TACON 1/5

23

Interpoll Inc.
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RESULTS OF THE JUNE 25 AND 26, 1980 PARTICULATE EMISSION COMPLIANCE TESTS ON THE NO. 2 LOADING POCKET COLLECTOR AND THE NO. 7 AND 8 PELLET SCREEN COLLECTOR AT THE ERIE MINING COMPANY PLANT NEAR HOYT LAKES, MINNESOTA

Submitted to:

ERIE MINING COMPANY
P. O. Box 847
Hoyt Lakes, Minnesota 55750

Attention: Frank Settimi

Approved by:

Perry Lonnes

Perry Lonnes, Ph.D.
Director of Environmental
Measurements Section

Report Number 0-784
July 7, 1980
bjr

TACON 15

Source category: Taconite ore processing
Plant name : Erie Mining Company
Test date : June 25-26, 1980
Process :

Date:
Location:
Ref. No.: 23
Basis for process rate :

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton
No. 7 and 8 pellet screen	Rotoclone	filt. PM	1	8.80	246	0.018	0.036
		filt. PM	2	5.06	246	0.010	0.021
		filt. PM	3	13.72	246	0.028	0.056
				AVERAGE		0.019	0.037
		CO2	1	0.0	246	0.00	0.00
		CO2	2	0.0	246	0.00	0.00
		CO2	3	0.0	246	0.00	0.00
				AVERAGE		0.00	0.00
No. 7 and 8 pellet screen	None	filt. PM	1	1490.15	246	~~3.0~~	~~6.1~~
		filt. PM	2	1577.30	246	3.2	6.4
		filt. PM	3	3503.56	246	7.1	14.2
				AVERAGE		5.2 ~~4.5~~	10.3 ~~8.9~~
		CO2	1	0.0	246	0.0000	0.0000
		CO2	2	0.0	246	0.000	0.000
		CO2	3	0.0	246	0.000	0.000
				AVERAGE		0.0000	0.000
No. 2 loading pocket	Rotoclone	filt. PM	1	32.38	416	0.039	0.078
		filt. PM	2	28.30	416	0.034	0.068
		filt. PM	3	28.39	416	0.034	0.068
				AVERAGE		0.036	0.071
		CO2	1	0.0	416	0.0000	0.0000
		CO2	2	0.0	416	0.000	0.000
		CO2	3	0.0	416	0.000	0.000
				AVERAGE		0.0000	0.000
No. 2 loading pocket	None	filt. PM	1	1515.40	416	1.8	3.6
		filt. PM	2	1581.02	416	1.9	3.8
		filt. PM	3	1521.47	416	1.8	3.7
				AVERAGE		1.9	3.7
		CO2	1	0.0	416	0.0000	0.0000
		CO2	2	0.0	416	0.000	0.000
		CO2	3	0.0	416	0.000	0.000
				AVERAGE		0.0000	0.000

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A - Results of Preliminary Measurements

B - Location of Test Ports and Traverse Points

C - Method 5 Field Data Sheets (No. 7 & 8 Pellet Screen Collector)

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E - Laboratory Data Sheets

F - Method 9 Field Data Sheets

G - Process Rate Data

H - Procedures

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J - Sampling Train Calibration Data

SYMBOLS AND ABBREVIATIONS

ACFM	actual cubic feet per minute
DSCFM	standard cubic feet of dry gas per minute
DEG-F	degrees Fahrenheit
FT/SEC	feet per second
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g	gram
HRS	hours
IN.	inches
IN. H.G.	inches of mercury
IN. W.C.	inches of water
LB	pound
LB/HR	pounds per hour
LB/10^6BTU	million British thermal units of input
microns (µm)	micrometer
MIN	minutes
SQ. FT.	square feet
v/v	percent by volume
mg/DSCM	milligrams per dry standard cubic meter
LB/DSCF	pounds per dry standard cubic foot
MWH	megawatt hours
ohm-cm	ohm-centimeter
HP	horsepower
PSI	pounds per square inch
w/w	percent by weight

Standard conditions are defined as 68°F (20°C) and 29.92 in. of mercury pressure.

1 INTRODUCTION

On June 25 and 26, 1980, Interpoll Inc. personnel conducted particulate emission compliance tests on the No. 2 Loading Pocket Collector and the No. 7 and 8 Pellet Screen Collector at the Erie Mining Company Pellet Plant near Hoyt Lakes, Minnesota. On-site testing was performed by a four-man team under the direction of J. Stock. Coordination between boiler operation and testing activities was provided by Larry Peterson of EMCO. The tests were witnessed by James Kolar of the Minnesota Pollution Control Agency Department of Air Quality.

Both of the sources tested are equipped with Rotoclone wet collectors. The first Rotoclone controls entrained taconite dust from the No. 2 Loading Pocket and the second Rotoclone captures entrained dust from the No. 7 and 8 Pellet Screens. Particulate emissions from these sources are governed by APC-5 which specifies that equipment installed before 1969 which is located not less than 1/4 mile from any residence or public roadway must have control equipment with a collection efficiency of not less than 85% by weight. In order to establish the compliance status of these two collectors, collection efficiency determinations were performed on each of these two collectors.

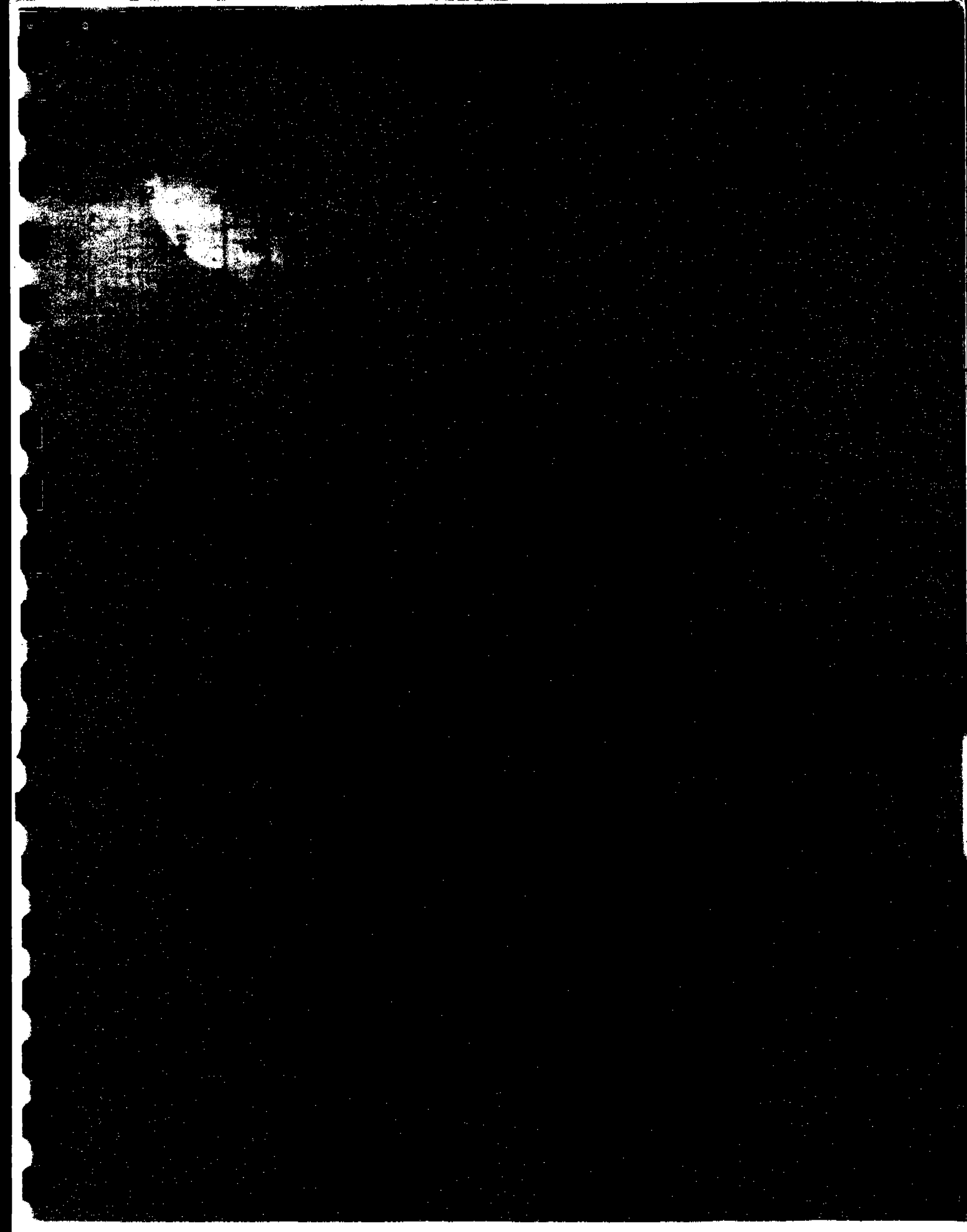
Particulate evaluations were performed in accordance with EPA Methods 1-5, CFR Title 40, Part 60, Appendix A (Revised July 1, 1979). Preliminary determinations of the gas velocity profile was made at both the inlet and outlet of the dust collectors before the first collection efficiency determination to allow selection of the appropriate nozzle diameter required for isokinetic sample withdrawal. Two Interpoll sampling trains which meet or exceed specifications in the above-cited reference were used to extract particulate samples from the inlet and outlet test sites using heated stainless steel-lined probes. A slight modification of the EPA Method 5 sampling train was used at the inlet. Instead of the all glass filter holder, a stainless steel filter holder was used. This modification is described in detail in the appendices.

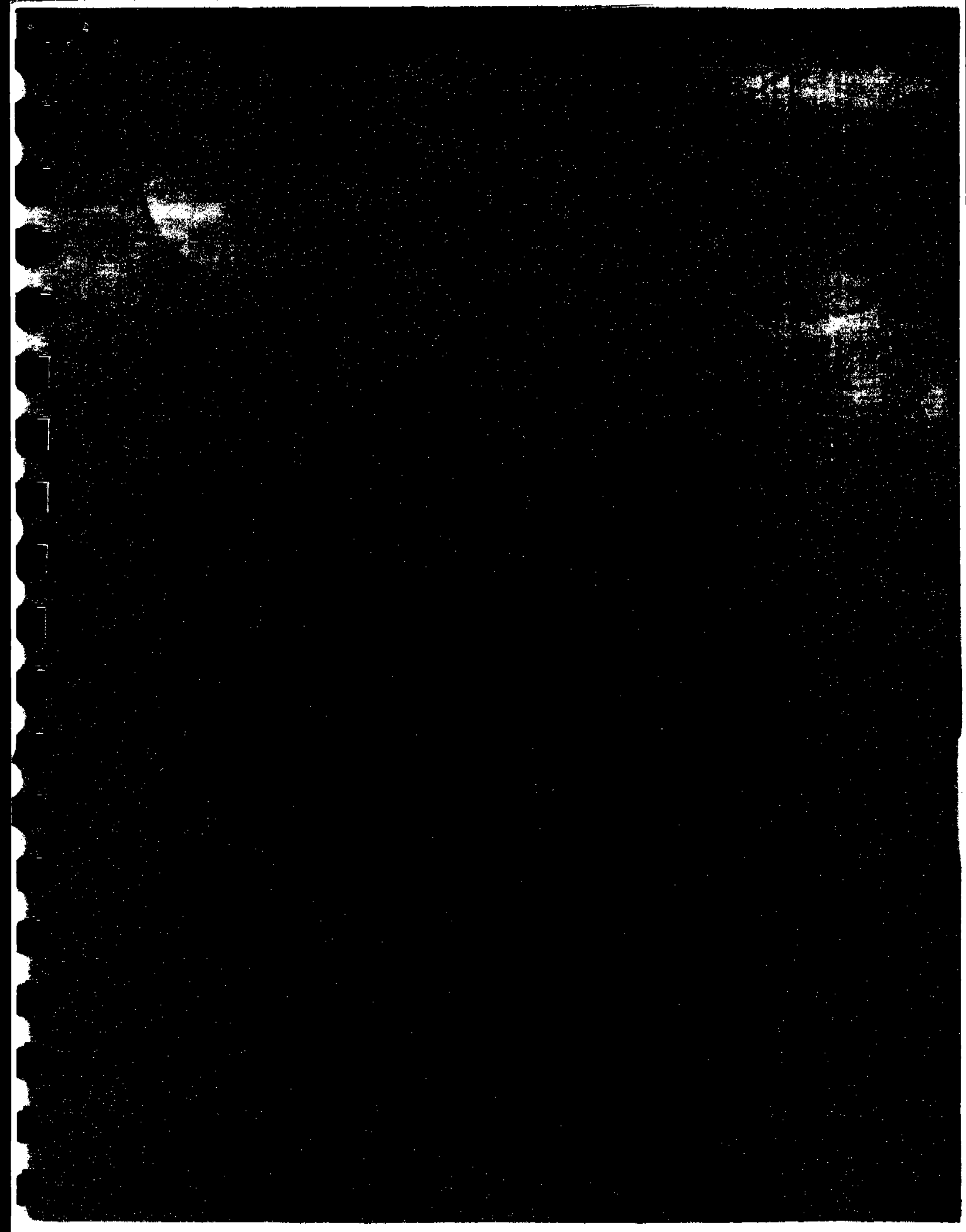
Testing on the No. 7 and 8 Pellet Screen stack was conducted from two test ports oriented at 90° on the stack. These test ports are approximately 31 feet downstream of the I.D. fan inlet and 9'-5" upstream of the stack outlet. A 20-point traverse was used to extract representative particulate samples. Each traverse point at the outlet was sampled three minutes to give a total sampling time of 60 minutes per run. A simultaneous traverse was performed at the inlet to the Rotoclone. A 42-point traverse was used at this site. Each traverse point was sampled 1.5 minutes to give a total sampling time of 63 minutes per run.

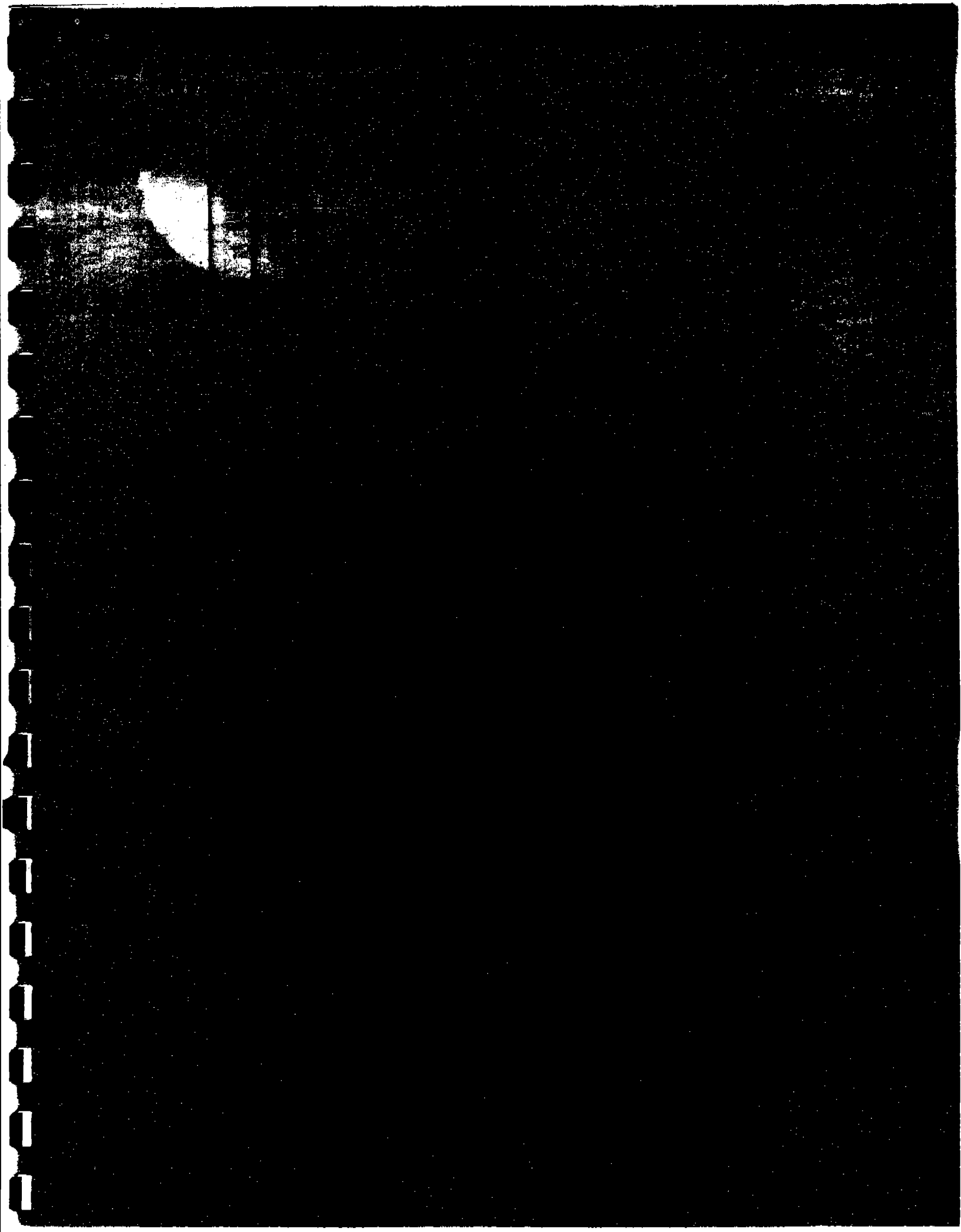
In the case of the No. 2 Loading Pocket Collector, a horizontal row of test ports on the stack was used for outlet testing. These test ports are approximately 24 feet downstream of the I.D. fan and nine feet upstream of the outlet of the rectangular stack. A 12-point traverse was used at this test site. Each traverse point was sampled five minutes to give a total sampling time of 60 minutes per run. At the inlet of the Rotoclone on the No. 2 Loading Pocket, two test ports oriented at 90° were used to form a 12-point traverse. As in the case of the outlet, each traverse point was sampled five minutes to give a total sampling time of 60 minutes per run. Inlet and outlet traverses were conducted simultaneously.

Visible emission determinations were attempted on both sources by a currently-certified observer. Successful readings were obtained on the No. 7 and 8 Pellet Screen stack, however, inclement weather prevented readings being taken on the No. 2 Loading Pocket stack. Unofficial readings before the test were about 5%.

The important results of the two tests are summarized in Section 2. Detailed results are presented in Section 3. Results of preliminary measurements, field data and all other supporting information are presented in the appendices.







3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas composition results for each source are presented first, followed by the particulate emission and opacity data for each source. Preliminary measurements including traverse point description are given in Appendix A and Appendix B.

The results have been calculated on a CDC 3300 computer using standard Fortran programs. EPA-published equations have been used as the basis of the calculation techniques in these programs. It should be noted in interpreting these results that the particulate emission rates have been calculated by both the "concentration x flow" and the "ratio of areas" methods and the average reported. The average is the best estimate of the true value, since the bias introduced by an isokinetic sampling is approximately equal but of opposite sign in the two calculation techniques and thus cancels in the average.

JOB: ERIE MINING COMPANY

INTERPOLL REPORT NO. 0-784

3.2.1 (TEST NO. 1) NO. 7 & 8 PELLET SCREEN ROTOCLONE INLET

RESULTS OF PARTICULATE LOADING DETERMINATIONS -- METHOD 5(BE)

	RUN 1	RUN 2	RUN 3
DATE OF RUN	06/25/80	06/25/80	06/25/80
TIME RUN START/END(HRS)	1015/1127	1150/1319	1325/1435
PITOT TUBE COEFFICIENT	.841	.841	.841
TOTAL MOISTURE IN GAS SAMPLE (GRAMS)	47.0	56.0	58.0
TOTAL PARTICULATE MATERIAL COLLECTED(GRAMS) *	12.5668	12.2906	27.1864
VOLUME THROUGH GAS METER			
METER CONDITIONS (CF)	54.14	45.83	45.60
STANDARD CONDITIONS (SCF)	49.20	41.09	40.58
TOTAL SAMPLING TIME (MIN)	63.0	63.0	63.0
NOZZLE DIAMETER (IN)	.186	.186	.186
AVERAGE STACK GAS TEMPERATURE DURING DETERMINATION (DEG-F)	165	170	173
VOLUMETRIC FLOW**			
ACTUAL ..... (ACFM)	53083	53703	53930
DRY STANDARD ... (DSCFM)	40247	39679	39514
ISOKINETIC VARIATION (%)	119.0	100.9	100.0
PARTICLE CONCENTRATION			
ACTUAL ..... (GR/ACF)	2.9884	3.4100	7.5742
DRY STANDARD ... (GR/DSCF)	3.9415	4.6152	10.3374
PARTICLE MASS FLOW (LB/HR)	1490.15	1577.30	3503.56

* DRY CATCH ONLY
** CALCULATED ON THE BASIS OF VELOCITY PRESSURES MEASURED DURING THIS PARTICULATE DETERMINATION.

3.2.2 (TEST NO. 1) NO. 7 & 8 PELLET SCREEN ROTOCLONE STACK

RESULTS OF PARTICULATE LOADING DETERMINATIONS -- METHOD 5(BE)

	RUN 1	RUN 2	RUN 3
DATE OF RUN	06/25/80	06/25/80	06/25/80
TIME RUN START/END(HRS)	1015/1121	1150/1252	1325/1427
PITOT TUBE COEFFICIENT	.840	.840	.840
TOTAL MOISTURE IN GAS SAMPLE (GRAMS)	74.0	61.0	70.0
TOTAL PARTICULATE MATERIAL COLLECTED(GRAMS) *	.0801	.0455	.1236
VOLUME THROUGH GAS METER			
METER CONDITIONS (CF)	58.68	58.33	57.35
STANDARD CONDITIONS (SCF)	54.12	53.09	51.98
TOTAL SAMPLING TIME (MIN)	60.0	60.0	60.0
NOZZLE DIAMETER (IN)	.247	.247	.247
AVERAGE STACK GAS TEMPERATURE DURING DETERMINATION (DEG-F)	107	110	110
VOLUMETRIC FLOW**			
ACTUAL ..... (ACFM)	53053	53118	52323
DRY STANDARD ... (DSCFM)	44315	44578	43500
ISOKINETIC VARIATION (%)	102.7	100.1	100.5
PARTICLE CONCENTRATION			
ACTUAL ..... (GR/ACF)	.0191	.0111	.0305
DRY STANDARD ... (GR/DSCF)	.0228	.0132	.0367
PARTICLE MASS FLOW (LB/HR)	8.80	5.06	13.72

* DRY CATCH ONLY
** CALCULATED ON THE BASIS OF VELOCITY PRESSURES MEASURED DURING THIS PARTICULATE DETERMINATION.

JOB: ERIE MINING COMPANY

INTERPOLL REPORT NO. 0-784

3.2.3 (TEST NO. 2) NO. 2 LOADING POCKET ROTOCLONE INLET

RESULTS OF PARTICULATE LOADING DETERMINATIONS -- METHOD 5(BE)

	RUN 1	RUN 2	RUN 3
DATE OF RUN	06/26/80	06/26/80	06/26/80
TIME RUN START/END(HRS)	850/ 954	1015/1119	1140/1244
PITOT TUBE COEFFICIENT	.841	.841	.841
TOTAL MOISTURE IN GAS SAMPLE (GRAMS)	45.0	50.0	58.0
TOTAL PARTICULATE MATERIAL COLLECTED(GRAMS) *	73.6653	76.7793	74.1555
VOLUME THROUGH GAS METER			
METER CONDITIONS (CF)	44.18	44.03	44.15
STANDARD CONDITIONS (SCF)	41.31	40.88	40.98
TOTAL SAMPLING TIME (MIN)	60.0	60.0	60.0
NOZZLE DIAMETER (IN)	.186	.186	.186
AVERAGE STACK GAS TEMPERATURE DURING DETERMINATION (DEG-F)	231	230	243
VOLUMETRIC FLOW**			
ACTUAL ..... (ACFM)	9356	9325	9530
DRY STANDARD ... (DSCFM)	6400	6347	6316
ISOKINETIC VARIATION (%)	100.6	100.5	101.2
PARTICLE CONCENTRATION			
ACTUAL ..... (GR/ACF)	18.8239	19.7219	18.5033
DRY STANDARD ... (GR/DSCF)	27.5168	28.9774	27.9194
PARTICLE MASS FLOW (LB/HR)	1515.40	1581.02	1521.47

* DRY CATCH ONLY
** CALCULATED ON THE BASIS OF VELOCITY PRESSURES MEASURED DURING THIS PARTICULATE DETERMINATION.

JOB: ERIE MINING COMPANY

INTERPOLL REPORT NO. 0-784

3.2.4 (TEST NO. 2) NO. 2 LOADING POCKET ROTOCLONE STACK

RESULTS OF PARTICULATE LOADING DETERMINATIONS -- METHOD 5(BE)

	RUN 1	RUN 2	RUN 3
DATE OF RUN	06/26/80	06/26/80	06/26/80
TIME RUN START/END(HRS)	850/ 951	1015/1117	1140/1242
PITOT TUBE COEFFICIENT	.844	.844	.844
TOTAL MOISTURE IN GAS SAMPLE (GRAMS)	66.0	61.0	62.0
TOTAL PARTICULATE MATERIAL COLLECTED(GRAMS) *	1.1875	1.0410	1.0447
VOLUME THROUGH GAS METER			
METER CONDITIONS (CF)	36.85	37.45	37.29
STANDARD CONDITIONS (SCF)	34.40	34.35	34.17
TOTAL SAMPLING TIME (MIN)	60.0	60.0	60.0
NOZZLE DIAMETER (IN)	.184	.184	.184
AVERAGE STACK GAS TEMPERATURE DURING DETERMINATION (DEG-F)	123	128	130
VOLUMETRIC FLOW**			
ACTUAL ..... (ACFM)	8926	8883	8871
DRY STANDARD ... (DSCFM)	7049	6998	6953
ISOKINETIC VARIATION (%)	101.1	101.7	101.8
PARTICLE CONCENTRATION			
ACTUAL ..... (GR/ACF)	.4206	.3683	.3698
DRY STANDARD ... (GR/DSCF)	.5327	.4675	.4718
PARTICLE MASS FLOW (LB/HR)	32.38	28.30	28.39

* DRY CATCH ONLY

** CALCULATED ON THE BASIS OF VELOCITY PRESSURES MEASURED DURING THIS PARTICULATE DETERMINATION.

RESULTS OF PARTICLE SIZE DISTRIBUTION DETERMINATION

METHOD: X-RAY SEDIMENTATION

SAMPLE: ERIE MINING CO.

3.4.1 TACONITE DUST: No. 7 & 8 Pellet Screen (Test 1 Run 2 6-25-80)

PARTICLE DIAMETER* (UM)	REL. CUM. FREQ. PERCENT BY MASS GREATER THAN
63.00	4.94
60.00	4.94
50.00	4.94
40.00	4.94
30.00	4.94
20.00	4.94
15.00	6.53
10.00	16.03
8.00	27.12
5.00	52.47
3.00	73.07
2.00	82.58
1.00	92.08
.80	93.66
.50	96.83
.30	98.41
.25	99.21

PARTICLE DIAMETER* (UM)	RELATIVE FREQ. PERCENT BY MASS
> 63.00	4.94
63.00- 60.00	0
60.00- 50.00	0
50.00- 40.00	0
40.00- 30.00	0
30.00- 20.00	0
20.00- 15.00	1.59
15.00- 10.00	9.50
10.00- 8.00	11.09
8.00- 5.00	25.35
5.00- 3.00	20.60
3.00- 2.00	9.51
2.00- 1.00	9.50
1.00- .80	1.58
.80- .50	3.17
.50- .30	1.58
.30- .25	.80
< .25	.79

*SPHERICAL PARTICLES AT A DENSITY OF 4.43 G/CC (ASSIGNED)

NOTE: MAGNETIC MATERIAL
COLOR - REDDISH BLACK

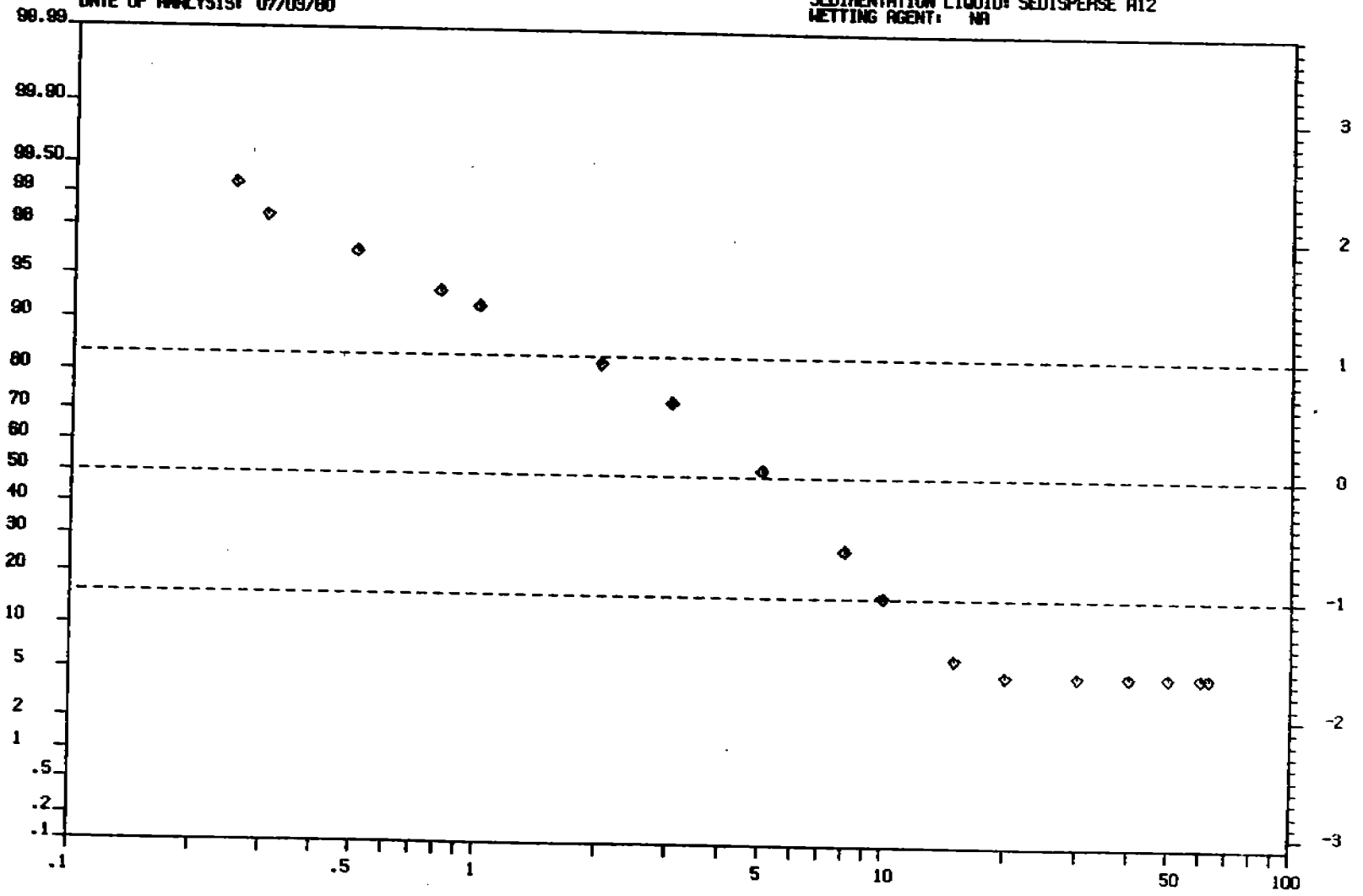
INTERPOLL REPORT NO. D-784

LOG-NORMAL PLOT OF THE CUMULATIVE WEIGHT-SIZE DISTRIBUTION

METHOD: X-RAY SEDIMENTATION

SAMPLE DESCRIPTION: ERIE MINING CO.
TACONITE DUST: 728 PEL SC ROTO INLET (TEST 1 RUN 2 8-25-80)
SAMPLE DENSITY (G/CC): 4.43 (ASSIGNED)
DATE OF ANALYSIS: 07/09/80

FEEDING LIQUID: NA
DISPERING AGENT(S): NA
SEDIMENTATION LIQUID: SEDISPERSE A12
WETTING AGENT: NA

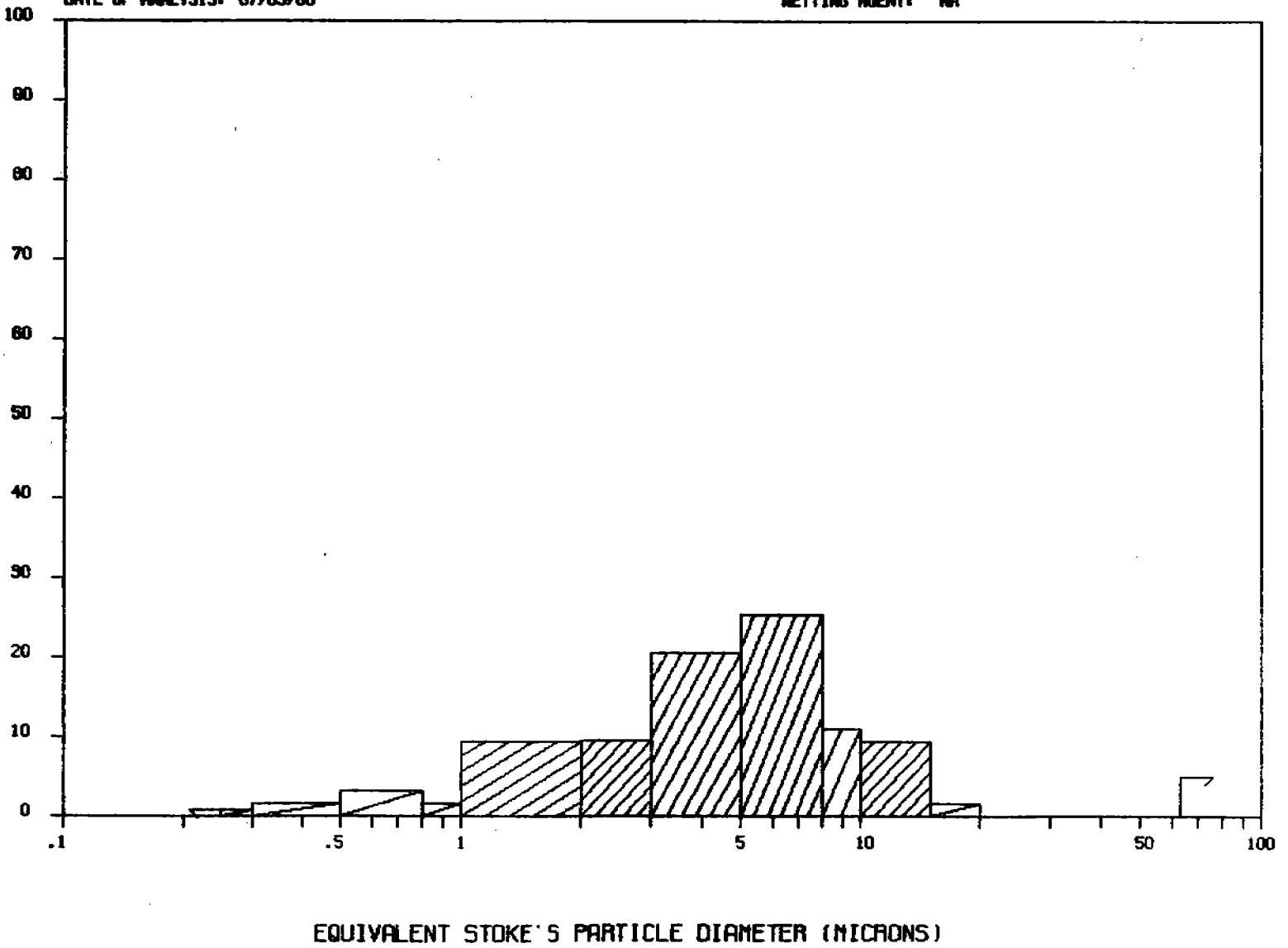


INTERPOLL REPORT NO. 0-784

SEMI-LOG PLOT OF THE WEIGHT-SIZE DISTRIBUTION
METHOD: X-RAY SEDIMENTATION

SAMPLE DESCRIPTION: ERIE MINING CO.
TACONITE DUST: 788 PEL SC ROTO INLET (TEST 1 RUN 2 6-25-80)
SAMPLE DENSITY (G/CC): 4.43 (ASSIGNED)
DATE OF ANALYSIS: 07/09/80

FEEDING LIQUID: NA
DISPERING AGENT(S): NA
SEDIMENTATION LIQUID: SEDISPERSE A12
WETTING AGENT: NA



RESULTS OF PARTICLE SIZE DISTRIBUTION DETERMINATION

METHOD: X-RAY SEDIMENTATION

SAMPLE: ERIE MINING CO.

3.4.2 TACONITE DUST: No. 2 Loading Pocket (Test 2 Run 2 6-26-80)

PARTICLE DIAMETER* (UM)	REL. CUM. FREQ. PERCENT BY MASS GREATER THAN
63.00	2.89
60.00	2.89
50.00	2.89
40.00	4.89
30.00	8.10
20.00	17.90
15.00	30.73
10.00	49.44
8.00	58.95
5.00	75.97
3.00	87.99
2.00	92.00
1.00	97.00
.80	98.00
.50	99.90

PARTICLE DIAMETER* (UM)	RELATIVE FREQ. PERCENT BY MASS
> 63.00	2.89
63.00- 60.00	0
60.00- 50.00	0
50.00- 40.00	2.00
40.00- 30.00	3.21
30.00- 20.00	9.80
20.00- 15.00	12.83
15.00- 10.00	18.71
10.00- 8.00	9.51
8.00- 5.00	17.02
5.00- 3.00	12.02
3.00- 2.00	4.01
2.00- 1.00	5.00
1.00- .80	1.00
.80- .50	1.90
< .50	.10

*SPHERICAL PARTICLES AT A DENSITY OF 4.43 G/CC (ASSIGNED)

NOTE: MAGNETIC MATERIAL
COLOR - REDDISH BLACK

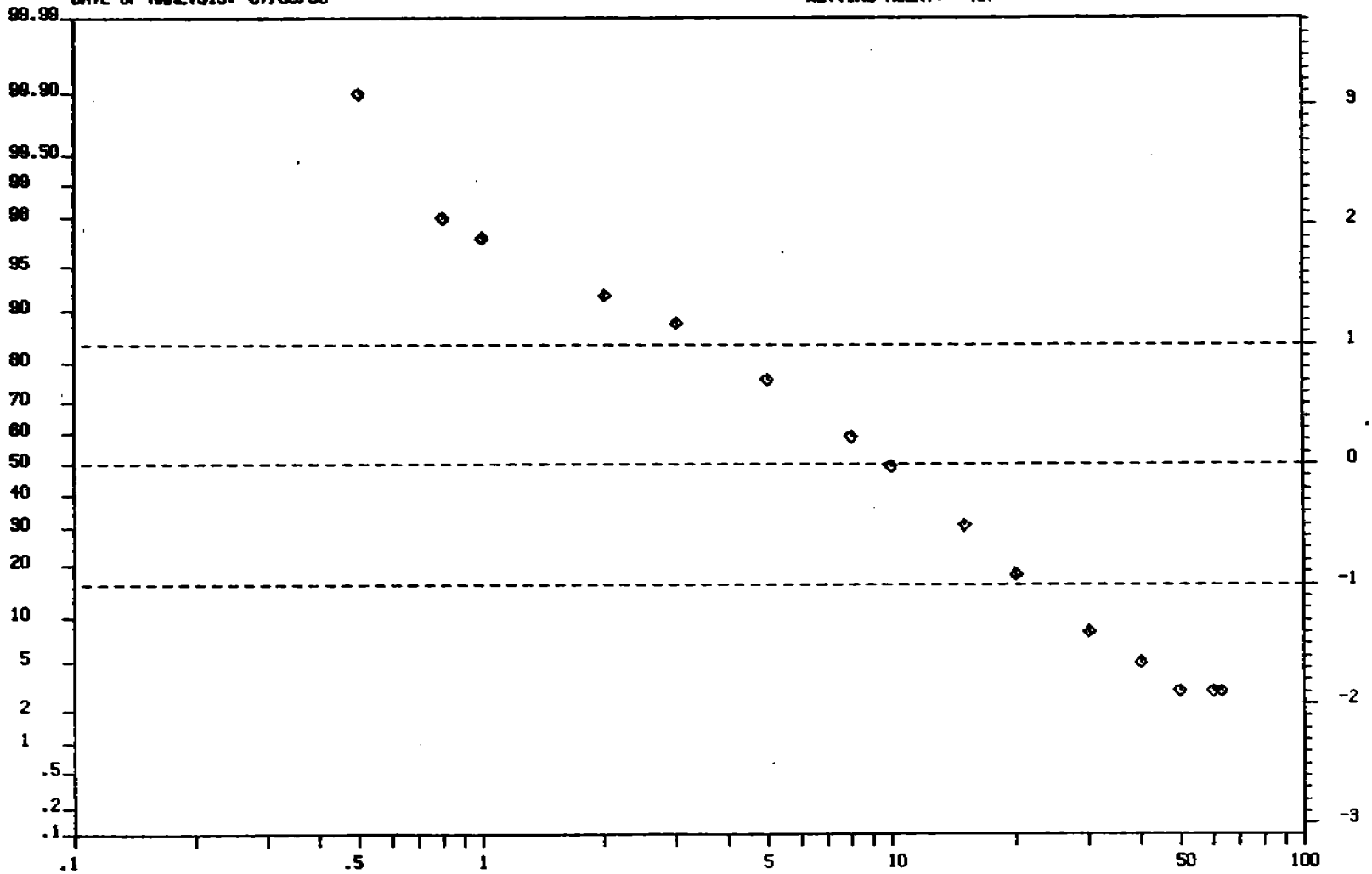
INTERPOLL REPORT NO. 0-784

LOG-NORMAL PLOT OF THE CUMULATIVE WEIGHT-SIZE DISTRIBUTION

METHOD: X-RAY SEDIMENTATION

SAMPLE DESCRIPTION: ERIE MINING CO.
TACONITE DUST: #2 LOAD PO ROTO INLET (TEST 2 RUN 2 6-26-80)
SAMPLE DENSITY (G/CC): 4.49 (ASSIGNED)
DATE OF ANALYSIS: 07/09/80

FEEDING LIQUID: NA
DISPERING AGENT(S): NA
SEDIMENTATION LIQUID: SEDISPERSE A12
WETTING AGENT: NA



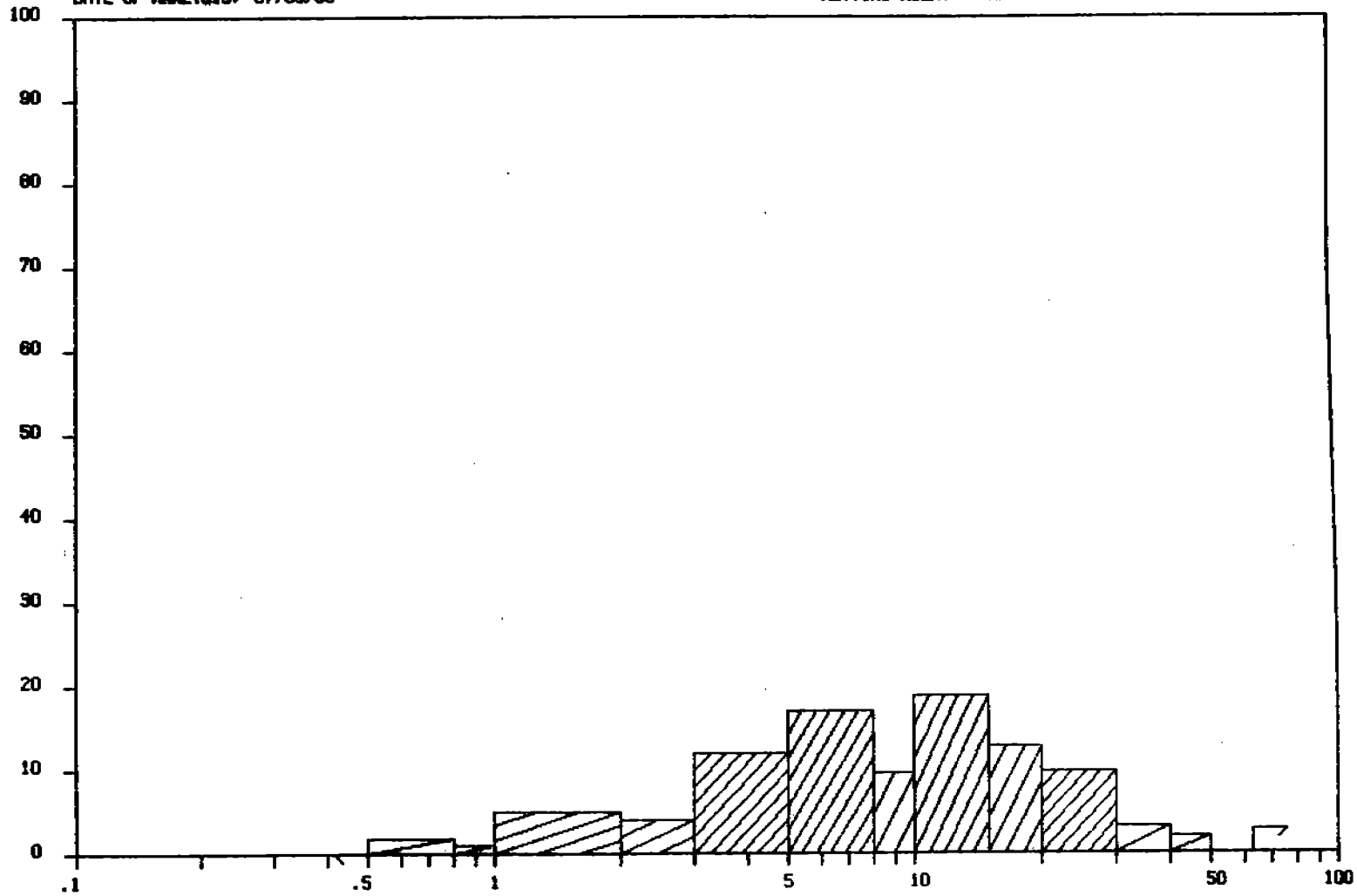
INTERPOLL REPORT NO. O-784

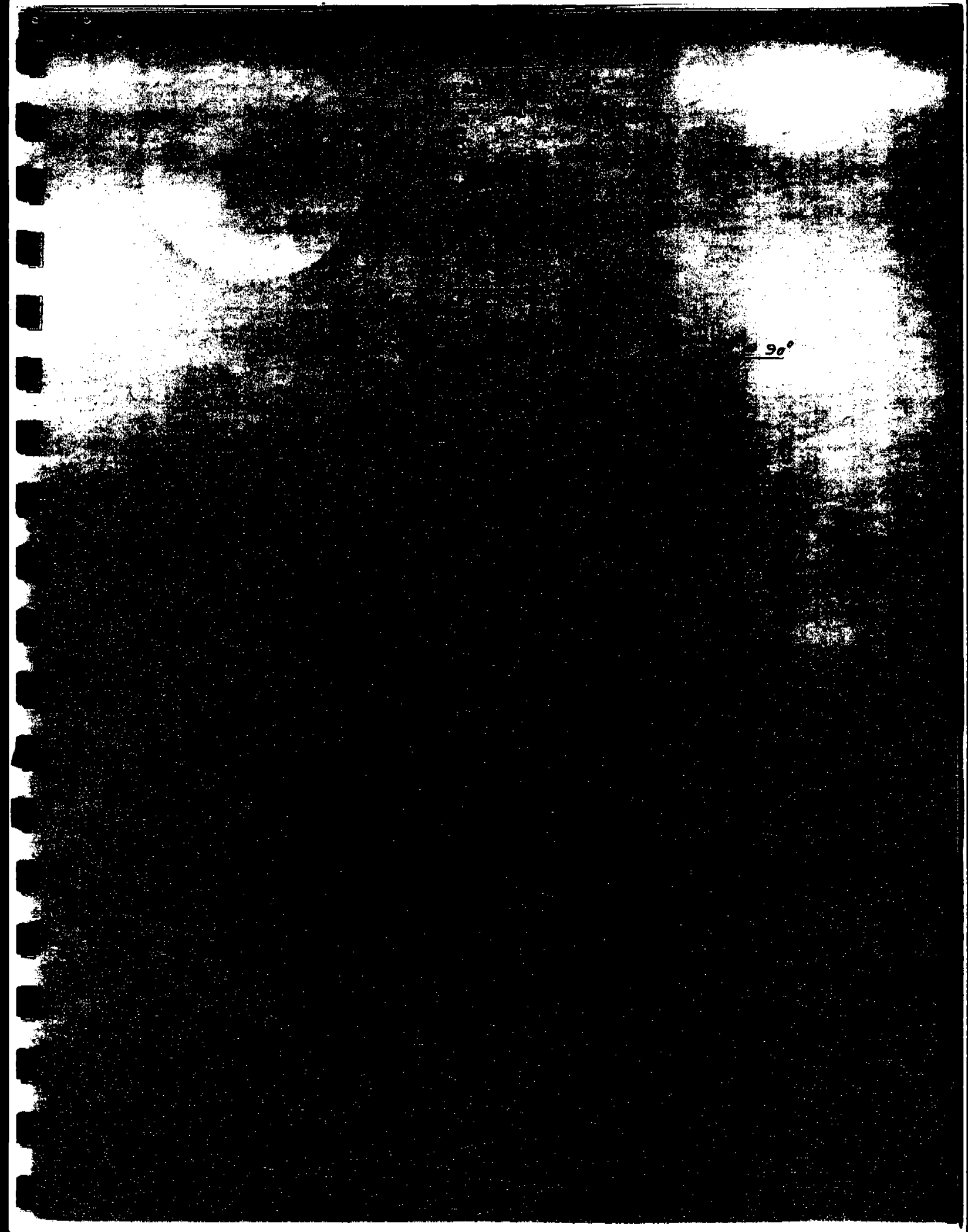
SEMI-LOG PLOT OF THE WEIGHT-SIZE DISTRIBUTION

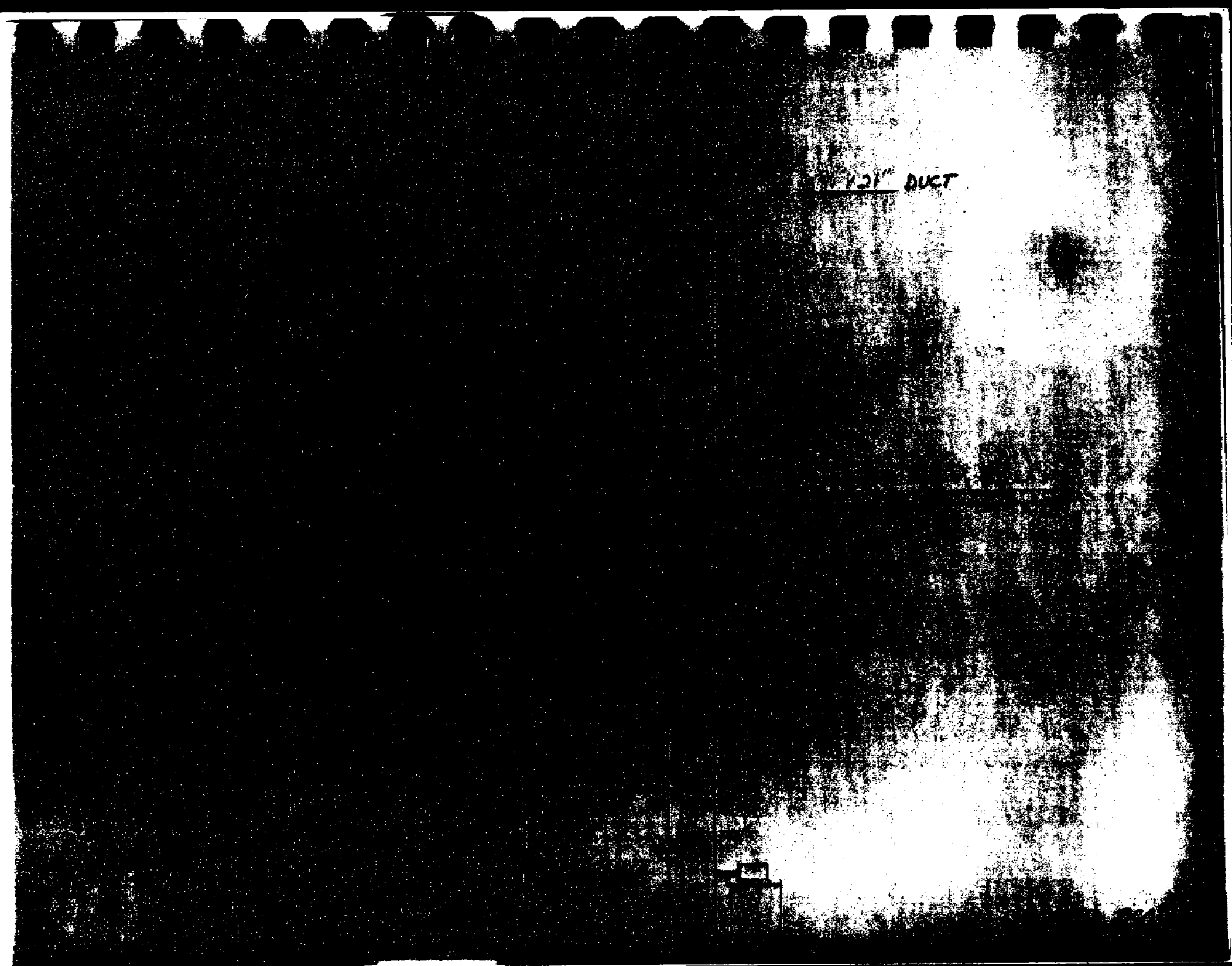
METHOD: X-RAY SEDIMENTATION

SAMPLE DESCRIPTION: ERIE MINING CO.
TACONITE DUST: #2 LOAD PO ROTO INLET (TEST 2 RUN 2 6-26-80)
SAMPLE DENSITY (G/CC): 4.49 (ASSIGNED)
DATE OF ANALYSIS: 07/09/80

FEEDING LIQUID: NA
DISPERING AGENT(S): NA
SEDIMENTATION LIQUID: SEDISPERSE A12
WETTING AGENT: NA




90°


12" DUCT