

K-SHELL-LINE CREEK
HORSESHOE RIDGE T(4)16

COAL ANALYSIS

DATA

CONFIDENTIAL

416

(1)

3.0 COAL QUALITY

3.1 Sample Preparation

There are six minable seams such as No.6, 7, 8, 9, 10B and 10A in descending order. However, main minable seams are confined to four lower seams, namely No.8, 9, 10B and 10A.

There are various test results of numerous samples taken out of numbers of bore holes and adits, and these data are already published in the past. Therefore, in this report, most of such data are omitted except some of those written in the geological report.

The data applied to this plant design are the results of tests by the laboratory of Mitsui Mining Co., Ltd. on adit samples taken out from No.8, 9, 10B and 10A seams in April, 1976. Besides, channel samples of No.6 and 7 seams were taken out from adits in December, 1976 and tested as well.

a. Channel sample (Seams 6, 7, 8, 9, 10B and 10A)

It was main purpose of the study and test of these samples to know quality of raw coal and clean coal, such as proximate analysis, total sulphur, phosphorus, FSI, Giesler fluidity test etc.

b. Bulk sample (Seams 8, 9, 10B and 10A)

It was main purpose of this study to get size distribution and

washability data. Therefore, screen analysis, attrition test, float and sink test, flotation test etc. have been done and the basic data of plant design were obtained.

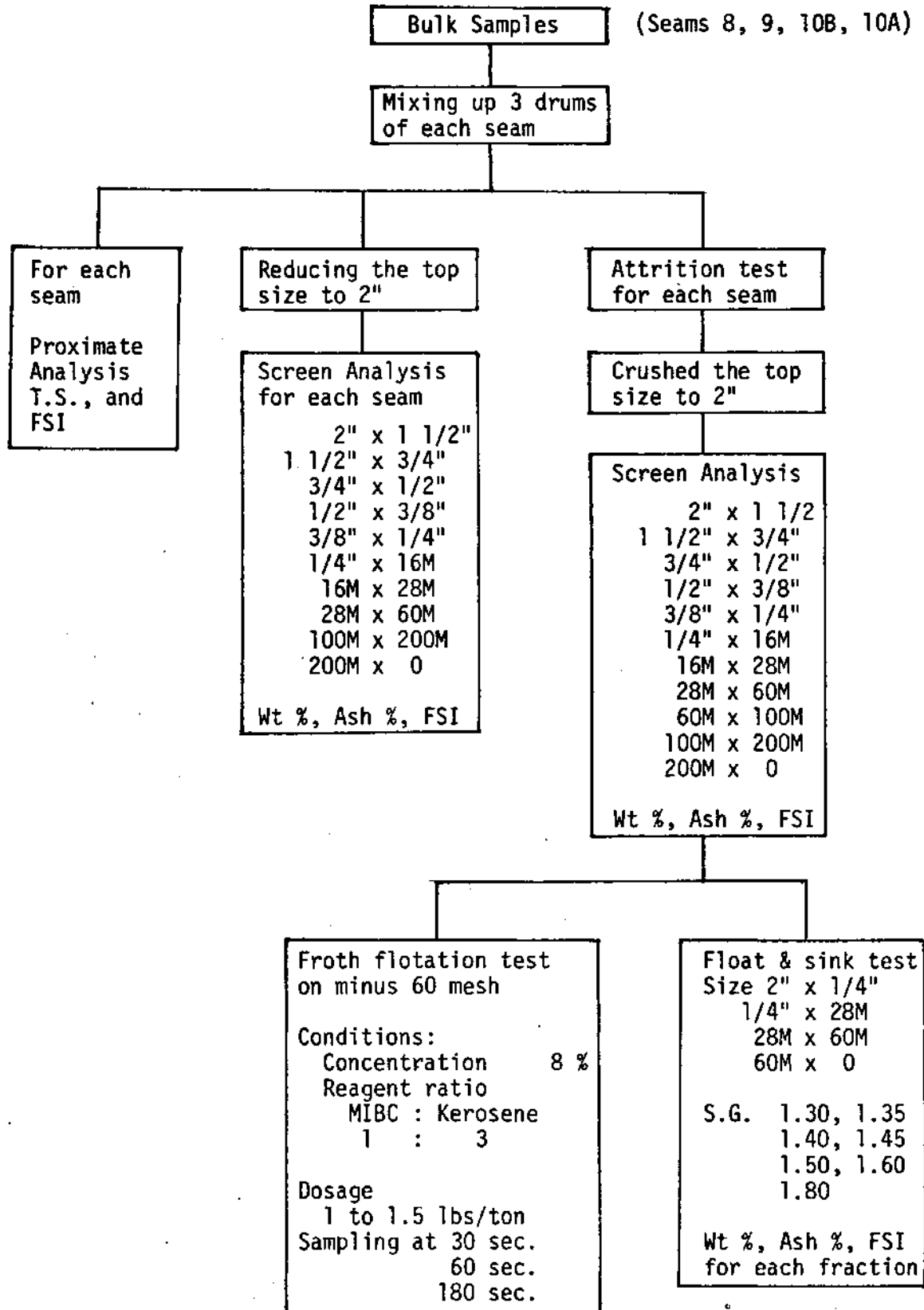
Part of the bulk sample of each seam was shipped to Birtley Engineering in Calgary, Canada, to wash. The result showed about 9.5% ash contents of clean coal by using their pilot plant consisting of H. M. Cyclone, Water Only Cyclone and Froth Flotation Cells. This clean coal was shipped to Japanese steel mills as drum samples in order to test coal quality and coking property.

c. Oxidized coal sample (seams 8, 9, 10B and 10A)

Oxidized coals were divided into two categories according to the degree of oxidization. Two samples of each seam were taken and tested mainly on coal quality, size distribution, degree of oxidization, etc.

The tests had been done on raw coal and clean coal of each seam. The test items were proximate analysis, total sulphur, FSI, screen analysis, Gieseler fluidity, ash composition, etc. The purpose of this study was to find out the proper use of these coals, that is whether or not this coal can be used as a coking coal, and to study applicability for thermal coal if not usable for coking coal.

3.2 Test Procedure of Bulk Samples



3.3 Proximate Analysis on each Sample

Channel Sample (Raw Coal)

	I.M. %	Ash %	V.M. %	F.C. %	T.S. %	FSI
6 seam (Adit 15)	1.8	12.2	21.3	64.7	0.52	4 1/2
7 seam (Adit 16)	1.5	27.0	20.1	51.4	0.42	3
8 seam (Adit 7)	1.5	17.3	19.5	61.7	0.32	3
9 seam (Adit 4)	1.5	17.5	18.4	62.6	0.31	3
10B seam (Adit 5)	1.3	16.1	19.2	63.4	0.42	7 1/2
10A seam (Adit 12)	1.1	20.7	18.3	59.9	0.42	4

Channel Sample (Clean Coal)

	I.M. %	Ash %	V.M. %	F.C. %	T.S. %	FSI
6 seam (Adit 15)	1.8	9.5	21.9	66.8	0.53	4 1/2
7 seam (Adit 16)	1.6	9.5	22.3	66.6	0.53	6
8 seam (Adit 7)	1.6	9.6	20.3	68.5	0.35	4
9 seam (Adit 4)	1.5	9.4	19.7	69.4	0.33	4
10B seam (Adit 5)	1.3	9.6	20.1	69.0	0.43	7 1/2
10A seam (Adit 12)	1.1	9.6	20.2	69.1	0.49	8 1/2

Bulk Sample (Raw Coal)

	I.M. %	Ash %	V.M. %	F.C. %	T.S. %	FSI
8 seam (Adit 7)	1.5	17.1	19.2	62.2	0.32	2 1/2
9 seam (Adit 4)	1.2	15.6	18.3	64.9	0.33	3
10B seam (Adit 5)	1.1	18.9	18.7	61.3	0.45	6 1/2
10A seam (Adit 12)	1.4	17.6	18.3	62.7	0.47	6

3.4 Screen Analysis and Attrition Test

Firstly, bulk sample of each seam (seams 8, 9, 10B and 10A) were reduced the top size up to 2 inches, then size analysis was done by the screens, 1 1/2", 3/4", 1/2", 3/8", 1/4", 16M, 28M, 60M, 100M and 200M. After determining the weight percent of each fraction, ash percent and FSI of each fraction were analyzed.

Size distribution of the bulk sample taken at an adit is not considered to represent that of the practical plant feed so called run-of-mine. The reason is the degradation which will occur during mining, handling and transporting the coal.

Therefore, washability test data and size analysis data for plant design should be based upon an attrition test, otherwise it is very difficult to get representative data for it. The attrition test was done under Coke Tumbler Test (ASTM) with 30 minutes of the duration time.

The procedure which was used for screen analysis and so forth on this sample was exactly the same as the raw coal. Data of screen analysis of attrition test on each seam are shown in Table 1 to Table 5 and Graph 1. However, screen analysis for No.6 and No.7 seams was not available since no bulk samples were taken.

TABLE 1

8 Seam Screen Analysis (Adit 7)

Size	Wt %	Ash %	FSI	Cumulative	
				Wt %	Ash %
2" x 1 1/2"	8.5	18.4	1 1/2	8.5	18.4
1 1/2" x 3/4"	28.2	18.4	1 1/2	36.7	18.4
3/4" x 1/2"	6.8	19.5	1 1/2	43.5	18.6
1/2" x 3/8"	6.0	18.7	2	49.5	18.6
3/8" x 1/4"	6.7	18.9	2	56.2	18.6
1/4" x 16M	26.9	16.4	3 1/2	83.1	17.9
16M x 28M	5.8	12.4	5 1/2	88.9	17.6
28M x 60M	4.9	12.3	5 1/2	93.8	17.3
60M x 100M	2.2	12.3	4 1/2	96.0	17.2
100M x 200M	1.9	12.6	4 1/2	97.9	17.1
200M x 0	2.1	13.4	1 1/2	100.0	17.0

8 Seam Attrition Test (Adit 7)

	Wt %	Ash %	FSI	Cumulative	
				Wt %	Ash %
2" x 1 1/2"	6.8	18.6	1 1/2	6.8	18.6
1 1/2" x 3/4"	14.1	25.9	1 1/2	20.9	23.5
3/4" x 1/2"	4.7	22.7	1 1/2	25.6	23.4
1/2" x 3/8"	4.1	26.8	1 1/2	29.7	23.9
3/8" x 1/4"	5.4	23.2	2	35.1	23.8
1/4" x 16M	26.6	17.9	3	61.7	21.2
16M x 28M	8.0	13.7	3 1/2	69.7	20.4
28M x 60M	11.7	12.0	5 1/2	81.4	19.2
60M x 100M	5.4	11.2	4 1/2	86.8	18.7
100M x 200M	7.4	10.9	4 1/2	94.2	18.1
200M x 0	5.8	10.9	2	100.0	17.6

TABLE 2

9 Seam Screen Analysis (Adit 4)

Size	Wt %	Ash %	FSI	Cumulative	
				Wt %	Ash %
2" x 1 1/2"	6.4	13.6	2 1/2	6.4	13.6
1 1/2" x 3/4"	31.4	16.6	1 1/2	37.8	16.1
3/4" x 1/2"	6.3	17.1	1 1/2	44.1	16.2
1/2" x 3/8"	8.2	17.2	2 1/2	52.3	16.4
3/8" x 1/4"	8.2	17.5	2 1/2	60.5	16.5
1/4" x 16M	28.1	14.5	4 1/2	88.6	15.9
16M x 28M	4.4	12.2	7	93.0	15.7
28M x 60M	3.1	10.6	7 1/2	96.1	15.6
60M x 100M	1.5	11.3	6 1/2	97.6	15.5
100M x 200M	1.3	12.2	6	98.9	15.4
200M x 0	1.1	14.4	4	100.0	15.4

9 Seam Attrition Test (Adit 4)

Size	Wt %	Ash %	FSI	Cumulative	
				Wt %	Ash %
2" x 1 1/2"	5.1	11.1	3	5.1	11.1
1 1/2" x 3/4"	13.9	14.6	1 1/2	19.0	13.7
3/4" x 1/2"	4.0	19.8	1 1/2	23.0	14.7
1/2" x 3/8"	5.8	18.8	2	28.8	15.6
3/8" x 1/4"	5.6	19.3	1 1/2	34.4	16.2
1/4" x 16M	28.8	16.3	4	63.2	16.2
16M x 28M	7.0	11.5	6	70.2	15.8
28M x 60M	10.1	10.9	7 1/2	80.3	15.1
60M x 100M	5.4	13.0	6	85.7	15.0
100M x 200M	6.7	10.9	7 1/2	92.4	14.7
200M x 0	7.6	15.8	3 1/2	100.0	14.8

TABLE 3

10B Seam Screen Analysis (Adit 5)

Size	Wt %	Ash %	FSI	Cumulative	
				Wt %	Ash %
2" x 1 1/2"	2.8	21.8	4	2.8	21.8
1 1/2" x 3/4"	15.5	21.2	4 1/2	18.3	21.3
3/4" x 1/2"	6.4	16.2	7 1/2	24.7	20.0
1/2" x 3/8"	9.7	17.7	7 1/2	34.4	19.3
3/8" x 1/4"	9.7	18.0	7	44.1	19.0
1/4" x 16M	37.7	18.2	7 1/2	81.8	18.7
16M x 28M	7.1	18.7	7	88.9	18.7
28M x 60M	5.1	19.2	6 1/2	94.0	18.7
60M x 100M	2.3	19.8	5 1/2	96.3	18.7
100M x 200M	1.9	20.5	5 1/2	98.2	18.8
200M x 0	1.8	21.2	5	100.0	18.8

10B Seam Attrition Test (Adit 5)

Size	Wt %	Ash %	FSI	Cumulative	
				Wt %	Ash %
2" x 1 1/2"	0.7	30.0	1 1/2	0.7	30.0
1 1/2" x 3/4"	2.4	22.8	4	3.1	24.4
3/4" x 1/2"	2.3	20.1	4	5.4	22.5
1/2" x 3/8"	3.1	21.1	4	8.5	22.0
3/8" x 1/4"	5.9	19.4	4	14.4	21.0
1/4" x 16M	40.2	19.9	6 1/2	54.6	20.2
16M x 28M	9.9	17.2	6	64.5	19.7
28M x 60M	13.3	17.4	7	77.8	19.3
60M x 100M	6.5	17.4	6 1/2	84.3	19.2
100M x 200M	11.5	17.8	6 1/2	95.9	19.0
200M x 0	4.1	18.5	3 1/2	100.0	19.0

TABLE 4

10A Seam Screen Analysis (Adit 12)

Size	Wt %	Ash %	FSI	Cumulative	
				Wt %	Ash %
2" x 1 1/2"	5.3	12.9	8 1/2	5.3	12.9
1 1/2" x 3/4"	25.3	18.5	6 1/2	30.6	13.4
3/4" x 1/2"	9.5	20.0	4	40.1	18.1
1/2" x 3/8"	9.2	18.0	5	49.3	18.3
3/8" x 1/4"	8.6	18.9	5	57.9	18.4
1/4" x 16M	30.4	17.3	6	88.3	18.0
16M x 28M	5.1	15.2	7	93.4	17.8
28M x 60M	3.4	14.4	7 1/2	96.8	17.6
60M x 100M	1.3	14.1	6 1/2	98.1	17.4
100M x 200M	1.0	14.0	7	99.1	17.4
200M x 0	0.9	14.9	7 1/2	100.0	17.3

10A Seam Attrition Test (Adit 12)

Size	Wt %	Ash %	FSI	Cumulative	
				Wt %	Ash %
2" x 1 1/2"	4.0	28.3	2	4.0	28.3
1 1/2" x 3/4"	9.0	25.3	2	13.0	26.2
3/4" x 1/2"	3.8	23.7	3	16.8	25.7
1/2" x 3/8"	4.8	22.8	3	21.6	25.0
3/8" x 1/4"	6.0	20.7	3	27.6	24.1
1/4" x 16M	35.3	18.3	5 1/2	62.9	20.8
16M x 28M	7.9	13.7	7 1/2	70.8	20.0
28M x 60M	10.1	12.8	8	80.9	19.1
60M x 100M	5.3	13.3	6	86.2	18.8
100M x 200M	8.2	12.0	7	94.4	18.2
200M x 0	5.6	11.8	6 1/2	100.0	17.8

TABLE 5

Composite Screen Analysis and Attrition Test

Composite Ratio

Seam	# 8	# 9	# 10B	# 10A
Ratio %	35.0	26.8	23.2	15.0

1. Composite Screen Analysis

Size	Wt %	Cum. Wt %
2" x 1 1/2"	6.1	6.1
1 1/2" x 3/4"	25.7	31.8
3/4" x 1/2"	7.0	38.8
1/2" x 3/8"	7.9	46.7
3/8" x 1/4"	8.1	54.8
1/4" x 16"	30.2	85.0
16M x 28M	5.6	90.6
28M x 60M	4.2	94.3
60M x 100M	1.9	96.7
100M x 200M	1.6	98.3
200M x 0	1.7	100.0

2. Composite Attrition Test

Size	Wt %	Cum. Wt %
2" x 1 1/2"	4.6	4.6
1 1/2" x 3/4"	10.6	15.2
3/4" x 1/2"	3.8	19.0
1/2" x 3/8"	4.4	23.4
3/8" x 1/4"	5.7	29.1
1/4" x 16M	31.6	60.7
16M x 28M	8.2	68.9
28M x 60M	11.4	80.3
60M x 100M	5.6	85.9
100M x 200M	8.3	94.2
200M x 0	5.8	100.0

GRAPH 1

RRB'S GRAIN DIAGRAM

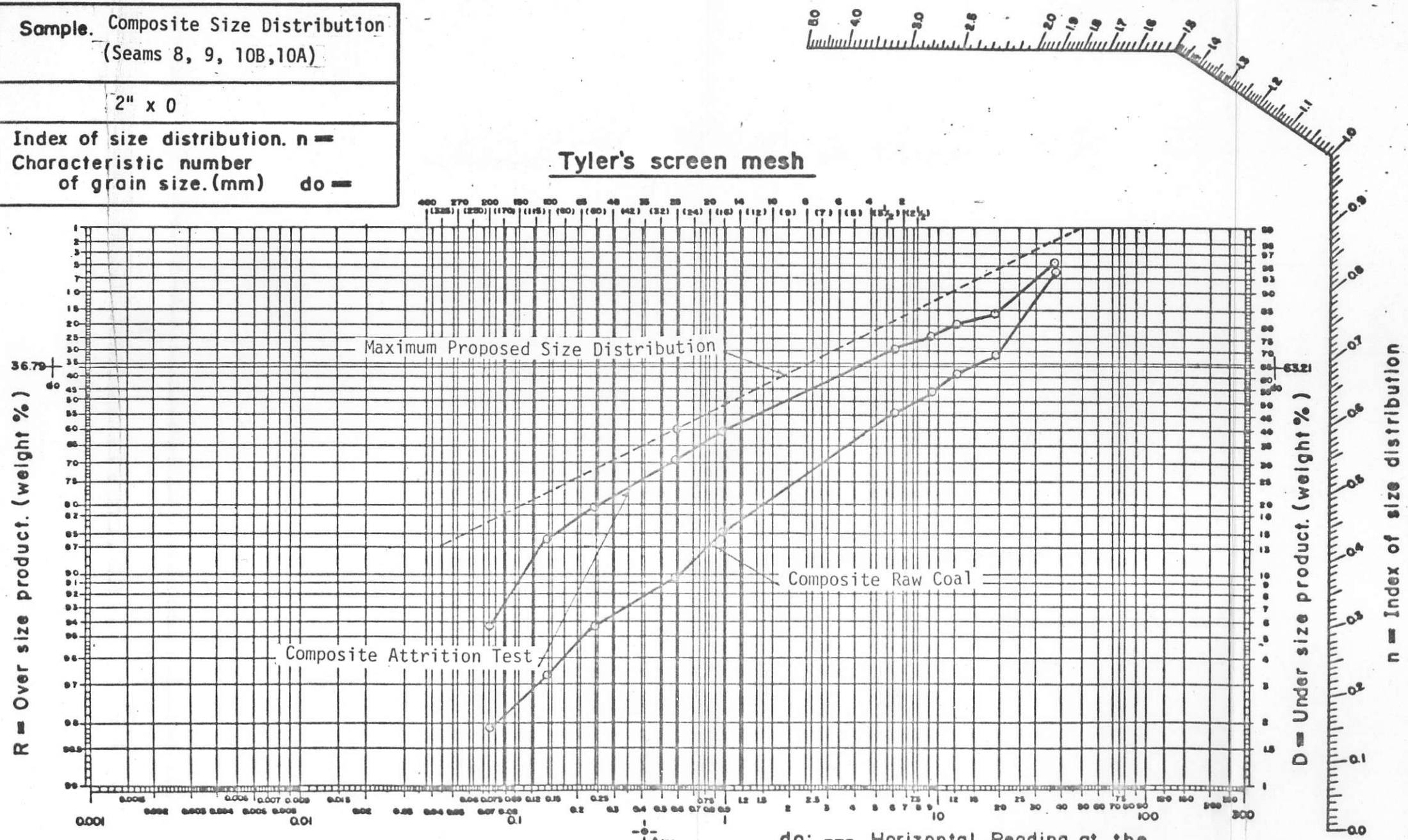
Sample. Composite Size Distribution
(Seams 8, 9, 10B, 10A)

2" x 0

Index of size distribution. n =
Characteristic number
of grain size. (mm) do =

$$R = 100.0 - \left(\frac{d}{50}\right)^2$$

$$D = 100 - R$$



3.5 Float and Sink Test

In order to get washability data of raw coal, a composite sample of each fraction, such as 2" x 1/4", 1/4" x 28M, 28M x 60M and 60M x 0, on seams of No.8, 9, 10B and 10A are made respectively after attrition test. Using above composite samples, float and sink test has been done at the specific gravity of 1.30, 1.35, 1.40, 1.45, 1.50, 1.60 and 1.80, and also ash contents and FSI were analyzed on each fraction.

In case of minus 60 mesh fraction, froth flotation test has been done besides float and sink analysis.

Because bulk sample has not been taken from No.6 and No.7 seams, channel samples were gotten from upper and lower portions separately seam by seam, then float and sink test has been done at the specific gravity of 1.30, 1.40, 1.50 and 1.60 on the samples which include whole size range 2" x 0.

Float and sink test of each size fraction on each seam is exhibited in Table 6 to 10. Relationship between specific gravity and ash contents of each seam is shown in Graph 2 to 5.

WASHABILITY DATA

TABLE 6 #8 SEAM BULK SAMPLE (ADIT 7)

SPECIFIC GRAVITY	2" x 1/4"					1/4" x 28M				
	FRACTIONAL			CUM. FLOATS		FRACTIONAL			CUM. FLOATS	
	WT %	ASH %	FSI	WT %	ASH %	WT %	ASH %	FSI	WT %	ASH %
- 1.30	0.2	1.8	9	0.2	1.8	19.3	1.2	9	19.3	1.2
1.30 - 1.35	6.7	5.0	3	6.9	4.9	23.1	4.7	5	42.4	3.1
1.35 - 1.40	25.5	8.4	2	32.4	7.7	13.8	8.3	1-1/2	56.2	4.4
1.40 - 1.45	23.6	13.8	2	56.0	10.3	8.8	13.4	1-1/2	65.0	5.6
1.45 - 1.50	10.2	20.3	1-1/2	66.2	11.8	9.8	19.6	1-1/2	74.8	7.4
1.50 - 1.60	14.3	26.6	1-1/2	80.5	14.4	9.9	26.4	1-1/2	84.7	9.7
1.60 - 1.80	5.7	38.9	1-1/2	86.2	16.0	7.0	39.6	1-1/2	91.7	11.9
+ 1.80	13.8	74.4	0	100.0	24.1	8.3	72.0	0	100.0	16.9

SPECIFIC GRAVITY	28M x 60M					60M x 0				
	FRACTIONAL			CUM. FLOATS		FRACTIONAL			CUM. FLOATS	
	WT %	ASH %	FSI	WT %	ASH %	WT %	ASH %	FSI	WT %	ASH %
- 1.30	17.4	1.7	9	17.4	1.7	9.6	1.7	10	9.6	1.7
1.30 - 1.35	29.2	5.0	5	46.6	3.8	39.1	3.6	6	48.7	3.2
1.35 - 1.40	24.4	9.3	2	71.0	5.7	17.3	7.0	1-1/2	66.0	4.2
1.40 - 1.45	11.0	14.7	2	82.0	6.9	13.3	10.6	1/2	79.3	5.3
1.45 - 1.50	4.2	19.4	1-1/2	86.2	7.5	5.8	15.4	1/2	85.1	6.0
1.50 - 1.60	4.5	26.3	1-1/2	90.7	8.4	5.8	22.3	1/2	90.9	7.0
1.60 - 1.80	6.2	39.2	1-1/2	96.9	10.4	4.3	36.3	1/2	95.2	8.3
+ 1.80	3.1	68.1	0	100.0	12.2	4.8	67.2	0	100.0	11.2

WASHABILITY DATA

TABLE 7 #9 SEAM BULK SAMPLE (ADIT 4)

SPECIFIC GRAVITY	2" x 1/4"					1/4" x 28M				
	FRACTIONAL			CUM. FLOATS		FRACTIONAL			CUM. FLOATS	
	WT %	ASH %	FSI	WT %	ASH %	WT %	ASH %	FSI	WT %	ASH %
- 1.30	0.4	2.6	9	0.4	2.6	11.2	1.2	10	11.2	1.2
1.30 - 1.35	33.2	4.7	2-1/2	33.6	4.7	26.7	4.5	5-1/2	37.9	3.5
1.35 - 1.40	34.5	9.1	1-1/2	68.1	6.9	24.0	8.5	2	61.9	5.5
1.40 - 1.45	10.0	13.6	1-1/2	78.1	7.8	14.3	14.0	1-1/2	76.2	7.1
1.45 - 1.50	5.6	18.4	1-1/2	83.7	8.5	5.9	19.7	1-1/2	82.1	8.0
1.50 - 1.60	4.3	25.4	1	88.0	9.3	5.2	27.2	1-1/2	87.3	9.1
1.60 - 1.80	2.3	41.7	1	90.3	10.2	3.2	41.2	1-1/2	90.5	10.3
+ 1.80	9.7	72.1	0	100.0	16.2	9.5	67.5	0	100.0	15.9

SPECIFIC GRAVITY	28M x 60M					60M x 0				
	FRACTIONAL			CUM. FLOATS		FRACTIONAL			CUM. FLOATS	
	WT %	ASH %	FSI	WT %	ASH %	WT %	ASH %	FSI	WT %	ASH %
- 1.30	25.0	1.3	9-1/2	25.0	1.3	21.3	1.0	10	21.3	1.0
1.30 - 1.35	31.3	4.1	7-1/2	56.3	2.9	27.5	3.2	7-1/2	48.8	2.2
1.35 - 1.40	18.3	8.2	2	74.6	4.2	18.2	6.4	2	67.0	3.4
1.40 - 1.45	11.2	13.8	1-1/2	85.8	5.4	11.2	10.6	1-1/2	78.2	4.4
1.45 - 1.50	3.7	19.5	1-1/2	89.5	6.0	4.8	15.5	1-1/2	83.0	5.1
1.50 - 1.60	3.1	27.1	1-1/2	92.6	6.7	3.5	22.5	1-1/2	86.5	5.8
1.60 - 1.80	2.4	41.5	1-1/2	95.0	7.6	2.6	35.1	1-1/2	89.1	6.6
+ 1.80	5.0	67.1	0	100.0	10.6	10.9	68.9	0	100.0	13.4

WASHABILITY DATA

TABLE 8 #10B SEAM BULK SAMPLE (ADIT 5)

SPECIFIC GRAVITY	2" x 1/4"					1/4" x 28M				
	FRACTIONAL			CUM. FLOATS		FRACTIONAL			CUM. FLOATS	
	WT %	ASH %	FSI	WT %	ASH %	WT %	ASH %	FSI	WT %	ASH %
- 1.30	9.0	1.4	10	9.0	1.40	12.1	1.2	10	12.1	1.2
1.30 - 1.35	22.1	5.6	9	31.1	4.4	23.5	5.7	9	35.6	4.2
1.35 - 1.40	18.2	10.8	3	49.3	6.8	19.6	10.8	4	55.2	6.5
1.40 - 1.45	15.5	14.9	2	64.8	8.7	11.4	15.1	2	66.6	8.0
1.45 - 1.50	9.8	20.6	1-1/2	74.6	10.3	7.6	19.5	2	74.2	9.2
1.50 - 1.60	6.4	27.4	1-1/2	81.0	11.6	8.2	27.3	1-1/2	82.4	11.0
1.60 - 1.80	6.0	43.0	1	87.0	13.8	8.3	42.0	1	90.7	13.8
+ 1.80	13.0	75.1	0	100.0	21.8	9.3	72.9	0	100.0	19.3

SPECIFIC GRAVITY	28M x 60M					60M x 0				
	FRACTIONAL			CUM. FLOATS		FRACTIONAL			CUM. FLOATS	
	WT %	ASH %	FSI	WT %	ASH %	WT %	ASH %	FSI	WT %	ASH %
- 1.30	20.0	1.8	9-1/2	20.0	1.8	15.0	1.4	10-1/2	15.0	1.4
1.30 - 1.35	20.9	5.1	8-1/2	40.9	3.5	22.5	4.4	9	37.5	3.2
1.35 - 1.40	17.1	10.1	4-1/2	58.0	5.4	14.8	8.4	5	52.3	4.7
1.40 - 1.45	13.2	14.6	3	71.2	7.1	12.8	12.5	2-1/2	65.1	6.2
1.45 - 1.50	5.9	20.1	1-1/2	77.1	8.1	6.2	17.3	1-1/2	71.3	7.2
1.50 - 1.60	6.8	27.7	1	83.9	9.7	6.9	24.9	1-1/2	78.2	8.7
1.60 - 1.80	6.2	40.0	1	90.1	11.8	11.9	37.0	1-1/2	90.1	12.5
+ 1.80	9.9	68.3	0	100.0	17.4	9.9	66.2	0	100.0	17.8

WASHABILITY DATA

TABLE 9 #10A SEAM BULK SAMPLE (ADIT 12)

SPECIFIC GRAVITY	2" x 1/4"					1/4" x 28M				
	FRACTIONAL			CUM. FLOATS		FRACTIONAL			CUM. FLOATS	
	WT %	ASH %	FSI	WT %	ASH %	WT %	ASH %	FSI	WT %	ASH %
- 1.30	0.8	1.5	11	0.8	1.5	4.7	1.1	10	4.7	1.1
1.30 - 1.35	1.3	7.2	9	2.1	5.0	8.0	5.4	9	12.7	3.8
1.35 - 1.40	15.6	11.4	6	17.7	10.6	18.6	10.7	6	31.3	7.9
1.40 - 1.45	17.6	15.7	2-1/2	35.3	13.2	29.3	14.2	2-1/2	60.6	11.0
1.45 - 1.50	21.8	21.0	2-1/2	57.1	16.2	14.9	19.4	1-1/2	75.5	12.6
1.50 - 1.60	24.8	28.9	1	81.9	20.0	15.0	26.6	1-1/2	90.5	14.9
1.60 - 1.80	15.2	38.4	1	97.1	22.9	8.2	38.0	1	98.7	16.9
+ 1.80	2.9	71.0	0	100.0	24.3	1.3	73.0	0	100.0	17.6

SPECIFIC GRAVITY	28M x 60M					60M x 0				
	FRACTIONAL			CUM. FLOATS		FRACTIONAL			CUM. FLOATS	
	WT %	ASH %	FSI	WT %	ASH %	WT %	ASH %	FSI	WT %	ASH %
- 1.30	23.3	1.6	10-1/2	23.3	1.6	21.6	1.6	10	21.6	1.6
1.30 - 1.35	11.1	4.9	9-1/2	34.4	2.7	21.3	4.6	9	42.9	3.1
1.35 - 1.40	19.6	9.1	6-1/2	54.0	5.0	18.6	8.4	4	61.5	4.7
1.40 - 1.45	20.4	13.6	2-1/2	74.4	7.4	16.3	13.1	2-1/2	77.8	6.5
1.45 - 1.50	11.7	19.1	1-1/2	86.1	9.0	7.7	18.8	2	85.5	7.6
1.50 - 1.60	6.2	26.3	1	92.3	10.1	7.1	26.2	1-1/2	92.6	9.0
1.60 - 1.80	5.4	38.7	1	97.7	11.7	3.8	38.1	1	96.4	10.1
+ 1.80	2.3	69.5	0	100.0	13.0	3.6	69.8	0	100.0	12.3

WASHABILITY DATA

TABLE 10 #6 SEAM CHANNEL SAMPLE (ADIT 15)

2" x 0

SPECIFIC GRAVITY	UPPER				BOTTOM			
	FRACTIONAL		CUM. FLOATS		FRACTIONAL		CUM. FLOATS	
	WT %	ASH %	WT %	ASH %	WT %	ASH %	WT %	ASH %
- 1.30	11.1	2.5	11.1	2.5	32.0	1.9	32.0	1.9
1.30 - 1.40	57.1	4.5	68.2	4.2	30.0	6.1	62.0	3.9
1.40 - 1.50	20.6	13.0	88.8	6.2	8.4	15.4	70.4	5.3
1.50 - 1.60	5.1	25.9	93.9	7.3	4.8	26.8	75.2	6.7
+ 1.60	6.1	67.9	100.0	11.0	24.8	73.2	100.0	23.2

#7 SEAM CHANNEL SAMPLE (ADIT 16)

2" x 0

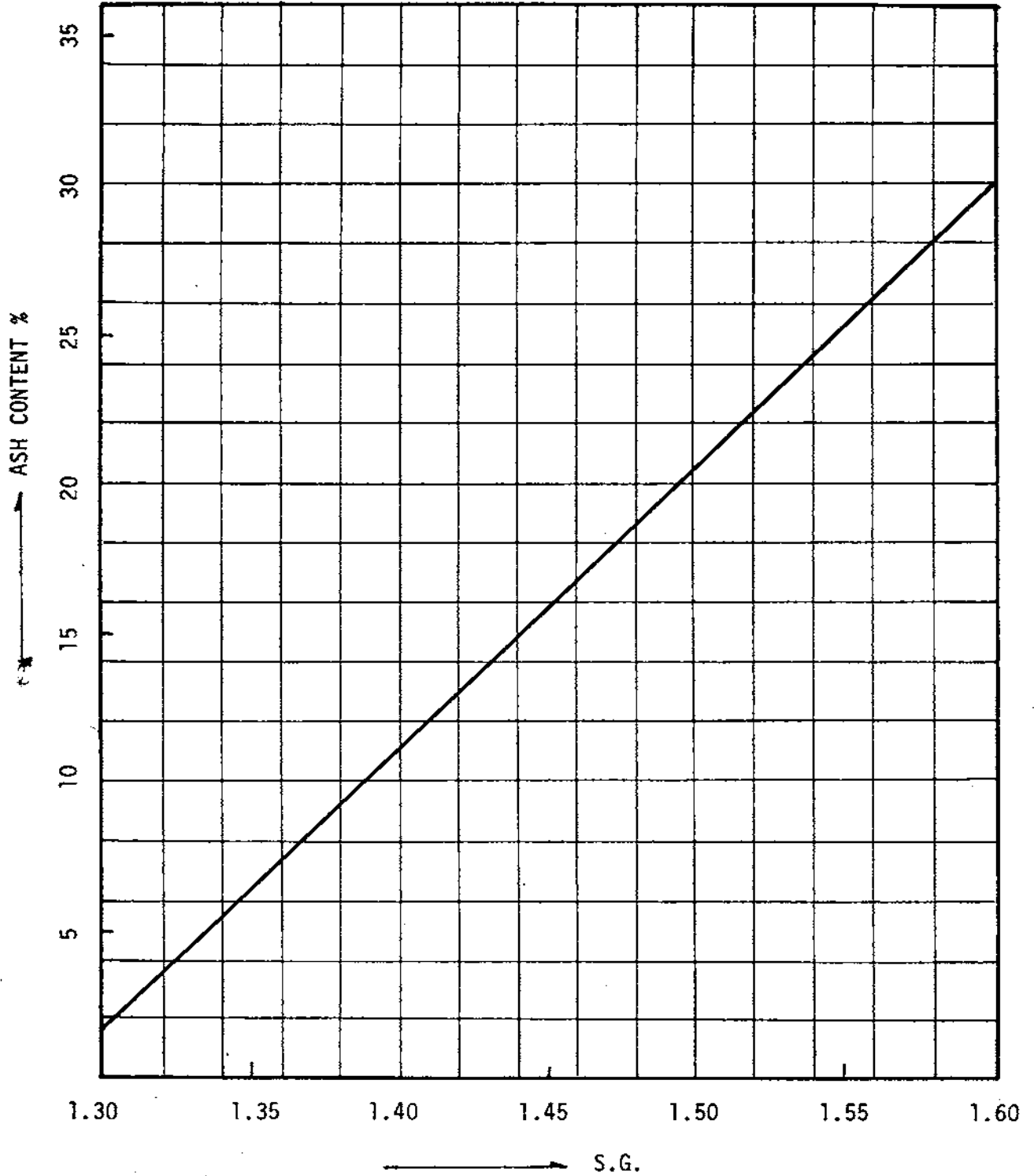
SPECIFIC GRAVITY	UPPER				BOTTOM			
	FRACTIONAL		CUM. FLOATS		FRACTIONAL		CUM. FLOATS	
	WT %	ASH %	WT %	ASH %	WT %	ASH %	WT %	ASH %
- 1.30	6.1	1.7	6.1	1.7	12.1	2.1	12.1	2.1
1.30 - 1.40	34.3	5.0	40.4	4.5	31.3	8.0	43.4	6.4
1.40 - 1.50	18.0	14.2	58.4	7.5	10.8	16.6	54.2	8.4
1.50 - 1.60	8.4	25.0	66.8	9.7	8.6	27.1	62.8	11.0
+ 1.60	33.2	60.1	100.0	26.4	37.2	61.1	100.0	29.6

GRAPH 2 #8 SEAM
ASH CONTENT VS. SPECIFIC GRAVITY

$$Y = 1.2823 + 0.010X$$

Y : S.G.

X : ASH CONTENT

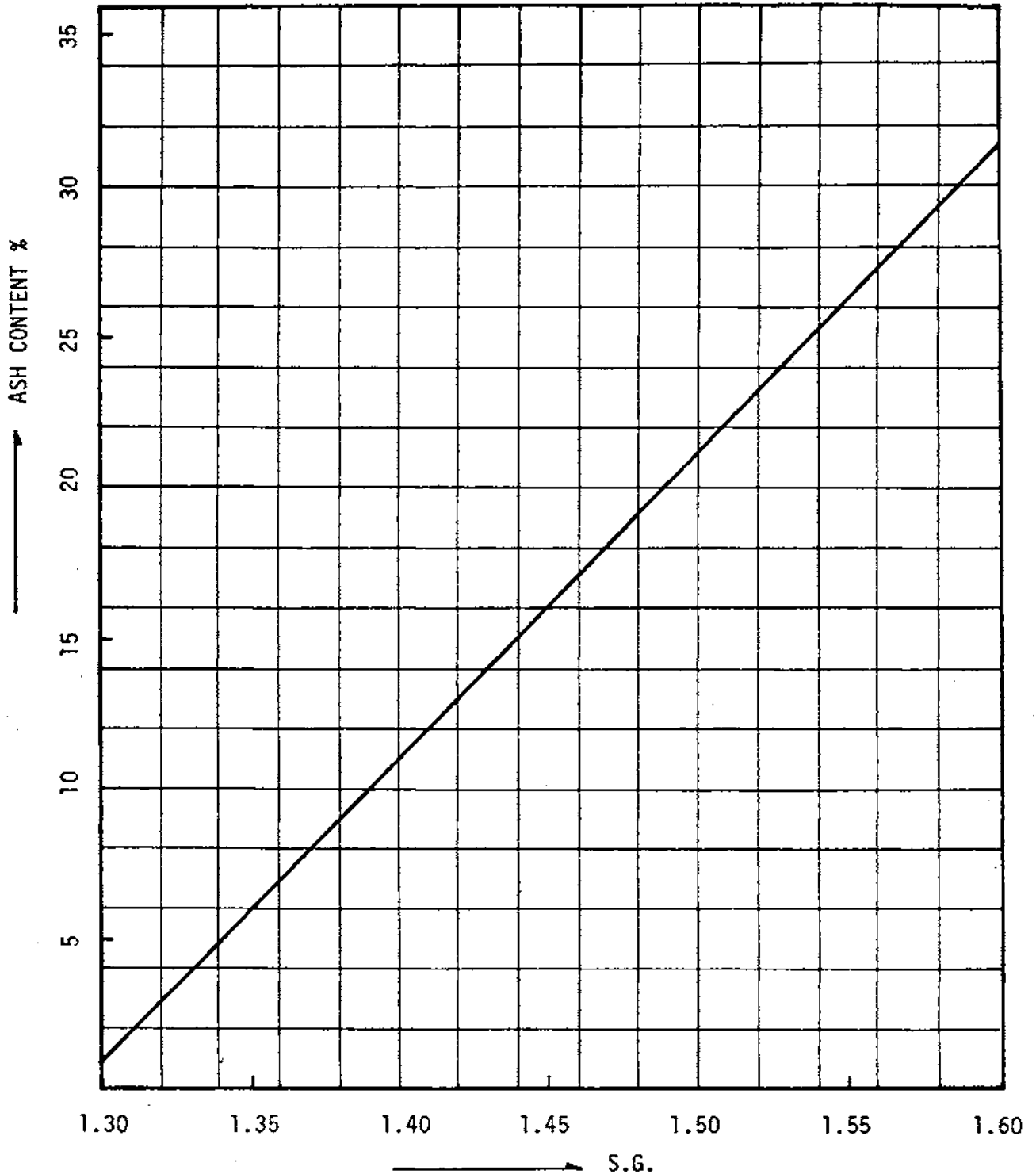


GRAPH 3 #9 SEAM
ASH CONTENT VS. SPECIFIC GRAVITY

$$Y = 1.2909 + 0.0098X$$

Y : S.G.

X : ASH CONTENT

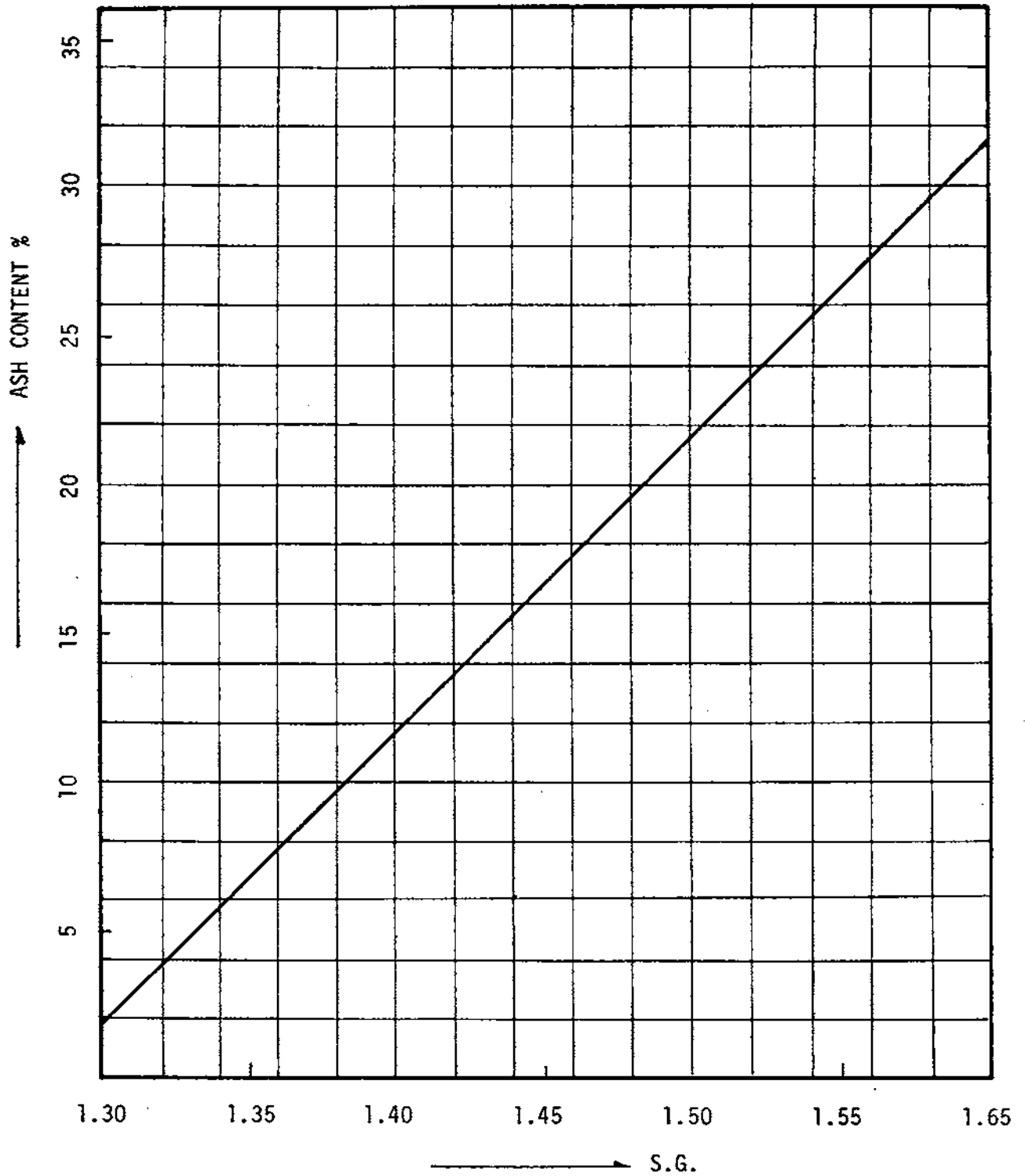


GRAPH 4 #10B SEAM
ASH CONTENT VS. SPECIFIC GRAVITY

$$Y = 1.2802 + 0.0101X$$

Y : S.G.

X : ASH CONTENT

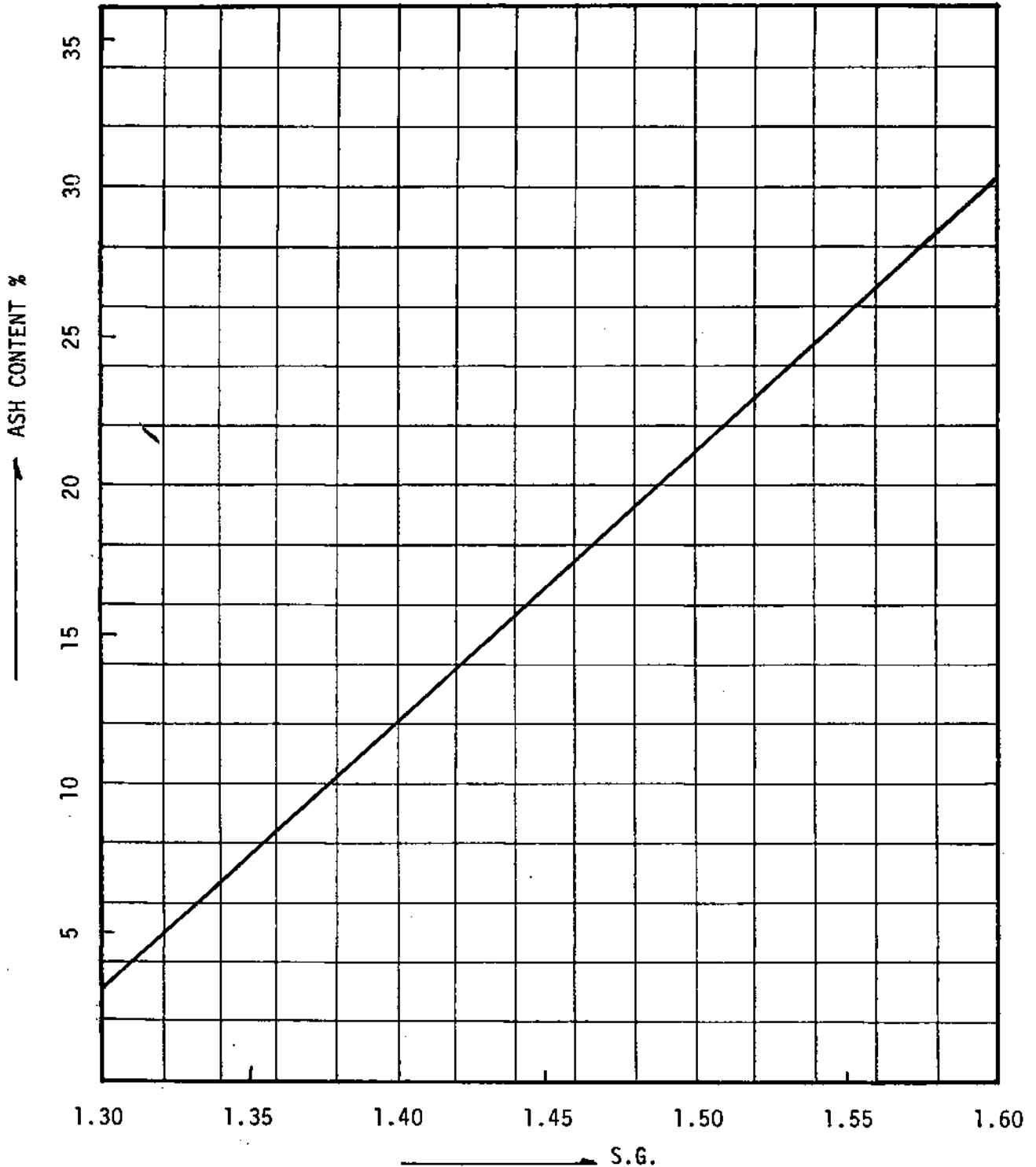


GRAPH 5 #10A SEAM
ASH CONTENT VS. SPECIFIC GRAVITY

$$Y = 1.264 + 0.0111X$$

Y : S.G.

X : ASH CONTENT



3.6 Froth Flotation Test

Froth flotation test has been done on the minus 60 mesh fraction materials which were gotten after the attrition test at Mitsui Mining Co., Ltd., Tokyo, Japan. Followings are the conditions for the test.

3.6.1 Test condition

a. Test samples:

Seam name: No.8, 9, 10B and 10A

Size: 60M x 0

b. Reagent:

MIBC : Kerosene; 1 : 3

c. Dosage:

500 gr, 750 gr, 1,000 gr/solid ton

d. Sampling time:

30 sec., 60 sec., 180 sec.

e. Pulp condition:

Solid concentration: 8%

Temperature: 20°C - 22°C

pH: 7

f. Test machine:

Type: M.S. (Mineral separator)

Capacity: 2,000 cc.

r.p.m.: 1,750

Impeller: 54 mm 2 stages

Motor: 1/2 kw.

3.6.2 Test Results

Reagent consumption: 750 gram per solid ton

No.	Retention Time (Sec.)	#8 Seam				#9 Seam			
		WT %	ASH %	CUMULATIVE		WT %	ASH %	CUMULATIVE	
				WT %	ASH %			WT %	ASH %
1	0 - 30"	48.1	8.2	48.1	8.2	19.4	8.4	19.4	8.4
2	30" - 60"	23.8	9.0	71.9	8.5	28.8	8.6	48.2	8.5
3	60" - 180"	13.1	8.5	85.0	8.5	40.3	10.5	88.5	9.4
4	Tailings	15.0	24.5	100.0	10.9	11.5	46.0	100.0	13.6
	Total	100.0	10.9			100.0	13.6		

No.	Retention Time (Sec.)	#10B Seam				#10A Seam			
		WT %	ASH %	CUMULATIVE		WT %	ASH %	CUMULATIVE	
				WT %	ASH %			WT %	ASH %
1	0 - 30"	33.8	12.5	33.8	12.5	35.0	9.6	35.0	9.6
2	30" - 60"	38.1	14.7	71.9	13.4	36.3	10.9	71.3	10.3
3	60" - 180"	18.7	16.6	90.6	14.1	21.2	11.9	92.5	10.6
4	Tailings	9.4	51.6	100.0	17.6	7.5	35.1	100.0	12.5
	Total	100.0	17.6			100.0	12.5		

3.7 Clean Coal Quality (#6, 7 seam)

	# 6 Seam		# 7 Seam	
	Upper	Bottom	Upper	Bottom
Proximate Analysis				
I.M. %	2.4	1.4	2.0	1.4
Ash %	9.6	9.4	9.4	9.4
V.M. %	20.7	22.8	21.1	22.9
F.C. %	68.3	66.4	67.5	66.3
Total	100.0	100.0	100.0	100.0
T.S. %	0.54	0.56	0.50	0.53
Ultimate Analysis				
C %	87.8	88.6	88.6	88.8
H %	4.6	4.9	4.8	5.0
O %	5.8	3.9	4.9	4.2
N %	1.3	2.0	1.2	1.4
S %	0.5	0.6	0.5	0.6
F.S.I.	2	7	3 1/2	7 1/2
Max. Fluidity DDPM	-	21	1	33
Petrographic Analysis				
Vitrinite	51.3	59.0	48.2	60.1
Total Reactive	60.3	66.8	57.4	67.4
Total Inert	39.7	33.2	42.6	32.6
Mean Reflectance	1.29	1.30	1.30	1.29
Stability Index	52	58	49	58

Clean Coal Quality (#8, 9, 10B, 10A seam)

	⁷ #8 Seam	⁴ #9 Seam	10B Seam	¹² #10A Seam
Proximate Analysis				
T.M. %	1.3	1.2	1.0	0.9
Ash %	9.7	8.9	9.7	10.4
V.M. %	20.0	19.6	20.1	20.3
F.C. %	69.0	70.3	69.2	68.4
Total	100.0	100.0	100.0	100.0
T.S. %	0.39	0.35	0.47	0.54
Phosphorus (in coal) %	0.041	0.037	0.02	0.016
F.S.I.	4	4	7 1/2	7
Ultimate Analysis				
C %	88.68	89.12	89.32	89.06
H %	4.68	4.65	4.80	4.74
N %	1.16	1.18	1.22	1.10
S %	0.41	0.38	0.50	0.61
O %	5.07	4.67	4.16	4.49
Max. Fluidity DDPM	1.9	3.1	18	75
H.G.I.	83	84	105	96
Petrographic Analysis				
Vitrinite	55.9	57.8	69.3	62.2
Total Reactive	62.0	62.7	73.1	67.2
Total Inert	38.0	37.3	26.9	32.8
Mean Reflectance	1.40	1.47	1.51	1.47

	#8 Seam	#9 Seam	#10B Seam	#10A Seam
JIS DI ³⁰ ₁₅				
Minimum	73.2	85.5	92.2	83.2
Maximum	95.1	96.0	96.2	96.4
Average	80.8	89.7	94.1	92.5
Theoretical Yield %	75.3	90.5	77.1	50.6

Clean Coal Quality (Composite sample)

Sample	Composite Ratio	#8	#9	#10B	#10A	Tested by
A	Reserve	36	30	24	10	MKC
B	Seam thickness	51	25	17	7	"
C	Average of A & B	43	27	21	9	Kobe
D	" "	43	27	21	9	NKK

Sample	A	B	C	D
Proximate Analysis				
I.M. %	1.27	1.30	(dry basis)	
Ash %	9.52	9.50	9.42	9.8
V.M. %	19.60	19.47	20.16	20.3
F.C. %	69.61	69.73	70.42	69.9
Total	100.0	100.0	100.0	100.0
Total Sulphur %	0.42	0.40	0.42	0.40
Phosphorus(in Coal) %			0.034	
(in Ash) %				0.353
Ultimate Analysis				
C %	88.69	89.27		
H %	4.71	4.76		
O %	5.01	4.38		
N %	1.14	1.16		
S %	0.45	0.43		
F.S.I.	4 1/2	3 1/2	4	4

Sample	A	B	C	D
Max. Fluidity DDPM	1.9	2,2	0	3
Dilatometer				
Max. Contraction %	23	24	30	
Max. Dilatation %	-12	-17	-30	
JIS DI ₁₅ ³⁰	94.0	93.0	86.4	87.9
Petrographic Analysis				
Vitrinite			61.9	60.8
Total Reactive			66.0	66.3
Total Inert			34.0	33.7
Mean Reflectance			1.52	1.40

4.0 OUT OF SEAM DILUTION

Some amount of out of seam dilution material such as roof or floor rock will come into raw coal when the coal was mined. Therefore, washability data to be used for plant design should include such sort of dilution material.

Thickness of dilution is estimated 0.8 feet for No.6, 7 and 8 seams which have thicker partings and 0.4 feet for No.9, 10B and 10A seams. Specific gravity 2.4, which was determined by actual analysis data, was applied for the dilution material. Loss of the coal which might occur at mining face was assumed 2 feet for No.6, 7 and 8 seams and 1 feet for the other three seams.

Size distribution and ash contents of the dilution are assumed as follows:

a. Size distribution of dilution

Size	Wt %	Ash
2" x 28M	83.7	90.0
28M x 60M	8.0	85.0
60M x 0	8.3	82.0
Total	100.0	88.9

b. Specific gravity of dilution

Seam	Sample No.	S.G.
# 8	1	2.334
"	2	2.735
"	3	2.171
"	4	2.632
"	5	2.410
# 9	6	2.322
"	7	1.946
# 10B	8	2.391
# 10A	-	-
Average		2.368

c. Ratio of dilution for each seam

Seam	Wt %
# 6	9.0
# 7	7.5
# 8	3.5
# 9	3.8
# 10A	4.6
# 10B	7.4

d. Ratio of dilution on each size fraction

Seam	Size	Dilution %
# 6	2" x 0	9.0
# 7	2" x 0	7.5
# 8	2" x 28M	4.20
	28M x 60M	2.39
	60M x 0	1.56
	Average	3.50

Seam	Size	Dilution %
# 9	2" x 28M	4.50
	28M x 60M	2.93
	60M x 0	1.63
	Average	3.80
# 10B	2" x 28M	5.97
	28M x 60M	2.78
	60M x 0	1.71
	Average	4.60
# 10A	2" x 28M	8.39
	28M x 60M	5.64
	60M x 0	3.09
	Average	7.40

5.0 WASHABILITY DATA OF EACH SEAM

Float and sink test for each size fraction of each seam which was sampled at adit was modified by adding a certain amount of dilution material.

The modification was done by adding certain percentage of out seam dilution with an ash content, which was previously mentioned in this report, and 1.8 specific gravity, then washability data were recalculated.

In case of No.6 and No.7 seams, the modification has been done on the washability data of whole size fraction 2" x 0 because of lacking float and sink test of each size fraction.

In case of No.8, 9, 10B and 10A seams, all the washability data of 2" x 28M, 28M x 60M and 60M x 0 size fractions were modified by adding the dilution material. Washability data which include dilution material are shown in following Tables 11 through 24 and Graphs 6 through 19.

WASHABILITY DATA

TABLE 11 #8 SEAM RAW COAL (ADIT 7)

2" x 28M (WITH DILUTION)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	9.20	1.20	9.20	1.20	100.00	23.57	4.60	1.20
1.30 - 1.35	11.20	4.70	20.40	3.12	90.80	25.84	14.80	4.70
1.35 - 1.40	18.70	8.40	39.10	5.65	79.60	28.81	29.75	8.40
1.40 - 1.45	15.50	13.70	54.60	7.93	60.90	35.08	46.85	13.70
1.45 - 1.50	9.60	20.00	64.20	9.74	45.40	42.38	59.40	20.00
1.50 - 1.60	11.50	26.50	75.70	12.28	35.80	48.38	69.95	26.50
1.60 - 1.80	6.00	39.30	81.70	14.27	24.30	58.73	78.70	39.30
+ 1.80	18.30	65.10	100.00	23.57	18.30	65.10	90.85	65.10
TOTAL	100.00	23.57						

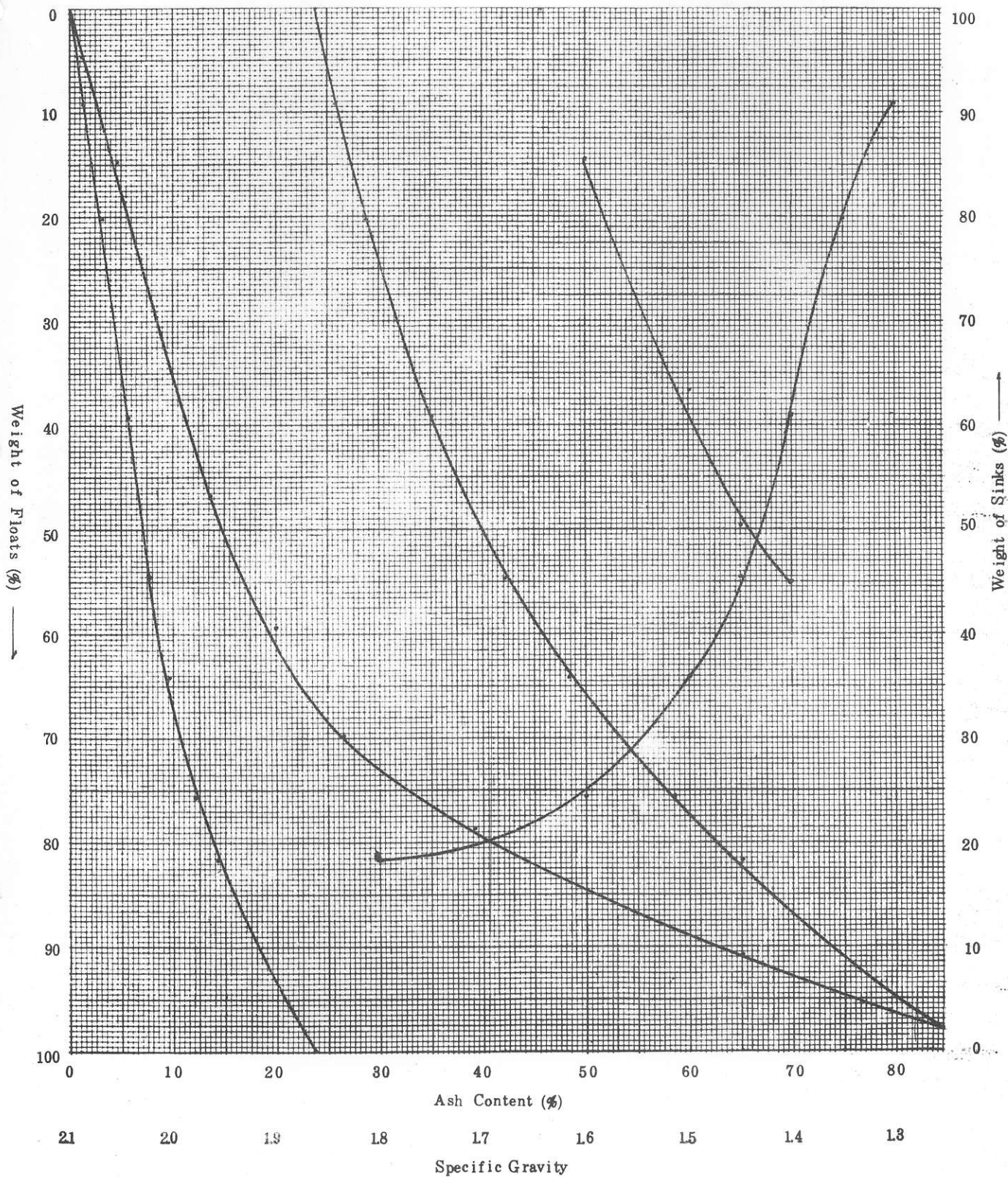
Graph 6 Washability Curves

SAMPLE: #8 Seam Raw Coal with Dilution

DATE: 1976

SIZE : 2" x 28M

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MITSUI MINING CO., LTD.



WASHABILITY DATA

TABLE 12 #8 SEAM RAW COAL (ADIT 7)

28M x 60M (WITH DILUTION)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	16.90	1.70	16.90	1.70	100.00	13.99	8.45	1.70
1.30 - 1.35	28.50	5.00	45.40	3.77	83.10	16.50	31.15	5.00
1.35 - 1.40	23.80	9.30	69.20	5.67	54.60	22.50	57.30	9.30
1.40 - 1.45	10.70	14.70	79.90	6.88	30.80	32.69	74.55	14.70
1.45 - 1.50	4.10	19.40	84.00	7.49	20.10	42.27	81.95	19.40
1.50 - 1.60	4.40	26.30	88.40	8.43	16.00	48.13	86.20	26.30
1.60 - 1.80	6.10	39.20	94.50	10.42	11.60	56.41	91.45	39.20
+ 1.80	5.50	75.50	100.00	13.99	5.50	75.50	97.25	75.50
TOTAL	100.00	13.99						

Graph 7

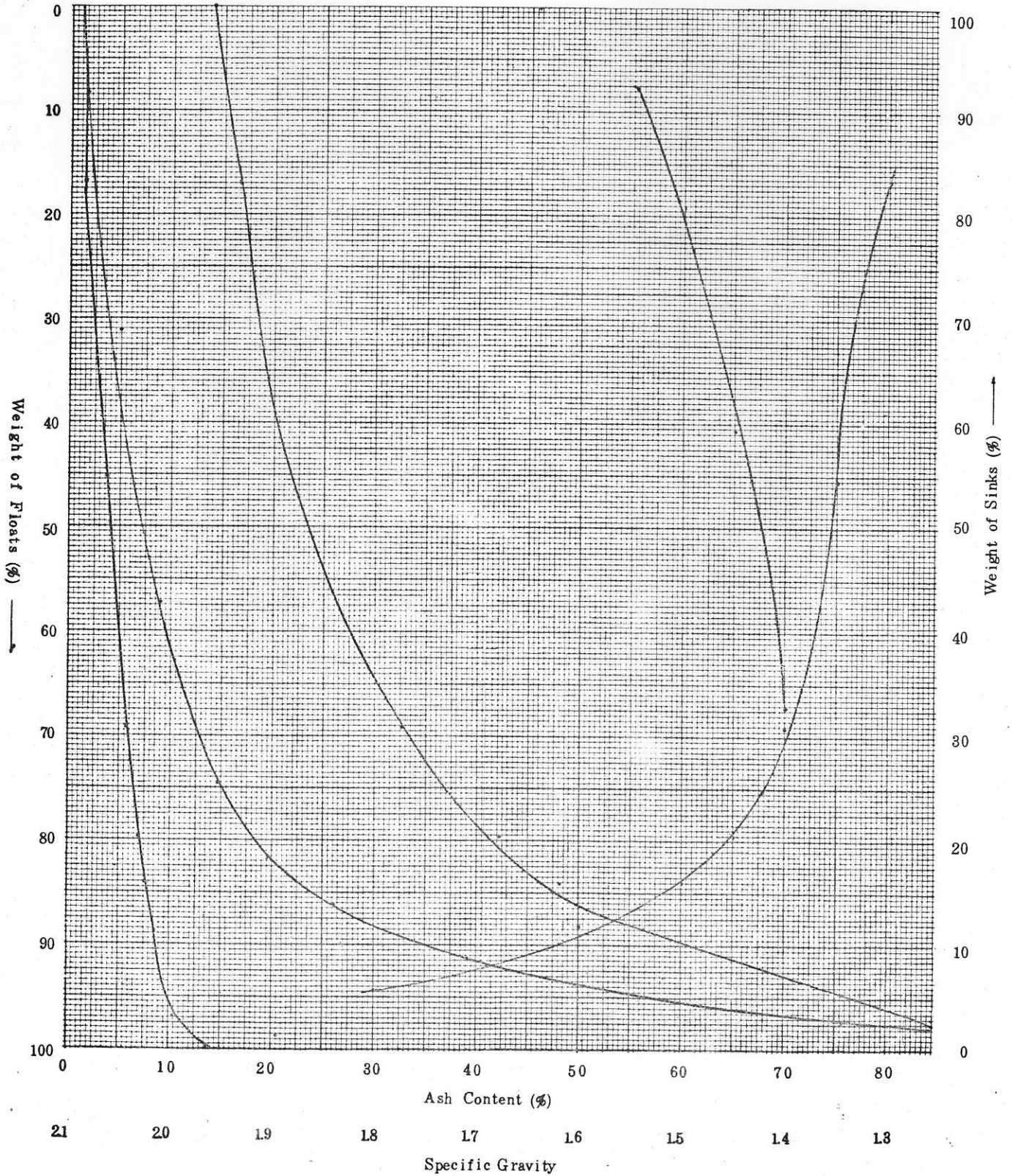
Washability Curves

SAMPLE: #8 Seam Raw Coal with Dilution

DATE: 1976

SIZE : 28M x 60M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



WASHABILITY DATA

TABLE 13 #8 SEAM RAW COAL (ADIT 7)

60M x 0 (WITH DILUTION)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	9.40	1.70	9.40	1.70	100.00	12.33	4.70	1.70
1.30 - 1.35	38.50	3.60	47.90	3.23	90.60	13.43	28.65	3.60
1.35 - 1.40	17.00	7.00	64.90	4.22	52.10	20.70	56.40	7.00
1.40 - 1.45	13.10	10.60	78.00	5.29	35.10	27.33	71.45	10.60
1.45 - 1.50	5.70	15.40	83.70	5.98	22.00	37.29	80.85	15.40
1.50 - 1.60	5.70	22.30	89.40	7.02	16.30	44.95	86.55	22.30
1.60 - 1.80	4.20	36.30	93.60	8.33	10.60	57.13	91.50	36.30
+ 1.80	6.40	70.80	100.00	12.33	6.40	70.80	96.80	70.80
TOTAL	100.00	12.33						

Graph 8

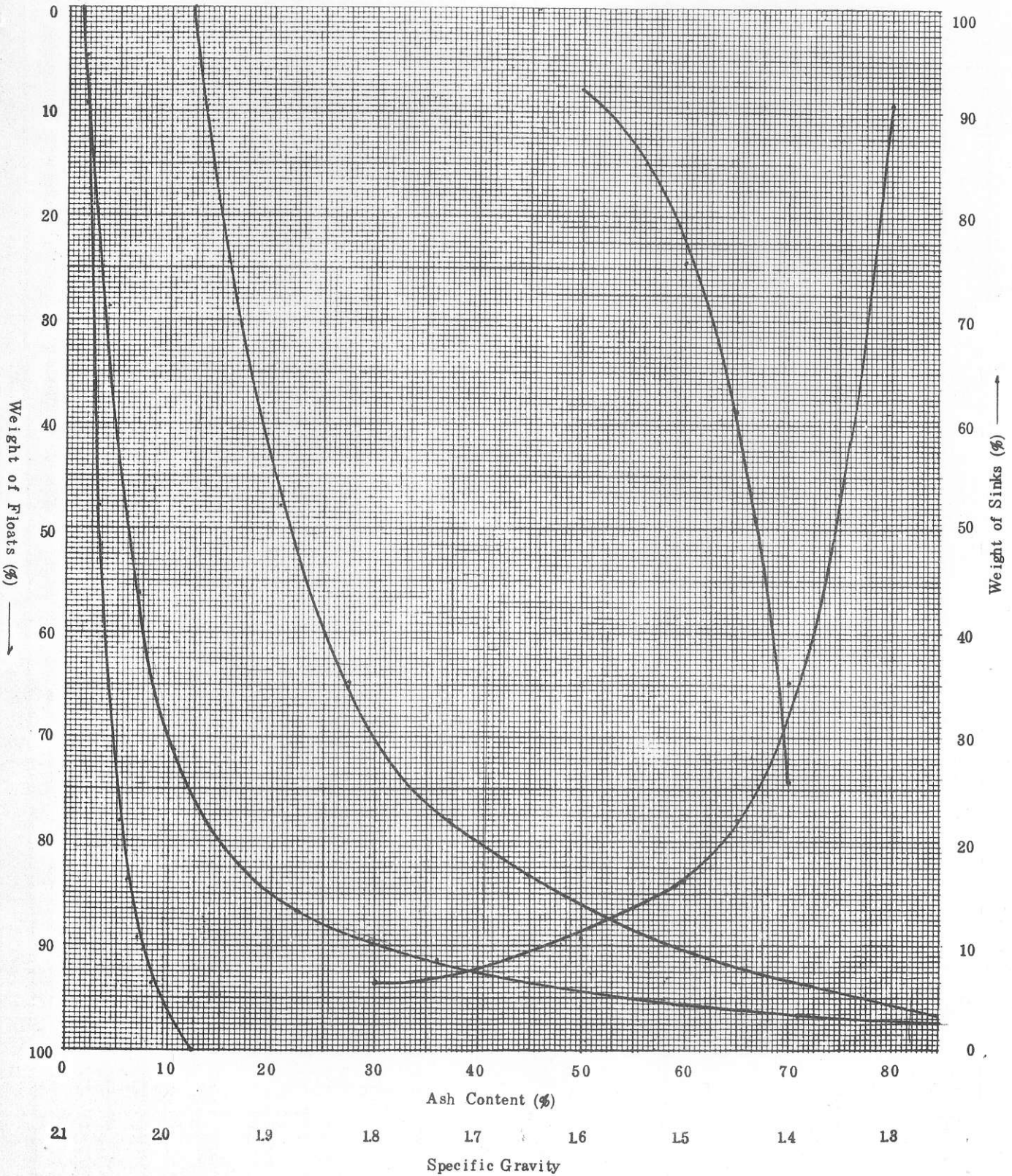
Washability Curves

SAMPLE: #8 Seam Raw Coal with Dilution

DATE: 1976

SIZE : 60M x 0

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WASHABILITY DATA

TABLE 14 #9 SEAM RAW COAL (ADIT 4)

2" x 28M (WITH DILUTION)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	5.60	1.30	5.60	1.30	100.00	19.66	2.80	1.30
1.30 - 1.35	28.40	4.60	34.00	4.06	94.40	20.75	19.80	4.60
1.35 - 1.40	27.70	8.90	61.70	6.23	66.00	27.70	47.85	8.90
1.40 - 1.45	11.60	13.80	73.30	7.43	38.30	41.30	67.50	13.80
1.45 - 1.50	5.50	19.10	78.80	8.24	26.70	53.25	76.05	19.10
1.50 - 1.60	4.50	26.60	83.30	9.24	21.20	62.10	81.05	26.60
1.60 - 1.80	2.50	41.40	85.30	10.17	16.70	71.67	84.55	41.40
+ 1.80	14.20	77.00	100.00	19.66	14.20	77.00	92.90	77.00
TOTAL	100.00	19.66						

Graph 9

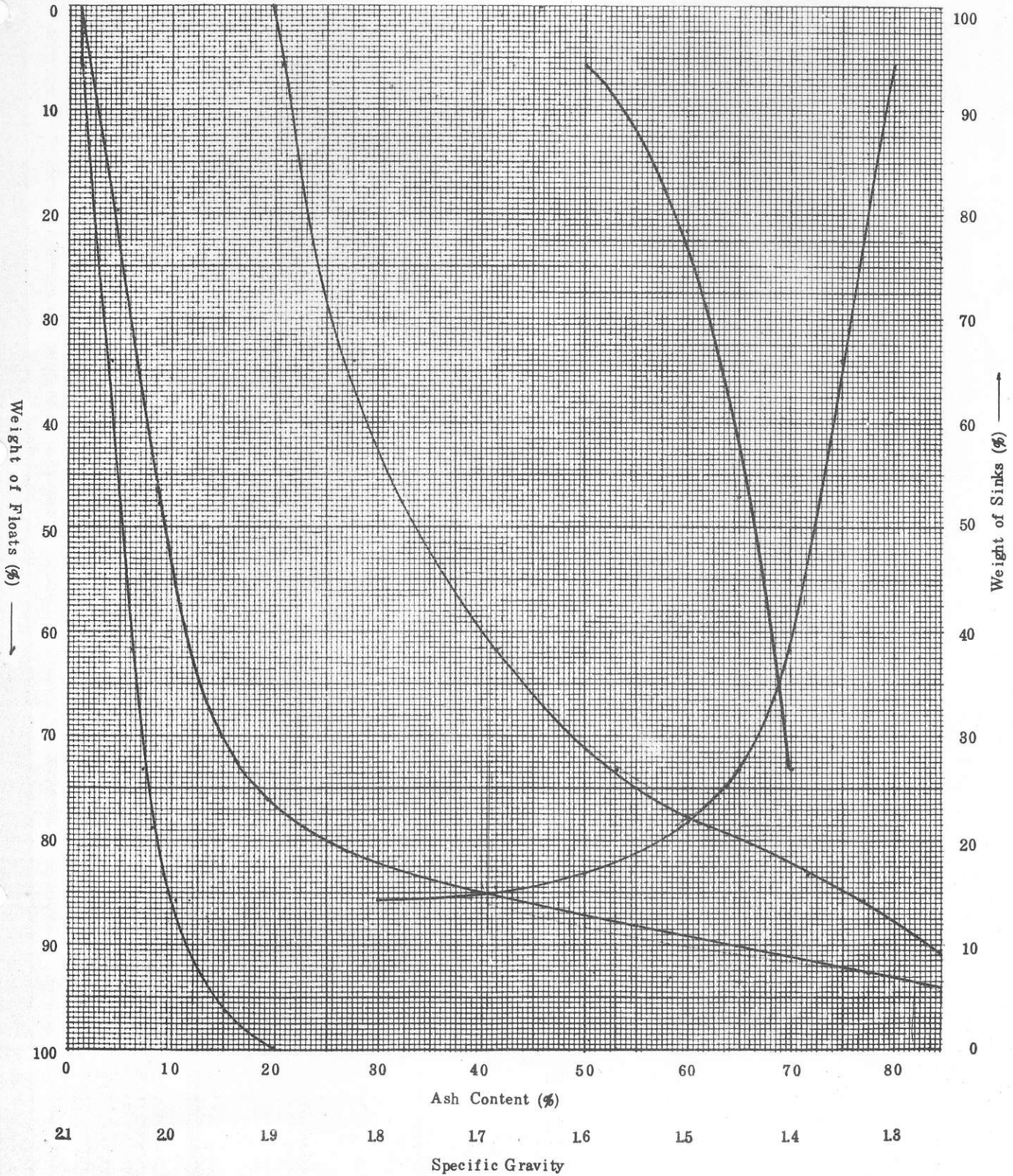
Washability Curves

SAMPLE: #9 Seam Raw Coal with Dilution

DATE: 1976

SIZE : 2"x 28M

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WASHABILITY DATA

TABLE 15 #9 SEAM RAW COAL (ADIT 4)

28M x 60M (WITH DILUTION)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	24.20	1.30	24.20	1.30	100.00	12.89	12.10	1.30
1.30 - 1.35	30.30	4.10	54.50	2.86	75.80	16.58	39.35	4.10
1.35 - 1.40	17.70	8.20	72.20	4.17	45.50	24.90	63.35	8.20
1.40 - 1.45	10.90	13.80	83.10	5.43	27.80	35.53	77.65	13.80
1.45 - 1.50	3.60	19.50	86.70	6.01	16.90	49.55	84.90	19.50
1.50 - 1.60	3.00	27.10	89.70	6.72	13.30	57.68	88.20	27.10
1.60 - 1.80	2.30	41.50	92.00	7.59	10.30	66.59	90.85	41.50
+ 1.80	8.00	73.80	100.00	12.89	8.00	73.80	96.00	73.80
TOTAL	100.00	12.89						

Graph 10

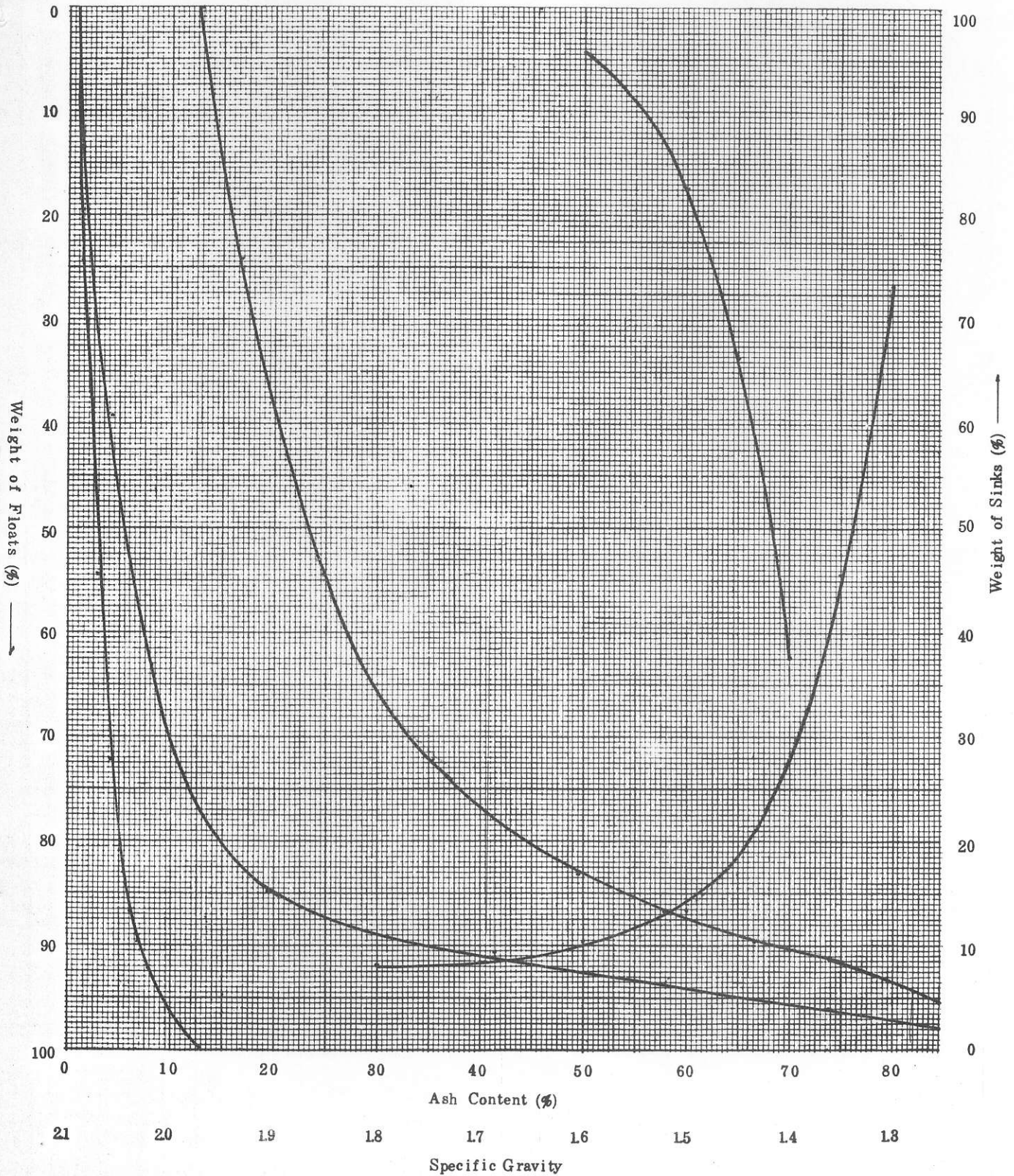
Washability Curves

SAMPLE: #9 Seam Raw Coal with Dilution

DATE: 1976

SIZE : 28M x 60M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



WASHABILITY DATA

TABLE 16 #9 SEAM RAW COAL (ADIT 4)

60M x 0 (WITH DILUTION)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	21.20	1.00	21.20	1.00	100.00	14.57	10.60	1.00
1.30 - 1.35	27.00	3.20	48.20	2.23	78.80	18.22	34.70	3.20
1.35 - 1.40	17.80	6.40	66.00	3.36	51.80	26.04	57.10	6.40
1.40 - 1.45	10.90	10.60	76.90	4.38	34.00	36.33	71.45	10.60
1.45 - 1.50	4.70	15.50	81.60	5.02	23.10	48.47	79.25	15.50
1.50 - 1.60	3.40	22.50	85.00	5.72	18.40	56.89	83.30	22.50
1.60 - 1.80	2.50	35.10	87.50	6.56	15.00	64.68	86.25	35.10
+ 1.80	12.50	70.60	100.00	14.57	12.57	70.60	93.75	70.60
TOTAL	100.00	14.57						

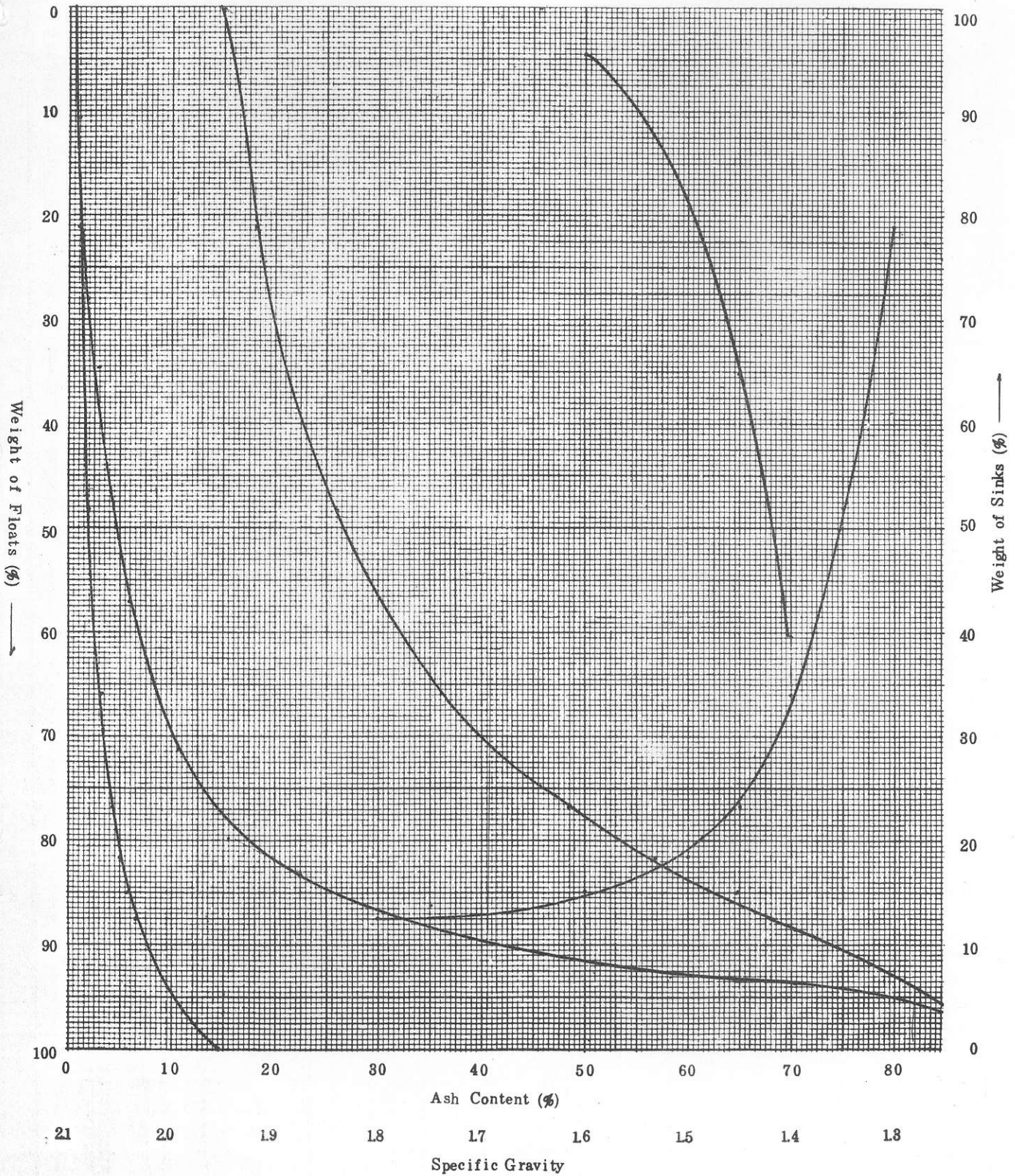
Graph 11

Washability Curves

SAMPLE: #9 A. Seam Raw Coal with Dilution DATE: 1976

SIZE : 60M x 0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



WASHABILITY DATA

TABLE 17 #10B SEAM RAW COAL (ADIT 5)

2" x 28M (WITH DILUTION)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	10.70	1.20	10.70	1.20	100.00	24.39	5.35	1.20
1.30 - 1.35	21.60	5.70	32.30	4.21	89.30	27.16	21.50	5.70
1.35 - 1.40	18.00	10.80	50.30	6.57	67.70	34.01	41.30	10.80
1.40 - 1.45	11.50	15.00	61.80	8.14	49.70	42.42	56.05	15.00
1.45 - 1.50	7.50	19.80	69.30	9.40	38.20	50.68	65.55	19.80
1.50 - 1.60	7.30	27.30	76.60	11.11	30.70	58.22	72.95	27.30
1.60 - 1.80	7.30	42.20	83.90	13.81	23.40	67.86	80.25	42.20
+ 1.80	16.10	79.50	100.00	24.39	16.10	79.50	91.95	79.50
TOTAL	100.00	24.39						

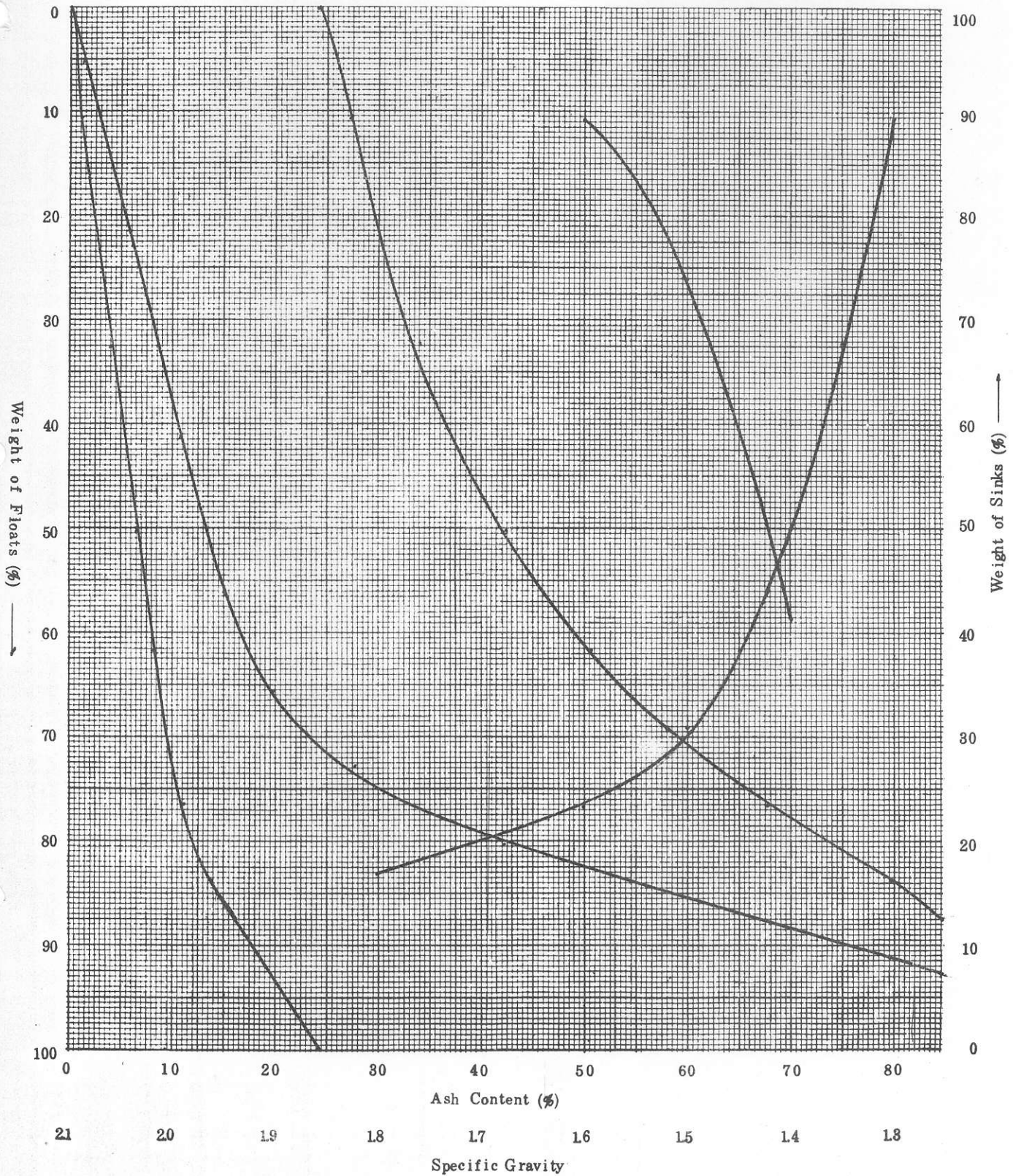
Graph 12

Washability Curves

SAMPLE: #10B Seam Raw Coal with Dilution DATE: 1976

SIZE : 2" x 28M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



WASHABILITY DATA

TABLE 18 #10B SEAM RAW COAL (ADIT 5)

28M x 60M (WITH DILUTION)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	19.40	1.80	19.40	1.80	100.00	19.48	9.70	1.80
1.30 - 1.35	20.20	5.10	39.60	3.48	80.60	23.73	29.50	5.10
1.35 - 1.40	16.50	10.10	56.10	5.43	60.40	29.97	47.85	10.10
1.40 - 1.45	12.80	14.60	68.90	7.13	43.90	37.43	62.50	14.60
1.45 - 1.50	5.70	20.10	74.60	8.12	31.10	46.83	71.75	20.10
1.50 - 1.60	6.60	27.70	81.20	9.72	25.40	52.83	77.90	27.70
1.60 - 1.80	6.10	40.10	87.30	11.84	18.80	61.65	84.25	40.10
+ 1.80	12.70	72.00	100.00	19.48	12.70	72.00	93.65	72.00
TOTAL	100.00	19.48						

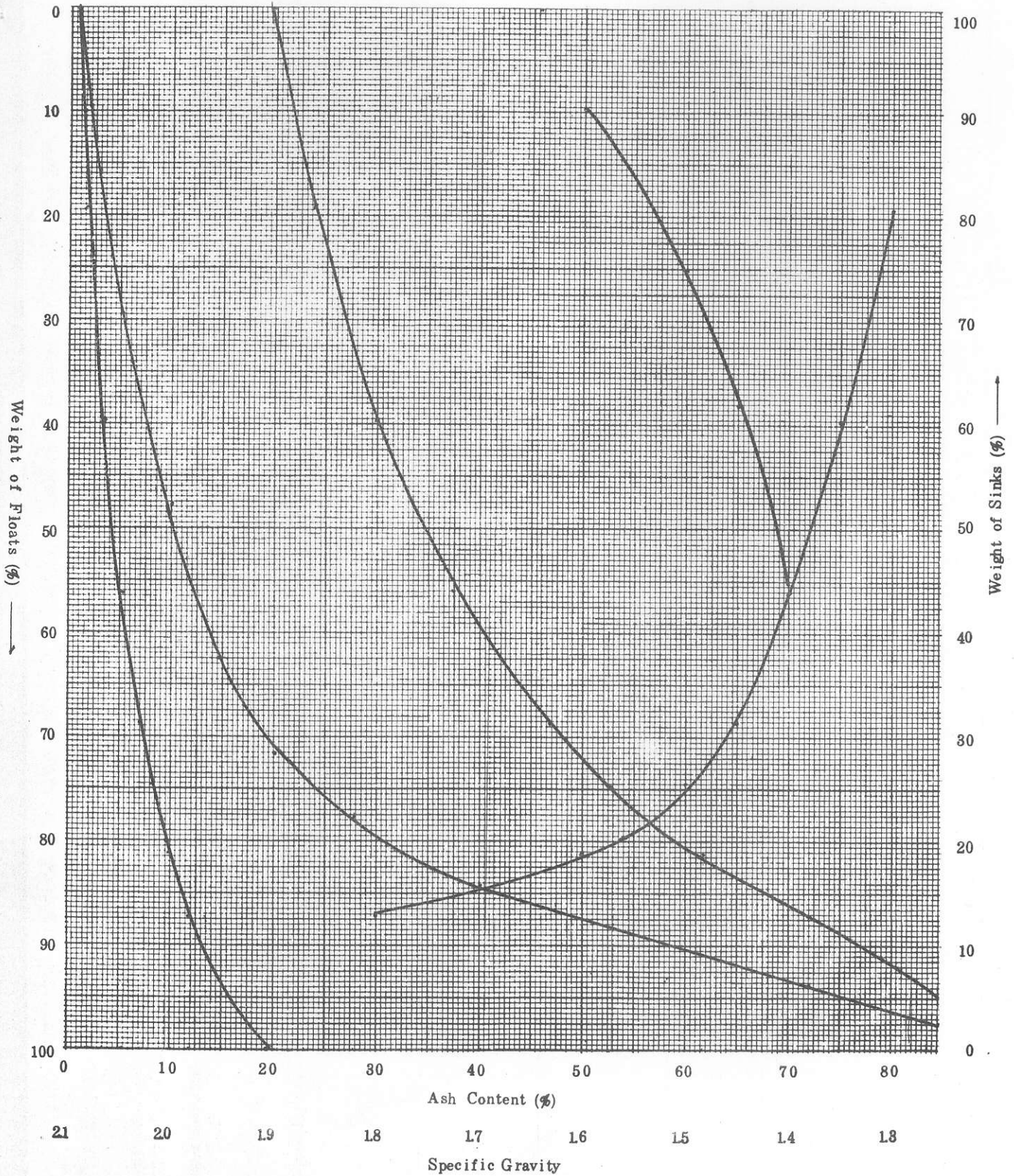
Graph 13

Washability Curves

SAMPLE:# 10B Seam Raw Coal with Dilution DATE: 1976

SIZE : 28M x 60M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



WASHABILITY DATA

TABLE 19 #10B SEAM RAW COAL (ADIT 5)

60M x 0 (WITH DILUTION)

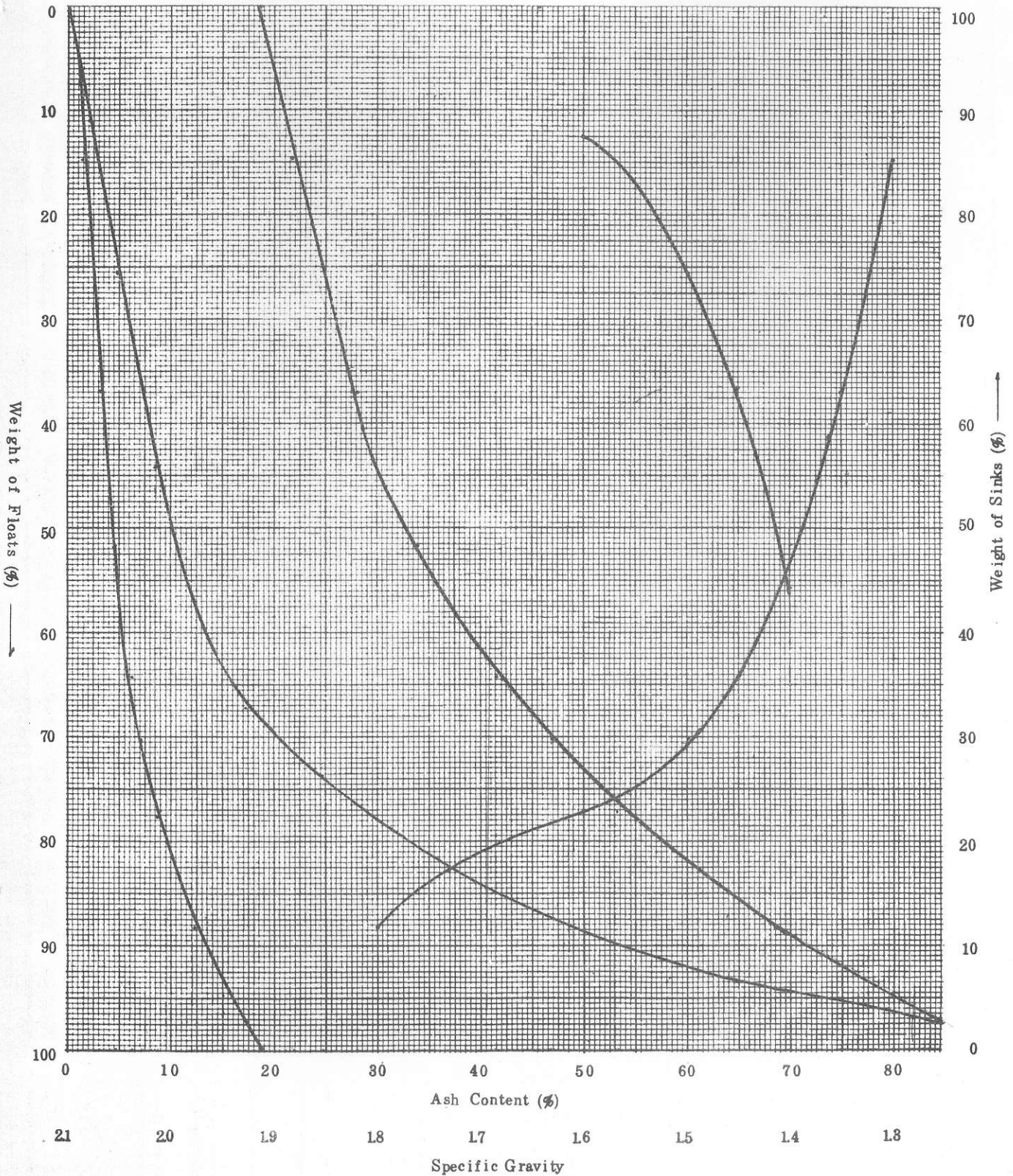
SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	14.80	1.40	14.80	1.40	100.00	18.83	7.40	1.40
1.30 - 1.35	22.02	4.40	37.00	3.20	85.20	21.86	25.90	4.40
1.35 - 1.40	14.60	8.40	51.60	4.67	63.00	28.01	44.30	8.40
1.40 - 1.45	12.60	12.50	64.20	6.21	48.40	33.92	57.90	12.50
1.45 - 1.50	6.20	17.30	70.40	7.18	35.80	41.46	67.30	17.30
1.50 - 1.60	6.90	24.90	77.30	8.77	29.60	46.52	73.85	24.90
1.60 - 1.80	11.10	37.00	88.40	12.31	22.70	53.10	82.85	37.00
+ 1.80	11.60	68.50	100.00	18.83	11.60	68.50	94.20	68.50
TOTAL	100.00	18.83						

Graph 14 Washability Curves

SAMPLE: #10B Seam Raw Coal with Dilution DATE: 1976

SIZE : 60M x 0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



WASHABILITY DATA

TABLE 20 #10A SEAM RAW COAL (ADIT 12)

2" x 28M (WITH DILUTION)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	2.90	1.10	2.90	1.10	100.00	26.14	1.45	1.10
1.30 - 1.35	4.90	5.60	7.80	3.93	97.10	26.89	5.35	5.60
1.35 - 1.40	16.00	10.90	23.80	8.61	92.20	28.02	15.80	10.90
1.40 - 1.45	22.60	14.60	46.40	11.53	76.20	31.62	35.10	14.60
1.45 - 1.50	16.10	20.20	62.50	13.76	53.60	38.80	54.45	20.20
1.50 - 1.60	17.20	27.80	79.70	16.79	37.50	46.78	71.10	27.80
1.60 - 1.80	10.00	38.20	89.70	19.18	20.30	62.86	84.70	38.20
+ 1.80	10.30	86.80	100.00	26.14	10.30	86.80	94.85	86.80
TOTAL	100.00	26.14						

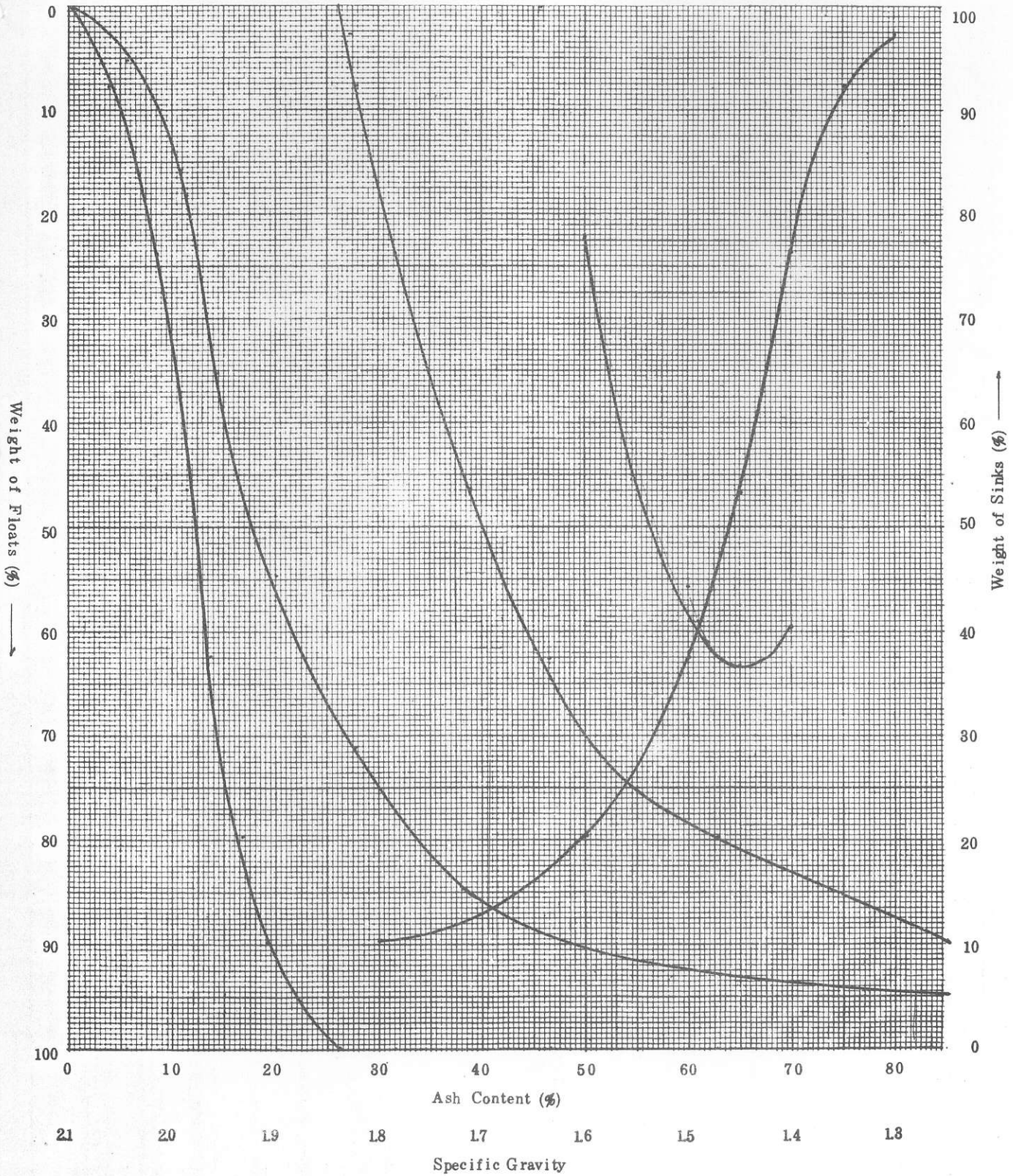
Graph 15

Washability Curves

SAMPLE: #10A Seam Raw Coal with Dilution DATE: 1976

SIZE : 2" x 28M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



WASHABILITY DATA

TABLE 21 #10A SEAM RAW COAL (ADIT 12)

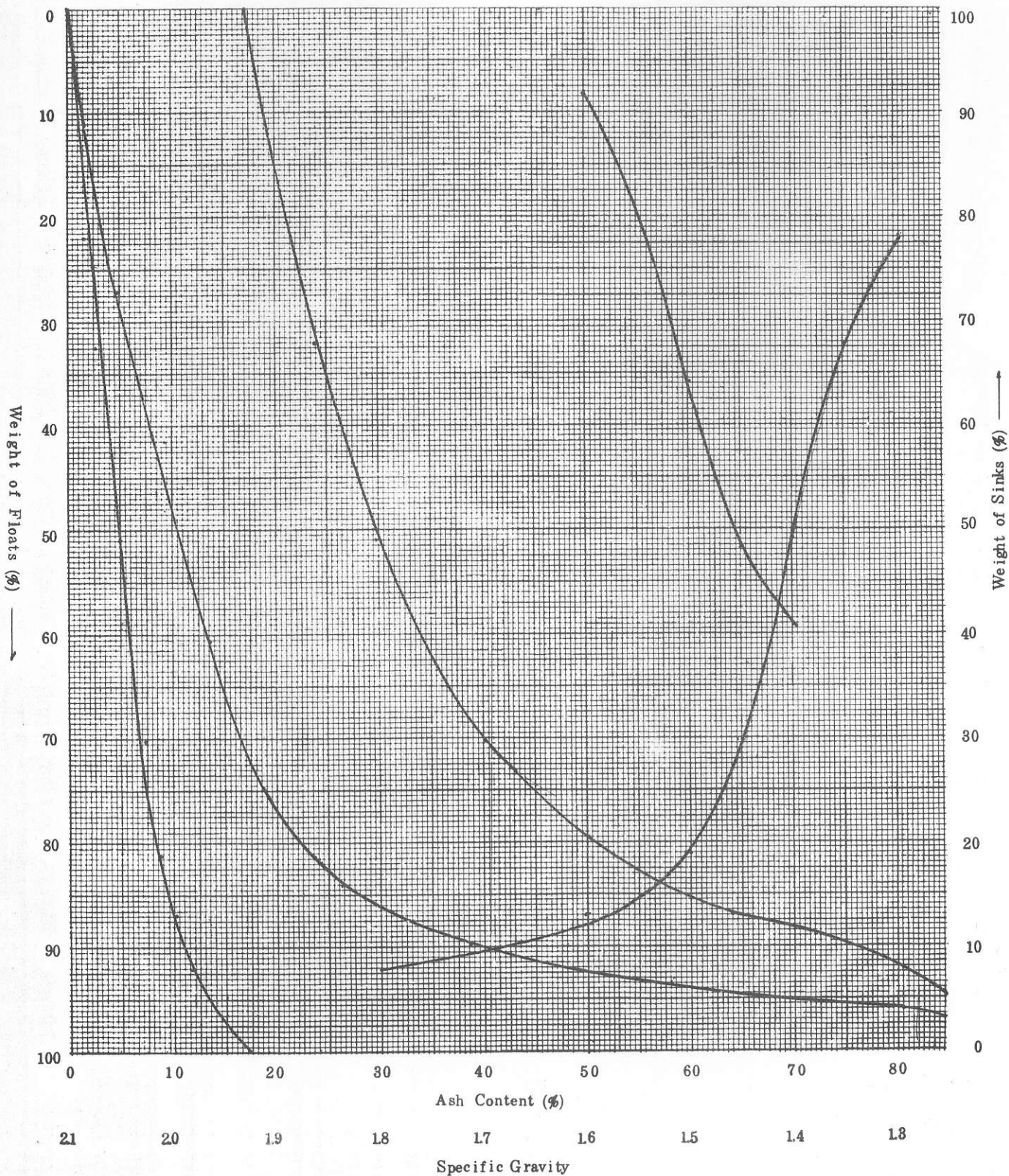
28M x 60M (WITH DILUTION)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	22.00	1.60	22.00	1.60	100.00	17.12	11.00	1.60
1.30 - 1.35	10.50	4.90	32.50	2.67	78.00	21.50	27.25	4.90
1.35 - 1.40	18.50	9.10	51.00	5.00	67.50	24.08	41.75	9.10
1.40 - 1.45	19.20	13.60	70.20	7.35	49.00	29.74	60.60	13.60
1.45 - 1.50	11.00	19.10	81.20	8.94	29.80	40.13	75.70	19.10
1.50 - 1.60	5.80	26.30	87.00	10.10	18.80	52.44	84.10	26.30
1.60 - 1.80	5.10	38.70	92.10	11.68	13.00	64.10	89.55	38.70
+ 1.80	7.90	80.50	100.00	17.12	7.90	80.50	96.05	80.50
TOTAL	100.00	17.12						

Graph 16 Washability Curves

SAMPLE: #10A Seam Raw Coal with Dilution DATE: 1976

SIZE : 28M x 60M CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



WASHABILITY DATA

TABLE 22 #10A SEAM RAW COAL (ADIT 12)

60M x 0 (WITH DILUTION)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	20.90	1.60	20.90	1.60	100.00	14.51	10.45	1.60
1.30 - 1.35	20.60	4.60	41.50	3.09	79.10	17.91	31.20	4.60
1.35 - 1.40	18.00	8.40	59.50	4.70	58.50	22.60	50.50	8.40
1.40 - 1.45	15.80	13.10	75.30	6.46	40.50	28.92	67.40	13.10
1.45 - 1.50	7.50	18.80	82.80	7.58	24.70	39.03	79.05	18.80
1.50 - 1.60	6.90	26.20	89.70	9.01	17.20	47.86	86.25	26.20
1.60 - 1.80	3.60	38.10	93.30	10.13	10.30	62.36	91.50	38.10
+ 1.80	6.70	75.40	100.00	14.51	6.70	75.40	96.65	75.40
TOTAL	100.00	14.51						

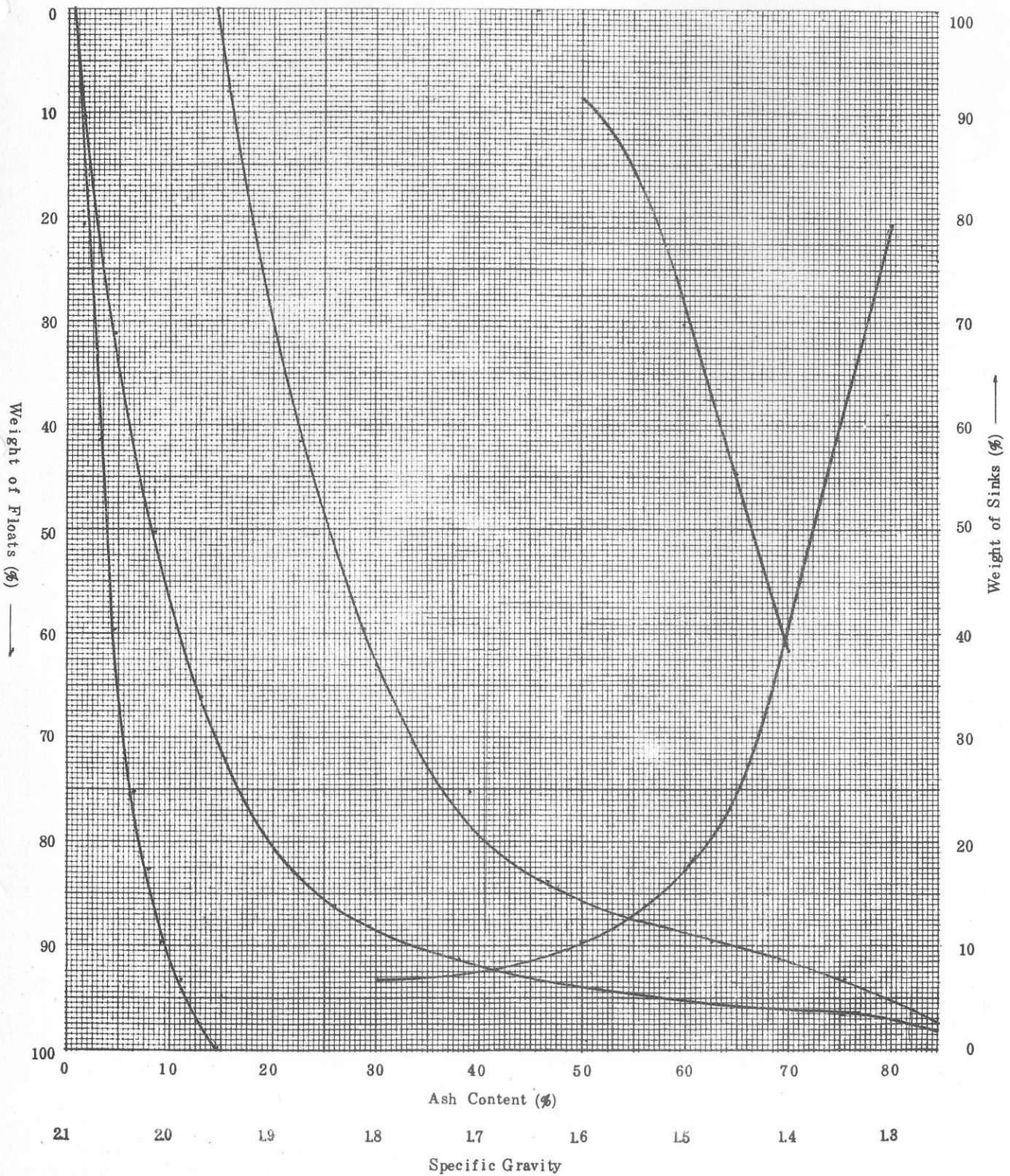
Graph 17

Washability Curves

SAMPLE: #10A Seam Raw Coal with Dilution DATE: 1976

SIZE : 60M x 0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



WASAHABILITY DATA

TABLE 23 #6 SEAM RAW COAL (ADIT 15)

2" x 0 (WITH DILUTION)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	21.1	2.0	21.1	2.0	100.0	24.0	10.55	2.0
1.30 - 1.40	38.0	5.2	59.1	4.1	78.9	29.9	40.10	5.2
1.40 - 1.50	12.5	13.8	71.6	5.8	40.9	52.9	65.35	13.8
1.50 - 1.60	4.5	26.4	76.1	7.0	28.4	70.1	73.85	26.4
+ 1.60	23.9	78.3	100.0	24.0	23.9	78.3	88.05	78.3
TOTAL	100.00	23.9						

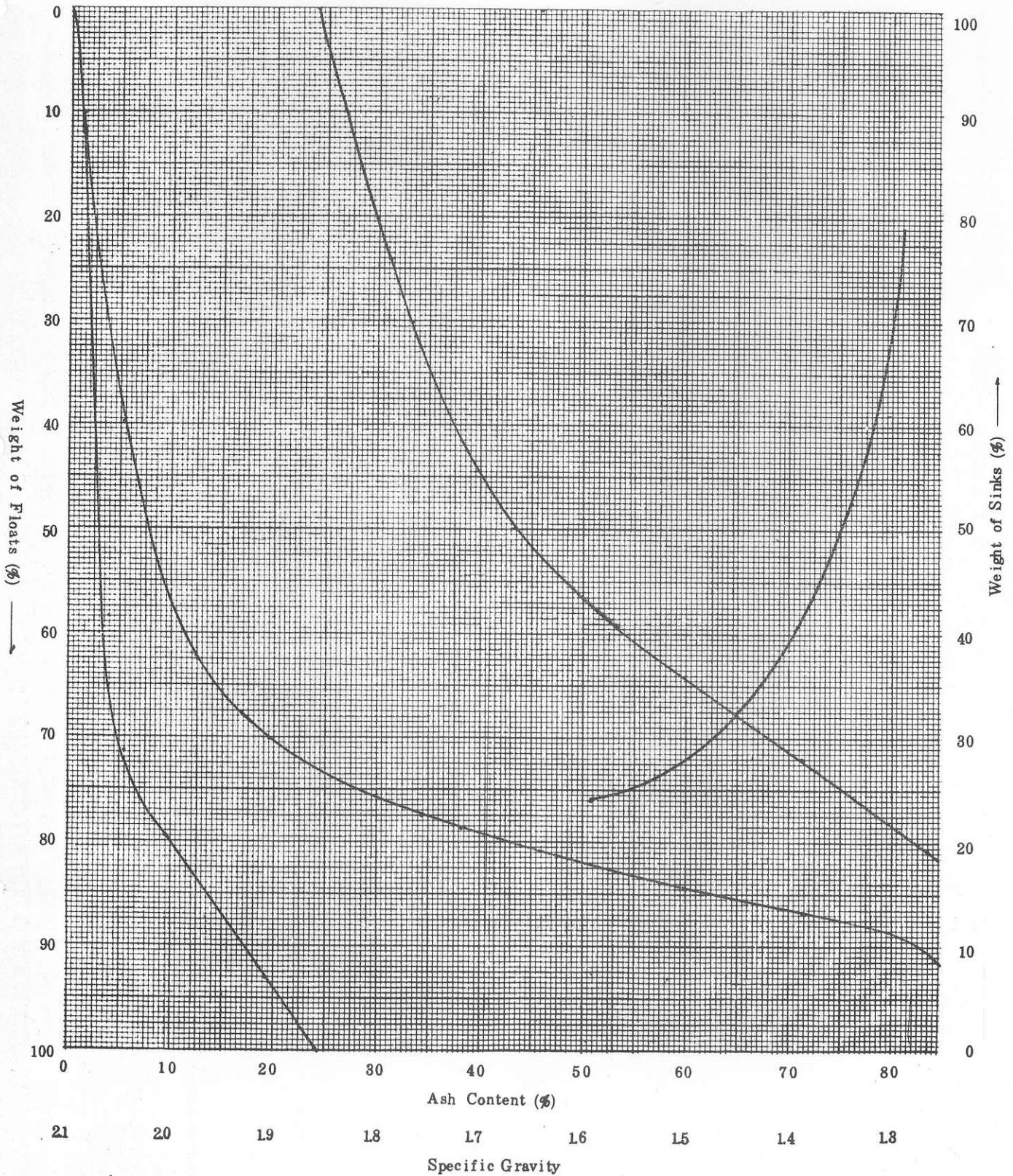
Graph 18

Washability Curves

SAMPLE: #6 Seam Raw Coal with Dilution DATE: Mar. 1977

SIZE : 2" x 0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



WASAHABILITY DATA

TABLE 24 #7 SEAM RAW COAL (ADIT 16)

2" x 0 (WITH DILUTION)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	9.4	2.0	9.4	2.0	100.0	33.1	4.7	2.0
1.30 - 1.40	29.8	7.0	39.2	5.8	90.6	36.4	24.3	7.0
1.40 - 1.50	12.1	15.6	51.3	8.1	60.8	50.8	45.3	15.6
1.50 - 1.60	7.9	26.5	59.2	10.6	48.7	59.5	55.3	26.5
+ 1.60	40.8	65.9	100.0	33.1	40.8	65.9	79.6	65.9
TOTAL	100.00	33.1						

Graph 19

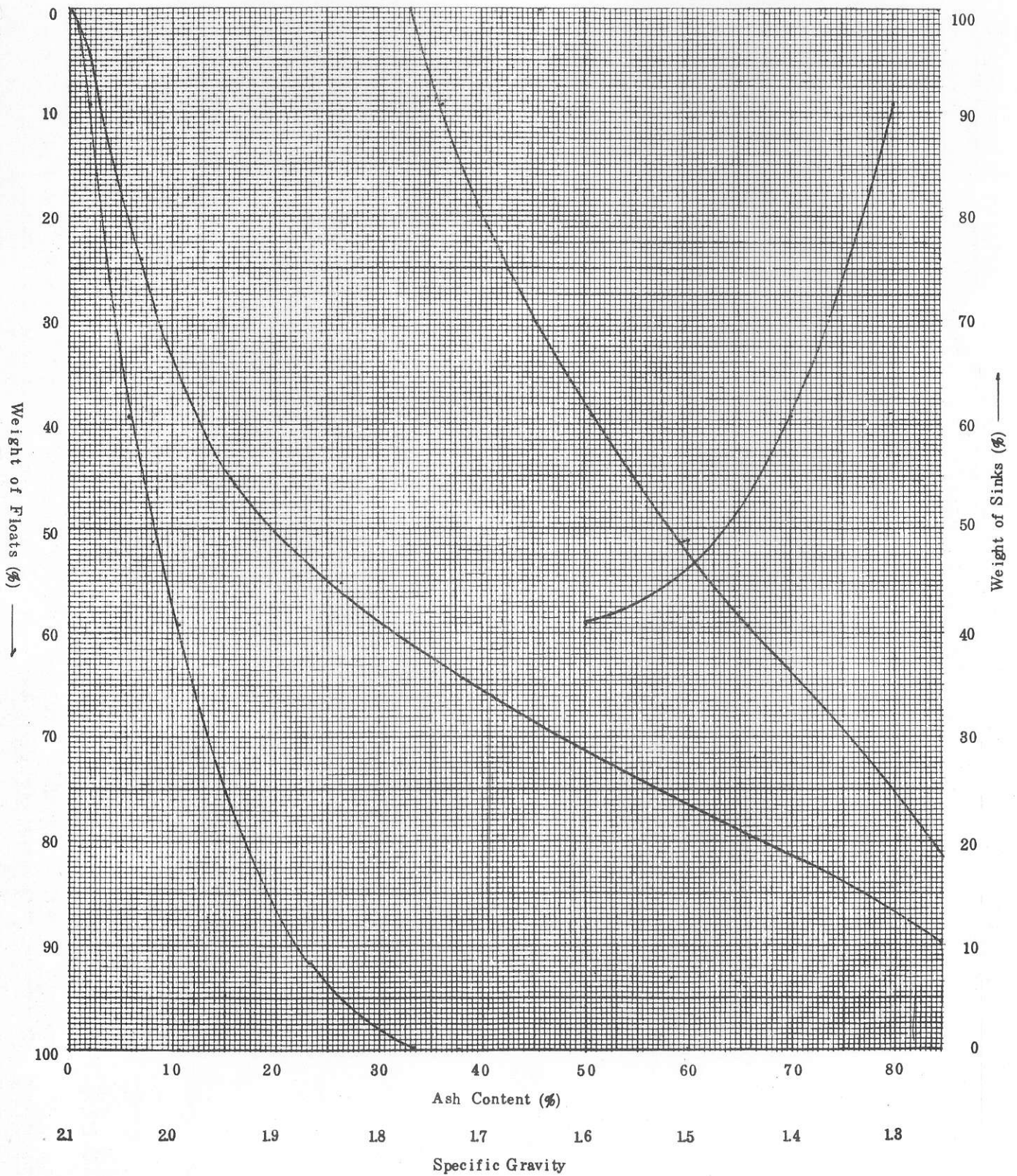
Washability Curves

SAMPLE: #7 Seam Raw Coal with Dilution

DATE: Mar. 1977

SIZE : 2" x 0

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MITSUI MINING CO., LTD.



6.0 WASHABILITY OF PLANT FEED

Representative washability of the plant feed applicable for plant design was calculated by using following seam ratio of main four seams as composite washability data.

Seam Raio

Seam	Ratio %
# 8	35.0
# 9	26.8
# 10B	23.2
# 10A	15.0

Washabilities of plant feed for size 2" x 28M, 28M x 60M and 60M x 0 can be found in the following Tables 25 through 27
Graphs 20 through 22.

WASHABILITY DATA

TABLE 25 PLANT FEED (WITH DILUTION)

2" x 28M (COMPOSITE OF SEAMS 8, 9, 10B, 10A)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	7.64	1.21	7.64	1.21	100.00	23.11	3.82	1.21
1.30 - 1.35	17.28	4.98	24.92	3.82	92.36	24.93	16.28	4.98
1.35 - 1.40	20.55	9.36	45.47	6.33	75.08	29.52	35.20	9.36
1.40 - 1.45	14.60	14.17	60.07	8.23	54.53	37.11	52.77	14.17
1.45 - 1.50	8.99	19.87	69.06	9.75	39.93	45.50	64.57	19.87
1.50 - 1.60	9.51	27.01	78.57	11.84	30.94	52.95	73.82	27.01
1.60 - 1.80	5.96	40.08	84.53	13.83	21.43	64.46	81.55	40.08
+ 1.80	15.47	73.85	100.00	23.11	15.47	73.85	92.27	73.85
TOTAL	100.00	23.11						

Graph 20

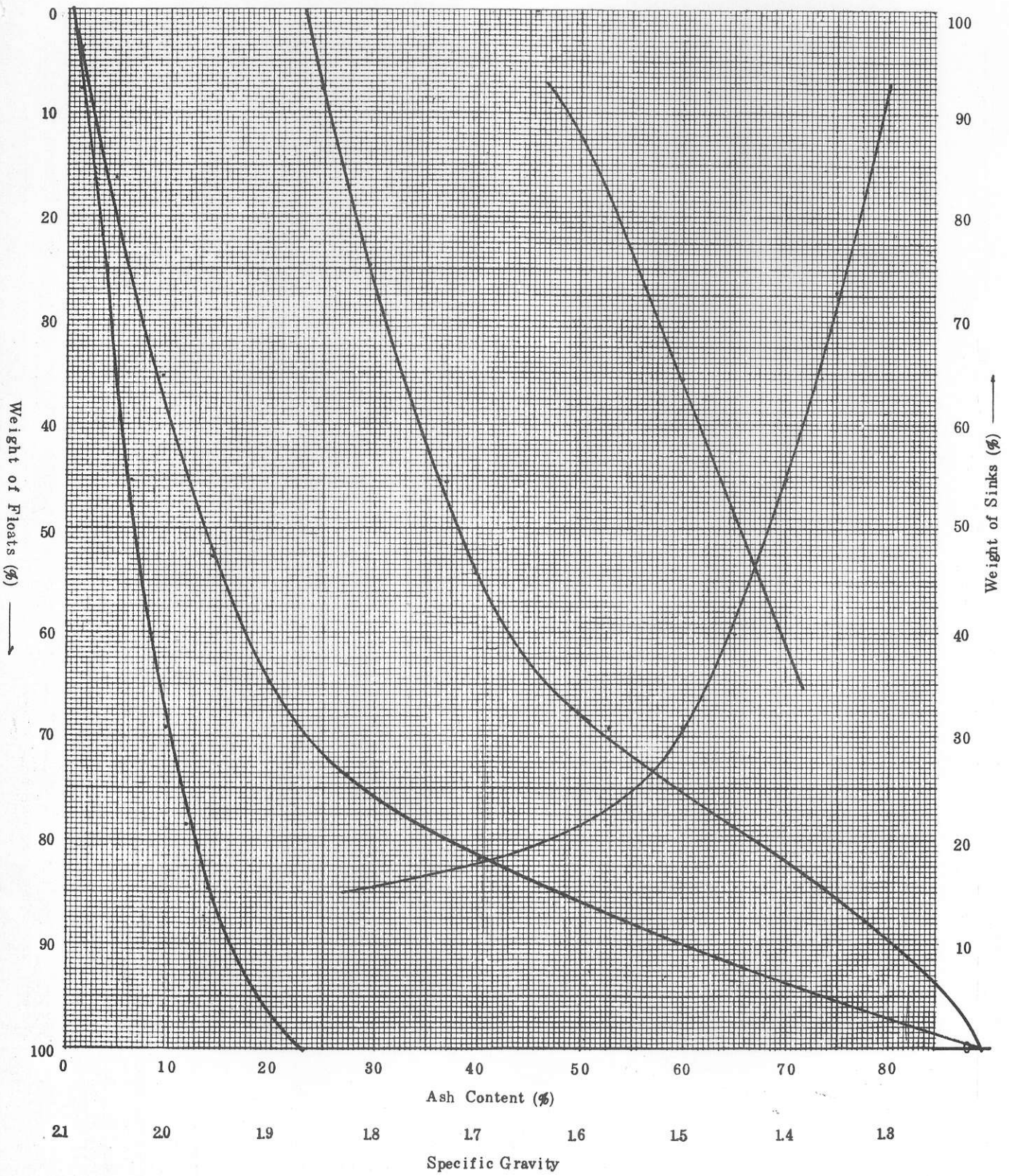
Washability Curves

SAMPLE: Raw Coal Washability

DATE: July 20, 1976

SIZE : 2" x 28M

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MITSUI MINING CO., LTD.



WASHABILITY DATA

TABLE 26 PLANT FEED (WITH DILUTION)

28M x 60M (COMPOSITE OF SEAMS 8, 9, 10B, 10A)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	20.21	1.58	20.21	1.58	100.00	15.45	10.11	1.58
1.30 - 1.35	24.37	4.71	44.58	3.29	79.79	18.97	32.40	4.17
1.35 - 1.40	19.68	9.16	64.26	5.09	55.42	25.24	54.32	9.16
1.40 - 1.45	12.52	14.21	76.78	6.58	35.74	34.09	70.52	14.21
1.45 - 1.50	5.37	19.50	82.15	7.42	23.22	44.81	79.47	19.50
1.50 - 1.60	4.74	26.89	86.89	8.48	17.85	52.42	84.52	26.89
1.60 - 1.80	4.95	39.67	91.84	10.16	13.11	61.65	89.37	39.67
+ 1.80	8.16	74.98	100.00	15.45	8.16	74.98	95.92	74.98
TOTAL	100.00	51.45						

Graph 21

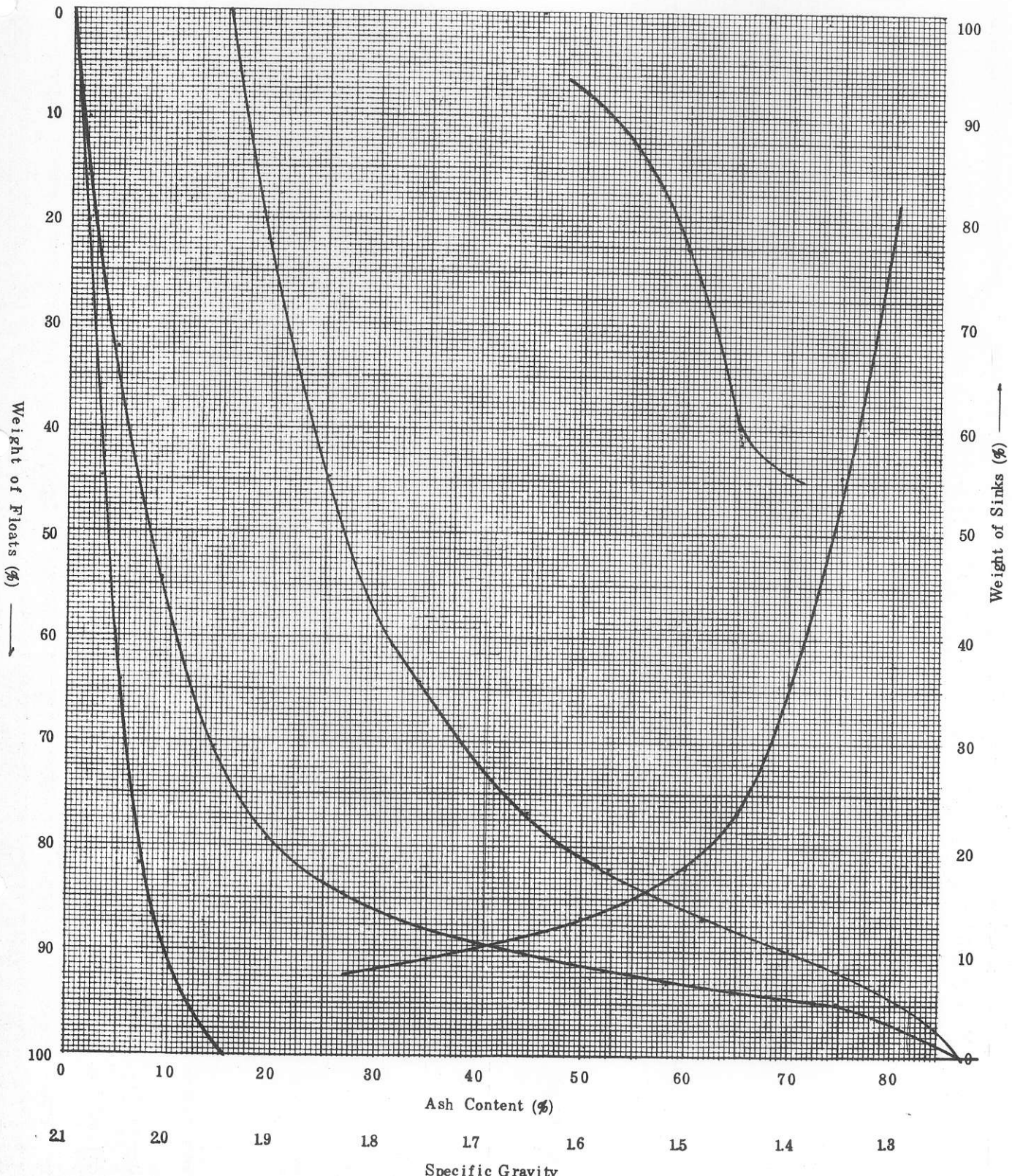
Washability Curves

SAMPLE: Raw Coal Washability

DATE: July 20, 1976

SIZE : 28M x 60M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



WASHABILITY DATA

TABLE 27 PLANT FEED

60M x 0 (COMPOSITE OF SEAMS 8, 9, 10B, 10A)

SPECIFIC GRAVITY	FRACTIONAL		CUMULATIVE				ELEMENTARY	
	WT %	ASH %	FLOATS		SINKS		WT %	ASH %
			WT %	ASH %	WT %	ASH %		
- 1.30	15.54	1.36	15.54	1.36	100.00	14.77	7.77	1.36
1.30 - 1.35	28.96	3.75	44.50	2.92	84.46	17.24	30.02	3.75
1.35 - 1.40	16.81	7.34	61.31	4.13	55.50	24.28	52.91	7.34
1.40 - 1.45	12.80	11.50	74.11	5.40	38.69	31.64	67.71	11.50
1.45 - 1.50	5.83	16.55	79.94	6.21	25.89	41.60	77.03	16.55
1.50 - 1.60	5.55	23.81	85.49	7.36	20.06	48.88	82.72	23.81
1.60 - 1.80	5.26	36.67	90.75	9.06	14.51	58.47	88.12	36.67
+ 1.80	9.25	70.87	100.00	14.77	9.25	70.87	95.38	70.87
TOTAL	100.00	14.77						

Graph 22

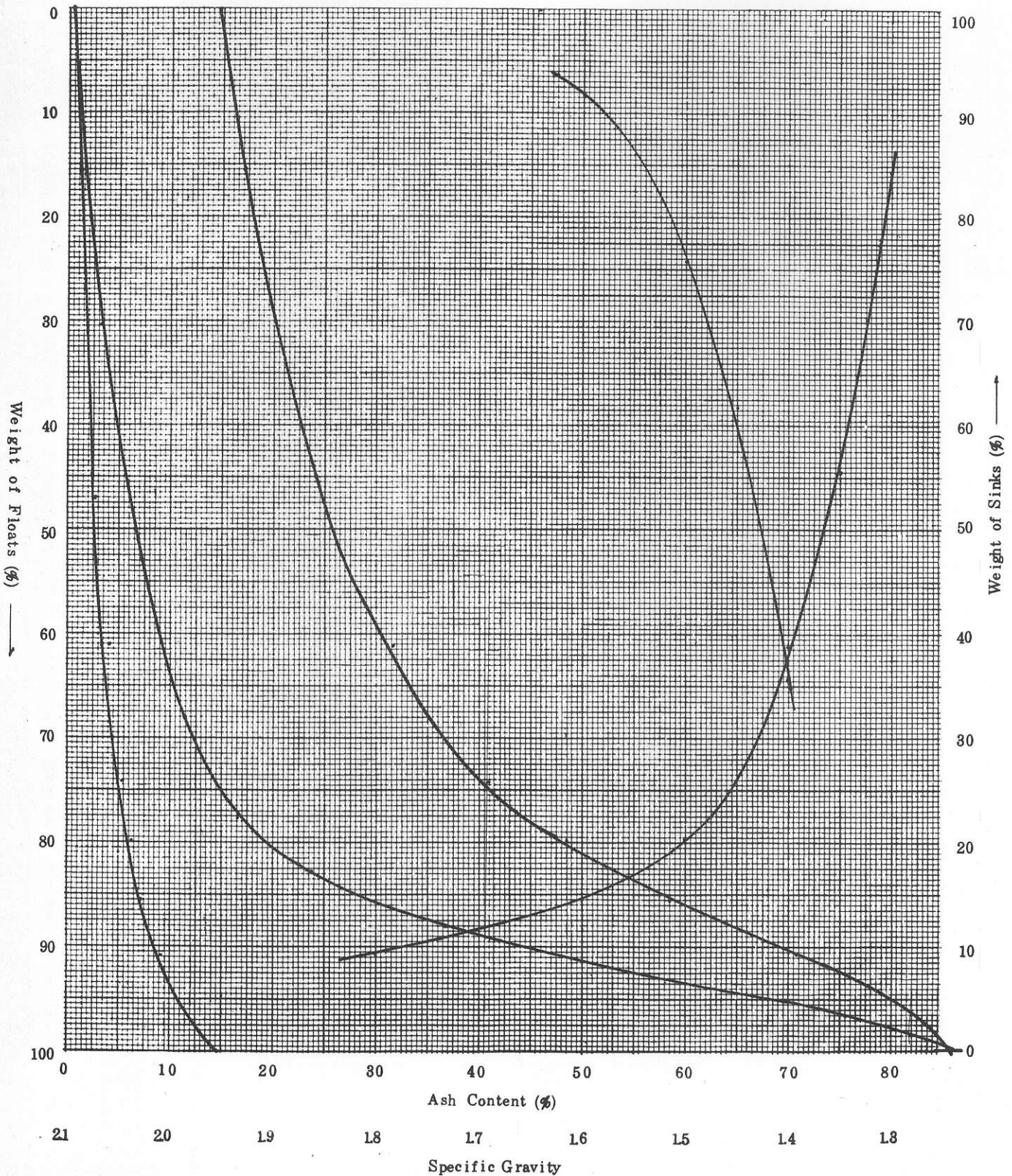
Washability Curves

SAMPLE: Raw Coal Washability

DATE: July 20, 1976

SIZE : 60M x 0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



7.0 BASIC DESIGN

7.1 Washability

It is very difficult to get 9.5 ash percent of clean coal from this coal without using heavy medium separation equipment, because in general, washabilities of this plant feed are not so good.

For example, the typical washability data of the plant feed shows pretty high near gravity material, such as 26, at the separating specific gravity which can allow to get 9.5 percent clean coal. This high near gravity material exceeds so called "formidable level", therefore, it is almost impossible to wash this coal using conventional washing system.

There are quite big differences between each seam on the washabilities, for example, in case, to get 9.5 ash percent clean coal near gravity material of seam No.6 7, 8, 9, 10B and 10A are 5, 18, 40, 5, 25 and 60 respectively.

On the other hand, since separation gravity of each seam to get 9.5 ash level of clean coal will be ranging from 1.4 to 1.9 very careful coal blending should be considered.

7.2 Blending System

It is necessary to maintain uniformity of a mining ratio of each seam as much as possible. In order to keep uniformity of plant

feed coal, the following blending system of raw coal is adopted.

The raw coal mined in the open pit is separately stored seam by seam at the stock piles of the mine site. The stored raw coal is loaded into a trailer by front end loader from the stock piles at a certain ratio for each seam, and transported into the truck dump bin at the plant site by trailer.

The raw coal from the truck dump bin is scattered uniformly by tripper conveyor and stored into the stock pile building at the plant site.

The live storage capacity of metallurgical raw coal is 12,000 tons, which will be equivalent to approximately 2 days production. The raw coal from the stockpile building will be reclaimed by using multiple feeders simultaneously so that uniform plant feed can be maintained.

7.3 Estimated Quality of Clean Coal

Based on the analysis results of samples taken out of each adit, and the proposed mining schedule and washing process, the quality of clean coal is expected as follows.

Metallurgical Coal

Ash %	9.5 (with 0.5% tolerance)
I.M.%	1.2
T.M.%	8.0
V.M.%	19.5 - 22.5
T.S.%	0.5
F.S.I.	4 - 6 1/2
Size	2" x 0

Thermal Coal (washed coal)

Ash %	10 - 12
T.M.%	6 - 8
V.M.%	19.5 - 22.5
T.S.%	0.5
Size	2" x 0
Calorific Value	7,500 - 7,700 K cal/kg (13,500 - 13,800 B.T.U.)

Thermal Coal (unwashed coal)

Ash %	23.0
T.M.%	6.0
V.M.%	17 - 20
T.S.%	0.5
Size	2" x 0
Calorific Value	6,400 Kcal/kg (11,500 B.T.U.)

7.4 Theoretical Yield

Size	Clean Coal Ash (%)	Theoretical Yield (%)
2" x 28M	8.5	61.67
	9.0	64.62
	9.5	67.58
	10.0	70.20
28M x 60M	8.5	86.95
	9.0	88.42
	9.5	89.90
	10.0	91.37
60M x 0	8.5	89.01
	9.0	90.56
	9.5	91.80
	10.0	92.82
2" x 0	8.5	69.93
	9.0	72.42
	9.5	74.89
	10.0	77.07

7.5 Clean Coal Ash and Yield

The relation between ash and yield of clean coal for typical plant feed is as follows:

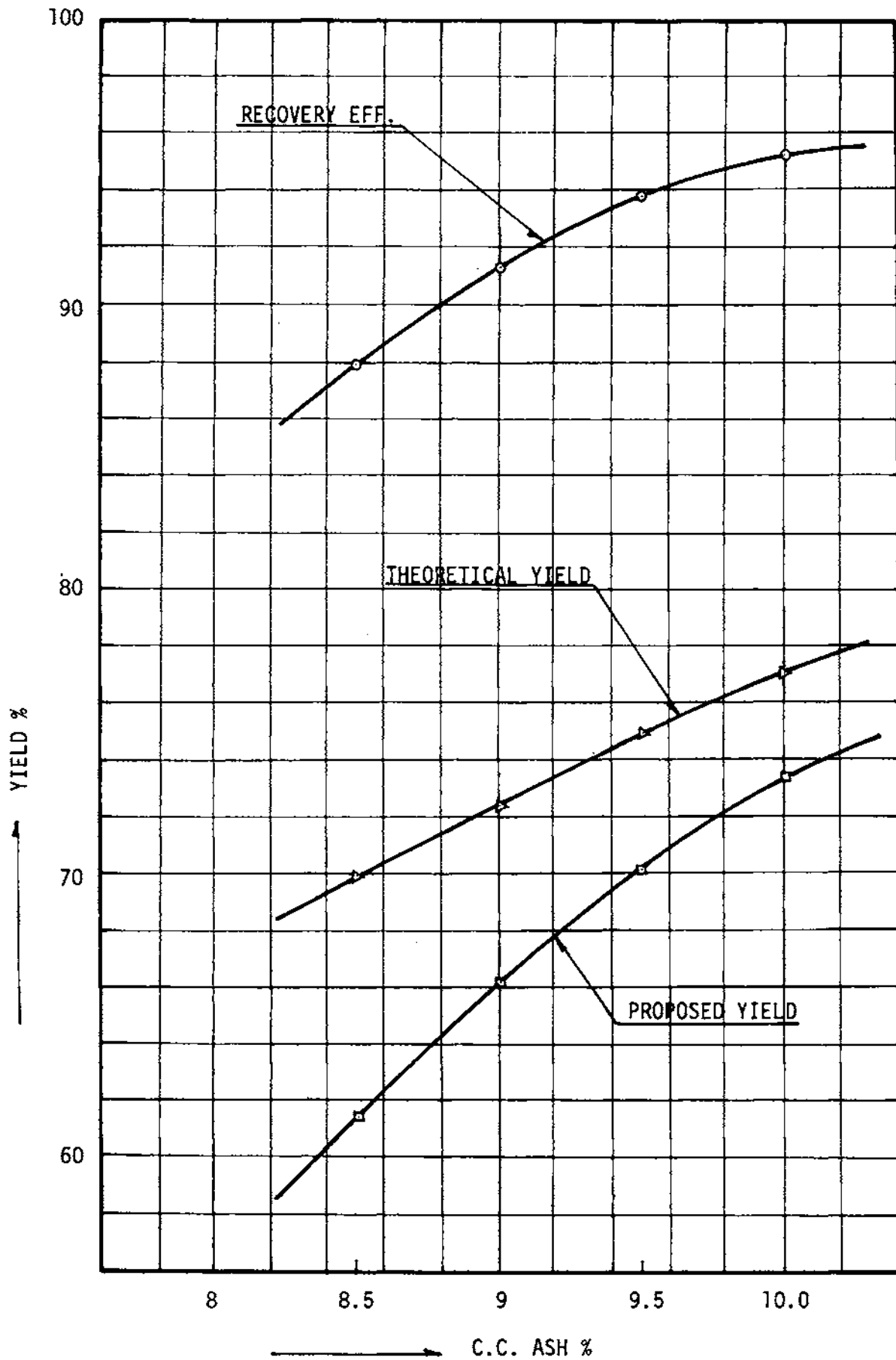
Clean Coal Ash (%)	Theoretical Yield (%)	Proposed Yield (%)	Recovery Efficiency (%)
8.5	69.93	61.46	87.89
9.0	72.42	66.14	91.33
9.5	74.89	70.26	93.82
10.0	77.07	73.43	95.28

According to these data, variation of the proposed yield of clean coal will be 8 percent versus 1 percent ash change in case of aiming clean coal ash less than 10 percent. When clean coal ash is less than 10 percent, it is considerable that not only the proposed yield but also recovery efficiency will decrease substantially. As far as marketability of metallurgical coal is concerned, it is difficult to find a stable market for such high ash coal. Consequently it is proposed to produce coal of 9.5 percent ash content at 70 percent yield.

The relation between clean coal ash and yield is shown in Graph 23.

Graph 23

CLEAN COAL YIELD VS ASH CONTENT (WITH DILUTION)



7.6 Trend of Coal Quality and Yield

Yearly projections of coal quality and yield are shown in following Table.

Year	Raw Coal Ash %	Yield %	Clean Coal			
			Ash %	V.M. %	T.S. %	F.S.I. %
1	22.4	71.8	9.5	20.4	0.42	4 1/2
2	21.6	71.7	"	20.2	0.42	5
3	21.6	70.7	"	20.2	0.42	5
4	21.8	70.5	"	20.3	0.43	5
5	23.0	69.9	"	20.6	0.45	5
6	25.0	66.6	"	20.8	0.46	5
7	23.2	68.2	"	20.5	0.44	5
8	21.0	70.7	"	20.1	0.41	5
9	20.4	70.7	"	20.1	0.40	4 1/2
10	20.4	71.2	"	20.0	0.40	4 1/2
11	20.2	72.4	"	19.9	0.40	4 1/2
12	20.2	72.1	"	19.9	0.40	4 1/2
13	20.5	71.0	"	20.0	0.41	5
14	20.5	70.7	"	19.9	0.42	5
15	20.7	70.0	"	20.0	0.42	5 1/2
16	20.8	69.9	"	20.0	0.43	5 1/2
17	20.9	70.0	"	20.0	0.43	5 1/2
18	20.7	69.5	"	19.9	0.43	5 1/2
19	20.8	70.2	"	19.9	0.43	6
20	21.9	62.7	"	20.1	0.48	6 1/2
Average	21.3	70.7	9.5	20.1	0.43	5

7.7 Selection of Preparation System

Heavy Media Cyclone process is adopted without using Dense Media Vessel system, in order to simplify the plant as much as possible taking into consideration the following items.

1. Production scale is comparatively small.
2. Washability is not so good and near gravity material is relatively high.
3. Considering the attrition test results and Hardgrove Index, this coal will be comparatively soft and easily pulverized.

The following plant process is applied.

<u>Size</u>	<u>Type of Washing Equipment</u>
2" x 28M	Heavy Media Cyclone
28M x 100M	Deister Table
100M x 0	Froth Flotation

By using froth flotation process, under 28 mesh of fine coal can be washed properly. However, Deister Table was adopted to concentrate 28 x 100 mesh fine coal for the following reasons.

- a. This coal has a property of easy degradation, and it contains more than 30 percent minus 28 mesh fine coal according to the test result. Consequently, if all the fine coal is processed through froth flotation, the cost of plant equipment and operation will become expensive.

- b. In general, the particle size to be properly processed by froth flotation is up to 28 mesh fine coal. However, froth flotation is not so effective for coarse fine coal, therefore, it is recommendable to process fine coal for less than 60 mesh or 100 mesh.
- c. The separation through froth flotation is difficult for obtaining thermal coal in case of oxidized coal.
- d. Water only cyclone could be used to separate coarse fine coal of 28 mesh to 100 mesh, however it is not recommendable to use this device for that size range fraction due to its poor washability.

Birtley Engineering, Calgary, Canada, reported their test results showing that clean coal ash content of 11 to 13 percent by using water only cyclone process. Consequently, it is difficult to keep clean coal ash content at 9.5 percent by water only cyclone process.

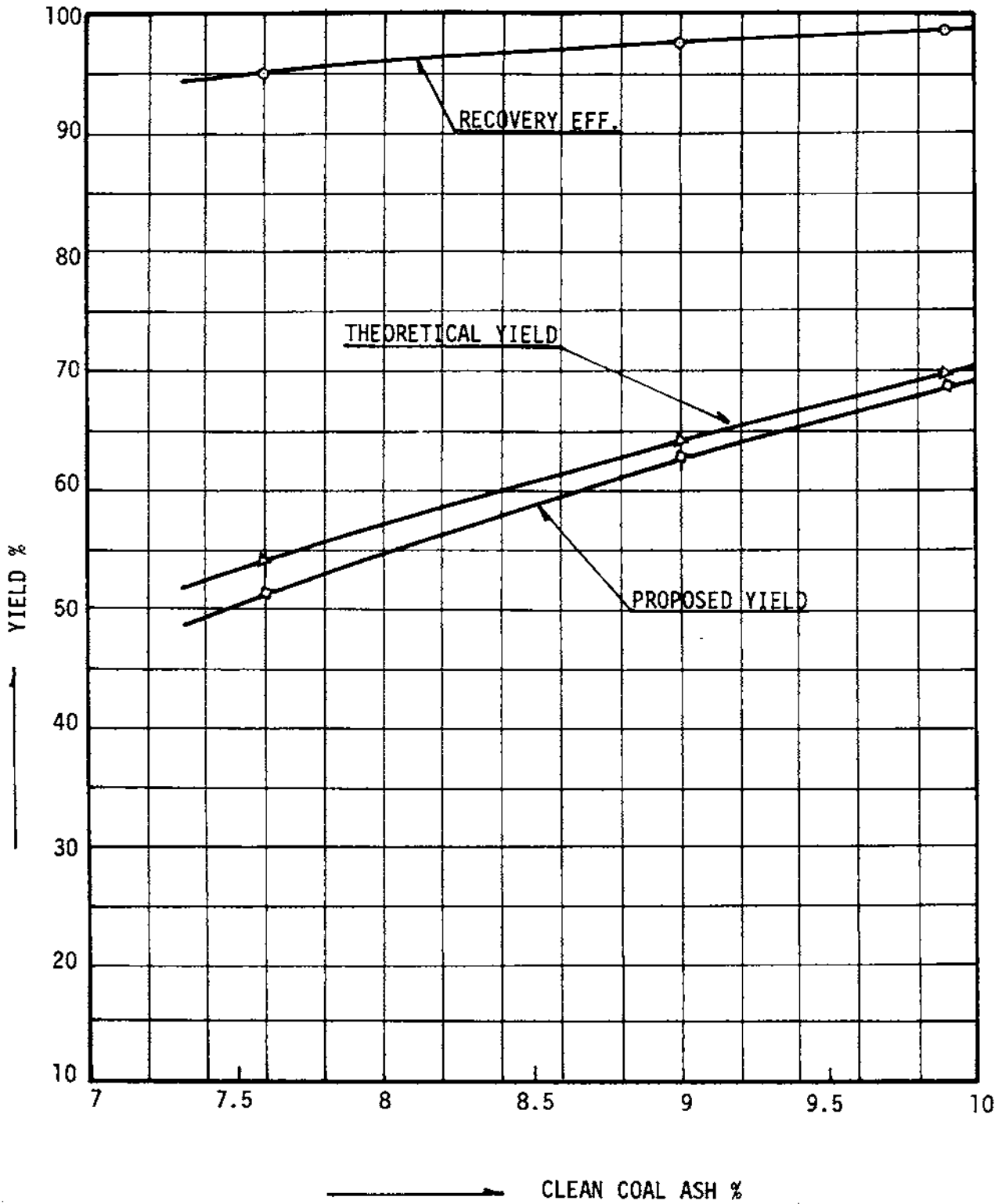
Whereas according to the test results obtained by the Deister Table process, clean coal ash content of 8.3 to 9.8 percent can be obtained if size range is 16 mesh to 100 mesh.

Recovery Efficiency	%	98.5
Near Gravity		26.6

Graph 24 shows the performance of Heavy Media Cyclone.

GRAPH 24

H.M. CYCLONE PERFORMANCE (2" x 28M)



7.8.2 Deister Table (28 mesh x 100 mesh)

The probable error (EP) of Deister Table will vary in relation to the specific gravity of separation (DP) and the particle size. The probable errors were settled based on many data in the United States as indicated below.

Estimated EP (I = 0.22)

S.G. of Separation	Proposed EP	I: Imperfection
		Guaranteed EP
1.4	0.088	0.106
1.5	0.110	0.132
1.6	0.132	0.158
1.7	0.154	0.185
1.8	0.176	0.211

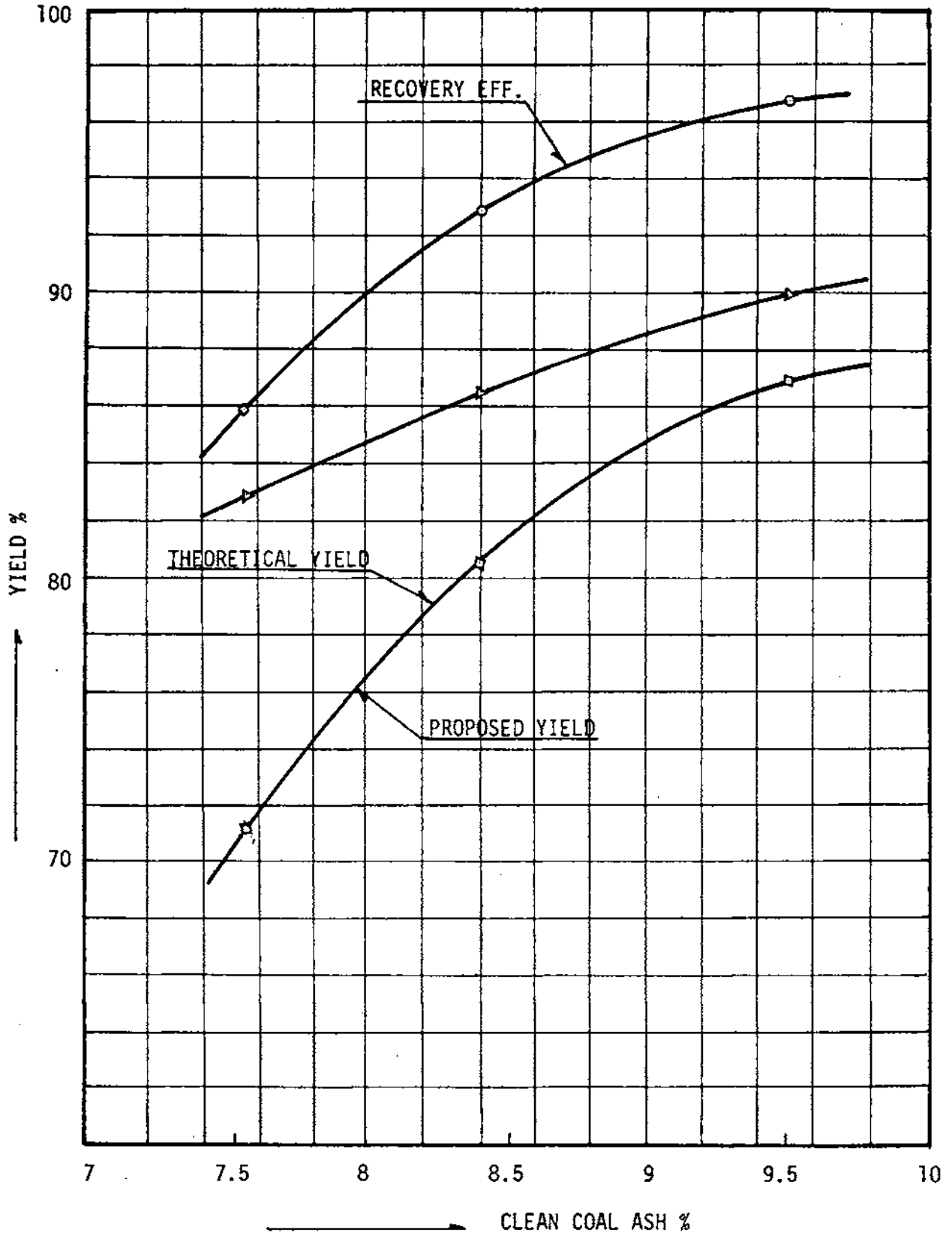
Using this data, the expected Deister Table performance with clean coal ash 9.5 percent is as follows.

Expected Deister Table Performance

S.G. of Separation (DP)		1.80
Probable Error (EP)		0.176
Raw Coal Ash	%	15.5
Clean Coal Ash	%	9.5
Refuse Ash	%	55.3
Proposed Yield	%	86.9
Theoretical Yield	%	89.8
Recovery Efficiency	%	96.8
Near Gravity		4.0

GRAPH 25

DEISTER TABLE PERFORMANCE (28M x 100M)



7.8.3 Froth Flotation (100 mesh x 0)

The performance of flotation is based on the flotation tests performed by Mitsui Mining Co. on the 60 mesh x 0 samples of each seam.

Using this result, the expected froth flotation performance of the 100 mesh x 0 plant feed is as follows.

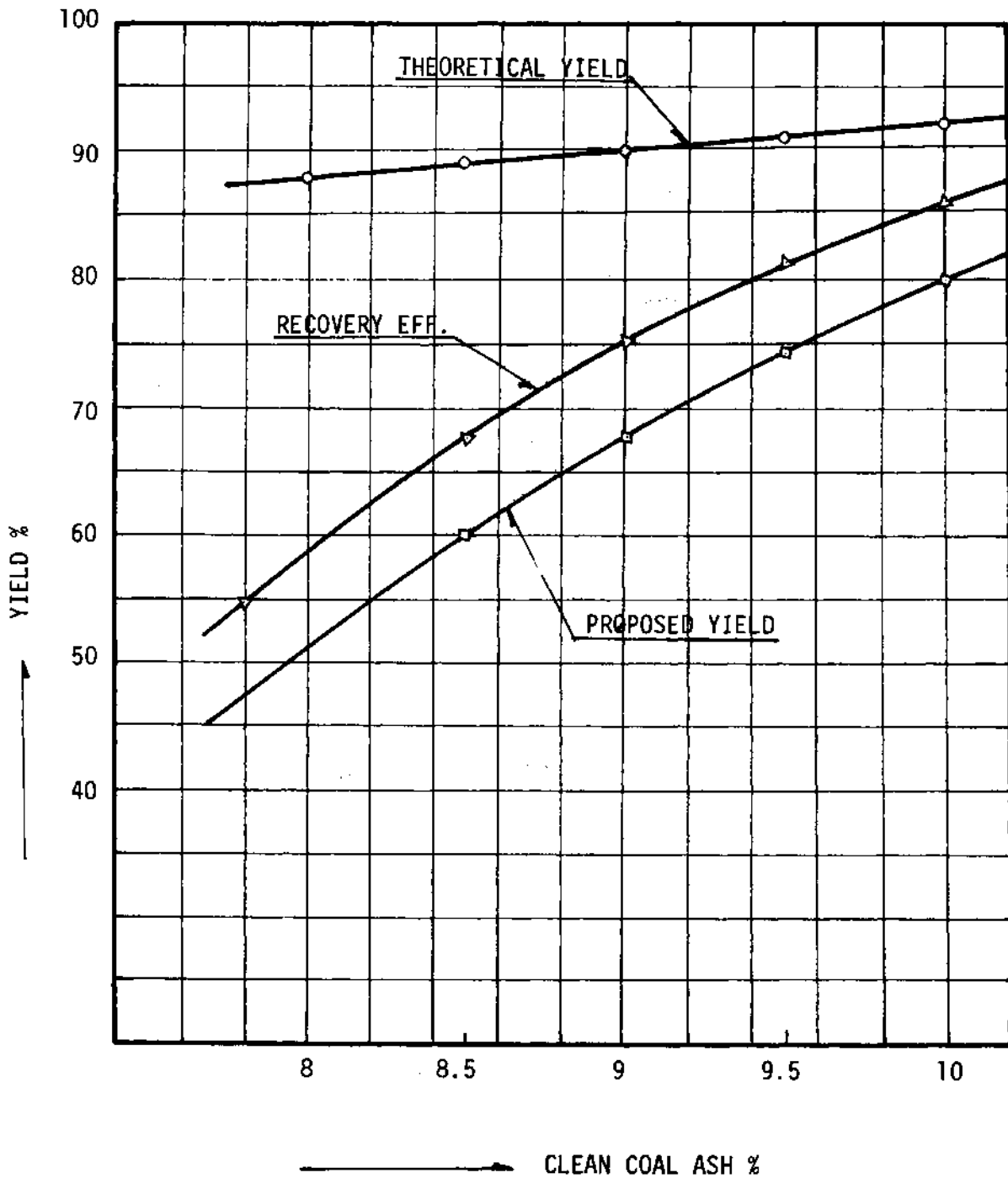
Expected Froth Flotation Performance

Raw Coal Ash	%	14.8
Clean Coal Ash	%	9.5
Refuse Ash	%	30.0
Theoretical Yield	%	91.7
Proposed Yield	%	74.1
Recovery Efficiency	%	80.8

Graph 26 shows the performance of froth flotation.

GRAPH 26

FROTH FLOTATION PERFORMANCE (100M x 0)



8.0 DESIGN CRITERIA

8.1 Production

Annual Raw Coal Production	2,000,000 STPY
Annual Clean Coal Production	
Metallurgical Coal	1,000,000 MTPY
Thermal Coal	400,000 MTPY

8.2 Operating Schedule

Operating days per year 245 days, based on following schedule.

3 shifts per day

5 working days per week

11 days of statutory holidays

5 days of allowance for strike

Plant Availability 75%

Plant yield 70%

8.3 Plant Capacity

$$\begin{aligned}\text{Hourly Raw Coal Feed Rate} &= \frac{2,000,000}{245 \times 24 \times 0.75} \\ &= 454 \text{ STPH}\end{aligned}$$

Assuming 10 percent peak load of raw coal production:

$$454 \text{ STPH} \times 1.1 = 500 \text{ STPH}$$

Maximum raw coal capacity:

$$\begin{aligned}500 \text{ STPH} \times 24 \times 0.75 \times 245 \\ = 2,205,000 \text{ STPY}\end{aligned}$$

Maximum clean coal capacity:

$$2,205,000 \times 0.7 \times 0.907 = 1,400,000 \text{ MTPY}$$

8.4 Size Distribution

	Average Wt %	Max. Fines Wt %	Max. Coarse Wt %
2" x 28M	70	60	80
28M x 100M	15	18	12
100M x 0	15	22	8
Total	100	100	100

The quantity of fine coal less than 28 mesh is adopted 30 percent of average figure in the flowsheet and plant equipment will be designed to handle maximum 40 percent.

LINE CREEK PROJECT

A COAL QUALITY REPORT ON THE TEST RESULTS
AT CHOFU RESEARCH LABORATORY OF CHANNEL
AND BULK SAMPLES FROM SEAMS
#8, #9, #10B, #10A

(INTERIM REPORT)

JULY, 23, 1976

MITSUI MINING COMPANY, LIMITED

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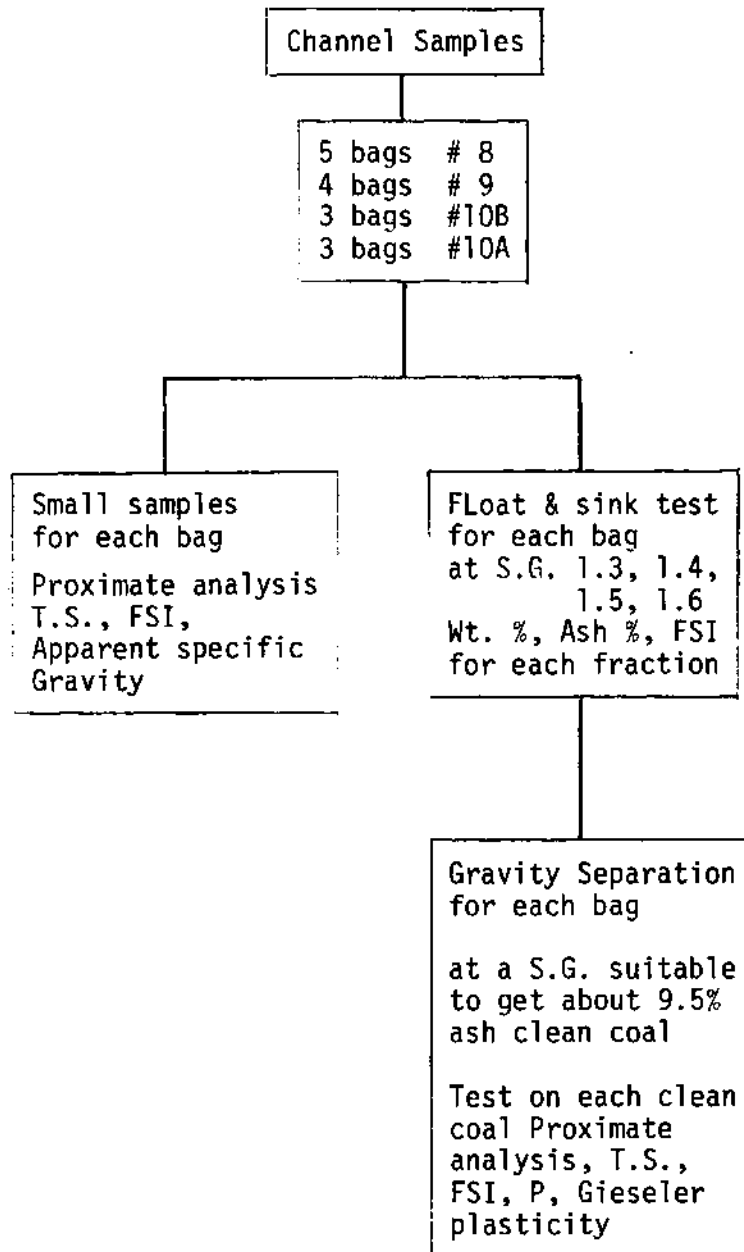
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CHANNEL SAMPLE

(SEAMS #8, #9, #10B, #10A)

1. Test Procedure of Line Creek Samples



1-1. Proximate Analysis on Each Channel Sample (Raw Coal)

#8 Seam (Adit 7)

No.	I.M. %	Ash %	V.M. %	F.C. %	T.S. %	F.S.I.	Thickness	Composite Ratio
S1	1.4	15.4	20.0	63.2	0.30	3 1/2	14.75'	39.08
S2	1.4	26.7	17.8	54.1	0.26	2	6.12'	17.40
S3	1.6	13.2	19.3	65.9	0.42	2 1/2	7.20'	18.80
S4	1.4	17.0	19.6	62.0	0.35	3 1/2	2.70'	7.25
S5	1.5	16.5	20.0	62.0	0.33	2	6.50'	17.47
Full seam	1.5	17.3	19.5	61.7	0.32	3	37.27'	100.00

#9 Seam (Adit 4)

No.	I.M. %	Ash %	V.M. %	F.C. %	T.S. %	F.S.I.	Thickness	Composite Ratio
S1	1.4	17.0	19.7	61.9	0.28	5	4.10'	23.16
S2	1.4	39.0	15.7	43.9	0.22	2 1/2	0.86'	5.41
S3	1.4	12.6	18.5	67.5	0.30	2 1/2	8.71'	48.49
S4	1.7	23.2	17.7	57.4	0.39	2	3.95'	22.94
Full seam	1.5	17.5	18.4	62.6	0.31	3	17.62'	100.00

#10B Seam (Adit 5)

No.	I.M. %	Ash %	V.M. %	F.C. %	T.S. %	F.S.I.	Thickness	Composite Ratio
S1	1.9	11.8	18.2	68.1	0.49	2 1/2	————	————
S2	1.4	14.8	18.8	65.0	0.38	4 1/2	2.65'	20.38
S3	1.3	16.4	19.3	63.0	0.43	8	10.43'	79.62
Full seam	1.3	16.1	19.2	63.4	0.42	7 1/2	13.08'	100.00

#10A Seam (Adit 12)

No.	I.M. %	Ash %	V.M. %	F.C. %	T.S. %	F.S.I.	Thickness	Composite Ratio
S1	1.1	25.1	17.6	56.2	0.40	2 1/2	4.69'	50.31
S2	1.1	16.2	19.1	63.6	0.45	6	5.05'	49.69
Full seam	1.1	20.7	18.3	59.9	0.42	4	9.74'	100.00

#10A Seam (Adit 6)

No.	I.M. %	Ash %	V.M. %	F.C. %	T.S. %	F.S.I.	Thickness	Composite Ratio
S1	1.7	19.5	18.5	60.3	0.43	2	9.43	

1-2. Washability Results and FSI on Each Seam

1-2-1. Washability of #8 Seam (Adit 7, Channel Samples)

(1) No. S1

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	12.8	1.0	9	12.8	1.0
1.40	42.8	7.2	3	55.6	5.8
1.50	26.3	16.8	2	81.9	9.3
1.60	9.2	26.6	1 1/2	91.1	11.1
+1.60	8.9	56.2	1	100.0	15.1

(2) No. S2

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	5.2	1.0	9 1/2	5.2	1.0
1.40	37.6	6.5	3 1/2	42.8	5.8
1.50	21.0	15.7	1 1/2	63.8	9.1
1.60	7.2	26.4	1 1/2	71.0	10.8
+1.60	29.0	65.6	0	100.0	26.7

(3) No. S3

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	6.2	1.2	9 1/2	6.2	1.2
1.40	47.1	6.3	3 1/2	53.3	5.7
1.50	36.7	15.4	1 1/2	90.0	9.7
1.60	4.5	26.0	1 1/2	94.5	10.4
+1.60	5.5	58.0	0	100.0	13.1

(4) No. S4

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	8.1	1.2	9 1/2	8.1	1.2
1.40	45.5	6.1	6	53.6	5.4
1.50	26.6	16.6	1 1/2	80.2	9.1
1.60	6.5	26.5	1 1/2	86.7	10.4
+1.60	13.3	60.0	1	100.0	17.0

(5) No. S5

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	2.6	1.9	9 1/2	2.6	1.9
1.40	43.2	6.5	3	45.8	6.2
1.50	28.4	13.9	1 1/2	74.2	9.2
1.60	10.8	24.2	1 1/2	85.0	11.1
+1.60	15.0	47.1	0	100.0	16.5

(6) Composite (S1 - S5)

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	8.1	1.1		8.1	1.1
1.40	43.0	6.7		51.1	5.8
1.50	27.7	15.8		78.8	9.3
1.60	8.1	25.9		86.9	10.9
+1.60	13.1	58.4		100.0	17.1

1-2-2. Washability of #9 Seam (Adit 4, Channel Samples)

(1) No. S1

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	18.0	1.1	9	18.0	1.1
1.40	38.6	5.8	5	56.6	4.3
1.50	7.6	16.2	1 1/2	64.2	5.7
1.60	24.7	24.6	1	88.9	11.0
+1.60	11.1	66.9	0	100.0	17.2

(2) No. S2

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	10.5	2.6	9	10.5	2.6
1.40	24.4	7.5	7	34.9	6.0
1.50	4.3	18.5	3 1/2	39.2	7.4
1.60	2.3	32.0	1/2	41.5	8.8
+1.60	58.5	61.2	0	100.0	39.4

(3) No. S3

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	5.7	1.8	9	5.7	1.8
1.40	62.9	6.7	3 1/2	68.6	6.3
1.50	22.0	14.8	1 1/2	90.6	8.4
1.60	2.9	26.4	1 1/2	93.5	8.9
+1.60	6.5	66.5	0	100.0	12.6

(4) No. S4

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	5.8	1.2	7 1/2	5.8	1.2
1.40	46.3	6.5	3	52.1	5.9
1.50	13.3	15.9	2	65.4	7.9
1.60	5.8	29.0	1 1/2	71.2	9.7
+1.60	28.8	57.6	0	100.0	23.5

(5) Composite (S1 - S4)

S.G.	Wt%	Ash%	Cum. Float	
			Wt%	Ash%
-1.30	8.8	1.4	8.8	1.4
1.40	51.4	6.5	60.2	5.8
1.50	15.7	16.2	75.9	7.7
1.60	8.6	25.7	84.5	9.6
+1.60	15.5	61.6	100.0	17.6

1-2-3. Washability of #10B Seam (Adit 5, Channel Samples)

(1) No. S1

S. G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	1.9	1.2	6	1.9	1.2
1.40	74.3	3.9	2	76.2	3.8
1.50	7.0	13.3	2	83.2	4.6
1.60	0.7	26.1	1 1/2	83.9	4.8
+1.60	16.1	48.3	0	100.0	11.8

(2) No. S2

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	13.1	1.1	10	13.1	1.1
1.40	42.2	6.9	6	55.3	5.5
1.50	29.8	16.1	2	85.1	9.2
1.60	6.3	27.2	1 1/2	91.4	10.5
+1.60	8.6	64.0	0	100.0	15.1

(3) No. S3

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt.%	Ash%
-1.30	10.9	1.2	9 1/2	10.9	1.2
1.40	47.2	7.0	8 1/2	58.1	5.9
1.50	22.0	16.8	3	80.1	8.9
1.60	6.1	29.2	1 1/2	86.2	10.3
+1.60	13.8	54.8	1	100.0	16.5

(4) Composite (S2 - S3)

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	11.4	1.2		11.4	1.2
1.40	46.2	7.0		57.6	5.8
1.50	23.6	16.6		81.2	9.0
1.60	6.1	28.8		87.3	10.4
+1.60	12.7	56.1		100.0	16.2

1-2-4. Washability of #10A Seam (Adit 12, Channel Samples)

(1) No. S1

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	3.0	1.4	9 1/2	3.0	1.4
1.40	16.8	8.2	8 1/2	19.8	7.2
1.50	36.0	18.0	2	55.8	14.2
1.60	24.5	25.7	1	80.3	17.7
+1.60	19.7	55.3	1	100.0	25.1

(2) No. S2

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	10.0	1.5	10	10.0	1.5
1.40	36.1	9.2	7	46.1	7.5
1.50	34.1	16.4	2 1/2	80.2	11.3
1.60	11.9	27.1	1 1/2	92.1	13.3
+1.60	7.9	51.8	1	100.0	16.4

(3) Composite (S1 - S2)

S.G.	Wt%	Ash%	F.S.I.	Cum. Float	
				Wt%	Ash%
-1.30	6.5	1.5		6.5	1.5
1.40	26.4	8.9		32.9	7.4
1.50	35.1	17.2		68.0	12.5
1.60	18.2	26.2		86.2	15.4
+1.60	13.8	54.3		100.0	20.8

Washability of 10A Seam (Adit 6, Channel Sample)

S.G.	Wt%	Ash%	F.S.I.	Wt%	Ash%
-1.30	0.9	0.7	8	0.9	0.7
1.40	23.6	6.2	3	24.5	6.0
1.50	46.5	15.1	2	71.0	12.0
1.60	15.6	24.7	2	86.9	14.2
+1.60	13.4	53.9	1 1/2	100.0	19.6

1-3. Washability Curves (2" x 0)

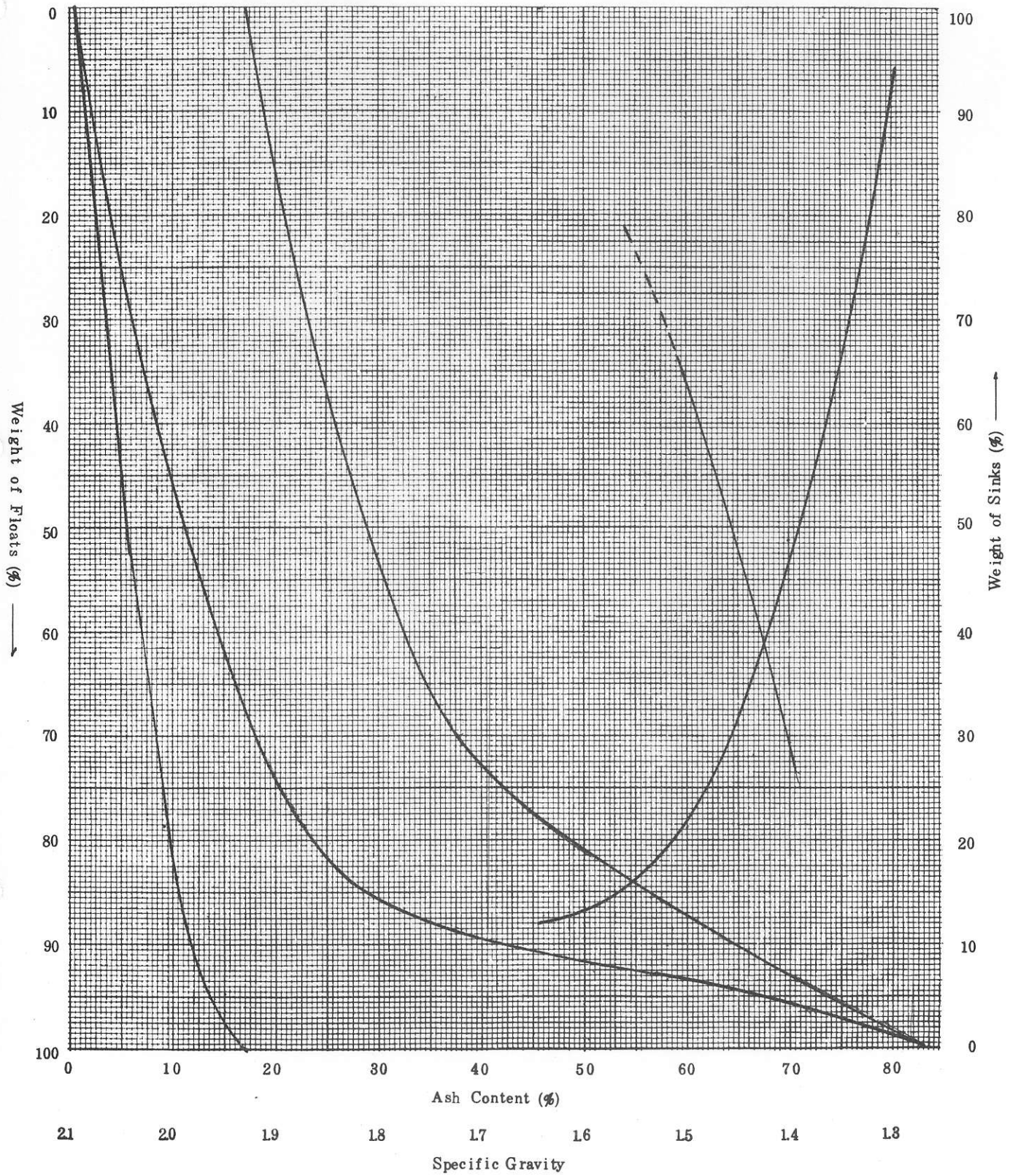
1-3-1. Washability Curves

SAMPLE: Composite 8 Seam (Adit 7)

DATE: July 15, 1976

SIZE : 2" x 0, Channel Sample

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



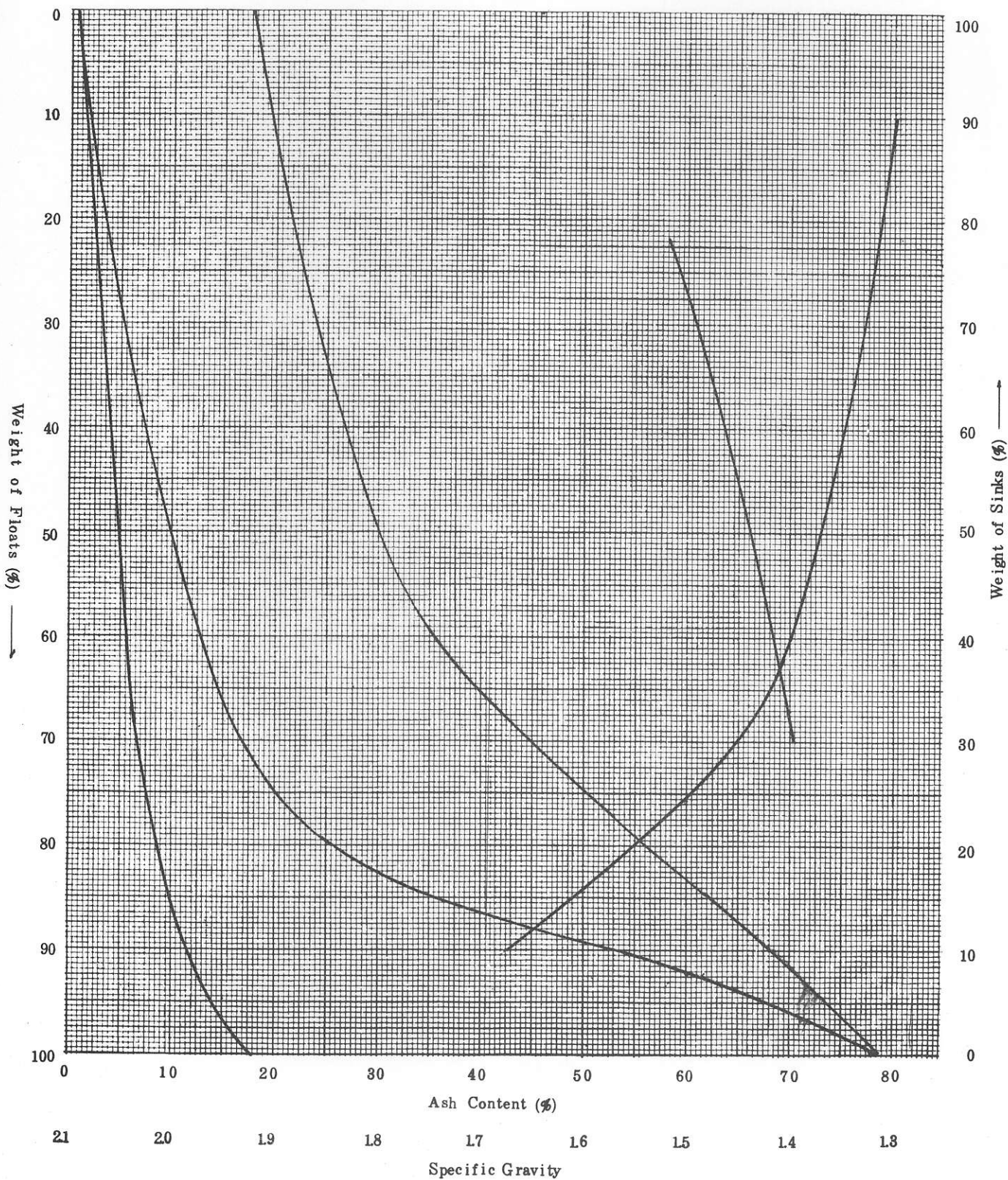
1-3-2. Washability Curves

SAMPLE: Composite 9 Seam (Adit 4)

DATE: July 15, 1976

SIZE : 2" x 0, Channel Sample

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



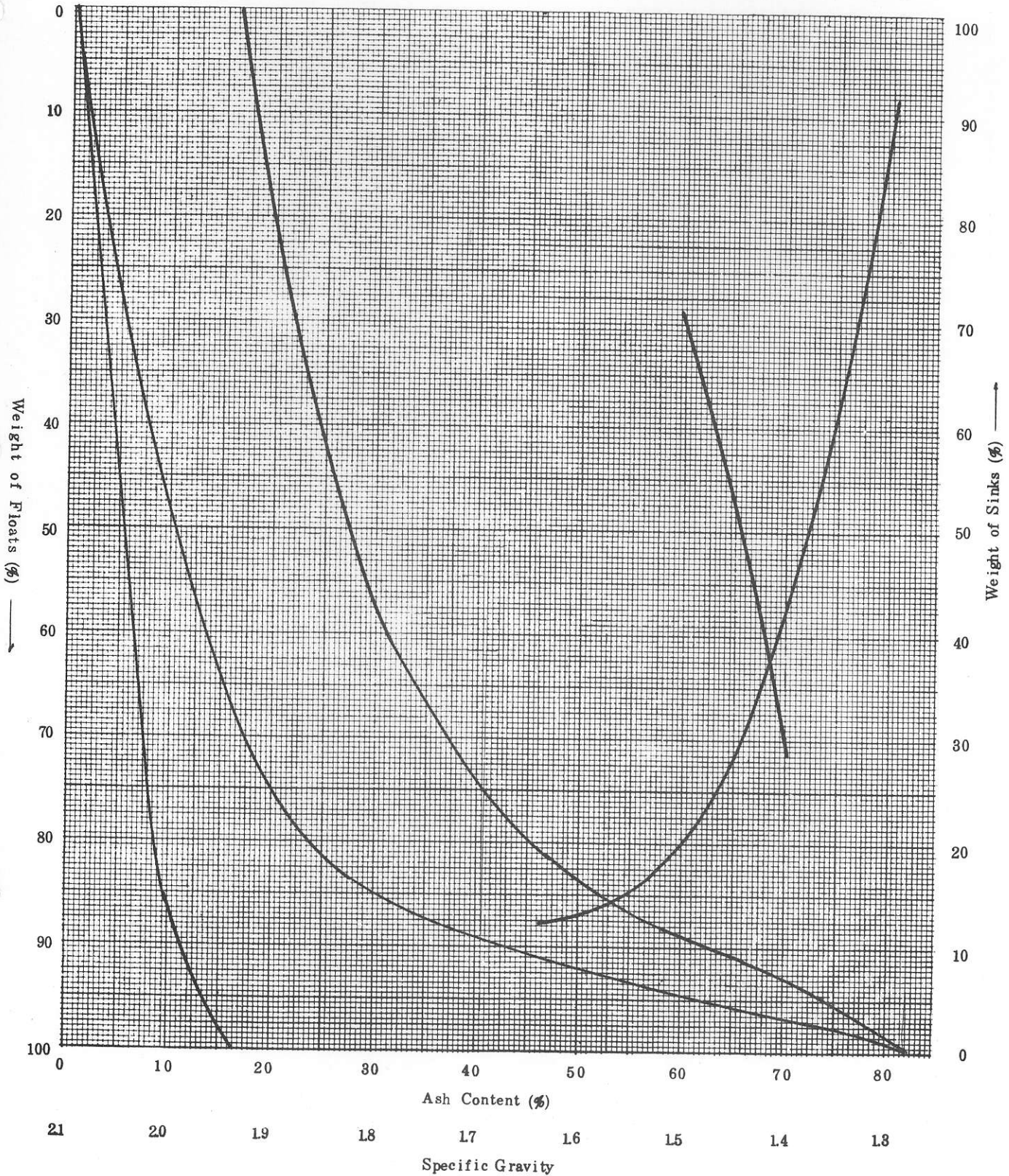
1-3-3. Washability Curves

SAMPLE: Composite 10B Seam (Adit 5)

DATE: July 15, 1976

SIZE : 2" x 0, Channel Sample

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



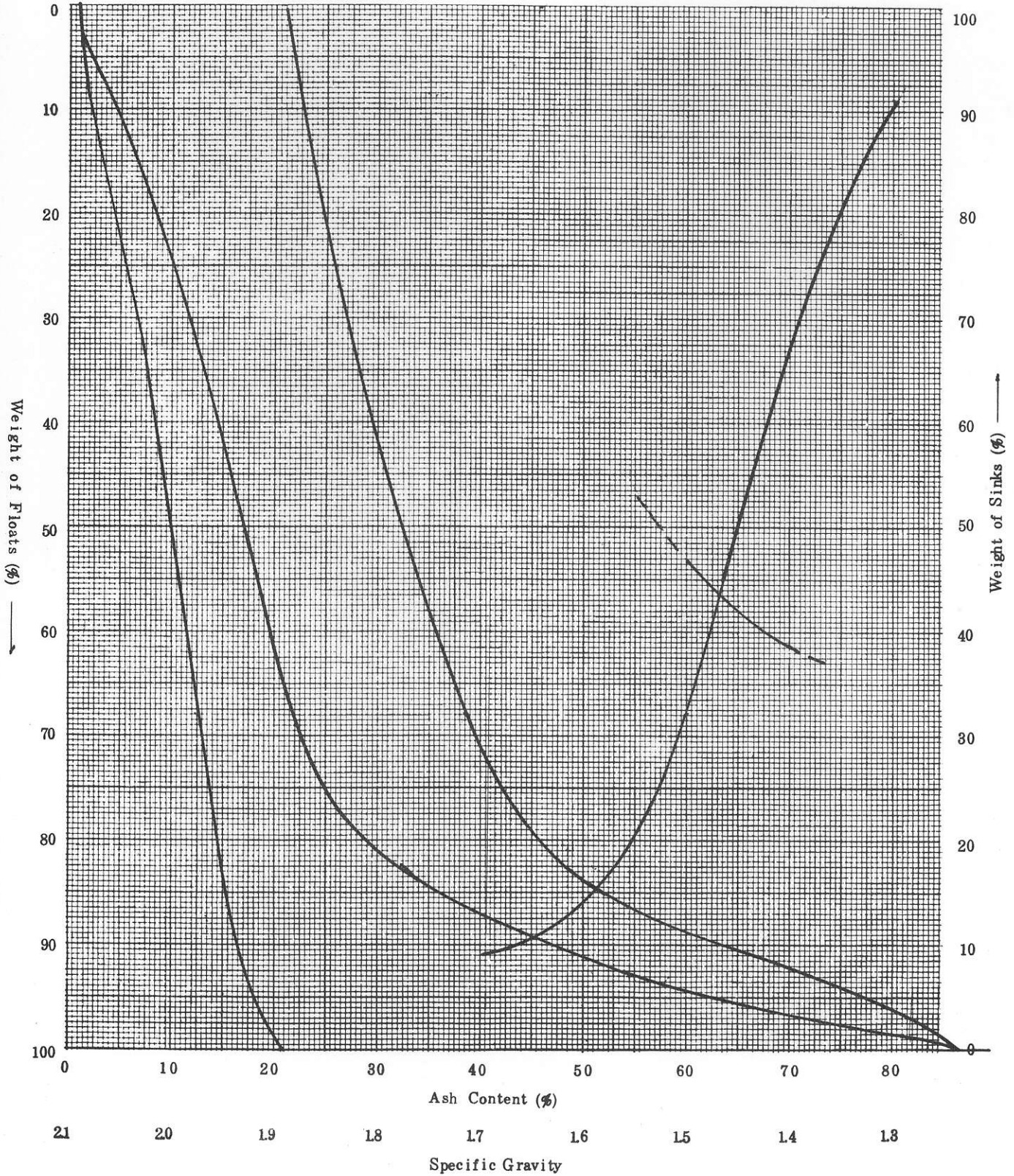
1-3-4. Washability Curves

SAMPLE: Composite 10A Seam (Adit 12)

DATE: July 15, 1976

SIZE : 2" x 0, Channel Sample

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



1-4. Proximate Analysis on Each Channel Sample (Clean Coal)

#8 Seam (Adit 7)

No.	I.M. %	Ash %	V.M. %	F.C. %	T.S. %	P %	F.S.I.
S1	1.5	9.2	21.1	68.2	0.32	0.012	5
S2	1.6	9.9	20.1	68.4	0.30	0.022	3 1/2
S3	1.8	9.8	19.9	68.5	0.41	0.081	3
S4	1.9	10.0	20.3	68.8	0.38	0.076	4 1/2
S5	1.6	10.0	19.4	69.0	0.37	0.091	2 1/2
Full seam	1.6	9.6	20.3	68.5	0.35	0.045	4

#9 Seam (Adit 4)

No.	I.M. %	Ash %	V.M. %	F.C. %	T.S. %	P %	F.S.I.
S1	1.3	9.8	20.4	68.5	0.30	0.009	6
S2	1.6	9.6	20.8	68.0	0.31	0.040	8
S3	1.5	9.1	19.1	70.3	0.29	0.018	3
S4	1.6	9.5	19.8	69.1	0.43	0.060	3 1/2
Full seam	1.5	9.4	19.7	69.4	0.33	0.027	4

#10B Seam (Adit 5)

No.	I.M. %	Ash %	V.M. %	F.C. %	T.S. %	P %	F.S.I.
S1	1.8	9.9	18.4	69.9	0.47	0.008	1 1/2
S2	1.3	9.6	19.1	70.0	0.39	0.062	5
S3	1.3	9.6	20.3	68.8	0.44	0.020	8
Full seam	1.3	9.6	20.1	69.0	0.43	0.029	7 1/2

#10A Seam (Adit 12)

No.	I.M. %	Ash %	V.M. %	F.C. %	T.S. %	P %	F.S.I.
S1	1.1	9.6	20.1	69.2	0.49	0.057	8 1/2
S2	1.1	9.6	20.4	68.9	0.48	0.020	8
Full seam	1.1	9.6	20.2	69.1	0.49	0.039	8 1/2

#10A Seam (Adit 6)

No.	I.M. %	Ash %	V.M. %	F.C. %	T.S. %	P %	F.S.I.
S1	1.8	10.0	20.1	68.1	0.48	0.024	2 1/2

1-4-1 Gieseler Plasticity On Each Seam

#8 Seam (Adit 7)

No.	Start °C	Fusion Temp. °C	Max. Fluid Temp °C	Melting Range °C	DDPM
S1	437	476	449	39	1.9
S2	448	470	452	22	1.3
S3	-	-	449	-	0.8
S4	-	-	446	-	0.8
S5	-	-	449	-	0.4

#9 Seam (Adit 4)

No.	Start °C	Fusion Temp. °C	Max. Fluid Temp. °C	Melting Range °C	DDPM
S1	431	476	449	45	2.5
S2	437	479	458	42	3.0
S3	-	-	449	-	0.6
S4	-	-	449	-	0.6

#10B Seam (Adit 5)

No.	Start °C	Fusion Temp. °C	Max. Fluid Temp. °C	Melting Range °C	DDPM
S1	-	-	449	-	0.2
S2	440	473	449	33	1.5
S3	427	479	452	52	5.2

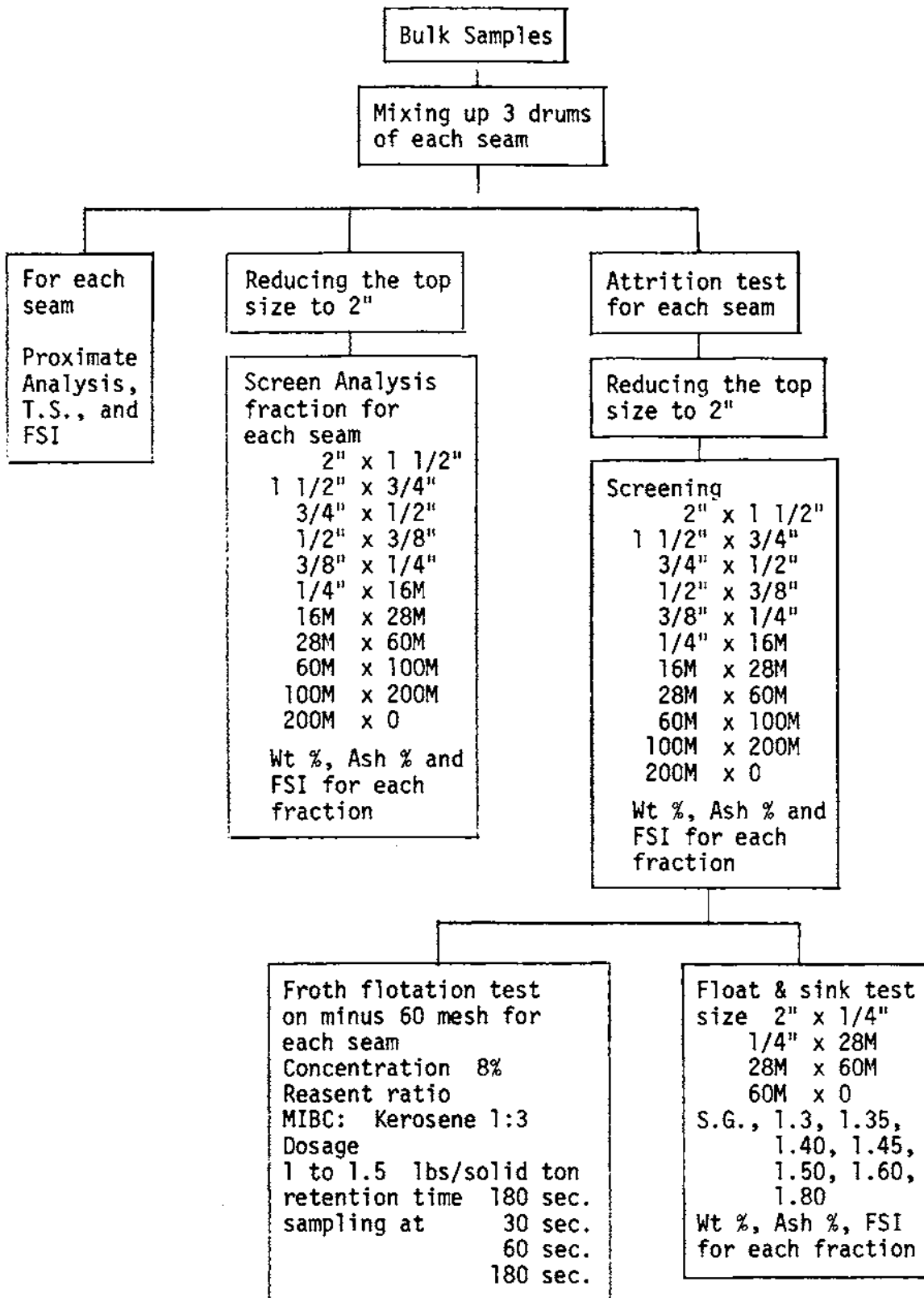
#10A Seam (Adit 12)

No.	Start °C	Fusion Temp. °C	Max. Fluid Temp. °C	Melting Range °C	DDPM
S1	413	485	449	72	31.5
S2	414	485	454	71	50.5
#10A (Adit 6)	-	-	449	-	0.2

BULK SAMPLE

(SEAMS #8, #9, #10B, #10A)

2. Test Procedure of Line Creek Samples



2-1. Proximate Analysis on Each Bulk Sample
(Raw Coal)

(1) #8 Seam (Adit 7)

I.M.%	Ash%	V.M%	F.C%	T.S%	F.S.I.
1.5	17.1	19.2	62.2	0.32	2 1/2

(2) #9 Seam (Adit 4)

I.M.%	Ash%	V.M%	F.C%	T.S%	F.S.I.
1.2	15.6	18.3	64.9	0.33	3

(3) #10B Seam (Adit 5)

I.M.%	Ash%	V.M%	F.C%	T.S%	F.S.I.
1.1	18.9	18.7	61.3	0.45	6 1/2

(4) #10A Seam (Adit 12)

I.M.%	Ash%	V.M%	F.C%	T.S%	F.S.I.
1.4	17.6	18.3	62.7	0.47	6

2-2. Screen Analysis and Attrition Test

2-2-1. Screen Analysis #8 Seam, Adit 7 (Raw Coal, crushed to 2")

Size	Wt%	Ash%	F.S.I.	Cumulative	
				Wt%	Ash%
2" x 1 1/2"	8.5	18.4	1 1/2	8.5	18.4
1 1/2" x 3/4"	28.2	18.4	1 1/2	36.7	18.4
3/4" x 1/2"	6.8	19.5	1 1/2	43.5	18.6
1/2" x 3/8"	6.0	18.7	2	49.5	18.6
3/8" x 1/4"	6.7	18.9	2	56.2	18.6
1/4" x 16M	26.9	16.4	3 1/2	83.1	17.9
16M x 28M	5.8	12.4	5 1/2	88.9	17.6
28M x 60M	4.9	12.3	5 1/2	93.8	17.3
60M x 100M	2.2	12.3	4 1/2	96.0	17.2
100M x 200M	1.9	12.6	4 1/2	97.9	17.1
200M x 0	2.1	13.4	1 1/2	100.0	17.0

Attrition Test

Size	Wt%	Ash%	F.S.I.	Cumulative	
				Wt%	Ash%
2" x 1 1/2"	6.8	18.6	1 1/2	6.8	18.6
1 1/2" x 3/4"	14.1	25.9	1 1/2	20.9	23.5
3/4" x 1/2"	4.7	22.7	1 1/2	25.6	23.4
1/2" x 3/8"	4.1	26.8	1 1/2	29.7	23.9
3/8" x 1/4"	5.4	23.2	2	35.1	23.8
1/4" x 16M	26.6	17.9	3	61.7	21.2
16M x 28M	8.0	13.7	3 1/2	69.7	20.4
28M x 60M	11.7	12.0	5 1/2	81.4	19.2
60M x 100M	5.4	11.2	4 1/2	86.8	18.7
100M x 200M	7.4	10.9	4 1/2	94.2	18.1
200M x 0	5.8	10.9	2	100.0	17.6

2-2-2. Screen Analysis
 #9 Seam, Adit 4
 (Raw Coal, Crushed to -2")

Size	Wt%	Ash%	F.S.I.	Cumulative	
				Wt%	Ash%
2" x 1 1/2"	6.4	13.6	2 1/2	6.4	13.6
1 1/2" x 3/4"	31.4	16.6	1 1/2	37.8	16.1
3/4" x 1/2"	6.3	17.1	1 1/2	44.1	16.2
1/2" x 3/8"	8.2	17.2	2 1/2	52.3	16.4
3/8" x 1/4"	8.2	17.5	2 1/2	60.5	16.5
1/4" x 16M	28.1	14.5	4 1/2	88.6	15.9
16M x 28M	4.4	12.2	7	93.0	15.7
28M x 60M	3.1	10.6	7 1/2	96.1	15.6
60M x 100M	1.5	11.3	6 1/2	97.6	15.5
100M x 200M	1.3	12.2	6	98.9	15.4
200M x 0	1.1	14.4	4	100.0	15.4

Attrition Test

Size	Wt%	Ash%	F.S.I.	Cumulative	
				Wt%	Ash%
2" x 1 1/2"	5.1	11.1	3	5.1	11.1
1 1/2" x 3/4"	13.9	14.6	1 1/2	19.0	13.7
3/4" x 1/2"	4.0	19.8	1 1/2	23.0	14.7
1/2" x 3/8"	5.8	18.8	2	28.8	15.6
3/8" x 1/4"	5.6	19.3	1 1/2	34.4	16.2
1/4" x 16M	28.8	16.3	4	63.2	16.2
16M x 28M	7.0	11.5	6	70.2	15.8
28M x 60M	10.1	10.9	7 1/2	80.3	15.1
60M x 100M	5.4	13.0	6	85.7	15.0
100M x 200M	6.7	10.9	7 1/2	92.4	14.7
200M x 0	7.6	15.8	3 1/2	100.0	14.8

2-2-3. Screen Analysis
 #10B Seam, Adit 5
 (Raw Coal, crushed to -2")

Size	Wt%	Ash%	F.S.I.	Cumulative	
				Wt%	Ash%
2" x 1 1/2"	2.8	21.8	4	2.8	21.8
1 1/2" x 3/4"	15.5	21.2	4 1/2	18.3	21.3
3/4" x 1/2"	6.4	16.2	7 1/2	24.7	20.0
1/2" x 3/8"	9.7	17.7	7 1/2	34.4	19.3
3/8" x 1/4"	9.7	18.0	7	44.1	19.0
1/4" x 16M	37.7	18.2	7 1/2	81.8	18.7
16M x 28M	7.1	18.7	7	88.9	18.7
28M x 60M	5.1	19.2	6 1/2	94.0	18.7
60M x 100M	2.3	19.8	5 1/2	96.3	18.7
100M x 200M	1.9	20.5	5 1/2	98.2	18.8
200M x 0	1.8	21.2	5	100.0	18.8

Attrition Test

Size	Wt%	Ash%	F.S.I.	Cumulative	
				Wt%	Ash%
2" x 1 1/2"	0.7	30.0	1 1/2	0.7	30.0
1 1/2" x 3/4"	2.4	22.8	4	3.1	24.4
3/4" x 1/2"	2.3	20.1	4	5.4	22.5
1/2" x 3/8"	3.1	21.1	4	8.5	22.0
3/8" x 1/4"	5.9	19.4	4	14.4	21.0
1/4" x 16M	40.2	9.9	6 1/2	54.6	20.2
16M x 28M	9.9	17.2	6	64.5	19.7
28M x 60M	13.3	17.4	7	77.8	19.3
60M x 100M	6.5	17.4	6 1/2	84.3	19.2
100M x 200M	11.6	17.8	6 1/2	95.9	19.0
200M x 0	4.1	18.5	3 1/2	100.0	19.0

2-2-4. Screen Analysis
 #10A Seam, Adit 12
 (Raw Coal, Crushed to -2")

Size	Wt%	Ash%	F.S.I.	Cumulative	
				Wt%	Ash%
2" x 1 1/2"	5.3	12.9	8 1/2	5.3	12.9
1 1/2" x 3/4"	25.3	18.5	6 1/2	30.6	13.4
3/4" x 1/2"	9.5	20.0	4	40.1	18.1
1/2" x 3/8"	9.2	18.9	5	49.3	18.3
3/8" x 1/4"	8.6	18.9	5	57.9	18.4
1/4" x 16M	30.4	17.3	6	88.3	18.0
16M x 28M	5.1	15.2	7	93.4	17.8
28M x 60M	3.4	14.4	7 1/2	96.8	17.6
60M x 100M	1.3	14.1	6 1/2	98.1	17.4
100M x 200M	1.0	14.0	7	99.1	17.4
200M x 0	0.9	14.9	7 1/2	100.0	17.3

Attrition Test

Size	Wt%	Ash%	F.S.I.	Cumulative	
				Wt%	Ash%
2" x 1 1/2"	4.0	28.3	2	4.0	28.3
1 1/2" x 3/4"	9.0	25.3	2	13.0	26.2
3/4" x 1/2"	3.8	23.7	3	16.8	25.7
1/2" x 3/8"	4.8	22.8	3	21.6	25.0
3/8" x 1/4"	6.0	20.7	3	27.6	24.1
1/4" x 16M	35.3	18.3	5 1/2	62.9	20.8
16M x 28M	7.9	13.7	7 1/2	70.8	20.0
28M x 60M	10.1	12.8	8	80.9	19.1
60M x 100M	5.3	13.3	6	86.2	18.8
100M x 200M	8.2	12.0	7	94.4	18.2
200M x 0	5.6	11.8	6 1/2	100.0	17.8

2-2-5 Composite Screen Analysis

Composite Ratio

Seam	#8,	#9,	#10B,	#10A,
Ratio	35	26.8	23.2	15.0

1. Screen Analysis

	Wt. %	Cum. Wt %
2" x 1-1/2"	6.1	6.1
1-1/2" x 3/4 "	25.7	31.8
3/4" x 1/2"	7.0	38.8
1/2" x 3/8"	7.9	46.7
3/8" x 1/4"	8.1	54.8
1/4" x 16M	30.2	85.0
16M x 28M	5.6	90.6
28M x 60M	4.2	94.3
60M x 100M	1.9	96.7
100M x 200M	1.6	98.3
200M x 0	1.7	100.0
Tot.	100.0	

2. Attrition Test

	Wt. %	Cum. Wt %
2" x 1-1/2"	4.6	4.6
1-1/2" x 3/4"	10.6	15.2
3/4" x 1/2"	3.8	19.0
1/2" x 3/8"	4.4	23.4
3/8" x 1/4"	5.7	29.1
1/4" x 16M	31.6	60.7
16M x 28M	8.2	68.9
28M x 60M	11.4	80.3
60M x 100M	5.6	85.9
100M x 200M	8.3	94.2
200M x 0	5.8	100.0
Tot.	100.0	

2-3.

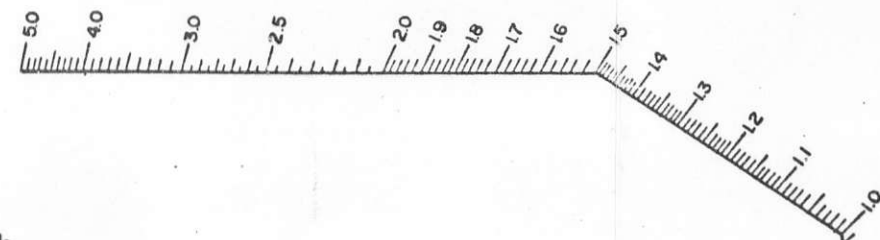
RRB'S GRAIN DIAGRAM

2-3-1.

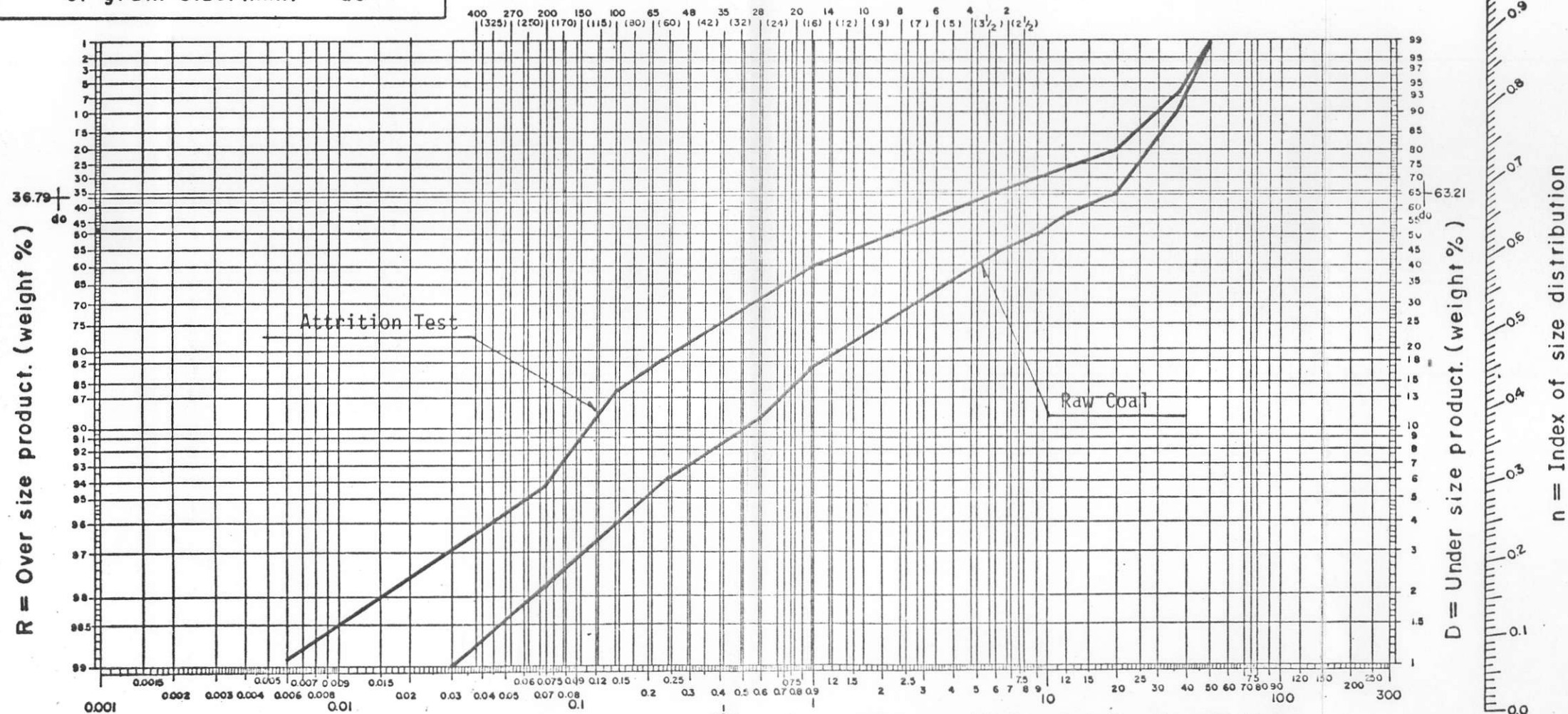
Sample. #8 Seam (Adit 7)
2" x 0
Index of size distribution. n = Characteristic number of grain size. (mm) do =

$$R = 100.0 - \left(\frac{d}{d_0}\right)^n$$

$$D = 100 - R$$



Tyler's screen mesh



do: --- Horizontal Reading at the intersection of the Lines RR and 36.79%

n: --- Reading on n scale at the intersection of the parallel line to the line RR across the pt. A(n) and scale n.

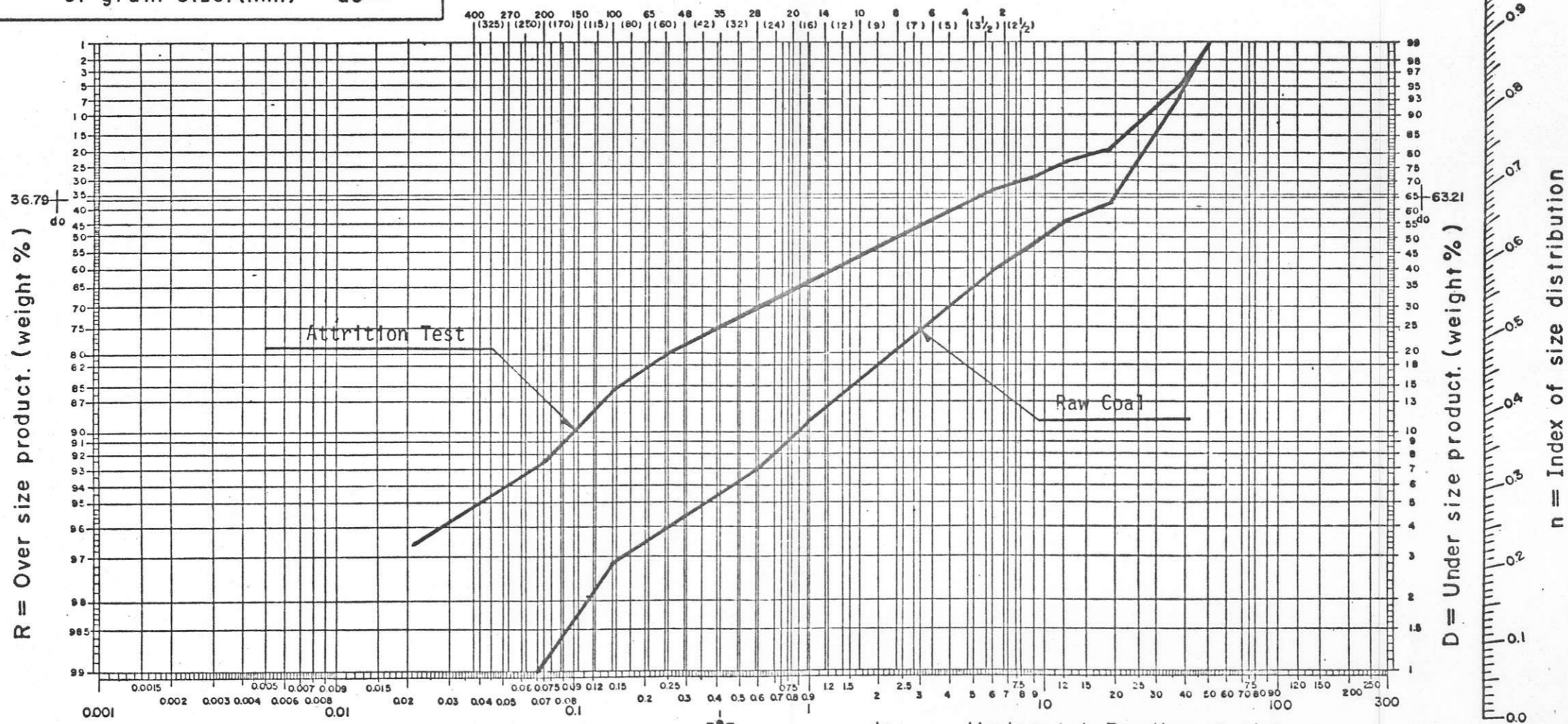
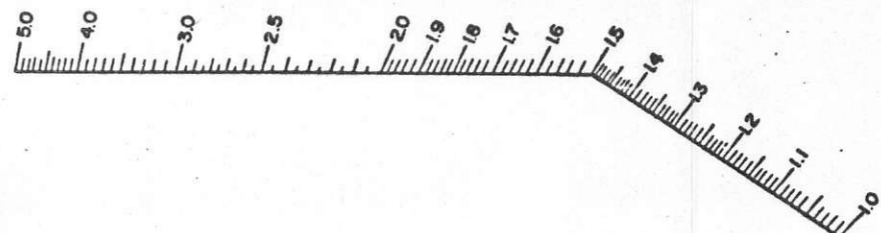
RRB'S GRAIN DIAGRAM

2-3-2.

Sample. #9 Seam (Adit 4)
2" x 0
Index of size distribution. n = Characteristic number of grain size. (mm) do =

$$R = 100.0 - \left(\frac{d}{d_0}\right)^n$$

$$D = 100 - R$$



do: --- Horizontal Reading at the intersection of the Lines RR and 36.79%

n: --- Reading on n scale at the intersection of the parallel line to the line RR. across the pt. A(n) and scale n.

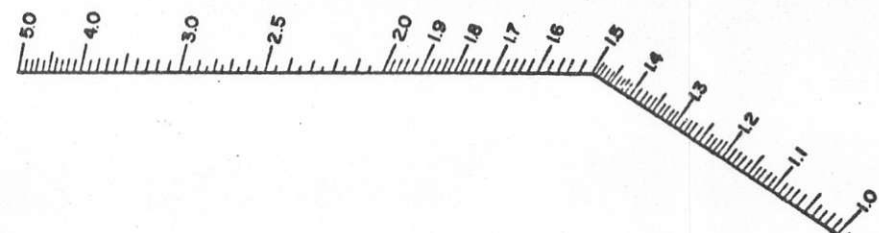
RRB'S GRAIN DIAGRAM

2-3-3.

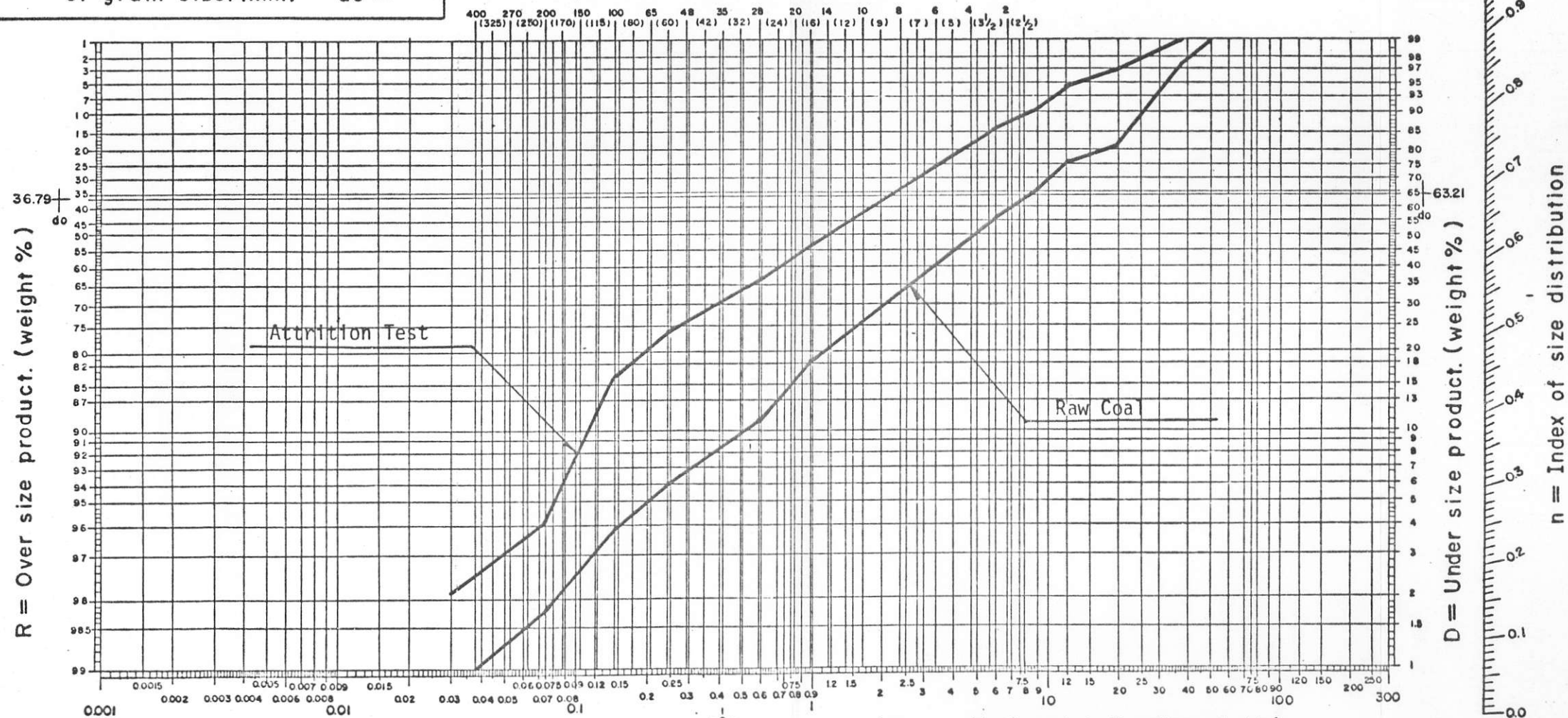
$$R = 100.0 - \left(\frac{d}{d_0}\right)^n$$

$$D = 100 - R$$

Sample.	#10B Seam (Adit 5)
	2" x 0
Index of size distribution. n =	
Characteristic number of grain size. (mm) do =	



Tyler's screen mesh



do: --- Horizontal Reading at the intersection of the Lines RR and 36.79%

n: --- Reading on n scale at the intersection of the parallel line to the line RR, across the pt. A(n) and scale n.

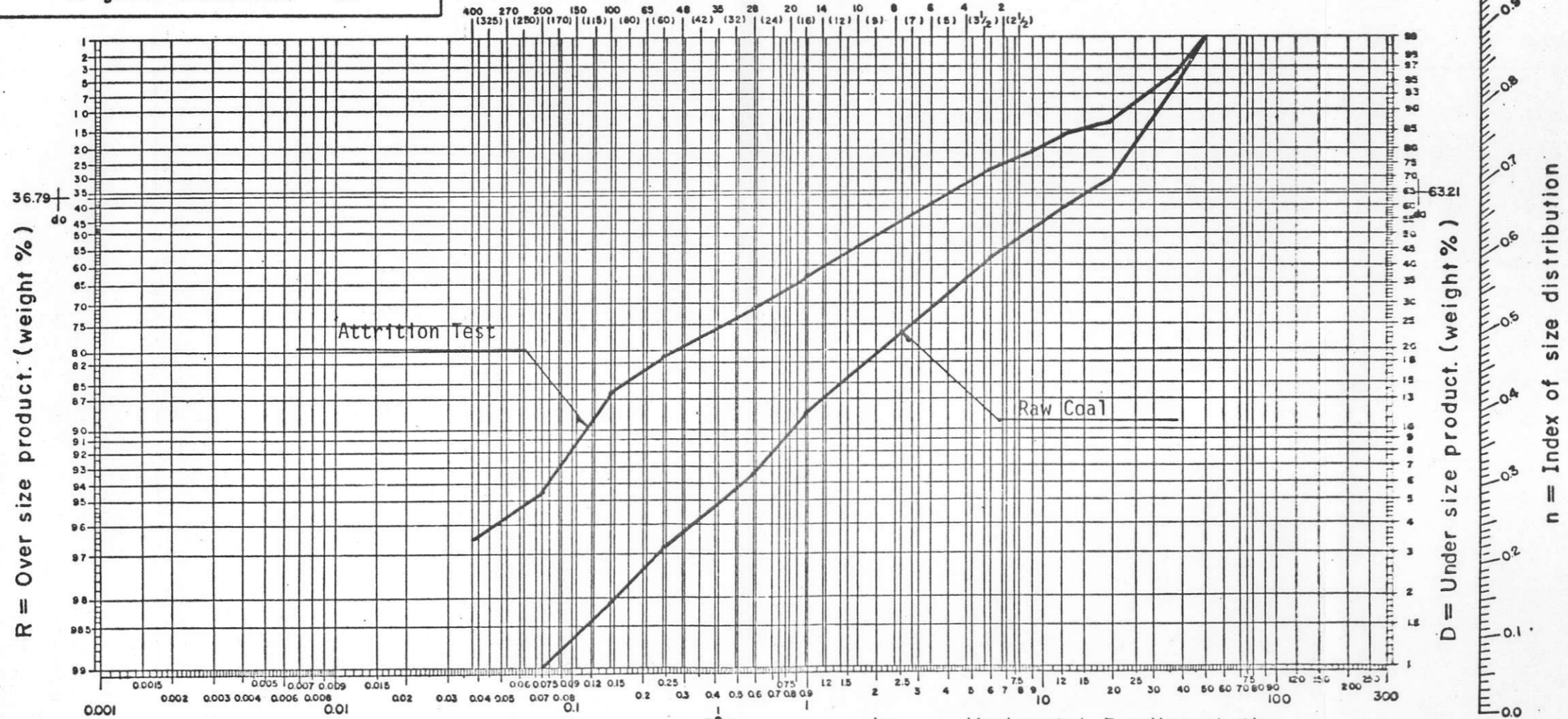
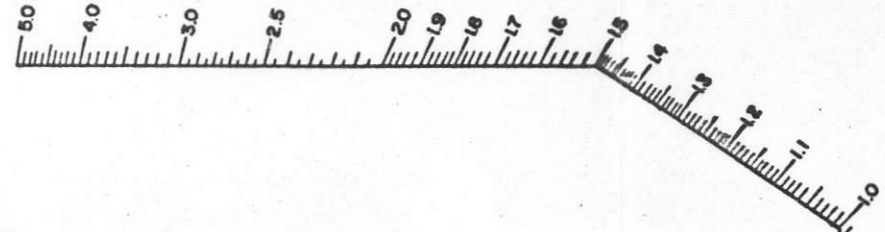
RRB'S GRAIN DIAGRAM

2-3-4.

$$R = 100.0 - \left(\frac{d}{d_0}\right)^n$$

$$D = 100 - R$$

Sample. #10A Seam (Adit 12)
2" x 0
Index of size distribution. n = Characteristic number of grain size. (mm) do =



do: --- Horizontal Reading at the intersection of the Lines RR and 36.79%

n: --- Reading on n scale at the intersection of the parallel line to the line RR, across the pt. A(n) and scale n.

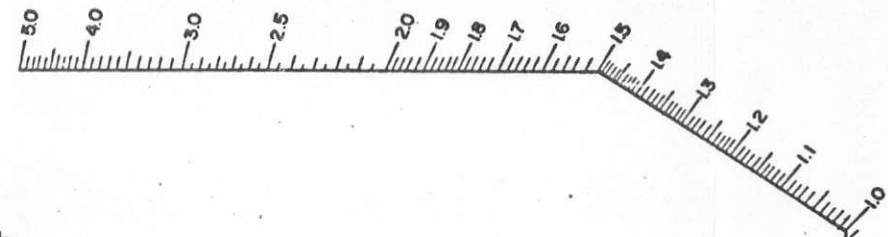
RRB'S GRAIN DIAGRAM

2-3-5.

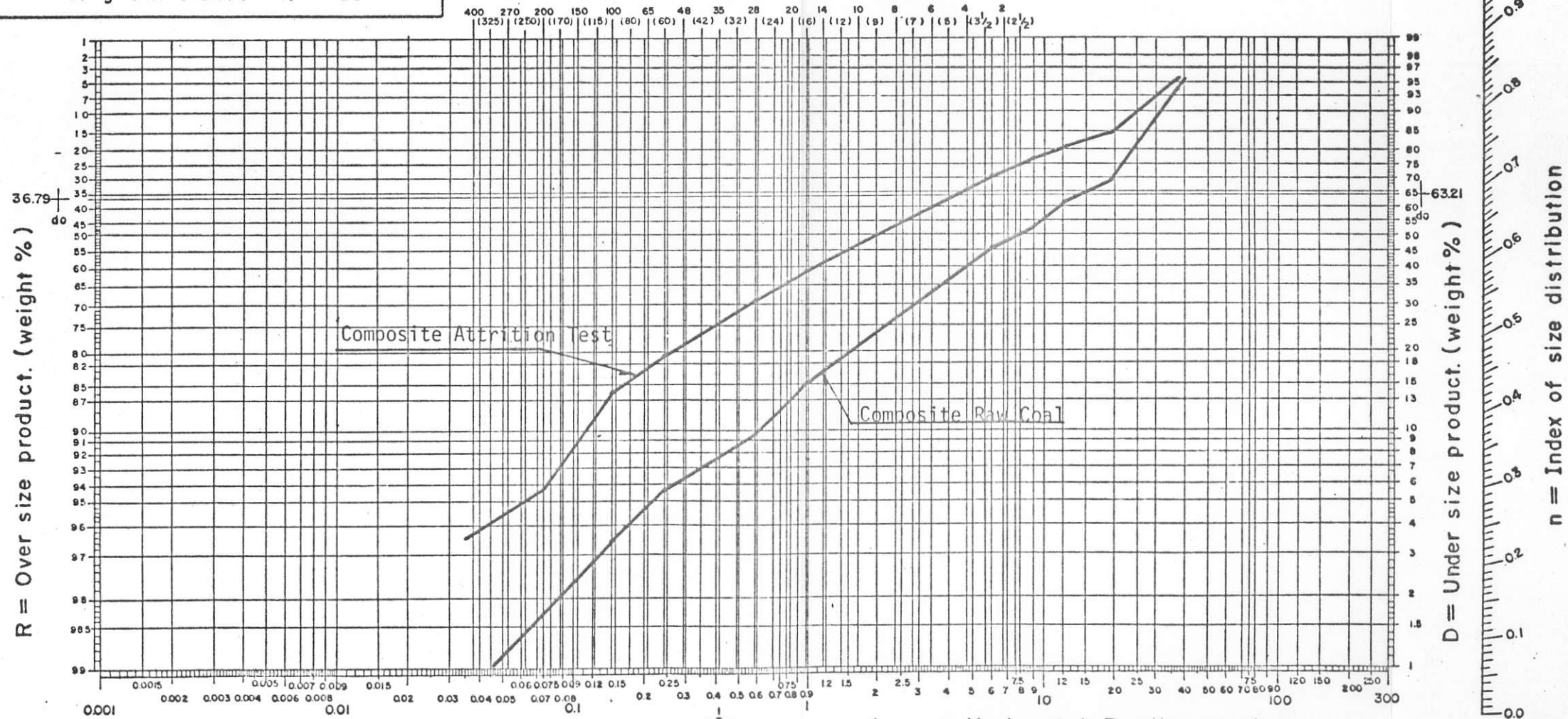
$$R = 100.0 - \left(\frac{d}{d_0}\right)^n$$

$$D = 100 - R$$

Sample. Composite Size Distribution (Seams 8, 9, 10B, 10A)
2" x 0
Index of size distribution. n = Characteristic number of grain size. (mm) do =



Tyler's screen mesh



do: --- Horizontal Reading at the intersection of the Lines RR and 36.79%

n: --- Reading on n scale at the intersection of the parallel line to the line RR. across the pt. A(n) and scale n.

2-4. Washability Data (Bulk Samples)

1. #8 Seam (Adit 7)

S.G.	2"x1/4"			1/4"x28M			28Mx60M			60Mx0		
	Wt%	Ash%	F.S.I.	Wt%	Ash%	F.S.I.	Wt%	Ash%	F.S.I.	Wt%	Ash%	F.S.I.
-1.30	0.2	1.8	9	19.3	1.2	9	17.4	1.7	9	9.6	1.7	10
1.35	6.7	5.0	3	23.1	4.7	5	29.2	5.0	5	39.1	3.6	6
1.40	25.5	8.4	2	13.8	8.3	1 1/2	24.4	9.3	2	17.3	7.0	1 1/2
1.45	23.6	13.8	2	8.8	13.4	1 1/2	11.0	14.7	2	13.3	10.6	1/2
1.50	10.2	20.3	1 1/2	9.8	19.6	1 1/2	4.2	19.4	1 1/2	5.8	15.4	1/2
1.60	14.3	26.6	1 1/2	9.9	26.4	1 1/2	4.5	26.3	1 1/2	5.8	22.3	1/2
1.80	5.7	38.9	1 1/2	7.0	39.6	1 1/2	6.2	39.2	1 1/2	4.3	36.3	1/2
+1.80	13.8	74.4	0	8.3	72.0	0	3.1	68.1	0	4.8	67.2	0
Total	100.0	24.1		100.0	16.9		100.0	12.2		100.0	11.1	

2. #9 Seam (Adit 4)

S.G.	2"x1/4"			1/4"x28M			28Mx60M			60Mx0		
	Wt%	Ash%	F.S.I.	Wt%	Ash%	F.S.I.	Wt%	Ash%	F.S.I.	Wt%	Ash%	F.S.I.
-1.30	0.4	2.6	9	11.2	1.2	10	25.0	1.3	9 1/2	21.3	1.0	10
1.35	33.2	4.7	2 1/2	26.7	4.5	5 1/2	31.3	4.1	7 1/2	27.5	3.2	7 1/2
1.40	34.5	9.1	1 1/2	24.0	8.5	2	18.3	8.2	2	18.2	6.4	2
1.45	10.0	13.6	1 1/2	14.3	14.0	1 1/2	11.2	13.8	1 1/2	11.2	10.6	1 1/2
1.50	5.6	18.4	1 1/2	5.9	19.7	1 1/2	3.7	19.5	1 1/2	4.8	15.5	1 1/2
1.50	4.3	25.8	1	5.2	27.2	1 1/2	3.1	27.1	1 1/2	3.5	22.5	1 1/2
1.80	2.3	41.7	1	3.2	41.2	1 1/2	2.4	41.5	1 1/2	2.6	35.1	1 1/2
+1.80	9.7	72.1	0	9.5	67.5	0	5.0	67.1	0	10.9	68.9	0
Total	100.0	16.2		100.0	15.9		100.0	10.6		100.0	13.4	

3. #10B Seam (Adit5)

S.G.	2"x1/4"				1/4"x28M				28Mx60M				60Mx0			
	Wt%	Ash%	F.S.I.	Wt%	Ash%	F.S.I.	Wt%	Ash%	F.S.I.	Wt%	Ash%	F.S.I.	Wt%	Ash%	F.S.I.	
-1.30	9.0	1.4	10	12.1	1.2	10	20.0	1.8	9 1/2	15.0	1.4	10 1/2				
1.35	22.1	5.6	9	23.5	5.7	9	20.9	5.1	8 1/2	22.5	4.4	9				
1.40	18.2	10.8	3	19.6	10.8	4	17.1	10.1	4 1/2	14.8	8.4	5				
1.45	15.5	14.9	2	11.4	15.1	2	13.2	14.6	3	12.8	12.5	2 1/2				
1.50	9.8	20.6	1 1/2	7.6	19.5	2	5.9	20.1	1 1/2	6.2	17.3	1 1/2				
1.60	6.4	27.4	1 1/2	8.2	27.3	1 1/2	6.8	27.7	1	6.9	24.9	1 1/2				
1.80	6.0	43.0	1	8.3	42.0	1	6.2	40.0	1	11.9	37.0	1 1/2				
+1.80	13.0	75.1	0	9.3	72.9	0	9.9	68.3	0	9.9	66.2	0				
Total	100.0	21.8		100.0	19.3		100.0	17.4		100.0	17.8					

4. #10A Seam (Adit 12)

S.G.	2"x1/4"				1/4"x28M				28Mx60M				60Mx0			
	Wt.	Ash%	F.S.I.	Wt%	Ash%	F.S.I.	Wt%	Ash%	F.S.I.	Wt%	Ash%	F.S.I.	Wt%	Ash%	F.S.I.	
-1.30	0.8	1.5	11	4.7	1.1	10	23.3	1.6	10 1/2	21.6	1.6	10				
1.35	1.3	7.2	9	8.0	5.4	9	11.1	4.9	9 1/2	21.3	4.6	9				
1.40	15.6	11.4	6	18.6	10.7	6	19.6	9.1	6 1/2	18.6	8.4	4				
1.45	17.6	15.7	2 1/2	29.3	14.2	2 1/2	20.4	13.6	2 1/2	16.3	13.1	2 1/2				
1.50	21.8	21.0	2 1/2	14.9	19.4	1 1/2	11.7	19.1	1 1/2	7.7	18.8	2				
1.60	24.8	28.9	1	15.0	26.6	1 1/2	6.2	26.3	1	7.1	26.2	1 1/2				
1.80	15.2	38.4	1	8.2	38.0	1	5.4	38.7	1	3.8	38.1	1				
+1.80	2.9	71.0	0	1.3	73.0	0	2.3	69.5	0	3.6	69.8	0				
Total	100.0	24.3		100.0	17.6		100.0	13.0		100.0	12.3					

2-5. FLOAT AND SINK TEST

SAMPLE: 1. #8 Seam (Adit 7)

DATE: July 15, 1976

SIZE: 2" x 0 (Composite)

CHOFU RESEARCH LABORATORY.
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{W_n} + \frac{1}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- - 1.30	10.58	1.39	5.29	14.71	14.71	10.58	1.39	1,766.13	89.42	19.75	
1.30 ~ 1.35	21.03	4.40	21.10	92.53	107.24	31.61	3.39	1,673.60	68.39	24.47	
1.35 ~ 1.40	19.79	8.28	41.51	163.86	271.10	51.40	5.27	1,509.74	48.60	31.06	64.44
1.40 ~ 1.45	15.08	13.27	58.94	200.11	471.21	66.48	7.09	1,309.63	33.52	39.07	48.44
1.45 ~ 1.50	8.54	19.35	70.75	165.25	636.46	75.02	8.48	1,144.38	24.98	45.81	33.68
1.50 ~ 1.60	10.06	26.05	80.05	262.06	898.52	85.08	10.56	882.32	14.92	59.14	13.03
1.60 ~ 1.80	5.95	38.87	88.06	231.28	1,129.80	91.03	12.41	651.04	8.97	72.58	
+ ~ 1.80	8.97	72.58	95.52	651.04	1,780.84	100.00	17.81	.00	.00	.00	
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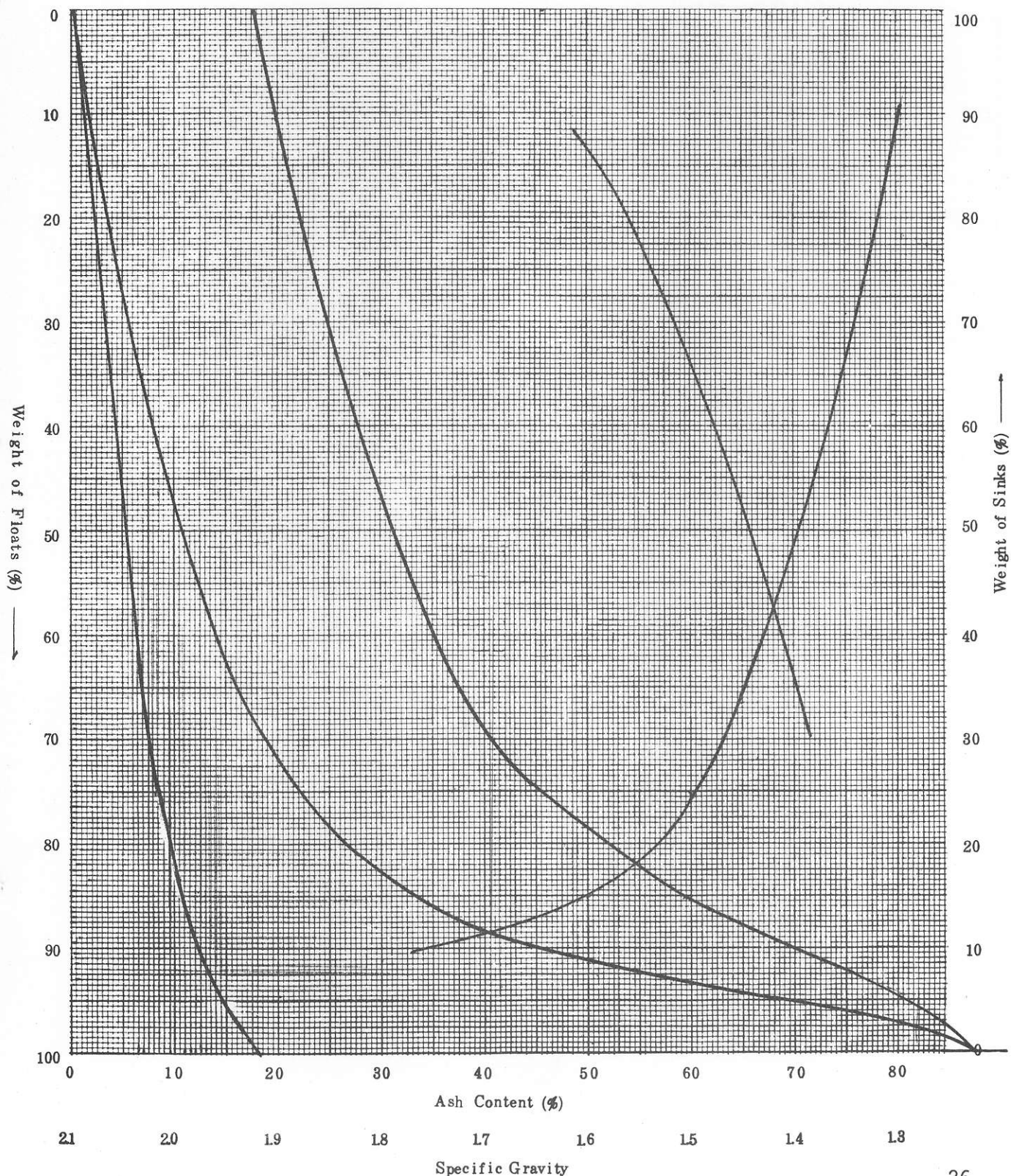
Washability Curves

SAMPLE: Composite 8 Seam (Adit 7)

DATE: July 15, 1967

SIZE : 2" x 0, Bulk Sample

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 2. #9 Seam (Adit 4)

DATE: July 15, 1976

SIZE: 2" x 0 (Composite)

CHOFU RESEARCH LABORATORY.
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{W_n} + \frac{W_n}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	10.88	1.16	5.44	12.62	12.62	10.88	1.16	1,483.07	89.12	16.64	
1.30 ~ 1.35	29.56	4.30	25.66	127.11	139.73	40.44	3.46	1,355.96	59.56	22.77	
1.35 ~ 1.40	25.90	8.46	53.39	219.11	358.84	66.34	5.41	1,136.85	33.66	33.77	72.72
1.40 ~ 1.45	11.90	13.23	72.29	157.44	516.28	78.24	6.60	979.41	21.76	45.01	45.33
1.45 ~ 1.50	5.36	18.48	80.92	99.05	615.33	83.60	7.36	880.36	16.40	53.68	21.60
1.50 ~ 1.60	4.34	25.97	85.77	112.71	728.04	87.94	8.28	767.65	12.06	63.65	5.69
1.60 ~ 1.80	2.69	40.22	89.29	108.19	836.23	90.63	9.23	659.46	9.37	70.38	
- ~ 1.80	9.37	70.38	95.32	659.46	1,495.69	100.00	14.96	.00	.00	.00	
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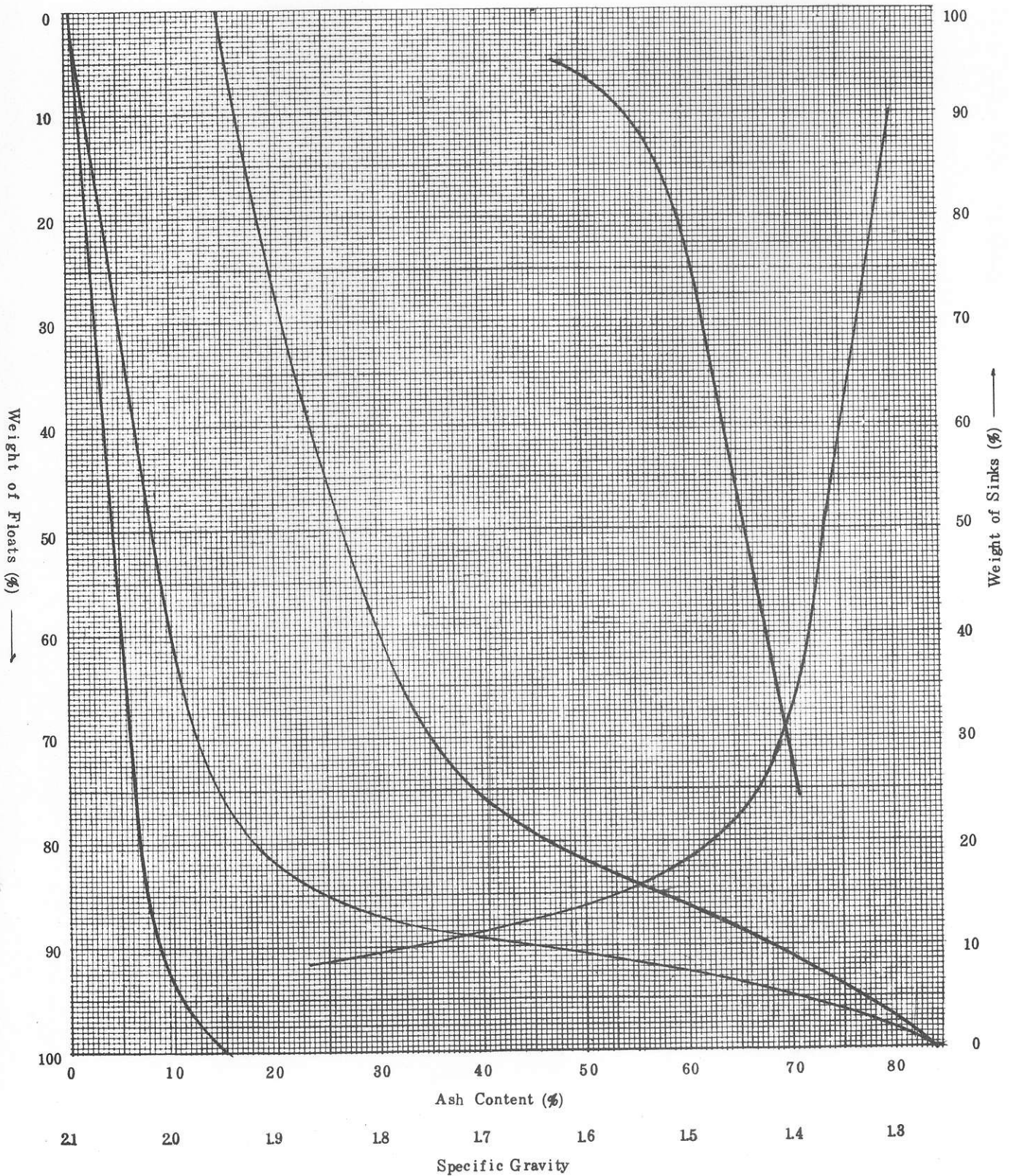
Washability Curves

SAMPLE: Composite 9 Seam (Adit 4)

DATE: July 15, 1976

SIZE : 2" x 0, Bulk Sample

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 3. #10B Seam (Adit)

DATE: July 15, 1976

SIZE: 2" x 0 (Composite)

CHOFU RESEARCH LABORATORY.

MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (g)	Ash (%)	$\frac{\sum W_{n-1}}{W_n}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	13.35	1.39	6.68	18.56	18.56	13.35	1.39	1,888.26	86.65	21.79	
1.30 ~ 1.35	22.73	5.33	24.72	121.15	139.71	36.08	3.87	1,767.11	63.92	27.65	
1.35 ~ 1.40	18.00	10.27	45.08	184.86	324.57	54.08	6.00	1,582.25	45.92	34.46	60.65
1.40 ~ 1.45	12.54	14.41	60.35	180.70	505.27	66.62	7.58	1,401.55	33.38	41.99	41.65
1.45 ~ 1.50	7.38	19.36	70.31	142.88	648.15	74.00	8.76	1,258.67	26.00	48.41	27.38
1.50 ~ 1.60	7.46	26.87	77.73	200.45	848.60	81.46	10.42	1,058.22	18.54	57.08	11.70
1.60 ~ 1.80	8.48	40.36	85.70	342.25	1,190.85	89.94	13.24	715.97	10.06	71.17	
- ~ 1.80	10.06	71.17	94.97	715.97	1,906.82	100.00	19.07	.00	.00	.00	
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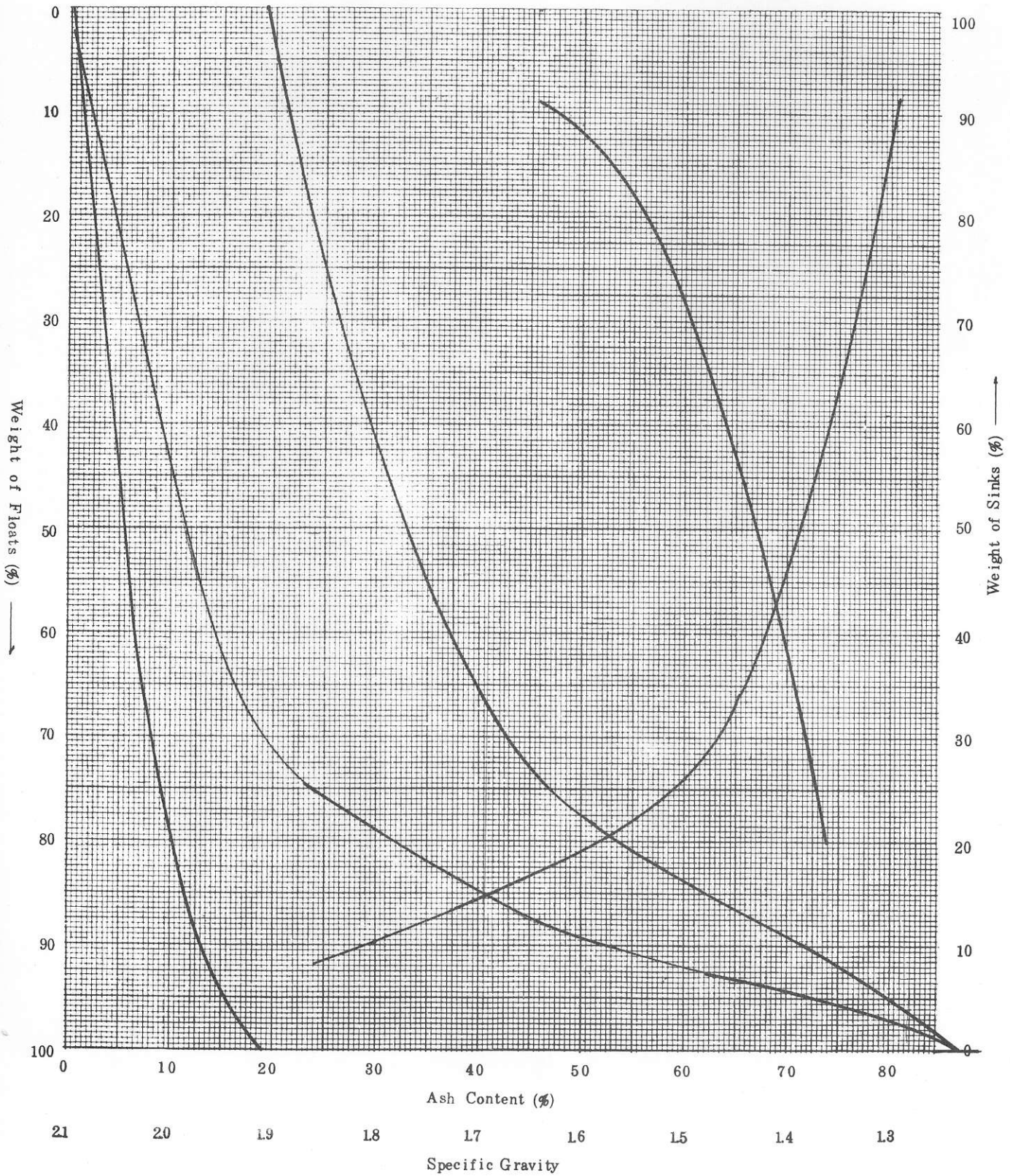
Washability Curves

SAMPLE: Composite 10B Seam (Adit 4)

DATE: July 15, 1976

SIZE : 2" x 0, Bulk Sample

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 4. #10A Seam (Adit 12)

DATE: July 15, 1976

SIZE: 2" x 0 (Composite)

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\Delta W_{n-1}}{W_n} \cdot \frac{1}{2}$	W · A	$\Sigma W \cdot A$	ΔW	$\frac{\Delta W \cdot A}{\Delta W}$	Total W · A - $\Sigma W \cdot A$	100 - ΔW	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	8.73	1.48	4.37	12.92	12.92	8.73	1.48	1,763.57	91.27	19.32	
1.30 ~ 1.35	9.01	5.05	13.24	45.50	58.42	17.74	3.29	1,718.07	82.26	20.89	
1.35 ~ 1.40	17.62	10.23	26.55	180.25	238.67	35.36	6.75	1,537.82	64.64	23.79	63.28
1.40 ~ 1.45	22.69	14.32	46.71	324.92	563.59	58.05	9.71	1,212.90	41.95	28.91	61.92
1.45 ~ 1.50	13.96	20.05	65.03	279.90	843.49	72.01	11.71	933.00	27.99	33.33	51.96
1.50 ~ 1.60	15.31	27.58	79.67	422.25	1,265.74	87.32	14.50	510.75	12.68	40.28	19.82
1.60 ~ 1.80	9.02	38.24	91.83	344.92	1,610.66	96.34	16.72	165.83	3.66	45.31	
- ~ 1.80	3.66	45.31	98.17	165.83	1,776.49	100.00	17.76	.00	.00	.00	
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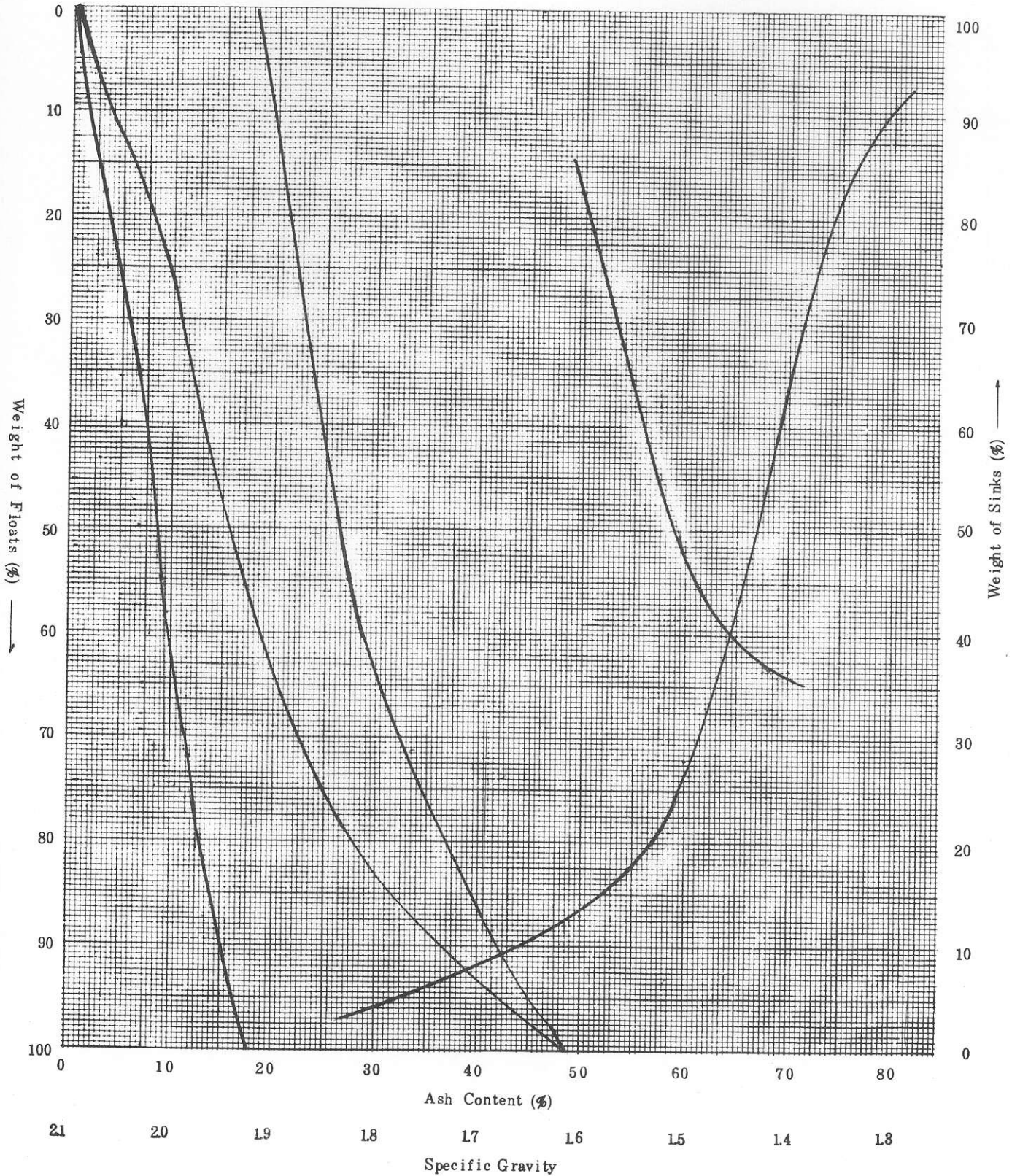
Washability Curves

SAMPLE: Composite 10A Seam (Adit 12)

DATE: July 15, 1976

SIZE : 2" x 0, Bulk Sample

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.

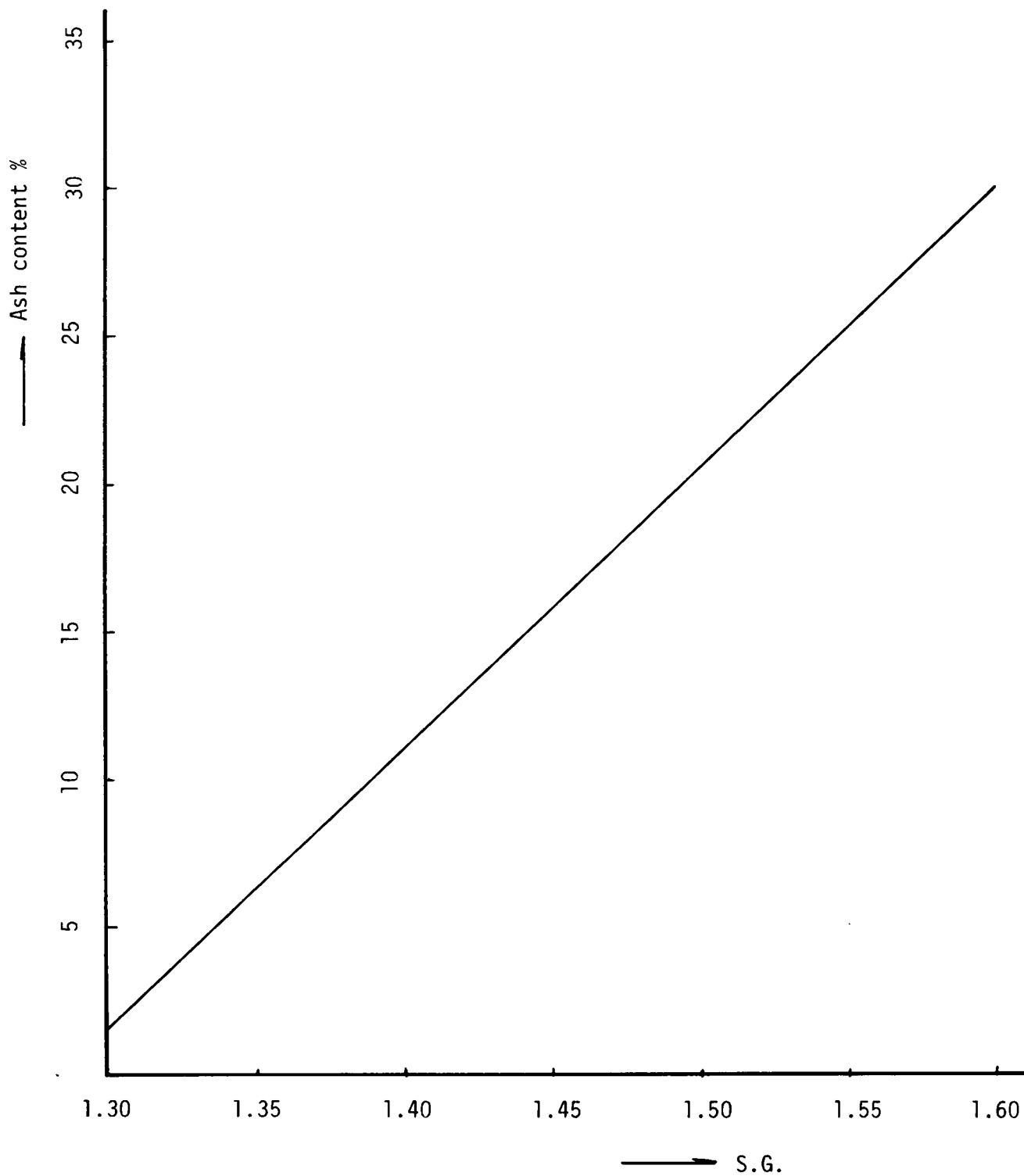


2-6-1. Line Creek #8 Seam
Ash Content vs. Specific Gravity

$$Y = 1.2823 + 0.0106X$$

Y : S.G.

X : Ash Content

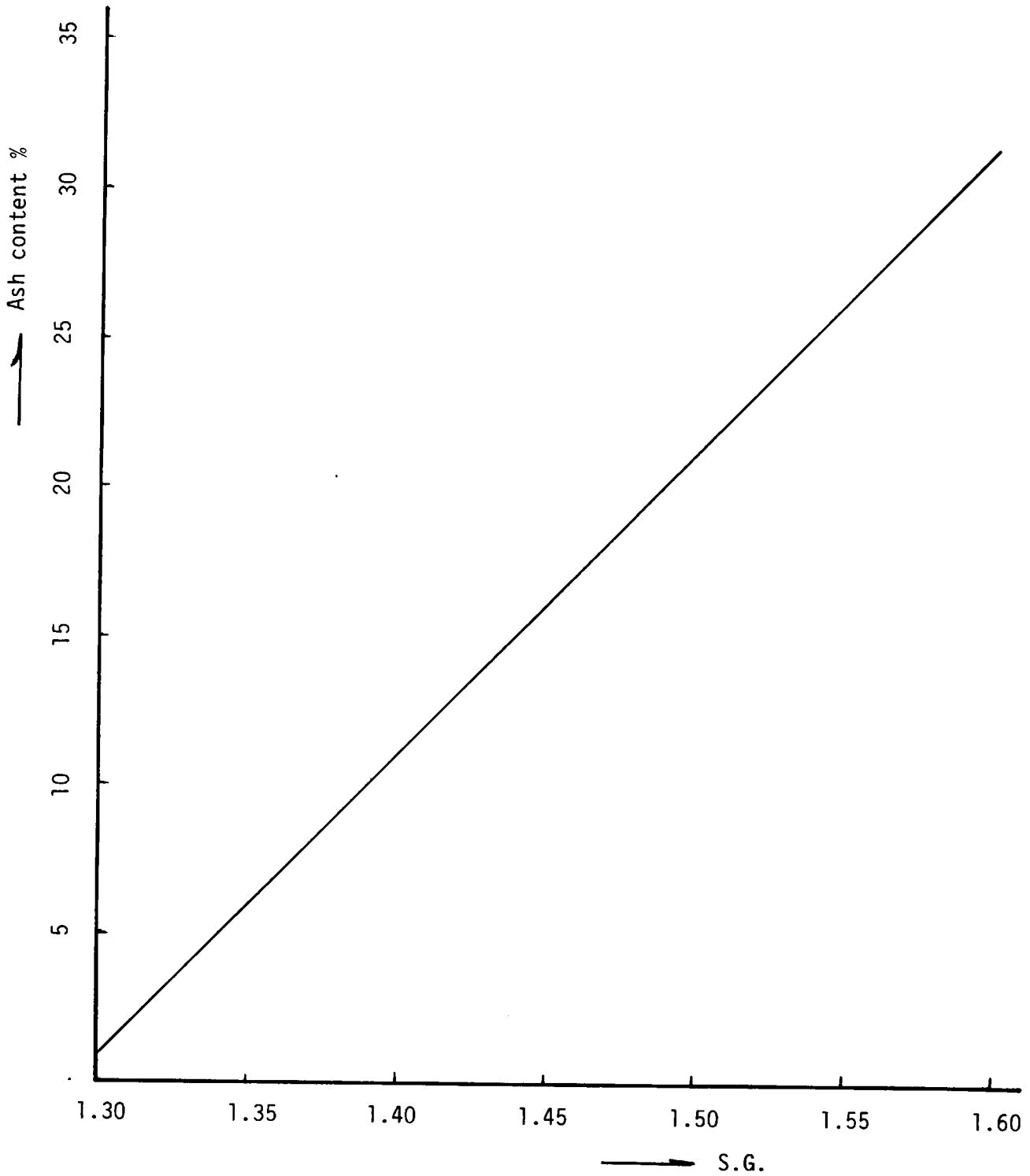


2-6-2. Line Creek #9 Seam
Ash Content vs. Specific Gravity

$$Y = 1.2909 + 0.0098X$$

Y : S.G.

X : Ash content

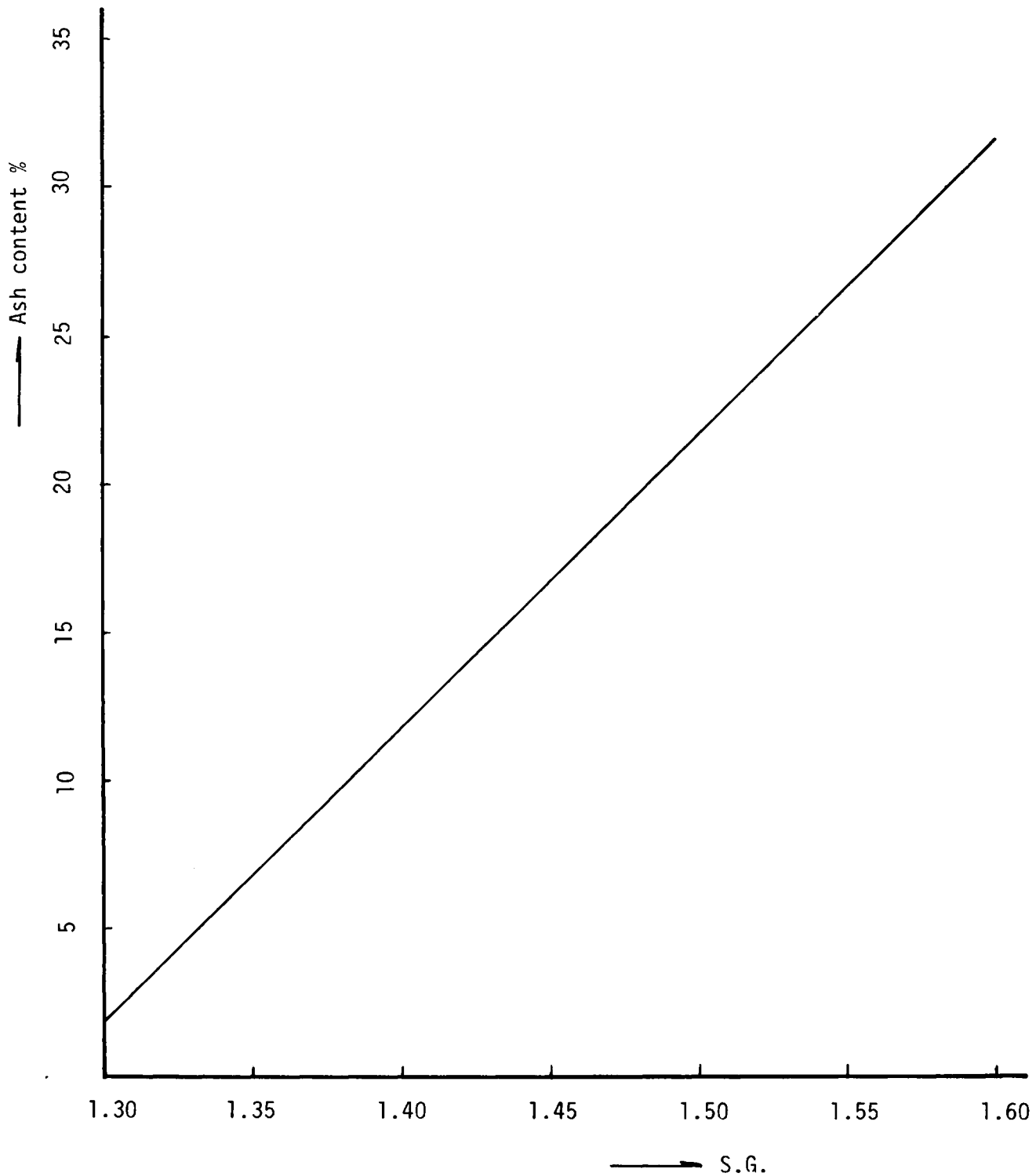


2-6-3. Line Creek #10B Seam
Ash Content vs. Specific Gravity

$$Y = 1.2802 + 0.0101X$$

Y : S.G.

X : Ash Content



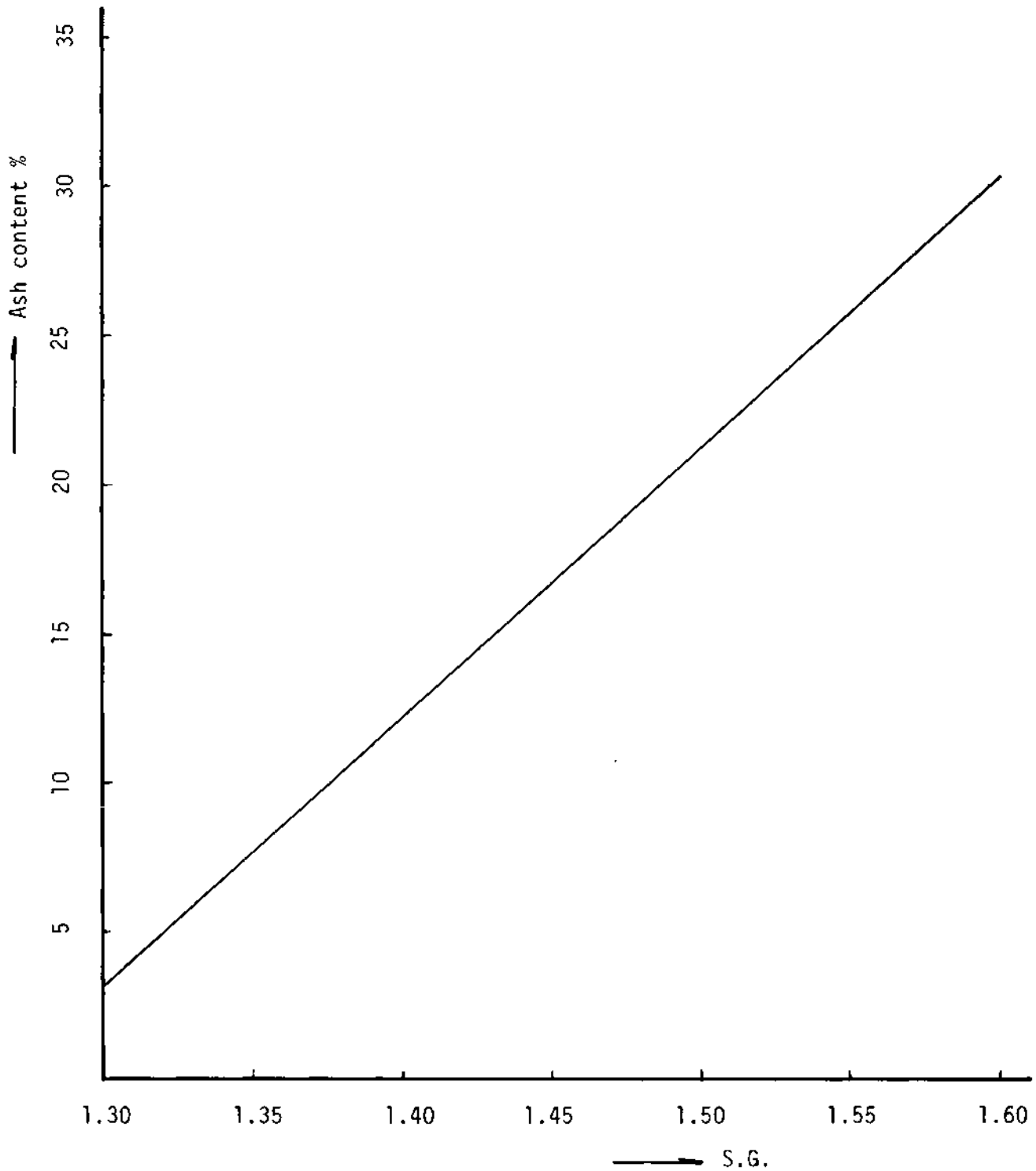
2-6-4.

Line Creek #10A Seam
Ash Content vs. Specific Gravity

$$Y = 1.264 + 0.0111X$$

Y : S.G.

X : Ash Content



2-7. Theoretical Yield of Each Seam

(bulk samples before dilution)
(at clean coal ash 9.5%)

#8 Seam (Adit 7)

Size	Wt.%	Theoretical Yield	S.G. of Separation
2" x 28M	69.7 x	66.32 = 46.23	1.494
28M x 60M	11.7 x	94.10 = 11.01	1.710
60M x 0	18.6 x	97.17 = 18.07	2.130
Total	100.0	75.31	

#9 Seam (Adit 4)

Size	Wt.%	Theoretical Yield	S.G. of Separation
2" x 28M	70.2 x	88.44 = 62.08	1.657
28M x 60M	10.1 x	98.20 = 9.92	2.310
60M x 0	19.7 x	93.74 = 18.47	2.140
Total	100.0	90.47	

#10B Seam (Adit 5)

Size	Wt.%	Theoretical Yield	S.G. of Separation
2" x 28M	64.5 x	74.68 = 48.17	1.505
28M x 60M	13.3 x	83.00 = 11.04	1.587
60M x 0	22.2 x	80.62 = 17.90	1.641
Total	100.0	77.11	

#10A Seam (Adit 12)

Size	Wt.%	Theoretical Yield	S.G. of Separation
2" x 28M	70.8 x	33.37 = 23.63	1.415
28M x 60M	10.1 x	89.01 = 8.99	1.547
60M x 0	19.1 x	94.27 = 18.01	1.688
Total	100.0	50.63	

2-8. FLOAT AND SINK TEST

SAMPLE: 1.#8 Seam (Adit 7, Bulk Sample)

DATE: July 12, 1976

SIZE: 2" x 1/4" (After attrition test)

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{W_n} \cdot \frac{1}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	.20	1.80	.10	.36	.36	.20	1.80	2,409.27	99.80	24.14	
1.30 ~ 1.35	6.70	5.00	3.55	33.50	33.86	6.90	4.91	2,375.77	93.10	25.52	
1.35 ~ 1.40	25.50	8.40	19.65	214.20	248.06	32.40	7.66	2,161.57	67.60	31.98	66.00
1.40 ~ 1.45	23.60	13.80	44.20	325.68	573.74	56.00	10.25	1,835.89	44.00	41.72	66.45
1.45 ~ 1.50	10.20	20.30	61.10	207.06	780.80	66.20	11.79	1,628.83	33.80	48.19	48.10
1.50 ~ 1.60	14.30	26.60	73.35	380.38	1,161.18	80.50	14.42	1,248.45	19.50	64.02	17.15
1.60 ~ 1.80	5.70	38.90	83.35	221.73	1,382.91	86.20	16.04	1,026.72	13.80	74.40	
+ ~ 1.80	13.80	74.40	93.10	1,026.72	2,409.63	100.00	24.10	.00	.00	.00	
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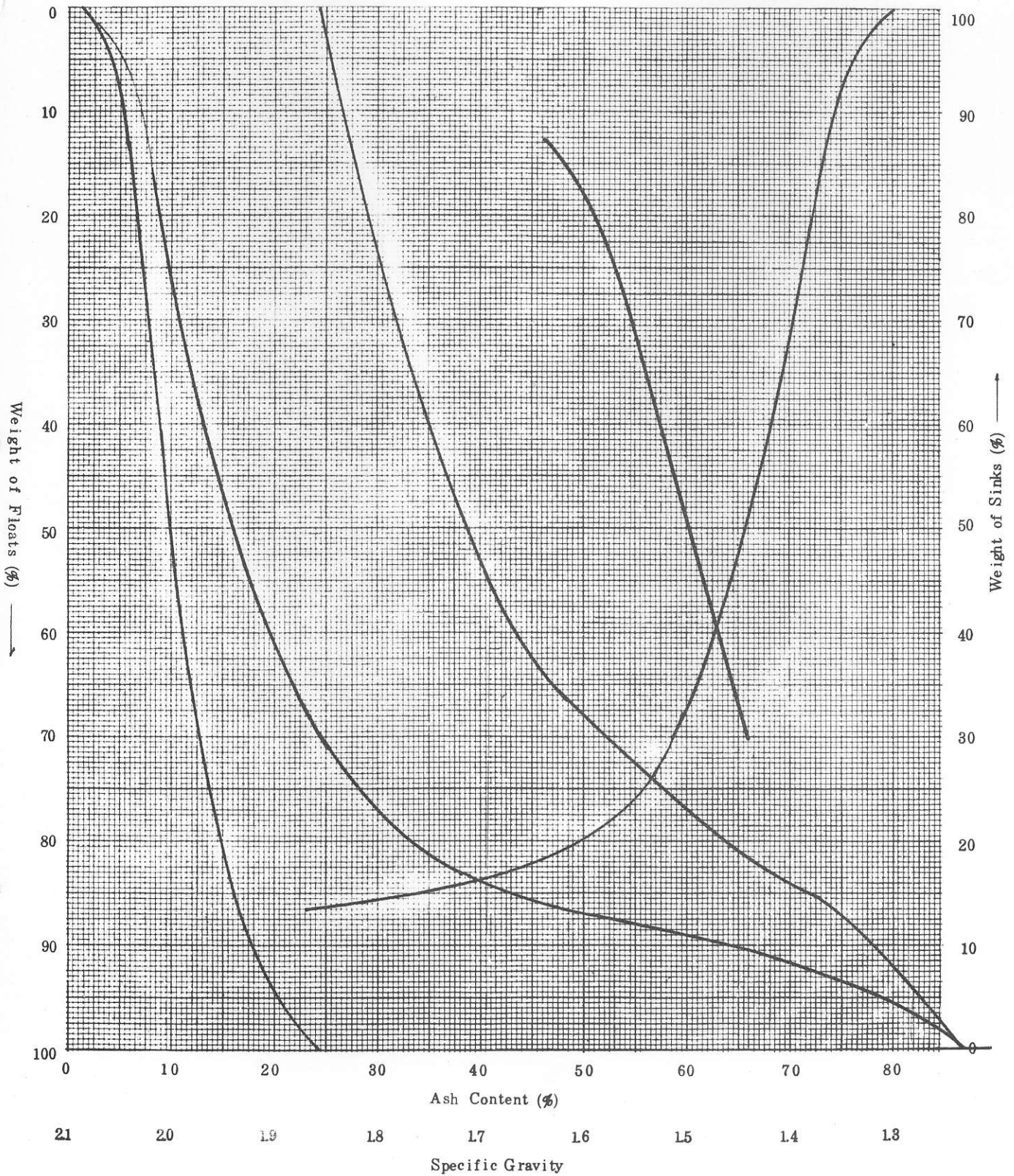
Washability Curves

SAMPLE: 8 Seam (Adit 7)

DATE: July 15, 1976

SIZE : 2" x 1/4"

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 2. #8 Seam (Adit 7)

SIZE: 1/4" x 28M

DATE: July 15, 1976

CHOFU RESEARCH LABORATORY.

MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{W_n} \cdot \frac{1}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	19.30	1.20	9.65	23.16	23.16	19.30	1.20	1,669.27	80.70	20.68	
1.30 ~ 1.35	23.10	4.70	30.85	108.57	131.73	42.40	3.11	1,560.70	57.60	27.10	
1.35 ~ 1.40	13.80	8.30	49.30	114.54	246.27	56.20	4.38	1,446.16	43.80	33.02	55.50
1.40 ~ 1.45	8.80	13.40	60.60	117.92	364.19	65.00	5.60	1,328.24	35.00	37.95	37.35
1.45 ~ 1.50	9.80	19.60	69.90	192.08	556.27	74.80	7.44	1,136.16	25.20	45.09	28.50
1.50 ~ 1.60	9.90	26.40	79.75	261.36	817.63	84.70	9.65	874.80	15.30	57.18	13.40
1.60 ~ 1.80	7.00	39.60	88.20	277.20	1,094.83	91.70	11.94	597.60	8.30	72.00	
+ ~ 1.80	8.30	72.00	95.85	597.60	1,692.43	100.00	16.92	.00	.00	.00	
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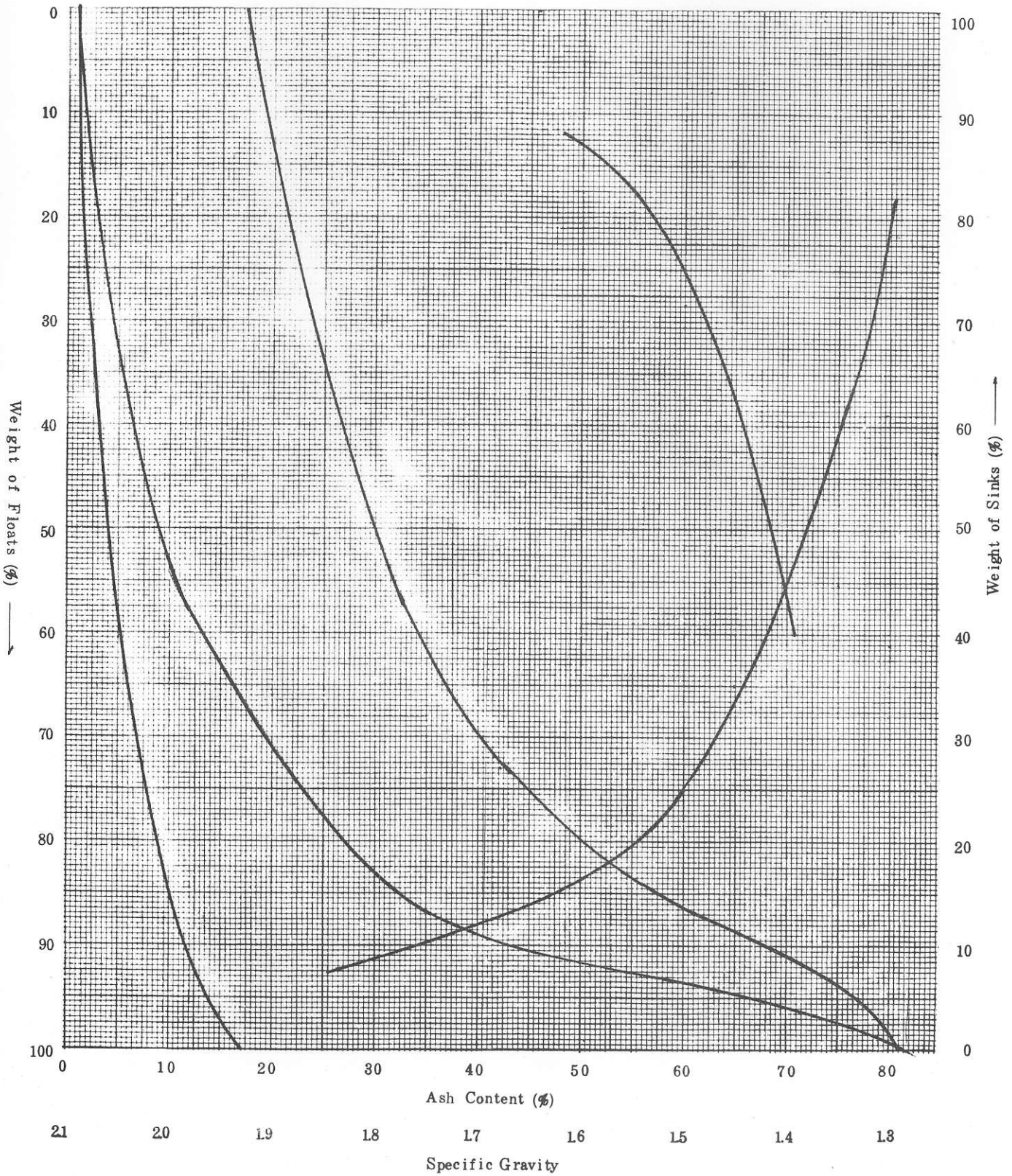
Washability Curves

SAMPLE: 8 Seam (Adit 7)

DATE: July 15, 1976

SIZE : 1/4" x 28M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 3. #8 Seam (Adit 7)

DATE: July 15, 1976

SIZE: 28M x 60M

CHOFU RESEARCH LABORATORY.

MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\Delta W_{n-1}}{W_n} \pm \frac{1}{2}$	W · A	$\Sigma W \cdot A$	ΣW	$\frac{\Delta W \cdot A}{\Sigma W}$	Total W · A - $\Sigma W \cdot A$	100 - ΣW	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	17.40	1.70	8.70	29.58	29.58	17.40	1.70	1,188.60	82.60	14.39	
1.30 ~ 1.35	29.20	5.00	32.00	146.00	175.58	46.60	3.77	1,042.60	53.40	19.52	
1.35 ~ 1.40	24.40	9.30	58.80	226.92	402.50	71.00	5.67	815.68	29.00	28.13	68.80
1.40 ~ 1.45	11.00	14.70	76.50	161.70	564.20	82.00	6.88	653.98	18.00	36.33	41.85
1.45 ~ 1.50	4.20	19.40	84.10	81.48	645.68	86.20	7.49	572.50	13.80	41.49	19.70
1.50 ~ 1.60	4.50	26.30	88.45	118.35	764.03	90.70	8.42	454.15	9.30	48.83	7.70
1.60 ~ 1.80	6.20	39.20	93.80	243.04	1,007.07	96.90	10.39	211.11	3.10	68.10	
+ ~ 1.80	3.10	68.10	98.45	211.11	1,218.18	100.00	12.18	.00	.00	.00	
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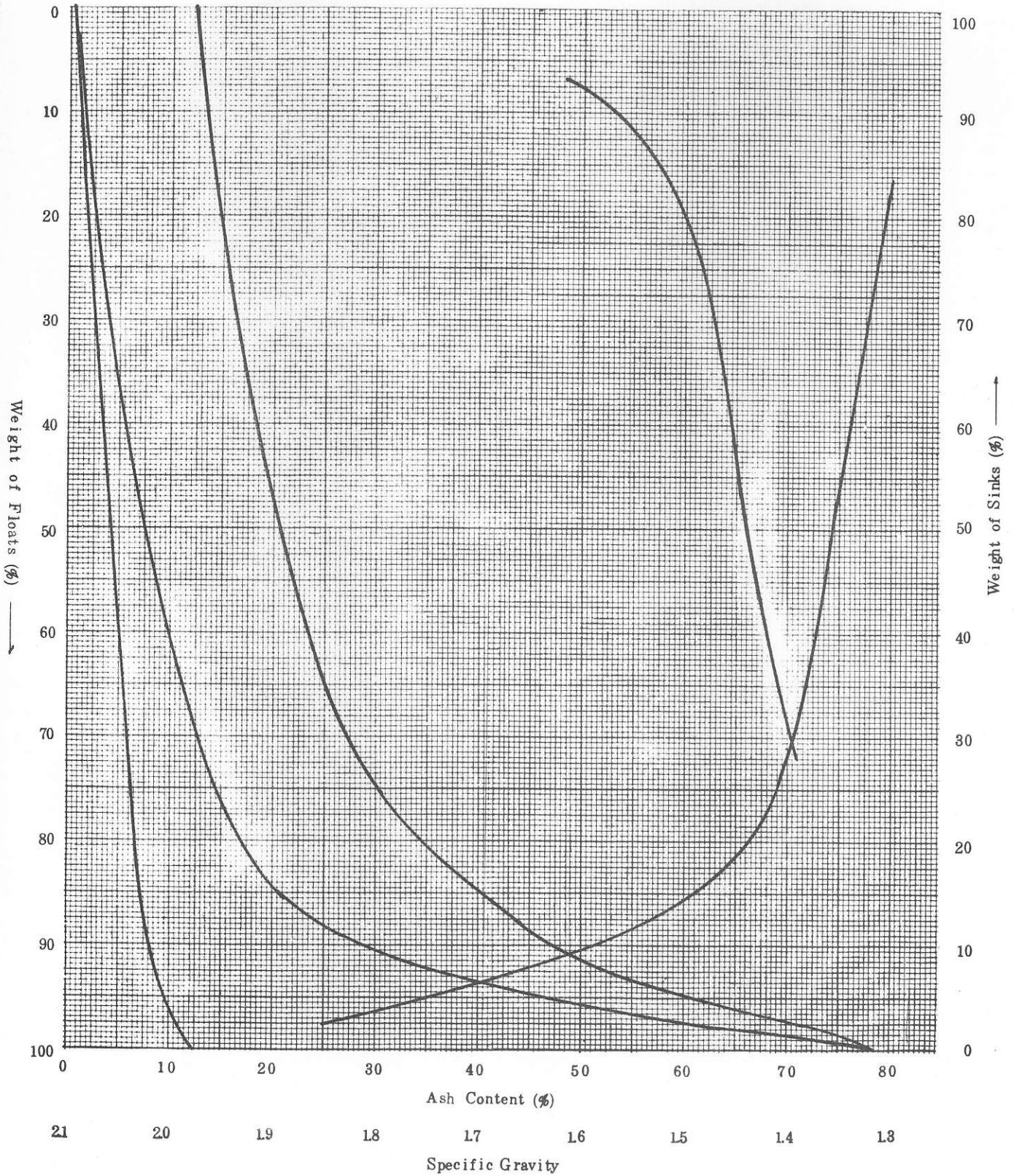
Washability Curves

SAMPLE: 8 Seam (Adit 7)

DATE: July 15, 1976

SIZE : 28M x 60M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 4. #8 Seam (Adit 7)

SIZE: 60M x 0

DATE: July 15, 1976

CHOFU RESEARCH LABORATORY.

MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{W_n} \cdot \frac{1}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	9.60	1.70	4.80	16.32	16.32	9.60	1.70	1,100.15	90.40	12.17	
1.30 ~ 1.35	39.10	3.60	29.15	140.76	157.08	48.70	3.23	959.39	51.30	18.70	
1.35 ~ 1.40	17.30	7.00	57.35	121.10	278.18	66.00	4.21	838.29	34.00	24.66	75.50
1.40 ~ 1.45	13.30	10.60	72.65	140.98	419.16	79.30	5.29	697.31	20.70	33.69	39.30
1.45 ~ 1.50	5.80	15.40	82.20	89.32	508.48	85.10	5.98	607.99	14.90	40.80	24.90
1.50 ~ 1.60	5.80	22.30	88.00	129.34	637.82	90.90	7.02	478.65	9.10	52.60	7.95
1.60 ~ 1.80	4.30	36.30	93.05	156.09	793.91	95.20	8.34	322.56	4.80	67.20	
+ ~ 1.80	4.80	67.20	97.60	322.56	1,116.47	100.00	11.16	.00	.00	.00	
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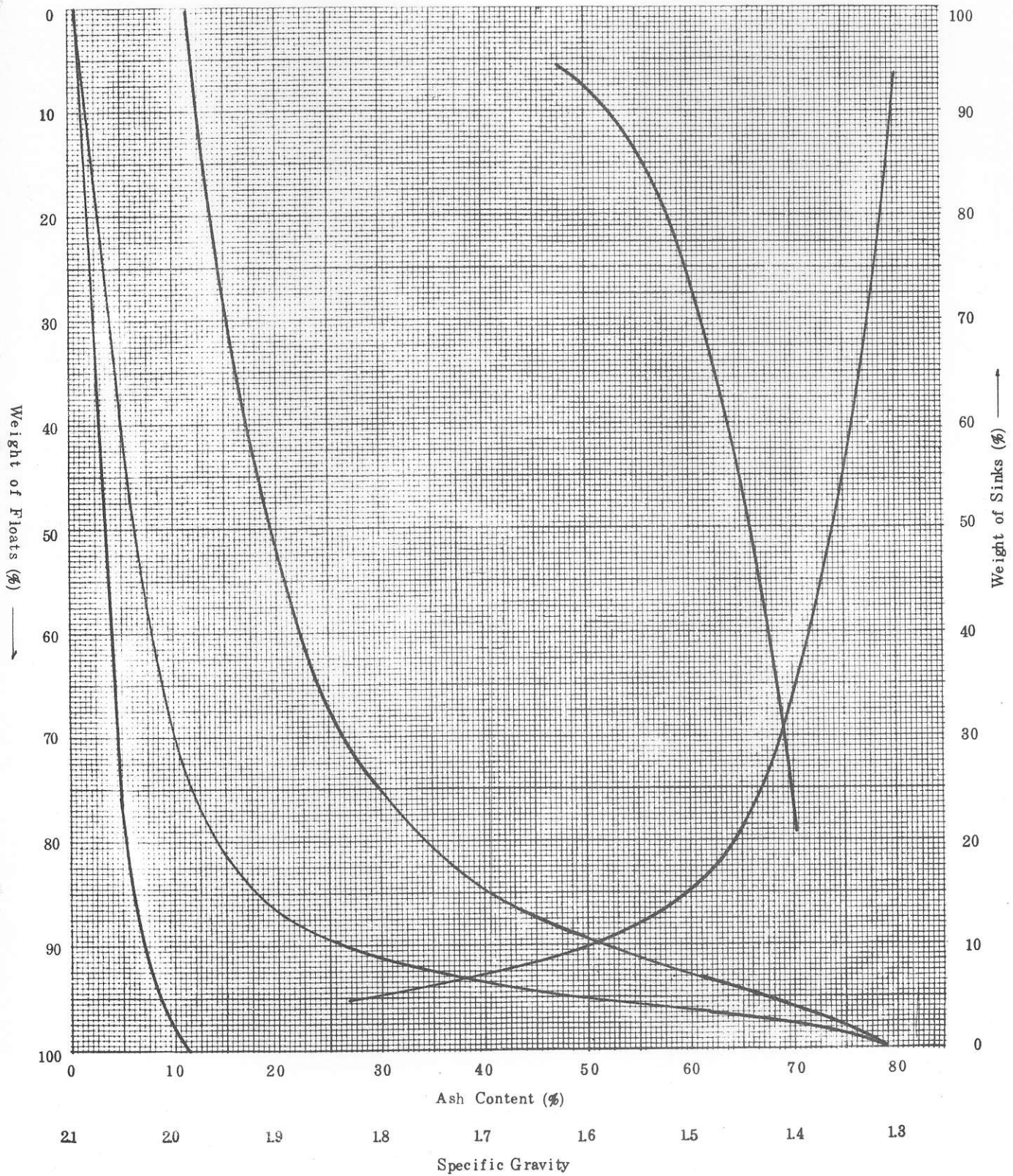
Washability Curves

SAMPLE: 8 Seam (Adit 7)

DATE: July 15, 1976

SIZE : 60M x 0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 5. #8 Seam (Adit 7)

DATE: July 15, 1976

SIZE: 2" x 28M (Composite)

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{W_n} \cdot \frac{1}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	9.68	1.21	4.84	11.71	11.71	9.68	1.21	2,026.46	90.32	22.44	
1.30 ~ 1.35	11.82	4.71	15.59	55.67	67.38	21.50	3.13	1,970.79	78.50	25.11	
1.35 ~ 1.40	19.69	8.37	31.35	164.81	232.19	41.19	5.64	1,805.98	58.81	30.71	57.76
1.40 ~ 1.45	16.25	13.69	49.32	222.46	454.65	57.44	7.92	1,583.52	42.56	37.21	51.99
1.45 ~ 1.50	10.00	19.96	62.44	199.60	654.25	67.44	9.70	1,383.92	32.56	42.50	38.36
1.50 ~ 1.60	12.11	26.52	73.50	321.16	975.41	79.55	12.26	1,062.76	20.45	51.97	15.28
1.60 ~ 1.80	6.34	39.28	82.72	249.04	1,224.45	85.89	14.26	813.72	14.45	57.67	
+ ~ 1.80	14.34	57.67	92.95	813.72	2,038.17	100.00	20.38	.00	.00	.00	
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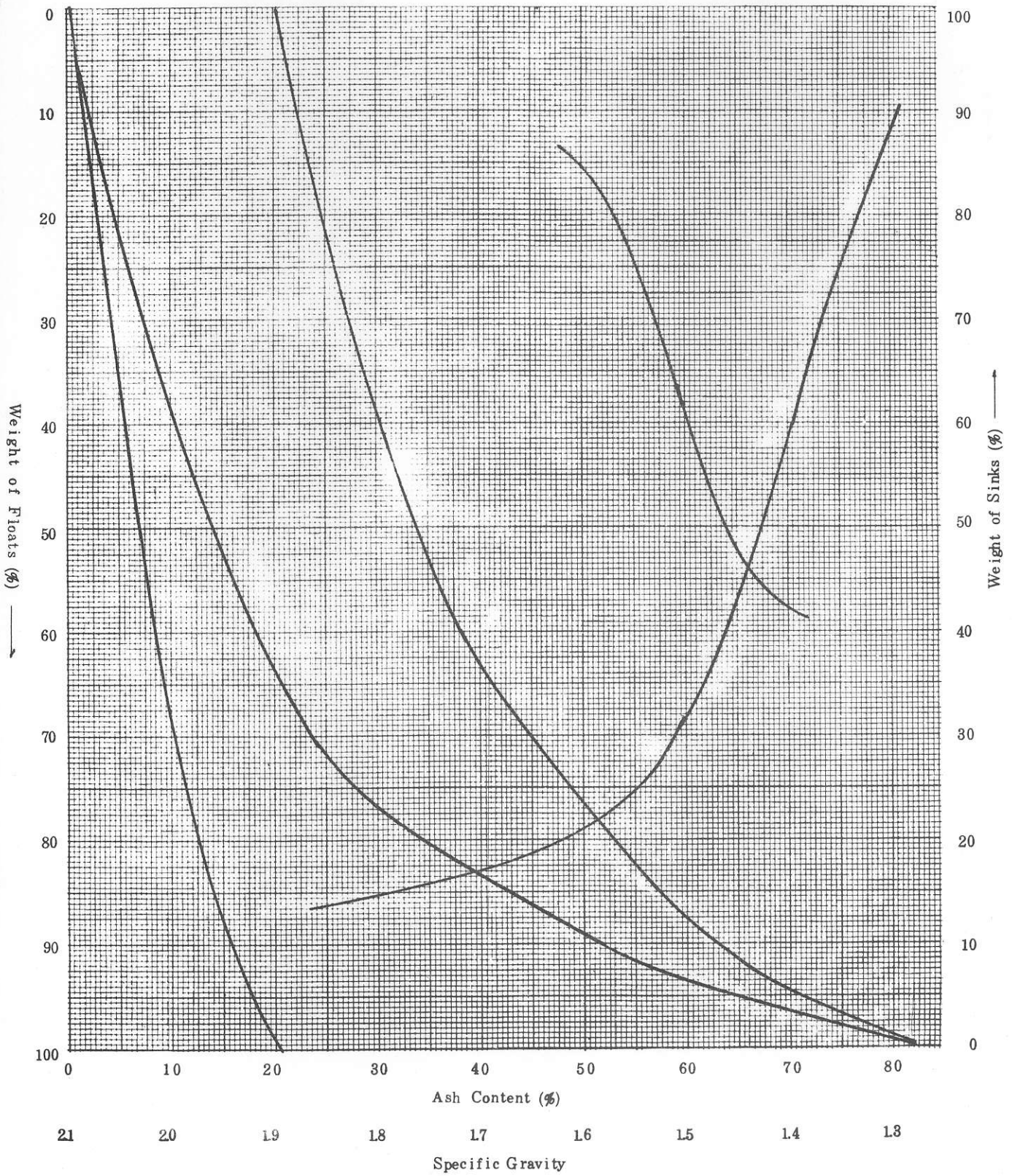
Washability Curves

SAMPLE: Composite: 8 Seam

DATE: July 15, 1976

SIZE : 2" x 28M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 6. #9 Seam (Adit 4)

DATE: July 15, 1976

SIZE: 2" x 1/4" (After attrition test)

CHOFU RESEARCH LABORATORY.
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (g)	Ash (g)	$\frac{\sum W_{n-1}}{W_n} \cdot \frac{1}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	.40	2.60	.20	1.04	1.04	.40	2.60	1,615.25	99.60	16.22	
1.30 ~ 1.35	33.20	4.70	17.00	156.04	157.08	33.60	4.68	1,459.21	66.40	21.98	
1.35 ~ 1.40	34.50	9.10	50.85	313.95	471.03	68.10	6.92	1,145.26	31.90	35.90	83.30
1.40 ~ 1.45	10.00	13.60	73.10	136.00	607.03	78.10	7.77	1,009.26	21.90	46.08	52.25
1.45 ~ 1.50	5.60	18.40	80.90	103.04	710.07	83.70	8.48	906.22	16.30	55.60	19.90
1.50 ~ 1.60	4.30	25.80	85.80	110.94	821.01	88.00	9.33	795.28	12.00	66.27	5.45
1.60 ~ 1.80	2.30	41.70	89.15	95.91	916.92	90.30	10.15	699.37	9.70	72.10	
+ ~ 1.80	9.70	72.10	95.15	699.37	1,616.29	100.00	16.16	.00	.00	.00	
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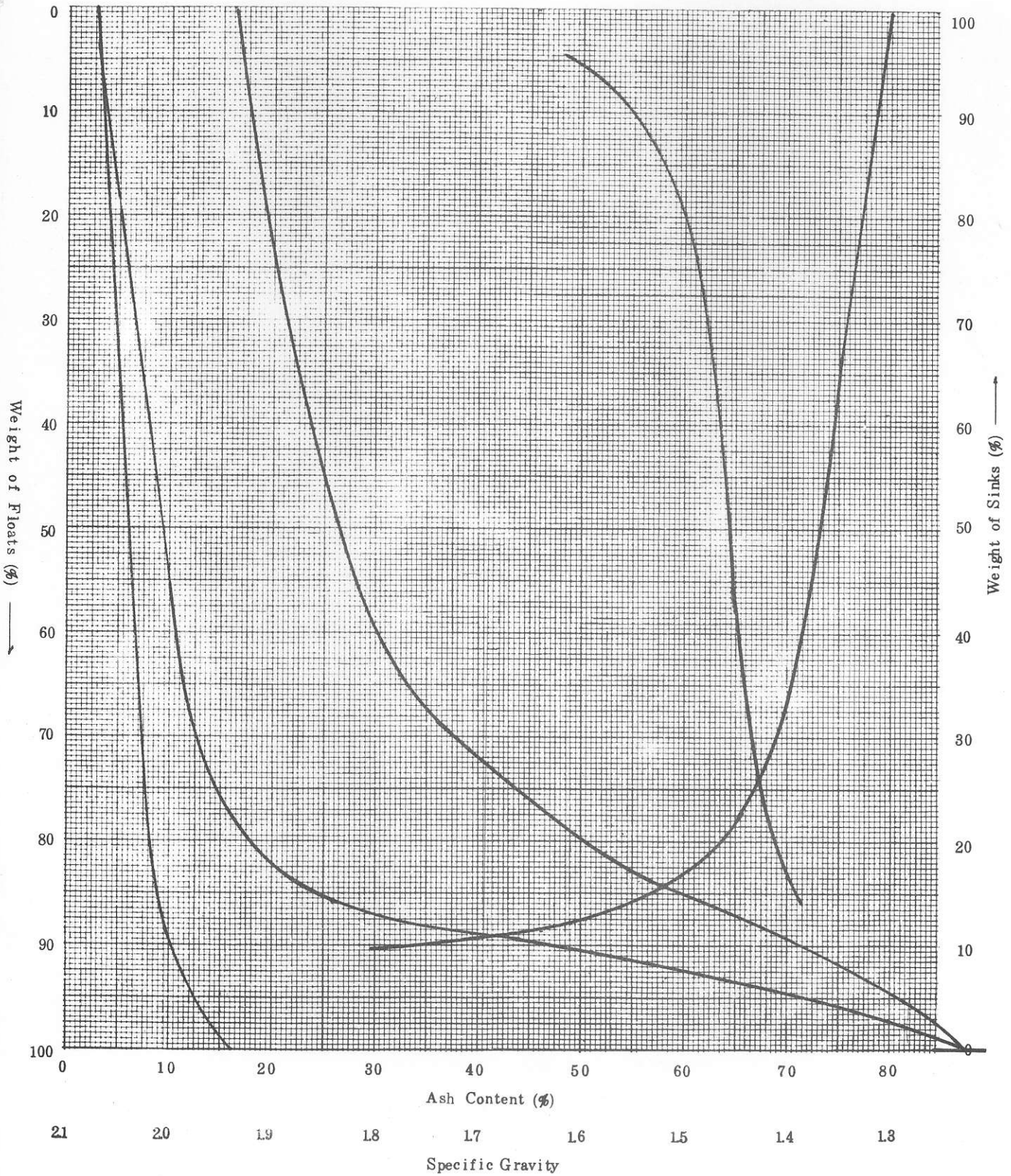
Washability Curves

SAMPLE: 9 Seam (Adit 4)

DATE: July 15, 1976

SIZE : 2" x 1/4"

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 7. #9 Seam (Adit 4)

DATE: July 15, 1976

SIZE: 1/4" x 28M

CHOFU RESEARCH LABORATORY.

MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{W_n} \cdot \frac{1}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	11.20	1.20	5.60	13.44	13.44	11.20	1.20	1,574.11	88.80	17.73	
1.30 ~ 1.35	26.70	4.50	24.55	120.15	133.59	37.90	3.52	1,453.96	62.10	23.41	
1.35 ~ 1.40	24.00	8.50	49.90	204.00	337.59	61.90	5.45	1,249.96	32.10	32.81	70.90
1.40 ~ 1.45	14.30	14.00	69.05	200.20	537.79	76.20	7.06	1,049.76	23.80	44.11	41.25
1.45 ~ 1.50	5.90	19.70	79.15	116.23	654.02	82.10	7.97	933.53	17.90	52.15	25.40
1.50 ~ 1.60	5.20	27.20	84.70	141.44	795.46	87.30	9.11	792.09	12.70	62.37	6.80
~ 1.80	3.20	41.20	88.90	131.84	927.30	90.50	10.25	660.25	9.50	69.50	
+ ~ 1.80	9.50	69.50	95.25	660.25	1,587.55	100.00	15.88	.00	.00	.00	
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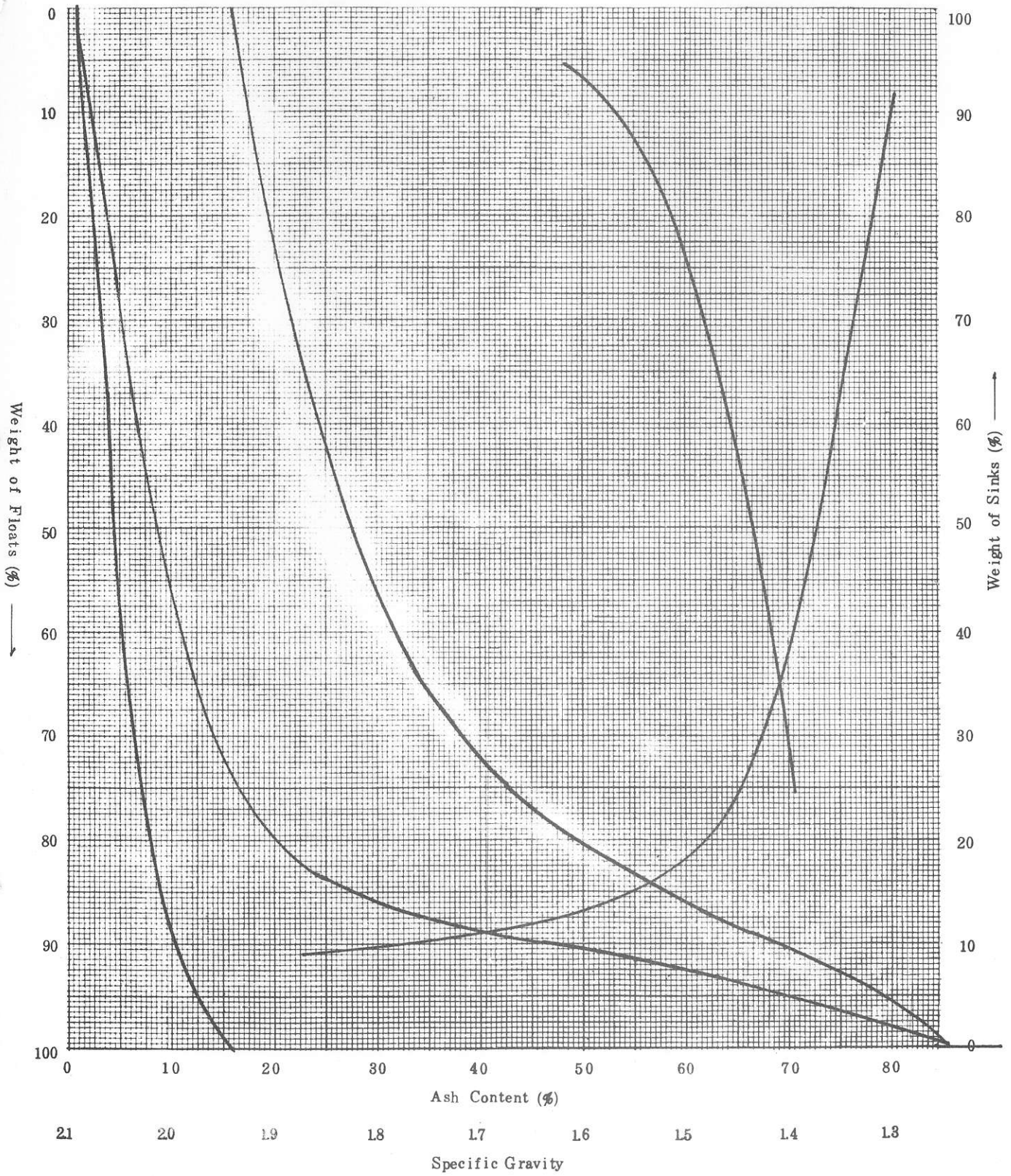
Washability Curves

SAMPLE: 9 Seam (Adit 4)

DATE: July 15, 1976

SIZE : 1/4" x 28M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 8. #9 Seam (Adit 4)

DATE: July 15, 1976

SIZE: 28M x 60M

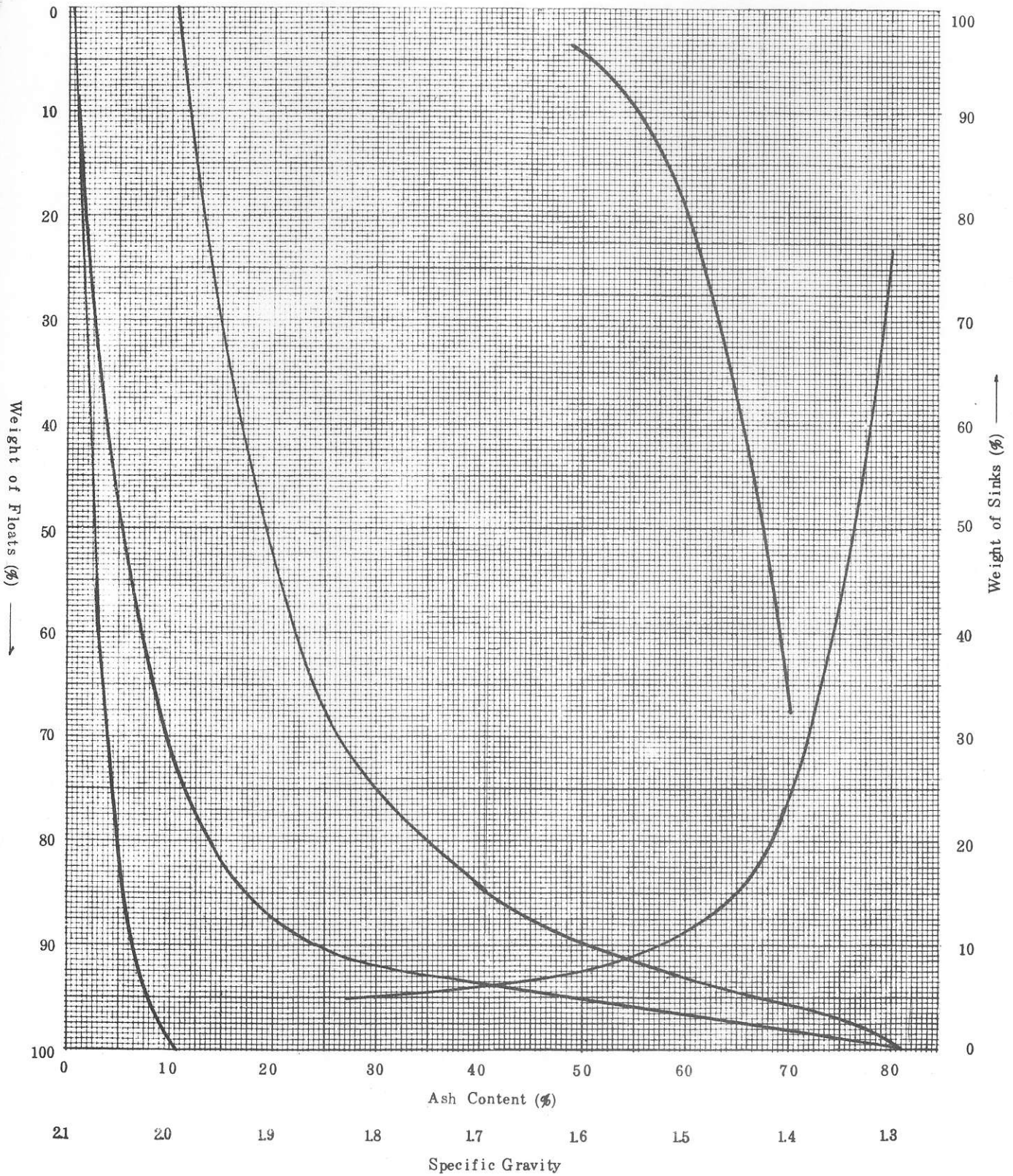
CHOFU RESEARCH LABORATORY.
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{W_n} \cdot \frac{1}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	25.00	1.30	12.50	32.50	32.50	25.00	1.30	1,024.21	75.00	13.66	
1.30 ~ 1.35	31.30	4.10	40.65	128.33	160.83	56.30	2.86	895.88	43.70	20.50	
1.35 ~ 1.40	18.30	8.20	65.45	150.06	310.89	74.60	4.17	745.82	25.40	29.36	64.50
1.40 ~ 1.45	11.20	13.80	80.20	154.56	465.45	85.80	5.42	591.26	14.20	41.64	34.75
1.45 ~ 1.50	3.70	19.50	87.65	72.15	537.60	89.50	6.01	519.11	10.50	49.44	18.00
1.50 ~ 1.60	3.10	27.10	91.05	84.01	621.61	92.60	6.71	435.10	7.40	58.80	4.30
1.60 ~ 1.80	2.40	41.50	93.80	99.60	721.21	95.00	7.59	335.50	5.00	67.10	
+ ~ 1.80	5.00	67.10	97.50	335.50	1,056.71	100.00	10.57	.00	.00	.00	
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Washability Curves

SAMPLE: 9 Seam (Adit 4)
 SIZE : 28M x 60M

DATE: July 15, 1976
 CHOFU RESEARCH LABORATORY,
 MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: g. #9 Seam (Adit 4)

DATE: July 15, 1976

SIZE: 60M x 0

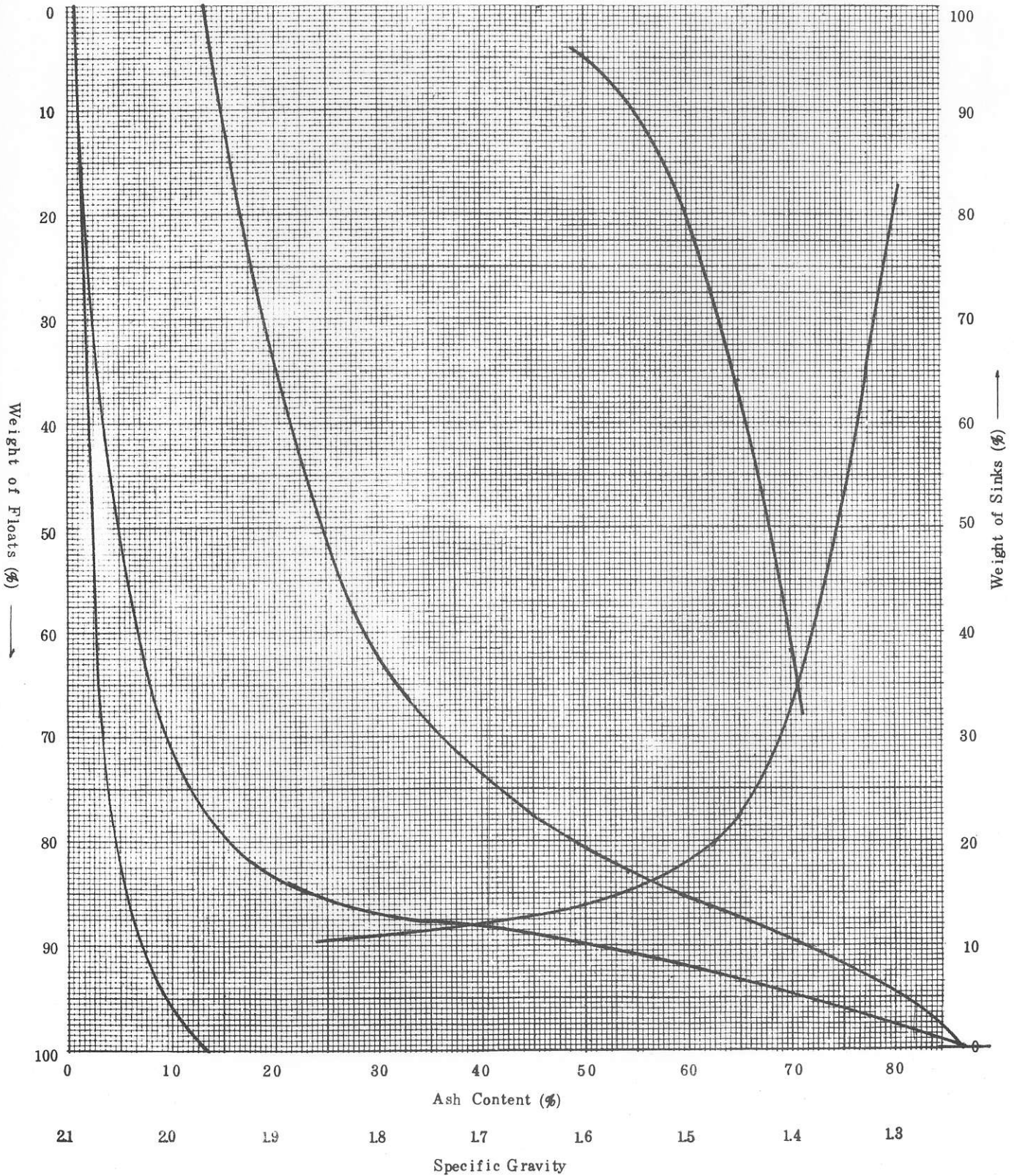
CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{W_n - 2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 -- $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	21.30	1.00	10.65	21.30	21.30	21.30	1.00	1,318.62	78.70	16.76	
1.30 ~ 1.35	27.50	3.20	35.05	88.00	109.30	48.80	2.24	1,230.62	51.20	24.04	
1.35 ~ 1.40	18.20	6.40	57.90	116.48	225.78	67.00	3.37	1,114.14	33.00	33.76	61.70
1.40 ~ 1.45	11.20	10.60	72.60	118.72	344.50	78.20	4.41	995.42	21.80	45.66	35.95
1.45 ~ 1.50	4.80	15.50	80.60	74.40	418.90	83.00	5.05	921.02	17.00	54.18	19.50
1.50 ~ 1.60	3.50	22.50	84.75	78.75	497.65	86.50	5.75	842.27	13.50	62.39	4.80
1.60 ~ 1.80	2.60	35.10	87.80	91.26	588.91	89.10	6.61	751.01	10.90	68.90	
+ ~ 1.80	10.90	68.90	94.55	751.01	1,339.92	100.00	13.40	.00	.00	.00	
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Washability Curves

SAMPLE: 9 Seam (Adit 4)
 SIZE : 60M x 0

DATE: July 15, 1976
 CHOFU RESEARCH LABORATORY,
 MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 10. #9 Seam (Adit 4)

DATE: July 15, 1976

SIZE: 2" x 28M (Composite)

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_n - 1}{W_n} \cdot 100$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	$\frac{100}{\sum W}$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	5.91	1.25	2.96	7.39	7.39	5.91	1.25	1,594.55	94.09	16.95	
1.30 ~ 1.35	29.89	4.61	20.86	137.79	145.18	35.80	4.06	1,456.76	64.20	22.69	
1.35 ~ 1.40	29.15	8.85	50.38	257.98	403.16	64.95	6.21	1,198.78	35.05	34.20	76.90
1.40 ~ 1.45	12.19	13.84	71.05	168.71	571.87	77.14	7.41	1,030.07	22.86	45.06	49.47
1.45 ~ 1.50	5.75	19.08	80.02	109.71	681.58	82.89	8.22	920.36	17.11	53.79	22.70
1.50 ~ 1.60	4.76	26.58	85.27	126.52	808.10	87.65	9.22	793.84	12.35	64.28	6.14
1.60 ~ 1.80	2.76	41.41	89.03	114.29	922.39	90.41	10.20	679.55	9.59	70.86	
+ ~ 1.80	9.59	70.86	95.21	679.55	1,601.94	100.00	16.02	.00	.00	.00	
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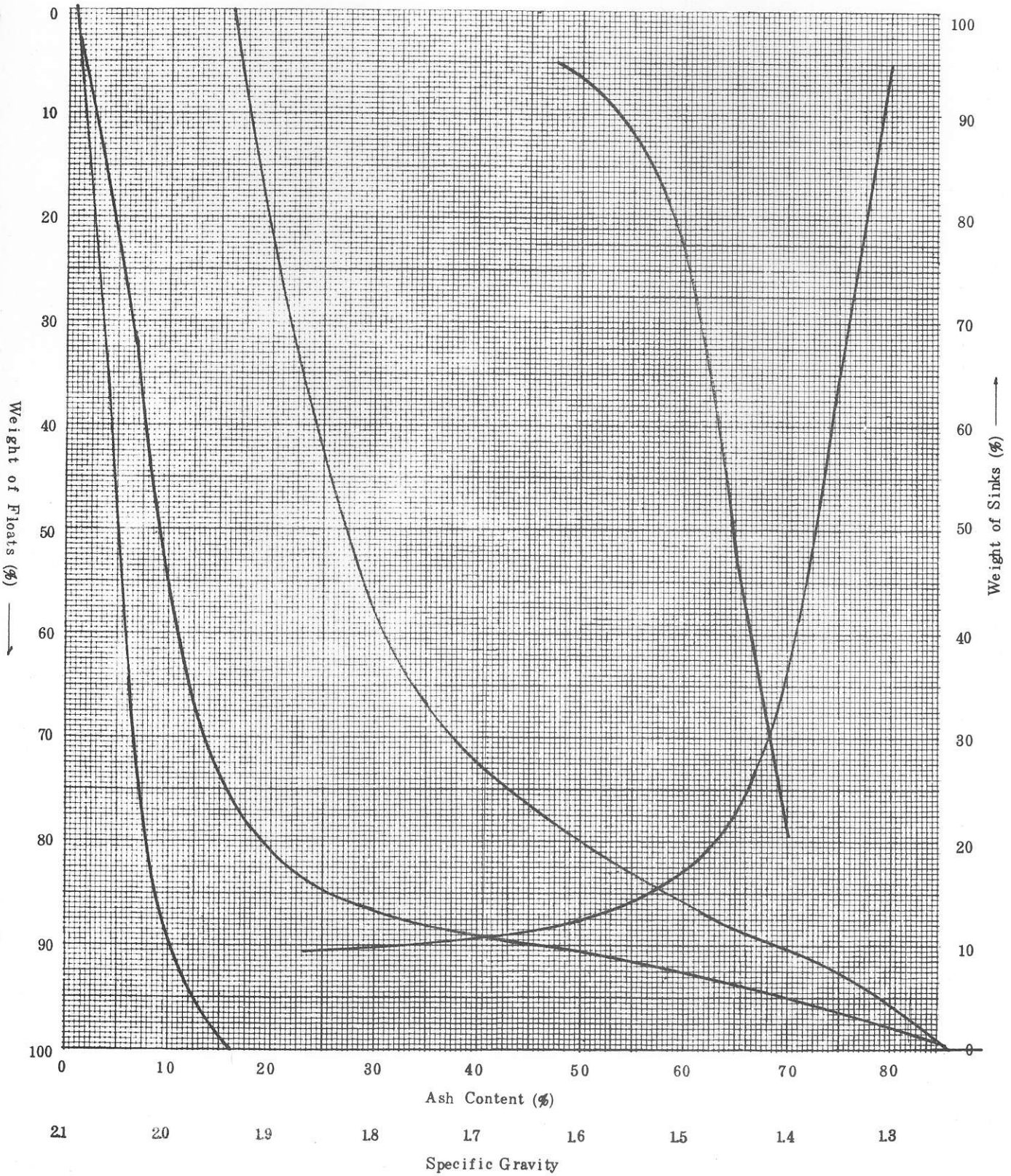
Washability Curves

SAMPLE: Composite: 9 Seam

DATE: July 15, 1976

SIZE : 2" x 28M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 11. #10 B Seam (Adit 5)

DATE: July 15, 1976

SIZE: 2" x 1/4" (After attrition test)

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (g)	Ash (g)	$\frac{\sum W_n - 1}{W_n} \cdot \frac{W_n}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	9.00	1.40	4.50	12.60	12.60	9.00	1.40	2,162.81	91.00	23.77	
1.30 ~ 1.35	22.10	5.60	20.05	123.76	136.36	31.10	4.38	2,039.05	68.90	29.59	
1.35 ~ 1.40	18.20	10.80	40.20	196.56	332.92	49.30	6.75	1,842.49	50.70	36.34	65.60
1.40 ~ 1.45	15.50	14.90	57.05	230.95	563.87	64.80	8.70	1,611.54	35.20	45.78	46.70
1.45 ~ 1.50	9.80	20.60	69.70	201.88	765.75	74.60	10.26	1,409.66	25.40	55.50	31.70
1.50 ~ 1.60	6.40	27.40	77.80	175.36	941.11	81.00	11.62	1,234.30	19.00	64.96	9.40
1.60 ~ 1.80	6.00	43.00	84.00	258.00	1,199.11	87.00	13.78	976.30	13.00	75.10	
+ ~ 1.80	13.00	75.10	93.50	976.30	2,175.41	100.00	21.75	.00	.00	.00	
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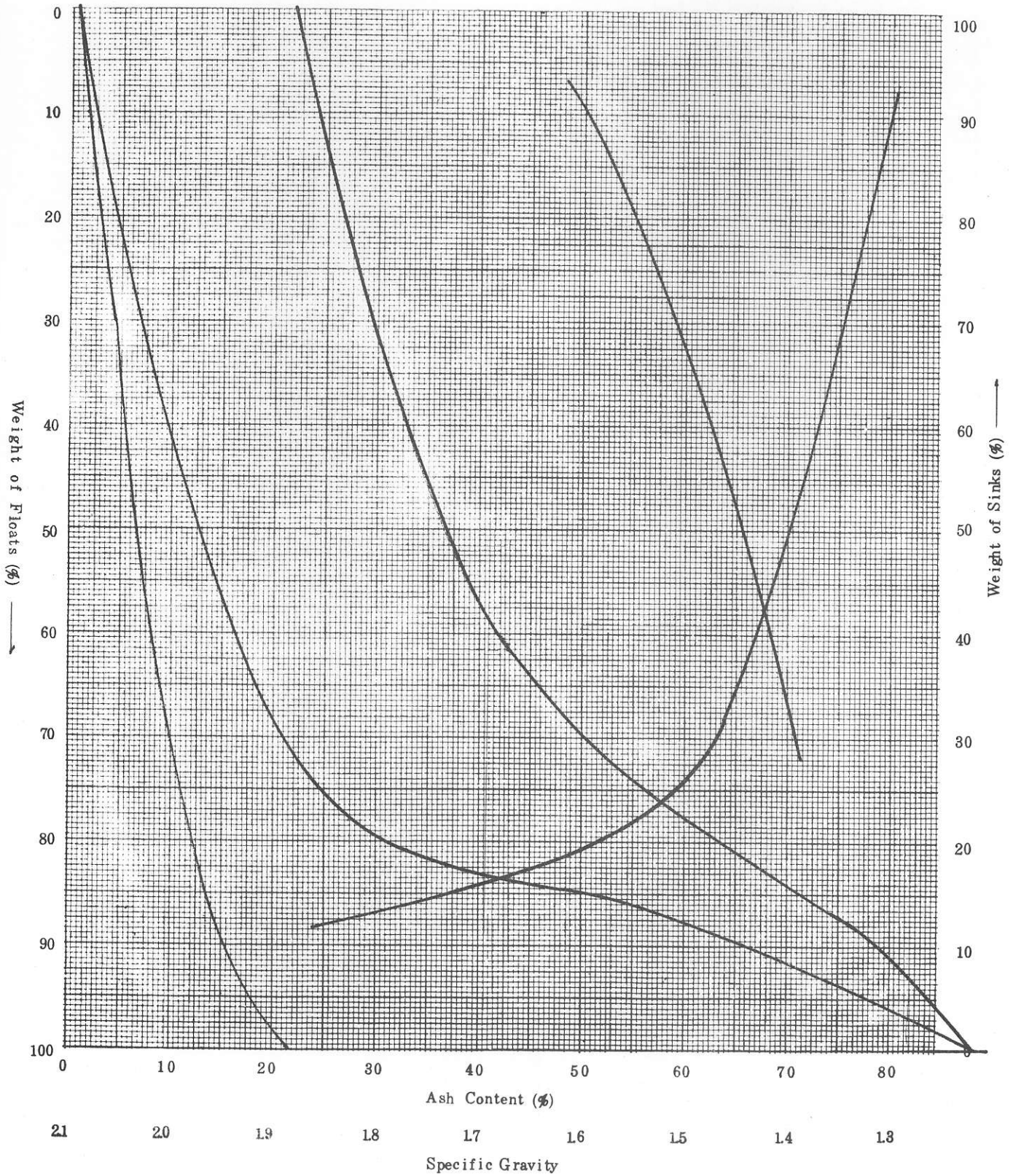
Washability Curves

SAMPLE: 10B Seam (Adit 5)

DATE: July 15, 1976

SIZE : 2" x 1/4"

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 12. #10B Seam (Adit 5)

DATE: July 15, 1976

SIZE: 1/4" x 28M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_n - 1}{W_n} \cdot \frac{1}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	12.10	1.20	6.05	14.52	14.52	12.10	1.20	1,916.40	87.90	21.80	
1.30 ~ 1.35	23.50	5.70	23.85	133.95	148.47	35.60	4.17	1,782.45	64.40	27.68	
1.35 ~ 1.40	19.60	10.80	45.40	211.68	360.15	55.20	6.52	1,570.77	44.80	35.06	62.10
1.40 ~ 1.45	11.40	15.10	60.90	172.14	532.29	66.60	7.99	1,398.63	33.40	41.88	42.70
1.45 ~ 1.50	7.60	19.50	70.40	148.20	680.49	74.20	9.17	1,250.43	25.80	48.47	31.35
1.50 ~ 1.60	8.20	27.30	78.30	223.86	904.35	82.40	10.98	1,026.57	17.60	58.33	12.35
1.60 ~ 1.80	8.30	42.00	86.55	348.60	1,252.95	90.70	13.81	677.97	9.30	72.90	
+ ~ 1.80	9.30	72.90	95.35	677.97	1,930.92	100.00	19.31	.00	.00	.00	
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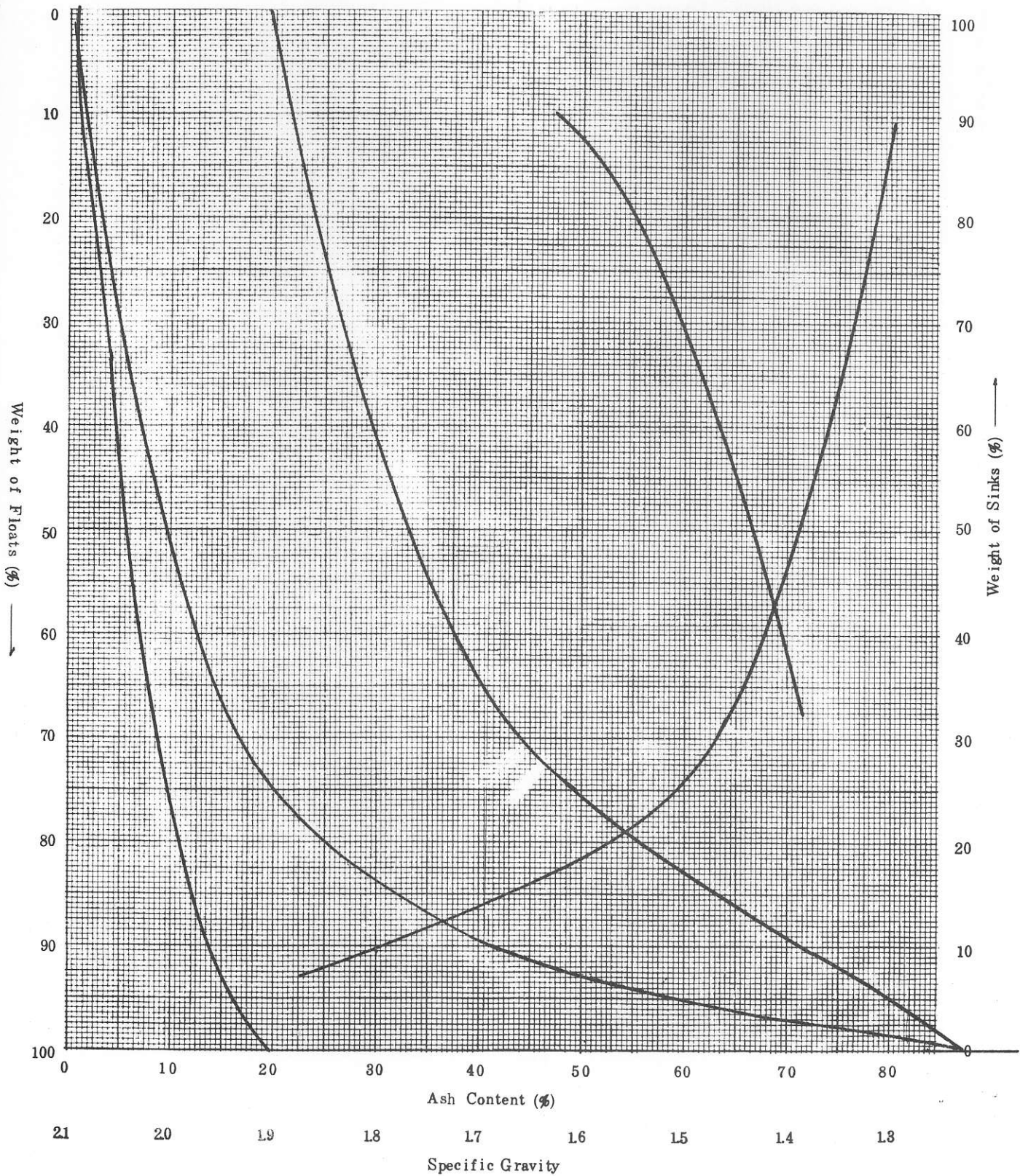
Washability Curves

SAMPLE: 10B Seam (Adit 5)

DATE: July 15, 1976

SIZE : 1/4" x 28M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 13. #10B Seam (Adit 5)

DATE: July 15, 1976

SIZE: 28M x 60M

CHOFU RESEARCH LABORATORY.

MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{W_n} + \frac{1}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	20.00	1.80	10.00	36.00	36.00	20.00	1.80	1,703.76	80.00	21.30	
1.30 ~ 1.35	20.90	5.10	30.45	106.59	142.59	40.90	3.49	1,597.17	59.10	27.02	
1.35 ~ 1.40	17.10	10.10	49.45	172.71	315.30	58.00	5.44	1,424.46	42.00	33.92	57.10
1.40 ~ 1.45	13.20	14.60	64.60	192.72	508.02	71.20	7.14	1,231.74	28.80	42.77	39.60
1.45 ~ 1.50	5.90	20.10	74.15	118.59	626.61	77.10	8.13	1,113.15	22.90	48.61	25.90
1.50 ~ 1.60	6.80	27.70	80.50	188.36	814.97	83.90	9.71	924.79	16.10	57.44	9.90
1.60 ~ 1.80	6.20	40.10	87.00	248.62	1,063.59	90.10	11.80	676.17	9.90	68.30	
+ ~ 1.80	9.90	68.30	95.05	676.17	1,739.76	100.00	17.40	.00	.00	.00	
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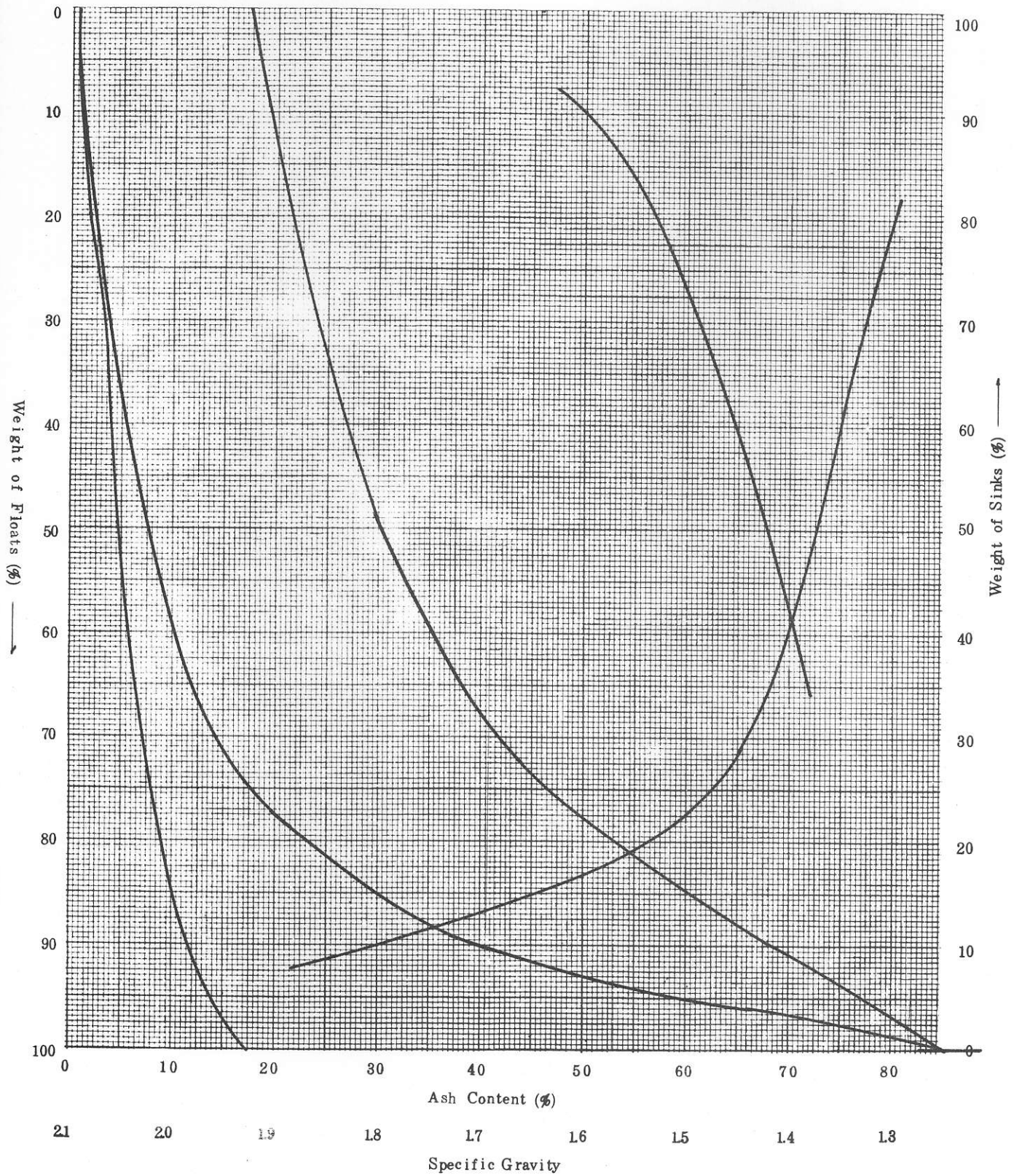
Washability Curves

SAMPLE: 10B Seam (Adit 5)

DATE: July 15, 1976

SIZE : 28M x 60M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 14. #10B Seam (Adit 5)

DATE: July 15, 1976

SIZE: 60M x 0

CHOFU RESEARCH LABORATORY.
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (g)	Ash (%)	$\frac{\sum W_{n-1}}{W_n} \cdot 100$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	15.00	1.40	7.50	21.00	21.00	15.00	1.40	1,758.07	85.00	20.68	
1.30 ~ 1.35	22.50	4.40	26.25	99.00	120.00	37.50	3.20	1,659.07	62.50	26.55	
1.35 ~ 1.40	14.80	8.40	44.90	124.32	244.32	52.30	4.67	1,534.75	47.70	32.18	56.30
1.40 ~ 1.45	12.80	12.50	58.70	160.00	404.32	65.10	6.21	1,374.75	34.90	39.39	37.25
1.45 ~ 1.50	6.20	17.30	68.20	107.26	511.58	71.30	7.18	1,267.49	28.70	44.16	25.90
1.50 ~ 1.60	6.90	24.90	74.75	171.81	683.39	78.20	8.74	1,095.68	21.80	50.26	12.85
1.60 ~ 1.80	11.90	37.00	84.15	440.30	1,123.69	90.10	12.47	655.38	9.90	66.20	
+ ~ 1.80	9.90	66.20	95.05	655.38	1,779.07	100.00	17.79	.00	.00	.00	
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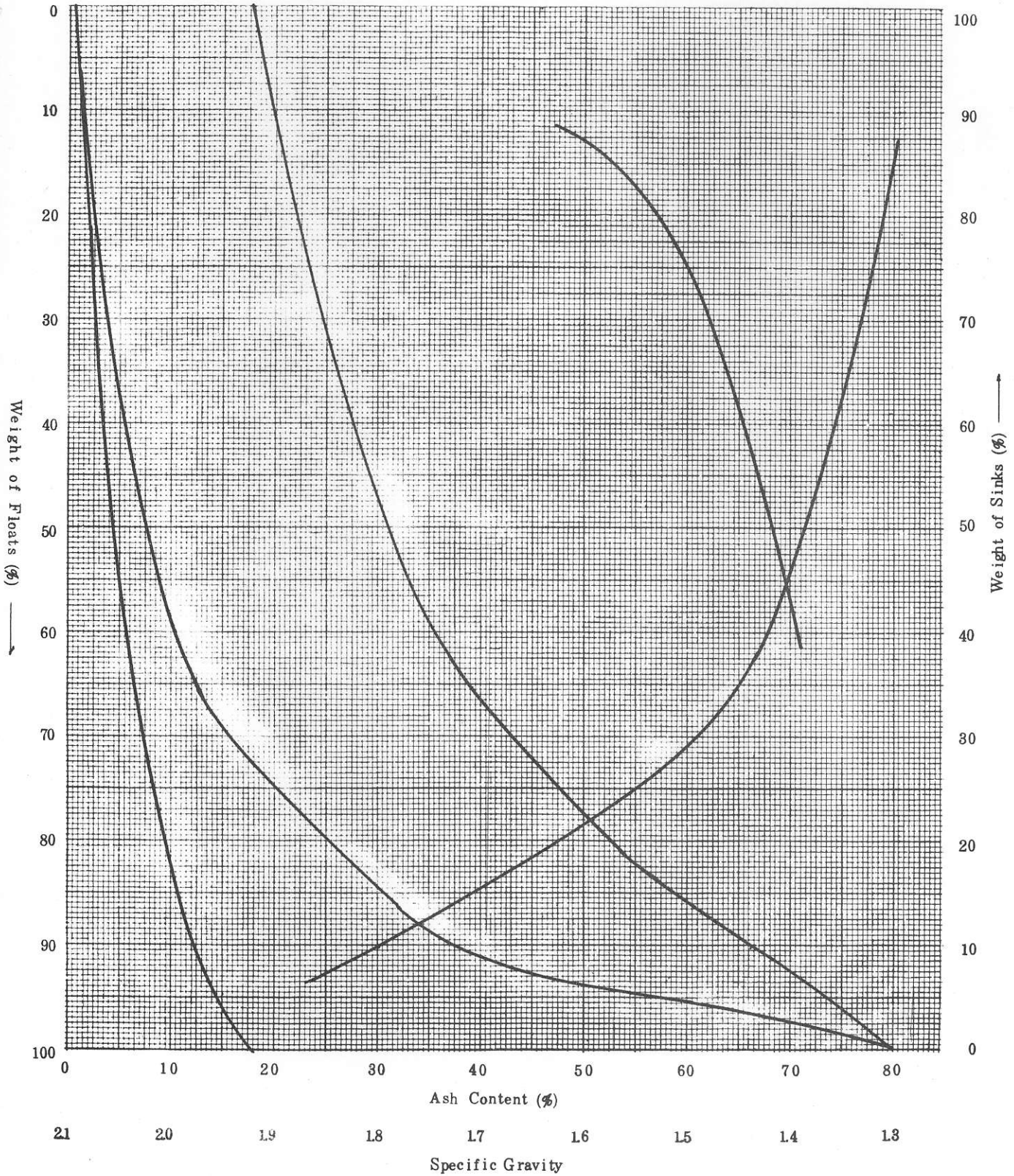
Washability Curves

SAMPLE: 10B Seam (Adit 5)

DATE: July 15, 1976

SIZE : 60M x 0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 15. #10B Seam (Adit 5)

DATE: July 15, 1976

SIZE: 2" x 28M

CHOFU RESEARCH LABORATORY.
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_n - 1}{W_n}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	11.41	1.23	5.71	14.03	14.03	11.41	1.23	1,970.90	88.59	22.25	
1.30 ~ 1.35	23.18	5.68	23.00	131.66	145.69	34.59	4.21	1,839.24	65.41	28.12	
1.35 ~ 1.40	19.28	10.80	44.23	208.22	353.91	53.87	6.57	1,631.02	46.13	35.36	62.86
1.40 ~ 1.45	12.31	15.04	60.03	185.14	539.05	66.18	8.15	1,445.88	33.82	42.75	43.58
1.45 ~ 1.50	8.09	19.80	70.23	160.18	699.23	74.27	9.41	1,285.70	25.73	49.97	28.20
1.50 ~ 1.60	7.80	27.32	78.17	213.10	912.33	82.07	11.12	1,072.60	17.93	59.82	11.69
1.60 ~ 1.80	7.79	42.17	85.97	328.50	1,240.83	89.85	13.81	744.10	10.15	73.38	
+ ~ 1.80	10.15	73.31	94.94	744.10	1,984.93	100.00	19.85	.00	.00	.00	
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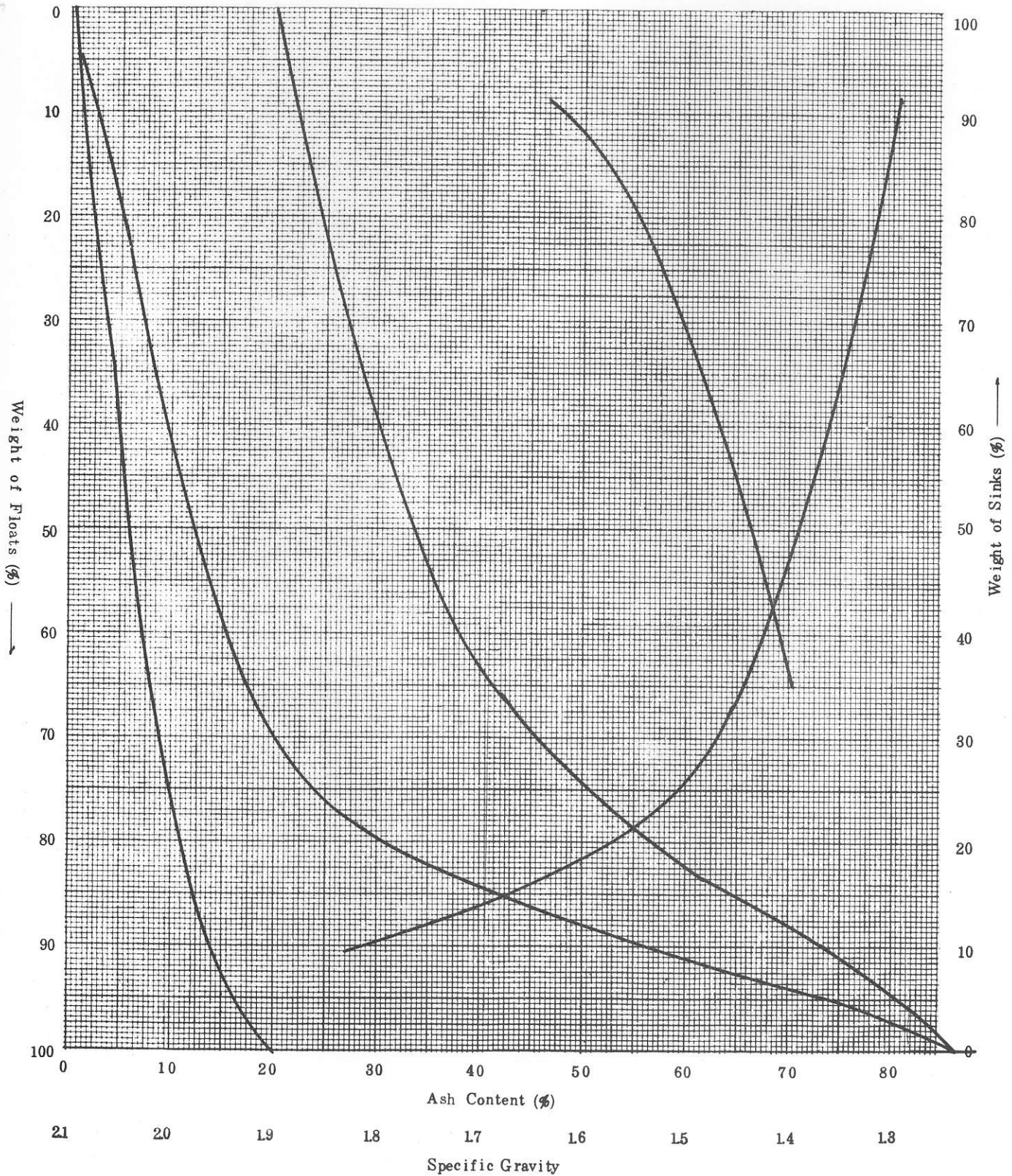
Washability Curves

SAMPLE: Composite: 10B Seam

DATE: July 15, 1976

SIZE : 2" x 28M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 16. #10A Seam (Adit 12)

DATE: July 15, 1976

SIZE: 2" x 1/4" (After attrition test)

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_n - 1}{W_n} \cdot \frac{1}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	.80	1.50	.40	1.20	1.20	.80	1.50	2,427.62	99.20	24.47	-
1.30 ~ 1.35	1.30	7.20	1.45	9.36	10.56	2.10	5.03	2,418.26	97.90	24.70	-
1.35 ~ 1.40	15.60	11.40	9.90	177.84	188.40	17.70	10.64	2,240.42	82.30	27.22	56.30
1.40 ~ 1.45	17.60	15.70	26.50	276.32	464.72	35.30	13.16	1,964.10	64.70	30.36	67.40
1.45 ~ 1.50	21.80	21.00	46.20	457.80	922.52	57.10	16.16	1,506.30	42.90	35.11	64.20
1.50 ~ 1.60	24.80	28.90	69.50	716.72	1,639.24	81.90	20.02	789.58	18.10	43.62	32.40
1.60 ~ 1.80	15.20	38.40	89.50	583.68	2,222.92	97.10	22.89	205.90	2.90	71.00	-
+ ~ 1.80	2.90	71.00	98.55	205.90	2,428.82	100.00	24.29	.00	.00	.00	-
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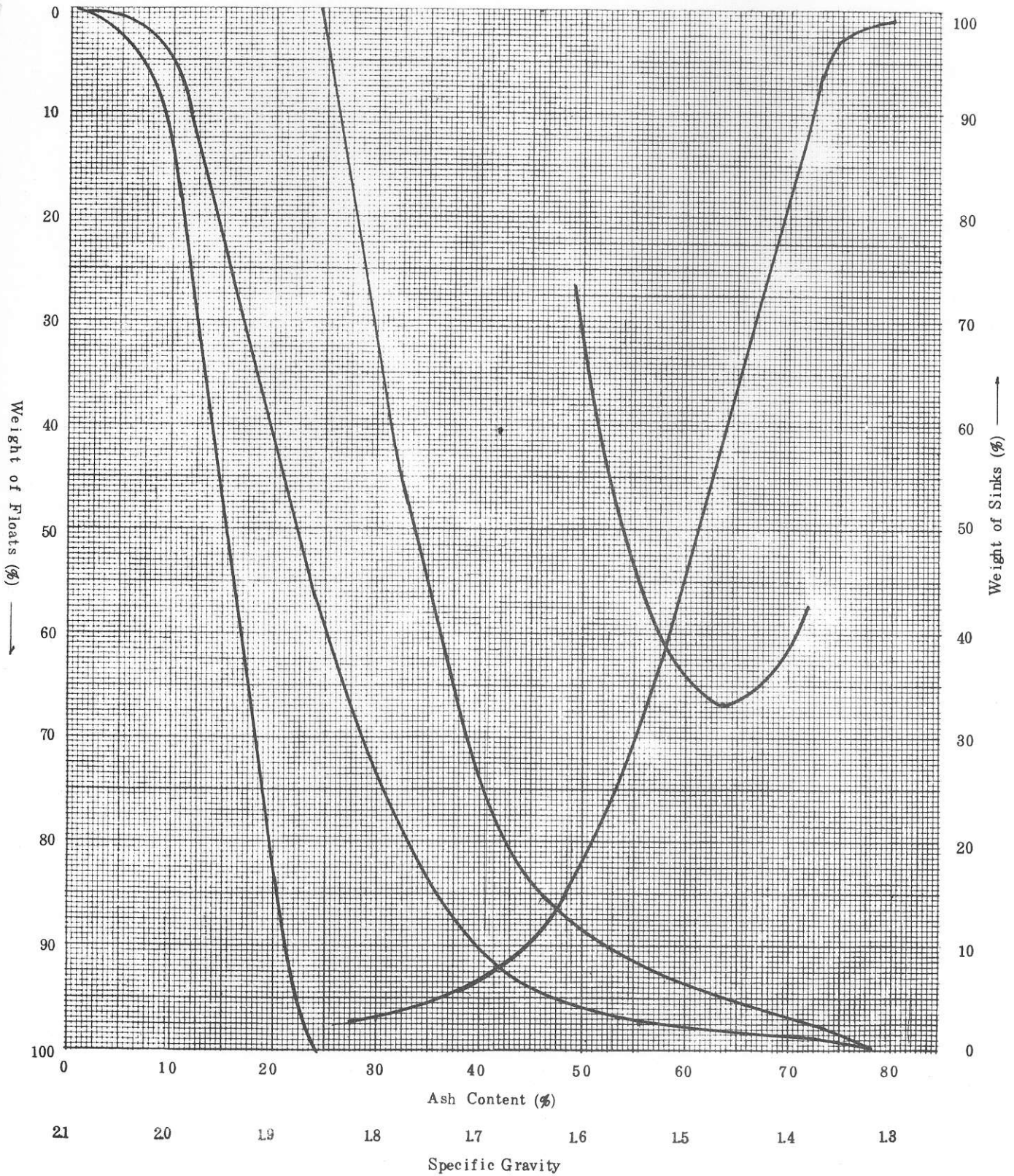
Washability Curves

SAMPLE: 10A Seam (Adit 12)

DATE: July 15, 1976

SIZE : 2" x 1/4"

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 17. #10A Seam (Adit 12)

DATE: July 15, 1976

SIZE: 1/4" x 28M

CHOFU RESEARCH LABORATORY.
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (g)	Ash (%)	$\frac{\sum W_n - 1}{W_n} \cdot 2$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	4.70	1.10	2.35	5.17	5.17	4.70	1.10	1,752.84	95.30	18.39	
1.30 ~ 1.35	8.00	5.40	8.70	43.20	48.37	12.70	3.81	1,709.64	87.30	19.58	
1.35 ~ 1.40	18.60	10.70	22.00	199.02	247.39	31.30	7.90	1,510.62	68.70	21.99	70.80
1.40 ~ 1.45	29.30	14.20	45.95	416.06	663.45	60.60	10.95	1,094.56	39.40	27.78	70.30
1.45 ~ 1.50	14.90	19.40	68.05	289.06	952.51	75.50	12.62	805.50	24.50	32.88	59.20
1.50 ~ 1.60	15.00	26.60	83.00	399.00	1,351.51	90.50	14.93	406.50	9.50	42.79	19.10
1.60 ~ 1.80	8.20	38.00	94.60	311.60	1,663.11	98.70	16.85	94.90	1.30	73.00	
+ ~ 1.80	1.30	73.00	99.35	94.90	1,758.01	100.00	17.58	.00	.00	.00	
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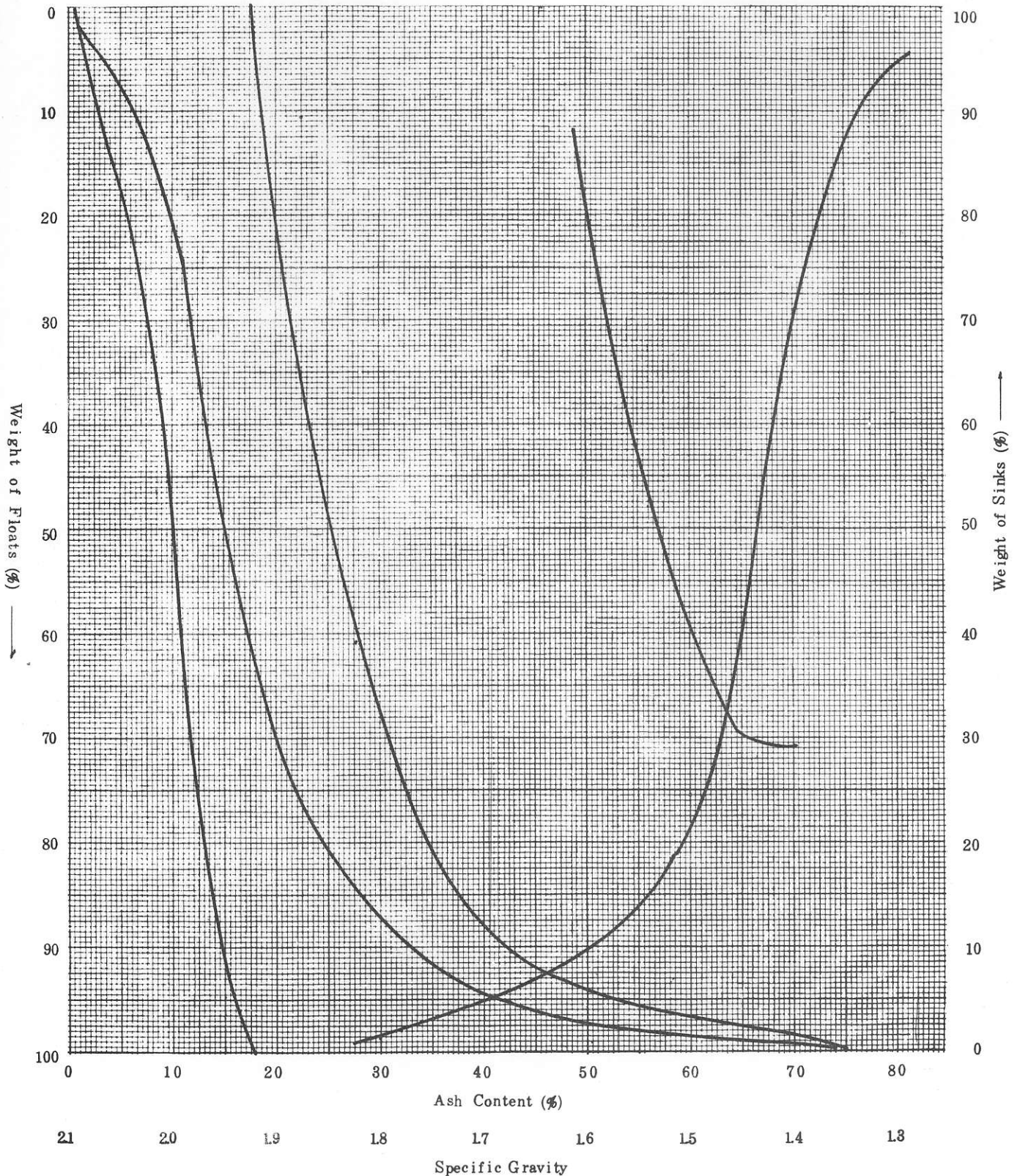
Washability Curves

SAMPLE: 10A Seam (Adit 12)

DATE: July 15, 1976

SIZE : 1/4" x 28M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 18. #10A Seam (Adit 12)

DATE: July 15, 1976

SIZE: 28M x 60M

CHOFU RESEARCH LABORATORY.
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{W_n} + \frac{1}{2}$	W · A	$\Delta W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	23.30	1.60	11.65	37.28	37.28	23.30	1.60	1,265.55	76.70	16.50	
1.30 ~ 1.35	11.10	4.90	28.85	54.39	91.67	34.40	2.66	1,211.16	65.60	18.46	
1.35 ~ 1.40	19.60	9.10	44.20	178.36	270.03	54.00	5.00	1,032.80	46.00	22.45	62.80
1.40 ~ 1.45	20.40	13.60	64.20	277.44	547.47	74.40	7.36	755.36	25.60	29.51	54.80
1.45 ~ 1.50	11.70	19.10	80.25	223.47	770.94	86.10	8.95	531.89	13.90	38.27	38.30
1.50 ~ 1.60	6.20	26.30	89.20	163.06	934.00	92.30	10.12	368.83	7.70	47.90	8.90
1.60 ~ 1.80	5.40	38.70	95.00	208.98	1,142.98	97.70	11.70	159.85	2.30	69.50	
+ ~ 1.80	2.30	69.50	98.85	159.85	1,302.83	100.00	13.03	.00	.00	.00	
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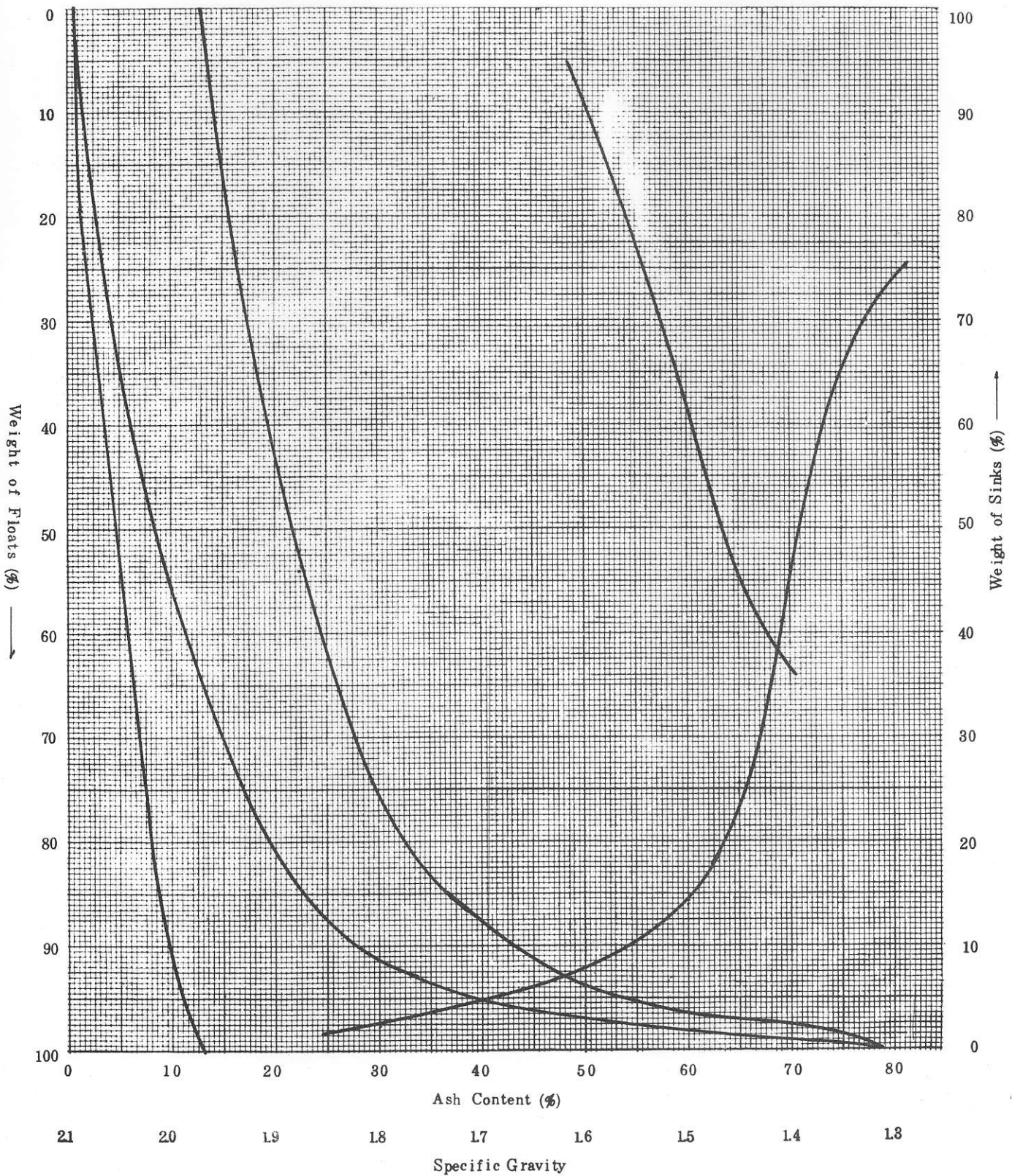
Washability Curves

SAMPLE: 10A Seam (Adit 12)

DATE: July 15, 1976

SIZE : 28M x 60M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 19. #10A Seam (Adit 12)

SIZE: 60M x 0

DATE: July 15, 1976

CHOFU RESEARCH LABORATORY.
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{W_n}$	W · A	$\sum W \cdot A$	ΔW	$\frac{\sum W \cdot A}{\Delta W}$	Total W · A - $\sum W \cdot A$	100 - ΔW	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	21.60	1.60	10.80	34.56	34.56	21.60	1.60	1,194.59	78.40	15.24	
1.30 ~ 1.35	21.30	4.60	32.25	97.98	132.54	42.90	3.09	1,096.61	57.10	19.21	
1.35 ~ 1.40	18.60	8.40	52.20	156.24	288.78	61.50	4.70	940.37	38.50	24.43	63.90
1.40 ~ 1.45	16.30	13.10	69.65	213.53	502.31	77.80	6.46	726.84	22.20	32.74	46.15
1.45 ~ 1.50	7.70	18.80	81.65	144.76	647.07	85.50	7.57	582.08	14.50	40.14	31.10
1.50 ~ 1.60	7.10	26.20	89.05	186.02	833.09	92.60	9.00	396.06	7.40	53.52	9.00
1.60 ~ 1.80	3.80	38.10	94.50	144.78	977.87	96.40	10.14	251.28	3.60	69.80	
+ ~ 1.80	3.60	69.80	98.20	251.28	1,229.15	100.00	12.29	.00	.00	.00	
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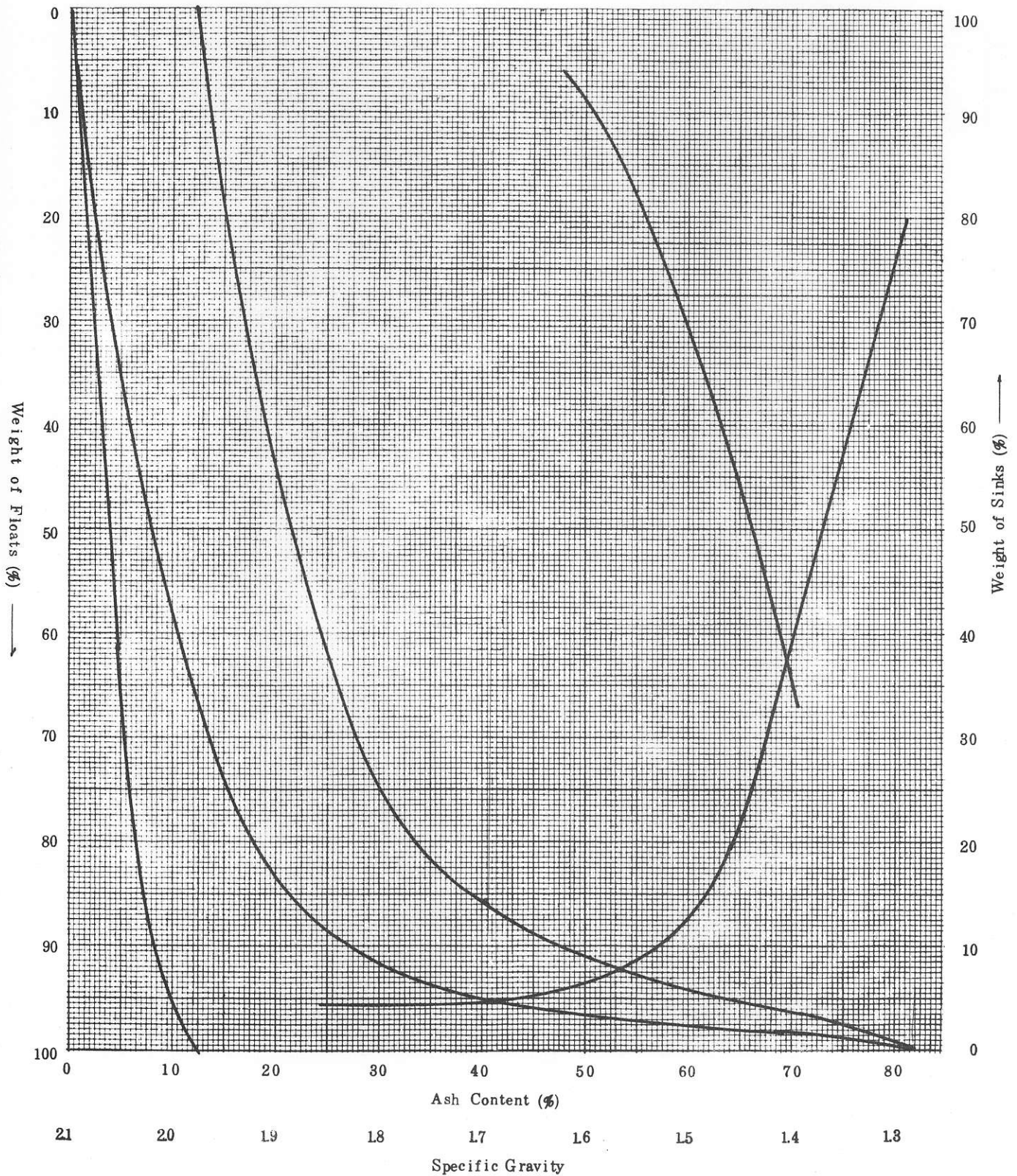
Washability Curves

SAMPLE: 10A Seam (Adit 12)

DATE: July 15, 1976

SIZE : 60M x 0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: 20. #10A Seam (Adit 12)

DATE: July 15, 1976

SIZE: 2" x 28M (Composite)

CHOFU RESEARCH LABORATORY.
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{W_n}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	3.18	1.14	1.59	3.63	3.63	3.18	1.14	2,015.27	96.82	20.81	
1.30 ~ 1.35	5.39	5.57	5.88	30.02	33.65	8.57	3.93	1,985.25	91.43	21.71	
1.35 ~ 1.40	17.43	10.94	17.29	190.68	224.33	26.00	8.63	1,794.57	74.00	24.25	65.15
1.40 ~ 1.45	24.74	14.62	38.37	361.70	586.03	50.74	11.55	1,432.87	49.26	29.09	69.17
1.45 ~ 1.50	17.59	20.17	59.54	354.79	940.82	68.33	13.77	1,078.08	31.67	34.04	61.15
1.50 ~ 1.60	18.82	27.78	77.74	522.82	1,463.64	87.15	16.79	555.26	12.85	43.21	24.28
1.60 ~ 1.80	10.92	38.22	92.61	417.36	1,881.00	98.10	19.18	137.90	1.90	71.45	
+ ~ 1.80	1.90	72.58	99.02	137.90	2,018.90	100.00	20.20	.00	.00	.00	
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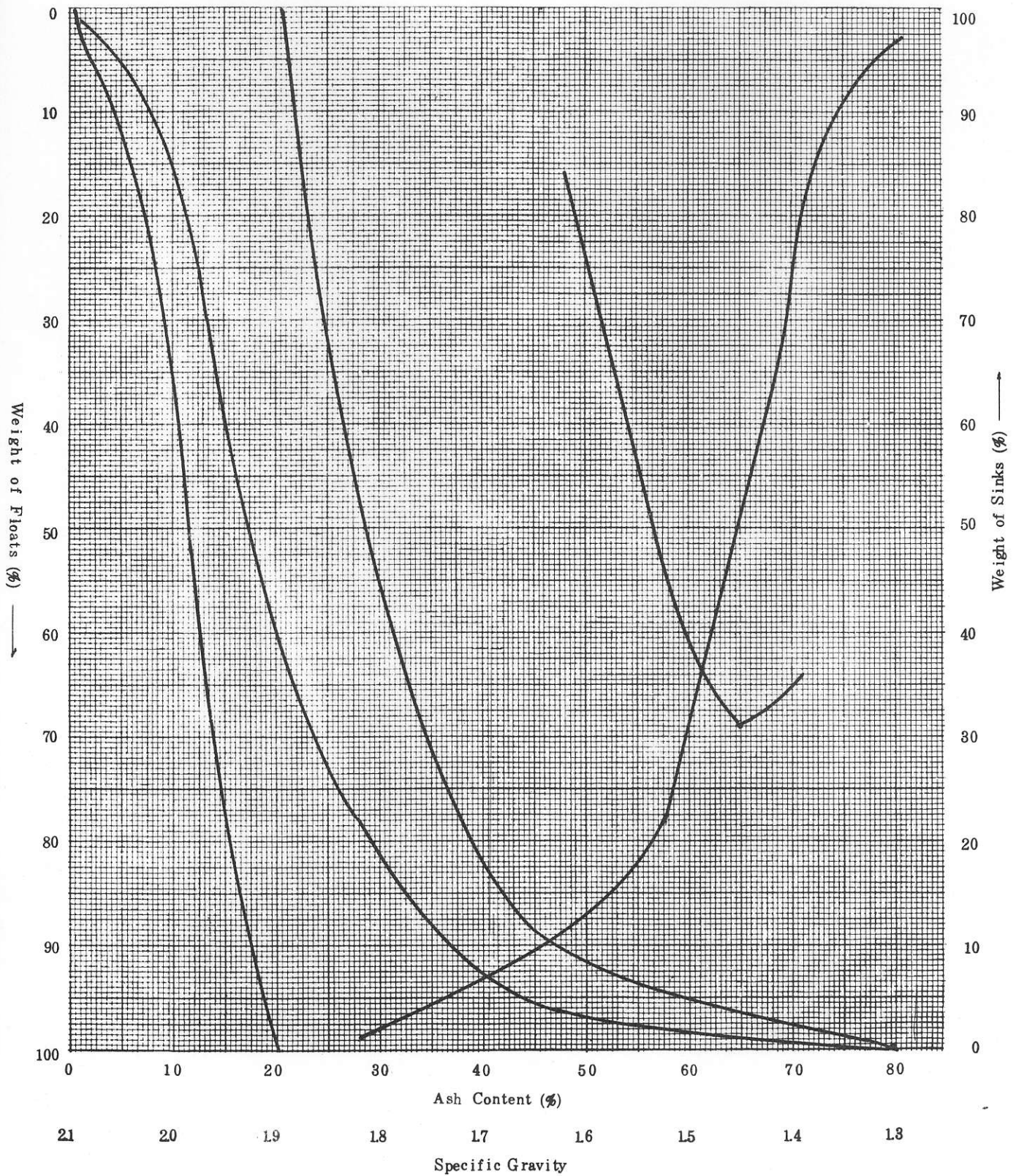
Washability Curves

SAMPLE: Composite: 10A Seam

DATE: July 15, 1976

SIZE : 2" x 28M

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



OXIDIZED COAL

LOW FSI & HIGH FSI

(SEAMS #8, #9, #10B, #10A)

Test Procedure of Line Creek Samples

[Oxidized Coal]

	Low FSI	High FSI
#8	1 drum	1 drum
#9	"	"
#10B	"	"
#10A	"	"

For each seam
Proximate analysis
T.S., FSI, Cal,
Ash Fusion, Hard-
grove index,
Ash composition,
ultimate analysis

Reducing the
top size to 2"

Sample for
Electric power
development Co.
and some steel mills

Screen analysis

2" x 1-1/2"
1-1/2" x 3/4"
3/4" x 1/2"
1/2" x 1/4"
1/4" x 2mm
2mm x 28M
28M x 60M
60M x 0

Wt%, Ash%, FSI
for each fraction

In case of high FSI oxidized
coal

Gravity separation for each
bag at a S.G. suitable
to get about 9.5% ash clean
coal

Test on each clean coal
proximate analysis, T.S.,
FSI, P, Gieseler plasticity

3-1 Screen Analysis on Each Seam

3-1-1 High F.S.I. Coal F.S.I. 2 - 4

Size	#8 Seam			#9 Seam		
	Wt %	Ash %	F.S.I.	Wt %	Ash %	F.S.I.
2" x 1-1/2"	4.3	19.4	1-1/2	3.2	22.1	2-1/2
1-1/2" x 3/4"	25.2	14.1	2	20.5	20.0	2
3/4" x 1/2"	6.1	15.9	2	3.6	23.2	1-1/2
1/2" x 1/4"	13.3	16.1	2	12.1	21.8	1-1/2
1/4" x 2mm	22.2	18.4	3	24.6	18.8	3
2mm x 28M	15.8	15.2	5	19.7	15.5	5-1/2
28M x 60M	6.6	13.4	6.	8.2	15.0	6
60M x 0	6.5	12.2	4-1/2	8.1	17.3	5
Tot.	100.0	15.7		100.0	18.6	

Size	#10B Seam			#10A Seam		
	Wt %	Ash %	F.S.I.	Wt %	Ash %	F.S.I.
2" x 1-1/2"	1.8	36.9	2-1/2	4.9	19.8	4
1-1/2" x 3/4"	12.0	19.4	4	18.8	19.4	3
3/4" x 1/2"	4.8	17.9	4	6.9	16.9	3-1/2
1/2" x 1/4"	14.5	16.4	4	15.9	17.0	4
1/4" x 2mm	30.8	16.5	4	22.9	16.3	5
2mm x 28M	20.0	16.7	4-1/2	17.6	14.1	7-1/2
28M x 60M	8.5	16.8	5	6.9	11.7	9
60M x 0	7.6	17.7	4-1/2	6.1	11.3	8-1/2
Tot	100.0	17.4		100.0	16.2	

3-1-2 Low F.S.I. Coal F.S.I. 2 - 0

Size	#8 Seam			#9 Seam		
	Wt %	Ash %	F.S.I.	Wt %	Ash %	F.S.I.
2" x 1-1/2"	4.3	17.4	1/2	9.0	16.5	1-1/2
1-1/2" x 3/4"	14.9	17.0	1/2	28.0	9.6	1-1/2
3/4" x 1/2"	5.8	16.0	1/2	7.3	9.6	1-1/2
1/2" x 1/4"	15.4	17.0	1/2	14.9	9.5	2
1/4" x 2mm	22.9	14.3	1/2	19.7	9.1	2
2mm x 28M	17.9	15.3	1-1/2	12.4	7.6	3
28M x 60M	9.1	15.9	2	4.8	7.0	3
60M x 0	9.7	16.9	2-1/2	3.9	7.7	2-1/2
Tot	100.0	15.9		100.0	9.1	

Size	#10B Seam			#10A Seam		
	Wt %	Ash %	F.S.I.	Wt %	Ash %	F.S.I.
2" x 1-1/2"	4.9	21.0	1-1/2	6.4	21.6	1-1/2
1-1/2" x 3/4"	22.0	20.2	1-1/2	27.2	18.8	1-1/2
3/4" x 1/2"	6.0	17.2	1-1/2	6.9	17.5	1-1/2
1/2" x 1/4"	16.3	18.1	1-1/2	16.7	17.5	2
1/4" x 2mm	22.5	18.3	1-1/2	19.1	16.5	1-1/2
28mm x 287	15.7	16.5	1/2	2.4	16.5	1-1/2
28M x 60M	6.4	14.7	2	5.2	15.4	2
60M x 0	6.2	14.7	1/2	6.1	16.4	1/2
Tot.	100.0	18.0		100.0	17.6	

3-2 Proximate Analysis (Raw Coal)

3-2-1 Each Seam High F.S.I.

Seam	I.M. %	Ash %	V.M. %	F.C. %	Kcal /kg	T.S. %	F.S.I.	H.G.I.	Melting Point °C
#8	1.6	15.7	18.8	63.9	7,020	0.37	3	87	+ 1,450
#9	1.4	18.7	19.1	60.8	6,820	0.33	3	85	+ 1,450
#10B	1.5	17.4	18.9	62.2	6,910	0.39	4	106	+ 1,450
#10A	1.2	16.3	19.1	63.4	7,080	0.45	5-1/2	94	+ 1,450

3-2-2 Each Seam Low F.S.I.

Seam	I.M. %	Ash %	V.M. %	F.C. %	Kcal /kg	T.S. %	F.S.I.	H.G.I.	Melting Point °C
#8	3.3	15.9	19.7	61.1	6,610	0.35	2	89	+ 1,450
#9	1.7	9.1	19.6	69.6	7,600	0.32	2	86	+ 1,450
#10B	2.4	18.0	19.4	60.2	6,630	0.37	1-1/2	85	+ 1,450
#10A	2.0	17.7	18.5	61.8	6,710	0.44	1-1/2	86	+ 1,450

3-3 Ultimate Analysis (Raw Coal)

High F.S.I.

	C %	H %	O %	N %	S %
#8	88.9	5.0	4.6	1.1	0.4
#9	88.2	5.0	5.1	1.3	0.4
#10B	88.7	5.1	4.6	1.1	0.5
#10A	88.7	5.0	4.7	1.1	0.5

Low F.S.I.

	C %	H %	O %	N %	S %
#8	86.4	4.6	7.4	1.2	0.4
#9	89.1	4.7	4.7	1.2	0.3
#10B	87.0	4.8	6.6	1.2	0.4
#10A	87.7	4.6	6.0	1.1	0.6

3-4 Proximate and Ultimate Analysis (Clean Coal)

3-4-1 Proximate Analysis

	FSI	I.M.	Ash %	V.M. %	F.e.%	T.S.	F.S.I.	P %
#8	Low	3.6	9.4	20.7	66.3	0.45	1/2	0.0949
#8	High	1.8	9.2	20.2	68.8	0.44	3	0.0711
#9	High	1.6	9.2	20.7	68.5	0.37	4	0.0398
#10	High	1.7	9.2	20.1	69.0	0.46	5	0.0201
#10A	High	1.3	9.5	20.9	68.3	0.54	8-1/2	0.0124

3-4-2 Ultimate Analysis

	FSI	C %	H %	O %	N %	S %
#8	Low	87.3	4.6	6.5	1.2	0.4
#8	High	89.0	4.6	4.8	1.1	0.5
#9	High	89.1	4.8	4.5	1.2	0.4
#10B	High	89.7	4.9	3.6	1.3	0.5
#10A	High	89.5	5.0	3.7	1.2	0.6

3-4-3 Clean Coal Yield on Each Seam

	FSI	Float		Sink	
		Wt %	Ash %	Wt %	Ash %
#8	Low	85.3	9.4	14.7	53.7
#8	High	84.8	9.2	15.2	51.9
#9	High	83.3	9.2	16.7	66.0
#10B	High	83.2	9.2	16.8	58.1
#10A	High	63.3	9.5	36.7	28.0

3-5. Gieseler Plasticity (Clean Coal)

	F.S.I.	Start °C	Fusion Temp. °C	Max. Fluid. Temp. °C	Melting Range °C	DDPM
#8	Low	-	-	443	-	0.15
#8	High	-	-	446	-	1.0
#9	High	443	470	446	28	1.4
#10B	High	445	470	446	25	1.1
#10A	High	413	485	449	72	15.1

FROTH FLOTATION TEST

(SEAMS #8, #9, #10B, #10A)

4. Results of Froth Flotation Test

4-1. Procedure of Test

(1) Feed Coal: 60Mesh x 0 on each Seam
after attrition test

(2) Reagent Ratio M.I.B.C. Kerosene
1 : 3

(3) Consumption of Reagents per solid ton
500g, 750g and 1,000g

(4) Retention Time
30", 30" - 60" and 60" - 180"

(5) Pulp Density: 8%

(6) Pulp Temperature: 20 - 22°C

(7) Pulp pH: 7.0

(8) Laboratory Test Machine

Type: M.S. (Mineral Separater)

Volume: 2,000 C.C.

R.P.M. 1,750

Impeller: Two Impellers

dia: 54mm

Drive Motor: 0.5KW

4-2. Test Results

(1) #8 Seam

No.	Retention Time	500g/T				750 g/T				1,000g/T			
		Wt %	Ash %	Wt % ^{Cum.}	Ash %	Wt %	Ash %	Wt % ^{Cum.}	Ash %	Wt %	Ash %	Wt % ^{Cum.}	Ash %
1	0 - 30"	27.5	7.4	27.5	7.4	48.1	8.2	48.1	8.2	45.6	8.5	45.6	8.5
2	30 - 60"	5.3	6.8	32.8	7.3	23.8	9.0	71.9	8.5	31.3	9.8	76.9	9.0
3	60 -180"	2.5	6.4	35.3	7.2	13.1	8.5	85.0	8.5	14.4	9.7	91.3	9.1
4	+180"	64.7	12.9	100	10.9	15.0	24.5	100.0	10.9	8.7	29.9	100.0	10.9
	(Tail)												
	Tot.	100.0	10.9			100.0	10.9			100.0	10.9		

(2) #9 Seam

No.	Retention Time	500 g/T				750 g/T				1,000g/T			
		Wt %	Ash %	Wt % ^{Cum.}	Ash %	Wt %	Ash %	Wt % ^{Cum.}	Ash %	Wt %	Ash %	Wt % ^{Cum.}	Ash %
1	0 - 30"	15.0	7.9	15.0	7.9	19.4	8.4	19.4	8.4	25.0	8.3	25.0	8.3
2	30 - 60"	26.3	8.7	41.3	8.4	28.8	8.6	48.2	8.5	25.9	9.8	50.9	9.1
3	60 -180"	37.5	9.0	78.8	8.7	40.3	10.5	88.5	9.4	41.8	11.1	92.7	10.0
4	+180"	21.2	30.9	100.0	13.4	11.5	46.0	100.0	13.6	7.3	56.5	100.0	13.4
	(Tail)												
	Tot.	100.0	13.4			100.0	13.6			100.0	13.4		

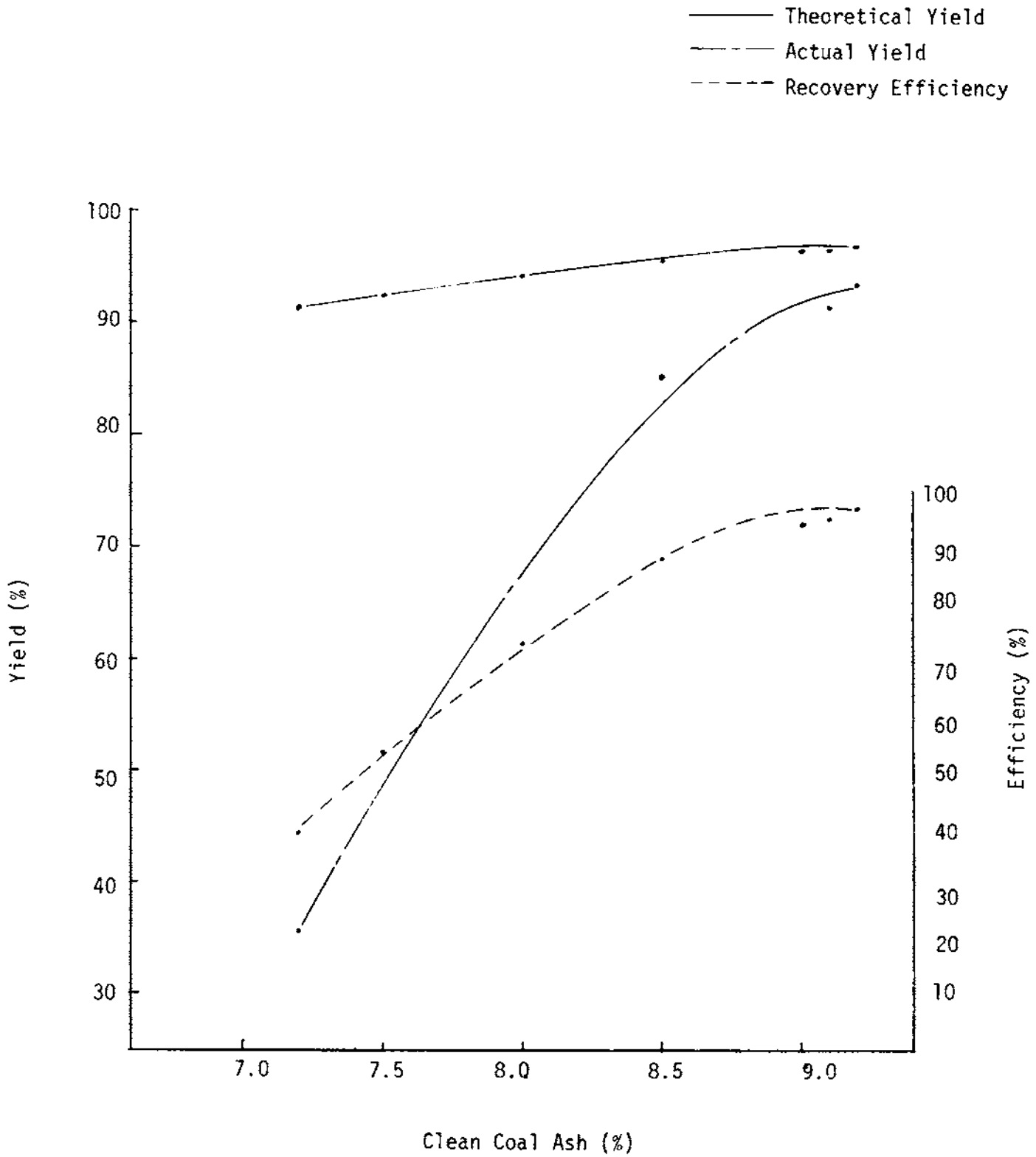
(3) #10B Seam

No.	Retention Time	500 g/T				750 g/T				1,000 g/T			
		Wt %	Ash %	Wt %	Cum. Ash %	Wt %	Ash %	Wt %	Cum. Ash %	Wt %	Ash %	Wt %	Cum. Ash %
1	0 - 30"	28.1	12.2	28.1	12.2	33.8	12.5	33.8	12.5	32.5	12.7	32.5	12.7
2	30 - 60"	29.4	13.8	57.5	13.0	38.1	14.7	71.9	13.4	40.6	15.5	73.1	14.3
3	60 - 180"	21.9	14.4	79.4	13.4	18.7	16.6	90.6	14.1	20.6	17.0	93.7	14.9
4	+180	20.6	34.6	100.0	17.8	9.4	51.6	100.0	17.6	6.3	59.2	100.0	17.7
	Tot.	100.0	17.8			100.0	17.6			100.0	17.7		

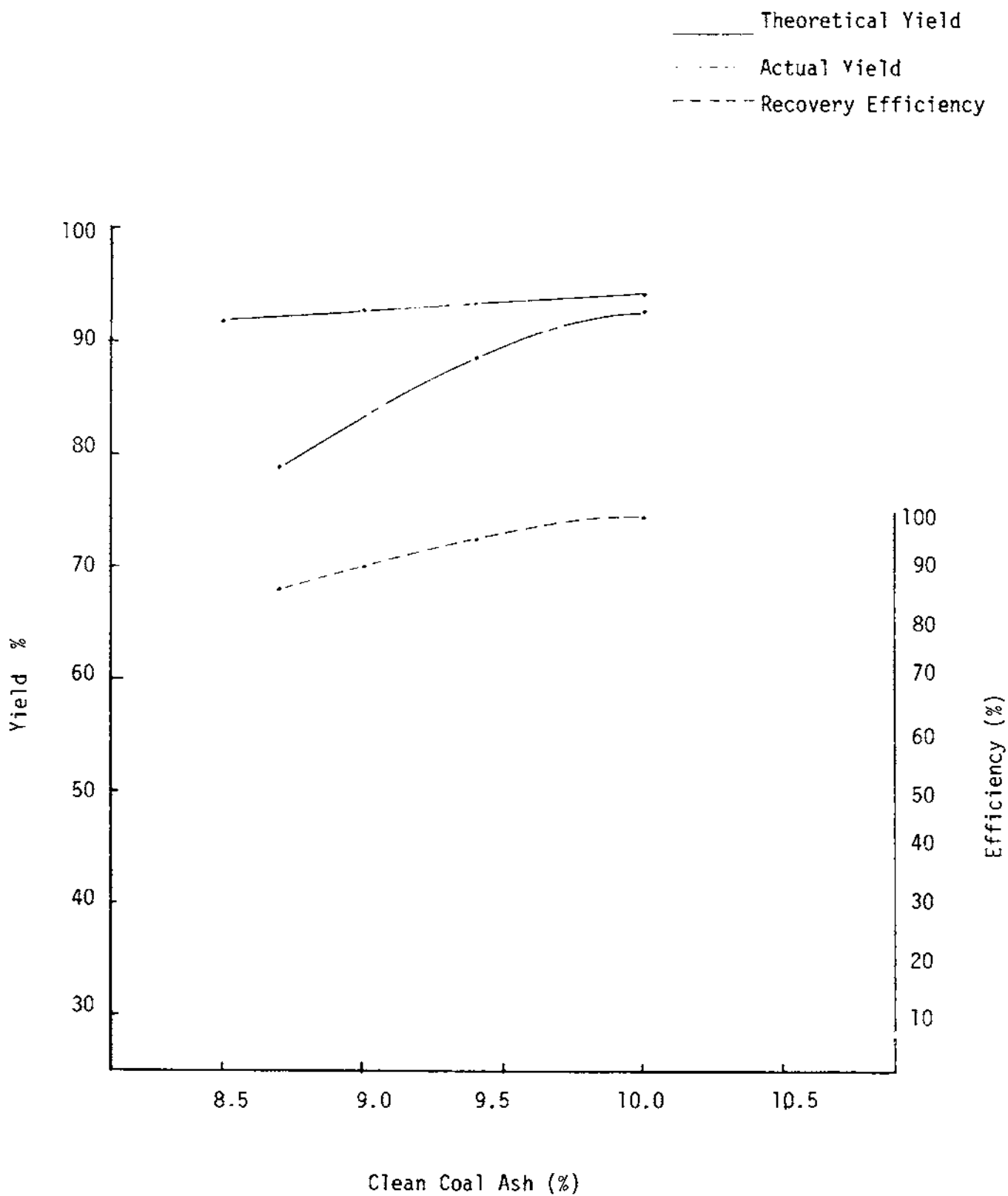
(4) #10A Seam

No.	Retention Time	500 g/T				750 g/T				1,000 g/T			
		Wt %	Ash %	Wt %	cum. Ash %	Wt %	Ash %	Wt %	Cum. Ash %	Wt %	Ash %	Wt %	Cum. Ash %
1	0 - 30"	33.8	9.6	33.8	9.6	35.0	9.6	35.0	9.6	34.4	9.6	34.4	9.6
2	30 - 60"	28.1	10.4	61.9	10.0	36.3	10.9	71.3	10.3	43.8	11.0	78.2	10.4
3	60 - 180"	20.0	10.2	81.9	10.0	21.2	11.9	92.5	10.6	18.1	13.3	96.3	10.9
4	+180	18.1	22.2	100.0	12.2	7.5	35.1	100.0	12.5	3.7	49.9	100.0	12.4
	Tot.	100.0	12.2			100.0	12.5			100.0	12.4		

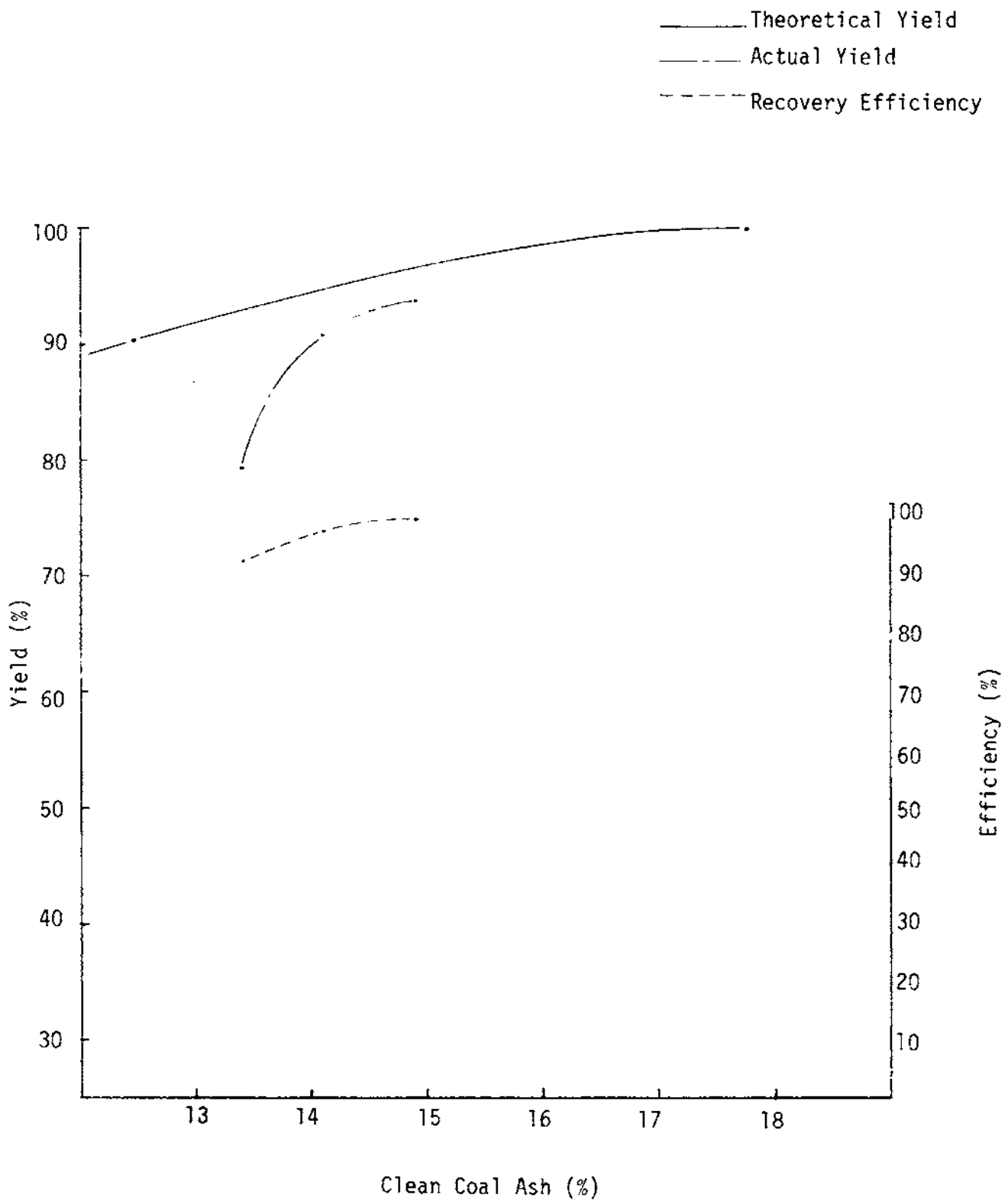
#8 Seam Test Results



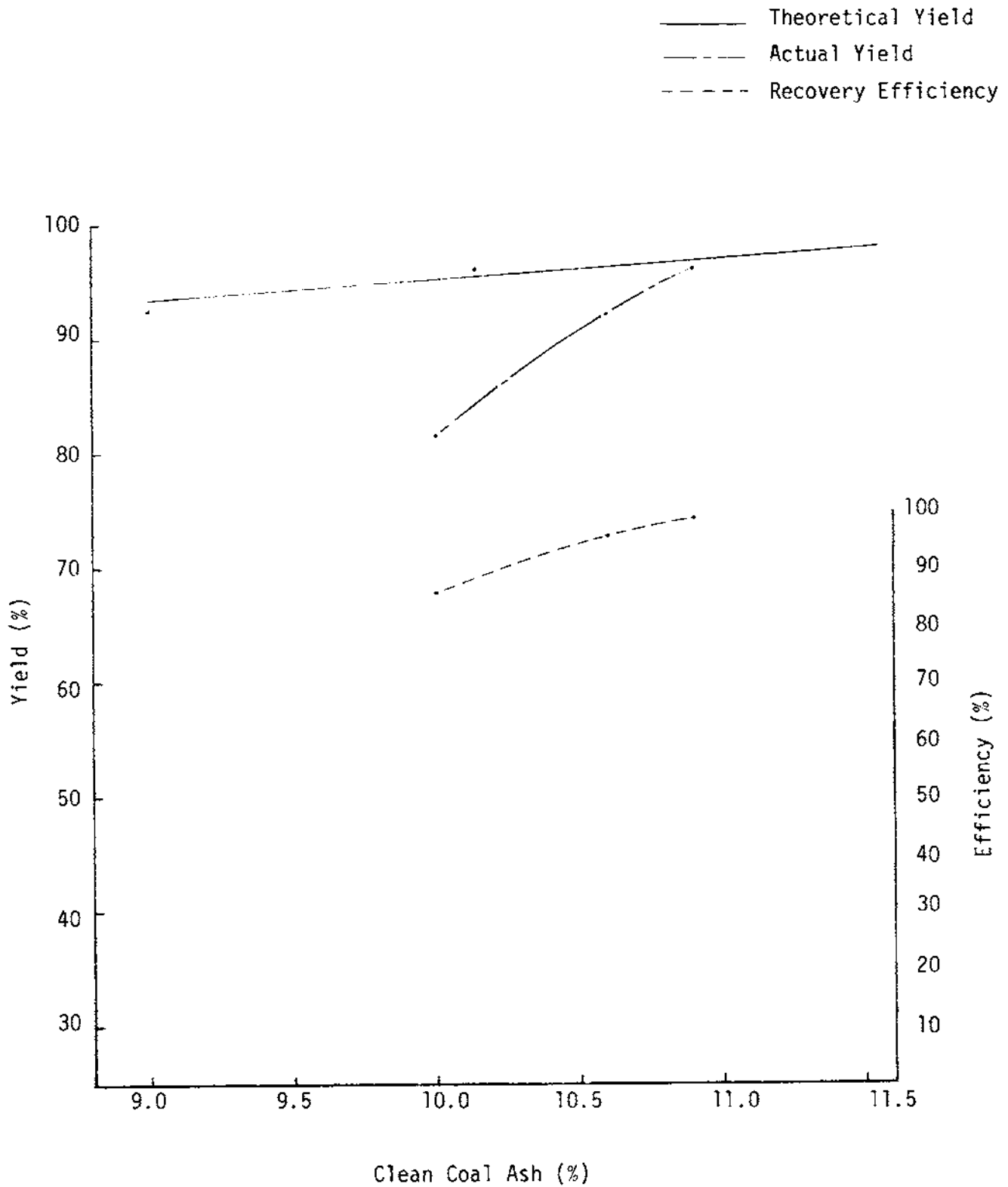
#9 Seam Test Results



#10B Seam Test Results

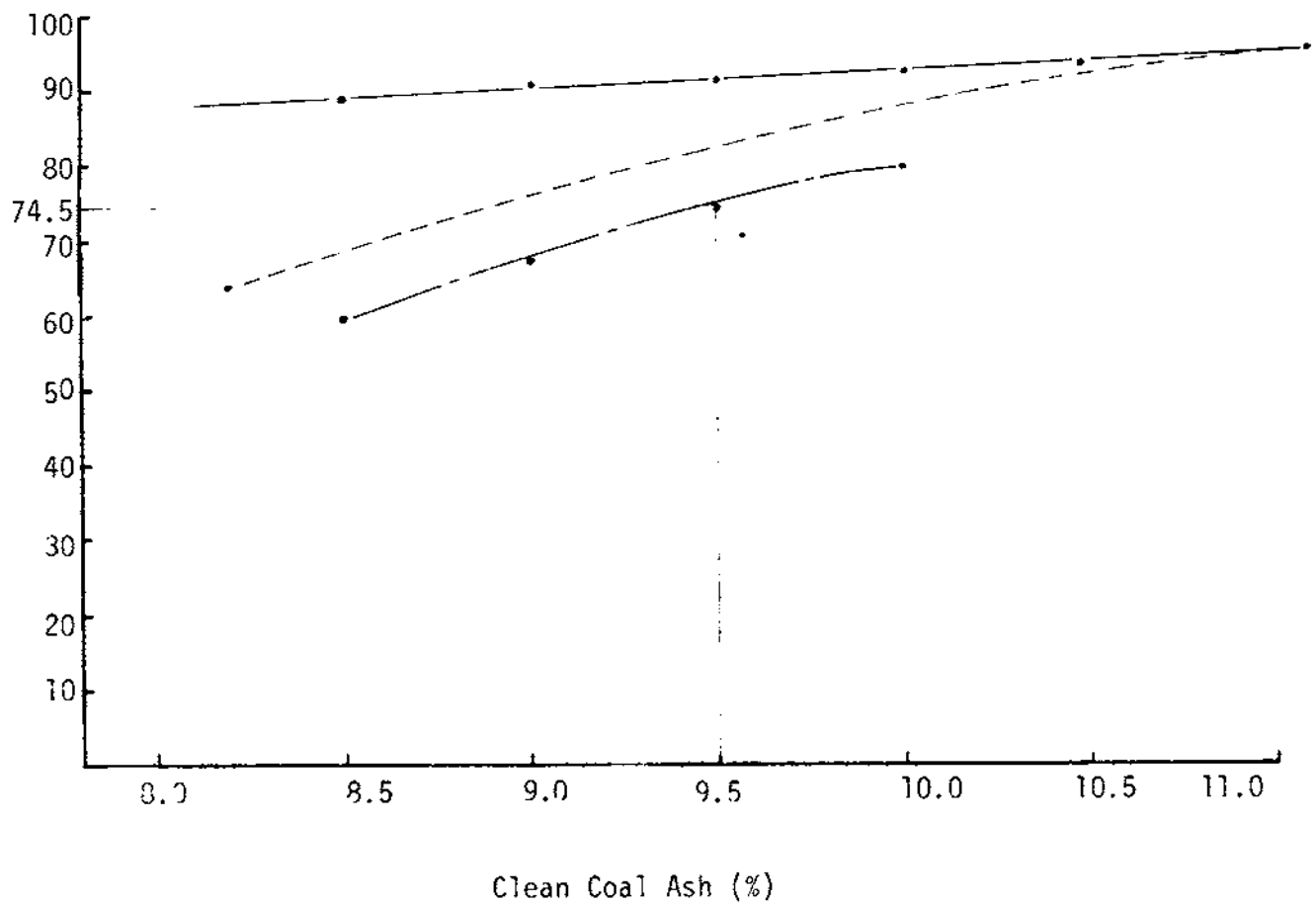


#10A Seam Test Results



Proposed Yield on Composite Seams

———— Theoretical Yield
- - - - - Actual Yield
- - - - - Recovery Efficiency



Ash Composition(oxidized coal)

High FSI		SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	Na ₂ O	K ₂ O	SO ₃
	8 Seam	56.4	37.20	0.99	1.38	0.10	0.48	0.47	0.34
	9 Seam	60.7	33.01	0.79	0.66	0.27	0.46	1.27	0.26
	10B Seam	64.7	30.70	0.99	0.34	0.21	0.43	0.88	0.06
	10A Seam	64.8	30.44	0.50	0.36	0.13	0.95	1.24	0.08
Low FSI									
	8 Saem	55.8	34.88	0.90	2.99	0.42	0.38	0.56	0.60
	9 Seam	58.5	33.73	0.62	3.04	0.29	0.45	0.33	0.66
	10B Seam	65.4	29.30	0.76	1.11	0.35	0.38	0.68	0.17
	10A Seam	66.0	30.21	0.76	0.61	0.24	0.41	0.51	0.06

PETROGRAPHIC ANALYSIS

MITSUI MINING CO., LTD.

Name of Coal 8 Seam (Clean Coal)

S. 51-8-20

Location _____
 Seam _____
 Pit _____

Date of Sampling _____
 Date of Arrival _____

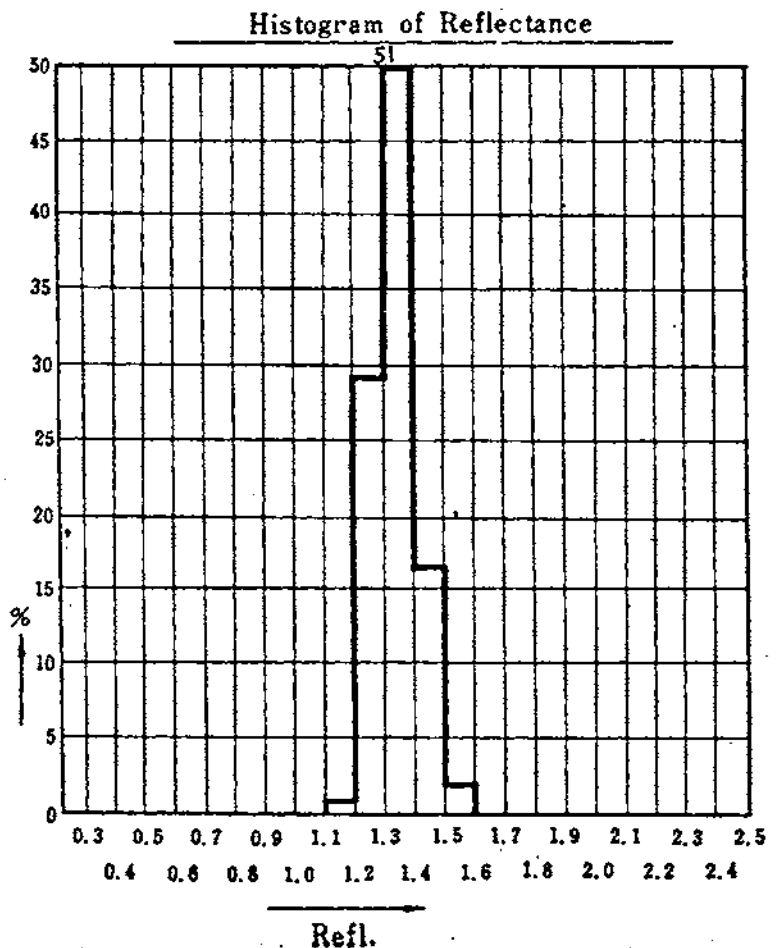
Descriptor _____

		Petrographic Analysis	
Reactive Entities	Vitrinoid Types	1	
		2	
		3	
		4	
		5	
		6	
		7	
		8	
		9	
		10	
	11	0.5	
	12	14.1	
	13	24.8	
	14	8.2	
	15	1.0	
	16		
	17		
	18		
	19		
	20		
	21		
		Vitrinoids	48.6
		1/3 S. Fus.	9.5
		Resinoids	
		Exinoids	
		Total Reactives	58.2
Inert Entities	2/3 S. Fus.	19.1	
	Micrinoids	11.5	
	Fusinoids	0.9	
	Min. Matter	4.8	
	<i>Sclerotinite</i>	0.2	
	<i>Weathered</i>	5.5	
	Total Inerts	41.8	
		Mean Refl.	1.34
		Strength Index	5.61
		Comp. Balance Index	3.06
		Calculated Strength	50

Approximate Analysis		
Moisture	1.5	%
Ash	9.6	%
Vol. Matter	20.3	%
Fix Carbon	68.6	%
Sulphur	0.39	%
F. S. I.	3.5	
Cal		Kcal/kg

Ultimate Analysis		
Carbon	89.2	%
Hydrogen	4.9	%
Oxygen	4.5	%
Nitrogen	1.0	%
Sulfue	0.4	%

Gieseler Plastometer	
Max. Fluidity	D.D.P.M.
Softening Temp.	°C
Max. Fluid Temp.	°C
Solid. Temp.	°C
Range	°C



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PETROGRAPHIC ANALYSIS

MITSUI MINING CO., LTD.

S. 51-8-20

Name of Coal 8 Seam (Clean Coal)

Location _____
 Seam _____
 Pit _____

Date of Sampling _____
 Date of Arrival _____

Descriptor _____

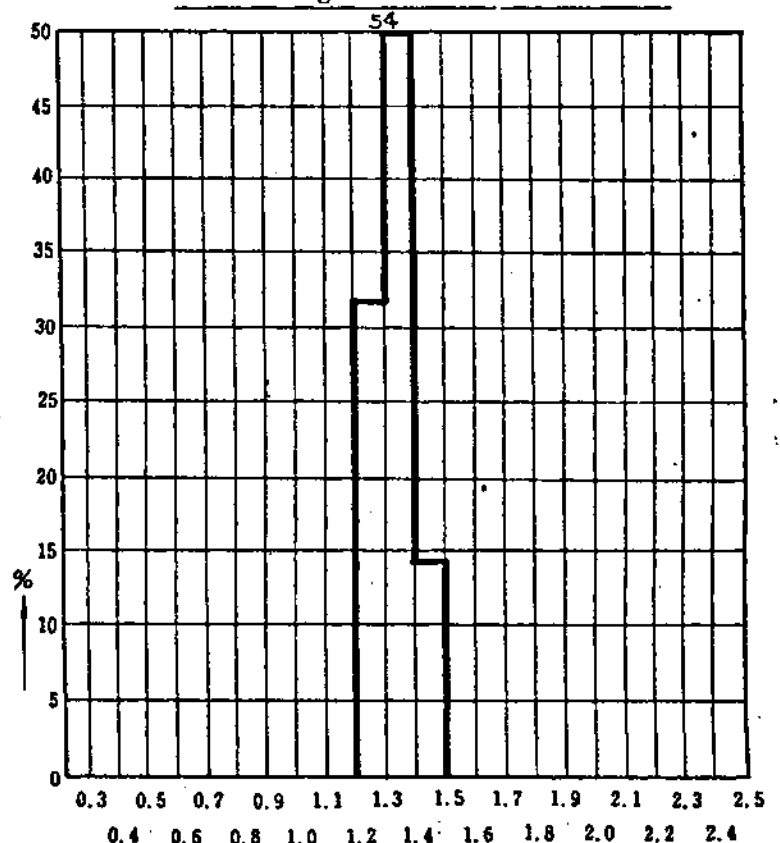
Petrographic Analysis	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	16.2
13	27.4
14	7.1
15	
16	
17	
18	
19	
20	
21	
Vitrinoids	50.7
1/3 S. Fus.	9.1
Resinoids	
Exinoids	0.5
Total Reactives	60.5
2/3 S. Fus.	18.2
Micrinoids	14.7
Fusinoids	1.6
Min. Matter	4.8
<i>Weathered</i>	0.4
Total Inerts	39.7
Mean Refl.	1.33
Strength Index	5.58
Comp. Balance Index	2.68
Calculated Strength	52

Aproximate Analysis	
Moisture	1.5 %
Ash	9.6 %
Vol. Matter	20.5 %
Fix Carbon	68.4 %
Sulphur	0.38 %
F. S. I.	3.5
Cal	Kcal/kg

Ultimate Analysis	
Carbon	89.4 %
Hydrogen	4.9 %
Oxygen	4.1 %
Nitrogen	1.2 %
Sulfue	0.4 %

Gieseler Plastometer	
Max. Fluidity	D. D. P. M.
Softening Temp.	°C
Max. Fluid Temp.	°C
Solid. Temp.	°C
Range	°C

Histogram of Reflectance



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PETROGRAPHIC ANALYSIS

MITSUI MINING CO., LTD.
S. 51-8-20

Name of Coal 3 Seam (Clean Coal)

Location _____
Seam _____
Pit _____

Date of Sampling _____
Date of Arrival _____

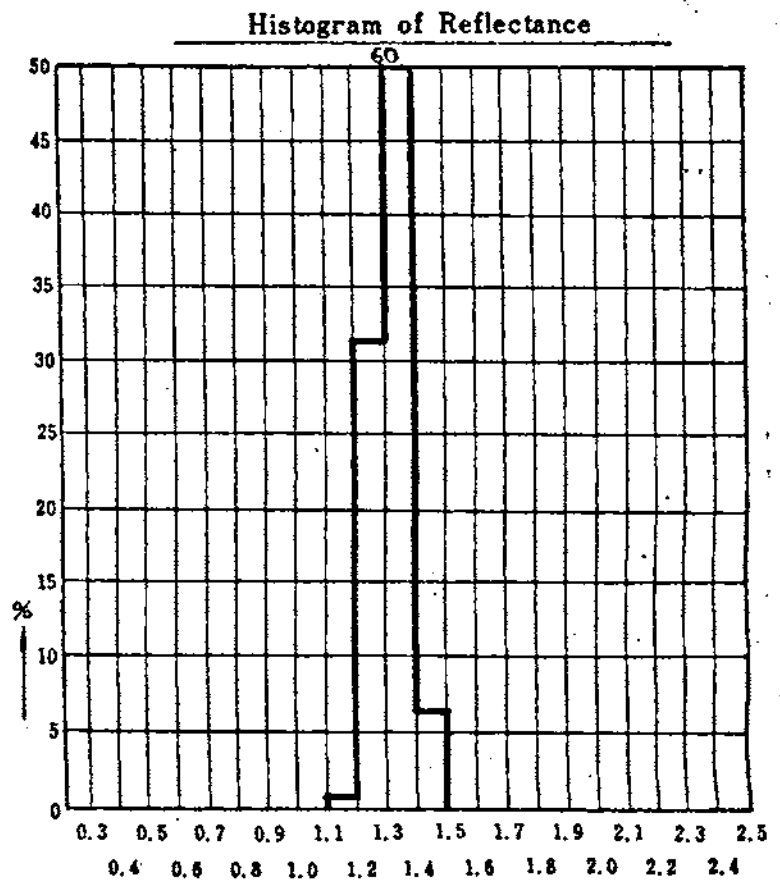
Descriptor _____

Petrographic Analysis	
Reactive Entities	Vitrinoid Types
	1
	2
	3
	4
	5
	6
	7
	8
	9
	10
	11
	12
	13
	14
	15
	16
	17
	18
	19
	20
21	
Vitrinoids	
1/3S. Fus.	
Resinoids	
Exinoids	
Total Reactives	
2/3S. Fus.	
Micrinoids	
Fusinoids	
Min. Matter	
<i>Unweathered</i>	
Total Inerts	
Mean Refl.	
Strength Index	
Comp. Balance Index	
Calculated Strength	

Approximate Analysis		
Moisture	1.6	%
Ash	9.7	%
Vol. Matter	20.5	%
Fix Carbon	68.2	%
Sulphur	0.39	%
F. S. I.	3.5	
Cal		Kcal/kg

Ultimate Analysis		
Carbon	89.3	%
Hydrogen	4.85	%
Oxygen		%
Nitrogen		%
Sulfue	0.4	%

Gieseler Plastometer	
Max. Fluidity	D.D.P.M.
Softening Temp.	°C
Max. Fluid Temp.	°C
Solid. Temp.	°C
Range	°C



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PETROGRAPHIC ANALYSIS

MITSUI MINING CO., LTD.

S. 51- 8- 20

Name of Coal 8 Seam Channel Sample S-1

Location _____
 Seam _____
 Pit _____

Date of Sampling _____

Date of Arrival _____

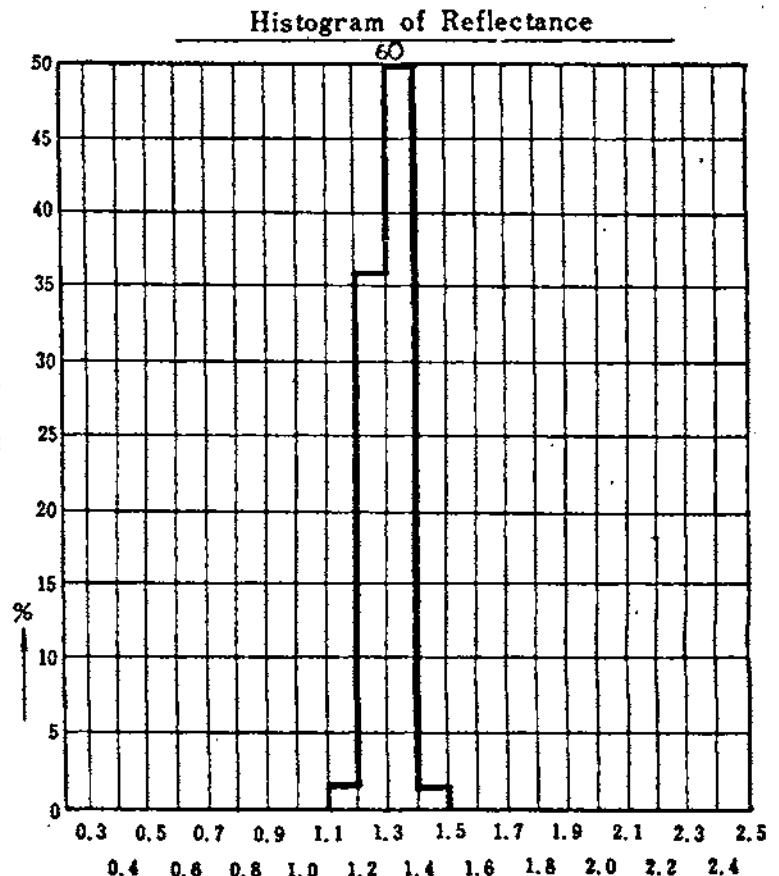
Descriptor _____

		Petrographic Analysis		
Reactive Entities	Vitrinoid Types	1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11	1.2	
		12	20.8	
		13	34.7	
		14	1.2	
		15		
		16		
		17		
		18		
		19		
		20		
		21		
		Vitrinoids	57.9	
		1/3S. Fus.	8.6	
		Resinoids		
		Exinoids		
		Total Reactives	66.5	
Inert Entities			2/3S. Fus.	17.1
			Micrinoids	10.5
			Fusinoids	0.4
			Min. Matter	4.6
			Weathered	0.9
			Total Inerts	33.5
		Mean Refl.	1.31	
		Strength Index	5.55	
		Comp. Balance Index	1.94	
		Calculated Strength	58	

Aproximate Analysis		
Moisture	1.5	%
Ash	9.2	%
Vol. Matter	21.1	%
Fix Carbon	68.2	%
Sulphur	0.32	%
F. S. I.	5	
Cal		Kcal/kg

Ultimate Analysis	
Carbon	%
Hydrogen	%
Oxygen	%
Nitrogen	%
Sulfue	%

Gieseler Plastometer		
Max. Fluidity	1.9	D.D.P.M.
Softening Temp.	437	°C
Max. Fluid Temp.	449	°C
Solid. Temp.	476	°C
Range	22	°C



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PETROGRAPHIC ANALYSIS

MITSUI MINING CO., LTD.

S. 51-8-20

Name of Coal 8 Seam Channel Sample S-2

Location _____
 Seam _____
 Pit _____

Date of Sampling _____
 Date of Arrival _____

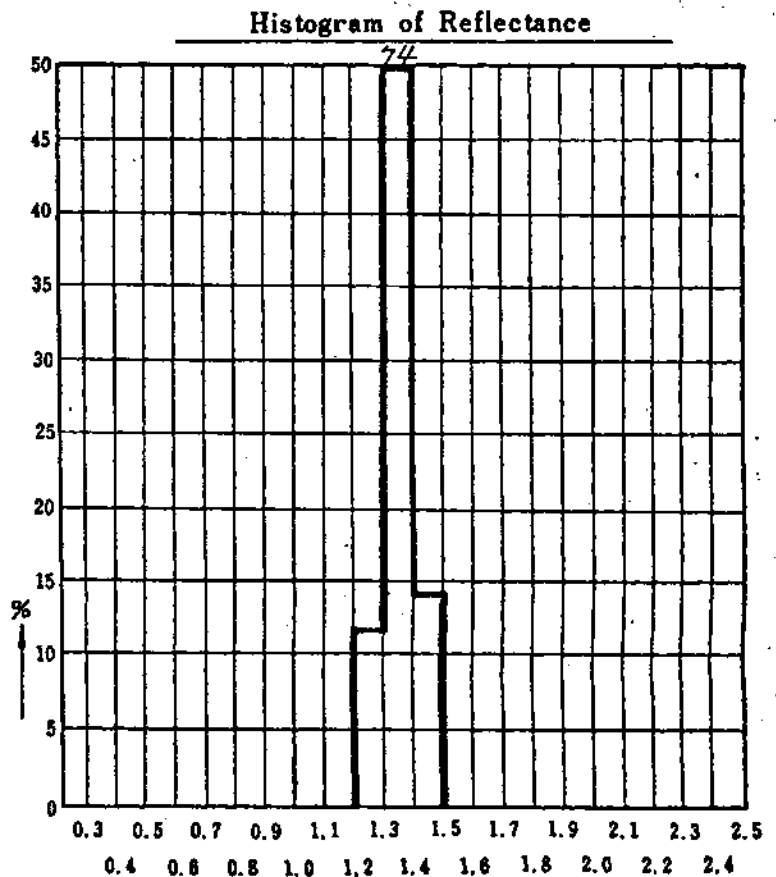
Descriptor _____

		Petrographic Analysis	
Reactive Entities	Vitrinoid Types	1	
		2	
		3	
		4	
		5	
		6	
		7	
		8	
		9	
		10	
		11	
		12	5.6
		13	34.3
		14	6.5
		15	
		16	
		17	
		18	
		19	
		20	
		21	
		Vitrinoids	46.4
		1/3 S. Fus.	11.1
		Resinoids	—
		Exinoids	—
		Total Reactives	57.5
Inert Entities		2/3 S. Fus.	22.1
		Micrinoids	14.5
		Fusinoids	0.2
		Min. Matter	5.0
		Weathered	0.7
		Total Inerts	42.5
		Mean Refl.	1.35
		Strength Index	5.72
		Comp. Balance Index	3.18
		Calculated Strength	50

Approximate Analysis		
Moisture	1.6	%
Ash	9.9	%
Vol. Matter	20.1	%
Fix Carbon	68.4	%
Sulphur	0.3	%
F. S. I.	3.5	
Cal		Kcal/kg

Ultimate Analysis	
Carbon	%
Hydrogen	%
Oxygen	%
Nitrogen	%
Sulfue	%

Gieseler Plastometer		
Max. Fluidity	1.3	D.D.P.M.
Softening Temp.	448	°C
Max. Fluid Temp.	452	°C
Solid. Temp.	470	°C
Range	22	°C



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PETROGRAPHIC ANALYSIS

MITSUI MINING CO., LTD.

Name of Coal 8 Seam Channel Sample S-3

S. 51-8-20

Location _____

Date of Sampling _____

Seam _____

Date of Arrival _____

Pit _____

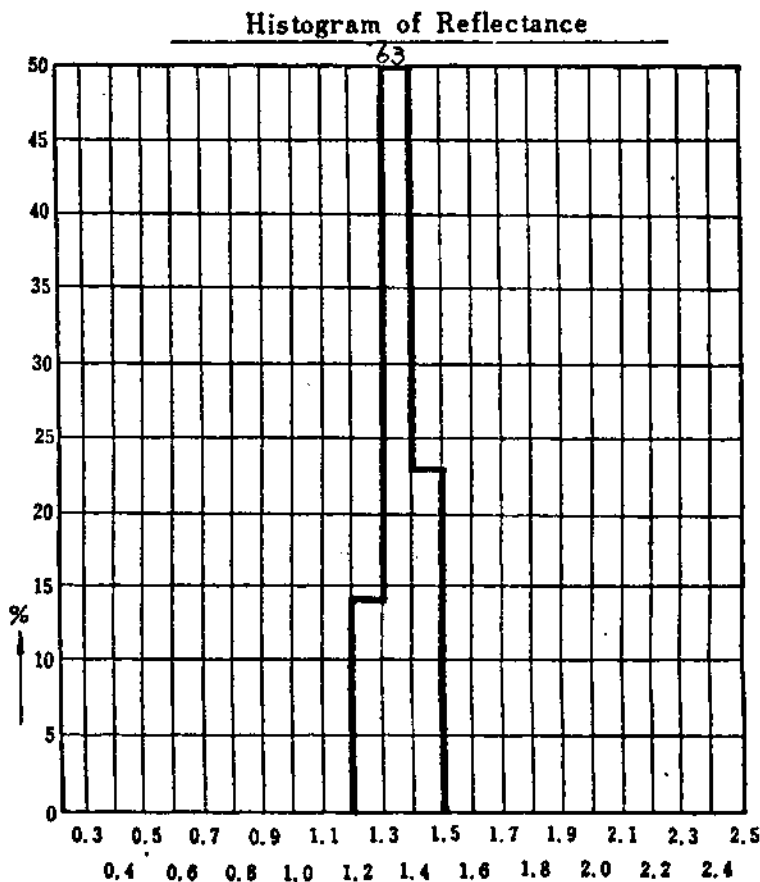
Descriptor _____

		Petrographic Analysis			
Reactive Entities	Vitrinoid Types	1			
		2			
		3			
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12	6.3		
		13	28.4		
		14	10.4		
		15			
		16			
		17			
		18			
		19			
		20			
		21			
		Vitrinoids	45.1		
		1/3S. Fus.	12.9		
		Resinoids	—		
		Exinoids	—		
		Total Reactives	58.0		
Inert Entities	Entities	2/3S. Fus.	25.9		
		Micrinoids	10.7		
		Fusinoids	0.2		
		Min. Matter	4.9		
		<i>weathered</i>	0.3		
				Total Inerts	42.0
				Mean Refl.	1.36
		Strength Index	5.82		
		Comp. Balance Index	3.20		
		Calculated Strength	51.		

Aproximate Analysis		
Moisture	1.8	%
Ash	9.8	%
Vol. Matter	19.9	%
Fix Carbon	68.5	%
Sulphur	0.41	%
F. S. I.	3	
Cal		Kcal/kg

Ultimate Analysis	
Carbon	%
Hydrogen	%
Oxygen	%
Nitrogen	%
Sulfue	%

Gieseler Plastometer		
Max. Fluidity	0.8	D.D.P.M
Softening Temp.	—	°C
Max. Fluid Temp.	449	°C
Solid. Temp.	—	°C
Range	—	°C



※

PETROGRAPHIC ANALYSIS

MITSUI MINING CO., LTD.

S 51-8-20

Name of Coal 8 Seam Channel Sample S-4

Location _____
 Seam _____
 Pit _____

Date of Sampling _____
 Date of Arrival _____

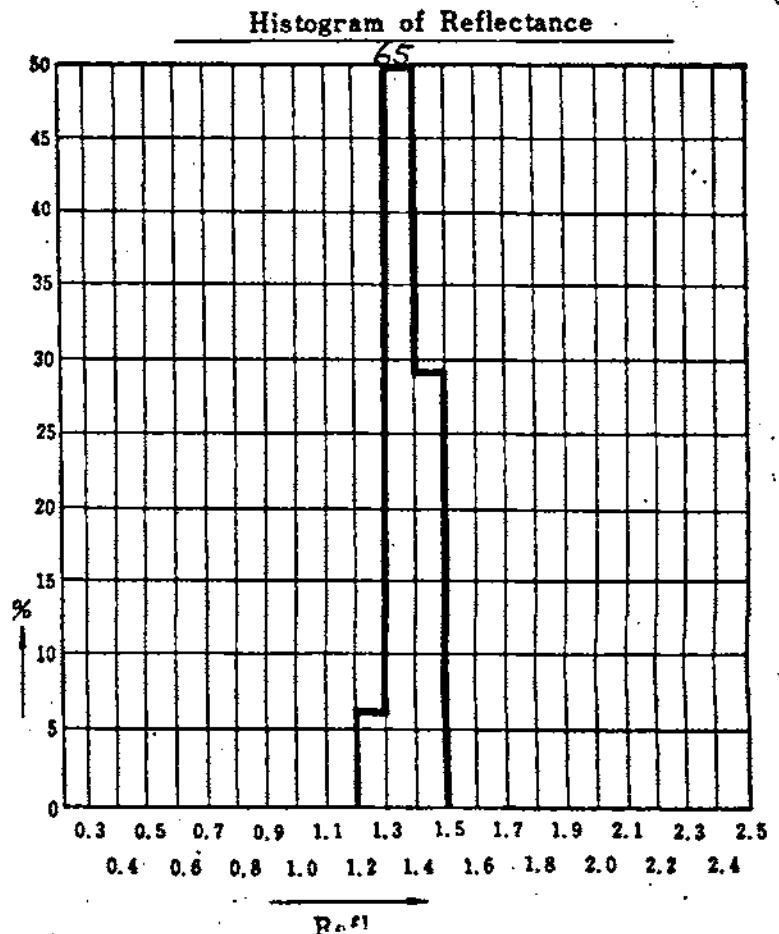
Descriptor

		Petrographic Analysis		
Reactive Entities	Vitrinoid Types	1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11		
		12	3.5	
		13	37.6	
		14	16.8	
		15		
		16		
		17		
		18		
		19		
		20		
		21		
		Vitrinoids	57.9	
		1/3 S. Fus.	7.2	
		Resinoids	-	
		Exinoids	-	
		Total Reactives	65.1	
Inert Entities			2/3 S. Fus.	14.5
			Micrinoids	10.3
			Fusinoids	0.6
			Min. Matter	5.0
			Weathered	4.5
			Total Inerts	34.9
		Mean Refl.	1.37	
		Strength Index	6.04	
		Comp. Balance Index	2.34	
		Calculated Strength	57.5	

Aproximate Analysis		
Moisture	1.9	%
Ash	10.0	%
Vol. Matter	20.3	%
Fix Carbon	68.8	%
Sulphur	0.38	%
F. S. I.	4.12	
Cal		Kcal/kg

Ultimate Analysis	
Carbon	%
Hydrogen	%
Oxygen	%
Nitrogen	%
Sulfue	%

Gieseler Plastometer		
Max. Fluidity	0.8	D.D.P.M.
Softening Temp.	-	°C
Max. Fluid Temp.	446	°C
Solid. Temp.	-	°C
Range	-	°C



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100 -

Refl

PETROGRAPHIC ANALYSIS

MITSUI MINING CO., LTD.

Name of Coal 8 Seam Channel Sample S-5

S. 51- 8-20

Location _____

Date of Sampling _____

Seam _____

Date of Arrival _____

Pit _____

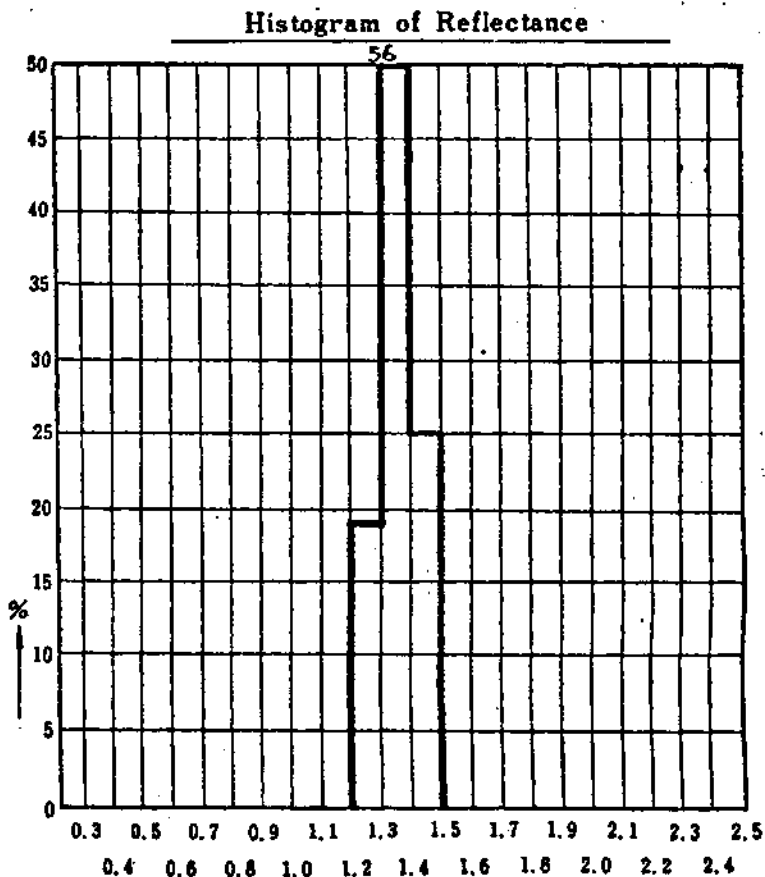
Descriptor _____

		Petrographic Analysis		
Reactive Entities	Vitrinoid Types	1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11		
		12	8.3	
		13	24.6	
		14	11.0	
		15		
		16		
		17		
		18		
		19		
		20		
		21		
		Vitrinoids	43.9	
		1/3S. Fus.	10.4	
		Resinoids		
		Exinoids		
		Total Reactives	54.3	
Inert Entities			2/3S. Fus.	20.9
			Micrinoids	14.3
			Fusinoids	1.7
			Min. Matter	5.0
			<i>Weathered</i>	3.8
			Total Inerts	45.7
		Mean Refl.	1.34	
		Strength Index	5.64	
		Comp. Balance Index	3.65	
		Calculated Strength	45	

Aproximate Analysis		
Moisture	1.6	%
Ash	10.0	%
Vol. Matter	19.4	%
Fix Carbon	69.0	%
Sulphur	0.37	%
F. S. I.	2.5	
Cal		Kcal/kg

Ultimate Analysis	
Carbon	%
Hydrogen	%
Oxigen	%
Nitrogen	%
Sulfue	%

Gieseler Plastometer		
Max. Fluidity	0.4	D.D.P.M.
Softening Temp.	—	°C
Max. Fluid Temp.	449	°C
Solid. Temp.	—	°C
Range	—	°C



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PETROGRAPHIC ANALYSIS

MITSUI MINING CO., LTD.

S. 51-8-20

Name of Coal 8 Seam Low FSI

Location _____

Seam _____

Pit _____

Date of Sampling _____

Date of Arrival _____

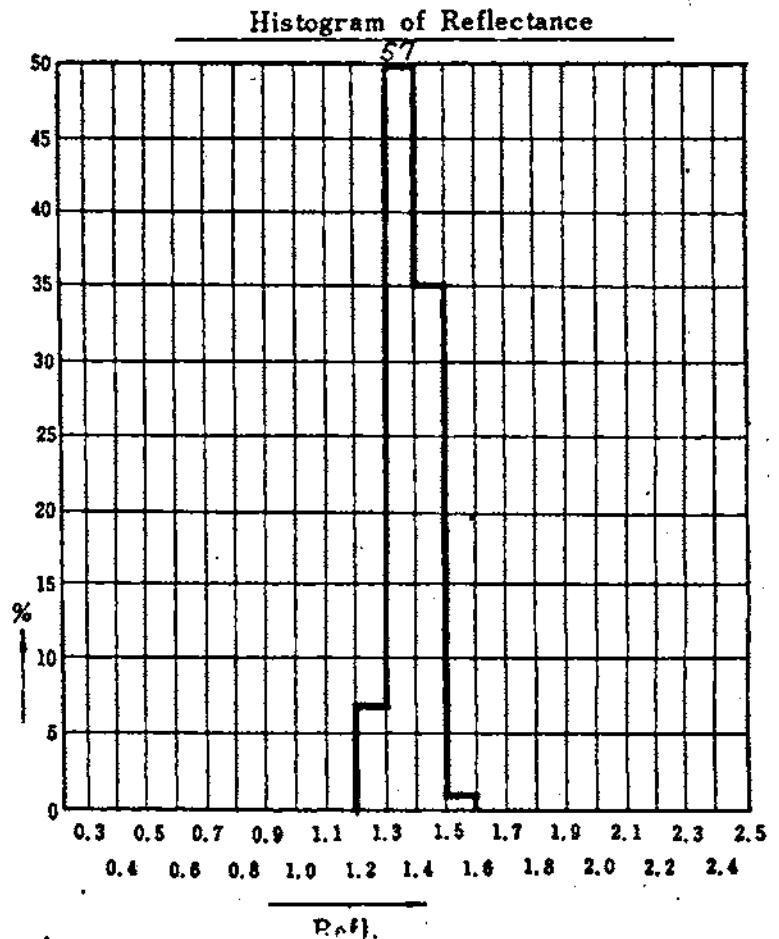
Descriptor _____

		Petrographic Analysis	
Reactive Entities	Vitrinoid Types	1	
		2	
		3	
		4	
		5	
		6	
		7	
		8	
		9	
		10	
		11	
		12	3.2
		13	25.8
		14	15.9
		15	0.4
		16	
		17	
		18	
		19	
		20	
		21	
		Vitrinoids	45.3
		1/3S. Fus.	9.3
		Resinoids	—
		Exinoids	—
		Total Reactives	54.6
Inert Entities		2/3S. Fus.	18.5
		Micrinoids	14.1
		Fusinoids	2.0
		Min. Matter	4.7
		Weathered	6.1
		Total Inerts	45.4
		Mean Refl.	1.37
		Strength Index	5.84
		Comp. Balance Index	3.89
		Calculated Strength	44.

Aproximate Analysis		
Moisture	3.6	%
Ash	9.4	%
Vol. Matter	20.7	%
Fix Carbon	66.3	%
Sulphur	0.45	%
F. S. I.	5	
Cal		Kcal/kg

Ultimate Analysis		
Carbon	87.3	%
Hydrogen	4.6	%
Oxigen	6.5	%
Nitrogen	1.2	%
Sulfue	0.4	%

Gieseler Plastometer		
Max. Fluidity	0.15	D.D.P.M.
Softening Temp.	—	°C
Max. Fluid Temp.	443	°C
Solid. Temp.	—	°C
Range	—	°C



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PETROGRAPHIC ANALYSIS

MITSUI MINING CO., LTD.

S 51-8-20

Name of Coal 3 Seam High FSI

Location

Seam

Pit

Date of Sampling

Date of Arrival

Descriptor

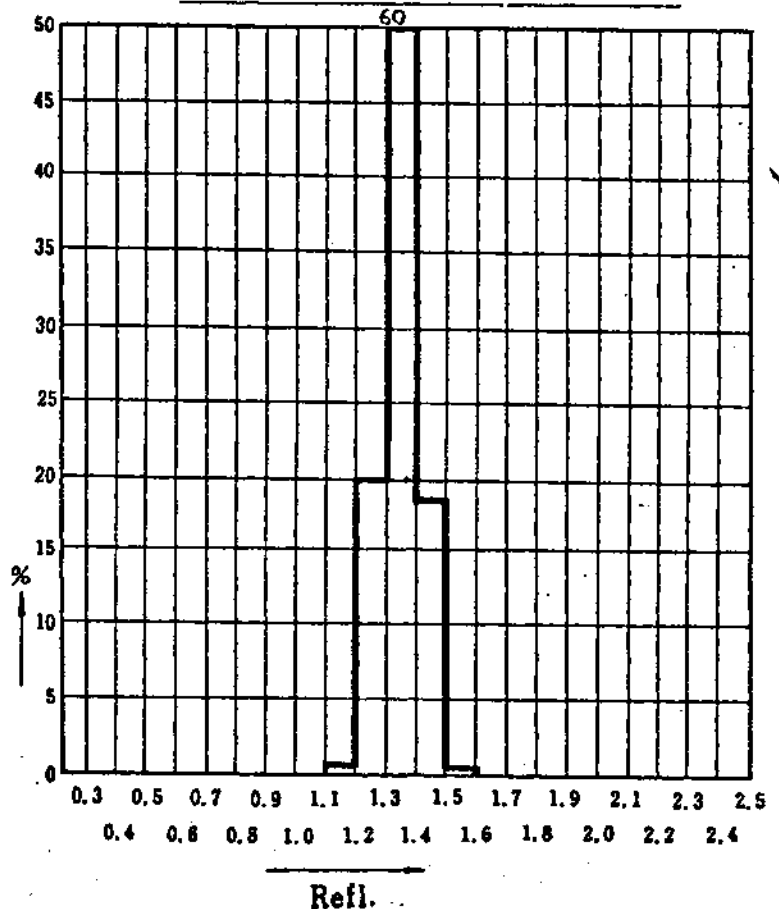
		Petrographic Analysis	
Reactive Entities	Vitrinoid Types	1	
		2	
		3	
		4	
		5	
		6	
		7	
		8	
		9	
		10	
		11	0.4
		12	8.4
		13	25.1
		14	7.5
		15	0.4
		16	
		17	
		18	
		19	
		20	
		21	
	Vitrinoids	41.8	
	1/3S. Fus.	11.0	
	Resinoids		
	Exinoids	0.6	
	Total Reactives	53.4	
Inert Entities	2/3S. Fus.	21.9	
	Micrinoids	14.4	
	Fusinoids	1.0	
	Min. Matter	4.6	
	Unweathered	4.7	
	Total Inerts	46.6	
	Mean Refl.	1.34	
	Strength Index	5.59	
	Comp. Balance Index	3.89	
	Calculated Strength	42	

Approximate Analysis		
Moisture	1.8	%
Ash	9.2	%
Vol. Matter	20.2	%
Fix Carbon	68.8	%
Sulphur	0.44	%
F. S. I.	3	
Cal		Kcal/kg

Ultimate Analysis		
Carbon	89.0	%
Hydrogen	4.6	%
Oxygen	4.8	%
Nitrogen	1.1	%
Sulfue	0.5	%

Gieseler Plastometer		
Max. Fluidity	1.0	D.D.P.M.
Softening Temp.	—	°C
Max. Fluid Temp.	446	°C
Solid. Temp.	—	°C
Range	—	°C

Histogram of Reflectance



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32.9

PETROGRAPHIC ANALYSIS

MITSUI MINING CO., LTD.

Name of Coal 9 Seam High FSI
 Location _____
 Seam _____
 Pit _____

S 51-8-30
 Date of Sampling _____
 Date of Arrival _____

Descriptor _____

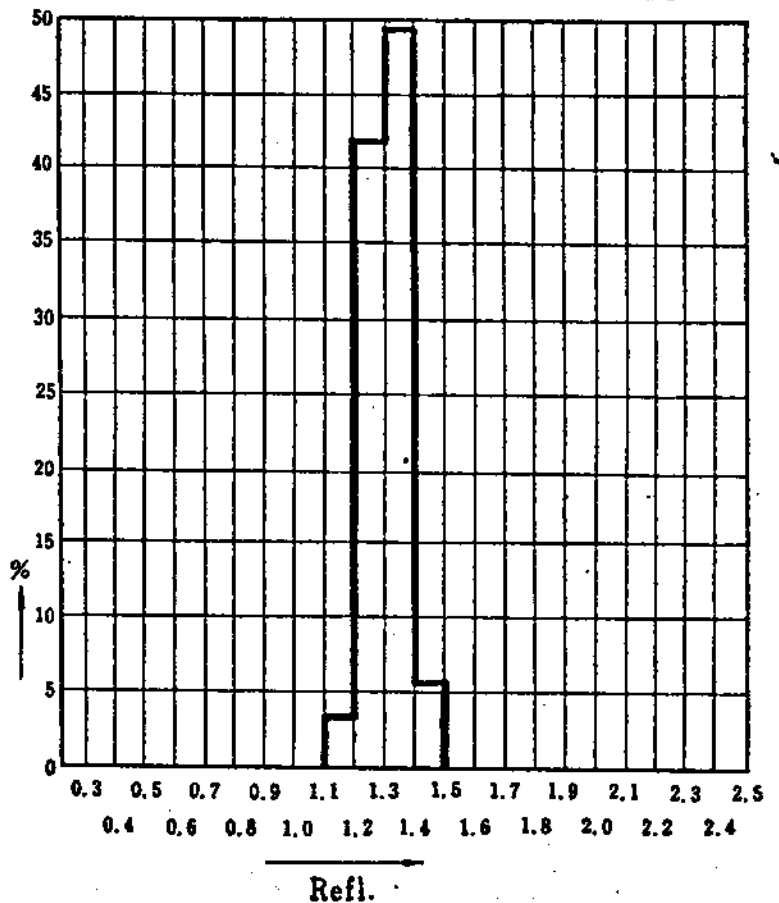
		Petrographic Analysis	
Reactive Entities	Vitrinoid Types	1	
		2	
		3	
		4	
		5	
		6	
		7	
		8	
		9	
		10	
	11	1.7	
	12	24.4	
	13	28.5	
	14	3.5	
	15		
	16		
	17		
	18		
	19		
	20		
	21		
	Vitrinoids	58.1	
	1/3S. Fus.	7.7	
	Resinoids		
	Exinoids	0.8	
	Total Reactives	66.6	
Inert Entities	2/3S. Fus.	15.4	
	Micrinoids	11.8	
	Fusinoids	0.8	
	Min. Matter	4.6	
	Schistinite	0.2	
	Weathered	0.6	
	Total Inerts	33.4	
	Mean Refl.	1.30	
Strength Index	5.49		
Comp. Balance Index	1.91		
Calculated Strength	58		

Aproximate Analysis		
Moisture	1.6	%
Ash	9.2	%
Vol. Matter	20.7	%
Fix Carbon	68.5	%
Sulphur	0.37	%
F. S. I.	4	
Cal		Kcal/kg

Ultimate Analysis		
Carbon	89.1	%
Hydrogen	4.8	%
Oxygen	4.5	%
Nitrogen	1.2	%
Sulfue	0.4	%

Gieseler Plastometer		
Max. Fluidity	1.4	D.D.P.M.
Softening Temp.	442	°C
Max. Fluid Temp.	446	°C
Solid. Temp.	470	°C
Range	28	°C

Histogram of Reflectance



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PETROGRAPHIC ANALYSIS

MITSUI MINING CO., LTD.

S. 51-8-30

Name of Coal 10 B Seam High FSI

Location

Seam

Pit

Date of Sampling

Date of Arrival

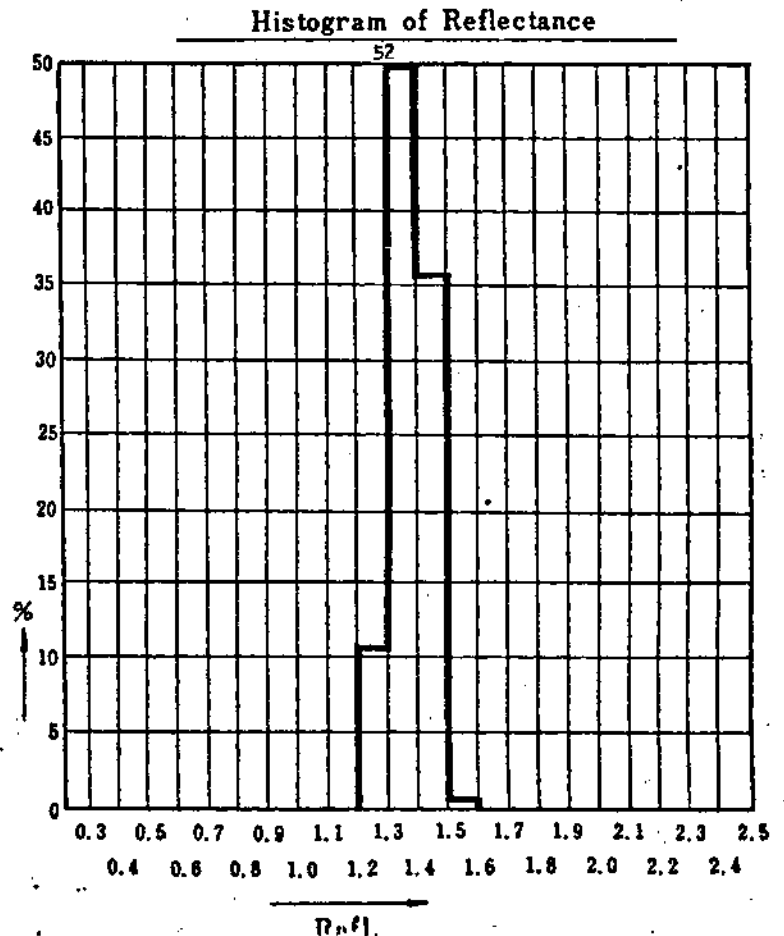
Descriptor

		Petrographic Analysis		
Reactive Entities	Vitrinoid Types	1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11		
		12	7.7	
		13	36.2	
		14	25.1	
		15	0.7	
		16		
		17		
		18		
		19		
		20		
		21		
		Vitrinoids	69.7	
		1/3 S. Fus.	5.3	
		Resinoids		
		Exinoids		
		Total Reactives	75.0	
Inert Entities			2/3 S. Fus.	10.7
			Micrinoids	9.0
			Fusinoids	0.3
			Min. Matter	4.6
			Sclerotinite	0.2
			Weathered	0.2
			Total Inerts	25.0
		Mean Refl.	1.38	
		Strength Index	6.23	
		Comp. Balance Index	1.47	
		Calculated Strength	64	

Aproximate Analysis		
Moisture	1.7	%
Ash	9.2	%
Vol. Matter	20.1	%
Fix Carbon	69.0	%
Sulphur	0.46	%
F. S. I.	5	
Cal		Kcal/kg

Ultimate Analysis		
Carbon	89.7	%
Hydrogen	4.9	%
Oxygen	3.6	%
Nitrogen	1.3	%
Sulfue	0.5	%

Gieseler Plastometer		
Max. Fluidity	1.1	D.D.P.M.
Softening Temp.	445	°C
Max. Fluid Temp.	446	°C
Solid. Temp.	470	°C
Range	25	°C



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PETROGRAPHIC ANALYSIS

MITSUI MINING CO., LTD.

S.51-8-30

Name of Coal 10A Seam High FSI

Location

Seam

Pit

Date of Sampling

Date of Arrival

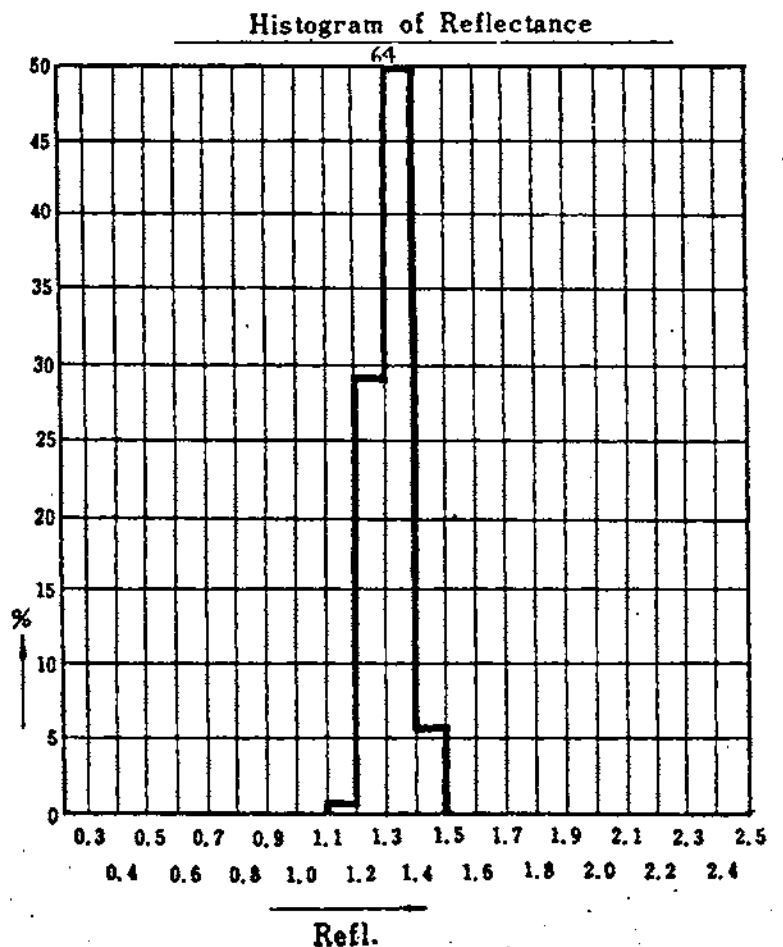
Descriptor

		Petrographic Analysis		
Reactive Entities	Vitrinoid Types	1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11	0.7	
		12	19.2	
		13	42.5	
		14	4.0	
		15		
		16		
		17		
		18		
		19		
		20		
		21		
		Vitrinoids	66.4	
		1/3S. Fus.	5.9	
		Resinoids		
		Exinoids		
		Total Reactives	72.3	
Inert Entities			2/3S. Fus.	11.9
			Micrinoids	10.3
			Fusinoids	0.2
			Min. Matter	4.8
			<i>Weathered</i>	0.5
			Total Inerts	27.7
		Mean Refl.	1.31	
		Strength Index	5.70	
		Comp. Balance Index	1.49	
		Calculated Strength	62	

Aproximate Analysis		
Moisture	1.3	%
Ash	9.5	%
Vol. Matter	20.9	%
Fix Carbon	68.3	%
Sulphur	0.54	%
F. S. I.	8.5	
Cal		Kcal/kg

Ultimate Analysis		
Carbon	89.5	%
Hydrogen	5.0	%
Oxygen	3.7	%
Nitrogen	1.2	%
Sulfue	0.6	%

Gieseler Plastometer		
Max. Fluidity	15.1	D.D.P.M.
Softening Temp.	413	°C
Max. Fluid Temp.	449	°C
Solid. Temp.	485	°C
Range	72	°C



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LINE CREEK PROJECT

A COAL QUALITY REPORT ON THE TEST RESULTS
AT CHOFU RESEARCH LABORATORY OF ADIT
SAMPLES FROM SEAMS #6 AND #7

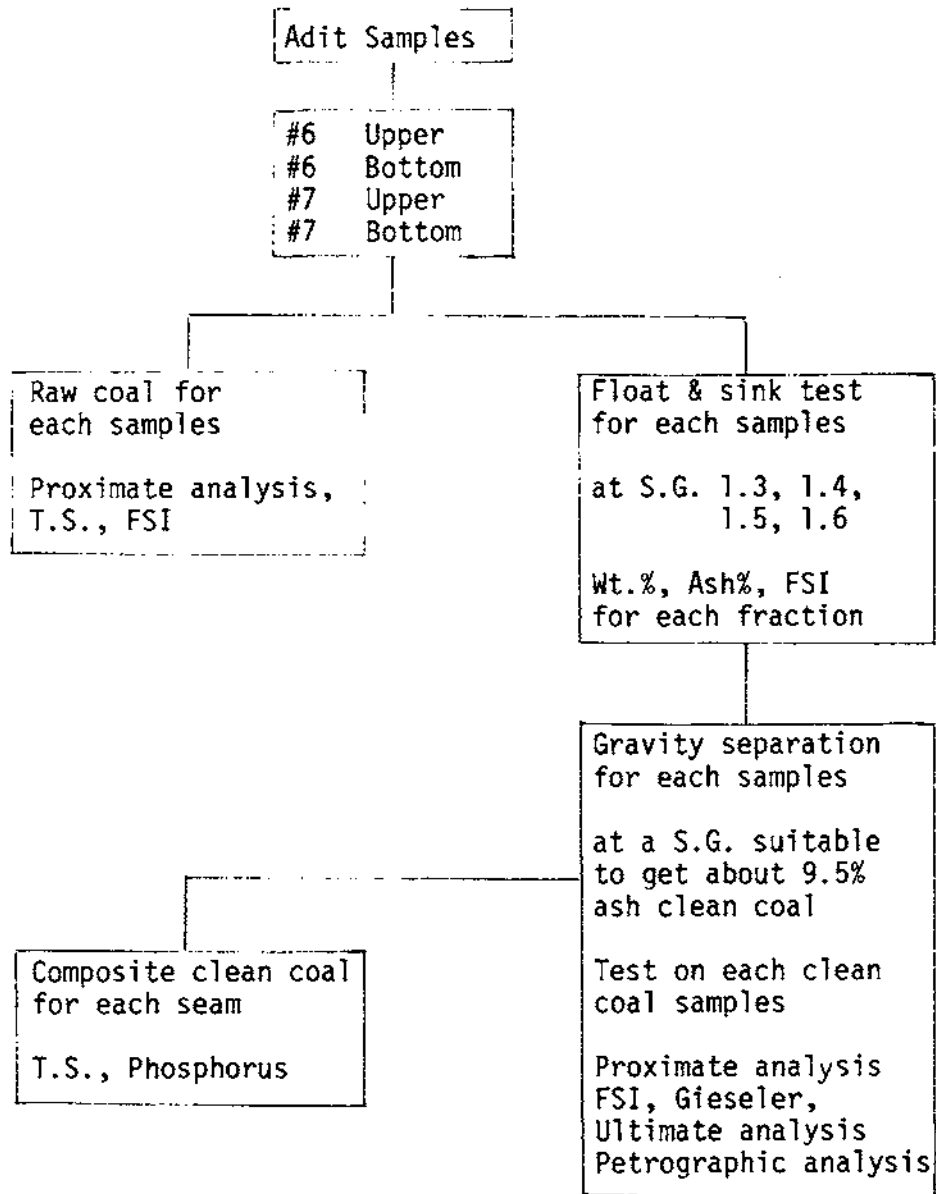
FEBRUARY 28, 1977

MITSUI MINING COMPANY, LIMITED

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Test Procedure of Line Creek Samples



Line Creek
Proximate Analysis

Raw Coal

	I.M. %	Ash %	V.M. %	F.C. %	T.S. %	FSI	P. %
#6 Upper (Adit 15)	2.2	11.1	20.6	66.1	0.49	1 1/2	
Bottom	1.5	13.1	21.9	63.5	0.54	7 1/2	
#7 Upper (Adit 16)	2.0	26.0	19.5	52.5	0.39	1 1/2	
Bottom	1.2	27.5	20.3	51.0	0.44	3 1/2	

Clean Coal

#6 Upper (Adit 15)	2.4	9.6	20.7	68.3	0.54	2	
Bottom	1.4	9.4	22.8	66.4	0.56	7	
Composite	-	9.5	-	-	0.53	4 1/2	0.093
#7 Upper (Adit 16)	2.0	9.4	21.1	67.5	0.50	3 1/2	
Bottom	1.4	9.4	22.9	66.3	0.53	7 1/2	
Composite	-	9.5	-	-	0.53	6	0.049

Line Creek

Ultimate Analysis

	C	H	O	N	S
#6 Upper (Adit 15)	87.8	4.6	5.8	1.3	0.5
#6 Bottom	88.6	4.9	3.9	2.0	0.6
#7 Upper (Adit 16)	88.6	4.8	4.9	1.2	0.5
#7 Bottom	88.8	5.0	4.2	1.4	0.6

Gieseler Plastmeter

	Softening °C	Max Fluidity °C	Solidification °C	D.D.M.
#6 Upper (Adit 15)	-	-	-	-
#6 Bottom	422	455	485	21
#7 Upper (Adit 16)	-	452	-	1
#7 Bottom	416	455	482	33

FLOAT AND SINK TEST

SAMPLE: #6 Seam , Upper

DATE: Feb.26, 1977

SIZE: 2"x 0

CHOFU RESEARCH LABORATORY.

MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1} + W_n}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	11.1	2.5	5.6	27.8	27.8	11.1	2.5	1071.1	88.9	12.0	
1.30 ~ 1.40	57.1	4.5	39.7	257.0	284.8	68.2	4.2	814.1	31.8	25.6	
1.40 ~ 1.50	20.6	13.0	78.5	267.8	552.6	88.8	6.2	546.3	11.2	48.8	
1.50 ~ 1.60	5.1	25.9	91.4	132.1	684.7	93.9	7.3	414.2	6.1	67.9	
+ 1.60	6.1	67.9	97.0	414.2	1,098.9	100.0	11.0	-	-	-	
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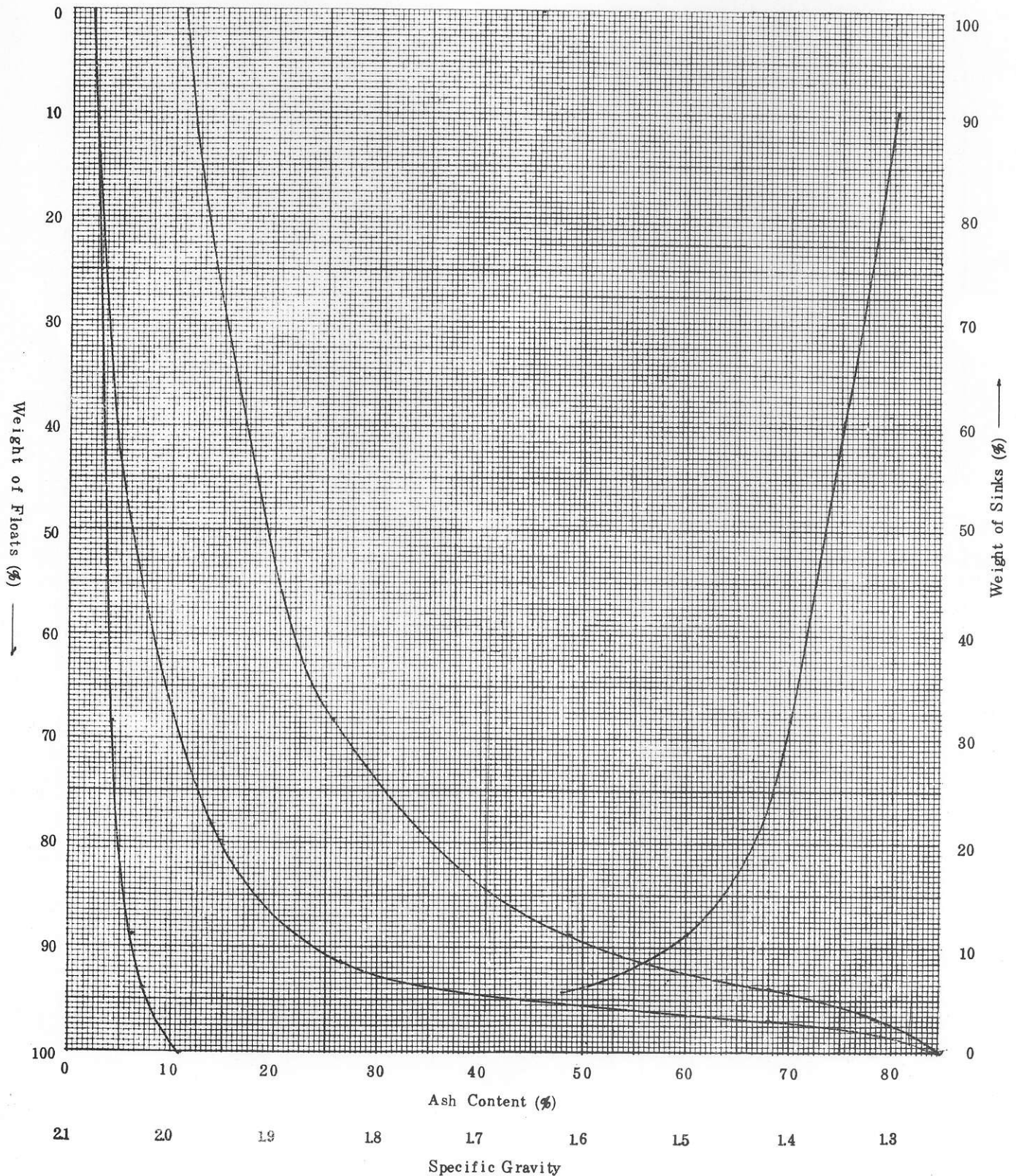
Washability Curves

SAMPLE: #6 Seam Upper

DATE: Feb. 25, 1977

SIZE : 2" x 0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



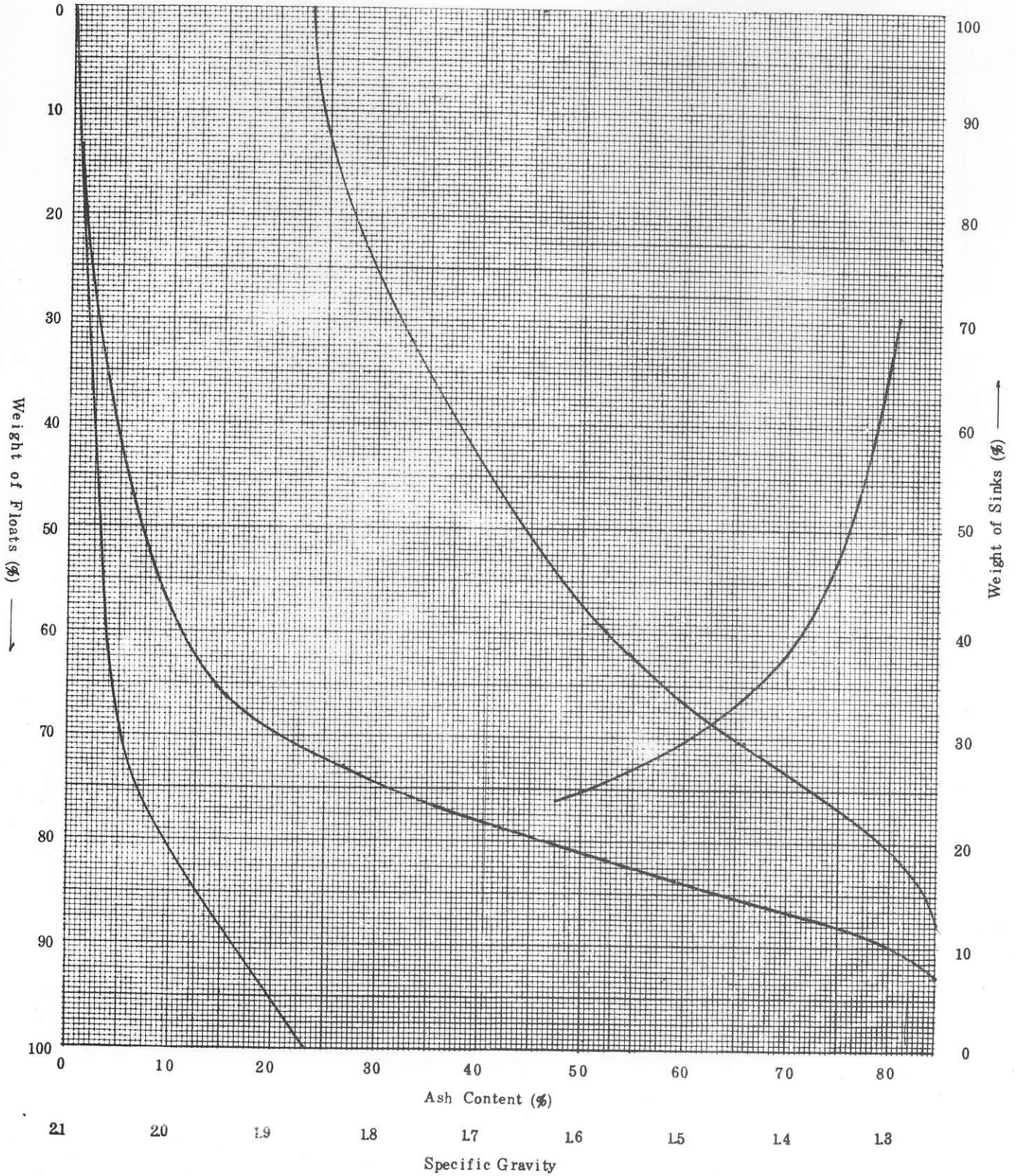
Washability Curves

SAMPLE: #6 Seam Bottom

DATE: Feb. 25, 1977

SIZE : 2" x 0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: #7 Seam, Upper

DATE: Feb, 25, 1977

SIZE: 2"x0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{W_n + \frac{1}{2}}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	6.1	1.7	3.1	10.4	10.4	6.1	1.7	2632.4	93.9	28.0	
1.30 ~ 1.40	34.3	5.0	23.3	171.5	181.9	40.4	4.5	2460.9	59.6	41.3	
1.40 ~ 1.50	18.0	14.2	49.4	255.6	437.5	58.4	7.5	2205.3	41.6	53.0	
1.50 ~ 1.60	8.4	25.0	62.6	210.0	647.5	66.8	9.7	1995.3	33.2	60.1	
+ 1.60	33.2	60.1	83.4	1995.3	2642.8	100.0	26.4				
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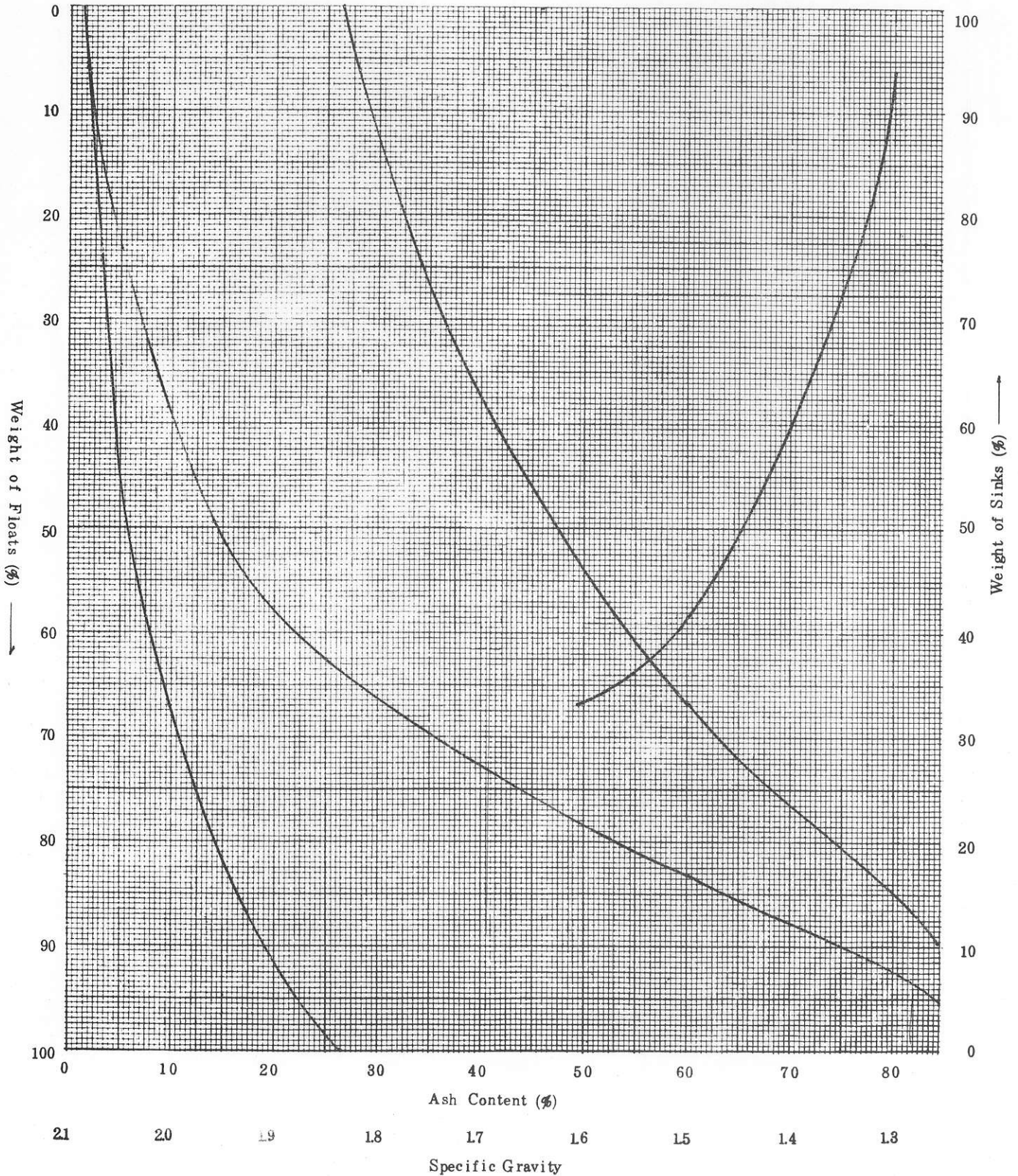
Washability Curves

SAMPLE: #7 Seam upper

DATE: Feb. 25, 1977

SIZE : 2" x 0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



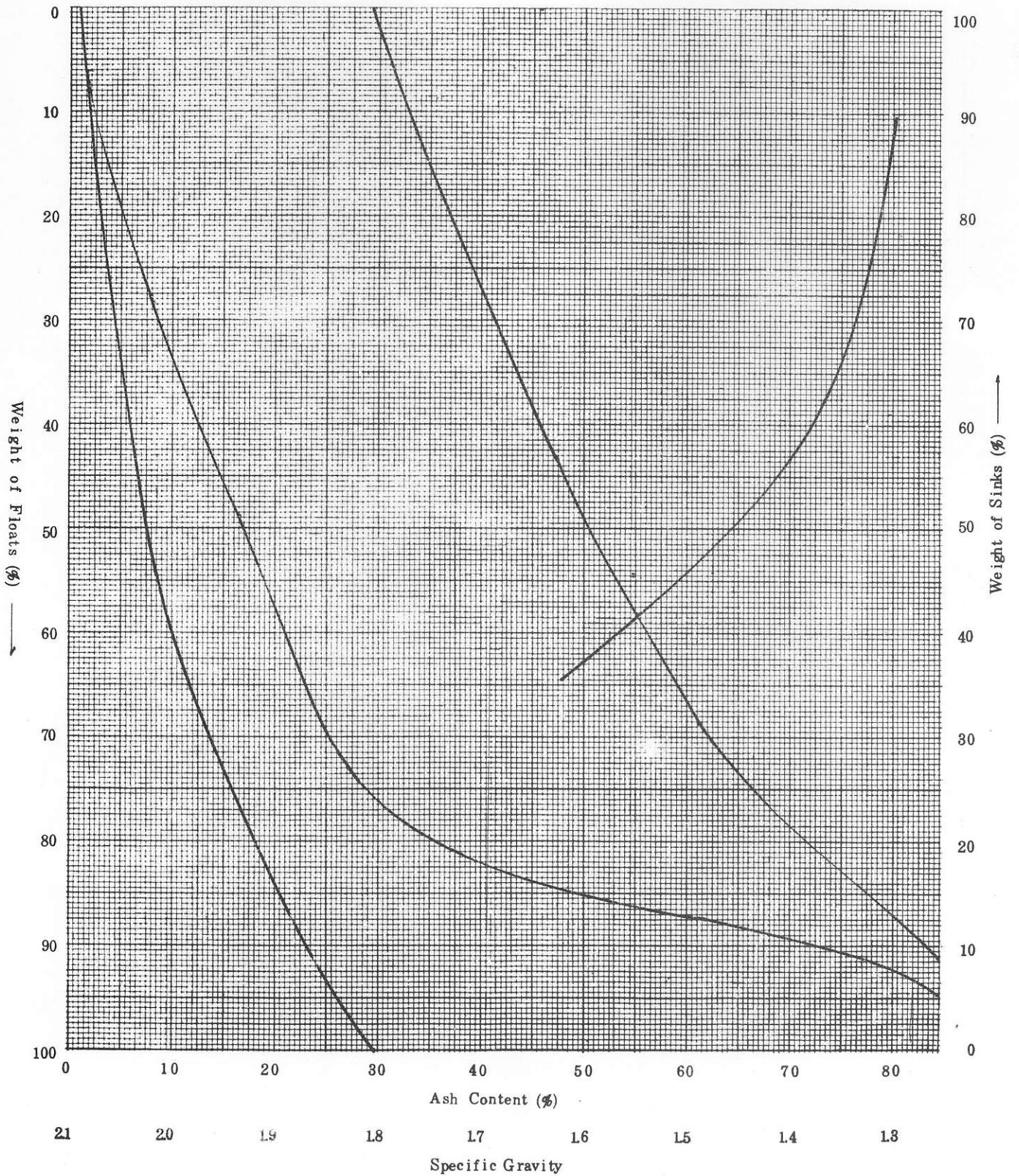
Washability Curves

SAMPLE: #7 Seam Bottom

DATE: Feb. 25, 1977

SIZE : 2" x 0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



FLOAT AND SINK TEST

SAMPLE: #6 Seam, Composite

SIZE: 2"x 0

DATE: Feb. 25, 1977

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{2} + \frac{W_n}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	23.1	2.0	11.6	46.2	46.2	23.1	2.0	1743.9	76.9	22.7	
1.30 ~ 1.40	41.6	5.2	43.9	216.3	262.5	64.7	4.1	1527.6	35.3	43.3	
1.40 ~ 1.50	13.7	13.8	71.6	189.1	451.6	78.4	5.8	1338.5	21.6	62.0	
1.50 ~ 1.60	4.9	26.4	80.9	129.4	581.0	83.3	7.0	1209.1	16.7	72.4	
+ 1.60	16.7	72.4	91.7	1209.1	1790.1	100.0	17.9				
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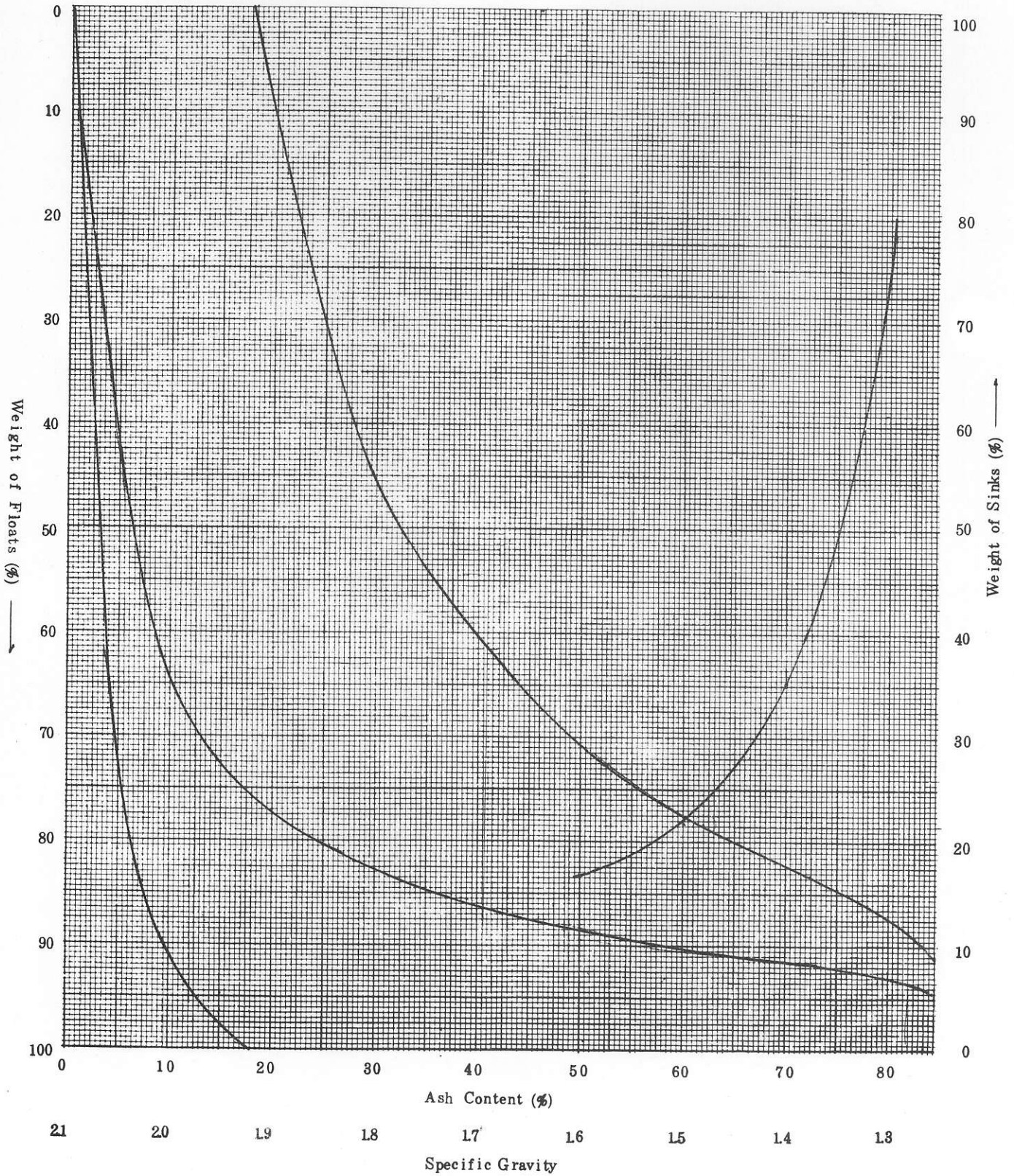
Washability Curves

SAMPLE: #6 Seam Composite

DATE: Feb. 25, 1977

SIZE : 2' x 0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



372

FLOAT AND SINK TEST

SAMPLE: #7 Seam, Composite

DATE: Feb. 25, 1977

SIZE: 2"x 0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.

Specific gravity	a		b	c	d	e	f	g	h	i	j
	Weight (%)	Ash (%)	$\frac{\sum W_{n-1}}{2}$	W · A	$\sum W \cdot A$	$\sum W$	$\frac{\sum W \cdot A}{\sum W}$	Total W · A - $\sum W \cdot A$	100 - $\sum W$	$\frac{g}{h}$	± 0.1 S.G.
- 1.30	10.2	2.0	5.1	20.4	20.4	10.2	2.0	2843.9	89.8	31.7	
1.30 ~ 1.40	32.2	7.0	26.3	225.4	245.8	42.4	5.8	2618.5	57.6	45.5	
1.40 ~ 1.50	13.1	15.6	49.0	204.4	450.2	55.5	8.1	2414.1	44.5	54.2	
1.50 ~ 1.60	8.5	26.5	59.8	225.3	675.5	64.0	10.6	2188.8	36.0	60.8	
+ 1.60	36.0	60.8	82.0	2188.8	2864.3	100.0	28.6				
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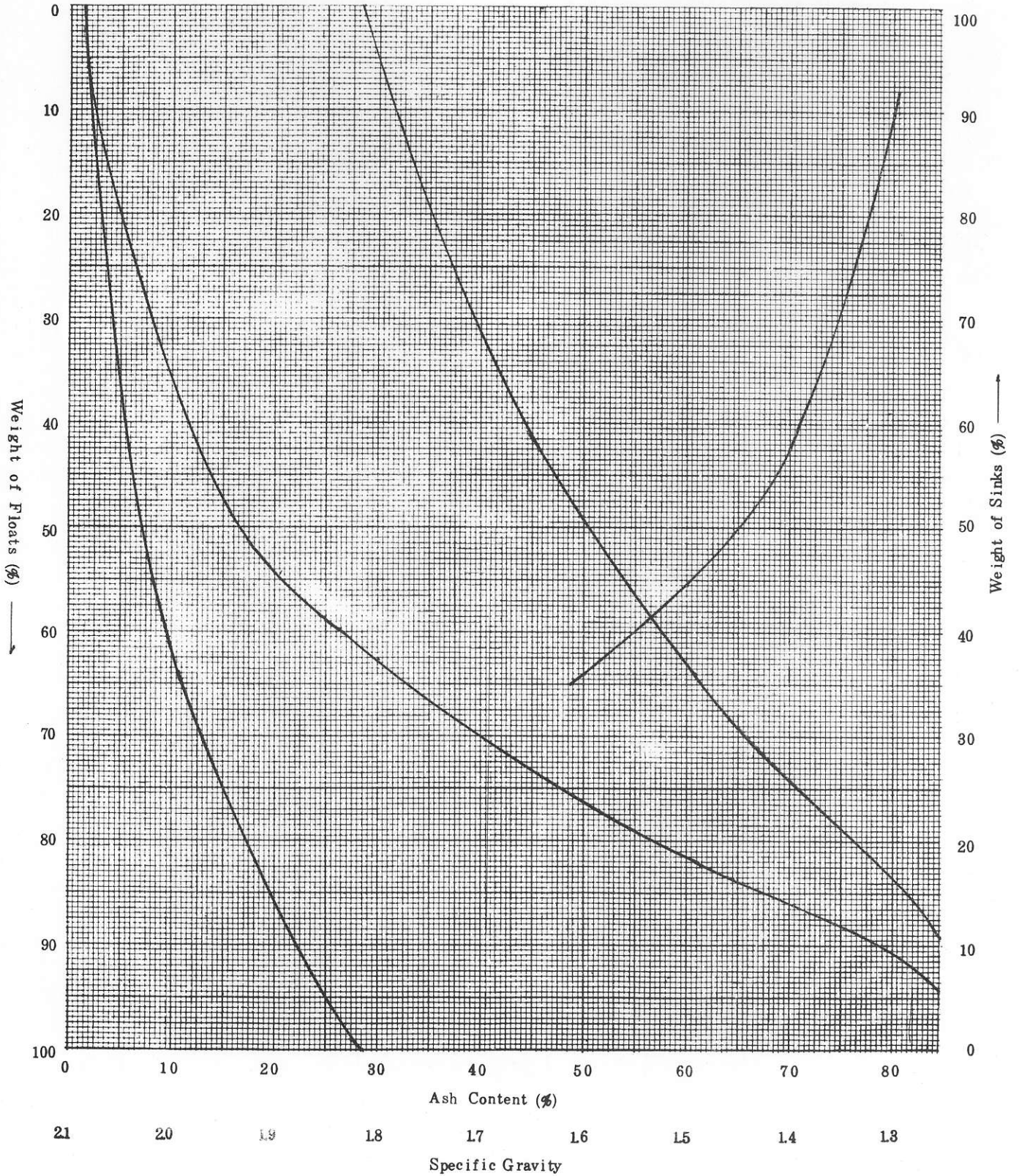
Washability Curves

SAMPLE: #7 Seam Composite

DATE: Feb. 25, 1977

SIZE : 2"x0

CHOFU RESEARCH LABORATORY,
MITSUI MINING CO., LTD.



PETROGRAPHIC ANALYSIS

Line Creek
 Name of Coa #6 Seam Upper
 Location _____
 Seam _____
 Pit _____

MITSUI MINING CO., LTD.
 S. 52 - 2 - 28

Date of Sampling _____
 Date of Arrival _____

Descriptor _____

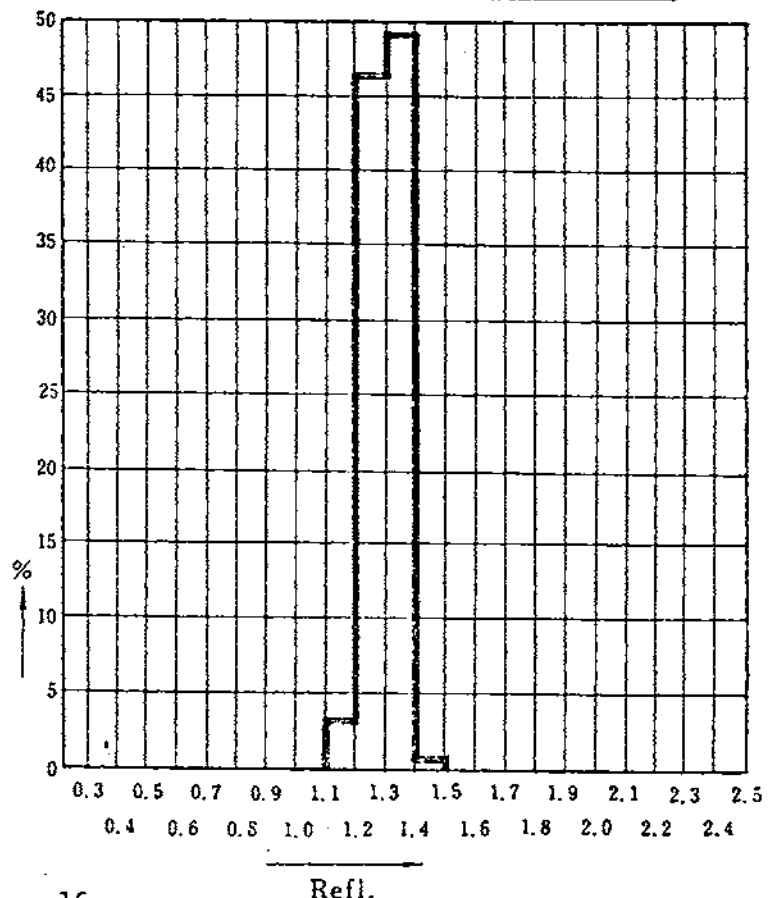
		Petrographic Analysis	
Reactive Entities	Vitrinoid Types	1	
		2	
		3	
		4	
		5	
		6	
		7	
		8	
		9	
		10	
		11	1.5
		12	24.1
		13	25.2
		14	0.5
		15	
		16	
		17	
		18	
		19	
		20	
		21	
		Vitrinoids	51.5
		1/3 S. Fus.	9.0
		Resinoids	
		Exinoids	
		Total Reactives	60.5
Inert Entities		2/3 S. Fus.	17.9
		Micrinoids	14.6
		Fusinoids	1.1
		Min. Matter	4.8
		Sclerotinite	0.8
		Weathered	0.5
		Total Inerts	39.7
		Mean Refl.	1.29
		Strength Index	5.29
		Comp. Balance Index	2.49
		Calculated Strength	52

Aproximate Analysis		
Moisture	2.4	%
Ash	9.6	%
Vol. Matter	20.7	%
Fix Carbon	67.3	%
Sulphur	0.54	%
F. S. I.	2	
Cal		Kcal/kg

Ultimate Analysis		
Carbon	87.8	%
Hydrogen	4.6	%
Oxygen	5.8	%
Nitrogen	1.3	%
Sulfue	0.5	%

Gieseler Plastometer		
Max. Fluidity	17	D.D.P.M.
Softening Temp.	-	°C
Max. Fluid Temp.	-	°C
Solid. Temp.	-	°C
Range	-	°C

Histogram of Reflectance



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PETROGRAPHIC ANALYSIS

Name of Coal Line Creek #6 Seam Bottom

MITSUI MINING CO., LTD.

S. 52 - 2 - 28

Location _____
Seam _____
Pit _____

Date of Sampling _____
Date of Arrival _____

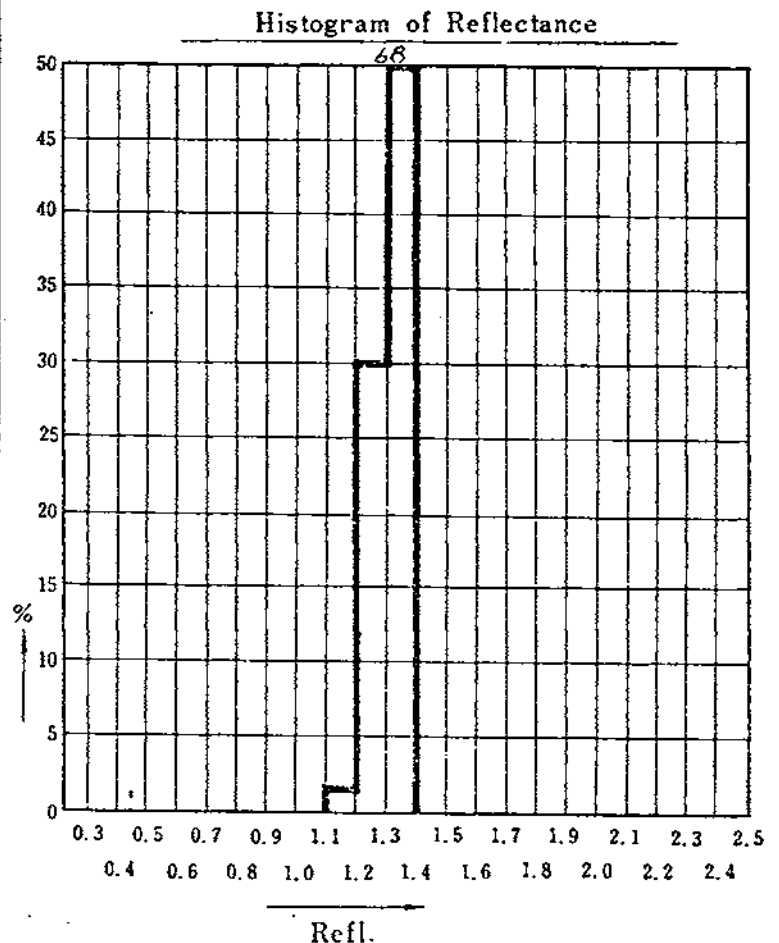
Descriptor _____

Petrographic Analysis	
Reactive Entities	Vitrinoid Types
	1
	2
	3
	4
	5
	6
	7
	8
	9
	10
	11
	12
	13
	14
	15
	16
	17
	18
	19
	20
21	
Vitrinoids 59.0	
1/3 S. Fus. 7.8	
Resinoids	
Exinoids	
Total Reactives 66.8	
Inert Entities	2/3 S. Fus. 15.6
	Micrinoids 11.2
	Fusinoids 0.5
	Min. Matter 4.7
	Seleninite 0.3
	Weathered 0.9
	Total Inerts 33.2
Mean Refl. 1.30	
Strength Index 5.53	
Comp. Balance Index 1.88	
Calculated Strength 58	

Aproximate Analysis		
Moisture	1.4	%
Ash	9.4	%
Vol. Matter	22.8	%
Fix Carbon	66.4	%
Sulphur	0.56	%
F. S. I.	7	
Cal		Kcal/kg

Ultimate Analysis		
Carbon	88.6	%
Hydrogen	4.9	%
Oxygen	3.9	%
Nitrogen	2.0	%
Sulfue	0.6	%

Gieseler Plastometer		
Max. Fluidity	21	D.D.P.M.
Softening Temp.	422	°C
Max. Fluid Temp.	455	°C
Solid. Temp.	485	°C
Range	63	°C



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PETROGRAPHIC ANALYSIS

Name of Coal Line Creek #7 Seam Upper
 Location _____
 Seam _____
 Pit _____

MITSUI MINING CO., LTD.
 S. 52 - 2 - 28

Date of Sampling _____
 Date of Arrival _____

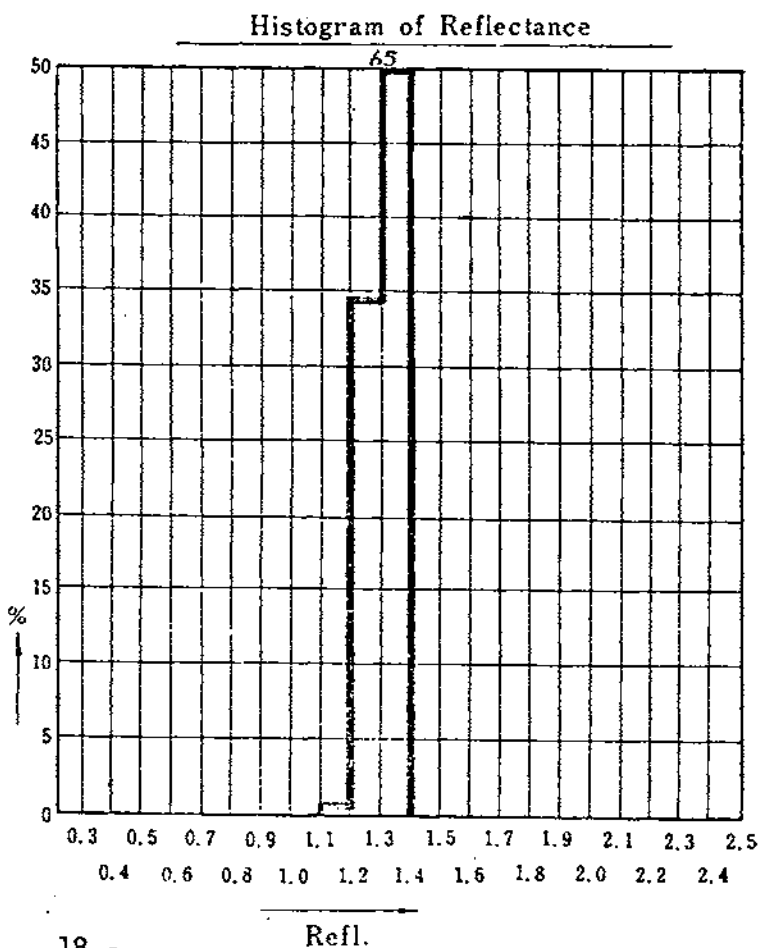
Descriptor _____

		Petrographic Analysis	
Reactive Entities	Vitrinoid Types	1	
		2	
		3	
		4	
		5	
		6	
		7	
		8	
		9	
		10	
		11	0.5
		12	16.4
		13	31.3
		14	
		15	
		16	
		17	
		18	
		19	
		20	
		21	
	Vitrinoids	48.2	
	1/3 S. Fus.	9.2	
	Resinoids		
	Exinoids		
	Total Reactives	57.4	
Inert Entities	2/3 S. Fus.	18.5	
	Micrinoids	15.9	
	Fusinoids	1.1	
	Min. Matter	4.7	
	Sclerotinite	1.6	
	Weathered	0.8	
	Total Inerts	42.6	
	Mean Refl.	1.30	
	Strength Index	5.28	
	Comp. Balance Index	2.82	
	Calculated Strength	49	

Aproximate Analysis		
Moisture	2.0	%
Ash	9.4	%
Vol. Matter	21.1	%
Fix Carbon	67.5	%
Sulphur	0.50	%
F. S. I.	3 1/2	
Cal		Kcal/kg

Ultimate Analysis		
Carbon	88.6	%
Hydrogen	4.8	%
Oxygen	4.9	%
Nitrogen	1.2	%
Sulfue	0.5	%

Gieseler Plastometer		
Max. Fluidity	1	D.D.P.M.
Softening Temp.	-	°C
Max. Fluid Temp.	452	°C
Solid. Temp.	-	°C
Range	-	°C



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PETROGRAPHIC ANALYSIS

Line Creek
 Name of Coal #7 Seam Bottom
 Location _____
 Seam _____
 Pit _____

MITSUI MINING CO., LTD.
 S. 52 - 2 - 28

Date of Sampling _____
 Date of Arrival _____

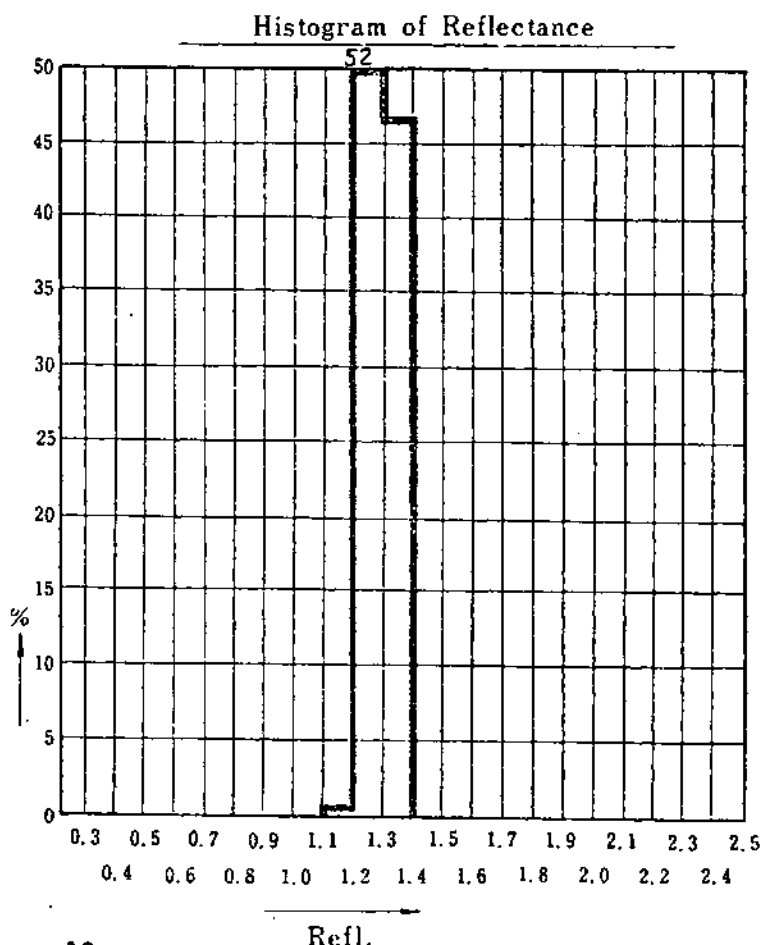
Descriptor

		Petrographic Analysis		
Reactive Entities	Vitrinoid Types	1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11		
		12	0.6	
		13	31.3	
		14	28.2	
		15		
		16		
		17		
		18		
		19		
		20		
		21		
		Vitrinoids	60.1	
		1/3 S. Fus.	7.3	
		Resinoids		
		Exinoids		
		Total Reactives	67.4	
Inert Entities			2/3 S. Fus.	14.7
			Micrinoids	9.7
			Fusinoids	0.4
			Min. Matter	4.7
			Schrotinite	0.3
			Weathered	2.8
			Total Inerts	32.6
			Mean Refl.	1.29
		Strength Index	5.32	
		Comp. Balance Index	1.75	
		Calculated Strength	58	

Aproximate Analysis		
Moisture	1.4	%
Ash	9.4	%
Vol. Matter	22.9	%
Fix Carbon	66.3	%
Sulphur	0.53	%
F. S. I.	7 1/2	
Cal		Kcal/kg

Ultimate Analysis		
Carbon	88.8	%
Hydrogen	5.0	%
Oxygen	4.2	%
Nitrogen	1.4	%
Sulfue	0.6	%

Gieseler Plastometer		
Max. Fluidity	33.	D.D.P.M.
Softening Temp.	416.	°C
Max. Fluid Temp.	455.	°C
Solid. Temp.	482.	°C
Range	66.	°C



* S. Fus. 22.0% 中に
 V. Transitional 0.1% を含む。