.8B						0A
C	14400B	4500B	30000B	0A	0A				Y	ADD
A12014	5434.7	AS PH	A11	1	0A	0A	9.234B	0A	Y	ADD
B	5434.7A	5434.7A	7182000A	1286B						0A
C	273600B	85500B	575000B	0A	0A				Y	ADD
A22011	0.1473	CS PH	A22	2					Y	ADD
H	14.031C	14.173C	334000B	494B	0A	0A	0A	0A	Y	ADD
C	206000C	375900C	14250C	0A	0A				Y	ADD
A22021	2.177	BS PH	A22	2	0A	0A	0A	0A	Y	ADD
B	4.626B	4.680B	58000B	32B	0A				Y	ADD
C	22000C	80C	250B	0A	0A				Y	ADD
A22028	0	AG PH	A20	2	0A	0A	0A	0A	Y	ADD
B	0.238B	0.238B	46000B	1B	0A				Y	ADD
C	3900C	100C	700B	0A	0A				Y	ADD
A22039	0	AG TX	A22	2	0A	0A	0A	0A	Y	ADD
B	14.8101A	14.8101A	P2240A	5.04A	0A	0A	0A	0A	Y	ADD
C	2390B	655B	4535A	0A	0A				Y	ADD
A22040	0.0013A	CG HZ	A21	2	0A	0A	0A	0A	Y	ADD
H	4.358B	4.358B	45000B	1.7A	0A				Y	ADD
C	3280C	160B	1080A	0A	0A				Y	ADD
A22042	0	AG HZ	A21	2	0A	0A	0A	0A	Y	ADD
B	0.0456B	0.0456B	3700B	0.1B	0A				Y	ADD
C	300C	10C	60B	0A	0A				Y	ADD
A22045	0.254	CG MN	B22	2	0A	0A	0A	0A	Y	ADD
B	252A	252A	1286000A	86A	0A				Y	ADD
C	36000B	10500B	70000A	0A	0A				Y	ADD
A22046	0	AG MN	B20	2	0A	0A	0A	0A	Y	ADD
B	2.255A	2.255A	183300A	11.3A	0A				Y	ADD
C	6000B	1415B	5430A	0A	0A				Y	ADD
A22047	3996B	AG NK	A20	2	0A	0A	0A	0A	Y	ADD
B	39149A	25149A	8426000B	16622B	0A				Y	ADD
C	86000B	946000B	674000B	0A	0A				Y	ADD
A22048	0.0005	AG TX	A22	2	0A	0A	0A	0A	Y	ADD
B	1.216A	1.216A	153700B	3.1B	0A				Y	ADD
C	13050C	360C	2400B	0A	0A				Y	ADD
A22056	34.71	AG PH	A22	2	0A	0A	0A	0A	Y	ADD
B	75.58A	53.87A	2710000A	3043A	0A				Y	ADD
C	17300B	2064000A	271000A	1500B	0A				Y	ADD
A22058	32.1	ASL PH	A21	1	0A	0A	0.066B	0A	Y	ADD
B	32.1A	32.1A	13700B	15B	0A				Y	ADD
C	1500C	170C	1100B	0A	0A				Y	ADD
A22034	1032	AL PH	A21	1	0A	0A	0A	0A	Y	ADD
B	42A	42A	0A	0A	0A				Y	ADD
C	0A	0A	0A	0A	0A				Y	ADD
A22005	151	AS PH	A21	1	0A	0A	0.32B	0A	Y	ADD
B	151A	151A	254000B	101B	0A				Y	ADD
C	21000C	2500B	16600B	0A	0A				Y	ADD
A22013	361	AS PH	A21	1	0A	0A	0.78B	0A	Y	ADD
B	361A	361A	612000B	243B	0A				Y	ADD
C	50000C	6000B	40000B	0A	0A				Y	ADD
A22014	2159	AS PH	A21	1	0A	0A	4.63	0A	Y	ADD
B	2159A	2159A	3645000B	1448B	0A				Y	ADD
C	299000C	36000B	238000B	0A	0A				Y	ADD
A22029	52	AS PH	A21	1	0A	0A	0.11B	0A	Y	ADD
B	52B	52B	84000B	35B	0A				Y	ADD
C	7200C	900B	5600B	0A	0A				Y	ADD
A22003	178.9	AS PH	A21	1	0A	0A	0.404B	0A	Y	ADD
B	178.9A	178.9A	65000B	92B	0A				Y	ADD
C	9000C	1000C	7000B	0A	0A				Y	ADD

A22018	2.5	AS FH	A21	1							Y	ADD
B	2.5A	2.5A	OA	OA	OA	OA	OA	OA	OA	OA		OA
C	OA	OA	OA	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A22019	9.6	AS FH	A21	1							Y	ADD
B	9.6A	9.6A	OA	OA	OA	OA	OA	OA	OA	OA		OA
C	OA	OA	OA	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A22059	108	ASLPH	A21	1							Y	ADD
B	108A	108A	480003	52R						0.2318	OA	OA
C	5000R	580R	39003	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A22060	12.5	ASLPH	A21	1							Y	ADD
B	12.5A	12.5A	550H	0.50						0.0030	OA	OA
C	58C	10C	45C	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32011	0.0124	CS FH	A12	2							Y	ADD
B	12.41C	12.422C	289100R	306B						OA	OA	OA
C	216000C	1755P0C	13350C	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32021	1.216	RS FH	A12	2							Y	ADD
B	8.234R	9.086R	790003	55B						OA	OA	OA
C	21600C	130C	370B	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32040	0.0431	RG HZ	A12	2							Y	ADD
B	0.194C	0.194C	OA	OA	OA	OA	OA	OA	OA	OA		OA
C	OA	OA	OA	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32042	0	AG FZ	A12	2							Y	ADD
B	MINA	MINA	OA	OA	OA	OA	OA	OA	OA	OA		OA
C	OA	OA	OA	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32045	9.4R	AG MN	B12	2							Y	ADD
B	41.88A	41.88A	OA	OA	OA	OA	OA	OA	OA	OA		OA
C	OA	OA	OA	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32047	29712	RG NK	A10	2							Y	ADD
B	23437A	23437A	26570003	2430H						OA	OA	OA
C	80400B3700000R	212600B	3000B	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32048	0.019R	AG TX	A12	2							Y	ADD
B	0.071C	0.071C	OA	OA	OA	OA	OA	OA	OA	OA		OA
C	OA	OA	OA	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32056	9.79	AG FH	A12	2							Y	ADD
B	91.45A	90.5A	7E243000410250A	14.17A						OA	OA	OA
C	86000R167600GR195000CA	130003	364000H								Y	ADD
A32034	1414.4	AL PH	A11	1							Y	ADD
B	64.4R	64.4R	OA	OA	OA	OA	OA	OA	OA	OA		OA
C	OA	OA	OA	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32013	411	AS FH	A11	1							Y	ADD
B	411A	411A	434000H	106B						0.59R	OA	OA
C	23000C	5800R	39000R	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32006	53	HS PH	A11	1							Y	ADD
B	53R	53R	12000R	2B						0.0985P	OA	OA
C	1100C	150C	1000R	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32023	2263	BS FH	A11	1							Y	ADD
B	2263B	2263R	3330003	52R						2.46H	OA	OA
C	29500C	4000C	28500H	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32058	24	BSLPH	A11	1							Y	ADD
B	24R	24R	7100C	2C						0.052C	OA	OA
C	620C	600C	600C	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32014	6534	AS FH	A11	1							Y	ADD
B	6534A	6534A	64130003	1516R						8.43B	OA	OA
C	329000C	85000R	554003	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32005	135	AS FH	A11	1							Y	ADD
B	135A	135A	1610003	35R						0.196B	OA	OA
C	7700C	2000R	1300R	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32006	215	RS FH	H11	1							Y	ADD
B	215R	215R	390003	6R						0.288B	OA	OA
C	3500C	470C	3200R	OA	OA	OA	OA	OA	OA	OA	Y	ADD
A32059	6.7	BSLPH	A11	1							Y	ADD
B	6.7B	6.7B	OA	OA	OA	OA	OA	OA	OA	OA		OA
C	OA	OA	OA	OA	OA	OA	OA	OA	OA	OA	Y	ADD

```

//STEP3 EXEC PGM=IFEGNEP.COND=(0,NE,STEP2.GO)
//SYSIN DD DUMMY
//SYSPRINT DD SYSCUT=A
//SYSUT1 DD DSN=ECSTOUT.DISP=(OLD,CDELETE)
//SYSUT2 DD DSN=DATABASE.DISP=(NEW,KEEP).UNIT=(3400..DEFER).
// VOL=SER=ECDF1.LABEL=(2.SL).DCB=(RECFM=FB,LRECL=200,RLKSIZE=2000)
//
UPDATE

```

SECTION III

PROGRAM 2 - EFFLUENT QUANTITY MATRIX LISTING

- a) Description
- b) Flowchart
- c) Listing

PROGRAM #2 (Effluent Quantity Matrix Listing)

Purpose: To produce a listing showing the quantities of each of the 60 effluents under consideration broken down by plant and further subdivided by major plant division. This will provide a reference for finding the source of the effluent within the facility for each plant.

Input Cards: The footnote card deck will be required due to the fact that the quantity emitted is a footnoted item. The cards in the footnote deck are formatted as follows:

- a) card columns 1-2 contain the footnote key code (A0-Z9)
- b) card columns 3-80 contain the footnote information

Footnotes can span more than one card by simply coding the same footnote key code on two or more consecutive footnote cards.

Printed Output: Each plant's listing will consist of three pages, each containing 20 effluents/page. Each of these three pages of effluent quantity information have cols. for the following:

- a) the effluent description, which can be a chemical symbol (e.g. H2O) or a description (e.g. NAPTHA, PARTICULATES, etc.)
- b) columns for each of the major plant divisions (1-19)
- c) a column for TOTAL effluent quantities emitted from the plant

NOTE: The TOTAL field refers to the total amount of a particular effluent that is emitted from each facility into the environment. It does not necessarily represent the sum of the quantities of that effluent emitted from the major plant divisions within the facility.

Also, at the end of the listing will be a page or two of footnotes that were referenced in the course of the listing.

Manipulation of the Data Base: The original data base will be copied from magnetic tape to a temporary disk file. This temporary file will then be sorted as follows:

- a) first by plant number (1-4) in ascending order
- b) then by effluent number (1-60) in ascending order
- c) finally by major plant division number (1-20) in ascending order

Once the file is arranged in this manner, the printed output can be generated by reading file records sequentially with no backing up and would require very little temporary core storage of output values. This will reduce the time and space needed, and thereby lower costs.

```

//STEP1 EXEC PGM=IEFGENER
//SYSPRINT DD SYSOUT=A
//SYSUT1 DD DSN=DATABASE,DISP=(OLD,PASS),VOL=SER=IESDF1,LABEL=(2,SL),
//          UNIT=(3400,OLFER),DCB=(RECFM=FB,LRECL=200,RLKS17=2000)
//SYSUT2 DD DSN=ESTEMP,UNIT=SYSDA,DISP=(NEW,PASS),SPACE=(CYL,(1,1)),
//          DCB=(RECFM=FB,LRECL=29,BKGI70=2900)
//SYSIN DD *
      GENERATE MAXFLOS=10
      RECORD FIELD=(29,1)
/*
//STEP2 EXEC SORTD,COND=(0,NE)
//SORTIN DD DSN=ESTEMP,DISP=(OLD,DELETE)
//SORTOUT DD DSN=EFFIG4,UNIT=SYSDA,DISP=(NEW,PASS),SPACE=(CYL,(1,1)),
//          DCB=*.SORTIN
//SORTWK01 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK02 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK03 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK04 DD UNIT=3330,SPACE=(CYL,(1,1))
//SYSIN DD *
      SORT FIELDS=(1,1,CH,A,4,2,CH,A,2,2,CH,A),FILSZ=24000
      RECORD TYPE=F,LENGTH=(29)
/*
//STEP3 EXEC PL1FCLG,PARM='X,A,SM=(2,72,1),LC=80'
//PL1L.SYSIN DD *
/* ***** EFFLUENT QUANTITY MATRIX LISTING ***** */
FIGURE4: PROCEDURE OPTIONS(MAIN) ;
-DECLARE
  SYSIN      FILE STREAM INPUT ;
  FIG4       FILE RECORD INPUT ;
  PRCOUT     PRINT STREAM ;
  PRCUT      PRINT STREAM ;
-DCL 01 EFFLUENT REC ..
      02 PLANT NUMBER          CHAR(1) ;
      02 DIVISION NUMBER      CHAR(2) ;
      02 EFFLUENT NUMBER      CHAR(2) ;
      02 EFF DESCRIPTION      CHAR(12) ;
      02 QUANTITY             CHAR(10) ;
      02 QTY FOOTNOTE        CHAR(2) ;
-DCL 01 FOOTNOTE(300) .
      02 FKEY                CHAR(2) ;
      02 FNCNTENTS          CHAR(78) ;
1DECLARE
  LENGTH(4,20)          FIXED BINARY(15,0)  INITIAL(
    3,4,4,5,7,6,8,3,3,5,3,5,7,3,3,3,7,7,8, /* EL PASO      */
    3,3,4,5,5,7,4,5,5,5,5,3,4,5,4,4,3,6,6, /* NATURAL     */
    3,4,4,6,5,6,4,5,5,4,3,6,1,6,5,3,4,1,6,7, /* WESCO      */
    3,5,5,5,5,6,5,3,3,6,3,5,3,4,3,3,4,3,5,7, /* ANG         */
  )
  (P NUM,D NUM,E NUM)    FIXED BINARY(15,0)
  (P CHK,D CHK,E CHK)    FIXED BINARY(15,0)  INITIAL(1)
  (DIV,EFF)              FIXED BINARY(15,0)
  (1,11,12,13,14,15)     FIXED BINARY(15,0)
  NUM CHK                FIXED BINARY(15,0)  INITIAL(0)
  QTYVAL(20)             CHARACTER(10)
  FNVAL(20)              CHARACTER(13)
  KEYS USFD(300)         CHARACTER(2)
  KEY(300)               CHARACTER(2)
-DECLARE
  L1                      CHARACTER(136)  INITIAL(
    'EFFLUENT QUANTITY '
  )
  L2                      CHARACTER(136)  INITIAL(
    'MATERIALS FOR PLANT #'
  )
  L3                      CHARACTER(135)
  L4                      CHARACTER(19)  INIT('DIVISION #')
  L5                      CHARACTER(12)  INITIAL('EFFLUENT ')
  L7                      CHARACTER(53)  INITIAL(
    'QUANTITIES GIVEN IN TONS/DAY '
  )
  L3 = REPEAT('***',134)
-DECLARE
  EFF DESC(60)           CHARACTER(12)  INITIAL(
    'AL2O3'              'AL2(SO4)3'    'BICARBONATE'
    'BOILER ASH'         'CaO'          'CASO3.2H2O'
    'CASO4.2H2O'         'CHLORIDE'     'COAL DUST'    'Fe2O3'
  )

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      FLY ASH      : GASIFIER ASH : K2O      : MG0
      NA2O        : NA2SO3      : NA2SO4   : NO3
      PARTICULATES : PHOSPHATE  : REFUSE    : SI02
      SO3         : SO4        : SP02     : SULPHUR
      SUSP. SOLIDS : UNREACTED C : CHLORIDES : FATTY ACIDS
      HCN         : H2O        : NH3      : PHENOLICS
      SULPHUR     : THIOCYANATES : CO       : COS
      CO2         : CS2        : FATTY ACIDS : HCN
      HYDROCARBENS : H2         : H2O      : H2S
      NAPHTHA     : NH3        : NOX      : N2
      O2          : PHENOLICS  : PYRIDINES : SO2
      THIOCYANATES : SLUDGE (DWT) : SLUDGE (DWT) : SLUDGE (CTH)
1 ON ENDFILE(SYSIN) BEGIN :
  CLOSE FILE(SYSIN) :
  CALL WRITE PAGE HEADINGS :
  PUT FILE(FNOUT) EDIT('** THE FOLLOWING FOOTNOTES WERE REFERENCED:**'
    (PAGE, COL(15),..)) :
  PUT FILE(FNOUT) SKIP(3) :
  I1 = 1 :
  GO TO READ EFFLUENT FILE :
END :
- ON FNCFILE(FIG4) BEGIN :
  CLOSE FILE(FIG4) :
  PLANT NUMBER = '5' :
  DIVISION NUMBER = '01' :
  EFFLUENT NUMBER = '01' :
  CALL INSERT :
  GO TO END OF PROGRAM :
END :
1 OPEN FILE(SYSIN) INPUT :
  FILE(PRINTOUT) OUTPUT PAGESIZE(40) LINESIZE(140) :
  FILE(FNOUT) OUTPUT PAGESIZE(65) LINESIZE(85) :
  FILE(FIG4) SEQUENTIAL INPUT :
- I = 1 :
READ FOOTNOTE DECK :
DO WHILE('1'P) :
  GET FILE(SYSIN) EDIT( FOOTNOTE(I) ) ( A(2),A(78) ) :
  KEY(I) = FKEY(I) :
  I = I + 1 :
END READ FOOTNOTE DECK :
- READ EFFLUENT FILE :
DO WHILE('1'P) :
  READ FILE(FIG4) INTO(EFFLUENT REC) :
  CALL INSERT :
  QTYVAL(D NUM) = SUBSTR(QUANTITY,10-LENGTH(P.NUM,D NUM)) :
  IF QTY FOOTNOTE = ' ' THEN FNVAL(D NUM) = ' ' :
  ELSE IF INDEX( STRING(KEYS USED), QTY FOOTNOTE ) THEN
    FNVAL(D NUM) = '*' || QTY FOOTNOTE :
  ELSE DO :
    KEYS USED(I1) = QTY FOOTNOTE :
    I1 = I1 + 1 :
    I2 = INDEX( STRING(KEY), QTY FOOTNOTE ) :
    I3 = (I2 + 1) / 2 :
    PUT FILE(FNOUT) EDIT(QTY FOOTNOTE || ' *** ' || FNCONTENTS(I3) )
      ( SKIP(2),A ) :
    I3 = I3 + 1 :
  DO WHILE(KEY(I3)=QTY FOOTNOTE) :
    PUT FILE(FNOUT) EDIT(FNCONTENTS(I3)) (SKIP(1),X(7),A) :
    I3 = I3 + 1 :
  ENDO :
  FNVAL(D NUM) = '*' || QTY FOOTNOTE :
END :
D CHK = D CHK + 1 :
IF D CHK > 20 THEN DO :
  D CHK = 1 :
  CALL PRINT ONE EFF :
  E CHK = E CHK + 1 :
  IF E CHK > 60 THEN DO :
    E CHK = 1 :
    P CHK = P CHK + 1 :
    IF P CHK < 5 THEN CALL WRITE PAGE HEADINGS :
  ENDO :

```

```

END :
END READ EFFLUENT FILE :
1INSERT: PROCEDURE :
P NUM = PLANT NUMBER :
D NUM = DIVISION NUMBER :
E NUM = EFFLUENT NUMBER :
DO WHILE( P NUM > P CHK ) :
CALL FILL EFFS :
IF P CHK = 5 THEN RETURN :
CALL WRITE PAGE HEADINGS :
END :
DO WHILE( E NUM > E CHK ) :
CALL FILL LINE :
END :
DO WHILE( D NUM > D CHK ) :
QTYVAL(D CHK) = SUBSTR( N*.10-LENGTH(P CHK,D CHK)) :
FNVAL(D CHK) = :
D CHK = D CHK + 1 :
END :
RETURN :
END INSERT :
-FILL EFFS: PROCEDURE :
IS = P CHK :
DO EFF=IS TO 60 :
CALL FILL LINE :
END :
E CHK = 1 :
P CHK = P CHK + 1 :
RETURN :
END FILL EFFS :
-FILL LINE: PROCEDURE :
DO DIV=D CHK TO 20 :
QTYVAL(DIV) = SUBSTR( N*.10-LENGTH(P CHK,DIV)) :
FNVAL(DIV) = :
END :
CALL PRINT ONE EFF :
D CHK = 1 :
E CHK = E CHK + 1 :
RETURN :
END FILL LINE :
1PRINT ONE EFF: PROCEDURE :
RF1: FORMAT( A(12),A(4),2 A(5),A(5),A(8),A(7),A(9),2 A(4),A(6),A(4),
A(6),A(8),4 A(4),2 A(8),A(9),COL(14),2 A(5),A(5),A(8),A(7),A(9),2 A(4),
A(6),A(4),A(6),A(8),4 A(4),2 A(8),A(9),A(3) ) :
RF2: FORMAT( A(12),2 A(4),A(5),2 A(6),A(8),A(5),A(6),A(7),3 A(6),
A(4),A(5),A(6),2 A(5),A(4),A(7),A(9),COL(14),4 A(4),A(5),2 A(6),A(8),
A(5),A(6),A(7),3 A(6),A(4),A(5),A(6),2 A(5),A(4),A(7),A(9),A(3) ) :
RF3: FORMAT( A(12),A(4),2 A(5),A(7),A(6),A(7),A(5),2 A(6),A(5),A(4),
A(7),A(4),A(7),A(6),A(4),A(5),A(4),A(7),A(4),COL(14),2 A(5),A(7),
A(6),A(7),A(5),2 A(6),A(5),A(4),A(7),A(4),A(7),A(6),A(4),A(5),A(4),
A(7),A(8),A(3) ) :
RF4: FORMAT( A(12),A(4),4 A(6),A(7),A(6),2 A(4),A(7),A(4),A(6),
A(4),A(5),A(4),A(4),A(5),A(4),A(8),COL(14),4 A(6),A(7),A(6),
2 A(4),A(7),A(4),A(6),A(4),A(5),2 A(4),A(5),A(4),A(6),A(7),A(3) ) :
IF P CHK = 1 THEN PUT FILE(PRINTOUT) EDIT
( EFF DESC(E CHK),QTYVAL,FNVAL ) (R(RF1)) :
ELSE IF P CHK = 2 THEN PUT FILE(PRINTOUT) EDIT
( EFF DESC(E CHK),QTYVAL,FNVAL ) (R(RF2)) :
ELSE IF P CHK = 3 THEN PUT FILE(PRINTOUT) EDIT
( EFF DESC(E CHK),QTYVAL,FNVAL ) (R(RF3)) :
ELSE PUT FILE(PRINTOUT) EDIT(EFF DESC(E CHK),QTYVAL,FNVAL) (R(RF4)) :
PUT FILE(PRINTOUT) SKIP(2) :
NUM CHK = NUM CHK + 1 :
IF NUM CHK = 20 & E CHK < 60 THEN CALL WRITE PAGE HEADINGS :
RETURN :
END PRINT ONE EFF :
1WRITE PAGE HEADINGS: PROCEDURE :
RFH01: FORMAT( PAGE,COL(26),A,SKIP(2),COL(42),A,SKIP(3),A(130),SKIP,
COL(20),A,SKIP,A,A(11),SKIP,A,A,SKIP,A,A ) :
NUM CHK = 0 :
IF P CHK = 1 THEN PUT FILE(PRINTOUT) EDIT(L1||L2||'1',
L7, L3, L4, L5, L3.

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* NAME 1 2 3 4 5 6 7 8 9 10
* 10 11 12 13 14 15 16 17 18 19 TOTAL
*****
(R(RFH01)) :
ELSE IF P CHK=2 THEN PUT FILE(PRNTOUT) EDIT(L1||L2||'2'.
L7. L3. L4. L5. L3.
* NAME 1 2 3 4 5 6 7 8 9 10
* 11 12 13 14 15 16 17 18 19 TOTAL
*****
(R(RFH01)) :
ELSE IF P CHK=3 THEN PUT FILE(PRNTOUT) EDIT(L1||L2||'3'.
L7. L3. L4. L5. L3.
* NAME 1 2 3 4 5 6 7 8 9 10
* 11 12 13 14 15 16 17 18 19 TOTAL
*****
(R(RFH01)) :
ELSE IF P CHK=4 THEN PUT FILE(PRNTOUT) EDIT(L1||L2||'4'.
L7. L3. L4. L5. L3.
* NAME 1 2 3 4 5 6 7 8 9 10
* 10 11 12 13 14 15 16 17 18 19 TOTAL
*****
(R(RFH01)) :
ELSE :
PUT FILE(PRNTOUT) SKIP(3) :
RETURN :
END WRITE PAGE HEADINGS :
-END OF PROGRAM:
END FIGURE4 :
/*
//GO.FIG4 DD DSN=66FIG4.DISP=(OLD,DELETE)
//GO.PRNTOUT DD SYSCUT=(G.,0030)
//GO.FNOUT DD SYSOUT=(G.,0030)
//GO.SYSIN DD *
A10SHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
A11CONCENTRATION GREATER THEN 10 MG/M3 IN THE ENVIRONMENT.
A2JUDGED TO BE POSSIBLY HAZARDOUS TO VEGETATION IN CASE OF ACID MINE DRAINAGE.
A3CONSISTS OF 271 TPD DUE TO EVAPORATION FROM RAW WATER STORAGE AND 210 TPD
A4FROM DEGASER VENTS.
A4IN THE FORM OF SLUDGE FROM LIME TREATMENT, DEMINERALIZER AND ZEOLITE SOFTNER.
A5POTENTIALLY HAZARDOUS SINCE IT CONTAINS SALTS AND OTHER WATER TREATMENT
A6CHEMICALS.
A6INCLUDES STEAM LOSSES IN DEAERATOR VENTS, LEAKS AND OTHER LOSSES FROM BOILER
A8AND ITS PIPING.
A70SHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRA-
A71TION GREATER THAN 5 PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO STATE AIR
A7QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
A8ESTIMATED AS NO2.
A9EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS.
B0POTENTIALLY HAZARDOUS DUE TO SOME ELEMENTS AND COMPOUNDS PRESENT WHICH CAN BE
B1LEACHED BY WATER.
B1POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN SOME ELEMENTS AND COMPOUNDS
B2LEACHED OUT FROM THE ASH.
B3ESTIMATED USING EMISSION FACTORS.
B4CONSISTS MAINLY OF GASIFIER ASH PARTICLES.
B5EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF
B6COAL LOCKS.
B70SHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
B8CONCENTRATION GREATER THAN 20 PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO
B9ARE ALSO APPLICABLE.
B60SHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
B6CONCENTRATION GREATER THAN 50 PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO
B7ARE ALSO APPLICABLE.
B7GASIFIER ASH, UNREACTED CARBON AND WATER ARE IN THE FORM OF A SLUDGE.
B8CONSISTS OF EVAPORATION TO ATMOSPHERE FROM FINE ASH POND.
B9EVAPORATED INTO ATMOSPHERE ALONG WITH WATER FROM FINE ASH POND.
C00SHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
C0CONCENTRATION GREATER THAN 10 PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
C0EMISSION STANDARDS ARE ALSO APPLICABLE.

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C1ESTIMATED AS ACETIC ACID.
 C2OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 C2CONCENTRATION GREATER THAN 10 PPM IN THE ENVIRONMENT.
 C3ESTIMATED AS PHENOL.
 C4OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 C4CONCENTRATION GREATER THAN 5 PPM IN THE ENVIRONMENT.
 C5CONSISTS OF 0.144 TPD TO CATALYTIC INCINERATOR AND 0.32 TPD TO VENT GAS
 C5INCINERATOR.
 C6CONSISTS OF 19178 TPD TO CATALYTIC INCINERATOR AND 447 TPD TO VENT GAS
 C6INCINERATOR.
 C7TO CATALYTIC INCINERATOR.
 C8OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 C8CONCENTRATION GREATER THAN 20 PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 C8EMISSIONS STANDARDS ARE ALSO APPLICABLE.
 C9CONSISTS OF 2540TPD TO CATALYTIC INCINERATOR AND 70TPD TO VENT GAS INCINERATOR
 D0CONSISTS OF 4TPD TO CATALYTIC INCINERATOR AND 3TPD TO VENT GAS INCINERATOR.
 D1CONSISTS OF 21TPD TO CATALYTIC INCINERATOR AND 32TPD TO VENT GAS INCINERATOR.
 D2CONSISTS OF 107.5TPD TO CATALYTIC INCINERATOR AND 5.5TPD TO VENT GAS
 D2INCINERATOR.
 D3CONSISTS OF 415TPD TO CATALYTIC INCINERATOR AND 12TPD TO VENT GAS INCINERATOR.
 D4CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 D5IN THE FORM OF SLUDGE.
 D6POTENTIALLY HAZARDOUS DUE TO COOLING TOWER CHEMICALS IN IT.
 D7ESTIMATED AS PYRIDINE.
 D8OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 D8CONCENTRATION GREATER THAN 5 PPM IN THE ENVIRONMENT.
 D9ESTIMATED AS HSCN.
 E0OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 E0CONCENTRATION GREATER THAN 50 PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 E0EMISSION STANDARDS ARE ALSO APPLICABLE.
 E1CONSISTS OF DISSOLVED SOLIDS IN COOLING WATER WHICH ARE SMITTED IN THE DRIFT.
 E2EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS. EMISSION DUE TO LOCK GAS
 E3DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF COAL LOCKS.
 E4EVAPORATED INTO ATMOSPHERE ALONG WITH WATER FROM FINE ASH POND. ESTIMATED AS
 E4ACETIC ACID.
 E5EVAPORATED INTO ATMOSPHERE ALONG WITH WATER FROM FINE ASH POND. ESTIMATED AS
 E5PHENOL.
 E6ESTIMATED AS ACETIC ACID. CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 E7ESTIMATED AS PHENOL. CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 E8OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 E8CONCENTRATION GREATER THAN 5 PPM IN THE ENVIRONMENT. CONSISTS OF DRIFT AND
 E8EVAPORATION LOSSES.
 E9ESTIMATED AS HSCN. CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 F7EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS. ESTIMATED USING EMISSION FACTORS
 F8EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS. CONSISTS MAINLY OF OF GASIFIER
 F9PARTICLES. ESTIMATED USING EMISSION FACTORS.
 G1OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 G1CONCENTRATION GREATER THAN 10 MG/M3 IN THE ENVIRONMENT.
 G2JUDGED TO BE POSSIBLY HAZARDOUS TO VEGETATION IN CASE OF ACID MINE DRAINAGE.
 G3POTENTIALLY HAZARDOUS SINCE IT CONTAINS SALTS AND OTHER WATER TREATMENT
 G3CHEMICALS.
 G4CONSISTS OF EVAPORATION FROM RAW WATER STORAGE.
 G5POTENTIALLY HAZARDOUS DUE TO SOME ELEMENTS AND COMPOUNDS PRESENT WHICH CAN
 G5BE LEACHED BY WATER.
 G6CONSISTS OF 44TPD OF WATER ACCOMPANYING THE BOILER ASH AND 132TPD OF WATER
 G6ACCOMPANYING THE FLY ASH.
 G7POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN SOME ELEMENTS AND COMPOUNDS
 G7LEACHED OUT FROM THE ASH.
 G8CONSISTS OF FLY ASH COLLECTED BY THE ELECTROSTATIC PRECIPITATOR.
 G9CONSISTS OF FLY ASH PARTICLES.
 H0OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 H0CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO
 H0STATE AIR QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
 H1OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 H1CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO
 H1STATE AIR QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
 H2FORMED IN BOILER DUE TO COMBUSTION OF COAL, H2S AND COS.
 H3OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 H3CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO
 H3STATE AIR QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
 H4ESTIMATED AS NO2.
 H5ESTIMATED USING EMISSION FACTORS.

H6CONSISTS OF GASIFIER ASH PARTICLES.
 H7CONSISTS OF WATER VAPOR FROM ASH QUENCHING OPERATION.
 H8EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING
 H9OF COAL LOCKS.
 H9ASH AND WATER ARE IN THE FORM OF A SLUDGE.
 I0DOES NOT INCLUDE 116.4TPD H2S IN THE H2S RICH GAS SENT TO CLAUS PLANT.
 I1DOES NOT INCLUDE 24.5TPD CO2 IN THE H2S RICH GAS SENT TO THE CLAUS PLANT.
 I2DOES NOT INCLUDE 6.8TPD H2O IN THE H2S RICH GAS SENT TO THE CLAUS PLANT.
 I3ALL THE H2S IS OXIDIZED TO SO2. ANY UNCONTROLLED H2S LEAVES THE CLAUS UNIT AS
 I3SO2.
 I4OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 I4CONCENTRATION GREATER THAN 10PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 I4EMISSION STANDARDS ARE ALSO APPLICABLE.
 I5DIRECT OPERATING COST FOR OPERATING WASTE LIQUID DISPOSAL SYSTEM.
 I6OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 I6CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 I6EMISSION STANDARDS ARE ALSO APPLICABLE.
 I7IT IS A PART OF THE SLUDGE SENT TO THE MINE. COST IS ONLY ALLOCATED TO
 I7CASO4.2H2O SINCE IT IS THE MAJOR COMPONENT.
 I8POTENTIALLY HAZARDOUS BECAUSE CA IONS MAY BE LEACHED BY WATER.
 I9POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN CA IONS LEACHED OUT FROM
 I9THE SLUDGE.
 J0COST FOR OPERATING LIQUID WASTE DISPOSAL SYSTEM.
 J1PART OF THE SLUDGE FROM THE BIOLOGICAL WASTE WATER SLUDGE SENT TO MINE. COST
 J1IS ALLOCATED ONLY TO CAC03 SINCE IT IS A MAJOR COMPONENT.
 J2CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 J3ESTIMATED AS ACETIC ACID.
 J4OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 J4CONCENTRATION GREATER THAN 10PPM IN THE ENVIRONMENT.
 J5ESTIMATED AS PHENOL.
 J6OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 J6CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT.
 J7ESTIMATED AS HSCN.
 J8OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 J8CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 J8EMISSION STANDARDS ARE ALSO APPLICABLE.
 J9CONSISTS OF DISSOLVED SOLIDS IN COOLING WATER WHICH ARE EMITTED IN THE DRIFT.
 K0ESTIMATED USING EMISSION FACTORS. CONSISTS OF GASIFIER ASH PARTICLES.
 K1CONSISTS OF DRIFT AND EVAPORATION LOSSES. ESTIMATED AS ACETIC ACID.
 K2CONSISTS OF DRIFT AND EVAPORATION LOSSES. ESTIMATED AS PHENOL.
 K3CONSISTS OF DRIFT AND EVAPORATION LOSSES. ESTIMATED AS HSCN.
 L1OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 L1CONCENTRATION GREATER THAN 10 MG/M3 IN THE ENVIRONMENT.
 L2SLUDGE CONSISTS OF 13.5TPD CAC03, 0.42TPD MG(OH)2, 0.77TPD AL2(SO4)3 AND
 L217.4TPD SUSPENDED SOLIDS.
 L3POTENTIALLY HAZARDOUS SINCE IT CONTAINS SALTS AND OTHER WATER TREATMENT
 L3CHEMICALS.
 L4CONSISTS OF 14.4% AL2O3, 25.9% CAO, 11.8% MGO, 3.6% NA2O, 5.2% SO3,
 L426.5% SIO2, 1.5% SFC2 AND 1.2% K2O.
 L5POTENTIALLY HAZARDOUS DUE TO SOME ELEMENTS AND COMPOUNDS PRESENT WHICH CAN BE
 L5LEACHED BY WATER.
 L6CONSISTS OF 32.8% SIO2, 27.7% CAO, 17.0% AL2O3, 5.1% NA2O, 10.0% MGO,
 L61.0% K2O, 5.3% FE2O3 AND 1.1% TI02.
 L7PARTICULATES ARE FLY ASH PARTICLES.
 L8OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 L8CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 L8STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 L9ESTIMATED AS NO2.
 M0PART OF THE COAL LOCK GAS INCINERATED IN THE BOILER.
 M1OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 M1CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 M1STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 M2AN ADDITIONAL 4823TPD OF H2O VAPOR IS EMITTED TO THE STACK GAS TREATMENT UNIT.
 M3CONSISTS OF LEAKS AND STEAM VENTS TO THE ATMOSPHERE FROM THE STEAM LINE.
 M4CONSISTS MAINLY OF GASIFIER ASH PARTICLES.
 M5FROM ASH QUENCH.
 M6EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING
 M6OF COAL LOCKS.
 M7CONSISTS OF SOLIDS FROM THE TRIPLE EFFECT EVAPORATOR CONCENTRATOR CONTAINING
 M7CYANIDES, PHENOLS, FATTY ACIDS AND METAL IONS.
 M8POTENTIALLY HAZARDOUS DUE TO THE PRESENCE OF CYANIDES, PHENOLS, FATTY ACIDS
 M8AND METAL IONS THAT COULD BE LEACHED BY WATER.

M0POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN SOME ELEMENTS AND COMPOUNDS
 M9LEACHED OUT FROM ASH AND SLUDGE.
 N0DOES NOT INCLUDE 149.1TPD H2S IN THE H2S RICH GAS SENT TO CLAUS PLANT.
 N1DOES NOT INCLUDE 34.05TPD CO2 IN THE H2S RICH GAS VENT TO CLAUS UNIT.
 N2DOES NOT INCLUDE 6.78TPD H2O IN THE H2S RICH GAS VENT TO CLAUS UNIT.
 N3SCMP OF THE CONTROLLED H2S LEAVES THE CLAUS UNIT AS SO2.
 N4OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 N4CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 N4STATE AIR QUALITY STANDARDS ARE ALSO APPLICABLE.
 N5AN ADDITIONAL 0.238TPD OF SULPHUR IN THE VAPOR PHASE IS EMITTED FROM THE CLAUS
 N5PROCESS.
 N6OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 N6CONCENTRATION GREATER THAN 200PPM IN THE ENVIRONMENT.
 N7DIRECT OPERATING COSTS FOR OPERATING WASTE LIQUOR DISPOSAL SYSTEM.
 N8SULPHUR IS IN VAPOR STATE.
 N9OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 N9CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT.
 P0EMITTED AS A SLUDGE.
 P1POTENTIALLY HAZARDOUS SINCE IT MAY BE LEACHED BY WATER.
 P2POTENTIALLY HAZARDOUS SINCE IT MAY CONTAIN SODIUM AND CALCIUM IONS LEACHED OUT
 P2FROM SALTS.
 P3CONSISTS OF 66.7% CaCO3, 15.3% ORGANIC MATTER FOR BIOTREATING, 8.0% CALCIUM
 P3SALTS OF PHENOLS, 5.8% CALCIUM SALTS OF FATTY ACIDS AND 4.2% OTHER INORGANIC
 P3CALCIUM SALTS.
 P4CONSISTS OF EVAPORATION AND DRIFT LOSSES.
 P5ESTIMATED AS ACETIC ACID.
 P6OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 P6CONCENTRATION GREATER THAN 10PPM IN THE ENVIRONMENT.
 P7ESTIMATED AS PHENOL.
 P8OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 P8CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT.
 P9OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 P9CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT.
 Q0ESTIMATED AS HSCN.
 Q1CONSISTS OF DISSOLVED SOLIDS IN COOLING WATER WHICH ARE EMITTED IN THE DRIFT.
 Q2CONSISTS OF 66.4% CaCO3, 9.6% Mg(OH)2 AND 4.0% Al2(SO4)3.
 R1AN ADDITIONAL 4823TPD OF H2O VAPOR IS EMITTED TO THE STAG GAS TREATMENT UNIT.
 R1CONSISTS OF LEAKS AND STEAM VENTS TO THE ATMOSPHERE FROM THE STEAM LINE.
 R2SOME OF THE UNCONTROLLED H2S LEAVES THE CLAUS UNIT AS SO2. AN ADDITIONAL
 R20.238TPD OF SULFUR IN THE VAPOR PHASE IS EMITTED FROM THE CLAUS PROCESS.
 R3OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 R3CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 R3STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 R3ESTIMATED AS NO2.
 R4CONSISTS OF EVAPORATION AND DRIFT LOSSES. ESTIMATED AS ACETIC ACID.
 R5CONSISTS OF EVAPORATION AND DRIFT LOSSES. ESTIMATED AS PHENOL.
 R6CONSISTS OF EVAPORATION AND DRIFT LOSSES. ESTIMATED AS HSCN.
 S1OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 S1CONCENTRATION GREATER THAN 10 MG/M3 IN THE ENVIRONMENT.
 S2POTENTIALLY HAZARDOUS DUE TO WATER TREATMENT CHEMICALS THAT MAY BE PRESENT.
 S3POTENTIALLY HAZARDOUS DUE TO ELEMENTS OR COMPOUNDS PRESENT WHICH CAN
 S3BE LEACHED BY WATER.
 S4OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 S4CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 S4STATE AIR QUALITY STANDARDS ARE ALSO APPLICABLE.
 S5OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 S5CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 S5AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 S6ESTIMATED AS NO2.
 S7ESTIMATED USING EMISSION FACTORS.
 S8EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF
 S8COAL LOCKS.
 S9OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 S9CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 S9STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 T0CONSISTS MAINLY OF GASIFIER ASH PARTICLES. ESTIMATED USING EMISSION FACTORS.
 T1POTENTIALLY HAZARDOUS DUE TO ELEMENTS AND COMPOUNDS WHICH MAY BE
 T1LEACHED FROM ASH.
 T2DIRECT OPERATING COST FOR WASTE LIQUID DISPOSAL.
 T3AN ADDITIONAL 1.3TPD OF CO2 IS EMITTED TO THE ATMOSPHERE IN THE STRETFORD
 T3LEFT STREAM.
 T4REPORTED BY ANG AS ORGANIC SULFUR.

T50SHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
T50CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT.
T65STRETFORD BLEED STEAM.
T7INCINERATION IS DONE IN A STEAM SUPERHEATER WITH TAR OIL, NAPHTHA AND
T7PHENOLICS AS FUEL.
T8EMITTED AS STRETFORD OXIDIZER EFFLUENT.
T9POTENTIALLY HAZARDOUS SINCE IT CONTAINS HIGH CONCENTRATIONS OF DISSOLVED
T9SALTS AND OTHER CHEMICALS.
U0MAY CONTAIN FATTY ACIDS, AMMONIA, PHENOLICS, OTHER VOLATILE CONTAMINANTS AND
U0DISSOLVED SOLIDS WHICH ARE EMITTED ALONG WITH THE DRIFT.
U1POTENTIALLY HAZARDOUS SINCE IT CONTAINS FATTY ACIDS, AMMONIA, ETC.
U2ESTIMATED AS NO2. INCINERATION IS DONE IN A STEAM SUPERHEATER WITH TAR OIL,
V0NAPHTHA AND PHENOLICS AS FUEL.

//
//

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SECTION IV

PROGRAM 3 - COMPARATIVE MATRIX FOR EFFLUENT QUANTITIES FROM EACH GASIFICATION FACILITY

- a) Description
- b) Flowchart
- c) Listing

PROGRAM #3 (Comparative Matrix for Effluent Quantities from Each Gasification Facility)

Purpose: To generate a listing which expresses the effluent quantities as a ratio to the minimum non-zero effluent quantity (for each division (1-19) and for TOTAL effluent quantities) across all four plants. From this listing the effectiveness of the different plants, relative to one another, for control of each effluent can be readily accessed.

Input Cards: None required

Printed Output: The comparative matrix listing will follow the general format of Figure #5, page 55 of the "Progress Report for Period June 1, 1976-February 28, 1977"; with the exception that the listing will be spread over five pages as follows:

- a) page #1 will contain the comparisons across divisions 1-5
- b) page #2 will contain the comparisons across divisions 6-10
- c) page #3 will contain the comparisons across divisions 11-15
- d) page #4 will contain the comparisons across divisions 16-19
- e) page #5 will contain the comparisons for the TOTAL effluent quantities generated

Each page will have the comparisons for all 60 effluents and no footnotes.

Manipulation of the Data Base: The original data base file will be copied from magnetic tape to a temporary disk file. This temporary file will then be sorted as follows:

- a) first by major plant division number (1-20) in ascending order
- b) then by effluent number (1-60) in ascending order
- c) finally by plant number (1-4) in ascending order

This sorted file will then be used to create a third file which has any missing data entries inserted. This allows for easier calculations of the plant-to-plant quantity ratios, since four consecutive records can be read each time for comparing the quantities of an effluent in each division. These ratios are then stored in an array, forming a column of ratios for each division. The output then can be generated directly from the array.

FIGURE # 5

FLOWCHART

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//STEP1 EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSUT1 DD DSN=DATABASE.VOL=SER=2250F1, LABEL=(2,SL), DISP=(OLD,PASS),
// UNIT=(3400,,DEFER), DCB=(RECFM=FB, LRECL=200, BLKSIZE=2000)
//SYSUT2 DD DSN=66TEMP, UNIT=SYSDA, DISP=(NEW,PASS), SPACE=(CYL,(1,1)),
// DCB=(LRECL=27, BLKSIZE=2700, RECFM=FB)
//SYSIN DD *
GENERATE MAXFLDS=10
RECORD FIELD=(27,1)
/*
//STEP2 EXEC SORTU
//SORTIN DD DSN=66TEMP, DISP=(OLD,DELETE)
//SORTOUT DD DSN=66FIG5, UNIT=SYSDA, DISP=(NEW,PASS), SPACE=(CYL,(1,1)),
// DCB=(LRECL=27, BLKSIZE=2700, RECFM=FB)
//SORTWK01 DD UNIT=3330, SPACE=(CYL,(1,1))
//SORTWK02 DD UNIT=3330, SPACE=(CYL,(1,1))
//SORTWK03 DD UNIT=3330, SPACE=(CYL,(1,1))
//SORTWK04 DD UNIT=3330, SPACE=(CYL,(1,1))
//SYSIN DD *
SORT FIELDS=(2,2,CH,A,4,2,CH,A,1,1,CH,A), FILSZ=E4000
RECCAO TYPE=F, LENGTH=(27)
/*
//STEP3 EXEC PL1LFCLG, PARM='X,A,LC=20,SM=(2,72,1)'
//PL1L.SYSIN DD *
/* ***** COMPARITIVE QUANTITY RATIO MATRIX LISTING ***** */
COMPUTY: PROCEDURE OPTIONS(MAIN) ;
DECLARE
  COMP ARRAY(60,5,4) CHARACTER(6) ;
  DCL 01 FILL REC
    02 DIVNUM FIXED BIN(15,0)
    02 EFFNUM FIXED BIN(15,0)
    02 PLNUM FIXED BIN(15,0)
    02 QTY CHAR(10)
    02 NUMCODE CHAR(1)
  DCL 01 EFFLUENT REC
    02 PLANT NUMBER CHAR(1)
    02 DIVISION NUMBER CHAR(2)
    02 EFFLUENT NUMBER CHAR(2)
    02 EFF DESCRIPTION CHAR(12)
    02 QUANTITY CHAR(10)
  DECLARE
    NUM ARRAY(4) FIXED BINARY(15,0)
    QTY ARRAY(4) FLOAT DECIMAL
    QTY RATIO FIXED DECIMAL(4,2)
    (DIVCHK, EFFCHK, PLCHK) FIXED BINARY(15,0) INITIAL(1)
    (1,11,12,13,15,16,17) FIXED BINARY(15,0) INITIAL(0)
    (J,J1) FIXED BINARY(15,0) INITIAL(0)
    J2 FLOAT DECIMAL
    (DNUM,FNUM,FNUM) FIXED BINARY(15,0)
    FIG5 FILE RECORD SEQUENTIAL INPUT
    INSERT FILE RECORD SEQUENTIAL
    OUTPUT PRINT STREAM
  DECLARE
    V FIXED BINARY(15,0)
    L1 CHARACTER(53) INITIAL(
      'COMPARITIVE MATRIX FOR EFFLUENT QUANTITIES'
    )
    L2 CHARACTER(37) INITIAL(
      'FROM EACH GASIFICATION FACILITY'
    )
    L3 CHARACTER(132)
    L4 CHARACTER(90)
    L3 = REPEAT('***,131)
    L4 = 'SHOWING THE RATIO VALUE TO MINIMUM NON-ZERO EFFLUENT FOR '
    'THAT DIVISION FOR ALL FOUR PLANTS'
  -DECLARE
    QTY ABBREVS(6) CHARACTER(10) INITIAL(
      'MIN' 'NIL' 'NEG' '0' 'SM'
    )
  -DECLARE
    EFF DESC(60) CHARACTER(12) INITIAL(
      'AL2O3' 'AL(OH)3' 'AL2(SO4)3' 'BICARBONATE'
      'BOILER ASH' 'CaCO3' 'CaO' 'CASO3.2H2O'
      'CASO4.2H2O' 'CHLORIDE' 'COAL DUST' 'FE2O3'
      'FLY ASH' 'GASIFIER ASH' 'K2O' 'MGO'
    )

```

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*****
      NA2O      NA2SO3      NA2SO4      NUJ
PARTICULATES  PHOSPHATE  REFUSE      S102
SO3           SO4        SE02        SULPHUR
SUSP. SOLIDS  UNREACTED C  CHLORIDES  FATTY ACIDS
HCN           H2O        NH3         PHENOLICS
SULPHUR       THIOCYANATES  CO        C18
CO2           CS2        FATTY ACIDS  HCN
HYDROCARBONS  H2        H2O        H2S
NAPHTHA       NH3        N1X        N2
O2            PHENOLICS  PYRIDINES  SO2
THIOCYANATES  SLUDGE (RWT)  SLUDGE (HWNT)  SLUDGE (CTB)
1 ON ENDFILE(FIG5) BEGIN
  CLOSE FILE(FIG5)
  DIVISION NUMBER = '21'
  EFFLUENT NUMBER = '01'
  PLANT NUMBER = '1'
  CALL FILLDATA
  CLOSE FILE(INSERT)
  OPEN FILE(INSERT) INPUT
  GO TO STEP2
END
- ON ENDFILE(INSERT) BEGIN
  CLOSE FILE(INSERT)
  PUT FILE(OUTPUT) EDIT('**END OF FILE ON FILE(INSERT) **') (PAGE,A)
  GO TO END OF PROGRAM
END
1 OPEN FILE(OUTPUT) OUTPUT PAGESIZE(80) LINESIZE(132)
  OPEN FILE(FIG5) INPUT, FILE(INSERT) OUTPUT
-STEP1:
  DO WHILE('1'R)
    READ FILE(FIG5) INTO(EFFLUENT_REC)
    CALL FILLDATA
  END STEP1
-STEP2:
  DO I=1 TO 4
0STEP3:
    DO I1=1 TO 5
      DO I2=1 TO 60
        J = 0
        DO I3=1 TO 4
          READ FILE(INSERT) INTO(FILL_REC)
          IF NUMCODE = '0' THEN
            COMP ARRAY(I2,I1,I3) = SUBSTR( QTY,6)
          ELSE DO
            J = J + 1
            QTY ARRAY(J) = QTY
            NUM ARRAY(J) = I3
          END
        END
        IF J > 0 THEN DO
          J2 = QTY ARRAY(1)
          DO J1=2 TO J
            IF QTY ARRAY(J1) < J2 & QTY ARRAY(J1) > 0 THEN J2=QTY ARRAY(J1)
          END
          DO J1=1 TO J
            QTY RATIO = QTY ARRAY(J1) / J2
            COMP APRAY(I2,I1,NUM ARRAY(J1)) = SUBSTR( CHAR(QTY RATIO),2)
          END
        END
      END
    END STEP3
  IF I < 4 THEN CALL FORMAT1
  ELSE CALL FORMAT2
END STEP2
1FILLDATA: PROCEDURE
0 DNUM = DIVISION NUMBER
  DO WHILE(DNUM>DIVCHK)
    DIVNUM = DIVCHK
    DO EFFNUM = EFFCHK TO 60
      DO PLNUM = PLCHK TO 4
        QTY = ' '
        NUMCODE = '0'

```


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.....

SECTION V

PROGRAM 4 - COMPARATIVE EFFLUENT CONTROL COST AND ENERGY CONSUMPTION

- a) Description
- b) Flowchart
- c) Listing

PROGRAM #4

(COMPARITIVE EFFLUENT CONTROL COST AND ENERGY CONSUMPTION)

Purpose: To generate a comparative cost table that shows the operating costs involved, in terms of money and energy, in the control of all regulated effluents.

Input Cards: None required.

Printed Output: The output will consist of one page containing the cost information for all four plants relative to each controlled effluent. The operating cost will be given in terms of dollars per year and the total energy cost will be in terms of either MM Btu/hour or MM Btu/day.

Manipulation of the Data Base: The original data base file will be copied from magnetic tape to a temporary disk file which will be sorted as follows:

- a. first by major division number, in descending order. This places all TOTAL effluent records at the top of the file, since TOTAL records have a division number of 20.
- b. then by whether or not the effluent is regulated. This places all regulated effluents at the start of the TOTAL records.
- c. then by effluent number. This places the records to be used in the correct order (i.e. the same relative order as original list).
- d. finally by plant number. This allows sequential access of files and simplified construction of program output.

FIGURE # 7

LISTING PROGRAM FLOWCHART

EEEEEEEEEEEE	EEEEEEEEEEEE	SSSSSSSSSS
EEEEEEEEEEEE	EEEEEEEEEEEE	SSSSSSSSSS
EE	EE	SS
FF	EE	SS
FF	EE	SSS
EEEEEEEE	EEEEEEEE	SSSSSSSS
EEEEEEEE	EEEEEEEE	SSSSSSSS
EE	EE	SSSS
EE	EE	SS
EE	EE	SS
EEEEEEEEEEEE	EEEEEEEEEEEE	SSSSSSSSSS
EEEEEEEEEEEE	EEEEEEEEEEEE	SSSSSSSSSS

FFFFFFFFFFFF	IIIIIIIIII	GGGGGGGGGG	7777777777
FFFFFFFFFFFF	IIIIIIIIII	GGGGGGGGGG	7777777777
FF	II	GG	77
FF	II	GG	77
FF	II	GG	77
FFFFFFFF	II	GG	77
FFFFFFFF	II	GG	77
FF	II	GG	77
FF	II	GG	77
FF	II	GG	77
FF	IIIIIIIIII	GGGGGGGGGG	77
FF	IIIIIIIIII	GGGGGGGGGG	77

HH	HH
HH	HH
HH	HH
HH	HH
HH	HH
HHHHHHHHHH	HH
HHHHHHHHHH	HH
HH	HH
HH	HH
HH	HH
HH	HH

```

//STEP1 EXEC FGM=IFBGENER
//SYSPRINT DD SYSCUT=A
//SYSUT1 DD DSN=DATABASE,DISP=(OLD,PASS),VOL=SER=EESDF1,LABEL=(2,SL),
//          UNIT=(3400,,DLFBI),DCB=(RECFM=FB,LRECL=200,BLKSIZE=2000)
//SYSUT2 DD DSN=EXTMP,UNIT=SYSDA,DISP=(NEW,PASS),SPACE=(CYL,(1,1)),
//          DCB=(RECFM=FB,LRECL=19,BLKSIZE=1800)
//SYSIN DD *
GENERATE MAXFLDS=10
RECORD FIELD=(5,1,,1),FIELD=(1,34,,6),FIELD=(5,113,,7),
          FIELD=(7,127,,12)
/*
//STEP2 EXEC SORTC,COND=(0,NE)
//SORTIN DD DSN=EXTMP,DISP=(OLD,DELETE)
//SORTOUT DD DSN=EXTMP,UNIT=SYSDA,DISP=(NEW,PASS),SPACE=(CYL,(1,1)),
//          DCR=*,SORTIN
//SORTWK01 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK02 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK03 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK04 DD UNIT=3330,SPACE=(CYL,(1,1))
//SYSIN DD *
SORT FIELDS=(2,2,CH,C,6,1,CH,D,4,2,CH,A,1,1,CH,A),FILSZ=E4000
RECORD TYPE=F,LENGTH=(18)
/*
//STEP3 EXEC PL1LFC LG,PARM='X,A,SM=(2,72,1),LC=80'
//PL1L.SYSIN DD *
/* COMPARITIVE EFFLUENT CONTROL COST AND ENERGY CONSUMPTION LISTING*/
FIGURE7: PROCEDURE OPTIONS(MAIN) :
-DECLARE
  OUTPUT PRINT STREAM,
  FIG7 FILE RECORD SEQUENTIAL INPUT :
-DCL 01 EFFLUENT FLC,
      02 PLANT NUMBER CHAR(1) ,
      02 DIVISION NUMBER CHAR(2) ,
      02 EFFLUENT NUMBER CHAR(2) ,
      02 CONTROLLED EFF KEY CHAR(1) ,
      02 TOT ENERGY REQ CHAR(5) ,
      02 TOT OPER COST CHAR(7) ;
-DCL 01 CONTRL INFO(4) ,
      02 OPER COST CHAR(7) ,
      02 ENERGY REQ CHAR(5) ;
-DECLARE
  (ENUM,PNUM,ECHK,PCHK) FIXED BINARY(15,0) INITIAL(1) :
-DECLARE
  EFF DESC(60) CHARACTER(12) INITIAL(
    'AL2O3' 'AL(OH)3' 'AL2(SO4)3' 'BICARBONATE',
    'BOTLER ASH' 'CACO3' 'CAO' 'CASO3.2H2O',
    'CASO4.2H2O' 'CHLORIDE' 'COAL DUST' 'FE2O3',
    'FLY ASH' 'GASIFIER ASH' 'K2O' 'MGO',
    'NA2O' 'NA2SO3' 'NA2SO4' 'ND3',
    'PARTICULATES' 'PHOSPHATE' 'PERFUSE' 'SIO2',
    'SO3' 'SC4' 'SRO2' 'SULPHUR',
    'SUSP. SOLIDS' 'UNREACTED C' 'CHLORIDES' 'FATTY ACIDS',
    'HCN' 'H2C' 'NH3' 'PHENOLICS',
    'SULPHUR' 'THIOCYANATES' 'CO' 'COS',
    'CO2' 'CS2' 'FATTY ACIDS' 'HCN',
    'HYDROCARBONS' 'H2' 'H2O' 'H2S',
    'NAPTHA' 'NH3' 'NIX' 'N2',
    'O2' 'PHENOLICS' 'PYRIDINES' 'S2',
    'THIOCYANATES' 'SLUDGE (RWT)' 'SLUDGE (BWT)' 'SLUDGE (CTB)' ) ;
DECLARE
  L1 CHARACTER(66) INITIAL(
    'COMPARITIVE EFFLUENT CONTROL COSTS') ,
  L2 CHARACTER(51) INITIAL(
    'T AND ENERGY CONSUMPTION') ;
1 ON ENDFILE(FIG7) BEGIN ;
  CLOSE FILE(FIG7) ;
  SIGNAL CONDITION(ALLDONE) ;
END ;
- ON CONDITION(ALLDONE) BEGIN ;
  IF PCHK > 1 THEN CALL NEWEFF ;
  PUT FILE(OUTPUT) EDIT('END OF JOB')(PAGE,A) ;
  GO TO END OF PROGRAM ;

```

```

END :
1 OPEN FILE(OUTPUT) OUTPUT LINESIZE(132) PAGESIZE(40) ;
OPEN FILE(FIG7) SEQUENTIAL INPUT ;
0 PCT FILE(OUTPUT) EDIT ( L1 || L2 , REPEAT('*',131) ,
  'P L A N T # 1' , 'P L A N T # 2' , 'P L A N T # 3' ,
  'P L A N T # 4' , REPEAT('*****',3) ,
  'CONTROLLED' , REPEAT('TOTAL TOTAL',3) ,
  'EFFLUENT' , REPEAT('OPERATING ENERGY',3) ,
  'COST CONSUMED',3) ,
  '1/2YR MM (TU/D)',3) ,
  REPEAT('*****',3) )
(PAGE,LINE(5),COL(9),A,SKIP(2),A,COL(26),A,COL(50),A,COL(90),A,
COL(116),A,COL(13),A,(5)(COL(1),A,-)) ;
PUT FILE(OUTPUT) SKIP(3) ;
0 READ FILE(FIG7) INTO(EFFLUENT REC) ;
IF CONTROLLED EFF KEY = 'Y' | DIVISION NUMBER = '20' THEN
  SIGNAL CONDITION(ALLDONE) ;
ECHK = EFFLUENT NUMBER ;
CALL INSERT ;
DO WHILE('1'H) ;
  READ FILE(FIG7) INTO(EFFLUENT REC) ;
  IF CONTROLLED EFF KEY = 'Y' | DIVISION NUMBER = '20' THEN
    SIGNAL CONDITION(ALLDONE) ;
    ENUM = EFFLUENT NUMBER ;
    IF ENUM = ECHK THEN CALL NEWEFF ;
    ELSE CALL INSERT ;
  END ;
INWEFF: PROCEDURE ;
DO I=PCHK TO 4 ;
  OPER COST(I) = ' NR' ;
  ENERGY REQ(I) = ' NR' ;
END ;
PCHK = 1 ;
PUT FILE(OUTPUT) EDIT( EFF DESC(ECHK),CONTROL INFO )
  (SKIP(2),A,X(11),A,X(5),A,(3)(X(13),A,X(5),A)) ;
ECHK = EFFLUENT NUMBER ;
CALL INSERT ;
RETURN ;
END NEWEFF ;
-INSERT: PROCEDURE ;
ENUM = EFFLUENT NUMBER ;
PNUM = PLANT NUMBER ;
DO WHILE(PNUM > PCHK) ;
  OPER COST(PCHK) = ' NR' ;
  ENERGY REQ(PCHK) = ' NR' ;
  PCHK = PCHK + 1 ;
END ;
OPER COST(PCHK) = TOT OPER COST ;
ENERGY REQ(PCHK) = TOT ENERGY REQ ;
PCHK = PCHK + 1 ;
RETURN ;
END INSERT ;
-END OF PROGRAM:
CLOSE FILE(FIG7) ;
END FIGURE7 ;
/*
//GO.OUTPUT DD SYSOUT=(G..0030)
//GO.FIG7 DD DSN=66FIG7.DISP=(OLD,DELETE)
//GO.SYSIN DD *
//

```


SECTION VI

PROGRAMS 5, 6, 7, 8 - RELIABILITY BREAKOUT LISTINGS

a) Descriptions

b) Listings

- 1) Program 5 - Quantity Reliability Breakout Program Listing
- 2) Program 6 - Biological Hazard Reliability Program Listing
- 3) Program 7 - Installed Cost Reliability Program Listing
- 4) Program 8 - Operating Cost Reliability Program Listing

PROGRAMS #5, 6, 7, 8 (RELIABILITY BREAKOUT LISTINGS)

Purpose: To produce listings broken out as far as the reliability of the data. Such listings would be generated for quantity emitted, biological hazard, total installed cost, and total operating cost. These listings would show which data is most dependable and also which areas need more study and research.

Input Cards: Program 5. Quantity - none required.
Program 6. Biol. Hazard - footnote deck (see 'Input Cards' section of Program #2).
Program 7. Installed Cost - none required.
Program 8. Operating Cost - none required.

Printed Output: The reliability breakout listings will produce an estimated 33 total pages of output broken down as follows:

Program 5. Quantity - 12 pages (@ 3 pages/plant, no footnotes)
Program 6. Biol. Hazard - 13 pages (@ 3 pages/plant plus 1 or 2 pages for footnotes referenced)
Program 7. Installed Cost - 4 pages (@ 1 page/plant)
Program 8. Operating Cost - 4 pages (@ 1 page/plant)

Manipulation of the Data Base: The original data base file will be copied from magnetic tape to a temporary disk file. This temporary file will then be sorted as follows:

- a. first by plant number (1-4) in ascending order
- b. then by effluent number (1-60) in ascending order
- c. finally by major plant division (1-20) in ascending order

This file will be processed three times, once for each reliability level (i.e. A, B, or C). Only fields having the desired reliability level will have their values printed. If the field has a reliability level different from that being listed at the time, the program will print '-*- ' where '-*- ' represents the different reliability level value. This will serve as a reference device for interpreting the listing by indicating which section of the listing to look at for the value of the field in question.

[illegible]

```

//STEP1 EXEC PGM=IEFGENE2
//SYSPRINT DD SYSOUT=A
//SYSUT1 DD DSN=DATABASE,DISP=(OLD,PASS),VOL=SER=ESSDF1,LAB=L=(2,SL),
// UNIT=(1400,,DEFER),DCB=(RECFM=FB,LRECL=200,RLFSIZE=2000)
//SYSUT2 DD DSN=ELTEMP,UNIT=SYS04,DISP=(NEW,PASS),SPACE=(CYL,(1,1)),
// DCB=(RECFM=FB,LRECL=30,BLKSIZ=300)
//SYSIN DD *
GENERATE MAXFLDS=10
RECORD FIELD=(30,1)
/*
//STEP2 EXEC SORTC,COND=(0,NF)
//SORTIN DD DSN=ELTEMP,DISP=(OLD,DELETE)
//SORTOUT DD DSN=ELCRR,UNIT=SYS04,DISP=(NEW,PASS),SPACE=(CYL,(1,1)),
// DCB=*.SORTIN
//SORTWK01 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK02 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK03 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK04 DD UNIT=3330,SPACE=(CYL,(1,1))
//SYSIN DD *
SORT FIELDS=(1,1,CH,A,4,2,CH,A,2,2,CH,A),FILSZ=E4000
RECORD TYPE=F,LENGTH=(30)
/*
//STEP3 EXEC PL1FLCLG,PARM='X,A,SM=(7,72,1),LC=80'
//PL1L.SYSIN DD *
/* ***** QUANTITY BREAKOUT LISTING *****
OYPEL: PROCEDURE OPTIONS(MAIN) :
-DECLARE
  QTYRR FILE RECORD SEQUENTIAL INPUT .
  PRATOUT PRINT STREAM :
-DECL 01 EFFLUENT REC .
  02 PLANT NUMBER CHAR(1) .
  02 DIVISION NUMBER CHAR(2) .
  02 EFFLUENT NUMBER CHAR(2) .
  02 EFF. DESCRIPTION CHAR(12) .
  02 QUANTITY CHAR(10) .
  02 QTY FOOTNOTE CHAR(2) .
  02 QTY_REL CHAR(1) :
-DECLARE
  LENGTH(4,20) FIXED BINARY(15,0) INITIAL(
  3.4.4.5.7.6.8.3.3.5.3.5.7.3.3.3.3.7.7.8. /* FL PASO */
  3.3.4.5.5.7.4.5.6.5.5.3.4.5.4.4.3.6.8. /* NATURAL */
  3.4.4.6.5.6.4.5.5.3.5.3.5.3.4.4.6.7. /* WESCO */
  3.5.5.5.5.6.5.3.3.6.3.5.3.4.3.3.4.3.5.7 ) .
  (P NUM,D NUM,E NUM) FIXED BINARY(15,0) .
  (DIV,EFF) FIXED BINARY(15,0) .
  (P CHK,D CHK,E CHK) FIXED BINARY(15,0) INITIAL(1) .
  RFL LEVEL(3) CHARACTER(1) INITIAL( 'A','B','C' ) .
  QTYVAL(20) CHARACTER(10) :
-DECLARE
  L1 CHARACTER(36) INITIAL(
  'EFFLUENT QUANTITY' ) .
  L2 CHARACTER(36) INITIAL(
  'MATRIX FOR PLANT #' ) .
  L3 CHARACTER(135) .
  L4 CHARACTER(19) INITIAL( 'DIVISION #' ) .
  L5 CHARACTER(12) INITIAL( 'EFFLUENT #' ) .
  L6 CHARACTER(20) .
  L7 CHARACTER(53) INITIAL(
  'ALL NUMERICAL QUANTITIES GIVEN IN TONS/DAY' ) :
  L3 = REPEAT(' ',134) :
-DECLARE
  EFF_DESC(60) CHARACTER(12) INITIAL(
  'AL2O3' 'AL(OH)3' 'AL2(SO4)3' 'BICARBONATE' .
  'HCLIFR ASH' 'CaCO3' 'CAJ' 'CASO3.2H2O' .
  'CASO4.2H2O' 'CHLORIDE' 'CDM DUST' 'Fe2O3' .
  'FLY ASH' 'GASIFIER ASH' 'K2O' 'MGO' .
  'NA2O' 'NA2SO3' 'NA2SO4' 'NO3' .
  'PARTICULATES' 'PHOSPHATE' 'REFUSE' 'SiO2' .
  'SO3' 'SCA' 'SRO2' 'SULPHUR' .
  'SUSP. SOLIDS' 'UNREACTED C' 'CHLORIDES' 'FATTY ACIDS' .
  'HCN' 'H2O' 'NH3' 'PHENOLICS' .
  'SULPHUR' 'THIOCYANATES' 'CO' 'COS' .

```

```

      CO2      CS2      FATTY ACIDS      HCN      :
      HYDROCARBONS      H2      H2O      H2S      :
      NAPHTHA      NF3      NOX      N2      :
      O2      PHENOLICS      PYRIDINES      SO2      :
      THIOCYANATES      SLUDGE (RWT)      SLUDGE (HWT)      SLUDGE (CTR)      :
1 ON ENDFILE(OTYRB) BEGIN :
  CLOSE FILE(OTYRB) :
  PLANT NUMBER = 'S' :
  DIVISION NUMBER = '01' :
  EFFLUENT NUMBER = '01' :
  CALL INSERT :
  IF I1 < 3 THEN DO :
    OPEN FILE(OTYRB) SEQUENTIAL INPUT :
    READ FILE(OTYRB) INTO(EFFLUENT REC) :
    P CHK = 1 :
    E CHK = 1 :
    D CHK = 1 :
    I1 = I1 + 1 :
    CALL WRITE PAGE HEADINGS :
  END :
  ELSE DO :
    PUT FILE(PFNTOUT) EDIT('** END OF QUANTITY BREAKOUT LISTING **')
      (PAGE,A) :
    GO TO END OF PROGRAM :
  END :
END :
1 OPEN FILE(OTYRB) SEQUENTIAL INPUT,
  FILE(PFNTOUT) OUTPUT PAGESIZE(40) LINESIZE(140) :
  I1 = 1 :
  CALL WRITE PAGE HEADINGS :
-READ EFFLUENT FILE :
  DO WHILE('1'R) :
    READ FILE(OTYRB) INTO(EFFLUENT REC) :
    CALL INSERT :
    IF QTY REL = REL LEVEL(I1) THEN
      QTYVAL(D NUM) = SUBSTR(QUANTITY,10-LENGTH(P NUM,D NUM)) :
    ELSE QTYVAL(D NUM) =
      SUBSTR(' ' I1 QTY REL I1 ' ',10-LENGTH(P NUM,D NUM)) :
    D CHK = D CHK + 1 :
    IF D CHK > 20 THEN DO :
      D CHK = 1 :
      CALL PRINT ONE EFF :
      E CHK = E CHK + 1 :
      IF E CHK > 60 THEN DO :
        F CHK = 1 :
        P CHK = P CHK + 1 :
        IF P CHK < 5 THEN CALL WRITE PAGE HEADINGS :
      END :
    END :
  END READ EFFLUENT FILE :
1 INSERT: PROCEDURE :
  P NUM = PLANT NUMBER :
  D NUM = DIVISION NUMBER :
  E NUM = EFFLUENT NUMBER :
  DO WHILE( P NUM > F CHK ) :
    CALL FILL EFFS :
    IF P CHK = 5 THEN RETURN :
    CALL WRITE PAGE HEADINGS :
  END :
  DO WHILE( E NUM > F CHK ) :
    CALL FILL LINE :
  END :
  DO WHILE( D NUM > D CHK ) :
    QTYVAL(D CHK) = SUBSTR(' ',10-LENGTH(P CHK,D CHK)) :
    D CHK = D CHK + 1 :
  END :
  RETURN :
END INSERT :
-FILL EFFS: PROCEDURE :
  IS = E CHK :
  DO EFF=15 TO 60 :
    CALL FILL LINE :

```

```

END :
P_CHK = 1 :
P_CHK = P_CHK + 1 :
RETURN :
END FILL EFFS :
-FILL LINE: PROCEDURE :
  ON DIV=D_CHK TO 20 :
    QTYVAL(DIV) = SUBSTR(
      N*10-LENGTH(P_CHK,DIV)) :
  END :
  CALL PRINT_ONE_EFF :
  D_CHK = 1 :
  P_CHK = P_CHK + 1 :
  RETURN :
END FILL LINE :
1PRINT_ONE_EFF: PROCEDURE :
  RF1: FOMAT( A(12),A(4),2 A(5),A(6),A(7),A(8),2 A(4),A(6),A(4),
    A(6),A(8),4 A(4),2 A(5),A(9) ) :
  RF2: FOMAT( A(12),2 A(4),A(5),2 A(6),A(8),A(5),A(6),A(7),3 A(6),
    A(4),A(5),A(6),2 A(5),A(4),A(7),A(9) ) :
  RF3: FOMAT( A(12),A(4),2 A(5),A(7),A(6),A(7),A(5),2 A(6),A(5),A(4),
    A(7),A(4),A(7),A(6),A(4),A(5),A(4),A(7),A(4) ) :
  RF4: FOMAT( A(12),A(4),4 A(6),A(7),A(6),2 A(4),A(7),A(4),A(6),
    A(4),A(5),A(4),A(4),A(5),A(4),A(6),A(8) ) :
  IF P_CHK = 1 THEN PUT FILE(PRNTOUT) EDIT
    ( EFF_DESC(E_CHK),QTYVAL ) (R(RF1)) :
  ELSE IF P_CHK = 2 THEN PUT FILE(PRNTOUT) EDIT
    ( EFF_DESC(E_CHK),QTYVAL ) (R(RF2)) :
  ELSE IF P_CHK = 3 THEN PUT FILE(PRNTOUT) EDIT
    ( EFF_DESC(E_CHK),QTYVAL ) (R(RF3)) :
  ELSE PUT FILE(PRNTOUT) EDIT(EFF_DESC(E_CHK),QTYVAL) (R(RF4)) :
  PUT FILE(PRNTOUT) SKIP(1) :
  RETURN :
END PRINT_ONE_EFF :
1WRITE PAGE HEADINGS: PROCEDURE :
  RFHD1: FOMAT( PAGE,COL(26),A,COL(105),A,SKIP(2),
    COL(42),A,SKIP(3),A(130),SKIP,COL(20),
    A,SKIP,A,A(118),SKIP,A,A,SKIP,A,A) :
  L6 = '( RELIABILITY = ' || REL_LVL(11) || ' )' :
  IF P_CHK = 1 THEN PUT FILE(PRNTOUT) EDIT(L1||L2||'1'.
    L6, L7, L3, L4, L5, L3,
    NAME 1 2 3 4 5 6 7 8 9,
    10 11 12 13 14 15 16 17 18 19 TOTAL,
    ***** ** ** ** ** ** ** ** ** ** ** ** ** *
    ***** ** ** ** *
    (R(RFHD1)) :
  ELSE IF P_CHK=2 THEN PUT FILE(PRNTOUT) EDIT(L1||L2||'2'.
    L6, L7, L3, L4, L5, L3,
    NAME 1 2 3 4 5 6 7 8 9 10,
    11 12 13 14 15 16 17 18 19 TOTAL,
    ***** ** ** ** *
    ***** ** ** ** *
    (R(RFHD1)) :
  ELSE IF P_CHK=3 THEN PUT FILE(PRNTOUT) EDIT(L1||L2||'3'.
    L6, L7, L3, L4, L5, L3,
    NAME 1 2 3 4 5 6 7 8 9 10,
    11 12 13 14 15 16 17 18 19 TOTAL,
    ***** ** ** ** *
    ***** ** ** ** *
    (R(RFHD1)) :
  ELSE IF P_CHK=4 THEN PUT FILE(PRNTOUT) EDIT(L1||L2||'4'.
    L6, L7, L3, L4, L5, L3,
    NAME 1 2 3 4 5 6 7 8 9,
    10 11 12 13 14 15 16 17 18 19 TOTAL,
    ***** ** ** ** *
    ***** ** ** ** *
    (R(RFHD1)) :
  ELSE :
  PUT FILE(PRNTOUT) SKIP(3) :
  RETURN :
END WRITE PAGE HEADINGS :
-END OF PROGRAM:
END QTYREL :

```

/*
//GO.OTYRB DD DSN=66GPB.DISP=(OLD,DELETE)
//GO.PRINTOUT DD SYSCTL=(C.,0030)
//GO.SYSIN DD *
//


```

//STEP1 EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSUT1 DD DSN=DATAHASF,DISP=(OLD,PASS),VOL=SER=EESDF1,LADEL=(2,SL),
//          UNIT=(3400,,DEFFR),DCB=(RECFM=FB,LRECL=200,RLKSIZE=2000)
//SYSUT2 DD DSN=CCTEMP,UNIT=SYSDA,DISP=(NEW,PASS),SPACE=(CYL,(1,1)),
//          DCB=(RECFM=FB,LRECL=10,RLKSIZE=1000)
//SYSIN DD *
//          GENERATE MAXFLOS=10
//          RECORD FIELD=(5,1,,1),FIELD=(5,33,,6)
/*
//STEP2 EXEC SORTD,CEND=(0,NF)
//SORTIN DD DSN=CCTEMP,DISP=(OLD,DELPTS)
//SORTOUT DD DSN=CCREF,UNIT=SYSDA,DISP=(NEW,PASS),SPACE=(CYL,(1,1)),
//          DCB=*,SORTIN
//SORTWK01 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK02 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK03 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK04 DD UNIT=3330,SPACE=(CYL,(1,1))
//SYSIN DD *
//          SORT FIELDS=(1,1,CH,A,4,2,CH,A,2,2,CH,A),FILSZ=34000
//          RECORD TYPE=F,LENGTH=(10)
/*
//STEP3 EXEC PL1FCLG,PARM='X,A,SM=(7,72,1),LC=80',TIME,GO=3
//PL1L.SYSIN DD *
//          ***** BIOLOGICAL HAZARD RELIABILITY BREAKOUT LISTING ***** */
//          BIORL: PROCEDURE OPTIONS(MAIN) ;
-DECLARE
  BIORB      FILE RECORD SEQUENTIAL INPUT ,
  SYSIN      FILE STREAM INPUT ,
  FROUT      PRINT STREAM ,
  PRNTOUT    PRINT STREAM ;
-DCL 01 EFFLUENT REC ,
      02 PLANT NUMBER          CHAR(1) ,
      02 DIVISION NUMBER       CHAR(2) ,
      02 EFFLUENT NUMBER       CHAR(2) ,
      02 BIOLOGICAL HAZARD     CHAR(2) ,
      02 BIOHAZ FOOTNOTE       CHAR(2) ,
      02 BIOHAZ RELIABILITY    CHAR(1) ;
-DCL 01 FOOTNOTE ARRAY(300) ,
      02 FNKEY                 CHAR(2) ,
      02 FNCONTENTS            CHAR(78) ;
-DECLARE
  BIOHAZ ABBREV(20)            CHARACTER(2) ,
  FOOTNOTE(20)                 CHARACTER(3) ,
  (P NUM,D NUM,E NUM)          FIXED BINARY(15,0) ,
  (DIV,EFF)                    FIXED BINARY(15,0) ,
  (P CHK,D CHK,E_CHK)          FIXED BINARY(15,0) INITIAL(1) ,
  KEYS USED(300)               CHARACTER(2) ,
  KEY(300)                     CHARACTER(2) ,
  REL LEVEL(3)                 CHARACTER(1) INITIAL('A','B','C') ,
  PLANT(4)                     CHARACTER(1) INITIAL('1','2','3','4') ;
-DECLARE
  L1                            CHARACTER(36) INITIAL(
    'BIOLOGICAL HAZARD' ) ,
  L2                            CHARACTER(36) INITIAL(
    'MATRIX FOR PLANT #' ) ,
  L3                            CHARACTER(135) ,
  L4                            CHARACTER(19) INITIAL('DIVISION' ) ,
  L5                            CHARACTER(12) INITIAL('EFFLUENT' ) ,
  L6                            CHARACTER(20) ,
  L3 = REPEAT(' ',134) ;
-DECLARE
  EFF DESC(60)                 CHARACTER(12) INITIAL(
    'AL2O3' ) ,
    'AL(OH)3' ) ,
    'AL2(SO4)3' ) ,
    'BIOCARBONATE' ) ,
    'BOILER ASH' ) ,
    'C/C03' ) ,
    'CAO' ) ,
    'CASO3.2H2O' ) ,
    'CASO4.2H2O' ) ,
    'CHLORIDE' ) ,
    'COAL DUST' ) ,
    'FE2O3' ) ,
    'FLY ASH' ) ,
    'GASIFIER ASH' ) ,
    'K2O' ) ,
    'MGO' ) ,
    'NA2O' ) ,
    'NA2SO3' ) ,
    'NA2SO4' ) ,
    'NO3' ) ,
    'PARTICULATES' ) ,
    'PHOSPHATE' ) ,
    'REFUSE' ) ,
    'SIO2' ) ,
    'SO3' ) ,
    'SC4' ) ,
    'SIO2' ) ,
    'SULPHUR' ) ,
    'SUSP. SOLIDS' ) ,
    'UNREACTED C' ) ,
    'CHLORIDES' ) ,
    'FATTY ACIDS' ) ,
    'HCN' ) ,
    'H2O' ) ,
    'NH3' ) ,
    'PHENOLICS' )

```

```

SULPHUR      : THIOCYANATES : CO      : COS      :
CO2          : CS2          : FATTY ACIDS : HCN      :
HYDROCARBONS : H2          : H2O        : H2S      :
NAPHTHA      : NH3          : NOX        : N2       :
O2           : PHENOLICS    : PYRIDINES   : SO2      :
THIOCYANATES : SLUDGE (RWT) : SLUDGE (BWT) : SLUDGE (CTR) :
1. ON ENDFILE(SYSIN) BEGIN :
CLOSE FILE(SYSIN) :
I1 = 1 :
I4 = 1 :
CALL WRITE PAGE HEADINGS :
PUT FILE(FNCUT) EDIT('** THE FOLLOWING FOOTNOTES WERE REFERENCED:')
(PAGE,COL(15),A) :
PUT FILE(FNCUT) SKIP(3) :
GO TO READ FILE BIORB :
END :
- ON ENDFILE(BIORB) BEGIN :
CLOSE FILE(BIORB) :
PLANT NUMBER = 'S' :
DIVISION NUMBER = '01' :
EFFLUENT NUMBER = '01' :
CALL INSERT :
IF I4 < 3 THEN DO :
OPEN FILE(BIORB) SEQUENTIAL INPUT :
P CHK = 1 :
D CHK = 1 :
E CHK = 1 :
I4 = I4 + 1 :
CALL WRITE PAGE HEADINGS :
GO TO READ FILE BIORB :
END :
ELSE GO TO END OF PROGRAM :
END :
1. OPEN FILE(SYSIN) INPUT :
FILE(PFNCUT) OUTPUT PAGESIZE(40) LINESIZE(140) :
FILE(FNCUT) OUTPUT PAGESIZE(85) LINESIZE(85) :
FILE(BIORB) SEQUENTIAL INPUT :
- I = 1 :
READ FOOTNOTE DECK :
DO WHILE('1'B) :
GET FILE(SYSIN) EDIT( FOOTNOTE ARRAY(1) ) (A(2),A(78)) :
KEY(1) = FKEY(1) :
I = I + 1 :
END READ FOOTNOTE DECK :
- READ FILE BIORB :
DO WHILE('1'B) :
READ FILE(BIORB) INTO(EFFLUENT REC) :
CALL INSERT :
IF BIOHAZ RELIABILITY = REL LEVEL(I4) THEN DO :
BIOHAZ ABBREV(D NUM) = BIOLOGICAL HAZARD :
IF BIOHAZ FOOTNOTE = ' ' THEN FOOTNOTE(D NUM) = ' ' :
ELSE IF INDEX( STRING( KEYS USED), BIOHAZ FOOTNOTE ) THEN
FOOTNOTE(D NUM) = '** || BIOHAZ FOOTNOTE :
ELSE DO :
KEYS USED(I1) = BIOHAZ FOOTNOTE :
I1 = I1 + 1 :
I2 = INDEX( STRING( KEYS), BIOHAZ FOOTNOTE ) :
I3 = ( I2 + 1 ) / 2 :
PUT FILE(FNCUT) EDIT(BIOHAZ FOOTNOTE || '** || FNCOUNTERS(I3))
(SKIP(2),A) :
I3 = I3 + 1 :
DO WHILE( KEY(I3)=BIOHAZ FOOTNOTE ) :
PUT FILE(FNCUT) EDIT(FNCOUNTERS(I3)) (SKIP,X(7),A) :
I3 = I3 + 1 :
END :
FOOTNOTE(D NUM) = '** || BIOHAZ FOOTNOTE :
END :
ELSE DO :
BIOHAZ ABBREV(D NUM) = ' - ' :
FOOTNOTE(D NUM) = BIOHAZ RELIABILITY || ' - ' :
END :

```

```

D_CHK = D_CHK + 1 ;
IF D_CHK > 20 THEN DO ;
  D_CHK = 1 ;
  CALL PRINT ONE EFF ;
  E_CHK = E_CHK + 1 ;
  IF E_CHK > 60 THEN DO ;
    E_CHK = 1 ;
    P_CHK = P_CHK + 1 ;
    IF P_CHK < 5 THEN CALL WRITE_PAGE_HEADINGS ;
  END ;
END ;
END READ FILE BICRR ;
1INSERT: PROCEDURE ;
  P_NUM = PLANT NUMBER ;
  D_NUM = DIVISION NUMBER ;
  E_NUM = EFFLUENT NUMBER ;
  DO WHILE( P_NUM > P_CHK ) ;
    CALL FILL EFFS ;
    IF P_CHK = 5 THEN RETURN ;
    CALL WRITE PAGE HEADINGS ;
  END ;
  DO WHILE( E_NUM > E_CHK ) ;
    CALL FILL LINE ;
  END ;
  DO WHILE( D_NUM > D_CHK ) ;
    BIOHAZ ABREV(D_CHK) = ' ' ;
    FOOTNOTE(D_CHK) = 'N' ;
    D_CHK = D_CHK + 1 ;
  END ;
  RETURN ;
END INSERT ;
-FILL EFFS: PROCEDURE ;
  IS = E_CHK ;
  DO EFF=IS TO 60 ;
    CALL FILL LINE ;
  END ;
  E_CHK = 1 ;
  P_CHK = P_CHK + 1 ;
  RETURN ;
END FILL EFFS ;
-FILL LINE: PROCEDURE ;
  DO DIV=D_CHK TO 20 ;
    BIOHAZ ABREV(DIV) = ' ' ;
    FOOTNOTE(DIV) = 'A' ;
  END ;
  CALL PRINT ONE EFF ;
  D_CHK = 1 ;
  E_CHK = E_CHK + 1 ;
  RETURN ;
END FILL LINE ;
1PRINT ONE EFF: PROCEDURE ;
  PUT FILE(PRNTOUT) EDIT( EFF_DESC(E_CHK) ) (SKIP,A) ;
  DO IS = 1 TO 20 ;
    PUT FILE(PRNTOUT) EDIT(BIOHAZ ABREV(IS),FOOTNOTE(IS)) (X(1),A,A) ;
  END ;
  RETURN ;
END PRINT ONE EFF ;
-WRITE PAGE HEADINGS: PROCEDURE ;
  L6 = ' ( RELIABILITY = ' || REL_LEVEL(14) || ' )' ;
  PUT FILE(PRNTOUT) EDIT(L1 || L2 || PLANT(P_CHK) , L5, L3, L4, L5, L3,
  ' NAME 1 2 3 4 5 6 7 8 9 '
  ' 10 11 12 13 14 15 16 17 18 19 TCTAL'
  ' ***** REPEAT( ' ***** ,19 ) ( PAGE,COL(26),4,COL(105)
  A,SKIP(2),A(132),SKIP,COL(20),A,SKIP,A,A(120),SKIP,A,A,SKIP,A,A ) ;
  RETURN ;
END WRITE PAGE HEADINGS ;
-END OF PROGRAM:
END BIOREL ;
/*
//GO.BIORH DD DSN=CEBFB.DISP=(OLD,DELETE)
//GO.PRNTOUT DD SYSCUT=(G.,0030)
//GO.FNOUT DD SYSOUT=(G.,0030)

```

//GO. SYSIN DD *
 A1 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 A1 CONCENTRATION GREATER THAN 10 MG/M3 IN THE ENVIRONMENT.
 A2 JUDGED TO BE POSSIBLY HAZARDOUS TO VENTILATION IN CASE OF ACID MINE DRAINAGE.
 A3 CONSISTS OF 871 TPD DUE TO EVAPORATION FROM 2% WATER STORAGE AND 210 TPD
 A3 FROM DEGASER VENTS.
 A4 IN THE FORM OF SLUDGE FROM LIME TREATMENT, DEMINERALIZER AND ZEOLITE SOFTNER.
 A5 POTENTIALLY HAZARDOUS SINCE IT CONTAINS SALTS AND OTHER WATER TREATMENT
 A5 CHEMICALS.
 A6 INCLUDES STEAM LOSSES IN DEGRATER VENTS, LEAKS AND OTHER LOSSES FROM BOILER
 A6 AND ITS PIPING.
 A7 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRA-
 A7 TION GREATER THAN 5 PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO STATE AIR
 A7 QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
 A8 ESTIMATED AS NO2.
 A9 EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS.
 B0 POTENTIALLY HAZARDOUS DUE TO SOME ELEMENTS AND COMPOUNDS PRESENT WHICH CAN BE
 B0 LEACHED BY WATER.
 B1 POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN SOME ELEMENTS AND COMPOUNDS
 B1 LEACHED OUT FROM THE ASH.
 B2 ESTIMATED USING EMISSION FACTORS.
 B3 CONSISTS MAINLY OF GASIFIER ASH PARTICLES.
 B4 EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF
 B4 COAL LOCKS.
 B5 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 B5 CONCENTRATION GREATER THAN 20 PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO
 B5 ARE ALSO APPLICABLE.
 B6 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 B6 CONCENTRATION GREATER THAN 50 PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO
 B6 ARE ALSO APPLICABLE.
 B7 GASIFIER ASH, UNREACTED CARBON AND WATER ARE IN THE FORM OF A SLUDGE.
 B8 CONSISTS OF EVAPORATION TO ATMOSPHERE FROM FINE ASH POND.
 B9 EVAPORATED INTO ATMOSPHERE ALONG WITH WATER FROM FINE ASH POND.
 C0 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 C0 CONCENTRATION GREATER THAN 10 PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 C0 EMISSION STANDARDS ARE ALSO APPLICABLE.
 C1 ESTIMATED AS ACETIC ACID.
 C2 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 C2 CONCENTRATION GREATER THAN 10 PPM IN THE ENVIRONMENT.
 C3 ESTIMATED AS PHENOL.
 C4 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 C4 CONCENTRATION GREATER THAN 5 PPM IN THE ENVIRONMENT.
 C5 CONSISTS OF 0.144 TPD TO CATALYTIC INCINERATOR AND 0.32 TPD TO VENT GAS
 C5 INCINERATOR.
 C6 CONSISTS OF 0.178 TPD TO CATALYTIC INCINERATOR AND 447 TPD TO VENT GAS
 C6 INCINERATOR.
 C7 TO CATALYTIC INCINERATOR.
 C8 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 C8 CONCENTRATION GREATER THAN 20 PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 C8 EMISSIONS STANDARDS ARE ALSO APPLICABLE.
 C9 CONSISTS OF 2540 TPD TO CATALYTIC INCINERATOR AND 70 TPD TO VENT GAS INCINERATOR
 D0 CONSISTS OF 4 TPD TO CATALYTIC INCINERATOR AND 3 TPD TO VENT GAS INCINERATOR.
 D1 CONSISTS OF 21 TPD TO CATALYTIC INCINERATOR AND 32 TPD TO VENT GAS INCINERATOR.
 D2 CONSISTS OF 107.5 TPD TO CATALYTIC INCINERATOR AND 6.5 TPD TO VENT GAS
 D2 INCINERATOR.
 D3 CONSISTS OF 415 TPD TO CATALYTIC INCINERATOR AND 12 TPD TO VENT GAS INCINERATOR.
 D4 CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 D5 IN THE FORM OF SLUDGE.
 D6 POTENTIALLY HAZARDOUS DUE TO COOLING TOWER CHEMICALS IN IT.
 D7 ESTIMATED AS PYRIDINE.
 D8 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 D8 CONCENTRATION GREATER THAN 5 PPM IN THE ENVIRONMENT.
 D9 ESTIMATED AS HSCN.
 E0 OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 E0 CONCENTRATION GREATER THAN 50 PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 E0 EMISSION STANDARDS ARE ALSO APPLICABLE.
 F1 CONSISTS OF DISSOLVED SOLIDS IN COOLING WATER WHICH ARE EMITTED IN THE DRIFT.
 F2 EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS. EMISSION DUE TO LOCK GAS
 F2 DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF COAL LOCKS.
 F3 EVAPORATED INTO ATMOSPHERE ALONG WITH WATER FROM FINE ASH POND. ESTIMATED AS
 F3 ACETIC ACID.
 F4 EVAPORATED INTO ATMOSPHERE ALONG WITH WATER FROM FINE ASH POND. ESTIMATED AS

F2PHENOL.
 F3ESTIMATED AS ACETIC ACID. CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 F4ESTIMATED AS PHENOL. CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 F5OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 F6CONCENTRATION GREATER THAN 5 PPM IN THE ENVIRONMENT. CONSISTS OF DRIFT AND
 F7EVAPORATION LOSSES.
 F8ESTIMATED AS HSCN. CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 F9EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS. ESTIMATED USING EMISSION FACTORS
 F10EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS. CONSISTS MAINLY OF OF GASIFIER
 F11PARTICLES. ESTIMATED USING EMISSION FACTORS.
 F12OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 F13CONCENTRATION GREATER THAN 10 MG/M3 IN THE ENVIRONMENT.
 F14JUDGED TO BE POSSIBLY HAZARDOUS TO VEGETATION IN CASE OF ACID MINE DRAINAGE.
 F15POTENTIALLY HAZARDOUS SINCE IT CONTAINS SALTS AND OTHER WATER TREATMENT
 F16CHEMICALS.
 F17CONSISTS OF EVAPORATION FROM RAW WATER STORAGE.
 F18POTENTIALLY HAZARDOUS DUE TO SOME ELEMENTS AND COMPOUNDS PRESENT WHICH CAN
 F19BE LEACHED BY WATER.
 F20CONSISTS OF 44TPD OF WATER ACCOMPANYING THE BOILER ASH AND 132TPD OF WATER
 F21ACCOMPANYING THE FLY ASH.
 F22POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN SOME ELEMENTS AND COMPOUNDS
 F23LEACHED OUT FROM THE ASH.
 F24CONSISTS OF FLY ASH COLLECTED BY THE ELECTROSTATIC PRECIPITATOR.
 F25CONSISTS OF FLY ASH PARTICLES.
 F26OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 F27CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO
 F28STATE AIR QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
 F29OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 F30CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO
 F31STATE AIR QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
 F32FORMED IN BOILER DUE TO COMBUSTION OF COAL. H2S AND COS.
 F33OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 F34CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO
 F35STATE AIR QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
 F36ESTIMATED AS NO2.
 F37ESTIMATED USING EMISSION FACTORS.
 F38CONSISTS OF GASIFIER ASH PARTICLES.
 F39CONSISTS OF WATER VAPOR FROM ASH QUENCHING OPERATION.
 F40EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING
 F41OF COAL LOCKS.
 F42ASH AND WATER ARE IN THE FORM OF A SLUDGE.
 F43DOES NOT INCLUDE 116.6TPD H2S IN THE H2S RICH GAS SENT TO CLAUS PLANT.
 F44DOES NOT INCLUDE 26.5TPD CO2 IN THE H2S RICH GAS SENT TO THE CLAUS PLANT.
 F45DOES NOT INCLUDE 6.6TPD H2O IN THE H2S RICH GAS SENT TO THE CLAUS PLANT.
 F46ALL THE H2S IS OXIDIZED TO SO2. ANY UNCONTROLLED H2S LEAVES THE CLAUS UNIT AS
 F47S02.
 F48OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 F49CONCENTRATION GREATER THAN 10PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 F50EMISSION STANDARDS ARE ALSO APPLICABLE.
 F51DIRECT OPERATING COST FOR OPERATING WASTE LIQUOR DISPOSAL SYSTEM.
 F52OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 F53CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 F54EMISSION STANDARDS ARE ALSO APPLICABLE.
 F55IT IS A PART OF THE SLUDGE SENT TO THE MINE. COST IS ONLY ALLOCATED TO
 F56CASO4.2H2O SINCE IT IS THE MAJOR COMPONENT.
 F57POTENTIALLY HAZARDOUS BECAUSE CA IONS MAY BE LEACHED BY WATER.
 F58POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN CA IONS LEACHED OUT FROM
 F59THE SLUDGE.
 F60COST FOR OPERATING LIQUID WASTE DISPOSAL SYSTEM.
 F61PART OF THE SLUDGE FROM THE BIOLOGICAL WASTE WATER SLUDGE SENT TO MINE. COST
 F62IS ALLOCATED ONLY TO CaCO3 SINCE IT IS A MAJOR COMPONENT.
 F63CONSISTS OF DRIFT AND EVAPORATION LOSSES.
 F64ESTIMATED AS ACETIC ACID.
 F65OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 F66CONCENTRATION GREATER THAN 10PPM IN THE ENVIRONMENT.
 F67ESTIMATED AS PHENOL.
 F68OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 F69CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT.
 F70ESTIMATED AS HSCN.
 F71OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 F72CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR
 F73EMISSION STANDARDS ARE ALSO APPLICABLE.

J9CONSISTS OF DISSOLVED SOLIDS IN COOLING WATER WHICH ARE EMITTED IN THE DRIFT.
 K0ESTIMATED USING EMISSION FACTORS. CONSISTS OF GASIFIER ASH PARTICLES.
 K1CONSISTS OF DRIFT AND EVAPORATION LOSSES. ESTIMATED AS ACETIC ACID.
 K2CONSISTS OF DRIFT AND EVAPORATION LOSSES. ESTIMATED AS PHENOL.
 K3CONSISTS OF DRIFT AND EVAPORATION LOSSES. ESTIMATED AS HSCN.
 L1OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 L1CONCENTRATION GREATER THAN 10 MG/M3 IN THE ENVIRONMENT.
 L2SLUDGE CONSISTS OF 13.5TPO CACD3, 0.42TPO MG(OH)2, 0.77TPO AL2(SO4)3 AND
 L217.4TPO SUSPENDED SOLIDS.
 L3POTENTIALLY HAZARDOUS SINCE IT CONTAINS SALTS AND OTHER WATER TREATMENT
 L3CHEMICALS.
 L4CONSISTS OF 14.4% AL2O3, 25.9% CAO, 11.8% MGO, 3.6% NA2O, 5.2% SO3,
 L426.5% SIO2, 1.5% SF02 AND 1.2% K2O.
 L5POTENTIALLY HAZARDOUS DUE TO SOME ELEMENTS AND COMPOUNDS PRESENT WHICH CAN BE
 L5LEACHED BY WATER.
 L6CONSISTS OF 32.8% SIO2, 27.7% CAO, 17.0% AL2O3, 5.1% NA2O, 10.0% MGO,
 L61.0% K2O, 5.3% FE2O3 AND 1.1% TiO2.
 L7PARTICULATES ARE FLY ASH PARTICLES.
 L8OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 L8CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 L8STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 L9ESTIMATED AS NO2.
 M0PART OF THE COAL LOCK GAS INCINERATED IN THE BOILER.
 M1OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 M1CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 M1STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 M2AN ADDITIONAL 4823TPO OF H2O VAPOR IS EMITTED TO THE STACK GAS TREATMENT UNIT.
 M3CONSISTS OF LEAKS AND STEAM VENTS TO THE ATMOSPHERE FROM THE STEAM LINE.
 M4CONSISTS MAINLY OF GASIFIER ASH PARTICLES.
 M5FROM ASH OUFENCH.
 M6EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING
 M6OF COAL LOCKS.
 M7CONSISTS OF SOLIDS FROM THE TRIPLE EFFECT EVAPORATOR CONCENTRATOR CONTAINING
 M7CYANIDES, PHENOLS, FATTY ACIDS AND METAL IONS.
 M8POTENTIALLY HAZARDOUS DUE TO THE PRESENCE OF CYANIDES, PHENOLS, FATTY ACIDS
 M8AND METAL IONS THAT COULD BE LEACHED BY WATER.
 M9POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN SOME ELEMENTS AND COMPOUNDS
 M9LEACHED OUT FROM ASH AND SLUDGE.
 N0DOES NOT INCLUDE 149.1TPO H2O IN THE H2S RICH GAS SENT TO CLAUS PLANT.
 N1DOES NOT INCLUDE 34.05TPO CO2 IN THE H2S RICH GAS VENT TO CLAUS UNIT.
 N2DOES NOT INCLUDE 8.78TPO H2O IN THE H2S RICH GAS VENT TO CLAUS UNIT.
 N3SOME OF THE CONTROLLED H2S LEAVES THE CLAUS UNIT AS SO2.
 N4OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 N4CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 N4STATE AIR QUALITY STANDARDS ARE ALSO APPLICABLE.
 N5AN ADDITIONAL 0.238TPO OF SULPHUR IN THE VAPOR PHASE IS EMITTED FROM THE CLAUS
 N5PROCESS.
 N6OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 N6CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT.
 N7DIRECT OPERATING COSTS FOR OPERATING WASTE LIQUOR DISPOSAL SYSTEM.
 N8SULPHUR IS IN VAPOR STATE.
 N9OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 N9CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT.
 P0EMITTED AS A SLUDGE.
 P1POTENTIALLY HAZARDOUS SINCE IT MAY BE LEACHED BY WATER.
 P2POTENTIALLY HAZARDOUS SINCE IT MAY CONTAIN SODIUM AND CALCIUM IONS LEACHED OUT
 P2FROM SALTS.
 P3CONSISTS OF 66.7% CACD3, 15.3% ORGANIC MATTER FOR BIOTREATING, 8.0% CALCIUM
 P3SALTS OF PHENOLS, 5.8% CALCIUM SALTS OF FATTY ACIDS AND 4.2% OTHER INORGANIC
 P3CALCIUM SALTS.
 P4CONSISTS OF EVAPORATION AND DRIFT LOSSES.
 P5ESTIMATED AS ACETIC ACID.
 P6OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 P6CONCENTRATION GREATER THAN 10PPM IN THE ENVIRONMENT.
 P7ESTIMATED AS PHENOL.
 P8OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 P8CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT.
 P9OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 P9CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT.
 Q0ESTIMATED AS HSCN.
 Q1CONSISTS OF DISSOLVED SOLIDS IN COOLING WATER WHICH ARE EMITTED IN THE DRIFT.
 Q2CONSISTS OF 86.4% CACD3, 9.6% MG(OH)2 AND 4.0% AL2(SO4)3.

R1AN ADDITIONAL 4823TPD OF H₂O VAPOR IS EMITTED TO THE STAC GAS TREATMENT UNIT.
 R1CONSISTS OF LEAKS AND STEAM VENTS TO THE ATMOSPHERE FROM THE STEAM LINE.
 R2SOME OF THE UNCONTROLLED H₂S LEAVES THE CLAUSS UNIT AS SO₂. AN ADDITIONAL
 R20.238TPD OF SULFUR IN THE VAPOR PHASE IS EMITTED FROM THE CLAUSS PROCESS.
 R3OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 R3CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 R3STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 R3ESTIMATED AS NO₂.
 R4CONSISTS OF EVAPORATION AND DRIFT LOSSES. ESTIMATED AS ACETIC ACID.
 R5CONSISTS OF EVAPORATION AND DRIFT LOSSES. ESTIMATED AS PHENOL.
 R6CONSISTS OF EVAPORATION AND DRIFT LOSSES. ESTIMATED AS HSCN.
 S1OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 S1CONCENTRATION GREATER THAN 10 MG/M³ IN THE ENVIRONMENT.
 S2POTENTIALLY HAZARDOUS DUE TO WATER TREATMENT CHEMICALS THAT MAY BE PRESENT.
 S3POTENTIALLY HAZARDOUS DUE TO ELEMENTS OR COMPOUNDS PRESENT WHICH CAN
 S3BE LEACHED BY WATER.
 S4OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 S4CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 S4STATE AIR QUALITY STANDARDS ARE ALSO APPLICABLE.
 S5OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 S5CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 S5AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 S6ESTIMATED AS NO₂.
 S7ESTIMATED USING EMISSION FACTORS.
 S8EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF
 S8COAL LOCKS.
 S9OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 S9CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA
 S9STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
 T0CONSISTS MAINLY OF GASIFIER ASH PARTICLES. ESTIMATED USING EMISSION FACTORS.
 T1POTENTIALLY HAZARDOUS DUE TO ELEMENTS AND COMPOUNDS WHICH MAY BE
 T1LEACHED FROM ASH.
 T2DIRECT OPERATING COST FOR WASTE LIQUID DISPOSAL.
 T3AN ADDITIONAL 1.2TPD OF CO₂ IS EMITTED TO THE ATMOSPHERE IN THE STRETFORD
 T3BLEED STREAM.
 T4REPORTED BY ANG AS ORGANIC SULFUR.
 T5OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A
 T5CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT.
 T6STRETFORD BLEED STREAM.
 T7INCINERATION IS DONE IN A STEAM SUPERHEATER WITH TAR OIL, NAPHTHA AND
 T7PHENOLICS AS FUEL.
 T8EMITTED AS STRETFORD OXIDIZER EFFLUENT.
 T9POTENTIALLY HAZARDOUS SINCE IT CONTAINS HIGH CONCENTRATIONS OF DISSOLVED
 T9SALTS AND OTHER CHEMICALS.
 U0MAY CONTAIN FATTY ACIDS, AMMONIA, PHENOLICS, OTHER VOLATILE CONTAMINANTS AND
 U0DISSOLVED SOLIDS WHICH ARE EMITTED ALONG WITH THE DRIFT.
 U1POTENTIALLY HAZARDOUS SINCE IT CONTAINS FATTY ACIDS, AMMONIA, ETC.
 V0ESTIMATED AS NO₂. INCINERATION IS DONE IN A STEAM SUPERHEATER WITH TAR OIL,
 V0NAPHTHA AND PHENOLICS AS FUEL.
 //


```

//STEP1 EXEC PGM=IEFGEN
//SYSPRINT DD SYSOUT=A
//SYSUT1 DD DSN=DATAHASE,DISP=(OLD,PASS),VOL=SER=ESDF1,LABEL=(2,SL),
//          UNIT=(3400,,DEFER),DCH=(RECFM=FH,LRECL=200,BLKSIZE=2000)
//SYSUT2 DD DSN=DATAHASE,DISP=(NEW,PASS),SPACE=(CYL,(1,1)),
//          DCH=(RECFM=FH,LRECL=14,BLKSIZE=1400)
//SYSIN DD *
GENEPATF MAXFLDS=10
RECORD FIELD=(5,1,1),FIELD=(1,94,,),FIELD=(9,127,,7)
/*
//STEP2 EXEC SORTD,COND=(0,NE)
//SORTIN DD DSN=GETEMP,DISP=(OLD,DELETE)
//SORTOUT DD DSN=LCOST,UNIT=SYSDA,DISP=(NEW,PASS),DCH=*,SORTIN,
//          SPACE=(CYL,(1,1))
//SORTWK01 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK02 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK03 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK04 DD UNIT=3330,SPACE=(CYL,(1,1))
//SYSIN DD *
SORT FIELDS=(6,1,CH,D,1,1,CH,A,4,2,CH,A,2,2,CH,A),FILSZ=E500
RECORD TYPE=F,LENGTH=(14)
/*
//STEP3 EXEC PL1LFCLG,PARM='X,A,LC=80,SM=(2,72,1)',TIME,GO=2
//PL1L.SYSIN DD *
/* ***** OPERATING COST RELIABILITY BREAKOUT LISTING ***** */
COSTREL: PROCEDURE OPTIONS(MAIN):
-DECLARE
  OUTPUT PRINT STREAM
  COST FILE RECORD SEQUENTIAL INPUT
  FILE3 FILE RECORD SEQUENTIAL
-DCB 01 TEMP REC
      02 PLANT NUMBER CHAR(1)
      02 FILL1 CHAR(4)
      02 CONTROLLED EFF KEY CHAR(1)
      02 FILL2 CHAR(8)
-DCB 01 EFFLUENT REC
      02 FILL1 CHAR(1)
      02 DIVISION NUMBER CHAR(2)
      02 EFFLUENT NUMBER CHAR(2)
      02 FILL2 CHAR(1)
      02 OPERATING COST CHAR(7)
      02 OC REL CHAR(1)
-DECLARE
  (E NUM,D NUM) FIXED BINARY(15,0)
  (D CHK,P CHK) FIXED BINARY(15,0) INITIAL(1)
  (ENDFLAG,E CHK,DIV) FIXED BINARY(15,0) INITIAL(0)
  REL LEVEL(3) CHARACTER(1) INITIAL('A','H','C')
  PLANT(4) CHARACTER(1) INITIAL('1','2','3','4')
  COSTVAL(20) CHARACTER(7)
  L1 CHARACTER(66) INITIAL(
  'O P E R A T I N G C O S T M A T R I X F O R P L A N T #').
  L2 CHARACTER(140)
  L4 CHARACTER(10) INITIAL('D I V I S I O N #').
  L5 CHARACTER(12) INITIAL('E F F L U E N T #').
  LENGTH(4,20) FIXED BINARY(15,0) INITIAL(
  6.6.3.3.3.7.7.3.3.7.3.6.7.3.3.3.6.7.7.
  6.6.4.6.2.5.6.6.6.7.5.6.2.2.7.2.5.2.7.7.
  6.6.4.6.3.5.7.6.6.7.3.3.3.3.7.3.4.3.7.7.
  6.6.3.6.3.5.6.3.3.7.3.3.3.3.3.3.3.7.7.7.
  )
  EFF DESC(60) CHARACTER(12) INITIAL(
  'AL2O3', 'AL(OH)3', 'AL2(SO4)3', 'BICARBONATE',
  'BOILER ASH', 'CaCO3', 'CaO', 'CASO3.2H2O',
  'CASO4.2H2O', 'CHLORIDE', 'COAL DUST', 'Fe2O3',
  'FLY ASH', 'GASIFIER ASH', 'K2O', 'MgO',
  'NA2O', 'NA2SO3', 'NA2SO4', 'NO3',
  'PARTICULATES', 'PHOSPHATE', 'REFUSE', 'SiO2',
  'SO3', 'SO4', 'SRO2', 'SULPHUR',
  'SUSS. SOLIDS', 'UNREACTED C', 'CHLORIDES', 'FATTY ACIDS',
  'HCN', 'H2O', 'NH3', 'PHENOLICS',
  'SULPHUR', 'THIOCYANATES', 'CO', 'COS',
  'CO2', 'CS2', 'FATTY ACIDS', 'HCN',
  'HYDROCARBONS', 'H2', 'H2O', 'H2S'
  )

```

```

      :NAPHA      :NH3      :NOX      :N2      :
      :O2      :PHENOLICS :PYRIDINES :SU2      :
      :THIOCYANATES :SLUDGE (RWT) :SLUDGE(BWT) :SLUDGE (CTR) :
1  L2 = REPEAT( **.139 ) :
  ON ENDFILE(COST) BEGIN :
    PUT FILE(OUTPUT) EDIT(* END OF COST LISTING *) (PAGE,A) :
    GO TO END OF PROGRAM :
  END :
- ON ENDFILE(FILE3) BEGIN :
  CLOSE FILE(FILE3) :
  IF D_CHK > 1 THEN CALL FILL LINE :
  IF I1 < 3 THEN DO :
    OPEN FILE(FILE3) SEQUENTIAL INPUT :
    I1 = I1 + 1 :
    PUT FILE(OUTPUT) EDIT(*RELIABILITY=*REL LEVEL(I1).
      REPEAT(**.12) ) ( SKIP(2).A.A.SKIP.A.SKIP ) :
    D_CHK = 1 :
    E_CHK = 0 :
  - READ FILE(FILE3) INTO(EFFLUENT_REC) :
  END :
  ELSE ENDFLAG = 999 :
  END :
1 OPEN FILE(COST) SEQUENTIAL INPUT :
  FILE(FILE3) SEQUENTIAL OUTPUT :
  FILE(OUTPUT) OUTPUT PAGESIZE(M0) LINESIZE(140) :
  CALL WRITE PAGE HEADINGS :
-READ FILE2:
  DO WHILE(**.R) :
    READ FILE(COST) INTO(TEMP_REC) :
    PUT EDIT(TEMP_REC) (SKIP.A.A.A.A) :
    IF ( CONTROLLED EFF KEY = 'Y' & PLANT_NUMBER = PLANT(P_CHK) ) THEN
      WRITE FILE(FILE3) FROM(TEMP_REC) :
    ELSE IF CONTROLLED EFF KEY = 'Y' THEN DO :
      CALL PROCESS FILE3 :
      ENDFLAG = 0 :
      E_CHK = 0 :
      D_CHK = 1 :
      P_CHK = PLANT_NUMBER :
      CALL WRITE PAGE HEADINGS :
      WRITE FILE(FILE3) FROM(TEMP_REC) :
    END :
    ELSE DO :
      CALL PROCESS FILE3 :
      PUT FILE(OUTPUT) EDIT(* END OF COST LISTING *) (PAGE,A) :
      GO TO END OF PROGRAM :
    END :
  END READ FILE2 :
1PROCESS FILE3: PROCEDURE :
  I1 = 1 :
  CLOSE FILE(FILE3) :
  OPEN FILE(FILE3) SEQUENTIAL INPUT :
  PUT FILE(OUTPUT) EDIT(*RELIABILITY=*REL LEVEL(I1).
    REPEAT(**.12) ) ( SKIP.A.A.SKIP.A.SKIP ) :
-READ FILE3:
  DO WHILE(**.R) :
    READ FILE(FILE3) INTO(EFFLUENT_REC) :
    IF ENDFLAG = 999 THEN RETURN :
    ELSE DO :
      CALL INSERT :
      IF OC_REL = REL LEVEL(I1) THEN
        COSTVAL(D_NUM) = SUBSTR( OPERATING COST,8-LENGTH(P_CHK.D_NUM) ) :
      ELSE COSTVAL(D_NUM) =
        SUBSTR(' -|| OC_REL ||'-.9-LENGTH(P_CHK.D_NUM)) :
      D_CHK = D_CHK + 1 :
    END :
  END READ FILE3 :
  RETURN :
END PROCESS FILE3 :
1INSERT: PROCEDURE :
  E_NUM = EFFLUENT_NUMBER :
  D_NUM = DIVISION_NUMBER :
  IF E_CHK = 0 THEN E_CHK = E_NUM :

```

```

IF E NUM > F CHK THEN DO :
CALL FIL LINE :
E CHK = E NUM :
END :
DO WHILE( D NUM > D CHK ) :
COSTVAL(D CHK) = SUBSTR( N, 8-LENGTH(P CHK, D CHK)) :
D CHK = D CHK + 1 :
END :
RETURN :
END INSERT :
-FILL LINE: PROCEDURE :
DO DIV = D CHK TO 20 :
COSTVAL(DIV) = SUBSTR( N, 8-LENGTH(P CHK, DIV)) :
END :
CALL PRINT ONE LINE :
D CHK = 1 :
RETURN :
END FILL LINE :
PRINT ONE LINE: PROCEDURE :
IF P CHK = 1 THEN
PUT FILE(OUTPUT) EDIT( EFF DESC(E CHK), COSTVAL )
( SKIP, A(13), 2 A(7), 3 A(4), 2 A(8), A(4), A(7), A(8),
4 A(4), A(7), A(8), A(8) ) :
IF P CHK = 2 THEN PUT FILE(OUTPUT) EDIT( EFF DESC(E CHK), COSTVAL )
( SKIP, A(13), 2 A(7), A(5), A(7), A(3), A(6), 3 A(7), A(8), A(6), A(7),
2 A(3), A(8), A(3), A(6), A(3), A(8), A(8) ) :
IF P CHK = 3 THEN PUT FILE(OUTPUT) EDIT( EFF DESC(E CHK), COSTVAL )
( SKIP, A(13), A(7), A(7), A(5), A(7), A(4), A(8), A(8), A(7), A(7), A(8),
A(4), A(4), A(4), A(4), A(4), A(4), A(4), A(4), A(8) ) :
IF P CHK = 4 THEN PUT FILE(OUTPUT) EDIT( EFF DESC(E CHK), COSTVAL )
( SKIP, A(13), A(7), A(7), A(4), A(7), A(4), A(6), A(7), A(4), A(4), A(8),
8 A(4), A(8), A(8) ) :
RETURN :
END PRINT ONE LINE :
-WRITE PAGE HEADINGS: PROCEDURE :
IF P CHK = 1 THEN PUT FILE(OUTPUT) PAGE EDIT(L1, '1', L2, L4, L5, L2,
NAME 1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19
TOTAL
*****
*****
***** )
( COL(36), 2 A, SKIP, A(129), SKIP, COL(20), A, SKIP, A, A(117),
SKIP, 3 A, SKIP, 3 A ) :
IF P CHK = 2 THEN PUT FILE(OUTPUT) PAGE EDIT(L1, '2', L2, L4, L5, L2,
NAME 1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19
TOTAL
*****
*****
***** )
( COL(36), 2 A, SKIP, A(132), SKIP, COL(20), A, SKIP, A, A(120),
SKIP, 3 A, SKIP, 3 A ) :
IF P CHK = 3 THEN PUT FILE(OUTPUT) PAGE EDIT(L1, '3', L2, L4, L5, L2,
NAME 1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19
TOTAL
*****
*****
***** )
( COL(36), 2 A, SKIP, A(132), SKIP, COL(20), A, SKIP, A, A(120),
SKIP, 3 A, SKIP, 3 A ) :
IF P CHK = 4 THEN PUT FILE(OUTPUT) PAGE EDIT(L1, '4', L2, L4, L5, L2,
NAME 1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19
TOTAL
*****
*****
***** )
( COL(36), 2 A, SKIP, A(120), SKIP, COL(20), A, SKIP, A, A(105),
SKIP, 2 A, SKIP, 2 A ) :
RETURN :
END WRITE PAGE HEADINGS :
-END OF PROGRAM:

```

```

      END COSTREL ;
//*
//GO.OUTPUT DD SYSOUT=(G..0030)
//GO.COST DD DSN=DETCOST.DISP=(OLD,DELETE)
//GO.FILE3 DD DSN=CCFILE3.JNIT=SYSDA.SPACE=(CYL,(1,1)),
//          DISP=(NEW,DELETE).DCB=(RFCFM=FB,LRECL=14,BLKSIZE=1400)
//GO.SYSIN DD *
//

```

```

TTTTTTTTTTTT
TTTTTTTTTTTT
      NN      NN      SSSSSSSSSS      TTTTTTTTTTTTTT
      NNN     NN      SSSSSSSSSS      TTTTTTTTTTTTTT
      II      NNNN     VN      SS      SS
      II      VN NN     NN      SS      SS
      II      NN NN     NN      SSS
      II      NN NN     NN      SSSSSSSSSS
      II      NN NN     NN      SSSSSSSSSS
      II      VN      NN NN      SSS
      II      NN      NNNN     SS
      II      NN      NNN      SS
TTTTTTTTTTTT  NN      VN      SSSSSSSSSS
TTTTTTTTTTTT  NN      N      SSSSSSSSSS

```

[illegible]

```

//STEP1 EXEC PGM=IEFGENER
//SYSPRINT DD SYSOUT=A
//SYSUT1 DD DSN=CATALASE,DISP=(OLD,PASS),VOL=SER=CATALASE,LABEL=(2,SL),
// UNIT=(3409,,0,ERR),DCB=(RECFM=FB,LRECL=200,BLKSIZE=2000)
//SYSUT2 DD DSN=CATALASE,UNIT=SYSDA,DISP=(NEW,PASS),SPACE=(CYL,(1,1)),
// DCB=(RECFM=FB,LRECL=15,BLKSIZE=1600)
//SYSIN DD *
GENERATE MAXFLDS=10
RECORD FIELD=(5.1.1),FIELD=(1.84,,1),FIELD=(10.103,,7)
/*
//STEP2 EXEC SORTD,COND=(0,NE)
//SORTIN DD DSN=CATALASE,DISP=(OLD,DELETE)
//SORTOUT DD DSN=CATALASE,UNIT=SYSDA,DISP=(NEW,PASS),DCB=*,SORTIN,
// SPACE=(CYL,(1,1))
//SORTWK01 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK02 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK03 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK04 DD UNIT=3330,SPACE=(CYL,(1,1))
//SYSIN DD *
SORT FIELDS=(6.1,CH,D,1.1,CH,A,4.2,CH,A,2.2,CH,A),FILSZ=E500
RECORD TYPE=F,LENGTH=(16)
/*
//STEP3 EXEC PL1FCLG,PARM='X,A,LC=90,SM=(2.72,1)',TIME,GO=2
//PL1L.SYSIN DD *
/* ***** INSTALLED COST RELIABILITY BREAKOUT LISTING ***** */
COSTREL: PROCEDURE OPTIONS(MAIN) :
-DECLARE
  OUTPUT PRINT STREAM ,
  COST FILE RECORD SEQUENTIAL INPUT ,
  FILE3 FILE RECORD SEQUENTIAL :
-DCL 01 TEMP REC .
  02 PLANT NUMBER CHAR(1) .
  02 FILL1 CHAR(4) .
  02 CONTROLLED EFF KEY CHAR(1) .
  02 FILL2 CHAR(10) .
-DCL 01 EFFLUENT REC .
  02 FILL1 CHAR(1) .
  02 DIVISION NUMBER CHAR(2) .
  02 EFFLUENT NUMBER CHAR(2) .
  02 FILL2 CHAR(1) .
  02 INSTALLED COST CHAR(9) .
  02 IC REL CHAR(1) .
-DECLARE
  (E NUM,D NUM) FIXED BINARY(15,0) .
  (O CHK,P CHK) FIXED BINARY(15,0) INITIAL(1) .
  (E CHK,ENDFLAG,DIV) FIXED BINARY(15,0) INITIAL(0) .
  REL LEVEL(3) CHARACTER(1) INITIAL('A','B','C') .
  PLANT(4) CHARACTER(1) INITIAL('1','2','3','4') .
  L1 CHARACTER(66) INITIAL( ) .
  'I N S T A L L E D C O S T M A T R I X F O R P L A N T # ' .
  L2 CHARACTER(140) .
  L4 CHARACTER(10) INIT('D I V I S I O N #') .
  L5 CHARACTER(12) INITIAL(' EFFLUENT ') .
  COSTVAL(20) CHARACTER(9) .
  LENGTH(4,20) FIXED BINARY(15,0) INITIAL
    ( 5.7.3.3.1.6.7.3.3.7.3.6.7.1.3.1.3.7.7.8.
      5.6.5.7.1.6.7.7.7.8.6.7.2.1.8.1.5.1.7.8.
      5.6.4.7.1.6.7.7.7.7.3.3.3.1.8.1.5.3.7.8.
      5.7.3.7.1.6.7.3.3.8.3.3.3.1.2.1.3.3.8.8 ) .
  EFF DESC(60) CHARACTER(12) INITIAL(
    'AL203 ' 'AL(OH)3 ' 'AL2(SO4)3 ' 'BICARBONATE '
    'BOILER ASH ' 'CaCO3 ' 'CaO ' 'CaSO3.2H2O '
    'CaSO4.2H2O ' 'CHLORIDE ' 'COAL DUST ' 'Fe2O3 '
    'FLY ASH ' 'GASIFIER ASH ' 'K2O ' 'MgO '
    'Na2O ' 'Na2SO3 ' 'Na2SO4 ' 'NO3 '
    'PARTICULATES ' 'PHOSPHATE ' 'REFUSE ' 'SiO2 '
    'SO3 ' 'SO4 ' 'S002 ' 'SULPHUR '
    'SUSP. SOLIDS ' 'UNREACTED C ' 'CHLORIDES ' 'FATTY ACIDS '
    'HCN ' 'H2O ' 'NH3 ' 'PHENOLICS '
    'SULPHUR ' 'THIOCYANATES ' 'CO ' 'COS '
    'CO2 ' 'CS2 ' 'FATTY ACIDS ' 'HCN '
    'HYDROCARBENS ' 'H2 ' 'H2O ' 'H2S '
  )

```

```

      NAPTHA      : : NH2      : : NHX      : : N2      : :
      O2          : : PHENDLICS : : PYRIDINES : : SO2      : :
      THIOCYANATES : : SLUDGE (BWT) : : SLUDGE (LWWT) : : SLUDGE (CTR) : :
L2 = REPEAT( '**.129 ) ;
1 ON ENDFILE(COST) BEGIN ;
  PUT FILE(OUTPUT) EDIT('** END OF COST LISTING **') (PAGE,A) ;
  GO TO END OF PROGRAM ;
END ;
- CN ENDFILE(FILE3) BEGIN ;
  CLOSE FILE(FILE3) ;
  IF D_CHK > 1 THEN CALL FILL LINE ;
  IF I1 < 3 THEN DO ;
    OPEN FILE(FILE3) SEQUENTIAL INPUT ;
    I1 = I1 + 1 ;
    PUT FILE(OUTPUT) EDIT('RELIABILITY=',REL_LEVEL(I1),
      REPEAT('**.12) ) ( SKIP(2),A,A,SKIP,A,SKIP ) ;
    D_CHK = 1 ;
    E_CHK = 0 ;
    READ FILE(FILE3) INTO(EFFLUENT REC) ;
    END ;
    ELSE ENDFLAG = 999 ;
  END ;
1 OPEN FILE(COST) SEQUENTIAL INPUT ;
  FILE(FILE3) SEQUENTIAL OUTPUT ;
  FILE(OUTPUT) OUTPUT PAGESIZE(40) LINESIZE(140) ;
  CALL WRITE PAGE HEADINGS ;
-READ FILE2:
  DO WHILE('1'R) ;
    READ FILE(COST) INTO(TEMP REC) ;
    PUT EDIT(TEMP REC) (SKIP,A,A,A,A) ;
    IF ( CONTROLLED EFF KEY = 'Y' & PLANT_NUMBER = PLANT(P_CHK) ) THEN
      WRITE FILE(FILE3) FROM(TEMP REC) ;
    ELSE IF CONTROLLED EFF KEY = 'Y' THEN DO ;
      CALL PROCESS FILE3 ;
      ENDFLAG = 0 ;
      E_CHK = 0 ;
      D_CHK = 1 ;
      P_CHK = PLANT_NUMBER ;
      CALL WRITE PAGE HEADINGS ;
      WRITE FILE(FILE3) FROM(TEMP REC) ;
    END ;
    ELSE DO ;
      CALL PROCESS FILE3 ;
      PUT FILE(OUTPUT) EDIT('** END OF COST LISTING **') (PAGE,A) ;
      GO TO END OF PROGRAM ;
    END ;
  END READ FILE2 ;
1PROCESS FILE3: PROCEDURE ;
  I1 = 1 ;
  CLOSE FILE(FILE3) ;
  OPEN FILE(FILE3) SEQUENTIAL INPUT ;
  PUT FILE(OUTPUT) EDIT('RELIABILITY=',REL_LEVEL(I1),
    REPEAT('**.12) ) ( SKIP,A,A,SKIP,A,SKIP ) ;
-READ FILE3:
  DO WHILE('1'R) ;
    READ FILE(FILE3) INTO(EFFLUENT REC) ;
    IF ENDFLAG = 999 THEN RETURN ;
    ELSE DO ;
      CALL INSERT ;
      IF IC_REL = REL_LEVEL(I1) THEN
        COSTVAL(D_NUM) = SUBSTR( INSTALL-D COST,9-LENGTH(P_CHK,D_NUM) ) ;
      ELSE COSTVAL(D_NUM) =
        SUBSTR(
          D_CHK = D_CHK + 1 ;
        ) ;
    END ;
  END READ FILE3 ;
  RETURN ;
END PROCESS FILE3 ;
1INSERT: PROCEDURE ;
  E_NUM = EFFLUENT NUMBER ;
  D_NUM = DIVISION NUMBER ;
  IF E_CHK = 0 THEN E_CHK = E_NUM ;

```

```

IF E NUM > E CHK THEN DO :
CALL FILL LINE :
F CHK = F NUM :
END :
DO WHILE( D NUM > D CHK ) :
COSTVAL( E CHK ) = SUBSTR( N*,9-LENGTH(P_CHK,D_CHK)) :
D_CHK = D_CHK + 1 :
END :
RETURN :
END INSERT :
-FILL LINE: PROCEDURE :
DO DIV = D_CHK TO 20 :
COSTVAL(DIV) = SUBSTR( N*,9-LENGTH(P_CHK,DIV)) :
END :
CALL PRINT ONE LINE :
D_CHK = 1 :
RETURN :
END FILL LINE :
1PRINT ONE LINE: PROCEDURE :
IF P_CHK = 1 THEN
PUT FILE(OUTPUT) EDIT( EFF DESC(E_CHK),COSTVAL )
( SKIP,A(12),A(6),A(4),A(4),A(4),A(7),A(8),A(4),A(4),A(9),
A(4),A(7),A(8),A(0),A(4),A(0),A(4),A(3),A(3),A(9) ) :
IF P_CHK = 2 THEN PUT FILE(OUTPUT) EDIT(EFF DESC(E_CHK),COSTVAL)
( SKIP,A(12),A(6),A(7),A(6),A(8),A(0),A(7),A(8),A(8),A(8),A(9),A(7),
A(8),A(3),A(0),A(9),A(0),A(6),A(0),A(8),A(9) ) :
IF P_CHK = 3 THEN PUT FILE(OUTPUT) EDIT(EFF DESC(E_CHK),COSTVAL)
( SKIP,A(12),A(6),A(7),A(5),A(5),A(0),A(7),A(9),A(8),A(8),A(8),
A(4),A(4),A(4),A(0),A(9),A(0),A(6),A(4),A(3),A(9) ) :
IF P_CHK = 4 THEN PUT FILE(OUTPUT) EDIT(EFF DESC(E_CHK),COSTVAL)
( SKIP,A(12),A(6),A(8),A(4),A(8),A(0),A(7),A(8),A(4),A(4),A(9),
A(4),A(4),A(4),A(0),A(6),A(0),A(4),A(4),A(9),A(9) ) :
RETURN :
END PRINT ONE LINE :
-WRITE PAGE HEADINGS: PROCEDURE :
IF P_CHK = 1 THEN PUT FILE(OUTPUT) PAGE EDIT(L1,'1',L2,L4,L5,L2,
NAME 1 2 3 4 5 6 7 8 9 ,
10 11 12 13 15 17 18 19 ,
TOTAL ,
***** )
( COL(36),2 A,SKIP,A(117),SKIP,COL(20),A,SKIP,A,A(105),
SKIP,3 A,SKIP,3 A ) :
IF P_CHK = 2 THEN PUT FILE(OUTPUT) PAGE EDIT(L1,'2',L2,L4,L5,L2,
NAME 1 2 3 4 5 6 7 8 ,
9 10 11 12 13 15 17 19 ,
TOTAL ,
***** )
( COL(36),2 A,SKIP,A(130),SKIP,COL(20),A,SKIP,A,A(116),
SKIP,3 A,SKIP,3 A ) :
IF P_CHK = 3 THEN PUT FILE(OUTPUT) PAGE EDIT(L1,'3',L2,L4,L5,L2,
NAME 1 2 3 4 5 6 7 8 ,
9 10 11 12 13 15 17 18 19 ,
TOTAL ,
***** )
( COL(36),2 A,SKIP,A(126),SKIP,COL(20),A,SKIP,A,A(114),
SKIP,3 A,SKIP,3 A ) :
IF P_CHK = 4 THEN PUT FILE(OUTPUT) PAGE EDIT(L1,'4',L2,L4,L5,L2,
NAME 1 2 3 4 5 6 7 8 9 ,
10 11 12 13 15 17 18 19 TOTAL ,
***** )
( COL(36),2 A,SKIP,A(112),SKIP,COL(20),A,SKIP,A,A(100),
SKIP,2 A,SKIP,2 A ) :
RETURN :
END WRITE PAGE HEADINGS :
-END OF PROGRAM:

```


END COSTREL :

```
..GO.OUTPUT DD SYSOUT=(S..0030)
//GO.COST DD DSN=GO.COST.DISP=(OLD,DELETE)
//GO.FILE3 DD DSN=GO.FILE3.UNIT=SYS04.SPACE=(CYL,(1,1)).
//GO.SYSTN DD DISP=(NEW,DELETE).DCB=(PFCFM=FB,LRECL=10,BLKSIZE=100)
//
```

SECTION VII

PROGRAM 9 - SELECTIVE EXTRACTION PROGRAM

- a) Description
- b) Input Card Format
- c) Listing

PROGRAM #9 (TABLE #12 LISTINGS)

Purpose: To generate selective listings in a flexible format controlled by input cards which designate the key fields to be used. These would be used for cross-reference purpose with the effluent data records on file.

Input Cards: Footnotes would most likely not be used for reasons of maintaining program efficiency and avoiding unnecessary duplication since the quantity and biological hazard footnotes will all be found in other listings. The only input cards required will be those which control the type of listing, any selective key fields to be used, and acceptable values for key fields used.

Printed Output: Two main types of listings will be used. The first type is the general effluent listing which would require the following information from a control card:

- a. lower bound for effluent numbers to be accepted (01-60)
- b. upper bound for effluent numbers to be accepted (01-60)
- c. lower bound for division numbers to be accepted (01-20)
- d. upper bound for division numbers to be accepted (01-20)

Corresponding state and federal regulations will be printed for this type of listing only. The other type of listing is similar but is more selective as far as which records are printed. The control card for this type of listing would contain all the information required for the general type listing plus the key field to be used and the value or range of values being looked for. This information would be printed with the headings on each page of output. That column would then be removed from the output. Only the intersection of all qualified records will be used.

Manipulation of the Data Base: The original data base file will be copied from magnetic to a temporary disk file. This temporary file will then be sorted as follows:

- a. first by effluent number (1-60) in ascending order
- b. then by major plant division (1-20) in ascending order
- c. finally by plant number (1-4) in ascending order

This order allows for the selective extraction of effluent records while processing the file sequentially.

SELECTIVE EXTRACTION PROGRAM
DESCRIPTION OF CONTROL CARD FORMATS
AND DEFINITION OF KEY USED

<u>VARIABLE</u>	<u>CARD COLUMNS</u>	<u>DEFINITION</u>
EFF_LOWER	1-2	This variable defines the lower bound used as criteria for determining which effluent records will be printed; that is, all effluents records with effluent numbers greater than or equal to this value and satisfying the other conditions specified on the control card will be selected for output.
EFF_UPPER	3-4	This value defines the upper bound effluent number used as criteria for determining which effluent records will be printed.
DIV_LOWER	5-6	This variable defines the lower limit division number used to determine which effluent records will be printed; that is, all effluent records from divisions numbered greater than or equal to this value and conforming to the other criteria specified on the control card will be printed.
DIV_UPPER	7-8	This variable defines the upper limit division number used to determine which effluent records will be selected for output.
ADDITIONAL_KEY	9	This variable is used to denote whether or not there is to be a general listing of all the effluents records within the effluent and division bounds or a more selective type listing. ('Y' indicates selective type listing).
KEY_FIELD	10-12	This variable is specified only if a 'Y' is specified as the value for ADDITIONAL_KEY. It is used to specify what type of listing is to be generated. If this variable takes on a value of 'con' only effluent records with controlled effluents and meeting the addition criteria on the control card will be printed.
QTY_LOWER	13-18	This variable is only specified when KEY_FIELD takes on a value of 'QTY'. It is used to specify the lower limit of quantities emitted; that is, only effluents with quantities emitted greater than or equal to this value and satisfying the other criteria on the control card will be printed.

<u>VARIABLE</u>	<u>CARD COLUMNS</u>	<u>DEFINITION</u>
QTY-UPPER	19-24	This variable is also only specified when 'QTY' is specified in the KEY_FIELD. It is used to specify the upper limit of quantities emitted; that is, only effluents with quantities emitted less than or equal to this value and that satisfying the other criteria specified on the control card will be printed.
QTY-REL-CODE	13	This variable is only specified if KEY_FIELD is specified as 'REL'. It can take on a value of 'A', 'B', or 'C'. Only the effluent records with a reliability level corresponding to this value and satisfying the other criteria will be printed.
NATURE_CODE	13-14	This variable is only specified if KEY_FIELD takes on a value of 'NAT'. It can take on values of 'S', 'L', 'C', or 'SL' corresponding to the nature of the effluent. Only effluent records of the nature specified and satisfying the other criteria will be printed.
BIOLOGICAL_HAZARD_CODE	13-14	This variable is only specified if KEY_FIELD takes on a value of 'BIO'. It can take on values of 'NK', 'MN', 'PH', 'HZ', and 'TX', corresponding to the values of biological hazard code of the effluent. Only effluent records with biological hazard codes corresponding this value and satisfying the other control card conditions will be selected for output.
DISPOSITION_CODE	13	This variable is specified only if KEY_FIELD takes on a value of 'DIS'. This variable can take on values of 0-9 corresponding to the disposition code of the effluent. Only effluents records with a disposition code number corresponding to this value and meeting the other criteria specified on the control card will be printed.

```

EEEEEEEEEE  AAAAEEEEEE  SSSSSSSSSS
EEEEEEEEEE  AAAAEEEEEE  SSSSSSSSSS
EE          AAAA          SS
EE          AAAA          SS
EE          AAAA          SSS
EEEEEEEEEE  AAAAEEEEEE  SSSSSSSSSS
EEEEEEEEEE  AAAAEEEEEE  SSSSSSSSSS
EE          AAAA          SS
EE          AAAA          SS
EE          AAAA          SS
EEEEEEEEEE  AAAAEEEEEE  SSSSSSSSSS
EEEEEEEEEE  AAAAEEEEEE  SSSSSSSSSS

```

```

EEEEEEEEEE  XX          XX  TTTTTTTTTT  RRRRRRRRRR
EEEEEEEEEE  XX          XX  TTTTTTTTTT  RRRRRRRRRR
EE          XX          XX  TT          RR          RR
EE          XX          XX  TT          RR          RR
EE          XX          XX  TT          RR          RR
EEEEEEEEEE  XXXX        TT          RRRRRRRRRR
EEEEEEEEEE  XXXX        TT          RRRRRRRRRR
EE          XX          XX  TT          RR          RR
EE          XX          XX  TT          RR          RR
EE          XX          XX  TT          RR          RR
EEEEEEEEEE  XX          XX  TT          RR          RR
EEEEEEEEEE  XX          XX  TT          RR          RR

```

```

HH          HH
HH          HH
HH          HH
HH          HH
HHHHHHHHHH
HHHHHHHHHH
HH          HH
HH          HH
HH          HH
HH          HH
HH          HH

```

```

//STEP1 EXEC PGM=IFRGRNER
//SYSPRINT DD SYSOUT=A
//SYSUT1 DD DSN=DATABASE,DISP=(OLD,PASS),VOL=SER=ECSOF1,LABEL=(2,SL),
// UNIT=(3400,,DEFER),CCH=(RECFM=FB,LRECL=200,BLKSIZE=2000)
//SYSUT2 DD DSN=EGRTEMP,UNIT=SYSDA,DISP=(NEW,PASS),SPACE=(CYL,(1,1)),
// CCH=(RECFM=FB,LRECL=40,BLKSIZE=9200)
//SYSIN DD *
GENERATE MAXFLOS=10
RECORD FIELD=(27.1..1),FIELD=(5.30..28),FIELD=(1.43..33),
FIELD=(1.34..34),FIELD=(5.113..35),FIELD=(7.127..40)
/*
//STEP2 EXEC SORTD,COND=(0,NE)
//SORTIN DD DSN=EGRTEMP,DISP=(OLD,DELETE)
//SORTOUT DD DSN=EGRDATA,UNIT=SYSDA,DISP=(NEW,PASS),SPACE=(CYL,(1,1)),
// DCB=*,SORTIN
//SORTWK01 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK02 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK03 DD UNIT=3330,SPACE=(CYL,(1,1))
//SORTWK04 DD UNIT=3330,SPACE=(CYL,(1,1))
//SYSIN DD *
SORT FIELDS=(4,2,CH,A,2,2,CH,A,1,1,CH,A),FILSZ=E4000
RECORD TYPE=F,LENGTH=(46)
/*
//STEP3 EXEC PL1FCLG,PAPM='X,A,LC=80,SM=(2,72,1)'
//PL1L.SYSIN DD *
/* ***** SELECTIVE EXTRACTION PROGRAM ***** */
SELECT: PROCEDURE OPTIONS(MAIN) ;
-DCL 01 EFFLUENT REC .
02 PLANT NUMBER CHAR(1) .
02 DIVISION NUMBER CHAR(2) .
02 EFFLUENT NUMBER CHAR(2) .
02 EFF DESCRIPTION CHAR(12) .
02 QUANTITY EMITTED CHAR(10) .
02 QTY RELIABILITY CHAR(1) .
02 NATURE CHAR(2) .
02 BIOLOGICAL HAZARD CHAR(2) .
02 DISPOSITION CHAR(1) .
02 CONTROLLED EFF CODE CHAR(1) .
02 TOT ENERGY REQ CHAR(5) .
02 TOTAL OPERATING COST CHAR(7) .
-DCL 01 GENERAL CONTROL IMAGE BASED(CARDIN) .
02 EFF LOWER CHAR(2) .
02 EFF UPPER CHAR(2) .
02 DIV LOWER CHAR(2) .
02 DIV UPPER CHAR(2) .
02 ADDITIONAL KEY CHAR(1) .
02 KEY FILLD CHAR(3) .
02 FILLER CHAR(64) .
-DCL 01 QUANTITY KEY IMAGE BASED(CARDIN) .
02 FILL1 CHAR(12) .
02 QTY LOWER CHAR(6) .
02 QTY UPPER CHAR(6) .
02 FILL2 CHAR(66) .
-DCL 01 QTY REL KEY IMAGE BASED(CARDIN) .
02 FILL1 CHAR(12) .
02 QTY REL CODE CHAR(1) .
02 FILL2 CHAR(67) .
-DCL 01 NATURE KEY IMAGE BASED(CARDIN) .
02 FILL1 CHAR(12) .
02 NATURE CODE CHAR(2) .
02 FILL2 CHAR(66) .
-DCL 01 BIOHAZ KEY IMAGE BASED(CARDIN) .
02 FILL1 CHAR(12) .
02 BIOLOGICAL HAZARD CODE CHAR(2) .
02 FILL2 CHAR(66) .
-DCL 01 DISP KEY IMAGE BASED(CARDIN) .
02 FILL1 CHAR(12) .
02 DISPOSITION CODE CHAR(1) .
02 FILL2 CHAR(67) .
1DECLARE
CARD IMAGE CHAR(80) BASED(CARDIN) .
CARD FILE RECORD SEQUENTIAL INPUT .

```

```

EFFDATA      FILE RECORD SEQUENTIAL INPUT .
PRINT        PRINT STREAM .
CONTROL      PRINT STREAM .
ENDFLAG      FIXED BIN(15,0) INITIAL(0) .
1           FIXED BIN(15,0) INITIAL(1) .
XXXX        FLOAT DECIMAL .
CONV CHECK   CHAR(4) INITIAL('PASS') .
CARD CHECK   CHAR(4) INITIAL('PASS') .
(ELCHK,EUCHK,OLCHK,DUCHK) FIXED BIN(15,0) .
(OTYLO,OTYHI) FIXED BIN(31,0) .
KEYHEAD      CHAR(50) VARYING .
PD7C         FIXED DEC(4,2) .
(PCHK,FNUM,DNUM) FIXED BIN(15,0) .
OPCOST       FLOAT DECIMAL .
CH           CHAR(2) .
DIRECT OPERATING COST(4) FLOAT DECIMAL INITIAL
( 62280000 . 60000000 . 61300000 . 49330000 ) .
/* ( 28240030 . 27500000 . 27500000 . 27460000 ) . */
OTY          FLOAT DECIMAL .
(EFFCHK,DIVCHK) FIXED BIN(15,0) INITIAL(0) :
-DECLARE
  QTY, ABRFEVS(6) CHARACTER(10) INITIAL( ' ' ) SM' .
  MIN' . , NIL' . , NEG' . , '*' . , '*' . :
1 ON ENDFILE(EFFDATA) BEGIN :
  CLOSE FILE(EFFDATA) :
  FNDFLAG = 999 :
  PUT FILE(PRINT) SKIP :
  PUT FILE(PRINT) EDIT('** END OF LISTING FOR CONTROL CARD #' , I) .
  ( LINE(80), COL(40), A, F(2,0) ) :
  END :
- ON ENDFILE(CARD) BEGIN :
  CLOSE FILE(CARD), FILE(EFFDATA), FILE(PRINT) :
  PUT FILE(CONTROL) EDIT('** END OF JOB' ) ( SKIP(2), A ) :
  CLOSE FILE(CONTROL) :
  GO TO END OF PROGRAM :
  END :
- ON CONVERSION BEGIN :
  ONSOURCE = '0000000000000000' :
  CONV CHECK = 'FAIL' :
  CARD CHECK = 'FAIL' :
  END :
1 OPEN FILE(PRINT) OUTPUT LINESIZE(130) PAGESIZE(80) .
  FILE(CONTROL) OUTPUT LINESIZE(130) PAGESIZE(80) .
  FILE(EFFDATA) SEQUENTIAL INPUT .
  FILE(CARD) SEQUENTIAL INPUT :
  READ CONTROL CARD :
  DO WHILE( '1' ) :
  READ FILE(CARD) SET(CARDIN) :
  PUT FILE(CONTROL) EDIT('** CONTROL CARD #' , I, CARD IMAGE) .
  ( SKIP(3), A, F(2,0), COL(10), A ) :
  ELCHK = EFF LOWER :
  EUCHK = EFF UPPER :
  OLCHK = DIV LOWER :
  DUCHK = DIV UPPER :
  IF OLCHK < 1 | OLCHK > 60 THEN
    CALL CONTROL ERR('EFFLUENT LOWER BOUND') :
  IF EUCHK < 1 | EUCHK > 60 THEN
    CALL CONTROL ERR('EFFLUENT UPPER BOUND') :
  IF OLCHK < 1 | OLCHK > 20 THEN
    CALL CONTROL ERR('DIVISION LOWER BOUND') :
  IF DUCHK < 1 | DUCHK > 20 THEN
    CALL CONTROL ERR('DIVISION UPPER BOUND') :
  IF CARD CHECK = 'PASS' THEN DO :
  IF ADDITIONAL KEY = 'Y' THEN CALL GENERAL TYPE LIST :
  ELSE IF KEY FIELD = 'QTY' THEN CALL QTY KEY LIST :
  ELSE IF KEY FIELD = 'REL' THEN CALL REL KEY LIST :
  ELSE IF KEY FIELD = 'NAT' THEN CALL NAT KEY LIST :
  ELSE IF KEY FIELD = 'DIS' THEN CALL DIS KEY LIST :
  ELSE IF KEY FIELD = 'CON' THEN CALL CON KEY LIST :
  ELSE CALL CONTROL ERR('KEY FIELD') :
  ENDFLAG = 0 :

```


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```

0 ELSE DO :
  QTYLO = QTY LOWER :
  IF CONV CHECK = 'FAIL' | QTYLO <= 0 | QTYLO >= 1000000 THEN
    CALL CONTROL ERR('QUANTITY LOWER BOUND') :
  QTYHI = QTY UPPER :
  IF CONV CHECK = 'FAIL' | QTYHI <= 0 | QTYHI >= 1000000 THEN
    CALL CONTROL ERR('QUANTITY UPPER BOUND') :
  IF QTYLO > QTYHI THEN DO :
    PUT FILE(CONTROL) EDIT
    ('ERROR LOWER BOUND CANNOT EXCEED UPPER BOUND') (COL(10),A) :
  CARD CHECK = 'FAIL' :
  END :
  KEYHEAD = '( ' || QTY LOWER || ' : TPD <= QUANTITY EMITTED <= '
  || QTY UPPER || ' TPD )' :
  END :
1 IF CARD CHECK = 'PASS' THEN DO :
  DO WHILE('1'B) :
    READ FILE(EFFDATA) INTO(EFFLUENT REC) :
    IF ENDFLAG = 999 THEN RETURN :
    J = INDEX( STRING(QTY ABBREVS), QUANTITY EMITTED ) :
    IF J = 0 THEN DO :
      ENUM = EFFLUENT NUMBER :
      DNUM = DIVISION NUMBER :
      QTY = QUANTITY EMITTED :
      IF ENUM >= ELCHK & ENUM <= EUCHK &
        DNUM >= DLCHK & DNUM <= DUCHK &
        QTY >= QTYLO & QTY <= QTYHI THEN DO :
        IF ENUM == EFFCHK | DNUM == DIVCHK THEN DO :
          EFFCHK = ENUM :
          DIVCHK = DNUM :
          IF LINEND(PRINT) > 50 THEN JJ = 10 :
          ELSE JJ = 45 :
          IF LINEND(PRINT) > 50 THEN PUT FILE(PRINT) PAGE :
          PUT FILE(PRINT) EDIT('EFFLUENT # ' || EFFLUENT NUMBER || ' - '
          EFF DESCRIPTION, KEYHEAD, REPEAT('*'.74)) :
          'DIVISION #', DIVISION NUMBER,
          'QUANTITY', QTY, NATURE, BIOL, DISP, ENERGY, DIRECT,
          'REL', REL, HAZ, RSO, OPERATING,
          'TONS/DAY', MM RTU/D, COSTS :
          REPEAT('*'.74)) (LINE(JJ), COL(16), 4 A, SKIP(2), COL(11), A, SKIP(2)
          , COL(11), A, COL(24), A, COL(11), 2 A, 3(COL(24), A), COL(11), A) :
          END :
          PCHK = PLANT NUMBER :
          OPCOST = TOTAL OPERATING COST :
          XXXX = OPCOST / DIRECT OPERATING COST(PCHK) :
          PDOC = XXXX * 100.00 + 0.005 :
          PUT FILE(PRINT) EDIT('PLANT # ' || PLANT NUMBER, QUANTITY EMITTED,
          QTY RELIABILITY, NATURE, BIOLOGICAL HAZARD, DISPOSITION, TOT ENERGY REQ
          , PDOC, ' % ') (SKIP(2), COL(12), A, A, COL(24), A, COL(33), A,
          COL(45), A, COL(54), A, COL(62), A, COL(68), A, COL(79), F(4,2), A) :
          END :
        END :
      ELSE CARD CHECK = 'PASS' :
      RETURN :
    END QTY KEY LIST :
  REL KEY LIST: PROCEDURE :
  IF INDEX('ABC', QTY REL CODE) THEN DO :
    KEYHEAD = '( QUANTITY RELIABILITY = ' || QTY REL CODE || ' )' :
    DO WHILE('1'B) :
      READ FILE(EFFDATA) INTO(EFFLUENT REC) :
      IF ENDFLAG = 999 THEN RETURN :
      ENUM = EFFLUENT NUMBER :
      DNUM = DIVISION NUMBER :
      IF ENUM >= ELCHK & ENUM <= EUCHK &
        DNUM >= DLCHK & DNUM <= DUCHK &
        QTY RELIABILITY = QTY REL CODE THEN DO :
        IF ENUM == EFFCHK | DNUM == DIVCHK THEN DO :
          EFFCHK = ENUM :
          DIVCHK = DNUM :

```

```

IF LINENO(PRINT) > 50 THEN JJ = 10 :
ELSE JJ = 45 :
IF LINENO(PRINT) > 50 THEN PUT FILE(PRINT) PAGE :
PUT FILE(PRINT) EDIT('E F F L U E N T' # 'EFFLUENT NUMBER' - ' :
EFF DESCRIPTION,KEYHEAD,REPEAT('*.69').
| | | | | TOTAL | % OF | | |
| | DIVISION # | DIVISION NUMBER |
| | QUANTITY | NATURE | HAZ | DISP | ENERGY | DIRECT |
| | | | | HAZ | | REQ | OPERATING |
| | TONS/DAY | | | | MM BTU/D | COSTS |
REPEAT('*.69') (LINE(JJ),COL(16),4 A,SKIP(2),COL(11),A,SKIP(2)
,COL(11),A,COL(24),A,COL(11),2 A,3(COL(24),A),COL(11),A) :
END :
PCHK = PLANT NUMBER :
OPCOST = TOTAL OPERATING COST :
XXXX = OPCOST / DIRECT OPERATING COST(PCHK) :
PDOC = XXXX * 100.00 + 0.005 :
PUT FILE(PRINT) EDIT('PLANT #',PLANT NUMBER,QUANTITY EMITTED,
NATURE,BIOLOGICAL HAZARD,DISPOSITION,TOT ENERGY REQ,PDOC,' %' )
( SKIP(2),COL(12),A,4,COL(24),A,COL(39),A,COL(48),A,COL(56),A,
COL(62),A,COL(73),F(4,2),A ) :
END :
END :
END :
ELSE CALL CONTROL EFF('RELIABILITY CODE') :
RETURN :
END REL KEY LIST :
INAT KEY LIST: PROCEDURE :
CH = NATURE CODE :
IF CH='S' | CH='L' | CH='G' | CH='SL' THEN DO :
KEYHEAD = '( NATURE = ' || CH || ' )' :
DO WHILE('1'R) :
READ FILE(EFFDATA) INTO(EFFLUENT REC) :
IF ENDFLAG = 999 THEN RETURN :
ENUM = EFFLUENT NUMBER :
DNUM = DIVISION NUMBER :
IF ENUM >= FLCHK & ENUM <= LUCHK &
DNUM >= DLCHK & DNUM <= DUCHK &
NATURE = CH THEN DO :
IF ENUM = EFFCHK | DNUM = DIVCHK THEN DO :
EFFCHK = ENUM :
DIVCHK = DNUM :
IF LINENO(PRINT) > 50 THEN JJ = 10 :
ELSE JJ = 45 :
IF LINENO(PRINT) > 50 THEN PUT FILE(PRINT) PAGE :
PUT FILE(PRINT) EDIT('E F F L U E N T' # 'EFFLUENT NUMBER' - ' :
EFF DESCRIPTION,KEYHEAD,REPEAT('*.69').
| | | | | TOTAL | % OF | | |
| | DIVISION # | DIVISION NUMBER |
| | QUANTITY | QTY | DICH | DISP | ENERGY | DIRECT |
| | | | | HAZ | | REQ | OPERATING |
| | TONS/DAY | | | | MM BTU/D | COSTS |
REPEAT('*.69') (LINE(JJ),COL(16),4 A,SKIP(2),COL(11),A,SKIP(2)
,COL(11),A,COL(24),A,COL(11),2 A,3(COL(24),A),COL(11),A) :
END :
PCHK = PLANT NUMBER :
OPCOST = TOTAL OPERATING COST :
XXXX = OPCOST / DIRECT OPERATING COST(PCHK) :
PDOC = XXXX * 100.00 + 0.005 :
PUT FILE(PRINT) EDIT('PLANT #',PLANT NUMBER,QUANTITY EMITTED,
QTY RELIABILITY,BIOLOGICAL HAZARD-DISPOSITION,TOT ENERGY REQ,PDOC,
' %' )
( SKIP(2),COL(12),2 A,COL(24),A,COL(38),A,COL(45),A,
COL(53),A,COL(59),A,COL(70),F(4,2),A ) :
END :
END :
END :
ELSE CALL CONTROL EFF('NATURE CODE') :
RETURN :
END NAT KEY LIST :
IDIS KEY LIST: PROCEDURE :
IF INDEX('123456789',DISPOSITION CODE) THEN DO :
KEYHEAD = '( DISPOSITION = ' || DISPOSITION CODE || ' )' :

```



```

      ( SKIP(2).COL(12).A.A.COL(24).A.COL(38).A.COL(45).A.COL(54).A.
        COL(60).A.COL(71).F(4.2).A ) ;
    END ;
  END ;
  ELSE CALL CONTROL ECR('BIOLOGICAL HAZARD CODE') ;
  RETURN ;
END BIO KEY LIST ;
1 CON KEY LIST: PROCEDURE ;
  KEYHEAD = '( ONLY CONTROLLED EFFLUENTS )' ;
  DO WHILE('1'P) ;
    READ FILE(EFFDATA) INTO(EFFLUENT REC) ;
    IF ENDFLAG = 999 THEN RETURN ;
    ENUM = EFFLUENT NUMBER ;
    DNUM = DIVISION NUMBER ;
    IF ENUM >= ELCHK & ENUM <= EUCHEK &
       DNUM >= DLCHK & DNUM <= DUCHEK &
       CONTROLLED EFF CODE = 'Y' THEN DO ;
      IF ENUM = EFFCHK | DNUM = DIVCHK THEN DO ;
        EFFCHK = ENUM ;
        DIVCHK = DNUM ;
        IF LINEEND(PRINT) > 50 THEN JJ = 10 ;
        ELSE JJ = 45 ;
        IF LINEEND(PRINT) > 50 THEN PUT FILE(PRINT) PAGE ;
        PUT FILE(PRINT) EDIT('E F F L U E N T # 'EFFLUENT NUMBER.' - ',
          EFF DESCRIPTION,KEYHEAD,REPEAT(' ',74),
          ' | TOTAL | % OF ',
          ' DIVISION # DIVISION NUMBER',
          ' | QUANTITY | QTY | NATURE | ROL | DISP | ENERGY | DIRECT ',
          ' | REL | HAZ | REQ | OPERATING',
          ' | TONS/DAY | MM BTU/D | COSTS ',
          REPEAT(' ',74)) (LINE(JJ).COL(16).4 A.SKIP(2).COL(11).A.SKIP(2)
            .COL(11).A.COL(24).A.COL(11).2 A.A.COL(24).A).COL(11).A) ;
        END ;
        PCHK = PLANT NUMBER ;
        OPCODE = TOTAL OPERATING COST ;
        XXXX = OPCODE / DIRECT OPERATING COST(PCHK) ;
        PDDC = XXXX * 100.00 + 0.005 ;
        PUT FILE(PRINT) EDIT('PLANT # 'PLANT NUMBER,QUANTITY EMITTED,
          QTY RELIABILITY,NATURE,BIOLOGICAL HAZARD,DISPOSITION,TOT ENERGY,REQ
          ,PDDC,' X' ) ( SKIP(2).COL(12).A.A.COL(24).A.COL(38).A.
            COL(45).A.COL(54).A.COL(62).A.COL(68).A.COL(79).F(4.2).A ) ;
        END ;
      RETURN ;
    END CON KEY LIST ;
  -END OF PROGRAM:
  END SELECT ;
/*
//GO.EFFDATA DD DSN=EFFDATA.DISP=(CLO,DELETE)
//GO.PRINT DD SYSCUT=A
//GO.CONTROL DD SYSOUT=A
/*
//GO.CARD DD *
01600119YCCN
01600119YDIS2
/*
//
05700119YCCN
01600120YH1OPH
5656C120N
10500119YDIS2
30400404YNATS
01600120YHFLC
01600105YHFLC
01600119YQTY 100 1000
01600120YQTY 5000 2000
01600120YQTYABCD EFGHIJKL
01600120YQTY 10300
01600120YQTY 000010
01300106YQTY
45550120N

```

APPENDIX C

EMISSION SOURCES FOR EACH EFFLUENT

APPENDIX C: INTRODUCTION

Contained in this appendix is a general listing of all the effluents emitted and their data attributes. This listing is an effluent-by-effluent basis and identifies the source, quantity, quantity reliability, nature, biological hazard, disposition, energy expended to control, and percentage of operating costs expended on control for each effluent. Table 7-1 has been included to facilitate reading and understanding of the symbols used in this listing.

DEFINITION OF SYMBOLS USED IN COMPUTER GENERATED TABLES

<u>DIVISION # AND MEANING</u>		<u>BIOLOGICAL HAZARDS</u>	<u>DISPOSITION CODES</u>
1	Coal Storage Area	NK - None Known	1 - to mine
2	Coal Preparation Area	MN - Minor	2 - to atmosphere
3	Raw Water Treatment	PH - Possible Hazard	3 - to surface water
4	Boiler Plant	HZ - Hazard	4 - to deep well disposal
5	Oxygen Plant	TX - Toxic	5 - to Claus unit
6	Gasifiers		6 - to incineration
7	Ash Dewatering and Transfer Facility		7 - to stack gas treatment unit
8	ADIP Plant		8 - to ash handling
9	Claus Sulfur Plant		9 - to boiler
10	Stretford Sulfur Plant		0 - to superheater
11	Claus Incinerator		
12	Vent Gas Incinerator		
13	Catalytic Incinerator		
14	Untreated Stack Gas Vent		
15	Stack Gas Treatment		
16	Waste Water Concentrator		
17	Biological Waste Water Treatment		
18	Evaporation and Ash Ponds		
19	Cooling Towers		
20	Total Emissions		
		<u>QUANTITY CODES</u>	<u>NATURE CODES</u>
		SM - Small	S - Solid
		MIN - Minor	L - Liquid
		NIL - Nil	G - Gas
		N - None Emitted	SL - Sludge
		NR - None Reported	
<u>PLANT IDENTIFICATION</u>		<u>RELIABILITY LEVELS</u>	
Plant #1 - El Paso, New Mexico		A Good Reliability	-A- Refer to Reliability = A
Plant #2 - Natural, North Dakota		B Fair Reliability	-B- Refer to Reliability = B
Plant #3 - WESCO, New Mexico		C Poor Reliability	-C- Refer to Reliability = C
Plant #4 - ANG, North Dakota			

E F F L U E N T # 05 - BOILER ASH

```

*****
DIVISION #04 | QUANTITY | QTY | NATURE | BIOL. | DISP | TOTAL | % OF
               | TONS/DAY | REL  |         | HAZ   |      | ENERGY | DIRECT
               |          |      |         |       |      | REQ     | OPERATING
               |          |      |         |       |      | MM BTU/D | COSTS
*****
PLANT # 2      | 151      | A    | S       | PH    | 8    | 00000   | 0.00 %
PLANT # 3      | 135      | A    | S       | PH    | 8    | 00000   | 0.00 %
  
```

E F F L U E N T # 05 - BOILER ASH

```

*****
DIVISION #07 | QUANTITY | QTY | NATURE | BIOL. | DISP | TOTAL | % OF
               | TONS/DAY | REL  |         | HAZ   |      | ENERGY | DIRECT
               |          |      |         |       |      | REQ     | OPERATING
               |          |      |         |       |      | MM BTU/D | COSTS
*****
PLANT # 2      | 151      | A    | S       | PH    | 1    | 9        | 0.09 %
PLANT # 3      | 135      | A    | S       | PH    | 1    | 3        | 0.02 %
  
```

E F F L U E N T # 05 - BOILER ASH

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	151	A	S	PH	1	9	0.09 %
PLANT # 3	135	A	S	PH	1	3	0.02 %

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E F F L U E N T # 06 - CACG3

DIVISION #15	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 3	11	C	S	PH	1	0	0.00 %

EFFLUENT # 06 - CAC03

*****							TOTAL	% OF
DIVISION #17	QUANTITY	QTY	NATURE	BIOL.	DISP	ENERGY	DIRECT	
	TONS/DAY	REL		HAZ		REQ	OPERATING	
*****							MM BTU/D	COSTS
*****							*****	
PLANT # 3	42	B	S	PH	1	0	0.00	%

EFFLUENT # 06 - CAC03

*****							TOTAL	% OF
DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	ENERGY	DIRECT	
	TONS/DAY	REL		HAZ		REQ	OPERATING	
*****							MM BTU/D	COSTS
*****							*****	
PLANT # 3	53	B	S	PH	1	0	0.00	%

9851012N
ABCDEFHIJKL

FIELD=(1.63,.34).FIELD=(5.92,.35).FIELD=(7.98,.40)

//

EFFLUENT # 08 - CAS03.2H20

DIVISION #15	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	178.9	A	S	PH	1	8	0.05 %

EFFLUENT # 08 - CAS03.2H20

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	178.9	A	S	PH	1	8	0.05 %

EFFLUENT # 09 - CAS04.2H20

DIVISION #15	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 3	215	B	S	PH	1	1	0.01 %
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EFFLUENT # 09 - CAS04.2H20

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 3	215	B	S	PH	1	1	0.01 %
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E F F L U E N T # 11 - COAL DUST

DIVISION #01	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT

						REQ	OPERATING

						MM BTU/D	COSTS

PLANT # 1	SM	A	S	PH	2	1	0.40 %
PLANT # 2	SM	A	S	PH	2	1	0.45 %
PLANT # 3	SM	A	S	PH	2	1	0.44 %
PLANT # 4	SM	A	S	PH	2	1	0.45 %

E F F L U E N T # 11 - COAL DUST

DIVISION #02	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT

						REQ	OPERATING

						MM BTU/D	COSTS

PLANT # 1	SM	A	S	PH	2	3	0.47 %
PLANT # 2	SM	A	S	PH	2	3	0.52 %
PLANT # 3	SM	A	S	PH	2	3	0.51 %
PLANT # 4	1.085	3	S	PH	2	44	0.91 %

E F F L U E N T # 11 - COAL DUST

DIVISION #06	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.1412	C	S	PH	2	39	0.16 %
PLANT # 2	0.1473	C	S	PH	2	36	0.11 %
PLANT # 3	0.0124	C	S	PH	2	21	0.09 %
PLANT # 4	0.1342	C	S	PH	2	32	0.14 %

E F F L U E N T # 11 - COAL DUST

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.1412	C	S	PH	2	44	1.04 %
PLANT # 2	0.1473	C	S	PH	2	40	1.09 %
PLANT # 3	0.0124	C	S	PH	2	25	1.04 %
PLANT # 4	1.2192	B	S	PH	2	77	1.50 %

EFFLUENT # 13 - FLY ASH

DIVISION #04	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
*****						REQ	OPERATING
*****						MM BTU/D	COSTS

PLANT # 2	361	A	S	PH	8	00000	0.00 %
PLANT # 3	406	A	S	PH	8	00000	0.00 %
PLANT # 4	6.24	A	S	PH	8	00000	0.00 %

EFFLUENT # 13 - FLY ASH

DIVISION #07	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
*****						REQ	OPERATING
*****						MM BTU/D	COSTS

PLANT # 2	361	A	S	PH	1	21	0.21 %
PLANT # 3	406	A	S	PH	1	9	0.13 %
PLANT # 4	6.24	A	S	PH	1	0	0.00 %

EFFLUENT # 13 - FLY ASH

DIVISION #15	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS

PLANT # 3		S	B	S	PH	1	0.00 %

EFFLUENT # 13 - FLY ASH

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS

PLANT # 2	361	A	S	PH	1	21	0.21 %
PLANT # 3	411	A	S	PH	1	9	0.13 %
PLANT # 4	6.24	A	S	PH	1	0	0.00 %

E F F L U E N T # 14 - GASIFIER ASH

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*****
DIVISION #06 | QUANTITY | QTY | NATURE | BIOL. | DISP | TOTAL | % OF
               | TONS/DAY | REL  |        | HAZ    |      | ENERGY | DIRECT
               |          |      |        |        |      | REQ     | OPERATING
               |          |      |        |        |      | MM BTU/D | COSTS
*****
  
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PLANT # 1	5438.7	A	S	PH	8	00000	0.00 %
PLANT # 2	2159	A	S	PH	8	00000	0.00 %
PLANT # 3	6534	A	S	PH	8	00000	0.00 %
PLANT # 4	1763	A	G	PH	8	00000	0.00 %

C-13

E F F L U E N T # 14 - GASIFIER ASH

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*****
DIVISION #07 | QUANTITY | QTY | NATURE | BIOL. | DISP | TCTAL | % OF
               | TONS/DAY | REL  |        | HAZ    |      | ENERGY | DIRECT
               |          |      |        |        |      | REQ     | OPERATING
               |          |      |        |        |      | MM BTU/D | COSTS
*****
  
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PLANT # 1	5438.7	A	S	PH	1	115	1.75 %
PLANT # 2	2159	A	S	PH	1	123	1.23 %
PLANT # 3	6534	A	S	PH	1	133	1.87 %
PLANT # 4	1763	A	S	PH	1	80	1.11 %

EFFLUENT # 14 - GASIFIER ASH

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	5438.7	A	S	PH	1	115	1.75 %
PLANT # 2	2159	A	S	PH	1	123	1.23 %
PLANT # 3	6534	A	S	PH	1	133	1.87 %
PLANT # 4	1763	A	S	PH	1	80	1.11 %

EFFLUENT # 18 - NA2SO3

DIVISION #15	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	2.5	A	S	PH	1	0	0.00 %

EFFLUENT # 18 - NA2S03

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	2.5	A	S	PH	1	0	0.00 %

EFFLUENT # 19 - NA2S04

DIVISION #15	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	9.6	A	S	PH	1	0	0.00 %

EFFLUENT # 19 - NA2SO4

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*****
DIVISION #20 | QUANTITY | QTY | NATURE | BIOL. | DISP | TCTAL | % OF
               | TONS/DAY | REL  |         | HAZ   |      | ENERGY | DIRECT
               |          |      |         |       |      | REQ     | OPERATING
*****         |          |      |         |       |      | MM BTU/D | COSTS
*****

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PLANT # 2      9.6   A   S   PH   1   0   0.00 %

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EFFLUENT # 21 - PARTICULATES

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*****
DIVISION #04 | QUANTITY | QTY | NATURE | BIOL. | DISP | TCTAL | % OF
               | TONS/DAY | REL  |         | HAZ   |      | ENERGY | DIRECT
               |          |      |         |       |      | REQ     | OPERATING
*****         |          |      |         |       |      | MM BTU/D | COSTS
*****

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PLANT # 1      MIN   A   S   PH   2   00000   0.00 %
PLANT # 2      4.8   B   S   PH   7   81     0.49 %
PLANT # 3      5.82  A   S   PH   7   76     0.46 %
PLANT # 4      1.56  A   S   PH   2   22     0.30 %

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E F F L U E N T # 21 - PARTICULATES

DIVISION #06	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.0286	C	S	PH	2	7	0.09 %
PLANT # 2	0.018	C	S	PH	2	3	0.04 %
PLANT # 3	0.0327	C	S	PH	2	5	0.05 %
PLANT # 4	0.0088	C	S	PH	2	3	0.05 %

E F F L U E N T # 21 - PARTICULATES

DIVISION #12	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 3	0.0193	B	S	PH	2	00000	0.00 %

EFFLUENT # 21 - PARTICULATES

DIVISION #14	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	1.2	B	S	PH	2	00000	0.00 %

EFFLUENT # 21 - PARTICULATES

DIVISION #15	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	0.036	B	S	PH	2	0	0.00 %
PLANT # 3	0.82	B	S	PH	2	0	0.00 %

EFFLUENT # 21 - PARTICULATES

DIVISION #19	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
*****						REQ	OPERATING
*****						MM BTU/D	CCSTS

PLANT # 1	0.5244	C	S	PH	2	00000	0.00 %
PLANT # 2	0.923	C	S	PH	2	00000	0.00 %
PLANT # 3	0.344	C	S	PH	2	00000	0.00 %

EFFLUENT # 21 - PARTICULATES

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
*****						REQ	OPERATING
*****						MM BTU/D	CCSTS

PLANT # 1	0.553	C	S	PH	2	7	0.09 %
PLANT # 2	2.177	B	S	PH	2	3	0.04 %
PLANT # 3	1.216	B	S	PH	2	5	0.05 %
PLANT # 4	1.5638	A	S	PH	2	24	0.35 %

E F F L U E N T # 23 - REFUSE

DIVISION #02	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	1680	B	S	PH	8	135	1.21 %
PLANT # 3	2263	B	S	PH	1	7	0.11 %

C-20

E F F L U E N T # 23 - REFUSE

DIVISION #07	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	1680	B	S	PH	1	6	0.10 %

E F F L U E N T # 23 - REFUSE

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS

PLANT # 1	1680	A	S	PH	1	6	0.10 %
PLANT # 3	2263	B	S	PH	1	7	0.11 %

E F F L U E N T # 28 - SULPHUR

DIVISION #11	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS

PLANT # 2	0	A	G	PH	2	0	0.01 %

E F F L U E N T # 28 - SULPHUR

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	0	A	G	PH	2	0	0.01 %

C-22

E F F L U E N T # 29 - SUSP. SOLIDS

DIVISION #07	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	52	A	S	PH	1	3	0.03 %

E F F L U E N T # 29 - SUSP. SOLIDS

DIVISION #16	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 2	52	A	S	PH	8	00000	0.00 %
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E F F L U E N T # 29 - SUSP. SOLIDS

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 2	52	A	S	PH	1	3	0.03 %
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EFFLUENT # 30 - UNREACTED C

DIVISION #06	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	286.0	A	L	MN	8	00000	0.00 %

EFFLUENT # 30 - UNREACTED C

DIVISION #07	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	286	A	S	PH	1	6	0.09 %

C-25

E F F L U E N T # 30 - UNREACTED C

DIVISION #20							
QUANTITY	QTY	NATURE	BIOLOGICAL	DISP	TOTAL ENERGY	% OF DIRECT OPERATING COSTS	

TONS/DAY	REL		HAZ.		MM BTU/D		

PLANT # 1							
286							
A							
S							
PH							
1							
9							
0.09 %							

E F F L U E N T # 34 - H2O

DIVISION #03									

QUANTITY	QTY	NATURE	BIOLOGICAL	DISP	ENERGY REQ	TOTAL	% OF DIRECT	OPERATING COSTS	*****
TONS/DAY	REL		HAZ			MM BTU/D			
PLANT # 1	2906	A	L	PH	8	00000	0.00 %		
PLANT # 2	42	A	L	PH	1	0	0.00 %		
PLANT # 3	24	B	L	PH	1	00000	0.00 %		

EFFLUENT # 34 - H2O

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*****
DIVISION #04 | QUANTITY | QTY | NATURE | BIOL. | DISP | TOTAL | % OF
              | TONS/DAY | REL  |        | HAZ   |      | ENERGY | DIRECT
              |          |      |        |       |      | REQ     | OPERATING
              |          |      |        |       |      | MM BTU/D | COSTS
*****
  
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PLANT # 3 176 A L PH 8 00000 0.00 %

EFFLUENT # 34 - H2O

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*****
DIVISION #06 | QUANTITY | QTY | NATURE | BIOL. | DISP | TOTAL | % OF
              | TONS/DAY | REL  |        | HAZ   |      | ENERGY | DIRECT
              |          |      |        |       |      | REQ     | OPERATING
              |          |      |        |       |      | MM BTU/D | COSTS
*****
  
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PLANT # 1 1147.3 A L MN 8 00000 0.00 %

PLANT # 3 1150 A L PH 8 00000 0.00 %

EFFLUENT # 34 - H2O

DIVISION #07	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF	
	TONS/DAY	REL		HAZ		ENERGY	DIRECT	

						REQ	OPERATING	

						MM BTU/D	COSTS	

PLANT # 1	1147	A	L	MN	1	00000	0.00	%
PLANT # 2	660	A	L	PH	1	00000	0.00	%
PLANT # 3	1326	A	L	PH	1	00000	0.00	%
PLANT # 4	318.5	A	L	PH	1	14	0.20	%

EFFLUENT # 34 - H2O

DIVISION #15	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF	
	TONS/DAY	REL		HAZ		ENERGY	DIRECT	

						REQ	OPERATING	

						MM BTU/D	COSTS	

PLANT # 2	156	A	L	PH	1	00000	0.00	%
PLANT # 3	32	B	L	PH	1	0	0.00	%

EFFLUENT # 34 - H2O

DIVISION #19	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	1979	A	L	MN	8	00000	0.00 %
PLANT # 2	24	A	L	PH	1	00000	0.00 %

C-28

EFFLUENT # 34 - H2O

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	1147	A	L	MN	1	00000	0.00 %
PLANT # 2	1032	A	L	PH	1	0	0.00 %
PLANT # 3	1414.4	A	L	PH	1	0	0.00 %
PLANT # 4	613.3	A	L	PH	1	14	0.20 %

EFFLUENT # 34 - H2O

DIVISION #16	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	210	A	L	PH	8	00000	0.00 %
PLANT # 4	421	A	L	PH	1	00000	0.00 %

EFFLUENT # 34 - H2O

DIVISION #17	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	150	A	L	PH	1	00000	0.00 %
PLANT # 3	32.4	B	L	PH	1	0	0.00 %

EFFLUENT # 39 - CO

DIVISION #04	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 3	NIL	A	G	TX	7	0	0.00 %
PLANT # 4	1.344	B	G	TX	2	00000	0.00 %

EFFLUENT # 39 - CO

DIVISION #06	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	7.153	C	G	TX	2	00000	0.00 %
PLANT # 4	4.2409	C	G	TX	2	00000	0.00 %

EFFLUENT # 39 - CO

DIVISION #09	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 2	0.0101	B	G		TX	5	00000 0.00 %
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EFFLUENT # 39 - CO

DIVISION #10	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 1	53	A	G		TX	6	00000 0.00 %
PLANT # 2	14.8	A	G		TX	6	00000 0.00 %
PLANT # 4	9.744	A	G		TX	6	00000 0.00 %

EFFLUENT # 39 - CO

DIVISION #11	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 2	0	A	G	TX	2	0	0.00 %
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EFFLUENT # 39 - CO

DIVISION #12	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 1	NIL	A	G	TX	2	0	0.02 %
PLANT # 2	0	A	G	TX	2	0	0.01 %
PLANT # 4	3.024	A	G	TX	2	0	0.00 %

EFFLUENT # 39 - CO

DIVISION #13	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.856	B	G	TX	2	1	0.06 %

EFFLUENT # 39 - CO

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	8.009	C	G	TX	2	1	0.08 %
PLANT # 2	0	A	G	TX	2	0	0.01 %
PLANT # 4	8.6089	B	L	TX	2	0	0.00 %

EFFLUENT # 40 - COS

DIVISION #04	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	0	A	G	HZ	7	0	0.00 %
PLANT # 3	NIL	A	G	HZ	7	0	0.00 %

EFFLUENT # 40 - COS

DIVISION #06	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	0.00136	C	G	HZ	2	00000	0.00 %
PLANT # 3	0.0012	C	G	HZ	2	00000	0.00 %

EFFLUENT # 40 - COS

DIVISION #08	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	1.93	A	G	HZ	6	00000	0.00 %
PLANT # 3	1.51	B	G	HZ	9	00000	0.00 %

EFFLUENT # 40 - COS

DIVISION #09	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	0.338	C	G	HZ	5	00000	0.00 %
PLANT # 3	0	A	G	HZ	9	0	0.00 %

EFFLUENT # 40 - COS

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*****
DIVISION #10 | QUANTITY | QTY | NATURE | BIOL. | DISP | TCTAL | % OF
               | TONS/DAY | REL  |         | HAZ    |      | ENERGY | DIRECT
               |          |      |         |        |      | REQ     | OPERATING
               |          |      |         |        |      | MM BTU/D | COSTS
*****
PLANT # 1      2.064   C     G       HZ     6     00000   0.00 %
PLANT # 2      1.94    B     G       HZ     6     00000   0.00 %
PLANT # 3      1.95    B     G       HZ     9     00000   0.00 %
PLANT # 4      6.185   B     G       HZ     6     00000   0.00 %
  
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EFFLUENT # 40 - COS

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*****
DIVISION #11 | QUANTITY | QTY | NATURE | BIOL. | DISP | TOTAL | % OF
               | TONS/DAY | REL  |         | HAZ    |      | ENERGY | DIRECT
               |          |      |         |        |      | REQ     | OPERATING
               |          |      |         |        |      | MM BTU/D | COSTS
*****
PLANT # 2      0       A     G       HZ     2       0     0.01 %
  
```

EFFLUENT # 40 - COS

DIVISION #12	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	0	A	G	HZ	2	0	0.00 %
PLANT # 3	0	A	G	HZ	2	0	0.00 %
PLANT # 4	0	A	G	HZ	2	0	0.00 %

EFFLUENT # 40 - COS

DIVISION #13	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.0825	C	G	HZ	2	0	0.00 %

EFFLUENT # 40 - COS

DIVISION #14	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 3	0.0419	B	G	HZ	2	00000	0.00 %

EFFLUENT # 40 - COS

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.0825	C	G	HZ	2	0	0.00 %
PLANT # 2	0.00136	C	G	HZ	2	0	0.01 %
PLANT # 3	0.0431	B	G	HZ	2	0	0.00 %
PLANT # 4	0	A	G	HZ	2	0	0.00 %

EFFLUENT # 41 - CO2

DIVISION #04	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 1	7744	A	G	NK	2	00000	0.00 %
PLANT # 2	14299	A	G	NK	7	00000	0.00 %
PLANT # 3	19704	A	G	NK	7	00000	0.00 %
PLANT # 4	2897	A	G	NK	2	00000	0.00 %

EFFLUENT # 41 - CO2

DIVISION #05	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 1	12.6	A	G	NK	2	00000	0.00 %
PLANT # 3	12	A	G	NK	2	00000	0.00 %

EFFLUENT # 41 - CO2

DIVISION #06	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
*****						REQ	OPERATING
*****						MM BTU/D	COSTS

PLANT # 1	14.646	C	G	NK	2	00000	0.00 %
PLANT # 2	56.7	C	G	NK	2	00000	0.00 %
PLANT # 3	50	C	G	NK	2	00000	0.00 %
PLANT # 4	13.848	C	G	NK	2	00000	0.00 %

EFFLUENT # 41 - CO2

DIVISION #08	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
*****						REQ	OPERATING
*****						MM BTU/D	COSTS

PLANT # 2	701.7	A	G	NK	6	00000	0.00 %
PLANT # 3	547.3	A	G	NK	9	00000	0.00 %

EFFLUENT # 41 - C02

DIVISION #09	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	81.5	A	G	NK	5	00000	0.00 %
PLANT # 3	120.9	A	G	NK	9	00000	0.00 %

EFFLUENT # 41 - C02

DIVISION #10	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	19625	A	G	NK	6	00000	0.00 %
PLANT # 2	10090	A	G	NK	6	00000	0.00 %
PLANT # 3	9270	A	G	NK	9	00000	0.00 %
PLANT # 4	12500	A	G	NK	6	00000	0.00 %

EFFLUENT # 41 - C02

DIVISION #11	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	297	A	G	NK	2	00000	0.00 %

EFFLUENT # 41 - C02

DIVISION #12	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	515	A	G	NK	2	00000	0.00 %
PLANT # 2	19499	A	G	NK	2	00000	0.00 %
PLANT # 3	8890	A	G	NK	2	00000	0.00 %
PLANT # 4	23747	A	G	NK	2	00000	0.00 %

EFFLUENT # 41 - CO2

DIVISION #13	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	19519	B	G	NK	2	00000	0.00 %

C-43

EFFLUENT # 41 - CO2

DIVISION #14	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	2146	A	G	NK	2	00000	0.00 %
PLANT # 3	1747	A	G	NK	2	00000	0.00 %
PLANT # 4	287	A	G	NK	2	00000	0.00 %

EFFLUENT # 41 - C02

DIVISION #15	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	12154	A	G	NK	2	00000	0.00 %
PLANT # 3	19700	A	G	NK	2	00000	0.00 %

C-44

EFFLUENT # 41 - C02

DIVISION #19	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	18	C	G	NK	2	00000	0.00 %

EFFLUENT # 41 - CO2

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT

						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	27805	B	G	NK	2	00000	0.00 %
PLANT # 2	34171	A	G	NK	2	00000	0.00 %
PLANT # 3	30399	A	G	NK	2	00000	0.00 %
PLANT # 4	26945	A	G	NK	2	00000	0.00 %

EFFLUENT # 42 - CS2

DIVISION #09	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT

						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	0.0456	C	G	HZ	5	00000	0.00 %

EFFLUENT # 42 - CS2

DIVISION #10	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ.	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.072	C	G	HZ	6	00000	0.00 %
PLANT # 4	2.444	C	G	HZ	6	00000	0.00 %

EFFLUENT # 42 - CS2

DIVISION #11	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ.	OPERATING
						MM BTU/D	COSTS

PLANT # 2	0	A	G	HZ	2	0	0.00 %

E F F L U E N T # 42 - CS2

```

*****
DIVISION #12 | QUANTITY | QTY | NATURE | BIOL. | DISP | TCTAL | % OF
               | TONS/DAY | REL  |        | HAZ   |      | ENERGY | DIRECT
               |          |      |        |       |      | REQ     | OPERATING
*****       |          |      |        |       |      | MM BTU/D | COSTS
*****
PLANT # 3      |      0 | A   | G   | HZ   | 2   |      0 | 0.00 %
PLANT # 4      |      0 | A   | G   | HZ   | 2   |      0 | 0.00 %
  
```

E F F L U E N T # 42 - CS2

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*****
DIVISION #13 | QUANTITY | QTY | NATURE | BIOL. | DISP | TCTAL | % OF
               | TONS/DAY | REL  |        | HAZ   |      | ENERGY | DIRECT
               |          |      |        |       |      | REQ     | OPERATING
*****       |          |      |        |       |      | MM BTU/D | COSTS
*****
PLANT # 1      | 0.00288 | C   | G   | HZ   | 2   |      0 | 0.00 %
  
```

EFFLUENT # 42 - CS2

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.00288	C	G	HZ	2	0	0.00 %
PLANT # 2	0	A	G	HZ	2	0	0.00 %
PLANT # 3	0	A	G	HZ	2	0	0.00 %
PLANT # 4	0	A	G	HZ	2	0	0.00 %

EFFLUENT # 43 - FATTY ACIDS

DIVISION #07	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.1141	C	G	HZ	2	00000	0.00 %

EFFLUENT # 43 - FATTY ACIDS

DIVISION #18	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.574	C	G	HZ	2	00000	0.00 %

EFFLUENT # 43 - FATTY ACIDS

DIVISION #19	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.3826	C	G	HZ	2	00000	0.00 %
PLANT # 2	0.7626	C	G	HZ	2	00000	0.00 %
PLANT # 3	0.3687	C	G	HZ	2	00000	0.00 %

EFFLUENT # 43 - FATTY ACIDS

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	1.0707	C	G	HZ	2	00000	0.00 %
PLANT # 2	0.7626	C	G	HZ	2	00000	0.00 %
PLANT # 3	0.3867	C	G	HZ	2	00000	0.00 %

EFFLUENT # 44 - HCN

DIVISION #07	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.1143	C	G	TX	2	00000	0.00 %

EFFLUENT # 44 - HCN

DIVISION #09	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 3	0	A	G	TX	9	0	0.00 %

EFFLUENT # 44 - HCN

DIVISION #18	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.572	C	G	TX	2	00000	0.00 %

EFFLUENT # 44 - HCN

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.6863	C	G	TX	2	00000	0.00 %

C-52

EFFLUENT # 45 - HYDROCARBONS

DIVISION #04	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	0	A	G	MN	7	0	0.00 %
PLANT # 3	NIL	A	G	MN	7	0	0.00 %
PLANT # 4	0.8	A	G	MN	2	00000	0.00 %

EFFLUENT # 45 - HYDROCARBONS

DIVISION #06	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	2.447	C	G	MN	2	00000	0.00 %
PLANT # 2	0.294	C	G	MN	2	00000	0.00 %
PLANT # 3	0.380	C	G	MN	2	00000	0.00 %
PLANT # 4	1.8698	C	G	MN	2	00000	0.00 %

EFFLUENT # 45 - HYDROCARBONS

DIVISION #08	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	127.7	A	G	MN	6	00000	0.00 %
PLANT # 3	99.9	A	G	MN	9	00000	0.00 %

EFFLUENT # 45 - HYDROCARBONS

DIVISION #09	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 3	0	A	G	MN	9	0	0.00 %

C-54

EFFLUENT # 45 - HYDROCARBONS

DIVISION #10	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	114	A	G	MN	6	00000	0.00 %
PLANT # 2	87.8	A	G	MN	6	00000	0.00 %
PLANT # 3	83.9	A	G	MN	9	00000	0.00 %
PLANT # 4	267.1	A	G	MN	6	00000	0.00 %

EFFLUENT # 45 - HYDROCARBONS

DIVISION #12	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	NIL	A	G	MN	2	0	0.01 %
PLANT # 2	0	A	G	MN	2	7	0.21 %
PLANT # 3	0	A	G	MN	2	0	0.00 %
PLANT # 4	0.534	A	G	MN	2	0	0.00 %

EFFLUENT # 45 - HYDROCARBONS

DIVISION #13	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	4.33	C	G	MN	2	7	0.37 %

EFFLUENT # 45 - HYDROCARBONS

DIVISION #14	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 3	9.1	A	G	MN	2	00000	0.00 %

EFFLUENT # 45 - HYDROCARBONS

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	6.777	C	G	MN	2	7	0.38 %
PLANT # 2	0.294	C	G	MN	2	7	0.21 %
PLANT # 3	9.48	A	G	MN	2	0	0.00 %
PLANT # 4	3.2038	B	G	MN	2	0	0.00 %

E F F L U E N T # 46 - H2

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*****
DIVISION #04 | QUANTITY | QTY | NATURE | BIOL. | DISP | TOTAL | % OF
               | TONS/DAY | REL  |         | HAZ    |      | ENERGY | DIRECT
               |          |      |         |        |      | REO      | OPERATING
               |          |      |         |        |      | MM BTU/D | COSTS
*****
PLANT # 3     | NIL      | A    | G       | MN     | 7    | 0        | 0.00 %
  
```

E F F L U E N T # 46 - H2

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*****
DIVISION #06 | QUANTITY | QTY | NATURE | BIOL. | DISP | TOTAL | % OF
               | TONS/DAY | REL  |         | HAZ    |      | ENERGY | DIRECT
               |          |      |         |        |      | REO      | OPERATING
               |          |      |         |        |      | MM BTU/D | COSTS
*****
PLANT # 1     | 0.945    | C    | G       | MN     | 2    | 00000    | 0.00 %
PLANT # 4     | 0.7502   | C    | G       | MN     | 2    | 00000    | 0.00 %
  
```

EFFLUENT # 46 - H2

DIVISION #09	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 2	0.005	A	G	MN	5	00000	0.00 %
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C-58

EFFLUENT # 46 - H2

DIVISION #10	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 1	7	A	G	MN	6	00000	0.00 %
PLANT # 2	2.25	A	G	MN	6	00000	0.00 %
PLANT # 4	0.749	A	G	MN	6	00000	0.00 %

EFFLUENT # 46 - H2

DIVISION #11	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	0	A	G	MN	2	0	0.00 %

C-59

EFFLUENT # 46 - H2

DIVISION #12	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	NIL	A	G	MN	2	0	0.03 %
PLANT # 2	0	A	G	MN	2	1	0.03 %
PLANT # 4	0	A	G	MN	2	0	0.00 %

EFFLUENT # 46 - H2

DIVISION #13	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS

PLANT # 1	0.159	B	G	MN	2	3	0.14 %

EFFLUENT # 46 - H2

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS

PLANT # 1	1.104	C	G	MN	2	3	0.17 %
PLANT # 2	0	A	G	MN	2	1	0.03 %
PLANT # 4	0.7502	C	G	MN	2	0	0.00 %

E F F L U E N T # 47 - H2O

DIVISION #03	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	1081	A	G	NK	2	00000	0.00 %
PLANT # 3	2523	B	G	NK	2	00000	0.00 %

E F F L U E N T # 47 - H2O

DIVISION #04	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	5589	A	G	NK	2	00000	0.00 %
PLANT # 2	1995	A	G	NK	2	00000	0.00 %
PLANT # 3	2611	A	G	NK	7	00000	0.00 %
PLANT # 4	904	A	G	NK	2	00000	0.00 %

EFFLUENT # 47 - H2O

DIVISION #05	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	119.9	A	G	NK	2	00000	0.00 %

EFFLUENT # 47 - H2O

DIVISION #06	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.112	C	G	NK	2	00000	0.00 %
PLANT # 2	450	B	G	NK	2	00000	0.00 %
PLANT # 3	877	B	G	NK	2	00000	0.00 %
PLANT # 4	4.9409	C	G	NK	2	00000	0.00 %

EFFLUENT # 47 - H2O

DIVISION #07	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	907	A	G	NK	2	00000	0.00 %
PLANT # 2	450	A	G	NK	2	00000	0.00 %
PLANT # 4	192.3	A	G	NK	2	00000	0.00 %

EFFLUENT # 47 - H2O

DIVISION #08	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	16.8	A	G	NK	6	00000	0.00 %
PLANT # 3	13.1	A	G	NK	9	00000	0.00 %

E F F L U E N T : # 47 - H2O

DIVISION #09	QUANTITY	QTY	NATURE	BIOL.	DISP	TCTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	92.7	A	G	NK	5	00000	0.00 %
PLANT # 3	86.2	A	G	NK	9	00000	0.00 %

E F F L U E N T : # 47 - H2O

DIVISION #10	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	427	A	G	NK	6	00000	0.00 %
PLANT # 2	169.8	A	G	NK	6	00000	0.00 %
PLANT # 4	539	A	G	NK	6	00000	0.00 %

EFFLUENT # 47 - H2O

DIVISION #11	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	117.4	A	G	NK	2	00000	0.00 %

EFFLUENT # 47 - H2O

DIVISION #12	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	53	A	G	NK	2	00000	0.00 %
PLANT # 2	892	A	G	NK	2	00000	0.00 %
PLANT # 3	267	A	G	NK	2	00000	0.00 %
PLANT # 4	1704	A	G	NK	2	00000	0.00 %

EFFLUENT # 47 - H2O

DIVISION #13	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	639	B	G	NK	2	00000	0.00 %

EFFLUENT # 47 - H2O

DIVISION #14	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	722	A	G	NK	2	00000	0.00 %
PLANT # 4	110	A	G	NK	2	00000	0.00 %

EFFLUENT # 47 - H2O

DIVISION #15	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	6163	A	G	NK	2	00000	0.00 %
PLANT # 3	2608	A	G	NK	2	00000	0.00 %

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EFFLUENT # 47 - H2O

DIVISION #16	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	30	B	G	NK	2	00000	0.00 %

EFFLUENT # 47 - H2O

DIVISION #18	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS

PLANT # 1	5411	A	G	NK	2	4	0.14 %

EFFLUENT # 47 - H2O

DIVISION #19	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS

PLANT # 1	17844	A	G	NK	2	731	4.09 %
PLANT # 2	29149	A	G	NK	2	1362	3.46 %
PLANT # 3	23437	A	G	NK	2	199	6.97 %
PLANT # 4	27484	A	G	PH	2	678	6.50 %

EFFLUENT # 47 - H2O

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TCNS/DAY	REL		HAZ		ENERGY	DIRECT
*****						REQ	OPERATING
*****						MM BTU/D	COSTS

PLANT # 1	31644	A	G	NK	2	735	4.22 %
PLANT # 2	39968	A	G	NK	2	1362	3.46 %
PLANT # 3	29712	B	G	NK	2	199	6.97 %
PLANT # 4	30399	A	G	PH	2	678	6.50 %

EFFLUENT # 48 - H2S

DIVISION #04	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TCNS/DAY	REL		HAZ		ENERGY	DIRECT
*****						REQ	OPERATING
*****						MM BTU/D	COSTS

PLANT # 2	0	A	G	TX	7	0	0.00 %
PLANT # 3	NIL	A	G	TX	7	0	0.00 %

EFFLUENT # 48 - H2S

DIVISION #06	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.1532	C	G	TX	2	00000	0.00 %
PLANT # 2	0.0005	C	G	TX	2	00000	0.00 %
PLANT # 3	0.0044	C	G	TX	2	00000	0.00 %
PLANT # 4	0.1538	C	G	TX	2	00000	0.00 %

EFFLUENT # 48 - H2S

DIVISION #08	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	0.163	A	G	TX	6	1648	0.93 %
PLANT # 3	0.128	A	G	TX	9	1288	0.91 %

EFFLUENT # 48 - H2S

DIVISION #09	QUANTITY	QTY	NATURE	BIOLOGICAL	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	0.84	A	G	TX	5	133	0.39 %
PLANT # 3	0	B	G	TX	9	204	0.42 %

EFFLUENT # 48 - H2S

DIVISION #10	QUANTITY	QTY	NATURE	BIOLOGICAL	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.464	B	G	TX	6	14518	9.57 %
PLANT # 2	0.123	A	G	TX	6	436	2.65 %
PLANT # 3	1.35	A	G	TX	9	376	2.21 %
PLANT # 4	1.897	A	G	TX	6	1259	8.65 %

E F F L U E N T # 48 - H2S

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*****
DIVISION #11 | QUANTITY | QTY | NATURE | BIOL. | DISP | TOTAL | % OF
               | TONS/DAY | REL  |        | HAZ   |      | ENERGY | DIRECT
               |          |      |        |       |      | REQ     | OPERATING
               |          |      |        |       |      | MM BTU/D | COSTS
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PLANT # 2	0	A	G	TX	2	0	0.03 %
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E F F L U E N T # 48 - H2S

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*****
DIVISION #12 | QUANTITY | QTY | NATURE | BIOL. | DISP | TOTAL | % OF
               | TONS/DAY | REL  |        | HAZ   |      | ENERGY | DIRECT
               |          |      |        |       |      | REQ     | OPERATING
               |          |      |        |       |      | MM BTU/D | COSTS
*****

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PLANT # 1	NIL	A	G	TX	2	0	0.00 %
PLANT # 2	0	A	G	TX	2	0	0.00 %
PLANT # 3	0	A	G	TX	2	0	0.00 %
PLANT # 4	0	A	G	TX	2	0	0.00 %

EFFLUENT # 48 - H2S

DIVISION #13	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.0058	C	G	TX	2	0	0.00 %

EFFLUENT # 48 - H2S

DIVISION #14	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 3	0.0154	A	G	TX	2	00000	0.00 %

EFFLUENT # 49 - H2S

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.159	C	G	TX	2	0	0.00 %
PLANT # 2	0.0005	A	G	TX	2	0	0.03 %
PLANT # 3	0.0198	A	G	TX	2	0	0.00 %
PLANT # 4	0.1508	C	G	TX	2	00000	0.00 %

EFFLUENT # 49 - NAPTHA

DIVISION #06	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.224	C	G	MN	2	00000	0.00 %

EFFLUENT # 49 - NAPTHA

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.224	C	G	MN	2	00000	0.00 %

EFFLUENT # 50 - NH3

DIVISION #19	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	4.562	C	G	HZ	2	00000	0.00 %
PLANT # 2	9.16	C	G	HZ	2	00000	0.00 %
PLANT # 3	2.544	C	G	HZ	2	00000	0.00 %

EFFLUENT # 50 - NH3

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	4.562	C	G	HZ	2	00000	0.00 %
PLANT # 2	9.16	C	G	HZ	2	00000	0.00 %
PLANT # 3	2.544	C	G	HZ	2	00000	0.00 %

EFFLUENT # 51 - NOX

DIVISION #04	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	6.74	C	G	PH	2	00000	0.00 %
PLANT # 2	63.1	B	G	PH	7	00000	0.00 %
PLANT # 3	17.5	B	G	PH	7	00000	0.00 %
PLANT # 4	9.4	B	G	PH	2	00000	0.00 %

EFFLUENT # 51 - NOX

DIVISION #12	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.096	C	G	PH	2	00000	0.00 %
PLANT # 3	1.160	B	G	PH	2	00000	0.00 %
PLANT # 4	0.48	B	G	PH	2	00000	0.00 %

EFFLUENT # 51 - NOX

DIVISION #14	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	6.02	B	G	PH	2	00000	0.00 %

E F F L U E N T # 51 - NOX

DIVISION #15	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	28.6	B	G	PH	2	00000	0.00 %
PLANT # 3	17.5	C	G	PH	2	00000	0.00 %

E F F L U E N T # 51 - NOX

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	6.836	C	G	PH	2	00000	0.00 %
PLANT # 2	34.62	B	G	PH	2	00000	0.00 %
PLANT # 3	18.66	C	G	PH	2	00000	0.00 %
PLANT # 4	9.88	B	G	PH	2	00000	0.00 %

EFFLUENT # 52 - N2

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*****
DIVISION #04 | QUANTITY | QTY | NATURE | BIOL. | DISP | TOTAL | % OF
               | TONS/DAY | REL  |        | HAZ   |      | ENERGY | DIRECT
               |          |      |        |       |      | REQ     | OPERATING
               |          |      |        |       |      | MM BTU/D | COSTS
*****
  
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PLANT # 1	61444	A	G	NK	2	00000	0.00 %
PLANT # 2	99203	A	G	NK	7	00000	0.00 %
PLANT # 3	30502	A	G	NK	7	00000	0.00 %
PLANT # 4	10218	A	G	NK	2	00000	0.00 %

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EFFLUENT # 52 - N2

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*****
DIVISION #05 | QUANTITY | QTY | NATURE | BIOL. | DISP | TCTAL | % OF
               | TONS/DAY | REL  |        | HAZ   |      | ENERGY | DIRECT
               |          |      |        |       |      | REQ     | OPERATING
               |          |      |        |       |      | MM BTU/D | COSTS
*****
  
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PLANT # 1	18730.4	A	G	NK	2	00000	0.00 %
PLANT # 2	20464	A	G	NK	2	00000	0.00 %
PLANT # 3	19636	A	G	NK	2	00000	0.00 %
PLANT # 4	18075	A	G	NK	2	00000	0.00 %

EFFLUENT # 52 - N2

DIVISION #06	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	2.567	C	G	NK	2	00000	0.00 %

EFFLUENT # 52 - N2

DIVISION #09	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	256.2	A	G	NK	5	00000	0.00 %
PLANT # 3	294.5	A	G	NK	9	00000	0.00 %

EFFLUENT # 52 - N2

DIVISION #10	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% CF DIRECT OPERATING COSTS

PLANT # 1	1610	A	G	NK	6	00000	0.00 %
PLANT # 4	16.027	A	G	NK	6	00000	0.00 %

EFFLUENT # 52 - N2

DIVISION #11	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% CF DIRECT OPERATING COSTS

PLANT # 2	423	A	G	NK	2	00000	0.00 %

E F F L U E N T # 52 - N2

DIVISION #12	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	351	B	G	NK	2	00000	0.00 %
PLANT # 2	5929	A	G	NK	2	00000	0.00 %
PLANT # 3	3008	A	G	NK	2	00000	0.00 %
PLANT # 4	10865	A	G	NK	2	00000	0.00 %

E F F L U E N T # 52 - N2

DIVISION #13	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	2016	B	G	NK	2	00000	0.00 %

E F F L U E N T # 52 - N2

DIVISION #14	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	5000	A	G	NK	2	00000	0.00 %
PLANT # 4	1682	A	G	NK	2	00000	0.00 %

C-83

E F F L U E N T # 52 - N2

DIVISION #15	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	28332	A	G	NK	2	00000	0.00 %
PLANT # 3	30491	B	G	NK	2	00000	0.00 %

EFFLUENT # 52 - N2

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 1	82544	A	G	NK	2	00000	0.00 %
PLANT # 2	60148	A	G	NK	2	00000	0.00 %
PLANT # 3	53135	B	G	NK	2	00000	0.00 %
PLANT # 4	40840	A	G	NK	2	00000	0.00 %

C-84

EFFLUENT # 53 - 02

DIVISION #04	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 1	12250	A	G	NK	2	00000	0.00 %
PLANT # 2	1484	A	G	NK	7	00000	0.00 %
PLANT # 3	1273	A	G	NK	7	00000	0.00 %
PLANT # 4	405	A	G	NK	2	00000	0.00 %

EFFLUENT # 53 - 02

DIVISION #05	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	186.6	A	G	NK	2	00000	0.00 %
PLANT # 2	603	A	G	NK	2	00000	0.00 %
PLANT # 3	392	A	G	NK	2	00000	0.00 %
PLANT # 4	104	A	G	NK	2	00000	0.00 %

EFFLUENT # 53 - 02

DIVISION #09	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	0.0384	A	G	NK	5	00000	0.00 %

EFFLUENT # 53 - 02

DIVISION #10	QUANTITY TONS/DAY	QTY REL	NATURE	BIOLOGICAL HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 1	373	A	G	NK	6	00000	0.00 %
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EFFLUENT # 53 - 02

DIVISION #11	QUANTITY TONS/DAY	QTY REL	NATURE	BIOLOGICAL HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 2	7.3	A	G	NK	2	00000	0.00 %
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EFFLUENT # 53 - 02

DIVISION #12	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS

PLANT # 1	17	A	G	NK	2	00000	0.00 %
PLANT # 2	297	A	G	NK	2	00000	0.00 %
PLANT # 3	58	A	G	NK	2	00000	0.00 %
PLANT # 4	668	A	G	NK	2	00000	0.00 %

EFFLUENT # 53 - 02

DIVISION #13	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS

PLANT # 1	86	C	G	NK	2	00000	0.00 %

EFFLUENT # 53 - 02

DIVISION #14	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	224	A	G	NK	2	00000	0.00 %
PLANT # 4	584	A	G	NK	2	00000	0.00 %

EFFLUENT # 53 - 02

DIVISION #15	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	1260	A	G	NK	2	00000	0.00 %
PLANT # J	1273	B	G	NK	2	00000	0.00 %

E F F L U E N T # 53 - 02

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	12539	A	G	NK	2	00000	0.00 %
PLANT # 2	2391	A	G	NK	2	00000	0.00 %
PLANT # 3	1723	B	G	NK	2	00000	0.00 %
PLANT # 4	1761	A	G	NK	2	00000	0.00 %

E F F L U E N T # 54 - PHENOLICS

DIVISION #07	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.000061	C	G	HZ	2	00000	0.00 %

EFFLUENT # 54 - PHENOLICS

DIVISION #18	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.00031	C	G	HZ	2	00000	0.00 %

EFFLUENT # 54 - PHENOLICS

DIVISION #19	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.1161	C	G	HZ	2	00000	0.00 %
PLANT # 2	0.3648	C	G	HZ	2	00000	0.00 %
PLANT # 3	0.0033	C	G	HZ	2	00000	0.00 %

E F F L U E N T # 54 - PHENOLICS

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.11647	C	G	HZ	2	00000	0.00 %
PLANT # 2	0.3648	C	G	HZ	2	00000	0.00 %
PLANT # 3	0.0033	C	G	HZ	2	00000	0.00 %

E F F L U E N T # 55 - PYRIDINES

DIVISION #19	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.00665	C	G	HZ	2	00000	0.00 %

EFFLUENT # 55 - PYRIDINES

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.00665	C	G	HZ	2	00000	0.00 %

EFFLUENT # 56 - SO2

DIVISION #04	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	4	B	G	PH	2	00000	0.00 %
PLANT # 2	98.4	A	G	PH	7	00000	0.00 %
PLANT # 3	90.83	B	G	PH	7	00000	0.00 %
PLANT # 4	12.1	A	G	PH	2	00000	0.00 %

EFFLUENT # 56 - S02

DIVISION #09	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	0.699	A	G	PH	5	00000	0.00 %
PLANT # 3	14.5	A	G	PH	9	00000	0.00 %

C-93

EFFLUENT # 56 - S02

DIVISION #10	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 4	1.3	A	G	PH	2	00000	0.00 %

EFFLUENT # 56 - S02

DIVISION #11	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	3.34	A	G	PH	2	00000	0.00 %

EFFLUENT # 56 - S02

DIVISION #12	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	0.615	B	G	PH	2	00000	0.00 %
PLANT # 2	8.58	A	G	PH	2	00000	0.00 %
PLANT # 3	0.74	B	G	PH	2	00000	0.00 %
PLANT # 4	19.4	A	G	PH	2	00000	0.00 %

EFFLUENT # 56 - SO2

DIVISION #13	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 1	2.49	B	G	PH	2	00000	0.00 %

C-95

EFFLUENT # 56 - SO2

DIVISION #14	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	14.5	A	G	PH	2	00000	0.00 %

EFFLUENT # 56 - S02

DIVISION #15	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 2	8.29	A	G	PH	2	659	5.42 %
PLANT # 3	9.05	A	G	PH	2	854	8.53 %

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EFFLUENT # 56 - S02

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	7.105	B	G	PH	2	00000	0.00 %
PLANT # 2	34.71	A	G	PH	2	659	5.42 %
PLANT # 3	9.79	A	G	PH	2	854	8.53 %
PLANT # 4	32.8	A	G	PH	2	00000	0.00 %

E F F L U E N T # 57 - THIOCYANATES

DIVISION #19	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.08933	C	G	HZ	2	00000	0.00 %
PLANT # 2	0.179	C	G	HZ	2	00000	0.00 %
PLANT # 3	0.0032	C	G	HZ	2	00000	0.00 %

E F F L U E N T # 57 - THIOCYANATES

DIVISION #20	QUANTITY	QTY	NATURE	BIOL.	DISP	TOTAL	% OF
	TONS/DAY	REL		HAZ		ENERGY	DIRECT
						REQ	OPERATING
						MM BTU/D	COSTS

PLANT # 1	0.08933	C	G	HZ	2	00000	0.00 %
PLANT # 2	0.179	C	G	HZ	2	00000	0.00 %
PLANT # 3	0.0032	C	G	HZ	2	00000	0.00 %

EFFLUENT # 58 - SLUDGE (RWT)

DIVISION #03	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	32.1	A	SL	PH	1	1	0.01 %
PLANT # 3	24	B	SL	PH	1	0	0.00 %
PLANT # 4	510.8	A	SL	PH	8	00000	0.00 %

EFFLUENT # 58 - SLUDGE (RWT)

DIVISION #20	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
PLANT # 2	32.1	A	SL	PH	1	1	0.01 %
PLANT # 3	24	B	SL	PH	1	0	0.00 %

E F F L U E N T # 59 - SLUDGE(BWWT)

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*****
DIVISION #17 | QUANTITY | QTY | NATURE | BIGL. | DISP | TCTAL | % OF
               | TONS/DAY | REL  |         | HAZ   |      | ENERGY | DIRECT
               |          |      |         |       |      | REQ     | OPERATING
               |          |      |         |       |      | MM BTU/D | COSTS
*****

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PLANT # 2	108	A	SL	PH	1	4	0.03 %
PLANT # 3	6.7	B	SL	PH	1	0	0.00 %
PLANT # 4	3052	A	SL	PH	4	00000	0.00 %

E F F L U E N T # 59 - SLUDGE(BWWT)

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*****
DIVISION #20 | QUANTITY | QTY | NATURE | BIGL. | DISP | TCTAL | % OF
               | TONS/DAY | REL  |         | HAZ   |      | ENERGY | DIRECT
               |          |      |         |       |      | REQ     | OPERATING
               |          |      |         |       |      | MM BTU/D | COSTS
*****

```

PLANT # 2	108	A	SL	PH	1	4	0.03 %
PLANT # 3	6.7	B	SL	PH	1	0	0.00 %
PLANT # 4	3052	A	SL	PH	4	00000	0.00 %

E F F L U E N T # 60 - SLUDGE (CTB)

DIVISION #19	QUANTITY TONS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 2	12.5	A	SL	PH	1	0	0.00 %
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C-100

E F F L U E N T # 60 - SLUDGE (CTB)

DIVISION #20	QUANTITY TCNS/DAY	QTY REL	NATURE	BIOL. HAZ	DISP	TOTAL ENERGY REQ MM BTU/D	% OF DIRECT OPERATING COSTS
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PLANT # 2	12.5	A	SL	PH	1	0	0.00 %
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APPENDIX D

LIST OF COMPUTERIZED TABULAR FOOTNOTES

APPENDIX D: INTRODUCTION

Contained in this appendix is a list of alphabetically arranged footnotes which may be referenced in the computed generated tables.

 * LIST OF FOOTNOTES *

- A1 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THEN 10 MG/M3 IN THE ENVIRONMENT.
- A2 *** JUDGED TO BE POSSIBLY HAZARDOUS TO VEGETATION IN CASE OF ACID MINE DRAINAGE.
- A3 *** CONSISTS OF 871 TPD DUE TO EVAPORATION FROM RAW WATER STORAGE AND 210 TPD FROM DEGASER VENTS.
- A4 *** IN THE FORM OF SLUDGE FROM LINE TREATMENT, DEMINERALIZER AND ZEOLITE SOFTNER.
- A5 *** POTENTIALLY HAZARDOUS SINCE IT CONTAINS SALTS AND OTHER WATER TREATMENT CHEMICALS.
- A6 *** INCLUDES STEAM LOSSES IN DEAERATOR VENTS, LEAKS AND OTHER LOSSES FROM EGILER AND ITS PIPING.
- A7 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 5 PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO STATE AIR QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
- A8 *** ESTIMATED AS NO2 .
- A9 *** EMISSION FROM HIGH ETU AND LOW ETU GASIFIERS.
- B0 *** POTENTIALLY HAZARDOUS DUE TO SOME ELEMENTS AND COMPOUNDS PRESENT WHICH CAN BE LEACHED BY WATER.
- B1 *** POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN SOME ELEMENTS AND COMPOUNDS LEACHED OUT FROM THE ASH.

 * LIST OF FOOTNOTES *

- B2 *** ESTIMATED USING EMISSION FACTORS.
- B3 *** CONSISTS MAINLY OF GASIFIER ASH PARTICLES.
- B4 *** EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF COAL LOCKS.
- B5 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 20 PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO ARE ALSO APPLICABLE.
- B6 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 50 PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO ARE ALSO APPLICABLE.
- B7 *** GASIFIER ASH, UNREACTED CARBON AND WATER ARE IN THE FORM OF A SLUDGE.
- B8 *** CONSISTS OF EVAPORATION TO ATMOSPHERE FROM FINE ASH POND.
- B9 *** EVAPORATED INTO ATMOSPHERE ALONG WITH WATER FROM FINE ASH POND.
- C0 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 10 PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR EMISSION STANDARDS ARE ALSO APPLICABLE.
- C1 *** ESTIMATED AS ACETIC ACID.
- C2 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 10 PPM IN THE ENVIRONMENT.
- C3 *** ESTIMATED AS PHENOL.

 * LIST OF FCCI NOTES *

- C4 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 5 PPM IN THE ENVIRONMENT.
- C5 *** CONSISTS OF 0.144 TPD TO CATALYTIC INCINERATOR AND 0.32 TPD TO VENT GAS INCINERATOR.
- C6 *** CONSISTS 019178 TPD TO CATALYTIC INCINERATOR AND 447 TPD TO VENT GAS INCINERATOR.
- C7 *** TO CATALYTIC INCINERATOR.
- C8 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 20 PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR EMISSIONS STANDARDS ARE ALSO APPLICABLE.
- C9 *** CONSISTS OF 2540TPD TO CATALYTIC INCINERATOR AND 70TPD TO VENT GAS INCINERATOR
- D0 *** CONSISTS OF 4TPD TO CATALYTIC INCINERATOR AND 3TPD TO VENT GAS INCINERATOR.
- D1 *** CONSISTS OF 21TPD TO CATALYTIC INCINERATOR AND 32TPD TO VENT GAS INCINERATOR.
- D2 *** CONSISTS OF 107.5TPD TO CATALYTIC INCINERATOR AND 6.5TPD TO VENT GAS INCINERATOR.
- D3 *** CONSISTS OF 415TPD TO CATALYTIC INCINERATOR AND 12TPD TO VENT GAS INCINERATOR.
- D4 *** CONSISTS OF DRIFT AND EVAPORATION LOSSES.
- D5 *** IN THE FORM OF SLUDGE.
- D6 *** POTENTIALLY HAZARDOUS DUE TO COOLING TOWER CHEMICALS IN IT.
- D7 *** ESTIMATED AS PYRIDINE.

 * LIST OF FACILITIES *

- D8 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 5 PPM IN THE ENVIRONMENT.
- D9 *** ESTIMATED AS HSCN.
- E0 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 50 PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR EMISSION STANDARDS ARE ALSO APPLICABLE.
- E1 *** CONSISTS OF DISSOLVED SOLIDS IN COOLING WATER WHICH ARE EMITTED IN THE DRIFT.
- F0 *** EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS. EMISSION DUE TO LEAK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF COAL LOCKS.
- F1 *** EVAPORATED INTO ATMOSPHERE ALONG WITH WATER FROM FINE ASH POND. ESTIMATED AS ACETIC ACID.
- F2 *** EVAPORATED INTO ATMOSPHERE ALONG WITH WATER FROM FINE ASH POND. ESTIMATED AS PHENOL.
- F3 *** ESTIMATED AS ACETIC ACID. CONSISTS OF DRIFT AND EVAPORATION LOSSES.
- F4 *** ESTIMATED AS PHENOL. CONSISTS OF DRIFT AND EVAPORATION LOSSES.
- F5 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 5 PPM IN THE ENVIRONMENT. CONSISTS OF DRIFT AND EVAPORATION LOSSES.
- F6 *** ESTIMATED AS HSCN. CONSISTS OF DRIFT AND EVAPORATION LOSSES.
- F7 *** EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS. ESTIMATED USING EMISSION FACTORS

 * LIST OF FOOTNOTES *

- F8 *** EMISSION FROM HIGH BTU AND LOW BTU GASIFIERS. CONSISTS MAINLY OF CF GASIFIER PARTICLES. ESTIMATED USING EMISSION FACTORS.
- G1 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 10 MG/M3 IN THE ENVIRONMENT.
- G2 *** JUDGED TO BE POSSIBLY HAZARDOUS TO VEGETATION IN CASE OF ACID MINE DRAINAGE.
- G3 *** POTENTIALLY HAZARDOUS SINCE IT CONTAINS SALTS AND OTHER WATER TREATMENT CHEMICALS.
- G4 *** CONSISTS OF EVAPORATION FROM RAW WATER STORAGE.
- G5 *** POTENTIALLY HAZARDOUS DUE TO SOME ELEMENTS AND COMPOUNDS PRESENT WHICH CAN BE LEACHED BY WATER.
- G6 *** CONSISTS OF 44TPD OF WATER ACCOMPANYING THE ECILER ASH AND 132TPD OF WATER ACCOMPANYING THE FLY ASH.
- G7 *** POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN SOME ELEMENTS AND COMPOUNDS LEACHED OUT FROM THE ASH.
- G8 *** CONSISTS OF FLY ASH COLLECTED BY THE ELECTROSTATIC PRECIPITATOR.
- G9 *** CONSISTS OF FLY ASH PARTICLES.
- H0 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO STATE AIR QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
- H1 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO STATE AIR QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.

 * LIST OF FOOTNOTES *

- H2 *** FORMED IN BOILER DUE TO COMBUSTION OF CCAL, H2S AND COS.
- H3 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT. FEDERAL AND NEW MEXICO STATE AIR QUALITY AND EMISSION STANDARDS ARE ALSO APPLICABLE.
- H4 *** ESTIMATED AS NC2.
- H5 *** ESTIMATED USING EMISSION FACTORS.
- H6 *** CONSISTS OF GASIFIER ASH PARTICLES.
- H7 *** CONSISTS OF WATER VAPOR FROM ASH QUENCHING OPERATION.
- H8 *** EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF CCAL LOCKS.
- H9 *** ASH AND WATER ARE IN THE FORM OF A SLUDGE.
- I0 *** DOES NOT INCLUDE 116.6TPD H2S IN THE H2S RICH GAS SENT TO CLAUS PLANT.
- I1 *** DOES NOT INCLUDE 26.5TPD CO2 IN THE H2S RICH GAS SENT TO THE CLAUS PLANT.
- I2 *** DOES NOT INCLUDE 6.8TPD H2O IN THE H2S RICH GAS SENT TO THE CLAUS PLANT.
- I3 *** ALL THE H2S IS OXIDIZED TO SC2. ANY UNCONTROLLED H2S LEAVES THE CLAUS UNIT AS SC2.
- I4 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 10PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR EMISSION STANDARDS ARE ALSO APPLICABLE.

 * LIST OF FOOTNOTES *

- IS *** DIRECT OPERATING COST FOR OPERATING
WASTE LIQUOR DISPOSAL SYSTEM.
- I6 *** OSHA STANDARDS DO NOT PERMIT PROLONGED
EXPOSURE OF AN EMPLOYEE TO A
CONCENTRATION GREATER THAN 20PPM
IN THE ENVIRONMENT. NEW MEXICO STATE AIR
EMISSION STANDARDS ARE ALSO APPLICABLE.
- I7 *** IT IS A PART OF THE SLUDGE SENT TO
THE MINE. COST IS ONLY ALLOCATED TO
CASO4.2H2O SINCE IT IS THE MAJOR
COMPONENT.
- I8 *** POTENTIALLY HAZARDOUS BECAUSE CA
IONS MAY BE LEACHED BY WATER.
- I9 *** POTENTIALLY HAZARDOUS BECAUSE IT
MAY CONTAIN CA IONS LEACHED OUT FROM
THE SLUDGE.
- J0 *** COST FOR OPERATING LIQUID WASTE DISPOSAL
SYSTEM.
- J1 *** PART OF THE SLUDGE FROM THE BIOLOGICAL
WASTE WATER SLUDGE SENT TO MINE. COST
IS ALLOCATED ONLY TO CACCO3 SINCE
IT IS A MAJOR COMPONENT.
- J2 *** CONSISTS OF DRIFT AND EVAPORATION
LOSSES.
- J3 *** ESTIMATED AS ACETIC ACID.
- J4 *** OSHA STANDARDS DO NOT PERMIT PROLONGED
EXPOSURE OF AN EMPLOYEE TO A
CONCENTRATION THAN 10PPM IN THE ENVIRONMENT.
- J5 *** ESTIMATED AS PHENOL.
- J6 *** OSHA STANDARDS DO NOT PERMIT PROLONGED
EXPOSURE OF AN EMPLOYEE TO A
CONCENTRATION GREATER THAN 5PPM IN
THE ENVIRONMENT.

 * LIST OF FOOTNOTES *

J7 *** ESTIMATED AS HSCN.

J8 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. NEW MEXICO STATE AIR EMISSION STANDARDS ARE ALSO APPLICABLE.

J9 *** CONSISTS OF DISSOLVED SOLIDS IN COOLING WATER WHICH ARE EMITTED IN THE DRIFT.

K0 *** ESTIMATED USING EMISSION FACTORS. CONSISTS OF GASIFIER ASH PARTICLES.

K1 *** CONSISTS OF DRIFT AND EVAPORATION LOSSES. ESTIMATED AS ACETIC ACID.

K2 *** CONSISTS OF DRIFT AND EVAPORATION LOSSES. ESTIMATED AS PHENOL.

K3 *** CONSISTS OF DRIFT AND EVAPORATION LOSSES. ESTIMATED AS HSCN.

L1 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 10 MG/M3 IN THE ENVIRONMENT.

L2 *** SLUDGE CONSISTS OF 13.5TPD CACC3, 0.42TPD MG(OH)2, 0.77TPD AL2(SO4)3 AND 17.4TPD SUSPENDED SOLIDS.

L3 *** POTENTIALLY HAZARDOUS SINCE IT CONTAINS SALTS AND OTHER WATER TREATMENT CHEMICALS.

L4 *** CONSISTS OF 14.4% AL2O3, 25.9% CAO, 11.8% MGO, 3.6% NA2O, 5.2% SO3, 26.9% SiO2, 1.5% SF02 AND 1.2% K2O.

L5 *** POTENTIALLY HAZARDOUS DUE TO SOME ELEMENTS AND COMPOUNDS PRESENT WHICH CAN BE LEACHED BY WATER.

L6 *** CONSISTS OF 32.8% SiO2, 27.7% CAO, 17.0% AL2O3, 5.1% NA2O, 10.0% MGO, 1.0% K2O, 5.3% FE2O3 AND 1.1% TIC2.

 * LIST OF FOOTNOTES *

- L7 *** PARTICULATES ARE FLY ASH PARTICLES.
- L8 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
- L9 *** ESTIMATED AS NO2.
- M0 *** PART OF THE COAL LOCK GAS INCINERATED IN THE BOILER.
- M1 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
- M2 *** AN ADDITIONAL 4823TPD OF H2O VAPOR IS EMITTED TO THE STACK GAS TREATMENT UNIT.
- M3 *** CONSISTS OF LEAKS AND STEAM VENTS TO THE ATMOSPHERE FROM THE STEAM LINE.
- M4 *** CONSISTS MAINLY OF GASIFIER ASH PARTICLES.
- M5 *** FROM ASH QUENCH.
- M6 *** EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF COAL LOCKS.
- M7 *** CONSISTS OF SOLIDS FROM THE TRIPLE EFFECT EVAPORATOR CONCENTRATOR CONTAINING CYANIDES, PHENOLS, FATTY ACIDS AND METAL IONS.
- M8 *** POTENTIALLY HAZARDOUS DUE TO THE PRESENCE OF CYANIDES, PHENOLS, FATTY ACIDS AND METAL IONS THAT COULD BE LEACHED BY WATER.

 * LIST OF FOOTNOTES *

- M9 *** POTENTIALLY HAZARDOUS BECAUSE IT MAY CONTAIN SOME ELEMENTS AND COMPOUNDS LEACHED OUT FROM ASH AND SLUDGE.
- N0 *** DOES NOT INCLUDE 149.1TPD H₂S IN THE H₂S RICH GAS SENT TO CLAUS PLANT.
- N1 *** DOES NOT INCLUDE 34.05TPD CO₂ IN THE H₂S RICH GAS VENT TO CLAUS UNIT.
- N2 *** DOES NOT INCLUDE 8.78TPD H₂O IN THE H₂S RICH GAS VENT TO CLAUS UNIT.
- N3 *** SOME OF THE CONTROLLED H₂S LEAVES THE CLAUS UNIT AS SO₂.
- N4 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA STATE AIR QUALITY STANDARDS ARE ALSO APPLICABLE.
- N5 *** AN ADDITIONAL 0.238TPD OF SULPHUR IN THE VAPOR PHASE IS EMITTED FROM THE CLAUS PROCESS.
- N6 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT.
- N7 *** DIRECT OPERATING COSTS FOR OPERATING WASTE LIQUOR DISPOSAL SYSTEM.
- N8 *** SULPHUR IS IN VAPOR STATE.
- N9 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT.
- P0 *** EMITTED AS A SLUDGE.
- P1 *** POTENTIALLY HAZARDOUS SINCE IT MAY BE LEACHED BY WATER.
- P2 *** POTENTIALLY HAZARDOUS SINCE IT MAY CONTAIN SODIUM AND CALCIUM IONS LEACHED OUT FROM SALTS.

 * LIST OF FOOTNOTES *

- P3 *** CONSISTS OF 66.7% CaCO3, 15.3% ORGANIC MATTER FOR BIOTREATING, 8.0% CALCIUM SALTS OF PHENOLS, 5.8% CALCIUM SALTS OF FATTY ACIDS AND 4.2% OTHER INORGANIC CALCIUM SALTS.
- P4 *** CONSISTS OF EVAPORATION AND DRIFT LOSSES.
- P5 *** ESTIMATED AS ACETIC ACID.
- P6 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 10PPM IN THE ENVIRONMENT.
- P7 *** ESTIMATED AS PHENOL.
- P8 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT.
- P9 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT.
- Q0 *** ESTIMATED AS H₂SO₄.
- Q1 *** CONSISTS OF DISSOLVED SOLIDS IN COOLING WATER WHICH ARE EMITTED IN THE DRIFT.
- Q2 *** CONSISTS OF 86.4% CaCO3, 9.6% Mg(OH)2 AND 4.0% Al2(SO4)3.
- R1 *** AN ADDITIONAL 4823TPD OF H₂O VAPOR IS EMITTED TO THE STAG GAS TREATMENT UNIT. CONSISTS OF LEAKS AND STEAM VENTS TO THE ATMOSPHERE FROM THE STEAM LINE.
- R2 *** SOME OF THE UNCONTROLLED H₂S LEAVES THE CLAU₂ UNIT AS SC₂. AN ADDITIONAL 0.238TPD OF SULFUR IN THE VAPOR PHASE IS EMITTED FROM THE CLAU₂ PROCESS.

 * LIST OF FOOTNOTES *

- R3 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE. ESTIMATED AS NG2.
- R4 *** CONSISTS OF EVAPORATION AND DRIFT LOSSES. ESTIMATED AS ACETIC ACID.
- R5 *** CONSISTS OF EVAPORATION AND DRIFT LOSSES. ESTIMATED AS PHENOL.
- R6 *** CONSISTS OF EVAPORATION AND DRIFT LOSSES. ESTIMATED AS HSCN.
- S1 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 10 MG/M3 IN THE ENVIRONMENT.
- S2 *** POTENTIALLY HAZARDOUS DUE TO WATER TREATMENT CHEMICALS THAT MAY BE PRESENT.
- S3 *** POTENTIALLY HAZARDOUS DUE TO ELEMENTS OR COMPOUNDS PRESENT WHICH CAN BE LEACHED BY WATER.
- S4 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 50PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA STATE AIR QUALITY STANDARDS ARE ALSO APPLICABLE.
- S5 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 5PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
- S6 *** ESTIMATED AS NG2.
- S7 *** ESTIMATED USING EMISSION FACTORS.

 * LIST OF FOOTNOTES *

- S8 *** EMISSION DUE TO LOCK GAS DISPLACED FROM COAL LOCKS BY COAL DURING CHARGING OF COAL LOCKS.
- S9 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT. FEDERAL AND NORTH DAKOTA STATE AIR QUALITY AND FEDERAL EMISSION STANDARDS ARE ALSO APPLICABLE.
- T0 *** CONSISTS MAINLY OF GASIFIER ASH PARTICLES. ESTIMATED USING EMISSION FACTORS.
- T1 *** POTENTIALLY HAZARDOUS DUE TO ELEMENTS AND COMPOUNDS WHICH MAY BE LEACHED FROM ASH.
- T2 *** DIRECT OPERATING COST FOR WASTE LIQUID DISPOSAL.
- T3 *** AN ADDITIONAL 1.3TPD OF CO₂ IS EMITTED TO THE ATMOSPHERE IN THE STRETFORD BLEED STREAM.
- T4 *** REPORTED BY ANG AS ORGANIC SULFUR.
- T5 *** OSHA STANDARDS DO NOT PERMIT PROLONGED EXPOSURE OF AN EMPLOYEE TO A CONCENTRATION GREATER THAN 20PPM IN THE ENVIRONMENT.
- T6 *** STRETFORD BLEED STREAM.
- T7 *** INCINERATION IS DONE IN A STEAM SUPERHEATER WITH TAR OIL, NAPHTHA AND PHENOLICS AS FUEL.
- T8 *** EMITTED AS STRETFORD OXIDIZER EFFLUENT.
- T9 *** POTENTIALLY HAZARDOUS SINCE IT CONTAINS HIGH CONCENTRATIONS OF DISSOLVED SALTS AND OTHER CHEMICALS.

 * LIST OF FACTORIES *

- UC *** MAY CONTAIN FATTY ACIDS, AMMONIA,
 PHENOLICS, OTHER VOLATILE CONTAMINANTS AND
 DISSOLVED SOLIDS WHICH ARE EMITTED
 ALONG WITH THE CRIST.
- U1 *** POTENTIALLY HAZARDOUS SINCE IT CONTAINS
 FATTY ACIDS, AMMONIA, ETC.
- VO *** ESTIMATED AS NO2. INCINERATION
 IS DONE IN A STEAM SUPERHEATER WITH TAR OIL,
 NAPHTHA AND PHENOLICS AS FUEL.

APPENDIX E

**COMPANY RESPONSES TO THE PROGRESS REPORT FOR
THE PERIOD JUNE 1, 1976 - MARCH 1, 1977**

The Ralph M. Parsons Company

ENGINEERS • CONSTRUCTORS • PASADENA, CALIFORNIA 91124

October 5, 1977

RECEIVED

OCT 10 1977

Mr. James L. Elder
Engineering Experiment Station
The University of North Dakota
Grand Forks, North Dakota 58202

ENGINEERING EXPERIMENT STATION
University of North Dakota
Grand Forks, N. D. 58202

Coal Gasification Purification
Review of "A Comparative Analysis
of Effluents From Four Proposed
Dry Ash Lurgi Gasification Facilities"

Dear Mr. Elder:

Thank you for sending us a preliminary copy of your report "A Comparative Analysis of Effluents From Four Proposed Dry Ash Lurgi Gasification Facilities". As you wished, we have had our Director of Process, Mr. D. K. Beavon, review the report and the following are his comments presented in the order of the text.

Page 28, third paragraph and page 34, first paragraph: Refinery Claus plants commonly encounter variations in H_2S feed rate greater than 25 percent over very short periods, and the control instrumentation has long since been in use to cope adequately with this kind of variation. Refinery Claus plants frequently must cope with an even more serious variation in feed, which is the presence or absence of hydrocarbons such as propane in quantities corresponding to as much as half of the Claus plant air requirements. The coal conversion plant gases probably will have a more uniform hydrocarbon content than that experienced in refineries, hence should be no more difficult to cope with and should not present a problem requiring further development of instrumentation.

Page 32, first paragraph: It is stated that carbonyl sulfide is not removed in the Stretford process; this may not be exactly true, although it is considered a satisfactory engineering design basis. Numerous tail gas analyses in and out of the Stretford absorber of a Beavon Sulfur Removal plant have indicated removal of 15 to 20 percent of the COS which entered at a concentration about 30 ppm. It is possible that this is really an analytical problem, since perhaps the mass spectrometer analyses were obscured by the fact that the entering H_2S content was 10,000 to 15,000 ppm and the leaving H_2S content less than 1 ppm.

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Page 34, Paragraph 3: Conventional Stretford absorber towers use splash tray packing in which the gas phase is continuous throughout the column, and the liquid rains from one deck of boards to the next deck below. Since there is no "bubbling" mechanism in this stage of contacting, the passage on bubble coalescence does not apply. Correspondingly, there is no problem as relates to turndown of the gas rate; this has been demonstrated in the industrial operation of about 30 plants which incorporate the Stretford process. The Stretford solution flow rate can be maintained readily at the design value completely independent of the gas flow rate, and this is the normal operating practice. There is therefore no problem with turndown of the Stretford unit. Parenthetically, it is observed that the authors of the report appear to have relied on a somewhat incomplete review of the literature, without the benefit of observing actual plant operations.

Page 35, Paragraph 3: The Stretford process was developed by North West Gas and one of several early engineer/constructors of such units was the W. C. Holmes Company, now Peabody/Holmes. Holmes instituted a number of engineering design features to implement the process, and deserve credit for taking the process from the laboratory to the early industrial plants. Holmes named their implementation the "Holmes-Stretford Process." At present The Ralph M. Parsons Company have built probably a larger number of Stretford plants than have Holmes, and the Parsons plants differ from Holmes plants in a number of major ways. In a report of this kind it seems inappropriate to promote one engineering contractor as against another and it is suggested that the term "Holmes-Stretford" not be used.

Page 36, Paragraph 3: Unpublished information from one industrial plant and from a large pilot plant using venturi contactors shows that the gas residence time in the contacting device may be in fact about one second rather than the two or three minutes stated as a lower limit.

Page 37, Paragraph 1: This paragraph is significantly incomplete (as are some subsequent statements on the same subject). In a number of the Holmes plants the washed filter cake was discharged into batch autoclaves which were subsequently closed and heated to a temperature about 270° F under sufficient pressure to keep the water phase in a liquid state. Under these conditions the sulfur melts and may be drawn off in molten state, while the supernatant Stretford solution is held for reuse or discard. Since most of the Holmes plants worked on coke oven gas with a relatively high cyanide content causing considerable formation of thiocyanate, the autoclave liquor usually was discarded as a way of removing thiocyanate from the system. Nearly all the Parsons plants have incorporated continuous melting of the sulfur under pressure, with return of the Stretford solution to the main system. Only in a few plants producing less than one ton a day of sulfur has the sulfur been disposed of as a cake, and in these cases it is disposed of as a solid waste.

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Page 37, Paragraph 5: In the Parsons continuous autoclaving method the valuable chemicals are retained in the supernatant solution and returned to the Stretford unit. The sulfur is produced as a saleable liquid or solid product.

Page 38, Paragraph 2: The comments concerning achievable H_2S content need to take into account industrial experience on feed gases containing 90 percent or more of CO_2 . In one installation the feed gas contains more than 90 percent CO_2 , the balance being mostly H_2S which is essentially all removed and thus the treated gas is about 99 percent CO_2 . The latter, of course, governs the "equilibrium" condition of the system. By increasing contact time the H_2S content can be reduced to essentially any extent desired. If the contacting occurs in a splash tray tower only, which requires quite long residence time, the CO_2 has ample opportunity to dissolve in the Stretford solution and lower its pH, thus slowing the rate of H_2S uptake. On the other hand, it has been demonstrated industrially that the very thorough mixing achieved in an ejector venturi is capable of extracting 99.95 percent of the inlet H_2S with about one second contact time. As is well known, the rate of solution of CO_2 is governed by the relatively slow rate of CO_2 hydration to form carbonic acid. In consequence the ejector venturi is capable of extensive removal of H_2S while operating at a favorably high pH.

The Stretford unit at SASOL is now reportedly operating satisfactorily on 99 percent CO_2 feed gas, using only splash tray contacting.

Page 40, Paragraph 4: The comment concerning a 15 percent lower limit for the concentration of H_2S usable in a Claus plant is somewhat optimistic as regards conventional Claus technology. The Ralph M. Parsons Company has developed a patented method now working in two "Claus" plants recovering about 400 tons per day of sulfur from a feed gas stream containing about 8 percent hydrogen sulfide. This operation is to be described in a paper presented to the 27th Canadian Chemical Engineering Conference at Calgary, Alberta October 25, 1977. Similar extensions of Claus technology may be used down to about 1 percent H_2S concentration, limitations being economic, not technical. A scheme for preconcentrating the H_2S , e.g. by selective amine absorption, is unnecessary and would be very costly if applied on the scale of a substantial coal conversion plant.

Page 42, Paragraph 2: Three proved technologies are available for treating Claus tail gas to U. S. EPA standards and it is recommended that the authors acquaint themselves further with this subject. Two industrial installations in the United States use the Wellman-Lord process, requiring that the Claus tail gas be incinerated to convert sulfur compounds to sulfur dioxide, followed by absorption in a sodium acid sulfite solution; this has not gained wide acceptance because of its high capital and operating costs. Two other processes have gained wide acceptance, each having more than 30 industrial plants operating.

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One of these is the Beavon Sulfur Removal Process (References 1 and 2) in which the tail gases are hydrogenated to convert sulfur compounds to H_2S , followed by water removal and Stretford treatment; this process is energy-efficient in not requiring incineration. The Shell "Scot" process uses the same hydrogenation and water removal first steps, followed by extraction of most of the H_2S in Adip solution and then by incineration of the tail gas to convert uncaptured H_2S to SO_2 ; the energy requirements of this process are relatively large because of the need to steam strip a large volume of Adip solution and because of the need for final incineration.

The alternative (2) of a Stretford for H_2S removal followed by an SO_2 scrubber is completely impractical, since the Stretford solution would take up SO_2 practically quantitatively, converting it first to sodium sulfite and then to sodium thiosulfate, with an intolerably high consumption of alkali and resulting waste disposal problem.

Page 43, Paragraph 2: As mentioned above, instrumentation and controllers have been integrated into many plant systems in refinery Claus units capable of coping with upsets similar in magnitude and rapidity to those expected in a coal conversion plant. The control problem is undeniably a difficult one, but it has been solved well enough so that Claus plants fitted with Beavon Sulfur Removal Plants have operated in refineries, day in and day out, with H_2S emission at the one ppm level.

Page 43, Paragraph 4: As cited above, the statement about Claus and Stretford technologies having no operating history on a high carbon dioxide gas is simply incorrect. Both technologies have been proved in operation with more than 90 percent CO_2 in the feed gas, on a large industrial scale.

Page 47, Paragraph 1 states that neither Claus or Stretford has demonstrated a capability to maintain high efficiency on high CO_2 gases. As mentioned above, this is simply not correct; both have operated with high efficiency in high CO_2 gas, although these operations are not yet reported in the literature. Accordingly it is the opinion of this commentator that the recommended pilot unit work is unnecessary.

Page 47, Item 1.b: Picking at a fine point, to employ a volumetric flow controller for sour gas flow implies that the controller would regulate the flow from a substantial surge volume upstream, or that it would control the rate of sour gas production at a point still earlier in the conversion process, e.g. the Lurgi gasifier or the Rectisol unit. None of these is a practical possibility. In fact, the acid gas conversion process must be capable of taking the acid gas as it comes. Flow metering devices for this have been used for many years, as have devices to proportion the flow of air in the Claus operation.

The Ralph M. Parsons Company

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Thank you again for the report, and if there are further questions that you have, please contact us.

Very truly yours,

THE RALPH M. PARSONS COMPANY

K. L. Corey

KLC:mtr.

cc: Mr. N. J. Mujadin - ANG

References:

- (1) "Four Years' Experience with the Beavon Sulfur Removal Process",
D. K. Beavon, Air Pollution Control Association, Toronto, Canada,
June 23, 1977
- (2) "The Beavon Sulfur Removal Process for Purifying Claus Plant Tail
Gas", D. K. Beavon and R. P. Vaell, American Petroleum Institute,
New York City, May 9, 1972

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August 26, 1977

Mr. Mason H. Somerville, Manager
Engineering Experiment Station
School of Engineering and Mines
The University of North Dakota
Grand Forks, North Dakota 58202

Re: "A Comparative Analysis of
Effluents from Four Proposed
Dry Ash Lurgi Gasification Facilities"

Dear Mr. Somerville:

We appreciate the opportunity to review your draft interim progress report to ERDA. General comments on the captioned report are as follows:

1. A number of tables and specifics dealing with effluents from the proposed El Paso gasification facility require updating. A copy of El Paso Coal Gasification Project, San Juan County, New Mexico, INT-FES 77-03, dated February 8, 1977 was sent to you on August 10 and should be utilized for this purpose.
2. It seems that much progress could be made by focusing research on ways of reducing COS and improving wastewater cleanup and recycle methods rather than zeroing in on sulfur recovery as being the single most important part of effluent control needing R and D.
3. El Paso does not agree with the implied conclusion of the report indicating that commercial gasification should be deferred until sulfur recovery processes have been demonstrated on coal gasification waste gas streams from a Rectisol process unit.

The following specific comments are offered on a page by page basis.

Page 5, line 16

The reference to 96 percent sulfur recovery implies that four percent is emitted to the atmosphere. Only 1.85 percent is emitted since 2.15 percent leaves with by-products. In addition, sulfur recoveries and emissions for gasification, and steam and power facilities should be treated separately as was the case with the other three proposed projects.

Page 15, line 5

Coal to gasifiers is not washed.

Page 18, Table 5

Table 5 is misleading since "percent carbon recovered as SPG" could be incorrectly interpreted by the reader as a conversion efficiency. Most of the carbon is used to produce hydrogen which ends up as SPG. Thermal efficiency would be a more appropriate subject for Table 5.

Page 19, line 11

It should be explained that El Paso's by-product rates are the highest of the proposed plants because the low Btu fuel gasifiers produce by-products in addition to the high Btu units.

Page 32, paragraph B

Coal reactivity which determines the effective temperature for product gas equilibrium is the important factor in determining H_2S/COS ratio, not the actual temperature at the gasifier exit. The steam to oxygen ratio is also important.

Paragraph B states "An investigation of the reactivity of gasifier ash should be done prior to approval of mine disposal plans." This statement fails to recognize the work that El Paso has had conducted in this area. El Paso has sponsored work at New Mexico State University to investigate ash reactivity. Reducing conditions do not exist throughout the gasifier.

Page 33, line 11

The Claus reaction should be referred to as an equilibrium controlled reaction not an "actual reaction". The implication is made that Stretford is an absorber and is not limited by chemical reaction when, in fact, the chemical reaction which consumes the H_2S as it is absorbed is very important.

Page 34, 2nd paragraph

The entire discussion on absorbers needs to be rewritten. An absorber can, in fact, be operated over a significant range of L/G ratio.

The discussion of "stages of deterioration" in column performance describes a packed column filled with liquid with the gas phase bubbling through it which is certainly not the case with Stretford.

Page 38, line 4

CO_2 partial pressure, not CO_2/H_2S ratio, is important to Stretford design.

Page 43, paragraph F

This paragraph states that Stretford plants have not been operated on high CO₂ streams before. Again, it is the CO₂ partial pressure which is the key, not CO₂/H₂S ratio. El Paso knows of at least two Stretford facilities which have operated on streams showing a high CO₂ partial pressure. Mobil Oil Company operated a facility near Cayanosa, Texas until 1975 and Monopol GmbH was operating a facility in Bergkamen, West Germany in 1973.

Page 47, line 4

The statement is made that "neither system (Claus or Stretford) has demonstrated a capability to maintain the high removal efficiencies expected of them on an on-stream basis". This is not accurate.

Page 51, Table 10

Engineering Contractor: the Lummus Company.

Page 72, line 18

The El Paso oxygen plant vent gas is shown containing 18730.4 tons per day of H₂ - an impossibility since hydrogen comprises only a tiny fraction of the atmosphere. This should apparently read N₂ rather than H₂.

Because of the numerous corrections which are required to accurately portray El Paso's facility, we request an opportunity to review your revised draft which will hopefully incorporate the necessary revisions.

Very truly yours,

John M. Craig
Director
Environmental Affairs

JMC/CRB/clc

cc: M. Atcheson
J. Mills
C. R. Bowman

COLUMN NO.	STREAM NO.			1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	7.2
	STREAM																
	COMP.	MO. WT.	HR.	SIZED COAL TO PLANT	SIZED COAL TO GAS PRODUCTION	SIZED COAL TO FUEL GAS PRODUCTION	DRY ASH TO WIRE	OXYGEN TO GASIFIERS	DRY ASH FROM GAS PRODUCTION	CRUDE GAS	SHIFT FEED GAS	SHIFT PRODUCT GAS	CRUDE GAS TO GAS COOLING	MIXED GAS TO PURIFICATION	FEED GAS TO METHANE SYNTHESIS	PRODUCT GAS FROM METHANE SYNTHESIS	
1	CO ₂	44.010	-	-	-	-	-	-	-	30300.0	28.03	16568.0	28.03	24819.5	26.95	13732.0	28.03
2	N ₂ (1)	34.082	630	-	-	-	-	-	-	337.2	.37	217.2	.37	213.6	.32	180.0	.37
3	C ₂ H ₆	28.052	1663	-	-	-	-	-	-	437.5	.40	239.2	.40	239.2	.35	198.3	.40
4	CO	28.010	327	-	-	-	-	-	-	21837.8	20.20	11940.9	20.20	3392.7	5.03	9836.9	20.20
5	H ₂	2.016	325	-	-	-	-	-	-	42092.9	38.95	23016.4	38.95	31563.6	46.80	13076.5	38.95
6	C ₂ H ₄	16.042	1012	-	-	-	-	-	-	12031.4	11.13	6578.8	11.13	6578.5	9.75	5452.8	11.13
7	C ₂ H ₂	30.068	1773	-	-	-	-	-	-	656.2	.61	358.8	.61	358.8	.53	297.4	.61
8	H ₂ -Ar	25.000	-	-	-	-	-	293.6	2.00	338.3	.31	185.3	.31	185.3	.27	153.6	.31
9	O ₂	32.000	-	-	-	-	-	14386.4	198.00	-	-	-	-	-	-	-	-
10	N ₂	28.016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	TOTAL DRY GAS	-	-	-	-	-	-	14680.0	100	15609.9	100	53104.7	100	6745.2	100	4638.3	100
12	MOLECULAR WT. (DRY GAS)	-	-	-	-	-	-	32.04	-	21.10	-	21.10	-	21.10	-	20.62	-
13	TOTAL DRY GAS	-	-	-	-	-	-	4706.0	-	2280.47	-	12463.5	-	392.6	-	1031502	-
14	WATER (H ₂ O) (1)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
15	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
16	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
17	WATER (H ₂ O) (2)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
18	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
19	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
20	WATER (H ₂ O) (3)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
21	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
22	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
23	WATER (H ₂ O) (4)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
24	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
25	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
26	TOTAL LBS	-	-	-	-	-	-	4706.0	-	2280.47	-	12463.5	-	392.6	-	1031502	-
27	WATER (H ₂ O) (5)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
28	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
29	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
30	WATER (H ₂ O) (6)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
31	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
32	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
33	WATER (H ₂ O) (7)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
34	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
35	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
36	WATER (H ₂ O) (8)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
37	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
38	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
39	WATER (H ₂ O) (9)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
40	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
41	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
42	WATER (H ₂ O) (10)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
43	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
44	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
45	WATER (H ₂ O) (11)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
46	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
47	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
48	WATER (H ₂ O) (12)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
49	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
50	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
51	WATER (H ₂ O) (13)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
52	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
53	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
54	WATER (H ₂ O) (14)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
55	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
56	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
57	WATER (H ₂ O) (15)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
58	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
59	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
60	WATER (H ₂ O) (16)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
61	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
62	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
63	WATER (H ₂ O) (17)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
64	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
65	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
66	WATER (H ₂ O) (18)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
67	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
68	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
69	WATER (H ₂ O) (19)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
70	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
71	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
72	WATER (H ₂ O) (20)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
73	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
74	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
75	WATER (H ₂ O) (21)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
76	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
77	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
78	WATER (H ₂ O) (22)	18.015	314450	-	-	-	-	67522	-	34780	-	762764	-	357765	-	832796	-
79	CO ₂ (H ₂ O)	44.010	1518363	-	-	-	-	21846	-	9429	-	-	-	-	-	2280	-
80	ASH	15.222	373220	-	-	-	-	80612	-	453232	-	373220	-	-	-	-	-
81	WATER (H ₂ O) (23)	18.015	314450	-	-	-	-	67522	-	34780	-	7					

October 26, 1978

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OCT 30 1978

Dr. Mason H. Somerville, Manager
Engineering Experiment Station
School of Engineering and Mines
The University of North Dakota
Grand Forks, North Dakota 58202

ENGINEERING EXPERIMENT STATION
University of North Dakota
Grand Forks, N. D. 58202

Re: "A Comparative Analysis of
Effluents from Four Proposed
Dry Ash Lurgi Gasification Facilities"

Dear Dr. Somerville:

We appreciate the opportunity to review the captioned report to the Department of Energy dated July 1978. Our comments follow:

1. Page 4-21

The terms "foreseeable federal and state sulfur control standards" and "acceptable limits" are very subjective. Based upon the continued evolution of such standards and the political aspects of standards development, El Paso does not believe that it is possible to predict what such standards or limits may someday be, and therefore feels that conclusions drawn as to the appropriate or necessary control technology cannot and should not be made at this time.

Also, the statement is made that "stack gas scrubbing should reduce the SO₂ content to acceptable limits." This implies that without scrubbing SO₂ emissions are excessive, which contradicts the information presented in Table 3-3 on page 3-20. It should be noted that data in Table 3-3 for El Paso's facility is, in part, based on guarantees furnished by Stretford process licensors.

2. Pages 4-22 and 4-23

For further clarity in Table 4-4, it should be noted that the EPA guideline equation for allowable sulfur emissions is based on a certain percentage (1.8%) of sulfur in the raw coal gas following the shift reaction present as organic sulfur compounds. Also, it

should be noted that if the organic sulfur content of the raw coal gas differs substantially from this value, then the EPA feels that some adjustment should be made in the emission limit.⁽¹⁾ This additional information would aid in explaining the basis for Table 4-4 as well as some of the differences between this table and Table 3-3.

The first full paragraph on page 4-23, which describes Table 4-4, is unclear and it should be rewritten. At the least, a verb is missing from the second sentence.

3. Pages 5-26, 5-33, and 5-39

The design flow rate exiting El Paso's Phenosolvan unit is incorrectly specified to be 4450 gpm. Per page 1-88 of Volume I of El Paso's Final Environmental Statement (INT FES 77-03), the total flow leaving the gas liquor treatment areas is 2706 gpm (2377 gpm from stream 10.4 plus 329 gpm from stream 10.2).

Due to this error in specifying the effluent flow rate, subsequent information, such as that presented in Figure 5-7 and Tables 5-12 and 5-13, is also incorrect.

4. Pages 6-5 and 6-9

Coal lock vent gas displaced from the gasifier coal lock during coal charging will not be directly emitted to the atmosphere as you have assumed. El Paso plans to collect this vent gas and route the gas through a duct system to the incinerator. To avoid combustible mixtures, this vent gas is to be mixed with air at the coal lock to below gas explosive limits. The information in Table 6-3 should therefore be revised as the ultimate atmospheric emissions resulting from the coal lock vent will actually be the products of combustion of the stream whose approximate composition is now shown in this table.

5. Page 8-2

In line with our first comment regarding page 4-21, El Paso takes exception with the first full sentence on this page: "Claus and Stretford tail gas streams in New Mexico will have to be scrubbed both for COS and SO₂ control." Again, this is a subjective statement and not accurate.

(1) Control of Emissions from Lurgi Coal Gasification Plants, U.S. Environmental Protection Agency, EPA-450/2-78-012, March 1978, page 8-9.

October 26, 1978

Also, the intent and meaning of the last paragraph is unclear as to the type of solid waste and it should be rewritten. The proper means selected for solid waste and sludge disposal depends on several factors, one of which is moisture content. El Paso questions how existing waste water treating technology could be applied to treat the relatively low moisture gasification plant sludge (assuming sludge means dewatered ash). Also, the last sentence implies the need for the development of post-disposal treatment technology. It should first be determined whether such technology is required before focusing research on its development.

6. Page 8-5

The cost information which is included in Chapter 6 Gasification Plant and Effluent Control Economics, must be uniquely interpreted for each project based on engineering design philosophy, differences in plant location and numerous other facets of each project. As an example, in Table 8-1 on page 8-5, the tabular summary of fixed capital investment cost for pollution control for El Paso's project should include some or all of the low-BTU gasification plant cost and additional costs for associated plants needed to clean up low-BTU gasification, as a credit to pollution control cost. Such credit would raise the fixed capital investment cost for El Paso's project. Since such costs are not referenced in a public document, a qualification of the cost credit for El Paso's project should be made in the text or as a footnote to the table.

Sincerely,

J. M. Craig, Ph.D.
Director
Environmental Affairs

pa

THE UNIVERSITY OF NORTH DAKOTA

ENGINEERING EXPERIMENT STATION
Box 8103, University Station
Grand Forks, North Dakota 58202
(701) 777-3132

November 17, 1978

Dr. J. M. Craig, Ph.D.
Director
Environmental Affairs
El Paso Natural Gas Company
P.O. Box 1492
El Paso, TX 79978

Dear Dr. Craig:

Thank you for your letter of October 26, 1978, responding to our request for comments on our report, "A Comparative Analysis of Effluents from Four Proposed Dry Ash Lurgi Gasification Facilities." We sincerely appreciate the time and effort that you have taken in reviewing this. Your letter will be included with the final report.

I feel it is in our mutual interest to respond to some of your comments to provide you an opportunity to respond before the final report is issued.

1. Page 4-21

We agree that the terms "foreseeable federal and state sulfur control standards" and "acceptable limits" are subjective. However, based upon our conversations with officials from the state, government, and federal agencies involved, and the current state of best available control technology, we believe that it is improbable that the existing state and federal regulations concerning coal gasification standards will significantly be altered in the next five years. This information is of use and interest to the Environmental Control Technology Division of the Department of Energy. We have altered the statement "stack gas scrubbing should reduce the SO₂ content to acceptable limits" to read "stack gas scrubbing, if required, can be used to reduce the SO₂ content to within the existing regulated limits."

2. Pages 4-22 and 4-23

We will add a footnote to this table citing the EPA's F correction factor.

3. Pages 5-26, 5-33, and 5-39

This error will be corrected.

4. Pages 6-5 and 6-9

This information will be altered in the report to state that El Paso collects and routes the vent gas to the incinerator.

5. Page 8-2

We have altered the statement on page 8-2 to read: "Claus and Stretford tail gas streams in New Mexico may have to be scrubbed both for COS and SO₂ control." Our data indicates that the existing Claus and Stretford technology may not be able to meet the existing New Mexico limits without scrubbing. As a consequence of our opinion we have included this statement. This opinion is based upon the data for Claus and Stretford systems that were available to us at the time of the writing of the report. There is some question in regard to the accuracy of vendor guarantees concerning the content of Claus and Stretford tail gas streams.

The intent and meaning of this last paragraph is to relay to the Sponsor that the solid waste and sludge disposal area is currently unregulated (uncontrolled), the single exception being deep well waste disposal. As you well know, there are several solid waste and sludge streams which must be handled. At the present time, the ash dewatering schemes utilized in some of the facilities result in a relatively high moisture content of the ash. Furthermore, in some of the designs the ash stream can be used to balance plant water requirements. These problems are minimized in both the El Paso and WESCO design due to their location and their relatively low water use (and availability).

Some of the work that is being done within the state of North Dakota at the present time indicates that there may be need for a post disposal technology treatment. However, we agree with you that the need must be demonstrated before a technology is researched and developed. This paragraph will be clarified.

6. Page 8-5

We agree with your statement that the cost information must be uniquely interpreted on the basis of each individual project, design philosophy, and other facets of each project. However, we believe that our tabulation of environmental pollution control cost items is reasonably accurate. In fact, it substantially agrees with the identification of the pollution control investments itemized by Mr. R. E. Moore of your company. Mr. Moore is an employee of the Engineering Department (Process Engineering). We will, however, footnote the table to include the information that El Paso considers that some or all of the low Btu gasification plant cost should be associated and included in low Btu gasification as a credit to your control cost and that that cost is not identified in the table.

Dr. J. M. Craig

-3-

November 15, 1978

Again, I sincerely appreciate your response to our report. I understand that such a document takes a great deal of time and effort to review and want to express my deepest personal appreciation to you for your taking the time and effort required to review the report.

Please do not hesitate to contact me if we can be of further assistance to you.

Very truly yours,

Mason H. Somerville, Ph.D., P.E.
Director

ct

cc: A.G. Fletcher
Dr. Hung
Dr. Baria

NATURAL GAS PIPELINE COMPANY OF AMERICA

122 South Michigan Avenue • Chicago, Illinois 60603

August 15, 1977

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AUG 22 1977

ENGINEERING EXPERIMENT STATION
University of North Dakota
Grand Forks, N. D. 58202

Dr. Mason H. Somerville, Manager
Engineering Experiment Station
University of North Dakota
Grand Forks, North Dakota 58202

Dear Dr. Somerville:

Natural has reviewed your draft for ERDA titled "A Comparative Analysis of Effluents from Four Proposed Dry Ash Lurgi Gasification Facilities." This review has been made only on the data which is specific to the Dunn County Project. The Project's EAR was used as our reference for the data review.

Attached are the results of Natural's review. If you have any questions concerning our comments, please call me.

Sincerely,

Fred Strauss
Senior Planning Engineer

FRF:my
Attachment

Key for corrections on pages 7, 8 and 11

1. Fig. 1.2.3-10

Stream 5	
Total	52.442
H ₂ S	6.990
COS	0.0864
HCN	0.444

% S compounds	13.5%
% HCN	0.85%

2. Fig. 1.2.3-10

	Stream 5	Stream 11	Grand
Total	52.442	191.896	Total 244.34
H ₂ S	6.990	149.071	156.06
COS	0.0864		0.0864

% S compounds in feed	63.91%
-----------------------	--------

3. Fig. 1.2.3-7

Tail gas = 133.4 #/hr. + 2000 x 24 = 1.6 T/D

4. Fig. 1.2.3-7

S to Stretford 5764.4 + 723.0 = 6487.4 #/hr.
= 77.8 T/D

% S removed $\frac{6391.2}{6487.4} = 98.5\%$

T/D S entering 77.8 x 98.5% = 76.6 T/D

5. Fig. 1.2.3-7

S to gasification	20331 #/hr.
Claus product S	12133.7 #/hr.
Stretford product S	6391.2 #/hr.

% S recovered $\frac{6391.2 + 12,133.7}{20331} = 91.1\%$

6. Fig. 1.2.3-7

S vented to Atm 1461.2 #/hr.

Vented as SO₂ 1461.2 x 64.066 + 32 = 2925.41 #/hr.

Table 1.2.3-7 BTU input = 20618 MMBTU/hr.

Gross S Discharge

$$\frac{2925.41}{20618} = .142 \text{ \#SO}_2\text{/MMBTU}$$

Key for corrections on pages 99-134

A Figure 1.2.3-11

B Table 1.2.3-13

C Table 1.2.3-9

D Table 1.2.3-12

E Figure 1.2.3-10

F Table 1.2.3-8

G Table 1.2.3-14

H Table 1.2.3-10

I Table 1.2.3-15

recovery plants are expected to recover about 202 t/d which represents 89.2 percent of the coal sulfur charged to gasification. The stack gas scrubber on the boiler plant flue gas is expected to remove 90 percent of the sulfur in that total gas stream. Thus, for all of the coal sulfur charged to the plant complex, 266 t/d will be recovered for sale (76 percent); 40 t/d will be removed by the stack gas scrubber (15 percent); 4.9 t/d will be vented to the atmosphere (1.8 percent) and the remaining 7.2 percent will be distributed to the ash, the by-products and other waste sludges.

C. Natural Gas Pipeline Co.

The Natural Gas Pipeline Co. tentative plant design also uses coal fired steam boilers for the production of steam and electric power supplemented with an oil fired steam superheater. The fuel oil used in the steam superheater or vent gas incinerator as it is named will be produced by the gasification plant. The stack gases from the coal fired boilers is passed through hot electrostatic precipitators for particulate removal and then scrubbed to remove sulfur compounds. Both Claus and Stretford sulfur recovery plants are used to recover sulfur from the various other plant processing waste gas vents. The hot regenerator overhead, Rectisol plant, is sent to an ADIP unit for hydrocarbon removal (selective absorption) and then the high sulfur containing vent gas stream (about 78 percent H_2S) goes directly to the Claus plant. The hydrocarbons removed are incinerated in a steam superheater. The vent gas from the Rectisol pretreat section for naphtha recovery rich in sulfur compounds (about 13.5 percent), containing hydrocarbons and probably hydrogen cyanide (possible 0.85 percent), is sent to the Claus plant. The combined gas stream to the Claus

~64% (2)

plant (4 bed unit) contains about 66.5 percent sulfur compounds and the unit recovers 145.6 t/d sulfur (98.9 weight percent recovery) with the tail-gas containing 1.1 t/d sulfur. The tail-gas is burned in a separate oil fired incinerator to convert all combustible compounds to CO_2 , H_2O and SO_2 before discharge to the atmosphere. The expansion gases from the gas liquor buffer tank (gas liquor separation), the Phenosolvan vents and the H_2S rich flash gas streams are sent to a Stretford sulfur recovery plant and the resulting vent gas streams go to the oil fired steam superheater (known as the vent gas incinerator) before final discharge to the atmosphere. The Stretford unit is designed to remove about 98.5 percent of the sulfur entering or 76.5 t/d sulfur. Thus, the combined Claus and Stretford sulfur recovery plants produce about 222.1 t/d sulfur which represents 92.2 percent of the coal sulfur entering gasification. The Rectisol vent gas streams, which will contain in excess of 99 volume percent carbon dioxide, are burned in the vent gas incinerator prior to atmospheric discharge. The coal lock vent gas is burned in the steam boiler plant. The low pressure vent gas from gas separation and the biooxidation vent (process water treating) are discharged to the atmosphere without incineration.

These
by-pass
Stretford
Fig 1.2.3-10

D. American Natural Gas Co. (ANG)

The data given in this report is based on the ANG Coal Gasification Company building a nominal 250 MMSCFD SPG plant complex. Currently, public announcements indicate the first plant completed will be of a nominal 125 MMSCFD SPG capacity and it has recently been announced that ANG and Natural will build this first plant in Mercer County, North Dakota, as a joint venture. It is likely

III. Summary Tables, Effluents

A. Gaseous

The data for the gaseous effluent discharge from the four planned plant complexes has been compiled on a weight basis presented in Table 1. The hydrocarbon discharges are indicated to be very small for the Wesco and ANG plants, very nearly zero for the Natural plant, and, on a relative basis, quite large for the El Paso plant. The discharge of sulfur compounds, computed as sulfur, are lowest for the El Paso plant with the Wesco plant somewhat higher and the Natural and ANG plants relatively higher. The estimate of NO_x discharges appears to be lowest for the El Paso plant and considerably higher for the other three plant complexes.

The sulfur content of the gross gases discharged to the atmosphere (Table 1) can be summed up as shown in the following comparison. This comparison includes all sulfur compounds estimated to be in the discharged gaseous streams calculated as sulfur dioxide in pounds divided by the heating value of all coal charged to the complex in millions of Btu.

<u>Plant</u>	<u>Location</u>	<u>Gross Sulfur Discharge, lbs. SO₂/MMBtu</u>
El Paso	New Mexico	.029
WESCO	New Mexico	.038
Natural	North Dakota	.145
ANG	North Dakota	.126

GASIFICATION PLANT COMPLEXES, GASEOUS EFFLUENTS, EACH COMPLEX 250 MWCTP⁽¹⁾ OF SYNTHETIC PIPELINE GAS

Components, tons per day

- (1) Nominal Plant size per calendar day.
- (2) Data source gives 143 but this is unreasonable and is probably erroneous.
- (3) Gas stream also contains <0.012 t/d each of NH_3 and HCl .
- (4) Average molecular weight equals 22.5
- (5) NO_x as NO_2 .

12
E-24

TABLE 2: GASIFICATION PLANT COMPLEXES, SOLIDS AND SLUDGES,
EACH COMPLEX 250 MMSCFD¹ OF SYNTHETIC PIPELINE GAS

Source	Effluent and Disposition	Estimated Solids, tons	per Stream Day Water, tons	Solids, percent	Major Reference ²
<u>El Paso Natural Gas Company</u>					
Coal Preparation					
(1) Coal, 1 3/4"x2mm	Plant Use (Full Requirement)	28,248	- - -	100	El Paso Natural Gas Co. Second Supplement to Application of El Paso Natural Gas Co. for a Certificate of Public Convenience & Necessity Docket CP73-131 Dated: 10-8-73 Filed: 10-9-73 (Before FPC)
(2) Clean Coal, 2mmx100mesh	Fine Coal to Sales	2,544	- - -	100	
(3) Refuse from Coal Cleaning	Refuse to Mine (Coal Washing)	1,680	- - -	100	
Water					
(1) Raw Water Supply	Settling Basin-Silt & Sand, Disposed of				
(2) Treatment of Raw Water					
(a)	Filter Backwash-to Raw Water Supply				
(b)	Lime Treater Sludge-to Ash Handling				
(c)	Water Softener Blowdown-to Ash Handling				
(3) Cooling Water	Cooling Tower Blowdown-to Ash Handling				
(4) Process	Contaminated Gas Liquor-to Ash Handling				
(5) Process	Water from Glycol Regenerator-to Ash Handling				
Ash Handling (Gasifier Ash & Sludges)					
(1) Coarse Ash and Sludge	To Mine	6,768 (wet)	- - -	- - -	
(2) Fine Ash and Sludge	To Fine Ash Pond-Solar Evaporation	96 (wet)	- - -	- - -	
(3) Excess Water	To Evaporation Pond-Solar Evaporation	- - -	- - -	- - -	
Total Refuse + Ash + Sludge	Plant Complex Total	8,544	- - -	- - -	
<u>Western Gasification Company (WESCO)</u>					
Coal Preparation					
(1) Coal to Gasification (1 1/2"x7/16")	Plant Use, Gasification	24,820	- - -	100	Western Gasification Com- pany (WESCO) Coal-Gasification Project & Expansion of Navajo Mine By Utah Inter- national Inc. New Mexico Final Environmental State- ment Volume I, II U.S. Dept of the Interior- of Reclamation, 1975
(2) Coal to Boiler Plant (Clean 4x48m)	Plant Use, Steam/Power	3,868	- - -	100	
(3) Coal to Sales (Clean 4x48m)	Fine Coal to Sales	284	- - -	100	
(4) Refuse	Refuse to Holding Pond (Coal Washing)	2,263	- - -	100	
(5) Coal Dust	Inertial Separators & Bag Type Filters				
Raw Water Treatment	Lime Sludge - to Mine	24	24	50	
Waste Water Treatment	Sludge a) Biological	6.7	32.4	60	
	b) CaCO ₃				
Sanitary Sewage	Sludge - to Mine				
Flue Gas Treating (Boiler Plant)	Sludge a) CaSO ₄ ·2H ₂ O				
	b) Inerts				
	c) Fly Ash				
Ash Handling					
(1) Gasifier Ash (Quenched)	Wet Ash-to Mine				
(2) Boiler Plant Bottom Ash	Wet Ash-to Mine				
(3) Boiler Plant Fly Ash	Wet Ash-to Mine				
	Ash Subtotal				
	Plant Complex Total				
<u>Natural Gas Pipeline Company of America</u>					
Raw Water Clarification	Dissolved and Suspended Solids-to Mine	32.1	34.2	42	Natural Gas Pipeline Company of America. Environmental Assessment of a Gasification Complex in Dunn County, North Dakota, Volume I, Section 1, 1977.
Process Water Treating	Biotreating of Phenosolvan and Rectisol Effluents - to Mine	108	106	150	
Cooling Water System	Settled Out Materials from Cooling Towers + Chemicals - to Mine	12.5	11.4	24	
Boiler Plant Ash	Bottom Ash + Fly Ash - to Mine	151+361=512	537	127	
Gasification Plant Ash	Gasifier Ash - to Mine	2159	2,171	520	
Stack Gas Scrubber	Filter Cake (Primarily CaSO ₃ ·2H ₂ O)-to Mine	191	196	156	
Concentrator	Sludge - to Mine	52	51.4	13	
	Plant Complex Total	3066.6	3,107	1,032	

Fig 1.2.3-11 & Table 1.2.3-1

¹Nominal plant production per calendar day.

²The basic data was obtained from the sources listed. The reported numbers have been derived from the basic data by the authors.

NATURAL GAS PIPELINE COMPANY OF AMERICA

(275 MMCFD Stream Day)

Source	Effluent	Nature	Quantity, t/d
<u>Clarifier</u>			
<u>Raw Water Treatment</u>	Sludge	Solid-Liquid (A)	32.1 34.2 (S) 42 (L)
(1) CaCO_3		s (B)	13.5 14.4 (S)
(2) $\text{Mg}(\text{OH})_2$		s	.4 (S)
(3) $\text{Al}_2(\text{SO}_4)_3$		s	.8 (S)
(4) Suspended Solids		s (B)	17.4 18.6 (S)
<u>Oxygen Plant</u>	$\text{N}_2 + \text{O}_2$	Gaseous	21,067 (g)
(1)	N_2	g	20,464 (g)
(2)	O_2	g	603 (g)
<u>Coal Preparation</u>	Coal Dust	Solid-Particulate	Minor
<u>Storage</u>	Coal Dust	Solid-Particulate	Minor
		Particulate-Steam Water	Nil
<u>Boiler Plant</u>	Fly Ash	Solid-Liquid (A)	361 380 (S) 90 (L)
	Bottom Ash	Solid-Liquid (A)	151 152 (S) 37 (L)
	Soot Blowing	Vapor	636 g
	Stack Gas	Gaseous	See stack gas treater
<u>Stack Gas Treater</u>	Sludge	Solid-Liquid (A)	191 196 (S) 156 (L)
	Na_2SO_3	(S)	2.4 2.8 (S)
	Na_2SO_4	(S) (D)	9.6 9.8 (S)
	$\text{CaSO}_3 \cdot 2\text{H}_2\text{O}$	(S)	179.0 183.6 (S)
<u>Boiler Stack</u>	Flue Gas	Gas + Particulate	545.79 56,080 (g + s)
	(1) Particulate	s	688.8 (S)
	(2) H_2O	g	6,893 (g)
	(3) CO_2 ✓	g	14,297 14,302 (g)
	(4) N_2	g	33,332 33,344 (g)
	(5) SO_2	g	22.8 (g)
	(6) NO_x	g	34.6 (g)

NATURAL GAS PIPELINE COMPANY OF AMERICA

Source	Effluent	Nature	Quantity, t/d
Gasification <i>and boiler plant</i>	Ash	Solid-Liquid	2159 2171 (S) (520 (S) L)
	(1) Al_2O_3	s	312.6 310.9
	(2) CaO	s	562.3 559.2
	(3) Fe_2O_3	s	256.2 254.8
	(4) MgO	s	206.2 205.1
	(5) Na_2O	s	78.2 77.7
	(6) SO ₃	s	112.9 112.3
	(7) SiO_2 SiO_2	s	584.0 580.7
	(8) SrO_2	s	32.6 32.4
	(9) K_2O	s	26.1 25.9
	H ₂ O from Ash Grate/ Pinion Cooling	g	1,075 (g)
	Tar	Liquid	1117 (F)
	Oil	Liquid	171 (1)
	Gas-Liquid	Liquid	200 (1)
	Catalyst	Solid (Cobalt-Moly)	
(1) Used in plant			
(2) Processed in plant			
<u>Rectisol</u>	Naphtha	Liquid	153 (1)
	Vent Gases ³	Gaseous	
	Liquid Wastes ³	Liquid	
(3) Processed in plant			
<u>Methanation</u>	Condensate ⁴	Liquid	
(4) Water used in plant	Catalyst ⁵	Solid (Nickel)	
(5) Spent catalyst returned to manufacturer			
<u>Compression</u>	Condensate ⁴	Liquid	

This is a combined Stream - see (F)

Liquor Separation

Gas Scrubbing and Cooling

Shift Conversion

Cooling

Fig 1.2.3-1

NATURAL GAS PIPELINE COMPANY OF AMERICA

Source	Effluent	Nature	Quantity, t/d
<u>Sulfur Plant</u>	Sulfur (Product)	Solid	222 ✓ (g)
<u>Phenosolvan Plant</u>	NH ₃	Gas	124 ✓ (g)
	Crude Phenolics	Liquid	166 (l)
<u>Waste Water Treatment</u>			
<u>Biological Treatment</u>	Sludge	Solid-Liquid (A)	108 ✓ 106 (S) 150 (l)
	(1) CaCO ₃	s	70.7 72.0
	(2) organic matter	s	16.2 16.5
	(3) Ca salts phenols	s	8.5 8.6
	(4) Ca salts fatty acids	s	6.1 6.3
	(5) Ca salts, inorganic	s	4.3 4.6
Cooling Tower	Evaporation + Draft	Gaseous (H ₂ O)	29,119 ✓ (g)
	Sludge	Solid-Liquid (A)	11.4 12.5 (S) 24 (l)
	(1) CaCO ₃	s	9.8 10.8
	(2) Mg(OH) ₂	s	1.1 1.2
	(3) Al ₂ (SO ₄) ₃	s	0.5 ✓
Concentrator	Sludge	Solid-Liquid (A)	51.4 52 (S) 13 (l)
	(1) Ca	s	1.76 1.78
	(2) Mg	s	.73 .74
	(3) Na	s	12.40 12.54
	(4) K	s	.26 ✓
	(5) NH ₃	l	.82 .83
	(6) Bicarbonate	s	.50 .51
	(7) Chloride	s	7.34 7.43
	(8) SO ₄	s	21.27 21.52
	(9) NO ₃	s	3.89 3.94
	(10) Phosphate	s	.48 ✓
	(11) Si	s	.40 ✓
	(12) Cyanides	s	.072 ✓
	(13) Phenols	l	.18 ✓
	(14) Fatty Acids	l	1.30 1.32

NATURAL GAS PIPELINE COMPANY OF AMERICA

Source	Effluent	Nature	Quantity, t/d
Process Vent Gas Streams			
(1) Vent Gas Incinerator Stack	Gaseous POC?	g	26,625 26,633
(a) H ₂ S Free Flash Gases	44.01 (1) CO ₂ ✓	g (E)	19,499 19,503
(b) Stretford Vent Gas	28.01 (2) N ₂ ✓	g	5,929 5,931
(c) ADIP Vent Gas	32.00 (3) O ₂ ✓	g	297 ✓
(d) Expansion Gas	18.02 (4) H ₂ O ✓	g	892 893
	64.06 (5) SO ₂ ✓	g	8.6 ✓
(2) Claus Unit Incinerator Stack	Gaseous POC?	g	847 ✓
(a) Vent Gas Pretreat	(1) CO ₂ ✓	g	297 ✓
(b) H ₂ S Rich Claus Feed	(2) N ₂ ✓	g	423 ✓
	(3) O ₂ ✓	g	7 ✓
	(4) H ₂ O ✓	g	117 ✓
	(5) SO ₂ ✓	g	3.3 ✓
(3) Direct Discharge to Atmosphere Low Pressure Vent Gas	Gaseous Vent	g	285 ✓
	(1) CO ₂ ✓	g	0.8 ✓
	(2) H ₂ S ✓	g	0.053 ✓
	(3) N ₂ ✓	g	212.4 ✓
	(4) O ₂ ✓	g	60.4 ✓
	(5) H ₂ O ✓	g	11.4 ✓
	(6) (HCN) ✓	g	<0.012 ✓
	(7) (NH ₃) ✓	g	<0.012 ✓
(4) Direct discharge to Atmosphere Vent from Biooxidation	Gaseous Vent	g	172 ✓
	(1) CO ₂ ✓	g	171.6 ✓
	(2) SO ₂ ✓	g	.21 ✓

NATURAL GAS PIPELINE COMPANY OF AMERICA

Source	Effluent	Nature	Quantity, t/d
Summation of All Gaseous Streams From Process Units	Gaseous Vent Streams to Atmosphere		27929
		g	27,937
	(1) CO ₂ ✓	g	19,973 19,969
	(2) N ₂ ✓	g	6,566 6,564
	(3) O ₂ ✓	g	364 ✓
	(4) H ₂ O ✓	g	1,022 1020
	(5) SO ₂ ✓	g	12.11 ✓
	(6) H ₂ S ✓	g	0.053 ✓
	(7) HCN	g	<0.012 ✓
	(8) NH ₃		<0.012 ✓

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 3 - A Plant:

Plant Unit: Raw Water Treatment

	Plant Design Data	Experimental Data (Operating Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent			Total Sludge			
Nature			Solid-Liquid			
Biological Hazard						See Each Component
Disposition	32.1	(A)	Mine Disposal			
Quantity TPD	34.2 (S) 42 (L)					
Effluent	Mg(OH) ₂	SLUDGE COMPONENTS				
Nature	Solid A					
Biological Hazard						Minor (2) A
Disposition	Mine Disposal A					
Quantity TPD	.4 (S) B					
Effluent	Al ₂ (SO ₄) ₃					
Nature	Solid A					
Biological Hazard						Minor A
Disposition	Mine Disposal A					
Quantity	0.8 (S) B					
Effluent	Suspended Solids					
Nature	Solid A					
Biological Hazard						Minor (2) B
Disposition	Mine Disposal A					
Quantity TPD	18.6 (S) B	17.4 (B)				

* Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 3 - A* Plant:

Plant Unit: Raw Water Treatment

	Plant Design Data	Experimental Data (Operating Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent			CaCO ₃			
Nature			Solid <i>B</i>			
Biological Hazard						Minor (2) <i>B</i>
Disposition	13.5		Mine Disposal <i>A</i>			
Quantity TPD	14.4 <i>B</i>					
Effluent						
Nature						
Biological Hazard						
Disposition						
Quantity						
Effluent						
Nature						
Biological Hazard						
Disposition						
Quantity						
Effluent						
Nature						
Biological Hazard						
Disposition						
Quantity						

*Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 4 - A* Plant:

Plant Unit: Boiler Plant

	Plant Design Data	Experimental Data (Operating Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent			Fly Ash			
Nature			Particulate/Sludge <i>A</i>			
Biological Hazard						Minor ⁽¹⁾ <i>A</i>
Disposition	361 ^(A)		Mine Disposal <i>A</i>			
Quantity TPD	380 (S) <i>A</i> 90 (L)					
Effluent			Bottom Ash			
Nature			Solids-Sludge <i>A</i>			
Biological Hazard						Minor ⁽¹⁾ <i>A</i>
Disposition	151 ^(A)		Mine Disposal <i>A</i>			
Quantity TPD	157 (S) <i>A</i> 371 (L)					
Effluent			H ₂ O Soot Blowing			
Nature			H ₂ O Vapor <i>A</i>			
Biological Hazard						Minor ⁽¹⁾ <i>A</i>
Disposition			To Atmosphere <i>A</i>			
Quantity TPD	636 [✓] <i>A</i>					
Effluent			Fly Ash			
Nature			Particulate <i>A</i>			
Biological Hazard						Minor ⁽¹⁾ <i>A</i>
Disposition			To Atmosphere <i>A</i>			
Quantity TPD	4.8 [✓] <i>A</i>					

*Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 4 - A Plant:

Plant Unit: Boiler

	Plant Design Data	Experimental Data (Operating Gasification Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent			Flue Gas			
Nature			Gas and Particulate ^H			
Biological Hazard						See Each Constituent
Disposition	54,579		To Atmosphere ^H			
Quantity TPD	56,086 ^H					
Effluent			N ₂			
Nature			Gaseous ^H			
Biological Hazard						Minor (1) ^H
Disposition	33,332 ^(E)		To Atmosphere ^H			
Quantity TPD	33,344 ^H					
Effluent			H ₂ O			
Nature			Gaseous ^H			
Biological Hazard						None Known ^H
Disposition			To Atmosphere ^H			
Quantity TPD	6,886 ^(E)					
	6,893 ^H					
Effluent			CO ₂			
Nature			Gaseous ^H			
Biological Hazard						Minor (1) ^H
Disposition			To Atmosphere ^H			
Quantity	14,299 ^(E)					
	14,302 ^H					

* Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 6 - A Plant:

Plant Unit: Gasifiers

	Plant Design Data	Experimental Data (Operating Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent		Ash				
Nature		Solid + Liquid				
Biological Hazard						Potential Hazard $\frac{H}{A}$
Disposition	2159 $\frac{A}{A}$	Mine Disposal $\frac{H}{A}$				
Quantity TPD	2,171 (S) $\frac{H}{A}$ 520 (L) $\frac{H}{A}$	— ?				
Effluent		ASH SLUDGE COMPONENTS				
		Al ₂ O ₃	(Present as Various Salts)			
Nature		Solid $\frac{H}{A}$				
Biological Hazard						Minor $\frac{H}{A}$ (5)
Disposition	$\frac{C}{C}$	Mine Disposal $\frac{H}{A}$				
Quantity TPD	310.9 $\frac{H}{A}$ 312.6 $\frac{H}{A}$					
Effluent		CaO	(Present as Various Salts)			
Nature		Solid $\frac{H}{A}$				
Biological Hazard	$\frac{C}{C}$					Minor $\frac{H}{A}$
Disposition	559.2 $\frac{H}{A}$	Mine Disposal $\frac{H}{A}$				
Quantity TPD	562.3 $\frac{H}{A}$					
Effluent		Fe ₂ O ₃				
Nature						
Biological Hazard						
Disposition	$\frac{C}{C}$					
Quantity	254.8					

Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 6 - A Plant:

Plant Unit: Gasifiers

	Plant Design Data	Experimental Data (Operating Gasification Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent		MgO	(Present as Various Salts)			
Nature		Solid H				
Biological Hazard						Minor H
Disposition	(C)	Mine Disposal H				
Quantity TPD	205.1 206.2 H					
Effluent		Na ₂ O	(Present as Various Salts)			
Nature		Solid H				
Biological Hazard						Minor
Disposition	(C)	Mine Disposal H				
Quantity TPD	77.7 78.2 H					
Effluent		SO ₄	(Present as Various Salts)			
Nature		Solid H				
Biological Hazard	(C)					Possible Hazard
Disposition	112.3	Mine Disposal H				
Quantity TPD	112.9 H					
Effluent		SiO ₂	(Usually as Complex Silicates)			
Nature		Solid H				
Biological Hazard	(C)					Potential Hazard
Disposition	580.7	Mine Disposal H				
Quantity TPD	584.0 H					

* Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 6 - A Plant:

Plant Unit: Gasifier

		Plant Design Data	Experimental Data (Operating Gasification Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent			SrO ₂	(Present as Salts)			
Nature			Solid <i>H</i>				
Biological Hazard		(C)					Minor <i>A</i>
Disposition		32.4	Mine Disposal <i>H</i>				
Quantity	TPD	32.6 <i>H</i>					
Effluent			K ₂ O	(Present as Salts)			
Nature			Solid <i>H</i>				
Biological Hazard		(C)					Minor
Disposition		25.9	Mine Disposal <i>H</i>				
Quantity	TPD	26.1 <i>H</i>					
Effluent			H ₂ O Vapor				
Nature			Gaseous <i>H</i>				
Biological Hazard							None Known
Disposition			Atmosphere <i>H</i>				
Quantity	TPD	✓ 1,075 (G)					
Effluent							
Nature							
Biological Hazard							
Disposition							
Quantity							

*Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 7 - A Plant:

Plant Unit: Gas Scrubbing + Cooling

	Plant Design Data	Experimental Data (Operating Gasification Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent		Tar				
Nature	(F)	Liquid B				
Biological Hazard						Toxic A
Disposition	1117	To Market B				
Quantity TPD	1,117 (1) B					
Effluent		Oil				
Nature		Liquid B				
Biological Hazard						Toxic A
Disposition	✓	Used in Plant B				
Quantity TPD	200 (1) B					
Effluent		Gas Liquor				
Nature		Liquid B				
Biological Hazard						Toxic A
Disposition		Processed in Plant B				
Quantity	*					
Effluent						
Nature						
Biological Hazard						
Disposition						
Quantity						

Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 13 - A Plant:

Plant Unit: Stack Gas Treating

	Plant Design Data	Experimental Data (Operating Gasification Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent			Total Sludge			
Nature			Solid-Liquid H			
Biological Hazard	(A)					See Each Constituent
Disposition	191		Mine Disposal H			
Quantity TPD	196 (S) B 156 (L)					
Effluent		SLUDGE COMPONENTS	Na ₂ SO ₃			
Nature			Solid D			
Biological Hazard	(D)					Potential Hazard H
Disposition	24		Mine Disposal H			
Quantity TPD	2.6 B					
Effluent			Na ₂ SO ₄			
Nature			Solid H			
Biological Hazard	(D)					Potential Hazard H
Disposition	9.6		Mine Disposal H			
Quantity TPD	9.8 H					
Effluent			Ca ₂ SO ₃ ·2H ₂ O			
Nature			Solid H			
Biological Hazard	(D)					Minor H
Disposition	179.0		Mine Disposal H			
Quantity TPD	183.6 E					

*Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 14 - A Plant:

Plant Unit: Incinerator: Vent Gas

	Plant Design Data	Experimental Data (Operating Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent			Gaseous P.O.C.			
Nature			Gaseous <i>H</i>			
Biological Hazard						See Each Component
Disposition	26625		Atmosphere <i>H</i>			
Quantity TPD	26,633 <i>H</i>					
Effluent		P.O.C. COMPONENTS	CO ₂			
Nature			Gaseous <i>H</i>			
Biological Hazard	(E)					Minor <i>H</i>
Disposition			Atmosphere <i>H</i>			
Quantity	14489 19,503 <i>H</i>					
Effluent			N ₂			
Nature			Gaseous <i>H</i>			
Biological Hazard	(E)					None Known
Disposition			Atmosphere <i>H</i>			
Quantity	5929 5,931 <i>H</i>					
Effluent			O ₂			
Nature			Gaseous <i>H</i>			
Biological Hazard						None Known
Disposition			Atmosphere <i>H</i>			
Quantity	297 <i>H</i>					

* Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 14 - A Plant:

Plant Unit: Incinerator: Vent Gas

	Plant Design Data	Experimental Data (Operating Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent			H ₂ O			
Nature	(E)		Gaseous A			
Biological Hazard						None Kno
Disposition	892		Atmosphere A			
Quantity	895 A					
Effluent			SO ₂			
Nature			Gaseous			
Biological Hazard						Potential Hazard (4)
Disposition			Atmosphere			A
Quantity	8.6 B					
Effluent						
Nature						
Biological Hazard						
Disposition						
Quantity						
Effluent						
Nature						
Biological Hazard						
Disposition						
Quantity						

*Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 16- A Plant:

Plant Unit: Stack: Untreated Gas

		Plant Design Data	Experimental Data (Operating Gasification Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent		CO ₂					
Nature		Gaseous A					
Biological Hazard							Minor A
Disposition		Atmosphere A					
Quantity TPD		172 ✓ A					
Effluent		H ₂ S					
Nature		Gaseous A					
Biological Hazard			(E)				Potential Hazard (1) A
Disposition		Atmosphere A					
Quantity TPD		0.8 B 0.053					
Effluent		N ₂					
Nature		Gaseous A					
Biological Hazard							Minor H
Disposition		Atmosphere A					
Quantity TPD		212.4 ✓ A					
Effluent		O ₂					
Nature		Gaseous A					
Biological Hazard							None Know H
Disposition		Atmosphere A					
Quantity TPD		60.4 ✓ A					

* Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 17 - A Plant:

Plant Unit: Waster Water Treating - Biological

	Plant Design Data	Experimental Data (Operating Gasification Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent			Total Sludge			
Nature			Solid-Liquid <i>H</i>			
Biological Hazard	(A)					See Each Component
Disposition	108		Mine Disposal			
Quantity TPD	106 (8) B 150 (1)		<i>H</i>			
Effluent			CaCO ₃			
Nature			Solid <i>H</i>			
Biological Hazard	(6)					Minor <i>E</i>
Disposition	72.0		Mine Disposal <i>H</i>			
Quantity TPD	70.7 B					
Effluent			Organic Matter			
Nature			Solid <i>H</i>			
Biological Hazard	(6)					Possible Hazard <i>A</i>
Disposition	16.5		Mine Disposal <i>H</i>			
Quantity TPD	16.2 B					
Effluent			Ca Salts Phenols			
Nature			Solid <i>H</i>			
Biological Hazard	(6)					Possible Hazard <i>A</i>
Disposition	8.6		Mine Disposition <i>H</i>			
Quantity TPD	8.5 B					

Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 17 - A Plant:

Plant Unit: Waste Water Treating-Biological

	Plant Design Data	Experimental Data (Operating Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent			Ca Salts, Fatty Acids			
Nature			Solid <i>H</i>			
Biological Hazard	(G)					Possibl. Hazard
Disposition			Mine Disposal <i>H</i>			<i>B</i>
Quantity TPD	$\frac{6.3}{6.1} B$					
Effluent			Ca Salts, Inorganic			
Nature			Solid <i>A</i>			
Biological Hazard	(G)					Minor <i>H</i>
Disposition			Mine Disposal <i>H</i>			
Quantity TPD	$\frac{4.6}{4.5} B$					
Effluent						
Nature						
Biological Hazard						
Disposition						
Quantity						
Effluent						
Nature						
Biological Hazard						
Disposition						
Quantity						

Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 18 - A Plant:

Plant Unit: Waste Water Concentrator

	Plant Design Data	Experimental Data (Operating Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent			Total Sludge			
Nature			Solid- Liquid <i>H</i>			
Biological Hazard	(A)					See Each Component
Disposition	52 _B		Mine Disposal <i>H</i>			
Quantity TPD	51.4 (s) 13 (l)					
Effluent			Sludge Components, Ca (as salts)			
Nature	(H)		Solid <i>H</i>			
Biological Hazard	(H)					Minor <i>H</i>
Disposition	1.78		Mine Disposal <i>H</i>			
Quantity TPD	1.76 B					
Effluent			Mg (as salts)			
Nature			Solid <i>H</i>			
Biological Hazard	(H)					Minor <i>H</i>
Disposition	0.74		Mine Disposal <i>H</i>			
Quantity TPD	0.73 B					
Effluent			Na (as salts)			
Nature			Solid <i>H</i>			
Biological Hazard	(H)					Minor <i>A</i>
Disposition	12.54		Mine Disposal <i>H</i>			
Quantity TPD	12.4 B					

* Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 18 - A Plant:

Plant Unit: Waste Water Concentrator

	Plant Design Data	Experimental Data (Operating Plant)	Experimental Data (Operating Non-Casification Industry)	EPA Data	Theoretical Data	Other
Effluent			K	(as salts)		
Nature			Solid <i>A</i>			
Biological Hazard						Minor <i>B</i>
Disposition			Mine Disposal <i>A</i>			
Quantity TPD	0.26 <i>B</i>					
Effluent			NH ₃			
Nature			Liquid <i>A</i>			
Biological Hazard	<i>(H)</i>					Possible (7) Hazard
Disposition	0.83		Mine Disposal <i>A</i>			
Quantity	0.52 <i>B</i>					
Effluent			Bicarbonate	(dependant on anion)		
Nature	<i>(H)</i>		Solid <i>A</i>			
Biological Hazard	<i>(H)</i>					Possible Hazard
Disposition	0.51		Mine Disposal <i>A</i>			
Quantity TPD	0.5 <i>B</i>					
Effluent			Chloride	(dependant on anion)		
Nature			Solid <i>A</i>			
Biological Hazard	<i>(H)</i>					Minor
Disposition	7.43		Mine Disposal <i>A</i>			
Quantity TPD	7.34 <i>B</i>					

Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 18 - A Plant:

Plant Unit: Waste Water Concentrator

	Plant Design Data	Experimental Data (Operating Gasification Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent			SO ₄ (Dependent on Anion)			
Nature			Solid <i>H</i>			
Biological Hazard	(H)					Minor _A
Disposition	21.52		Mine Disposal <i>H</i>			
Quantity TPD	21.27 B					
Effluent			NO ₃ (Dependent on Anion as well)			
Nature			Solid <i>H</i>			
Biological Hazard	(H)					Minor _A
Disposition	3.94		Mine Disposal <i>H</i>			
Quantity TPD	3.89 B					
Effluent			Phosphate (Dependent on Anion)			
Nature			Solid <i>H</i>			
Biological Hazard	(H)					Possible Hazard
Disposition	0.49		Mine Disposal <i>H</i>			<i>H</i>
Quantity TPD	0.48 B					
Effluent			Si (As Complex Salts)			
Nature			Solid <i>H</i>			
Biological Hazard						Minor _A
Disposition	✓		Mine Disposal <i>H</i>			
Quantity TPD	0.40 B					

* Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 18- A Plant:

Plant Unit: Waste Water Concentrator

	Plant Design Data	Experimental Data (Operating Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent			Cyanides			
Nature			Solids <i>H</i>			
Biological Hazard						Possible Hazard
Disposition			Mine Disposal <i>H</i>			<i>H</i>
Quantity TPD	0.072 <i>✓</i> <i>B</i>					
Effluent			Phenols			
Nature			Liquid + Solid			
Biological Hazard						Potential Hazard
Disposition			Mine Disposal <i>H</i>			<i>H</i>
Quantity TPD	0.18 <i>✓</i> <i>B</i>					
Effluent			Fatty Acids			
Nature			Liquid + Solid			
Biological Hazard	<i>(H)</i>		<i>H</i>			Possible Hazard
Disposition	1.32		Mine Disposal <i>H</i>			<i>H</i>
Quantity TPD	1.30 <i>B</i>					
Effluent						
Nature						
Biological Hazard						
Disposition						
Quantity						

* Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

ENGINEERING EXPERIMENT STATION

DATA SOURCES

Subgrid 2 - 19 - A* Plant:

Plant Unit: Cooling Tower

		Plant Design Data	Experimental Data (Operating Plant)	Experimental Data (Operating Non-Gasification Industry)	EPA Data	Theoretical Data	Other
Effluent				Evaporation + Drift			
Nature				Gaseous (H ₂ O)			
Biological Hazard				H			None Known
Disposition				Atmosphere H			H
Quantity TPD		29.119 B					
Effluent				Sludge			
Nature				Solid-Liquid H			
Biological Hazard		A					See Each Component
Disposition		1205		Mine Disposal H			
Quantity TPD		11.4 (S) 24 (I)					
Effluent				SLUDGE COMPONENTS CaCO ₃			
Nature				Solid H			
Biological Hazard		I					Minor
Disposition		10.8		Mine Disposal H			
Quantity TPD		2.8 B					
Effluent				Mg (OH) ₂			
Nature				Solid H			
Biological Hazard		I					Minor
Disposition		1.2		Mine Disposal H			
Quantity TPD		2.1 B					

*Key: X - Y - Z where: X - Plant Identification (1, 2, 3, 4); Y - Unit Identification (1 thru 30); Z - A, B, C or D portion of Master grid. See Subgrid Key for further explanation.

Harry Fowle, Manager of Design and Construction

August 5, 1977

RECEIVED

AUG 9 1977

ENGINEERING EXPERIMENT STATION
University of North Dakota
Grand Forks, N. D. 58202

Dr. Mason H. Somerville
Engineering Experiment Station
University of North Dakota
Grand Forks, North Dakota 58202

Dear Dr. Somerville:

We have reviewed the draft of your report for ERDA and have the following comments:

<u>Item</u>	<u>Page</u>	<u>Description</u>
1	Index & Text	We use SNG (Substitute Natural Gas) instead of SPG.
2	5	The Wesco plant will generate only a small amount of electrical power for emergencies.
3	6	Both the Stretford waste vent gas and the Claus plant tail gas are sent to the boiler plant for incineration and on to Flue Gas Desulfurization for further sulfur removal.
4	7	Of the 226.4 STD of sulfur charged to the Gasification Unit, 224.9 STD, or 99.3%, is removed.

The Flue Gas Desulfurization in the boiler plant removes 90% of the sulfur charged to it. The total sulfur distribution is:

	ST/D	Wt%
By-product sulfur	202	78
In hydrocarbon by-products	11	4
Flue gas desulfurization waste	40	15
Vented to atmosphere	5	2
Contained in ash	2	1
	260	100

Dr. Mason H. Somerville
Grand Forks, North Dakota

August 5, 1977
Page 2

<u>Item</u>	<u>Page</u>	<u>Description</u>
5	12	Table I, under Wesco, gives footnote (2) that NO given in data source is unreasonably high. The Wesco Final Environmental Statement does not give this high (143) number.
6	12	Rectisol vent has no nitrogen, oxygen, or water vapor.
7	12	See attachment.
8	26	Bottom of page - typographical error. Should be <u>Wesco</u> plants.
9	62	References did not include Wesco Environmental Impact Statement.

I am enclosing the latest revision of our technical brochure. If you have any questions, please call either Larry Sasadeusz (714) 975-4527 or Tom Berty (714) 975-4474.

Very truly yours,

Harry Fowle

HF:lr
Enclosures

	N ₂	O ₂	H ₂ O	CO ₂	CO	H ₂	CH ₄	C ₂ H ₆	C ₃ H ₈	C ₂ H ₄	C ₃ H ₆	Hydro. Incl. CH ₄ & CH ₃ OH	CH ₃ OH	H ₂ S	SO ₂	COS	CS ₂	Sulfur NO _x Comp. as S	(5) Part.	
Oxygen Plant Vent	19,636	392		4																
Boiler Plant Stack (before scrubber)																				
Coal Combustion	25,672	1,214	1,931	8,019											64.60	62.84		32.30	17.5	0.82
Gas Liquor Vent	212	59	12	66											2.00			1.00		
Gas Liquor Expansion	0	0	6	44											1.80			1.90		
Hydrocarbons Removed	1,357	0	172	849											2.20			1.10		
Stretford Vent	1,460	0	157	9,474											1.90			.95		
Claus Tail Gas	319	0	37	121											14.48			7.24		
Catalyst Regeneration															0.22			.11		
Total to Stack Gas Scrubber	29,020	1,273	2,315	18,573											89.20			44.60	17.5	
Total to Stack and Atmosphere (after scrubber)	29,020	1,273	2,315	18,573											8.92			4.46		
Superheater Stack																				
Fuel Oil Combustion	3,008	211	191	733											.40			.20	1.2	
Coal Lock Vent (not incinerated)	0	0	0	1,740			0	9.1	1.4	0.5	0.6	11.9	.35	.004	0	0.07		.04		
Rectisol Vent	0	0	0	8,157											.42			.21		
Total to Superheater Stack	3,008	211	191	10,630			0	9.1	1.4	0.5	0.6	11.9	.35	.004	.82	0.07		.45		0.82
Cooling Towers			13,100																	
Total Gaseous Effluent															9.74			4.91	18.7	0.82

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AUG 17 1977

ENGINEERING EXPERIMENT STATION
University of North Dakota
Grand Forks, N. D. 58202

August 12, 1977

Mr. Mason H. Somerville
Manager, Engineering Experiment Station
The University of North Dakota
Grand Forks, North Dakota 58202

Dear Mr. Somerville:

ANG has examined the report "A Comparative Analysis of Effluents from Four Proposed Dry Ash Lurgi Gasification Facilities" and our comments are attached for your review.

If you have any questions regarding these comments or any aspect of our design, please do not hesitate to call.

Sincerely,

M. J. Mujadin
Manager, Process Engineering

MJM:njm

cc: Messrs. A. W. Hilley - NGPL
G. N. Weinreich

A Comparative Analysis of Effluents from
Four proposed Dry Ash Lurgi Gasification Facilities

Page No.

Comment

- 3 ANG has made the decision to alter the plant design to 125 MM SCFD SNG output.
- Synthetic pipeline gas is generally referred to as synthetic or substitute natural gas, or SNG, rather than as SPG.
- 4 ANG is using the U.S. Steel Phosam-W process for removal of ammonia from gas liquor.
- 9 The coal fines produced during crushing and handling will be sold to Basin Electric for the generation of electric power, and will no longer be used to produce steam for the gasification complex. The ANG steam boilers will be fired with tar and tar oil by-products. This will result in emission levels of only 0.78 lb. SO₂/MM BTU for our boilers, below the federal standard of 0.8 lb/SO₂ MM BTU. A stack gas scrubbing system therefore, is not necessary and has been deleted from our design.
- All of the Rectisol and Phosam-W waste gas streams will be treated in a Stretford unit for H₂S removal. They will then be incinerated in a superheater which will be fired by by-product tar oil, phenol and naphtha.
- All incinerated gases will be released to the atmosphere via a single 400 ft. stack.
- The statement that we have substituted only a Stretford sulfur recovery plant for the original Stretford-Claus/IFP unit resulting in a reduction in sulfur recovery from 204 t/d to 175-180 t/d is misleading. The scheme which utilized a Stretford-Claus/IFP unit also included a Wellman-Lord stack gas scrubbing unit to remove SO₂ from the boiler flue gas. The boilers at that time were coal fired. Our decision to use liquid by-products as fuel to these boilers reduced the amount of coal to the gasification complex. This was accompanied by a corresponding reduction in the amount of incoming sulfur. Actually, the percentage of sulfur that is recovered is nearly the same for both processing schemes. In fact, the Stretford only scheme, with emissions of 6.9% of the total incoming sulfur, is more efficient in this regard than the Wellman-Lord, Stretford,

Page No.

Comment

9 cont'd

Claus/IFP scheme which resulted in emissions of 7.1% of the incoming sulfur.

9-10

What is the basis for the statement that other choices of flue gas scrubbers can reduce the sulfur content of the stack gas discharge to atmosphere by 16-44 percent dependent on the configuration of equipment installed? Our evaluations indicate that further sulfur dioxide treatment of the superheater flue gas is impractical for several reasons. First, the maximum SO₂ content of the total superheater flue gas will be around 300 ppm (the average concentration would be around 200 ppm). This is considered to be near the limit that SO₂ recovery systems can be operated efficiently. (200 ppm is considered to be the lower practical limit). Furthermore, to remove any more SO₂ would require use of excessive amounts of steam, power and capital cost and would not produce any great difference in air quality.

13

Again, ANG will not install stack gas scrubbers.

15

The moisture content of ANG lignite is approximately 35% rather than 36%.

24

EPA's current thinking is reflected in the following formula for sulfur emissions obtained from Mr. Walt Weathers of EPA, Research Triangle Park, North Carolina:

$$E = (0.03) (f) (A) 0.075 (B) 0.25$$

where $f = (0.03) (\% \text{ organic sulfur}) = 0.46$

where $\%$ organic sulfur = the $\%$ organic sulfur in the mixed gas to the Rectisol unit.

where $E = \text{sulfur in \#/hr.}$

$A = \text{sulfur to gasifier in \#/hr.}$

$B = \text{MM BTU/hr. to gasifier in form of coal.}$

27

It is stated that Stretford technology has not been proven on raw Lurgi gas. Sasol, however, has recently started up a Stretford unit using the high CO₂ Rectisol off gas. In addition, Natural Gas Pipeline has a plant at Loudon, Illinois which currently treats a waste stream with a high CO₂ value (85%-90%).

28

Significant temporary variations in inlet H₂S concentration will not adversely affect the efficiency of the Stretford operation. This is one of the advantages of this process. A Claus plant requires a feed stream to the reactors with the proper H₂S/SO₂ ratio and fluctuations in sulfur content make control difficult if not impossible. Stretford, however, is an absorption process whose operation does not depend on constant H₂S levels.

<u>Page</u>	<u>Comment</u>
29	What is the source of the data presented in figure 1?
32	ANG is currently conducting several laboratory investigations to determine the leachability of the gasifier ash and the leachability of mixtures of the ash and overburden. Since the gasifier ash at Sasol is piled at the mine site, little information can be gained regarding effects of mine disposal of the ash.
35	<p>CO₂ production can vary depending upon the level of operation of the gasification complex, but it is not influenced by the mining plan. Satisfactory operation of a Stretford column, therefore, is not dependent upon proper execution of a blending scheme. In addition, large variations in CO₂ production will not adversely effect the Stretford unit.</p> <p>Higher molecular weight organic compounds in the syn gas are condensed and separated from the raw gas stream in a wash cooler rather than a spray cyclone.</p>
37	A centrifuge is not the only equipment that can be used to recover sulfur. Continuous autoclaves are in use at several plants. Utilizing the principle of gravity separation, sulfur is melted and withdrawn from the bottom of the autoclave, while Stretford solution is returned from the top of the autoclave back to the process.
38	A constant CO ₂ /H ₂ S ratio is not required to maintain a 1 ppm outlet. Also, condensable hydrocarbons and HCN would not affect sulfur levels at the outlet of the absorber. They can, however, affect sulfur purity and the size of the purge stream respectively.
43	See comment referring to page 27 of the progress report.

A Comparative Analysis of Effluents from
Four Proposed Dry Ash Lurgi Gasification Facilities

Page

Comments on Recommendations

47-49

It is not necessary to test the Stretford unit on a pilot plant basis since two similar applications already exist.

The decision for allowing credit for fuels used in steam generation, incineration or electric generation is confusing and should be clarified. The ANG Supplemental Application for a Permit to Construct is cited as a reference. In our Application, we requested two interpretations regarding the applicability of NSPS to our steam generating units. First, we requested that the incineration of the Stretford off-gases be exempted from the 0.8 lb. SO₂/MM BTU heat input emission standard. The NDSHD has since determined that since these gases are not produced for the purpose of generating useful heat, they are not subject to the 0.8 lb/MM BTU standard. We also requested that lignite derived liquid by-products be exempted from applicable NO_x emission standards, since the nitrogen and oxygen content of these derived fuels are higher than typical liquid fuels. The burning of these by-product fuels also will result in lower total emissions of both NO_x and SO₂ when compared to the alternative of burning lignite. Since BACT is utilized in burning these fuels, the NDSHD has determined that these fuels are not subject to the existing standards. Without these interpretations, lignite would have to be burned in the boilers and Stretford off-gases incinerated in a separate flare. This would result not only in higher emissions rates, but also higher energy costs.

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October 20, 1978

Dr. Dorab N. Baria
Department of Chemical Engineering
University of North Dakota
Grand Forks, ND 58202

Dear Dr. Baria:

The requirements of another project have prevented me from completing, until recently, the coal gasification analysis we discussed on the telephone approximately two months ago. I have just now been able to complete this project, and I am able to give you some information concerning current coal gasification facility costs. Specifically, please find enclosed a copy of excerpts of a memorandum detailing the plant costs for the El Paso plant.

You will note that these costs do not include mine costs specifically. Presumably mine costs would be internalized in the coal cost component of the direct operating costs. The total direct cost of the plant is 375 mm\$ (1978 dollars); including indirect costs, the fixed capital investment is 563.5 mm\$. The 250 MMSCFD plant (288 MMSCFD averaged over one year at a 86% capacity factor) costs 1,600 mm\$ or 1,096 mm\$ in 1972 dollars. Conversations with engineers with El Paso, WESCO, and ANR suggest that the great escalation is a result of severe inflation for several key process components. Double-walled reactor chambers, I am told, increased in cost 40% annually for 1974 and 1975, and approximately 10% annually thereafter.

I hope this information is helpful in your response to the DOE comments on your draft final report of A Comparative Study of...

Dr. Dorab N. Baria
Page two

October 20, 1978

If you have any comments or questions, or if you would like a copy of my report, feel free to contact me.

Sincerely yours,

Jim Stock
Policy Analyst

JS:ERZ
Enclosure

P.S. The memorandum included was given to me by Mike Atcheson of El Paso Natural Gas Company, El Paso, Texas. Its contents, while not proprietary, should not be quoted without his approval.

Memorandum

J. J. Mills

DATE: July 17, 1978

FROM: R. E. Moore

PLACE: ENGINEERING DEPARTMENT
Process Engineering

Subject: Pollution Control Investments

The investments associated with pollution control equipment for the 72 MSCFD plant are tabulated below.

MM\$ (1st Quarter 1978)

Stretford Sulfur Recovery	11.4
Evaporation Ponds	1.7
Shift Catalyst Regeneration Scrubber	0.3
Phenolsolvan (CGL only)	6.5
Gas Liquor Stripping (CGL only)	7.5
Cooling Tower (CGL only)	3.3
Vent Gas Recovery (Area 08)	0.6
Rectisol Vent Compression	5.4
Waste Water Treating (AP) and Sanitary)	0.3
Dusty Gas Liquor System	2.2
Incineration	2.1
Coal lock Vent System	0.9
Vapor Recovery - Storage and Loading	0.2
Dust Collection and Suppression	1.1
H ₂ Supply & Fuel Oil Hydrotreating	15.6
Ash Removal System	10.5
Subtotal	69.6
Associated Indirect Costs	13.2
Total	82.8

This estimate contains all items which could be associated with pollution control.

Roger E. Moore
R. E. Moore

REM/pl

1978 CAPITAL COST ESTIMATE FOR 72 MCFD PLANT

\$ MILLIONS

01	GAS PRODUCTION	38.6
02	SHIFT CONVERSION	7.7
03	GAS COOLING	10.3
04	GAS PURIFICATION	29.0
05	REFRIGERATION	5.1
06	METHANATION	14.3
07	PRODUCT GAS COMPRESSION	4.0
08	GAS LIQUOR SEPARATION	7.2
09	PHENOL RECOVERY	6.5
10	GAS LIQUOR STRIPPING	7.5
11	LOCK GAS RECOVERY	7.0
12	SULFUR RECOVERY	11.4
13	LIQUIDS HYDROTREATING	15.6
	PROCESS	<u>164.2</u>
23	AIR COMPRESSION	19.5
24	STEAM AND POWER	38.1
25	OXYGEN PRODUCTION	24.7
26	OXYGEN COMPRESSION	6.1
27	RAW WATER TREATING	13.5
28	COOLING WATER	3.7
30	MISC. UTILITIES	6.4
	UTILITIES	<u>112.0</u>
40	COAL CRUSHING	
41	COAL PREPARATION	23.7
42	COAL FINES HANDLING	2.9
43	ASH Dewatering	7.4
44	RIVER WATER PUMPING	5.2
45	RIVER WATER PIPELINE	12.3
46	RAW WATER STORAGE	3.0
48	ASH HANDLING	3.1
	COAL AND WATER	<u>57.6</u>
51	SITE PREPARATION	12.6
52	BUILDINGS	11.0
53	ELECTRICAL DISTRIBUTION	2.2
54	INTERCONNECTING PIPING	5.8
55	EVAPORATION PONDS	1.7
56	PRODUCT STORAGE AND LOADING	4.8
57	PRODUCT GAS PIPELINE	3.2
	OFFSITES	<u>41.3</u>
	PROCESS	164.2
	UTILITIES	112.0
	COAL AND WATER	57.6
	OFFSITES	41.3
	TOTAL DIRECT	<u>375.1</u>

SUMMARY OF ECONOMICS (\$)

	<u>72 MMCFO</u>	<u>144 MMCFO</u>	<u>288 MMCFO</u>	<u>288 MMCFO</u>
	<u>1978</u>	<u>Stand Alone</u>	<u>Stand Alone</u>	<u>Expanded</u>
		<u>1978</u>	<u>1978</u>	<u>1978</u>
Total Capital Cost, \$M	557,012	844,551	1,376,603	1,600,51
Cost of Service				
First Year, \$/MCF	7.20	5.57 <i>5.24/mile</i>	4.65 - 4.81 <i>/mile</i>	7.20
25 Year Average, \$/MCF	5.15	4.03 <i>4.22</i>	3.40 <i>3.56/mile</i>	3.79
Coal Cost Used, \$/Ton	14.00	13.00	12.00 14.00	<u>1/</u>

1/Phase 1 @ 14 S/T, Phase 2 @ 13 S/T and Phase 3 @ 12 S/T.

JLH
5/23/78

TOTAL CAPITAL REQUIREMENTS

Page 2

1478*

	<u>1978</u>
Direct Cost	374,577 *
Cat & Chem	2,000
Land or Navajo Payments	2,333
Contingency	28,100
Navajo Training	5,000
Roads	1,500
General Overheads	<u>7,000</u>
Subtotal	420,530
Working Capital	<u>9,700</u>
Subtotal	430,230
Sunk Costs	<u>15,900</u>
Subtotal	<u>446,130</u>
AFC on Equity	66,200
Interest during Constr.	<u>51,154</u>
TOTAL	563,500

E-63

* U.S. GOVERNMENT PRINTING OFFICE: 1980-640-258 2068

* Disregard small difference between this cost & that shown on Page

1978 Costs escalated to follow actual cash flow requirements projected for a 1980 Final Investment Decision and a fourth quarter 1982 startup. An escalation rate of 6% was used.