SHELL
K-HORSESHOE RIDGE 80(3) A

April 30/81

HORSESHOE RIDGE
COAL PROJECT
SHELL CANADA RESOURCES LTD
CL# 295, 296, 299, 368, 369, 373
LOGS Dave Handy

404

CONFIDENTIAL

ENCLOSURE 9

GEOLOGICAL BRANCH
ASSESSMENT REPORT

00 404

ROTARY HOLE NO. HSR-RDH-301

DATE	September 26, 1980 - October 2, 1980
ELEV.	1771.86
NORTHING	5533828.74
EASTING	661484.45
TOTAL DEPTH	294.1 m
ANGLE	-90°
AZIMUTH	-
LOGS RUN	Gamma, Neutron, Long Spaced Density (through rods) Caliper, Gamma, Density (open hole to 171 m) Partial Resistivity, Denisty Detail

Sample Depth (m)	Lithology (Chip Samples)
0.00	Over burden
1.52	Sandstone - med. gr., salt & pepper, weathered-or-br.
3.05	A/A - fine gr.
4.57	A/A and Siltstone- dark gray
6.10	A/A
7.62	Sandstone - fine gr. (brown)
9.14	Coaly Shale
10.67	A/A
12.19	A/A and Sandstone - fine gr, weathered brown
13.72	Sandstone/Coaly Shale/Coal
15.24	Coaly Shale/Coal
16.76	Siltstone-black
17.62 - 20.09	Coal
21.34	Sandstone- gray, fine gr.
22.34 - 22.56	Coal
22.86	Siltstone - dark gray
24.38	Sandstone - fine gr. to v. fine gr., gray
25.91	A/A
27.43	Siltstone - dark gray to black
28.96	Sandstone - fine gr. to v. fine gr., gray
30.18 - 31.85	Coal
32.00	Sandstone - fine gr., black, carbonaceous
33.56 - 34.23	Coal

ROTARY HOLE NO. HSR-RDH-301

Sample Depth (m)	LITHOLOGY
35.05	Sandstone - fine gr., dark gray
36.58	Sandstone - med. gr., gray
38.10	A/A
39.62	A/A
41.15	A/A
42.67	A/A
44.20	Sandstone - med. gr., highly oxidized or.-br., fault?
45.72	Sandstone - med. gr., dark gray with orange specs-less oxidized
47.24	A/A - med. gr., gray, A/A
48.77	A/A
50.29	A/A salt and pepper
51.82	A/A
53.34	A/A
54.86	Sandstone - med. gr., dark gray
56.39	Sandstone - A/A fine gr.
57.91	Sandstone - A/A - med. gr.
59.44	N.S.
60.96	Sandstone - oxidized as 44.20/br.
62.48	Sandstone - gray, med. gr., oxidized - brown
64.01	Sandstone - as 45.72
64.37 - 64.53	Coal
65.53	Sandstone A/A
67.06	A/A
68.58	Sandstone - gray, fine gr.
70.10	A/A
71.63	A/A
73.15	A/A
74.68	A/A
76.20	A/A
77.72	A/A - minor calcite
79.25	A/A - no calcite
80.77	Sandstone - med. gr., salt and pepper

ROTARY HOLE NO. HSR-RDH-301

Sample Depth (m)	LITHOLOGY
82.30	A/A
83.83	A/A
85.34	A/A
86.87	A/A
88.39	Siltstone - dark gray
89.92	A/A
91.44	Sandstone - salt and pepper A/A
92.96	A/A - minor calcite
94.49	Sandstone - A/A
96.01	Siltstone - dark gray
97.54	A/A
99.06	A/A
100.58	A/A
102.11	A/A
103.63	Siltstone A/A to r. fine gr. SST
105.16	Sandstone - fine gr., gray
106.68	Sandstone - A/A, minor calcite
108.20	A/A
109.73	A/A
111.25	Sandstone - med. gr., gray
112.78	Sandstone - med. gr., salt and pepper, minor calcite
114.30	A/A
115.82	A/A
117.35	A/A
118.87	A/A
120.40	Sandstone - med. - fine gr., A/A
121.5 - 124.0	Coal
123.44	Sandstone - med. gr., salt and pepper
End of hole for Nielsen	Drilling - due to care problems
Resumed drilling with SDS- dual wall	
124.97 - 126.49	Sandstone - A/A some brown oxidation

ROTARY HOLE NO. HSR-RDH-301

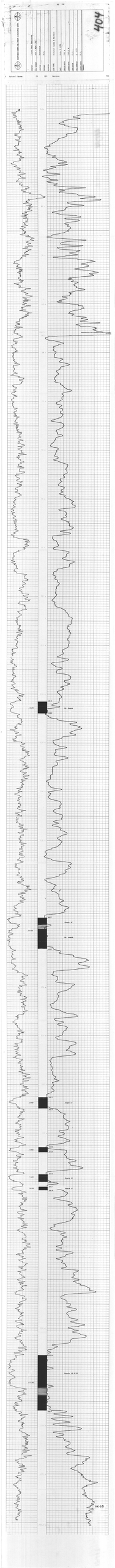
Sample Depth (m)	LITHOLOGY
126.5 - 128	A/A
128 - 129.5	A/A
129.5 - 131	Carb. to Coaly Shale
131 - 132.6	A/A
132.6 - 134	Sandstone - fine gr., dark gray
134 - 135.6	Shale - carbonaceous
135.6 - 137	A/A
137 - 138.7	A/A
138.7 - 149	A/A
149 - 150.9	Sandstone - gray, fine gr., minor calcite
150.9 - 152.4	A/A
152.4 - 153.3	A/A
153.3 - 155.5	A/A
155.5 - 157	A/A
157 - 158.5	A/A
158.5 - 160	A/A
160 - 161.5	Sandstone - dark gray, fine grained
161.5 - 163	A/A - minor calcite
163 - 164.6	A/A
165.7 - 172.1	Coal
172.2 - 173.7	Sandstone - med. gr., dark gray
173.7 - 175.3	A/A
175.3 - 176.8	A/A
176.8 - 178.3	A/A
178.3 - 179.8	Sandstone - fine gr., dark gray
179.8 - 181.4	A/A
181.4 - 182.9	A/A
182.9 - 184.4	A/A
184.4 - 185.9	A/A
185.9 - 187.5	A/A - minor calcite
187.5 - 189.0	Siltstone-carb. with v. fine gr. SST A/A&carb
190.5 - 192.0	Sandstone - fine gr., minor calcite

ROTARY HOLE NO. HSR-RDH-301

Sample Depth (m)	LITHOLOGY
192.0 - 193.6	A/A
193.6 - 195.1	A/A
195.1 - 196.6	A/A
196.6 - 198.1	A/A
198.1 - 199.6	A/A- fine to v. fine gr.
199.6 - 201.2	A/A
202.7 - 205.0	Coal
205.7 - 207.3	Sandstone - dk. gray, fine to med. gr.
207.3 - 208.8	A/A - minor calcite
208.8 - 210.3	A/A - med. gr.
210.3 - 211.8	A/A - minor coal
213.0 - 214.0	Coal
214.8 - 216.4	Sandstone - dk. gray, fine gr.
216.4 - 217.9	A/A - minor calcite
218.5 - 220.1	Coal
221.1 - 221.8	Coal
222.5 - 224.0	Sandstone - v. fine gr. - fine gr., minor calcite
224.0 - 225.6	A/A
227.1 - 228.6	A/A
228.6 - 230.1	A/A
230.1 - 231.6	A/A - minor orange oxidation
231.6 - 233.1	Sandstone - dark gray, fine gr.
233.1 - 234.7	A/A - v. fine gr.
234.7 - 236.2	Siltstone - dk. gray, black, coaly
236.2 - 237.7	Sandstone - dk. gray, fine gr.
237.7 - 239.3	Siltstone - A/A
239.3 - 240.8	A/A
240.8 - 242.3	Sandstone - dk. gray, fine gr.
242.3 - 243.8	Sandstone - dk. gray, med. gr.
245.4 - 246.9	A/A
246.9 - 248.4	Sandstone - dk. gray, fine gr.

ROTARY HOLE NO. HSR-RDH-301

Sample Depth (m)	LITHOLOGY
249.9 - 251.5	A/A
251.5 - 253.0	A/A
253.0 - 254.5	A/A - v. fine gr.
255.6 - 267.0	Coal
268.2 - 269.7	Sandstone - dk. gray, fine gr.
269.7 - 271.3	A/A
271.3 - 272.8	A/A
272.8 - 274.3	A/A
274.3 - 275.8	Siltstone - carb., black
275.8 - 277.4	Sandstone - dk. gray, fine gr.
277.4 - 278.9	A/A - fine gr. to v. fine gr.
278.9 - 280.4	A/A
280.4 - 281.9	A/A minor calcite
281.9 - 283.5	A/A
283.5 - 285.0	A/A
285.0 - 286.5	A/A
286.5 - 288.0	A/A
288.0 - 289.6	A/A
289.6 - 291.1	A/A
291.1 - 292.6	A/A
292.6 - 294.1	A/A
294.1	T.D.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SEISMOGRAPHS
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Seismometer
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Time Marks
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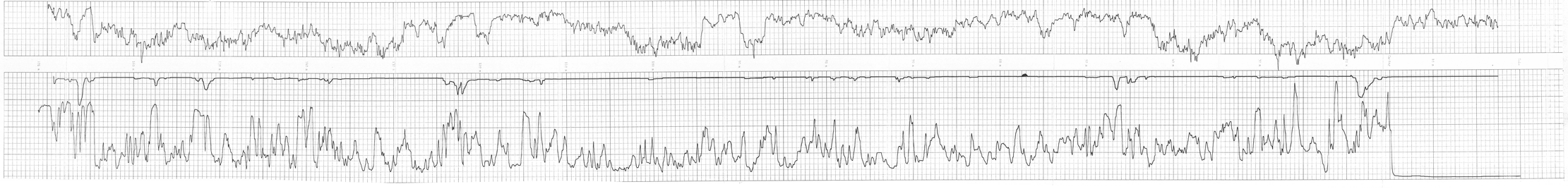

DAVIES EXPLORATION LOGGING LTD.

COMPANY	Ocean Rest Resources
HOLE NUMBER	O.R.R.-B2H-301
LOCATION	Nukwatina
PROVINCE	B.C.
ELEVATION	
LOG TYPE	CALIPER, NATURAL GAMMA, ~~RESISTIVITY~~, DENSITY
DATE	Oct. 2 1990
DRILLED DEPTH	258 m
LOGGED DEPTH	175 m
ZERO DRUM	Sur.
HOLE DIAMETER	3.25"
CASING LENGTH	15 m
REMARKS	Drift 1° Depths 5.75m, 8 15m m 1° 25 m 5.75m, 8 50 m

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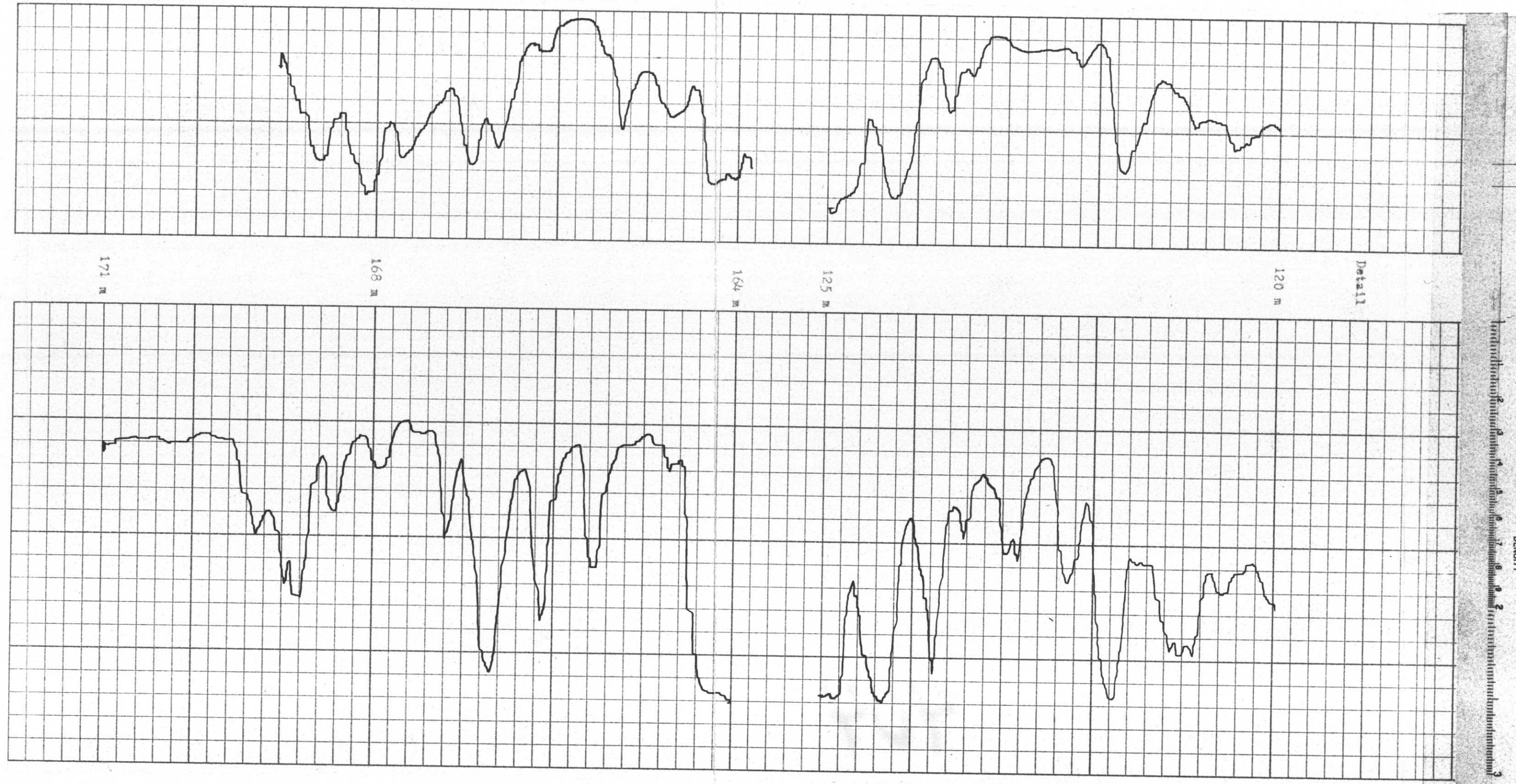

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K HORSESHOE RIDGE 80(3)A

DAVIES EXPLORATION LOGGING LTD.

COMPANY: Crown Nest Resources

HOLE NUMBER: H.S.R. - RDH - 301

LOCATION: Horseshoe

PROVINCE: B.C.

ELEVATION:

LOG TYPE: ~~CALIPER, NATURAL GAMMA~~ RESISTIVITY, DENSITY

DATE: Oct. 2 1980

DRILLED DEPTH:

LOGGED DEPTH:

ZERO DATUM: G.L.

HOLE DIAMETER: 5 1/8"

CASING LENGTH:

REMARKS: Detail

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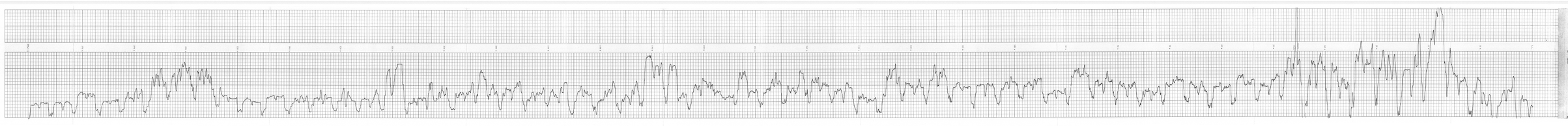

EATON EXPLORATION CANADA LTD.

CLIENT:	Chinook Petroleum
WELL NAME:	100 / 10-01 - 23-6
LOCATION:	Bashaw/Sedgewick
PROVINCE:	Alta.
COMPANY:	
TEST TYPE:	Long Interval Flow
DATE:	Dec. 2, 1972
PRESSURE:	2000 #
CHART NO.:	2100-2
DEPTH:	2
PRESSURE:	2,000
CLOCK:	24 Hr.

404

K-Shell-Horseshoe Ridge
80(4)A

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80(4)A

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APPENDIX 3

CROWS NEST RESOURC ALYSIS REPORT

AREA: HORSESHOE RIDGE HOLE NO. HS 201 DATE: February 18/80 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC. BASIS
79-623			10-28 drill cuttings	RAW	4.42	.50	46.84	15.07	37.59	1	0.5		7,692	ADB
														ARB
							47.07	15.15	37.78				7,731	DB
		8 UPPER		1.5 FLOAT		.35	8.51	22.41	68.73	4½	0.5	33	14,049	ADB
							8.54	22.49	68.97				14,098	DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-624			54-78 drill cuttings	RAW	11.03	.40	42.37	15.82	41.41	1	0.5		8,379	ADB
														ARB
							42.54	15.88	41.58				8,413	DB
		8 LOWER		1.5 FLOAT		.26	7.79	22.41	69.54	4	0.5	50	14,174	ADB
							7.81	22.47	69.72				14,211	DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-625			263-265 drill cuttings	RAW	25.14	.37	49.52	21.40	28.71	1	0.5		6,522	ADB
														ARB
							49.70	21.48	28.82				6,546	DB
				1.5 FLOAT		.33	10.19	20.76	68.72	5	0.5	32	13,813	ADB
		10					10.22	20.83	68.95				13,859	DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCE ANALYSIS REPORT

AREA: HORSESHOE RIDGE HOLE NO. HS 201 DATE: February 18/80 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC. BASIS
79-626		10	266.5-274 drill cuttings	RAW	11.13	.38	42.85	18.37	38.40	1	0.5		7,948	ADB
														ARB
							43.01	18.44	38.55				7,978	DB
				1.5 FLOAT		.22	9.72	19.74	70.32	2½	0.5	37	13,910	ADB
							9.74	19.78	70.48				13,941	DB
				FLOAT										ADB
														DB
				FLOAT										ADB
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				RAW										ADB
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														DB

CROWS NEST RESOURCES ANALYSIS REPORT

AREA: HORSESHOE RIDGE HOLE NO. HS 202 DATE: February 25, 1980 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/LB	CALC. BASIS
79-627			39.5-43.3	RAW	15.60	.49	45.52	17.13	36.86	4				ADB
														ARB
							45.74	17.21	37.05					DB
		Upper	Drill Cutting	1.5 FLOAT		.55	6.53	26.92	66.00	8		45		ADB
							6.57	27.07	66.36					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-628			43.3-46.8	RAW	2.86	.34	45.93	17.39	36.34	5½				ADB
														ARB
		Upper	Drill Cutting				46.10	17.45	36.45					DB
				1.5 FLOAT		.45	5.87	27.56	66.12	8		44		ADB
							5.90	27.69	66.41					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-629			46.8-51.3	RAW	2.76	.41	10.89	25.72	62.98	7				ADB
		Upper												ARB
							10.93	25.83	63.24					DB
			Drill Cuttings	1.5 FLOAT	.64	.64	5.07	27.19	67.10	8		87		ADB
							5.10	27.37	67.53					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCES ALYSIS REPORT

AREA: HORSESHOE RIDGE HOLE NO. HS 202 DATE: February 25, 1980 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC. BASIS
9-630		8 UPPER	51.3-58 Drill Cuttings	RAW	2.72	.49	31.15	22.68	45.68	5½				ADB
														ARB
							31.30	22.79	45.91					DB
				1.5 FLOAT		.42	6.42	26.80	66.36	8		58		ADB
							6.45	26.91	66.64					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
9-631		8 UPPER	58-63 Drill Cuttings	RAW	16.60	.63	15.83	24.72	58.82	4				ADB
														ARB
							15.93	24.88	59.19					DB
				1.5 FLOAT		.44	5.18	27.47	66.91	7½		80		ADB
							5.20	27.59	67.21					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-632		8 UPPER	63-70 Drill Cuttings	RAW	23.39	.46	38.33	19.20	42.10	3½				ADB
														ARB
							38.51	19.29	42.20					DB
				1.5 FLOAT		.08	5.61	27.35	66.96	8		53		ADB
							5.61	27.37	67.02					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCES. ALYSIS REPORT

AREA: HORSESHOE RIDGE HOLE NO. HS 202 DATE: February 25, 1980 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC. BASIS
9-639		?	206-210	RAW	10.61	.02	40.53	18.84	40.61	1				ADB
														ARB
							40.54	18.84	40.62					DB
			Drill Cuttings	1.5FLOAT		.31	9.19	23.34	67.16	4		44		ADB
							9.22	23.41	67.37					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				RAW										ADB
														ARB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				RAW										ADB
														ARB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCES ALYSIS REPORT

AREA: HORSESHOE RIDGE HOLE NO. HS 202 DATE: February 25, 1980 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC. BASIS
9-633		8 lower	90-94	RAW	14.70	.44	34.44	19.58	45.54	4				ADB
														ARB
							34.59	19.67	45.74					DB
			Drill Cuttings	1.5 FLOAT		.24	6.97	25.75	67.04	7		59		ADB
							6.99	25.81	67.20					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-634		8 lower	100-103	RAW	10.34	.39	36.94	19.26	43.41	3½				ADB
														ARB
							37.08	19.34	43.58					DB
			Drill Cuttings	1.5 FLOAT		.14	8.02	25.63	66.21	7		49		ADB
							8.03	25.67	66.30					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
9-635		8 lower	111-118	RAW	7.80	.11	23.47	21.21	55.21	2½				ADB
														ARB
							23.50	21.23	55.27					DB
			Drill Cuttings	1.5 FLOAT		.30	9.30	23.78	66.62	5½		68		ADB
							9.33	23.85	66.82					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCE ANALYSIS REPORT

AREA: HORSESHOE HOLE NO. HS 203 DATE: March 12/80 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC. BASIS
79-637			68.5-69.0	RAW	9.21	.53	34.24			3½				ADB
														ARB
							34.42							DB
				1.5 FLOAT		.54	10.52	20.68	68.26	6		55		ADB
		10					10.58	20.79	68.63					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-638			69.0-69.5	RAW	9.68	.38	52.78			1½				ADB
														ARB
							52.98							DB
				1.5 FLOAT		.51	11.18	21.75	66.56	8		28		ADB
		10					11.24	21.86	66.90					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-639			76-77	RAW	3.85	.34	50.59			1				ADB
														ARB
							50.76							DB
				1.5 FLOAT			NO SAMPLE					00		ADB
		10												DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCE ANALYSIS REPORT

AREA: HORSESHOE HOLE NO. HS 203 DATE: March 12/80 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/LB	CALC. BASIS
79-640		10	79.5-80	RAW	.72	.20	34.85			1				ADB
														ARB
							34.92							DB
				1.5 FLOAT		.61	10.02	20.09	69.28	3		50		ADB
							10.08	20.21	69.71					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-641		10	82.5-83.5	RAW	.11	.27	65.41			½				ADB
														ARB
							65.59							DB
				1.5 FLOAT		.37	14.06	19.80	65.77	3		14		ADB
							14.11	19.87	66.02					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-642		10	87.5-88.0	RAW	4.55	.23	33.25			2				ADB
														ARB
							33.33							DB
				1.5 FLOAT		.32	10.70	20.66	68.32	3		64		ADB
							10.73	20.73	68.54					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCE ALYSIS REPORT

AREA: HORSESHOE HOLE NO. HS 203 DATE: March 12/80 ANALYST Bernie, Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC. BASIS
79-643		/0	96.5-97.0	RAW	.17	.42	55.50			1				ADB
														ARB
							55.73							DB
				1.5 FLOAT		.31	10.62	22.22	66.85	8		21		ADB
							10.65	22.29	67.06					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				RAW										ADB
														ARB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				RAW										ADB
														ARB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCES ALYSIS REPORT

AREA: HORSESHOE HOLE NO. DDH HS 204 DATE: March 14, 1980 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC. BASIS
79-343	HS 1		30.6-31.4	RAW	4.76	.74	13.47			1				ADB
														ARB
							13.57							DB
		3		1.5 FLOAT		1.09	5.95	26.38	66.58	1		76		ADB
							6.01	26.67	67.32					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
9-344	HS 2		32.8-34.5	RAW	2.20	.85	17.49			½				ADB
														ARB
							17.64							DB
		3		1.5 FLOAT		1.74	4.16	26.38	67.72	½		73		ADB
							4.23	26.85	68.92					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-345	HS 3		57.6-59.1	RAW	1.69	.70	19.41			1½				ADB
														ARB
							19.55							DB
		4 upper		1.5 FLOAT		1.04	4.86	26.19	67.91	1½		75		ADB
							4.91	26.47	68.62					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCE ANALYSIS REPORT

AREA: HORSESHOE HOLE NO. HS 204 DATE: March 14, 1980 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/LB	CALC. BASIS
79-346	HS 4		61.2-65.2	RAW	6.67	.60	64.99			0				ADB
														ARB
							65.38							DB
				1.5 FLOAT		1.01	6.54	25.10	67.35	0		19		ADB
		4 LOWER					6.61	25.36	68.03					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-347	HS 5		72.8-74.6	RAW	4.72	.89	19.16			1½				ADB
														ARB
							19.33							DB
				1.5 FLOAT		1.07	4.50	26.18	68.25	1½		71		ADB
		5					4.55	26.46	68.99					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-348	HS 6		75.6-76.2	RAW	1.68	.54				4				ADB
														ARB
							22.19							DB
				1.5 FLOAT		.56	6.11	27.51	65.82	8		73		ADB
		5					6.14	27.67	66.19					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCE ANALYSIS REPORT

AREA: HORSESHOE HOLE NO. HS 204 DATE: March 14, 1980 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC. BASIS
79-349	HS 7		99-104	RAW	5.14	.67	34.18			4½				ADB
														ARB
							34.41							DB
				1.5 FLOAT		.51	6.05	25.69	67.75	8		56		ADB
		6 UPPER					6.08	25.82	68.10					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-350	HS 8		107.2-110.7	RAW	3.87	1.01	40.22			0				ADB
														ARB
							40.63							DB
				1.5 FLOAT		.89	6.62	25.08	67.41	1½		39		ADB
		6 LOWER					6.68	25.31	68.01					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-351	HS 10		149.3-155.2	RAW	3.09	.70	23.33			7				ADB
														ARB
							23.49							DB
				1.5 FLOAT		.56	6.12	26.44	66.88	8		71		ADB
		7 UPPER					6.15	26.59	67.26					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURC ALYSIS REPORT

AREA: HORSESHOE HOLE NO. HS 204 DATE: March 14/80 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/LB	CALC. BASIS
79-352	HS 11	7 LOWER	162.3-164.3	RAW	.94	.57	23.14			5½				ADB
														ARB
							23.27							DB
				1.5 FLOAT		.47	7.73	24.51	67.29	7½		69		ADB
							7.77	24.63	67.60					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-353	HS 12	7 LOWER	172.2-173.9	RAW	1.55	.52	21.32			3				ADB
														ARB
							21.43							DB
				1.5 FLOAT		.25	10.52	22.43	66.80	5½		68		ADB
							10.55	22.49	66.96					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-354	HS 13	8 UPPER	243.7-251.5	RAW	2.48	.58	19.56			2½				ADB
														ARB
							19.67							DB
				1.5 FLOAT		.76	6.45	21.84	70.95	4		73		ADB
							6.50	22.01	71.49					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURC ALYSIS REPORT

AREA: HORSESHOE HOLE NO. HS 204 DATE: March 14/80 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC. BASIS
79-622	HS 14	8 LOWER	259.9-260.9	RAW	3.48	.67	15.33			1½				ADB
														ARB
							15.43							DB
				1.5 FLOAT		.95	5.79	20.63	72.63	1½		76		ADB
							5.85	20.83	73.32					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-355	HS 15	8 LOWER	261.5-268.3	RAW	3.28	.51	19.32			1				ADB
														ARB
							19.42							DB
				1.5 FLOAT		.72	8.12	21.15	70.01	3½		67		ADB
							8.18	21.30	70.52					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-356	HS 16	8 LOWER	271.7-273.4	RAW	2.26	.44	39.84			1				ADB
														ARB
							40.02							DB
				1.5 FLOAT		.59	8.02	22.72	68.67	7½		37		ADB
							8.07	22.86	69.07					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOUR ALYSIS REPORT

AREA: HORSESHOE HOLE NO. HS 204 DATE: March 14/80 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC BASI
79-357	HS 17		386.7-391.9	RAW	5.08	.55	19.97			2½				ADB
														ARB
							20.08							DB
		9		1.5 FLOAT		.58	6.26	21.48	71.68	5½		72		ADB
							6.30	21.61	72.09					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-358	HS 18		392.8-395.2	RAW	2.78	.40	22.01			3				ADB
														ARB
							22.10							DB
		9		1.5 FLOAT		.65	8.49	21.31	69.55	5½		68		ADB
							8.55	21.45	70.00					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-359	HS 19		410.7-413.2	RAW	1.03	.48	14.17			6½				ADB
														ARB
							14.24							DB
				1.5 FLOAT		.52	8.57	23.73	67.18	7½		81		ADB
		10					8.62	23.85	67.53					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURC ALYSIS REPORT

AREA: HORSESHOE HOLE NO. HS 204 DATE: March 14/80 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC. BASIS
79-360	HS 20		433.8- ---?	RAW	3.40	.33	27.85			4				ADB
														ARB
							27.94							DB
		10		1.5 FLOAT		.85	9.70	22.02	67.43	7		63		ADB
							9.78	22.21	68.01					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				RAW										ADB
														ARB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				RAW										ADB
														ARB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURC ALYSIS REPORT

AREA: HORSESHOE HOLE NO. DDH HS 205 DATE: March 19/80 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC. BASIS
79-644	21	6	10.75-16.05	RAW	0.0	1.10	23.39			1½				ADB
														ARB
							23.65							DB
				1.5 FLOAT		.43	6.57	24.09	68.91	1½		62		ADB
							6.60	24.19	69.21					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-645	22	7 UPPER	57.80-66.40	RAW	5.58	.83	11.24			7½				ADB
														ARB
							11.33							DB
				1.5 FLOAT		.29	5.41	26.42	67.88	8		83		ADB
							5.43	26.50	68.07					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-646	23	7 LOWER	69.20-70.50	RAW	.91	.93	7.05			7½				ADB
														ARB
							7.12							DB
				1.5 FLOAT		.22	5.23	26.36	68.19	8		92		ADB
							5.24	26.42	68.34					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCES ANALYSIS REPORT

AREA: HORSESHOE HOLE NO. HS 205 DATE: March 19/80 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC. BASIS
79-647	24	7 LOWER	75.3-76.1	RAW	3.37	.75	19.96			7				ADB
														ARB
							20.11							DB
				1.5 FLOAT		.39	8.58	26.18	64.85	7½		70		ADB
							8.61	26.28	65.11					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-648	25	7 LOWER	78.60-79.65	RAW	9.76	.46	9.38			7				ADB
														ARB
							9.42							DB
				1.5 FLOAT		.38	6.98	25.88	66.76	8		88		ADB
							7.01	25.98	67.01					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
9-649	26	8 UPPER	152.9-161.4	RAW	4.63	.50	16.86			2½				ADB
														ARB
							16.94							DB
				1.5 FLOAT		.44	6.15	23.01	70.40	3½		76		ADB
							6.18	23.11	70.71					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURC. ALYSIS REPORT

AREA: HORSESHOE HOLE NO. HS 205 DATE: March 19, 1980 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC. BASIS
79-650	27	8 LOWER	165.3-166.35	RAW	1.92	.50	15.72			2				ADB
														ARB
							15.80							DB
				1.5 FLOAT		.45	4.48	23.06	72.01	3		77		ADB
							4.50	23.16	72.34					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-651	28	8 LOWER	168.35-170.35	RAW	4.20	.39	31.87			1				ADB
														ARB
							31.99							DB
				1.5 FLOAT		.40	7.18	22.84	69.58	4		49		ADB
							7.21	22.93	69.86					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-652	29	8 LOWER	171.6-175.75	RAW	3.30	.35	26.16			1½				ADB
														ARB
							26.25							DB
				1.5 FLOAT		.35	8.37	22.93	68.35	3½		57		ADB
							8.40	23.01	68.59					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCES ANALYSIS REPORT

AREA: HORSESHOE HOLE NO. HS 205 DATE: March 19, 1980 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/LB	CALC. BASIS
79-653	30	8 LOWER	179.0-181.15	RAW	2.04	.28	55.77			½				ADB
						-								ARB
							55.91							DB
				1.5 FLOAT		.71	7.04	22.20	70.05	5		22		ADB
							7.09	22.36	70.55					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-654	31 upper	9	245.85-247.0	RAW	2.13	.42	12.88			5½				ADB
														ARB
							12.93							DB
				1.5 FLOAT		.56	6.30	22.59	70.55	6½		82		ADB
							6.33	22.72	70.95					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-655	31 lower	9	247.75-248.55	RAW	4.21	.52	18.04			5½				ADB
														ARB
							18.13							DB
				1.5 FLOAT		.52	6.68	23.43	69.37	8		70		ADB
							6.71	23.55	69.74					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCES ANALYSIS REPORT

AREA: HORSESHOE HOLE NO. HS 205 DATE: March 19/80 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC BASIS
79-656	32		272.0-274.75	RAW	2.40	.46	12.78			2½				ADB
														ARB
							12.84							DB
		10		1.5 FLOAT		.74	6.93	22.14	70.19	3½		83		ADB
							6.98	22.31	70.71					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				RAW										ADB
														ARB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				RAW										ADB
														ARB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCES ANALYSIS REPORT

AREA: HORSESHOE HOLE NO. HS 209 DATE: March 21/80 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC BASI
79-657			138-162	RAW	1.60	.56	52.01			1				ADB
														ARB
							52.30							DB
		10		1.5 FLOAT		.48	9.55	19.69	70.28	5½		30		ADB
							9.60	19.79	70.61					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				RAW										ADB
														ARB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				RAW										ADB
														ARB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

CROWS NEST RESOURCES ANALYSIS REPORT

AREA: HORSESHOE HOLE NO. DDH HS 210 DATE: March 20, 1980 ANALYST Bernie Hudyma

LAB. NO.	SAMPLE NO.	SEAM	INTERVAL (METRES)	FRACTION	% AIR DRY LOSS	% MOISTURE	% ASH	% V.M.	% F.C.	F.S.I.	SULFUR	% YIELD	BTU/ LB	CALC BASIS
79-658		8 Upper	64.66-65.84	RAW	7.87	.51	19.66			5				ADB
														ARB
							19.76							DB
				1.5 FLOAT		.59	5.44	26.12	67.85	8½		66		ADB
							5.47	26.28	68.25					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-659		8 Upper	65.84-66.74	RAW	2.04	.57	78.60			0				ADB
														ARB
							79.05							DB
				1.5 FLOAT		.51	6.37	25.68	67.44	7		6		ADB
							6.40	25.81	67.79					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB
79-660		8 Upper	66.75-70.41	RAW	12.00	.71	28.40			6½				ADB
														ARB
							28.60							DB
				1.5 FLOAT		.44	5.55	24.44	69.57	8½		53		ADB
							5.57	24.55	69.88					DB
				FLOAT										ADB
														DB
				FLOAT										ADB
														DB

Birtley Coal
& Minerals Testing

A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

A REPORT TO
CROWS NEST RESOURCES LIMITED
OF THE WASHABILITY AND PILOT PLANT WASHING
RESULTS OF # 8 UPPER, LOWER & RIDER SEAMS
FROM THE HORSESHOE RIDGE PROJECT

MAY/JUNE 1980

Respectfully Submitted by,

Frank J. Horvat
General Manager

BIRTLEY COAL & MINERALS TESTING

Report No. :BC - 0143

505 - 50th Avenue S.E., P.O. Box 5488, Station "A", Calgary, Alberta T2H 1X9 Telephone (403) 253-8273

Birtley Coal
& Minerals Testing

A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD.

A REPORT TO
CROWS NEST RESOURCES LIMITED
OF THE WASHABILITY AND PILOT PLANT WASHING
RESULTS OF # 8 UPPER, LOWER & RIDER SEAMS
FROM THE HORSESHOE RIDGE PROJECT

MAY/JUNE 1980
REPORT NO.: BC-0143

INTRODUCTION:

The bulk samples were delivered to the Birtley Coal & Minerals Testing plant in Calgary, Alberta in well identified 45 gallon steel drums.

Each bulk sample was weighed, homogenized and a representative head sample extracted for the performance of the washability work according to the format in the report.

The remaining coal was washed as near to the ash specification of 9.5% as was practicable using the heavy media, two stage water cyclone and froth flotation circuits.

The report consists of the washability results with the curves, and the pilot plant balance sheet complete with the clean coal analysis.

505 - 50th Avenue S.E., P.O. Box 5488, Station "A", Calgary, Alberta T2H 1X9 Telephone (403) 253-6273

PILOT PLANT WASHING

Figure 1 is the flowsheet of the BIRTLEY COAL & MINERALS TESTING pilot plant. Raw coal is dumped by front end loader into a feeder unit consisting of a hopper with a 2" slot grizzly across the top, a syntron vibrating feed control and a belt conveyor. The 2" oversize coal is crushed to pass 2" by means of an auxiliary crusher, but "rock" is usually collected in barrels and reported as breaker reject.

The discharge end of the belt conveyor serves as a convenient point for taking the plant feed sample. The feed rate can be adjusted to a maximum of 7.5 metric tons per hour. This feed is conveyed by the bucket elevator to the third deck and discharged into a 3/4" rotary screen. The 3/4" oversize falls via a chute into a 5" x 8" jaw crusher where it is crushed to minus 3/4" and is recycled through the feed system via screw conveyors. The 3/4" x 0 screen underflow is washed with water onto a 28 mesh sieve bend and slot screen for desliming.

Heavy Media Operation

The 3/4" x 28 mesh coal is the feed to the 14" DSM Heavy Media cone on the second deck. The correct medium is adjusted to the required gravity by adding magnetite or diluting with water. The slurry of coal and correct medium is pumped to the cyclone from the mixing tube at a pressure of 9 to 10 psi. The overflow and underflow products are discharged onto a common, but split, 28 mesh drain and rinse screen preceded by a 28 mesh sieve bend where the magnetite is washed off into the correct and dilute medium tanks directly below. Additional clean spray water and baffles across the clean coal stream ensure that a minimum of magnetite is retained in the clean coal product. The coal and shale are collected in barrels by means of individual chutes for weighing.

The dilute medium is pumped to a thickening cone on the third deck from where it is fed to a 30" magnetic separator. The recovered magnetite is sluiced back to the correct medium tank. The specific gravity of the medium is monitored manually, using a density meter, and adjusted for loss by adding cyclone grade magnetite directly to the correct medium tank.

Large Diameter Water-Only Cyclone Operation (14")

The W.O.C. is operated by draining the heavy media system of all magnetite but using the same pumps and water as the medium. The cut point of the W.O.C. is altered by adjusting the vortex finder relative to its proximity to the apex of the cone. The function of the drain and rinse screens, when the W.O.C. is used, is for dewatering only. The heavy media recovery circuit is not utilized.

Fines (28M x 0) Treatment

The 28 mesh x 0 coal collected in the slimes tank ground level is pumped to the thickening cone on the third deck. From this point it can be fed directly to the froth circuit, or as is usual, to the two stage water-only cyclone system.

Coal to the 6" DSM water-only primary cyclone is pumped at a pulp density of 10% to 20% from the cyclone feed tank at a pressure of 20 psi, and a flow rate of 85 Imperial gallons per minute. A mechanically adjustable vortex finder facilitates settings for a desired ash content. The primary cyclone underflow with make-up water is fed to a similarly adjustable secondary 4" unit. The overflow is directed back to the primary cyclone feed tank with the underflow being the waste product.

The waste product is routed to the static thickener while the primary underflow is fed by gravity to a rapped 0.25 mm sieve bend. The sieve bend is the water-only cyclone product at approximately 65 mesh oversize, and is directed to the Eimco disc filter for dewatering.

The sieve bend underflow passes by gravity to the thickening cyclone feed tank, from where it is pumped to the 20° - 8" cyclone. This thickening cone serves a dual purpose: 1) it removes undesirable -325 mesh slimes from the flotation feed; 2) it provides a feed of proper density (15% - 25% solids) to the froth cells. The overflow with the -325 mesh slimes flows to the static thickener.

The flotation circuit consists of two (2) Birtley - Humboldt Multi-Wobble Cells in series. Since these cells were installed on September 12, 1976 there appears to be a marked improvement in tailings ash contents, indicating excellent recovery of froth product. A rotary reagent feeder introduces 4:1 Kerosene:Methylisobutylcarbinol into the circuit at the feed entry point for better conditioning.

The tailings join the water-only cyclone underflow and thickener cone overflow to form the thickener tails. The froth enters the Eimco disc filter and is dewatered along with the sieve bend overflow to form the filter cake or fines product. This and the coarse clean coal are combined to form the clean coal product or clean mix.

Each circuit is sampled for feed, product, and waste in addition to the 0.25 mm sieve bend overflow and underflow, filter cake, thickening cyclone overflow and underflow, and analyzed for ash content. The primary water-only cyclone overflow product is screened at 65 mesh as the plus 65 mesh figure is used to calculate the yield of the water-only cyclone circuit.

The heavy media clean coal is "drained" of extraneous moisture before being combined and homogenized with the partially dried filter cake. This partial drying is accomplished by spreading the fines product on a pad, heated electrically at 20°C, and reducing the moisture content from 22 - 28% to less than 12%.

1 MARCH, 1976

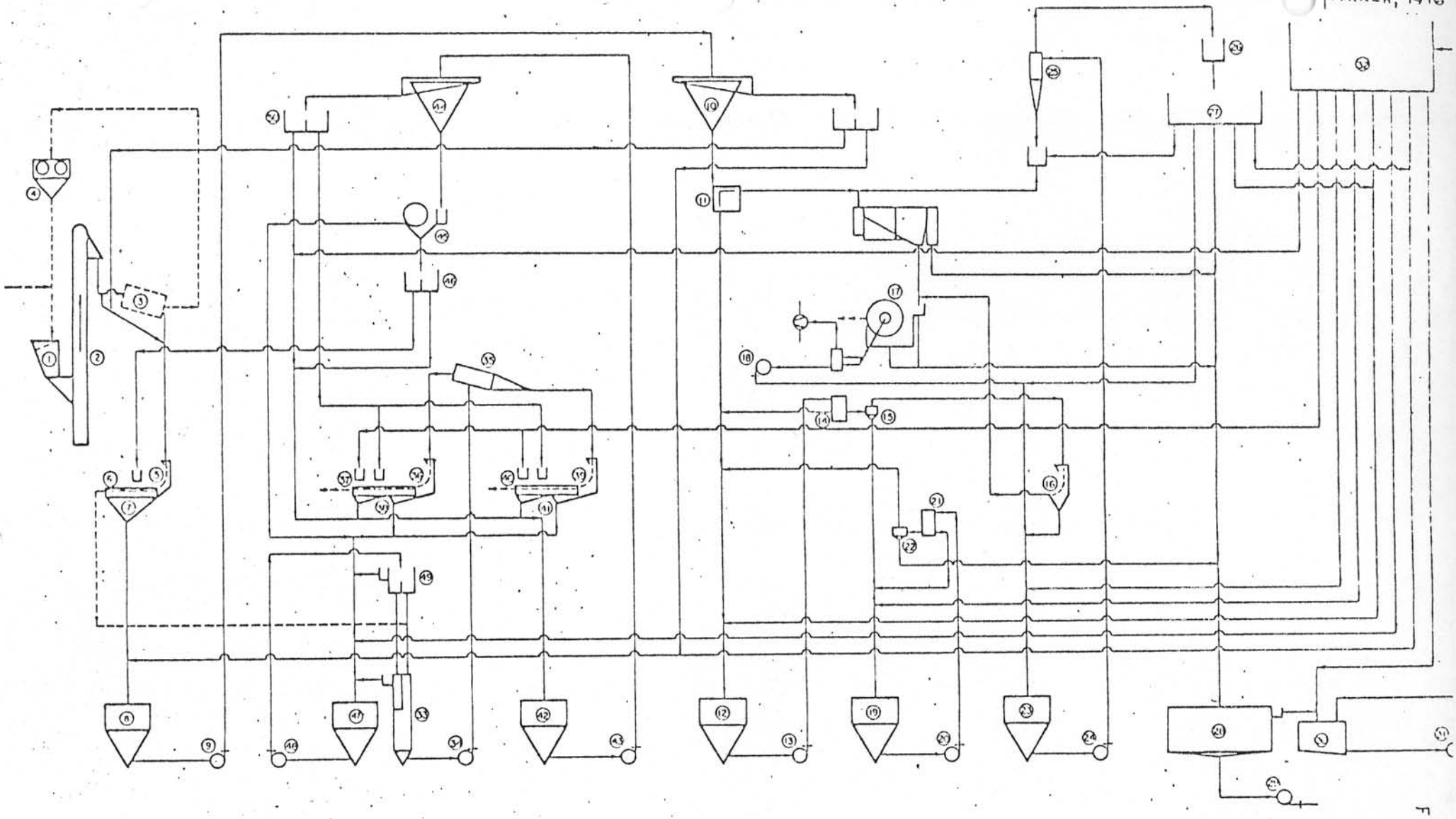


FIGURE 1

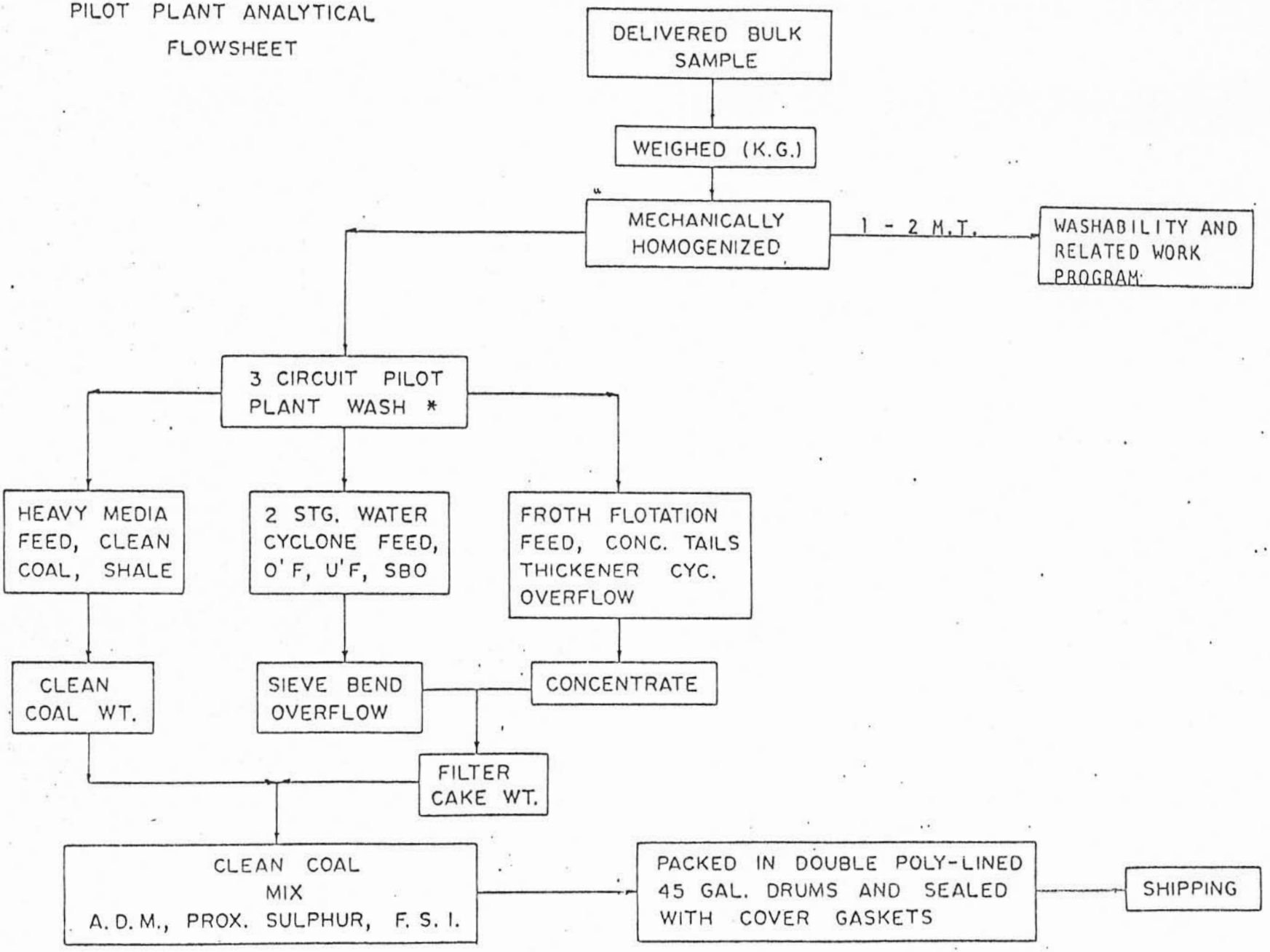
(1) Feed Bin
(2) Elevator
(3) Rotary Screen
(4) Jaw Crusher
(5) Sieve Bend
(6) Desliming Screen
(7) Underflow Collector
(8) 20M-0 Raw Coal Collection Tank
(9) Pump
(10) Settling Cone
(11) Diverter
(12) Primary Water Only Cyclone Feed Tank
(13) Pump
(14) Distributor
(15) Primary Water Only Cyclone
(16) Sieve Bend
(17) Vacuum Filter
(18) Filtrate Water Pump
(19) Secondary Water Only Cyclone Feed Tank
(20) Pump
(21) Distributor
(22) Secondary Water Only Cyclone
(23) Thickening Cyclone Feed Tank
(24) Pump
(25) Thickening Cyclone
(26) Overflow Distributor
(27) Head Box
(28) Thickener
(29) Waste Disposal Pump
(30) Clarified Water Collection Tank
(31) Clarified Water Pump
(32) Clarified Water Head Box
(33) Cyclone Feed Tank
(34) Pump
(35) D.S.M. Cyclone
(36) Sieve Bend
(37) C.C. Drain and Rinse Screen
(38) Underflow Collector
(39) Sieve Bend
(40) Discard Drain and Rinse Screen
(41) Underflow Collector
(42) Dilute Medium Tank
(43) Pump
(44) Settling Cone
(45) Magnetic Separator
(46) Splitter Box
(47) Correct Medium Tank
(48) Pump
(49) Distribution Box.
(50) Splitter Box

TEST PLANT FLOWSHEET

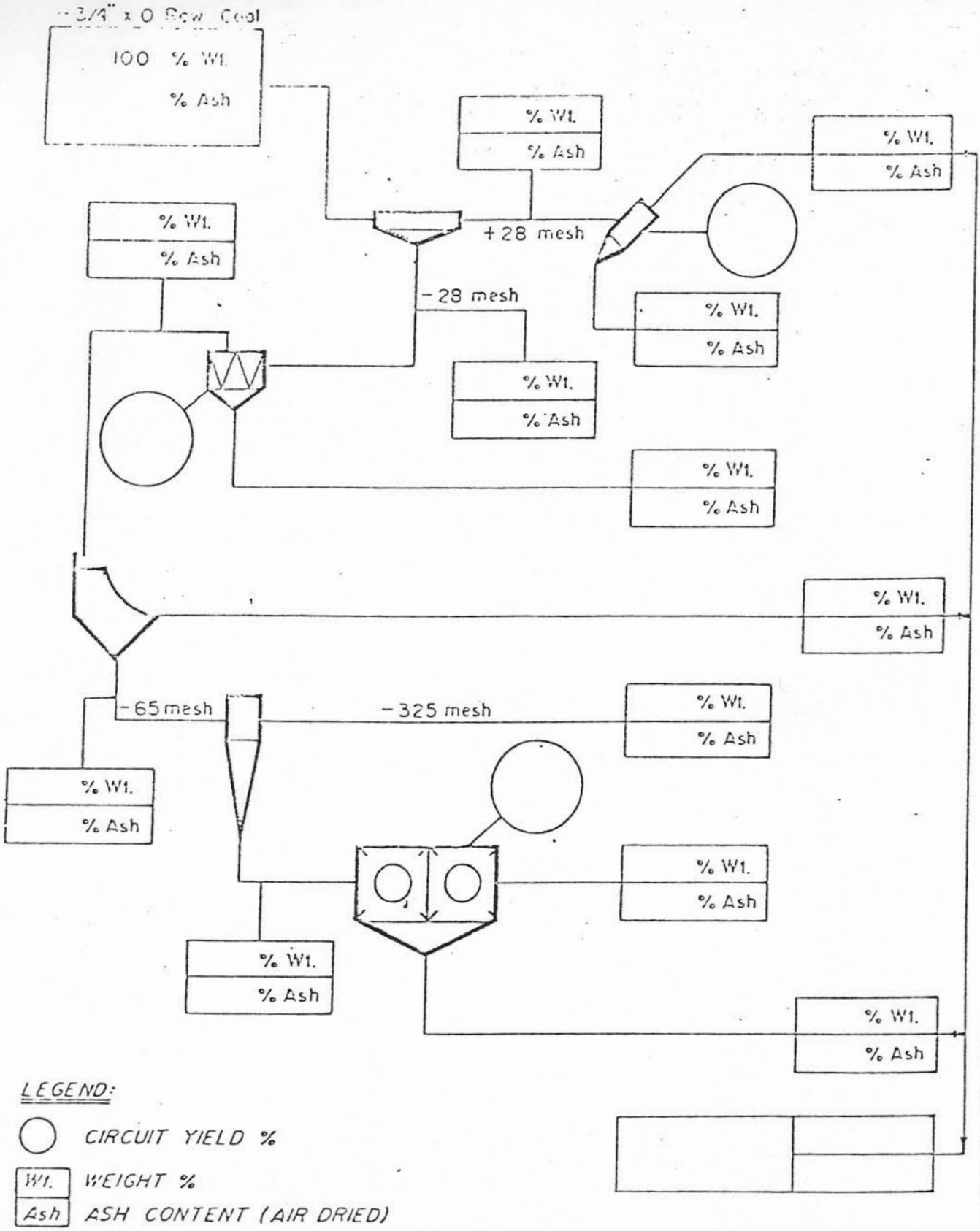
COAL SCIENCE & MINERALS TESTING

DIV. OF BIRTLEY ENGINEERING (CANADA) LTD. CALGARY, ALTA

TYPICAL
PILOT PLANT ANALYTICAL
FLOWSHEET



* ALL PLANT SAMPLES ANALYSED FOR ASH AND F.S.I.



BIRTLEY COAL & MINERALS TESTING

Title	Date
	Drawn

BIRTLEY COAL & MINERALS TESTING

SPECIAL PROCEDURES FOR HANDLING OF BULK SAMPLES

HEAD RAW PREPARATION

The order of preference for delivery of bulk samples is: 1) bulk truck loads. 2) poly-lined jute bags or re-enforced plastic bags. 3) barrels. The coal is dumped onto a steel mixing plate (32' x 60') and subjected to a preliminary mixing by means of a small front end loader and placed in a conical heap in the centre of the plate. (The bucket capacity is about 1 1/2 drums of coal).

Four (4) sampling points (quadrants) are selected along the perimeter of this central pile identified for clarity as Sites #1, #2, #3, #4, (see attached sketch) from which is withdrawn successive bucket loads of coal and placed in "quarter" conical piles relative to the sampling sites. However, to minimize the possibility of bias, on the second sampling pass, coal withdrawn from Site #1 is placed in pile #2, coal withdrawn from Site #2 is placed in pile #3 and so on until the central pile has been transferred into the 4 quartered piles.

Now the coal from the quartered piles is returned to the central location by taking bucket loads successively from piles A, B, C, and D to reform the central conical heap. Four (4) sampling sites are relocated and the whole procedure is repeated three (3) more times after which a head raw sample is extracted, by taking small increments from each of the "quartered" piles of such quantity that four (4) increments will fill two (2) - 45 gallon drums using a portable loading hopper. This hopper is designed in such a way that two (2) barrels are filled simultaneously by means of a split chute. The quantity of sample extracted is dependent on the top size of the coal and must conform to ASTM specifications for sampling of coal.

CLEAN COAL PREPARATION (Clean Mix)

After a preliminary moisture reduction of the heavy media clean coal and the fines filter cake to the desired levels, the products are homogenized as follows:-

The heavy media clean coal is spread in a thin layer on the meticulously clean mixing plate. The filter cake is "seeded" over the surface of the coarse coal by means of the front end loader. This total mass is subjected to a preliminary mixing routine and a central conical heap formed.

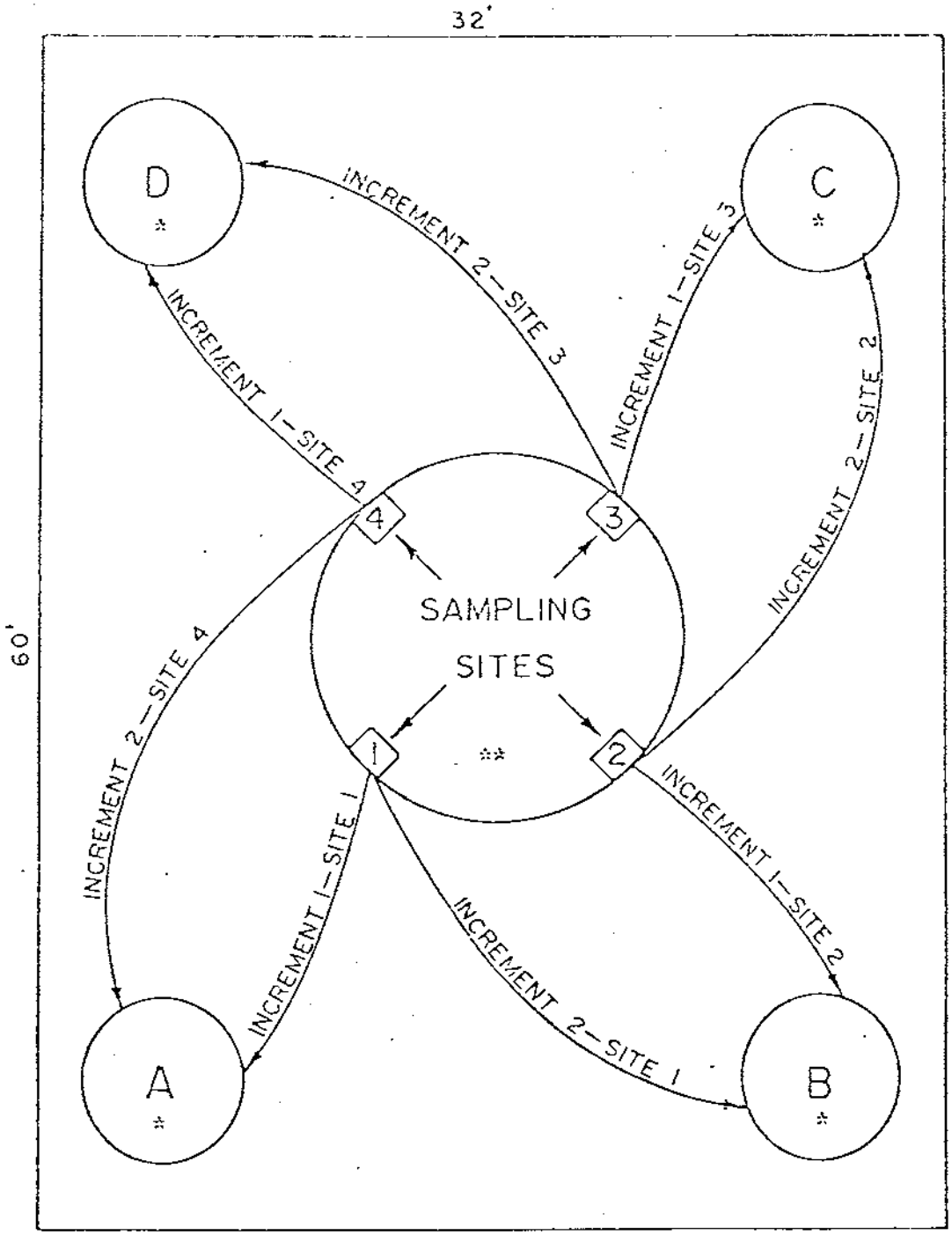
From this point on the procedures outlined for homogenizing the raw coal are strictly followed.

From the final four (4) quarters, double poly-lined barrels are filled by exactly the same procedure as outlined for the raw coal sample extraction. The coal is tamped into the barrels so that each barrel contains about 180 kg including moisture.

During the barrel filling procedure, a minimum of 60 increments are taken from the bucket load quantities with a small square mouth shovel. Each increment is of such quantity that a minimum of 100 kg of coal are retained for analytical purposes.

Finally the plastic liners are tied off and an identifying tag affixed inside the drum. The lid, with a gasket, is firmly attached to seal the barrel and the barrel is stencilled as to contents and destination.

SCHEMATIC OF RAW AND CLEAN COAL HOMOGENIZATION



* "Quarter" Piles ** Central Pile

Continue moving increments until all of the central pile is transferred to the "Quarter" piles A,B,C, and D, i.e. increment 3, site 1 to C, increment 3, site 2 to D, increment 3, site 3 to A, increment 3, site 4 to B etc.

CLIENT: CROWS NEST RESOURCES LIMITED

PROJECT:HORSESHOE RIDGE BLEND CLEAN COAL

LAB NO.:6523

	PROXIMATE								CALC.
ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	BTU/LB	F.S.I.		BASIS
8.4	0.5	9.0	22.0	68.5	0.53	13990	6 1/2		adb
		9.0	22.1	68.9	0.53	14060	-		db

DILATATION TEST				
ST(°C)	MDT(°C)	MC %	MD %	G. NO.
404	482	20	0	0.919

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	455
MAXIMUM	4	486
FINAL	0	513
RANGE =		58

Birtley Coal
& Minerals Testing

CLIENT: CROWS NEST RESOURCES LIMITED

PROJECT: HORSESHOE RIDGE BULK SAMPLE

ADIT 13, SEAM 8 UPPER

LAB NO.: 5090

HEAD RAW ANALYSIS

ADM%	MOISTURE	ASH%	VOL%	FC%	S %	F.S.I.	CALC. BASIS
4.1	0.6	19.4	20.8	59.2	0.51	3	a.d.b.
	4.7	18.6	19.9	56.8	0.49		a.r.b.
		19.5	20.9	59.6	0.51		d.b.

SIZE AND RAW ANALYSIS , a.d.b.

SIZE FRACTION	WT%	RM%	ASH%	VM %	FC%	S%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
2 " x 1/4"	50.0	1.3	23.6	18.9	56.2	0.49	1 1/2	50.0	23.6
1/4"x 28M	37.3	1.6	17.2	20.2	61.0	0.47	5 1/2	87.3	20.8
28M x 65M	6.6	1.2	13.5	21.5	63.8	0.53	7	93.9	20.3
65M x 0	6.1	1.4	14.8	20.6	63.2	0.65	6	100.0	20.0

WT% +2" = 9.6 -crushed to pass 2"

SINK-FLOAT ANALYSIS, a.d.b.: 2" x 1/4"(WT% =50.0)

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
- 1.30	3.2	3.1	9	3.2	3.1
1.30 - 1.35	32.5	6.5	3 1/2	35.7	6.2
1.35 - 1.40	17.6	10.2	2	53.3	7.5
1.40 - 1.45	11.9	14.5	1	65.2	8.8
1.45 - 1.50	5.6	19.6	1	79.8	9.6
1.50 - 1.55	3.4	24.4	1	74.2	10.3
1.55 - 1.60	2.1	29.4	1	76.3	10.8
1.60 - 1.70	2.9	36.1	1	79.2	11.8
1.70 - 1.80	1.6	44.7	1	80.8	12.4
+1.80	19.2	74.4	N.A.	100.0	24.3

Birtley Coal
& Minerals Testing

CLIENT : CROWS NEST RESOURCES LIMITED

PROJECT: HORSESHOE RIDGE BULK SAMPLE

ADIT 13 SEAM 8 UPPER

LAB NO.: 5090

SINK FLOAT ANALYSIS, a.d.b.: 1/4" x 28M(WT% 37.3)

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
- 1.30	28.2	2.3	9	28.2	2.3
1.30 - 1.35	24.2	6.0	4 1/2	52.4	4.0
1.35 - 1.40	13.5	9.0	2 1/2	65.9	5.0
1.40 - 1.45	8.6	13.6	1	74.5	6.0
1.45 - 1.50	5.1	19.1	1	79.6	6.9
1.50 - 1.55	3.1	23.5	1	82.7	7.5
1.55 - 1.60	2.1	29.3	1	84.8	8.0
1.60 - 1.70	2.6	35.4	1	87.4	8.8
1.70 - 1.80	1.8	44.6	1/2	89.2	9.6
+1.80	10.8	73.7	N.A.	100.0	16.5

SINK-FLOAT ANALYSIS ,a.d.b.: 28M x 65M (WT% =6.6)

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
- 1.30	46.2	1.9	9	46.2	1.9
1.30 - 1.35	17.3	5.5	4 1/2	63.5	2.9
1.35 - 1.40	9.8	8.9	1 1/2	73.3	3.7
1.40 - 1.45	6.4	12.8	1	79.7	4.4
1.45 - 1.50	4.0	17.9	1	83.7	5.1
1.50 - 1.55	2.6	24.0	1	86.3	5.6
1.55 - 1.60	1.5	29.0	1	87.8	6.0
1.60 - 1.70	1.9	36.6	1	89.7	6.7
1.70 - 1.80	1.3	46.7	1	91.0	7.3
+1.80	9.0	72.0	N.A.	100.0	13.1

Birtley Coal
& Minerals Testing

CLIENT : CROWS NEST RESOURCES LIMITED

PROJECT: HORSESHOE RIDGE BULK SAMPLE

ADIT 13 SEAM 8 UPPER

LAB NO. 5090

FROTH FLOTATION TEST,a.d.b.: 65M x0 (WT% =6.1)

PRODUCT	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
STAGE 1	62.5	7.3	7	62.5	7.3
STAGE 11	13.8	13.6	4 1/2	76.3	8.4
TAILINGS	23.7	33.9	2	100.0	14.5

FROTH FLOTATION PARAMETERS

Pulp Density	= 10%
Reagent	= 4:1 = Kerosene:MIBC
Dosage	= 0.48 lb/T.D.S.
Conditioning Time	= 60 seconds
Stage 1	= 1st minute froth
Stage 11	= 2nd minute froth

Birtley Coal
& Minerals Testing

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: HORSESHOE RIDGE ADIT 13, SEAM 8 UPPER BULK

LAB NO: 5090

COMPOSITE WASHABILITY DATA: 2"x65M RAW COAL FROM SINK FLOAT ANALYSIS

SPECIFIC GRAVITY FRACTION	DIRECT		% WT. of Ash of Total	Cum. Wt.of Ash %	CUMULATIVE FLOATS		SINK WT.of ASH%	CUMULATIVE SINKS		+0.1 S.G. DISTRIBUTION	
	WT%	ASH%			WT%	ASH%		WT %	ASH%	S.G.	WT%
-1.30	16.2	2.3	0.4	0.4	16.2	2.3	20.0	83.8	23.9		
1.30 -1.35	28.1	6.3	1.8	2.2	44.3	4.8	18.2	55.7	32.7		
1.35 -1.40	15.4	9.7	1.5	3.7	59.7	6.1	16.7	40.3	41.4	1.40	59.0
1.40 -1.45	10.2	14.1	1.4	5.1	69.9	7.3	15.3	30.1	50.8	1.45	34.1
1.45 -1.50	5.3	19.3	1.0	6.1	75.2	8.1	14.3	24.8	57.7	1.50	20.8
1.50 -1.55	3.2	24.0	0.8	6.9	78.4	8.8	13.5	21.6	62.5	1.55	12.0
1.55 -1.60	2.1	29.3	0.6	7.5	80.5	9.3	12.9	19.5	66.2	1.60	8.0
1.60 -1.70	2.7	35.9	1.0	8.5	83.2	10.2	11.9	16.8	70.8	1.70	4.4
1.70 -1.80	1.7	44.8	0.7	9.2	84.9	10.9	11.2	15.1	74.1		
+1.80	15.1	74.1	11.2	20.4	100.0	20.4					

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: HORSESHOE RIDGE ADIT 13, SEAM 8 UPPER BULK

LAB NO: 5090

WASHABILITY DATA: 2"x1/4" RAW COAL FROM SINK FLOAT ANALYSIS

SPECIFIC GRAVITY FRACTION	DIRECT		% WT. of Ash of Total	Cum. Wt.of Ash %	CUMULATIVE FLOATS		SINK WT.of ASH%	CUMULATIVE SINKS		+0.1 S.G. DISTRIBUTION	
	WT%	ASH%			WT%	ASH%		WT %	ASH%	S.G.	WT%
-1.30	3.2	3.1	0.1	0.1	3.2	3.1	24.2	96.8	25.0		
1.30 -1.35	32.5	6.5	2.1	2.2	35.7	6.2	22.1	64.3	34.4		
1.35 -1.40	17.6	10.2	1.8	4.0	53.3	7.5	20.3	46.7	43.5	1.40	67.6
1.40 -1.45	11.9	14.5	1.7	5.7	65.2	8.8	18.6	34.8	53.4	1.45	38.5
1.45 -1.50	5.6	19.6	1.1	6.8	70.8	9.6	17.5	29.2	59.9	1.50	23.0
1.50 -1.55	3.4	24.4	0.8	7.6	74.2	10.3	16.7	25.8	64.7	1.55	13.0
1.55 -1.60	2.1	29.4	0.6	8.2	76.3	10.8	16.1	23.7	67.9	1.60	8.4
1.60 -1.70	2.9	36.1	1.1	9.3	79.2	11.8	15.0	20.8	72.1	1.70	4.5
1.70 -1.80	1.6	44.7	0.7	10.0	80.8	12.4	14.3	19.2	74.4		
+ 1.80	19.2	74.4	14.3	24.3	100.0	24.3					

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: HORSESHOE RIDGE ADIT 13, SEAM 8 UPPER BULK

LAB NO: 5090

WASHABILITY DATA: 1/4"x 28M RAW COAL FROM SINK FLOAT ANALYSIS

SPECIFIC GRAVITY FRACTION	DIRECT		% WT. of Ash of Total	Cum. Wt.of Ash %	CUMULATIVE FLOATS		SINK WT.of ASH%	CUMULATIVE SINKS		+0.1 S.G. DISTRIBUTION	
	WT%	ASH%			WT%	ASH%		WT %	ASH%	S.G.	WT%
-1.30	28.2	2.3	0.6	0.6	28.2	2.3	15.9	71.8	22.1		
1.30 -1.35	24.2	6.0	1.5	2.1	52.4	4.0	14.4	47.6	30.3		
1.35 -1.40	13.5	9.0	1.2	3.3	65.9	5.0	13.2	34.1	38.7	1.40	51.4
1.40 -1.45	8.6	13.6	1.2	4.5	74.5	6.0	12.0	25.5	47.1	1.45	30.3
1.45 -1.50	5.1	19.1	1.0	5.5	79.6	6.9	11.0	20.4	53.9	1.50	18.9
1.50 -1.55	3.1	23.5	0.7	6.2	82.7	7.5	10.3	17.3	59.5	1.55	11.2
1.55 -1.60	2.1	29.3	0.6	6.8	84.8	8.0	9.7	15.2	63.8	1.60	7.8
1.60 -1.70	2.6	35.4	0.9	7.7	87.4	8.8	8.8	12.6	69.8	1.70	4.4
1.70 -1.80	1.8	44.6	0.8	8.5	89.2	9.6	8.0	10.8	73.7		
+1.80	10.8	73.7	8.0	16.5	100.0	16.5					

CLIENT: CROWS NEST RESOURCES LIMITED

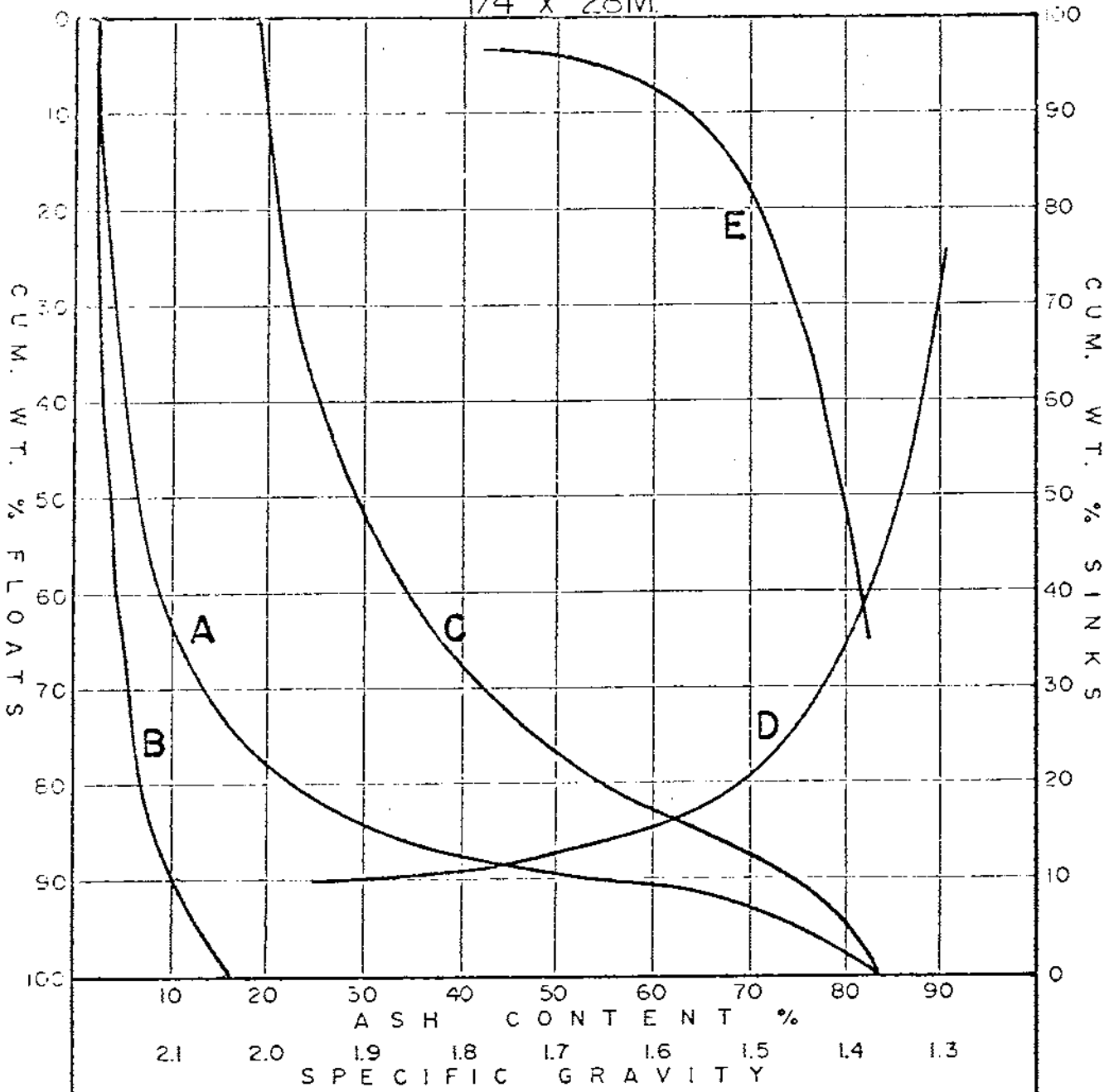
SAMPLE: HORSESHOE RIDGE ADIT 13 SEAM 8 UPPER BULK

LAB NO: 5090

WASHABILITY DATA: 28Mx65M RAW COAL FROM SINK FLOAT ANALYSIS

SPECIFIC GRAVITY FRACTION	DIRECT		% WT. of Ash of Total	Cum. Wt.of Ash %	CUMULATIVE FLOATS		SINK WT.of ASH%	CUMULATIVE SINKS		+0.1 S.G. DISTRIBUTION	
	WT%	ASH%			WT%	ASH%		WT %	ASH%	S.G.	WT%
-1.30	46.2	1.9	0.9	0.9	46.2	1.9	12.2	53.8	22.7		
1.30 -1.35	17.3	5.5	1.0	1.9	63.5	2.9	11.2	36.5	30.7		
1.35 -1.40	9.8	8.9	0.9	2.8	73.3	3.7	10.3	26.7	38.6	1.40	37.5
1.40 -1.45	6.4	12.8	0.8	3.6	79.7	4.4	9.5	20.3	46.8	1.45	22.8
1.45 -1.50	4.0	17.9	0.7	4.3	83.7	5.1	8.8	16.3	54.0	1.50	14.5
1.50 -1.55	2.6	24.0	0.6	4.9	86.3	5.6	8.2	13.7	59.9	1.55	8.8
1.55 -1.60	1.5	29.0	0.4	5.3	87.8	6.0	7.8	12.2	63.9	1.60	6.0
1.60 -1.70	1.9	36.6	0.7	6.0	89.7	6.7	7.1	10.3	68.9	1.70	3.2
1.70 -1.80	1.3	46.7	0.6	6.6	91.0	7.3	6.5	9.0	72.0		
+1.80	9.0	72.0	6.5	13.1	100.0	13.1					

WASHABILITY CURVES
1/4" x 28M



A – PRIMARY CURVE
B – CLEAN COAL CURVE
C – DISCARD CURVE
D — S.G. – YIELD CURVE
E — + 0.1 S.G. DISTRIBUTION CURVE

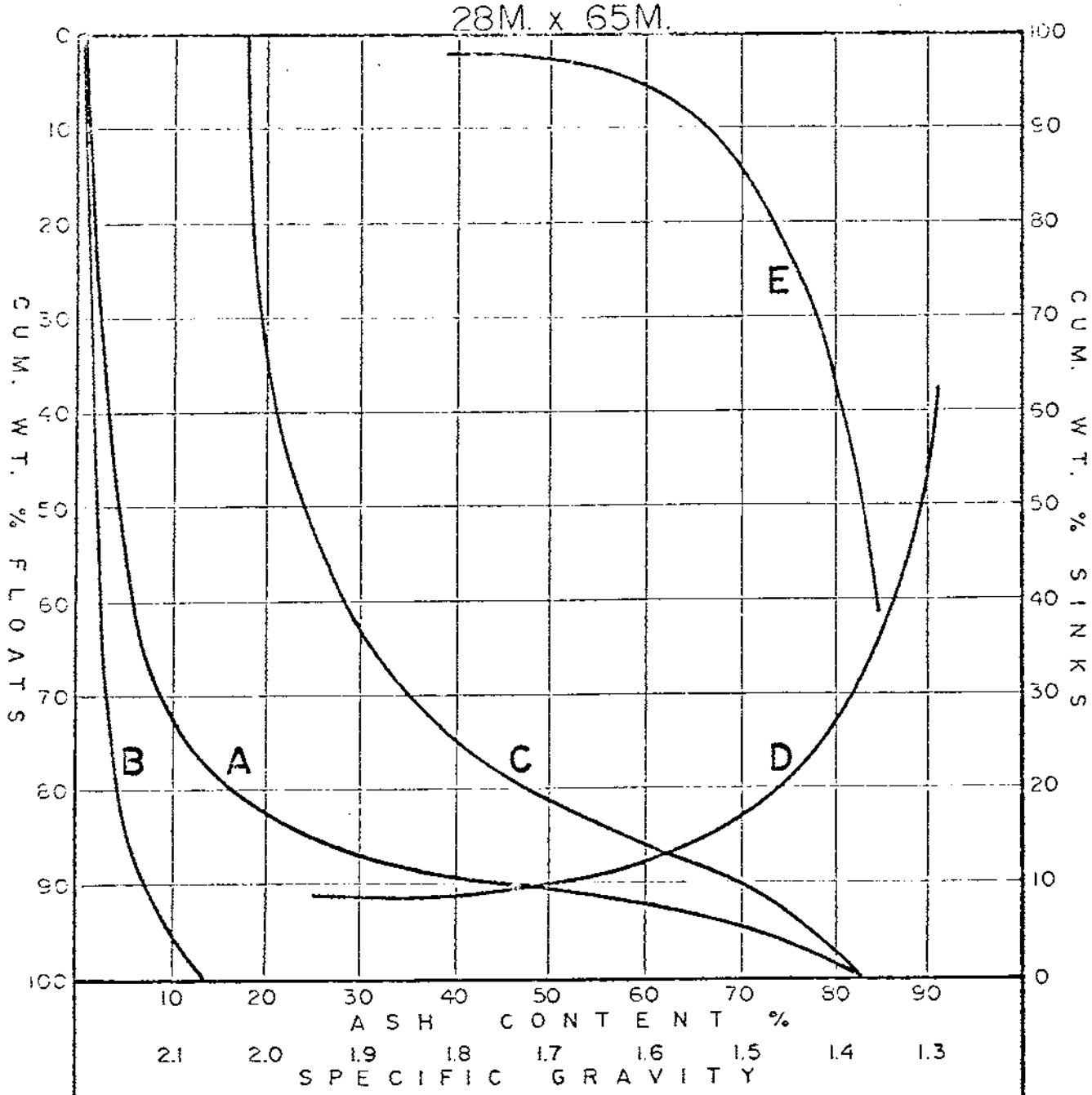
BIRTLEY COAL and MINERALS TESTING
calgary alberta

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: ADIT 13, SEAM 8 UPPER, HORSESHOE RIDGE

LAB NO: 5090 | DRAWN BY: A. | DATE: MAY 28, 1980

WASHABILITY CURVES
28M. x 65M.



A – PRIMARY CURVE
B – CLEAN COAL CURVE
C – DISCARD CURVE
D — S.G. – YIELD CURVE
E — + 0.1 S.G. DISTRIBUTION CURVE

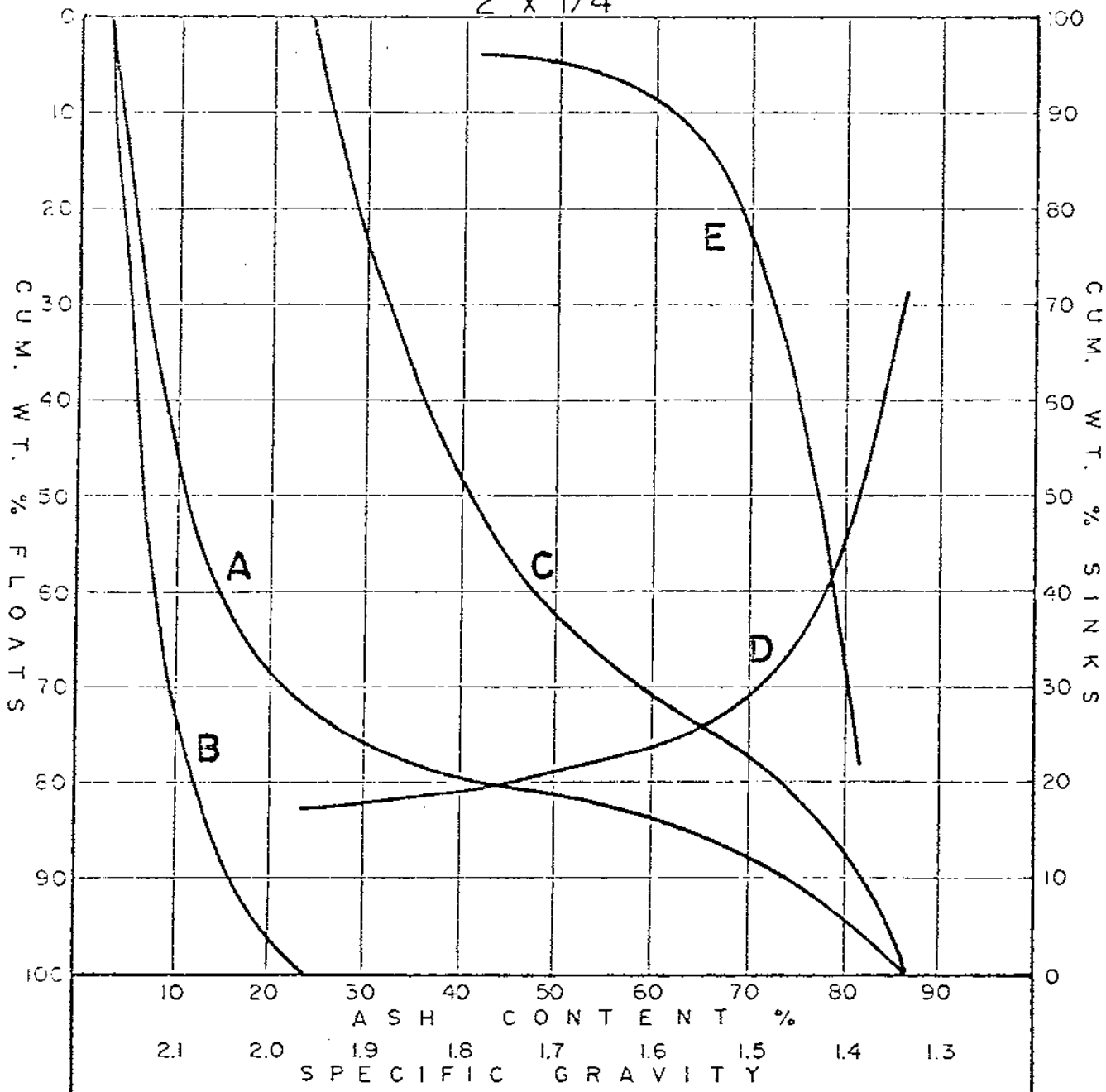
BIRTLEY COAL and MINERALS TESTING
calgary alberta

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: ADIT 13, SEAM 8 UPPER, HORSESHOE RIDGE

LAB NO: 5090 | DRAWN BY: A | DATE: MAY 28, 1980

WASHABILITY CURVES
2" x 1/4"



A – PRIMARY CURVE
B – CLEAN COAL CURVE
C – DISCARD CURVE
D — S.G. – YIELD CURVE
E — + 0.1 S.G. DISTRIBUTION CURVE

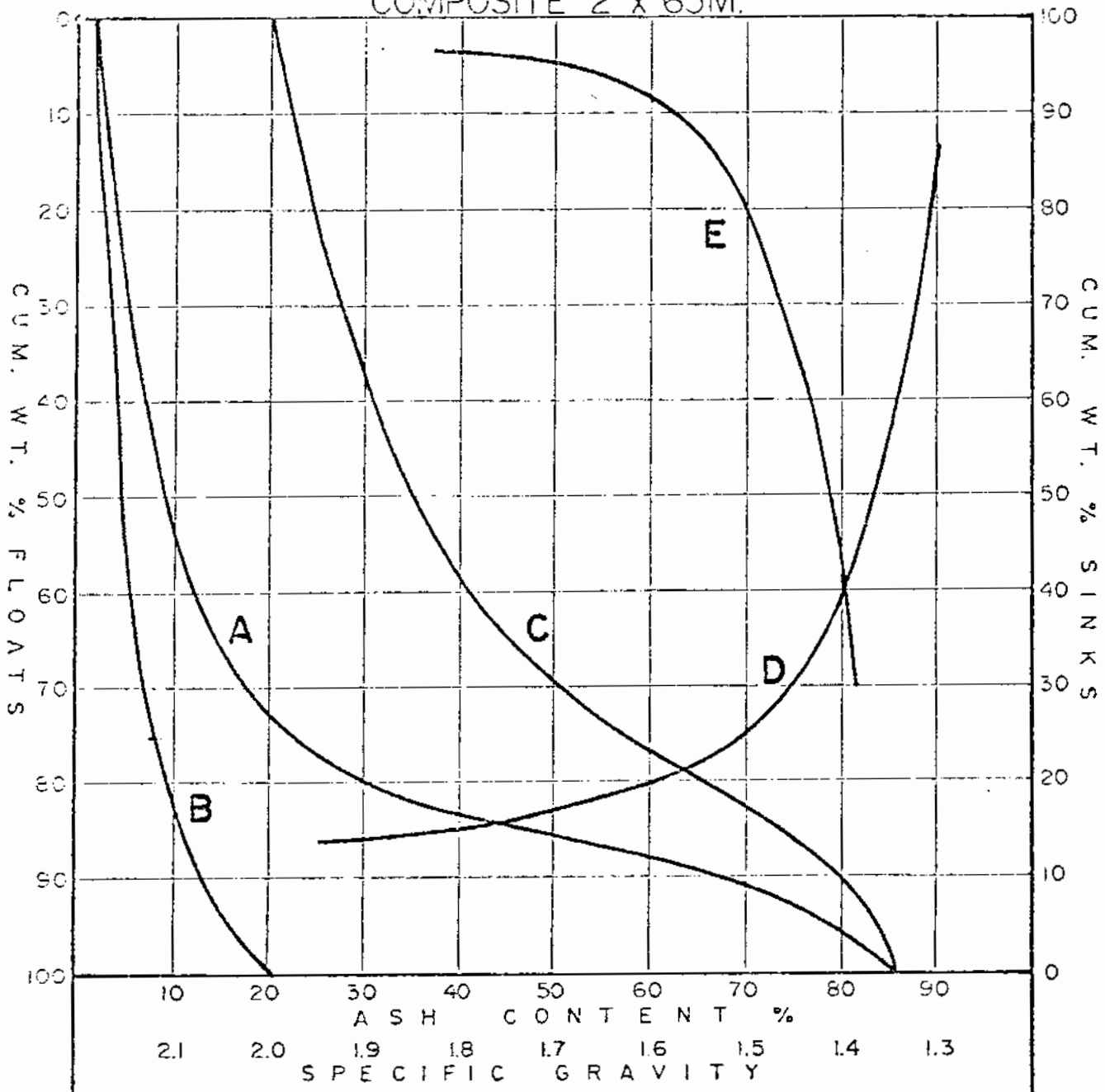
BIRTLEY COAL and MINERALS TESTING
calgary alberta

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: ADIT 13, SEAM 8 UPPER, HORSESHOE RIDGE

LAB NO: 5090 | DRAWN BY: JA | DATE: MAY 28, 1980

WASHABILITY CURVES
COMPOSITE 2" x 65M.



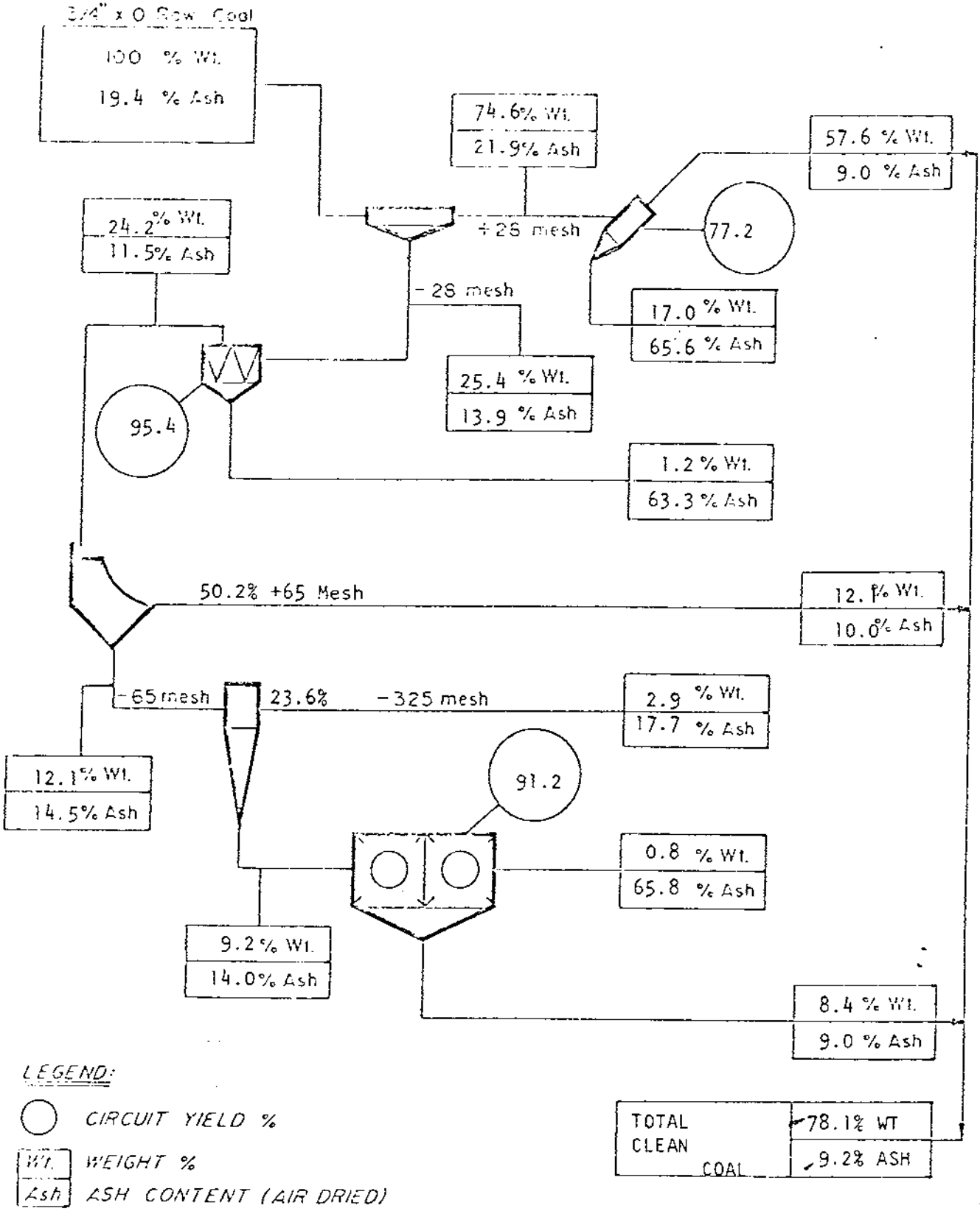
A – PRIMARY CURVE
B – CLEAN COAL CURVE
C – DISCARD CURVE
D — S.G. – YIELD CURVE
E — + 0.1 S.G. DISTRIBUTION CURVE

BIRTLEY COAL and MINERALS TESTING
calgary alberta

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: ADIT 13, SEAM 8 UPPER, HORSESHOE RIDGE

LAB NO: 5090 | DRAWN BY: A. | DATE: MAY 28, 1980



BIRTLEY COAL & MINERALS TESTING

Title PLANT BALANCE FLOW SHEET CROWS NEST RESOURCES LIMITED HORSESHOE RIDGE BULK SAMPLE ADIT 13, SEAM 8 UPPER LAB NO. 5091	Date JUNE 3, 1980 Drawn

SUMMARY - BULK WASHING DATA *

Bulk Sample HORSESHOE RIDGE ADIT 13,SEAM 8 UPPER Lab. No. 5091

Date Received May 16,1980 Date Washed June 3,1980

(a) RAW COAL

Delivered Weight 5.173 MT Washed Weight 4.055 MT

ADM % 4.1 ASH% 19.4 F.S.I. 3

(b) HEAVY MEDIA CIRCUIT: 3/4" x 28 Mesh= 74.6 % by weight

S.G. of Medium 1.43 Calculated Yield 77.2%

Sample	ASH %	F.S.I.
Feed	21.9	2 1/2
Clean Coal	9.0	3 1/2
Reject	65.6	1/2

(c) WATER -ONLY CYCLONE CIRCUIT :28M x0 = 25.4 % by weight

V.F.C. #1 2.54 cm. #2 5.08 cm. Calculated Yield 95.4%

Sample	ASH %	F.S.I.
Feed	13.9	3
Overflow	11.5	5 1/2
Underflow	63.3	1/2
S.B.O.	10.0	7
S.B.U.	14.5	4 1/2

(d) FROTH FLOTATION CIRCUIT: 65M x0 12.1 %by Weight

4:1 =Kerosene: M.I.B.C. Calculated Yield 91.2%

Sample	ASH %	F.S.I.
T.C.O.	17.7	1
Feed (T.C.U.)	14.0	5 1/2
Concentrate	9.0	6 1/2
Tailings	65.8	1/2

(e) FILTER CAKE: S.B.O. + CONCENTRATE = 9.7 ASH% 7 FSI

* All weights and analysis are on an Air Dried Basis unless otherwise indicated.

Birtley Coal
& Minerals Testing

SUMMARY -BULK WASHING DATA (Cont.)

BULK SAMPLE HORSESHOE RIDGE ADIT 13, SEAM 8 UPPER LAB NO. 5091

(f) CLEAN COAL: H.M.C.C. + FILTER CAKE Calculated Yield 78.1%

	PROXIMATE								
ADM	RM%	ASH%	VM %	FC %	S		FSI		
5.2	0.3	9.2	21.2	69.3	0.46		5		

DILATATION TEST				
ST (°C)	MDT (°C)	MC %	MD %	G
422	-	23 % @ 473°	--	--

GIESELER FLUIDITY TEST		
	DDPM	TEMP (°C)
START	1	461
MAXIMUM	3	482
FINAL	0	502
RANGE		41

Birtley Coal
& Minerals Testing

BULK SAMPLE: HORSESHOE RIDGE ADIT 13, SEAM 8 UPPER LAB NO. 5091

SUMMARY BULK WASHING DATA (Cont.)

CLEAN COAL

SIZE ANALYSIS		
SIZE FRACTION	WT %	Cumulative WT%
+ 3/4 "		
3/4 " x 1/2 "		
1/2 " x 1/4 "		
1/4 " x 6 M		
6 M x 14 M		
14 M x 28 M		
28 M x 65 M		
65 M x 100 M		
100 M x 200 M		
200 M x 0		

CLEAN COAL INVENTORY

DATE	SHIPPED		IN STOCK	
	BBLS	M.T.	BBLS	M.T.
June 9, 1980	-	-	15	2.943

Birtley Coal
& Minerals Testing

SUMMARY -BULK WASHING DATA (Cont.)

BULK SAMPLE HORSESHOE RIDGE ADIT 13, SEAM 8 UPPER LAB NO. 5091

(f) CLEAN COAL: H.M.C.C. + FILTER CAKE Calculated Yield 78.1%

ADM	PROXIMATE				S		FSI		
	RM%	ASH%	VM %	FC %					
5.2	0.3	9.2	21.2	69.3	0.46		5		

DILATATION TEST				
ST (°C)	MDT (°C)	MC %	MD %	G
422	-	23 % @ 473°	--	--

GIESELER FLUIDITY TEST		
	DDPM	TEMP (°C)
START	1	461
MAXIMUM	3	482
FINAL	0	502
RANGE		41

Birtley Coal
& Minerals Testing

BULK WASHING DATA

BULK SAMPLE HORSESHOE RIDGE ADIT 13, SEAM 8 UPPER LAB NO. 5091

HEAVY MEDIUM CIRCUIT

CYCLONE: 14" DSM operating @ 51.7 KPa.

MAGNETITE MEDIUM maintained @ 1.43 S.G.

1. FEED(3/4 x 28 Mesh) 3.027 M.T. 21.9 ASH% 2 1/2 FSI

2. CLEAN COAL 2.315 M.T. 9.0 ASH% 3 1/2 FSI

3. REJECT 0.712 M.T. 65.6 ASH% 1/2 FSI

4. YIELD CLEAN COAL (Weighted) = $\frac{2.315}{3.027}$ = 76.5 %

5. YIELD CLEAN COAL (Calculated) = $\frac{65.6 - 21.9}{65.6 - 9.0}$ = 77.2 %

Birtley Coal
& Minerals Testing

BULK WASHING DATA

Bulk Sample HORSESHOE RIDGE ADIT 13, SEAM 8 UPPER LAB NO. 5091

WATER - ONLY CYCLONE CIRCUIT

Primary Cyclone: 6" DSM operating @ 137.9 KPa

Vortex Finder Clearance set @ 2.54 c m.

Secondary Cyclone: 4" DSM operating @ 34.5 KPa

Vortex Finder Clearance set @ 5.08 c m.

Sieve Bend : 65 Mesh

1.	Feed (28 Mesh x 0)	13.9	ASH %	3	FSI	
2.	Primary Cyclone Overflow	11.5	ASH %	5 1/2	FSI	
3.	Secondary Cyclone Underflow	63.3	ASH %	1/2	FSI	
4.	Sieve Bend Overflow(S.B.O.)	10.0	ASH %	7	FSI	
5.	Sieve Bend Underflow(S.B.U.)	14.5	ASH %	4 1/2	FSI	
6.	Yield (W.O. Cyclone)	$\frac{63.3 - 13.9}{63.3 - 11.5}$	=	95.4	%	
7.	WT% 28Mx65M in Primary Cyclone Overflow		=	50.2	%	
8.	Estimated Yield of 28M x65M (S.B.O. , as % of 28 M x 0 Feed)		=	47.9	%	

Birtley Coal
& Minerals Testing

BULK WASHING DATA

BULK SAMPLE HORSESHOE RIDGE ADIT 13, SEAM 8 UPPER LAB NO. 5091

FROTH FLOTATION CIRCUIT

Flotation Cell: two(2) Birtley -Humboldt Multi-Wobble Impellers in series.

Reagent : 4:1 = Kerosene:M.I.B.C.

Thickening Cyclone : 20° - 8" cyclone Mayl-Patterson

1. Thickening Cyclone Overflow (T.C.O. -325M) 17.7 ASH% 1 FSI

2. Flotation Feed(Thickening Cyclone Underflow) 14.0 ASH% 5 1/2 FSI

3. Concentrate 9.0 ASH% 6 1/2 FSI

4. Tailings 65.8 ASH% 1/2 FSI

5. Yield Concentrate $\frac{65.8 - 14.0}{65.8 - 9.0}$ = 91.2 %

Birtley Coal
& Minerals Testing

BULK WASHING DATA

BULK SAMPLE HORSESHOE RIDGE ADIT 13, SEAM 8 UPPER LAB NO. 5091

FROTH FLOTATION CIRCUIT

Flotation Cell: two(2) Birtley -Humboldt Multi-Wobble impellers in series.

Reagent : 4:1 = Kerosene:M.I.B.C.

Thickening Cyclone : 20° - 8" cyclone Heyl-Patterson

1. Thickening Cyclone Overflow (T.C.O. -325M) 17.7 ASH% 1 FSI

2. Flotation Feed(Thickening Cyclone Underflow) 14.0 ASH% 5 1/2 FSI

3. Concentrate 9.0 ASH% 6 1/2 FSI

4. Tailings 65.8 ASH% 1/2 FSI

5. Yield Concentrate $\frac{65.8 - 14.0}{65.8 - 9.0}$ = 91.2 %

Birtley Coal
& Minerals Testing

LAB NO. 5091 DATE June 18/80

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE I.D. cm

STARTING TEMP. °C 350

SOFTENING TEMP. °C 422

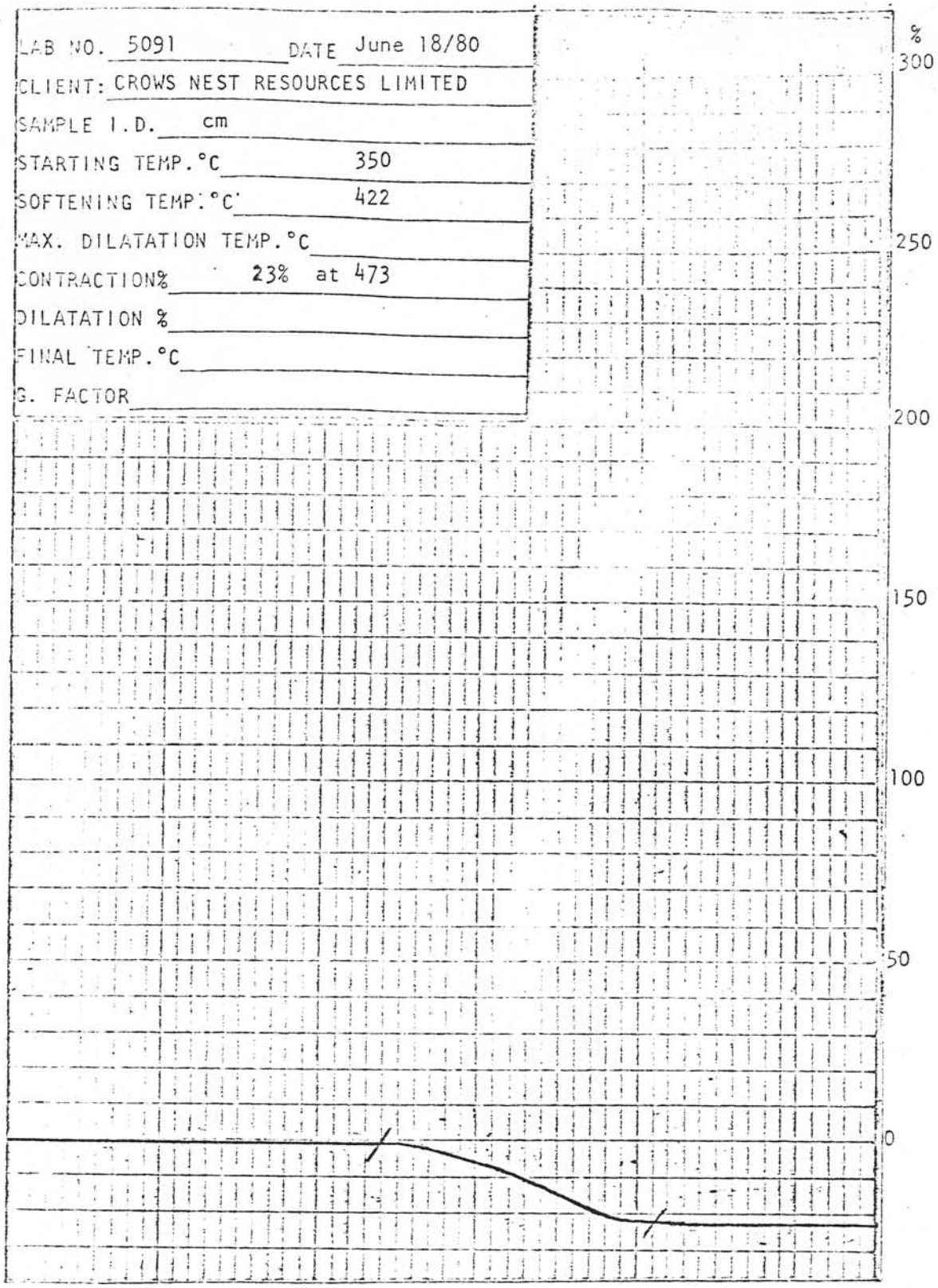
MAX. DILATATION TEMP. °C

CONTRACTION% 23% at 473

DILATATION %

FINAL TEMP. °C

G. FACTOR



RUHR DILATOMETER TEST

Birtley Coal
& Minerals Testing

CLIENT: CROWS NEST RESOURCES LIMITED

PRODUCT: HORSESHOE RIDGE BULK SAMPLE

ADIT 13, SEAM 8 LOWER

LAB NO.: 5092

HEAD RAW ANALYSIS

ADM%	MOISTURE	ASH%	VOL%	FC%	S %	F.S.I.	CALC. BASIS
1.1	0.7	27.1	19.0	53.2	0.48	3 1/2	a.d.b.
	1.8	26.8	18.8	52.6	0.47		a.r.b.
		27.3	19.1	53.6	0.48		d.b.

SIZE AND RAW ANALYSIS , a.d.b.

SIZE FRACTION	WT%	RM%	ASH%	VM %	FC%	S%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
2 " x 1/4"	48.7	0.9	33.8	17.8	47.5	0.46	1	48.7	33.8
1/4"x 28M	39.2	1.0	22.6	19.9	56.5	0.51	5 1/2	87.9	28.8
28M x 65M	6.5	0.7	16.8	21.8	60.7	0.64	7 1/2	94.4	28.0
65M x 0	5.6	0.6	15.7	20.7	63.0	0.71	7	100.0	27.3

WT% +2" = 9.3 -crushed to pass 2"

SINK-FLOAT ANALYSIS, a.d.b.: 2" x 1/4" (WT% =48.7)

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
- 1.30	2.6	2.9	9	2.6	2.9
1.30 - 1.35	16.9	6.1	5	19.5	5.7
1.35 - 1.40	13.4	9.5	2 1/2	32.9	7.2
1.40 - 1.45	10.0	14.8	2	42.9	9.0
1.45 - 1.50	5.2	20.6	1	48.1	10.3
1.50 - 1.55	5.0	25.3	1	53.1	11.7
1.55 - 1.60	4.9	29.2	1	58.0	13.1
1.60 - 1.70	7.2	36.7	1	65.2	15.7
1.70 - 1.80	5.8	46.7	1	71.0	18.3
+1.80	29.0	72.1	1/2	100.0	33.9

Birtley Coal
& Minerals Testing

CLIENT : CROWS NEST RESOURCES LIMITED

PROJECT: HORSESHOE RIDGE BULK SAMPLE

ADIT 13 SEAM 8 LOWER

LAB NO.: 5092

SINK-FLOAT ANALYSIS, a.d.b.: 1/4" x 28M (WT% =39.2)

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
- 1.30	22.1	2.0	9	22.1	2.0
1.30 - 1.35	17.9	5.8	6 1/2	40.0	3.7
1.35 - 1.40	11.0	9.9	4	51.0	5.0
1.40 - 1.45	8.9	14.3	2	59.9	6.4
1.45 - 1.50	5.6	19.8	1 1/2	65.5	7.6
1.50 - 1.55	4.6	25.2	1	70.1	8.7
1.55 - 1.60	3.4	30.1	1	73.5	9.7
1.60 - 1.70	5.2	36.1	1	78.7	11.4
1.70 - 1.80	4.2	45.1	1	82.9	13.2
+1.80	17.1	69.0	1/2	100.0	22.7

SINK-FLOAT ANALYSIS, a.d.b.: 28M x 65M (WT%=6.5)

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
- 1.30	45.6	2.0	9	45.6	2.0
1.30 - 1.35	13.2	5.9	6	58.8	2.9
1.35 - 1.40	8.0	9.3	2	66.8	3.6
1.40 - 1.45	6.5	14.2	1 1/2	73.3	4.6
1.45 - 1.50	4.3	20.3	1	77.6	5.5
1.50 - 1.55	2.9	26.2	1	80.5	6.2
1.55 - 1.60	2.2	30.3	1	82.7	6.8
1.60 - 1.70	3.1	38.5	1	85.8	8.0
1.70 - 1.80	2.2	45.7	1	88.0	8.9
+1.80	12.0	70.5	N.A.	100.0	16.3

Birtley Coal
& Minerals Testing

CLIENT: CROWS NEST RESOURCES LIMITED

PROJECT:HORSESHOE RIDGE BULK SAMPLE

ADIT 13 SEAM 8 LOWER

LAB NO.: 5092

FROTH FLOTATION TEST,a.d.b.= 65M x0(WT%=5.6)

PRODUCT	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
STAGE 1	70.8	8.4	8	70.8	8.4
STAGE 11	13.9	15.5	5 1/2	84.7	9.6
TAILINGS	15.3	47.9	1 1/2	100.0	15.4

FROTH FLOTATION PARAMETERS

Pulp Density	= 10%
Reagent	= 4:1=Kerosene:MIBC
Dosage	= 0.48 lb/T.D.S.
Conditioning Time	= 60 seconds
Stage 1	= 1st minute froth
Stage 11	= 2nd minute froth

Birtley Coal
& Minerals Testing

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: HORSESHOE RIDGE ADIT 13, SEAM 8 LOWER BULK

LAB NO: 5092

COMPOSITE WASHABILITY DATA: 2" x 65M RAW COAL FROM SINK FLOAT ANALYSIS

SPECIFIC GRAVITY FRACTION	DIRECT		% WT. of Ash of Total	Cum. Wt. of Ash %	CUMULATIVE FLOATS		SINK WT. of ASH%	CUMULATIVE SINKS		+0.1 S.G. DISTRIBUTION	
	WT%	ASH%			WT%	ASH%		WT %	ASH%	S.G.	WT%
-1.30	13.6	2.1	0.3	0.3	13.6	2.1	27.8	86.4	32.2		
1.30 -1.35	17.1	6.0	1.0	1.3	30.7	4.3	26.8	69.3	38.7		
1.35 -1.40	12.0	9.6	1.2	2.5	42.7	5.8	25.6	57.3	44.7	1.40	43.7
1.40 -1.45	9.3	14.6	1.4	3.9	52.0	7.3	24.2	48.0	50.4	1.45	31.3
1.45 -1.50	5.3	20.2	1.1	5.0	57.3	8.5	23.1	42.7	54.1	1.50	23.4
1.50 -1.55	4.7	25.3	1.2	6.2	62.0	9.8	21.9	38.0	57.6	1.55	18.2
1.55 -1.60	4.1	29.6	1.2	7.4	66.1	11.0	20.7	33.9	61.1	1.60	14.9
1.60 -1.70	6.1	36.6	2.2	9.6	72.2	13.2	18.5	27.8	66.5	1.70	11.0
1.70 -1.80	4.9	46.1	2.2	11.8	77.1	15.3	16.3	22.9	71.1		
+1.80	22.9	71.1	16.3	28.1	100.0	28.1					

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: HORSESHOE RIDGE ADIT 13, SEAM 8 LOWER BULK

LAB NO: 5092

WASHABILITY DATA: 2" x1/4" RAW COAL FROM SINK FLOAT ANALYSIS

SPECIFIC GRAVITY FRACTION	DIRECT		% WT. of Ash of Total	Cum. Wt.of Ash %	CUMULATIVE FLOATS		SINK WT.of ASH%	CUMULATIVE SINKS		+0.1 S.G. DISTRIBUTION	
	WT%	ASH%			WT%	ASH%		WT %	ASH%	S.G.	WT%
-1.30	2.6	2.9	0.1	0.1	2.6	2.9	33.8	97.4	34.7		
1.30 -1.35	16.9	6.1	1.0	1.1	19.5	5.7	32.8	80.5	40.7		
1.35 -1.40	13.4	9.5	1.3	2.4	32.9	7.2	31.5	67.1	46.9	1.40	45.5
1.40 -1.45	10.0	14.8	1.5	3.9	42.9	9.0	30.0	57.1	52.5	1.45	33.6
1.45 -1.50	5.2	20.6	1.1	5.0	48.1	10.3	28.9	51.9	55.7	1.50	25.1
1.50 -1.55	5.0	25.3	1.3	6.3	53.1	11.7	27.6	46.9	58.8	1.55	21.5
1.55 -1.60	4.9	29.2	1.4	7.7	58.0	13.1	26.2	42.0	62.4	1.60	17.1
1.60 -1.70	7.2	36.7	2.6	10.3	65.2	15.7	23.6	34.8	67.8	1.70	13.0
1.70 -1.80	5.8	46.7	2.7	13.0	71.0	18.3	20.9	29.0	72.1		
+1.80	29.0	72.1	20.9	33.9	100.0	33.9					

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: HORSESHOE RIDGE ADIT 13, SEAM 8 LOWER BULK

LAB NO: 5092

WASHABILITY DATA: 1/4"x28M RAW COAL FROM SINK FLOAT ANALYSIS

SPECIFIC GRAVITY FRACTION	DIRECT		% WT. of Ash of Total	Cum. Wt.of Ash %	CUMULATIVE FLOATS		SINK WT.of ASH%	CUMULATIVE SINKS		+0.1 S.G. DISTRIBUTION	
	WT%	ASH%			WT%	ASH%		WT %	ASH%	S.G.	WT%
-1.30	22.1	2.0	0.4	0.4	22.1	2.0	22.3	77.9	28.6		
1.30 -1.35	17.9	5.8	1.0	1.4	40.0	3.7	21.3	60.0	35.5		
1.35 -1.40	11.0	9.9	1.1	2.5	51.0	5.0	20.2	49.0	41.2	1.40	43.4
1.40 -1.45	8.9	14.3	1.3	3.8	59.9	6.4	18.9	40.1	47.1	1.45	30.1
1.45 -1.50	5.6	19.8	1.1	4.9	65.5	7.6	17.8	34.5	51.6	1.50	22.5
1.50 -1.55	4.6	25.2	1.2	6.1	70.1	8.7	16.6	29.1	57.0	1.55	17.5
1.55 -1.60	3.4	30.1	1.0	7.1	73.5	9.7	15.6	26.5	58.9	1.60	13.2
1.60 -1.70	5.2	36.1	1.9	9.0	78.7	11.4	13.9	21.3	65.3	1.70	9.4
1.70 -1.80	4.2	45.1	1.9	10.9	82.9	13.2	11.8	17.1	69.0		
+1 80	17.1	69.0	11.8	22.7	100.0	22.7					

CLIENT: CROWS NEST RESOURCES LIMITED

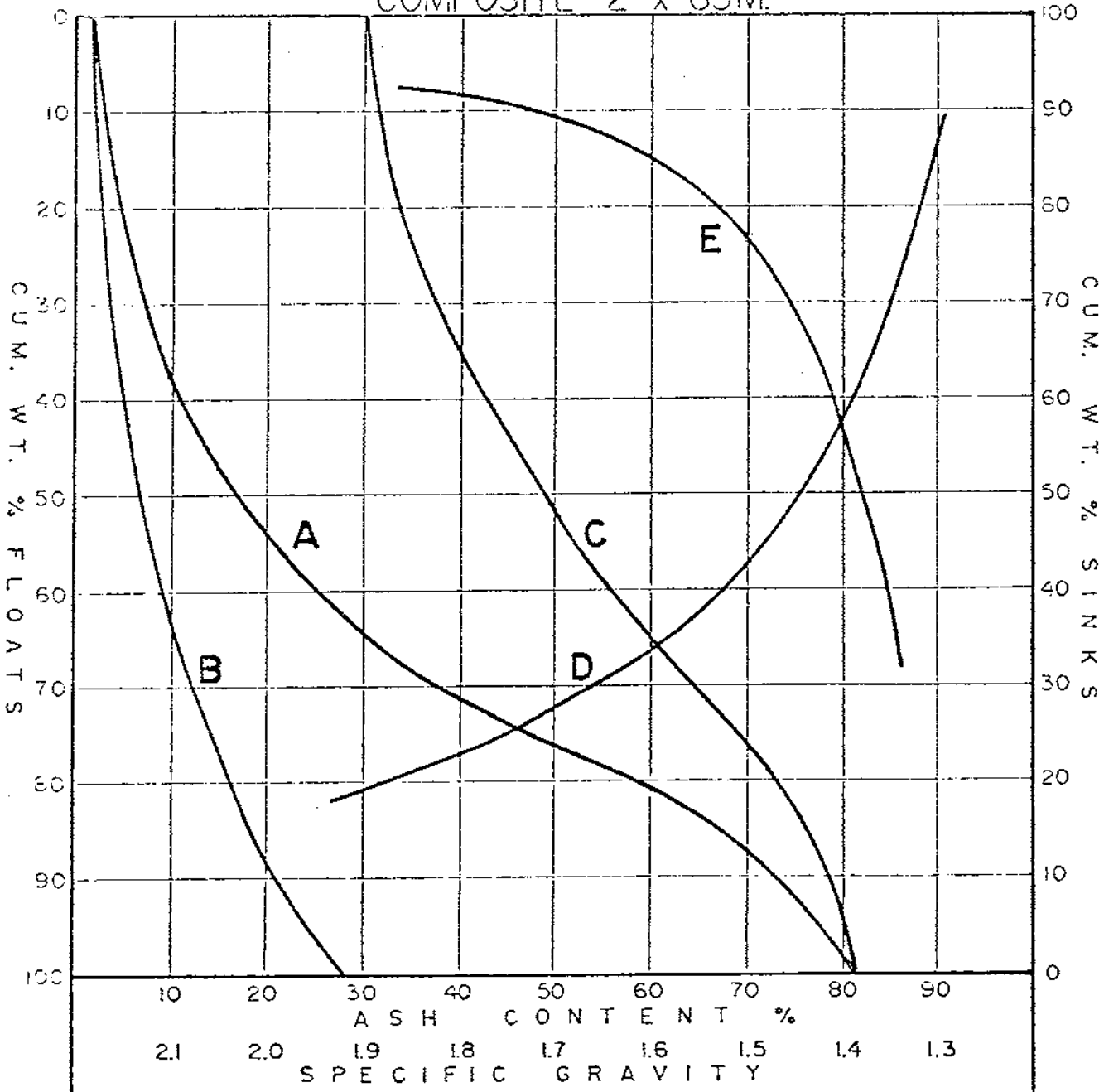
SAMPLE: HORSESHOE RIDGE ADIT 13, SEAM 8 LOWER BULK

LAB NO: 5092

WASHABILITY DATA: 28Mx65M RAW COAL FROM SINK FLOAT ANALYSIS

SPECIFIC GRAVITY FRACTION	DIRECT		% WT. of Ash of Total	Cum. Wt.of Ash %	CUMULATIVE FLOATS		SINK WT.of ASH%	CUMULATIVE SINKS		+0.1 S.G. DISTRIBUTION	
	WT%	ASH%			WT%	ASH%		WT %	ASH%	S.G.	WT%
-1.30	45.6	2.0	0.9	0.9	45.6	2.0	15.4	54.4	28.3		
1.30 -1.35	13.2	5.9	0.8	1.7	58.8	2.9	14.6	41.2	35.4		
1.35 -1.40	8.0	9.3	0.7	2.4	66.8	3.6	13.9	33.2	41.9	1.40	32.0
1.40 -1.45	6.5	14.2	0.9	3.3	73.3	4.6	13.0	26.7	48.7	1.45	21.7
1.45 -1.50	4.3	20.3	0.9	4.2	77.6	5.5	12.1	22.4	54.0	1.50	15.9
1.50 -1.55	2.9	26.2	0.7	4.9	80.5	6.2	11.4	19.5	58.5	1.55	11.0
1.55 -1.60	2.2	30.3	0.7	5.6	82.7	6.8	10.7	17.3	61.8	1.60	8.2
1.60 -1.70	3.1	38.5	1.2	6.8	85.8	8.0	9.5	14.2	66.9	1.70	5.3
1.70 -1.80	2.2	45.7	1.0	7.8	88.0	8.9	8.5	12.0	70.5		
+1.80	12.0	70.5	8.5	16.3	100.0	16.3					

WASHABILITY CURVES
COMPOSITE 2" x 65M.



A – PRIMARY CURVE
B – CLEAN COAL CURVE
C – DISCARD CURVE
D — S.G. – YIELD CURVE
E — + 0.1 S.G. DISTRIBUTION CURVE

BIRTLEY COAL and MINERALS TESTING
calgary alberta

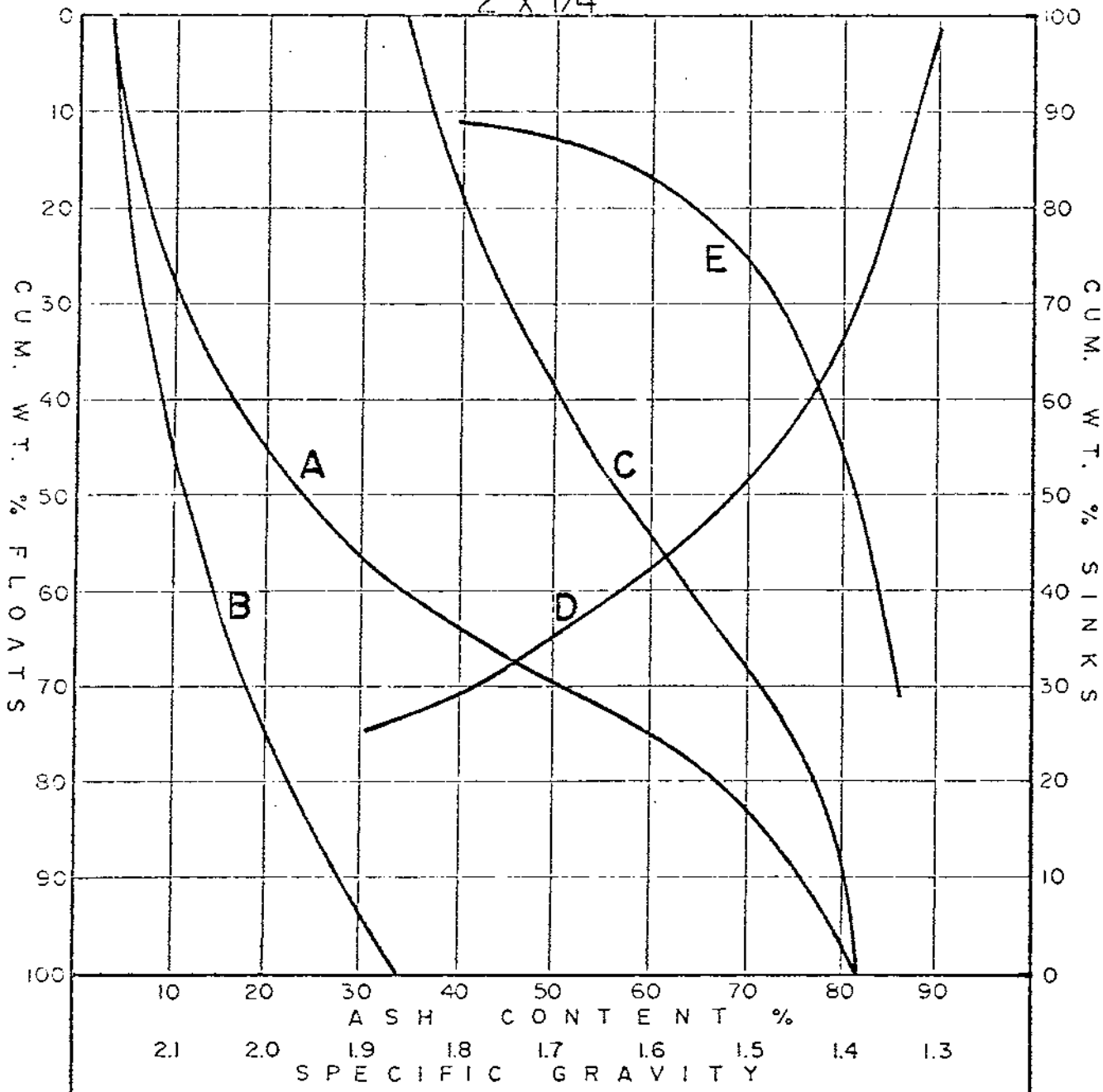
CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: ADIT 13, SEAM 8 LOWER, HORSESHOE RIDGE

LAB NO: 5092 | DRAWN BY: A. | DATE: MAY 30, 1980

WASHABILITY CURVES

2" x 1/4"



A – PRIMARY CURVE
B – CLEAN COAL CURVE
C – DISCARD CURVE
D — S.G. – YIELD CURVE
E — + 0.1 S.G. DISTRIBUTION CURVE

BIRTLEY COAL and MINERALS TESTING
calgary alberta

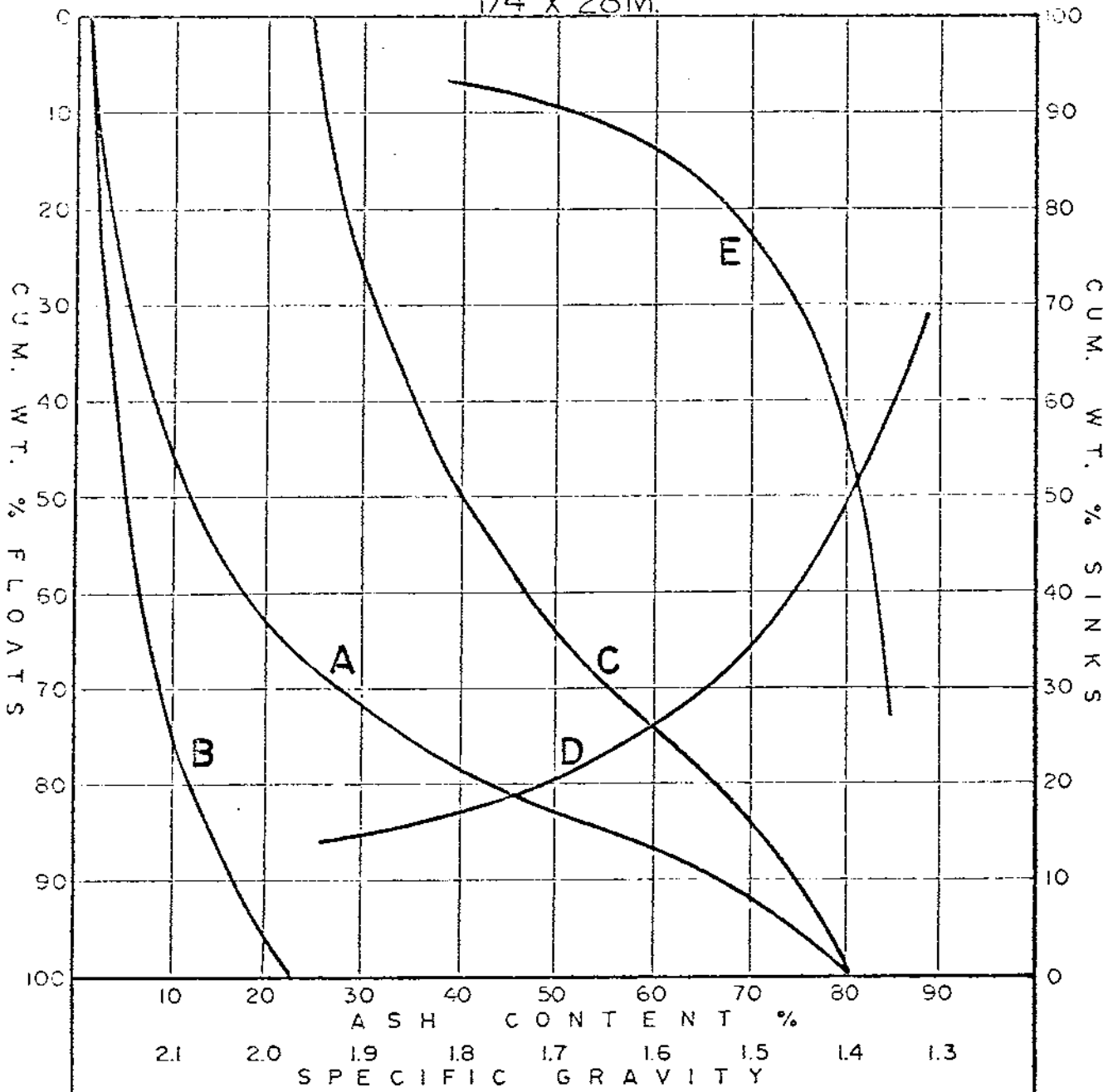
CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: ADIT 13, SEAM 8 LOWER, HORSESHOE RIDGE

LAB NO: 5092 | DRAWN BY: JA | DATE: MAY 30, 1980

WASHABILITY CURVES

1/4" x 28M.



A – PRIMARY CURVE
B – CLEAN COAL CURVE
C – DISCARD CURVE
D — S.G. – YIELD CURVE
E — + 0.1 S.G. DISTRIBUTION CURVE

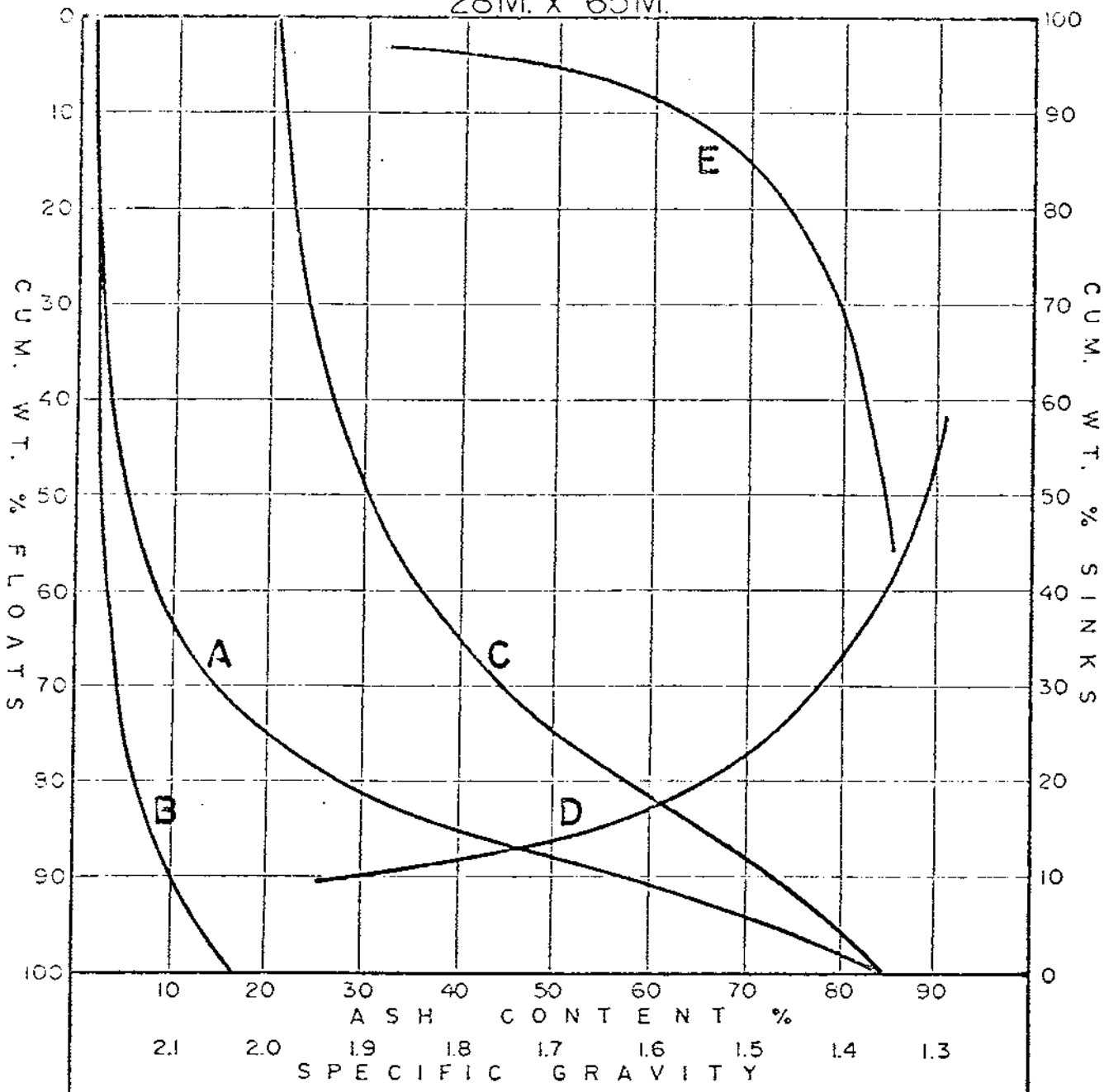
BIRTLEY COAL and MINERALS TESTING
calgary alberta

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: ADIT 13, SEAM 8 LOWER, HORSESHOE RIDGE

LAB NO: 5092	DRAWN BY: A.	DATE: MAY 30, 1980

WASHABILITY CURVES
28M. x 65M.



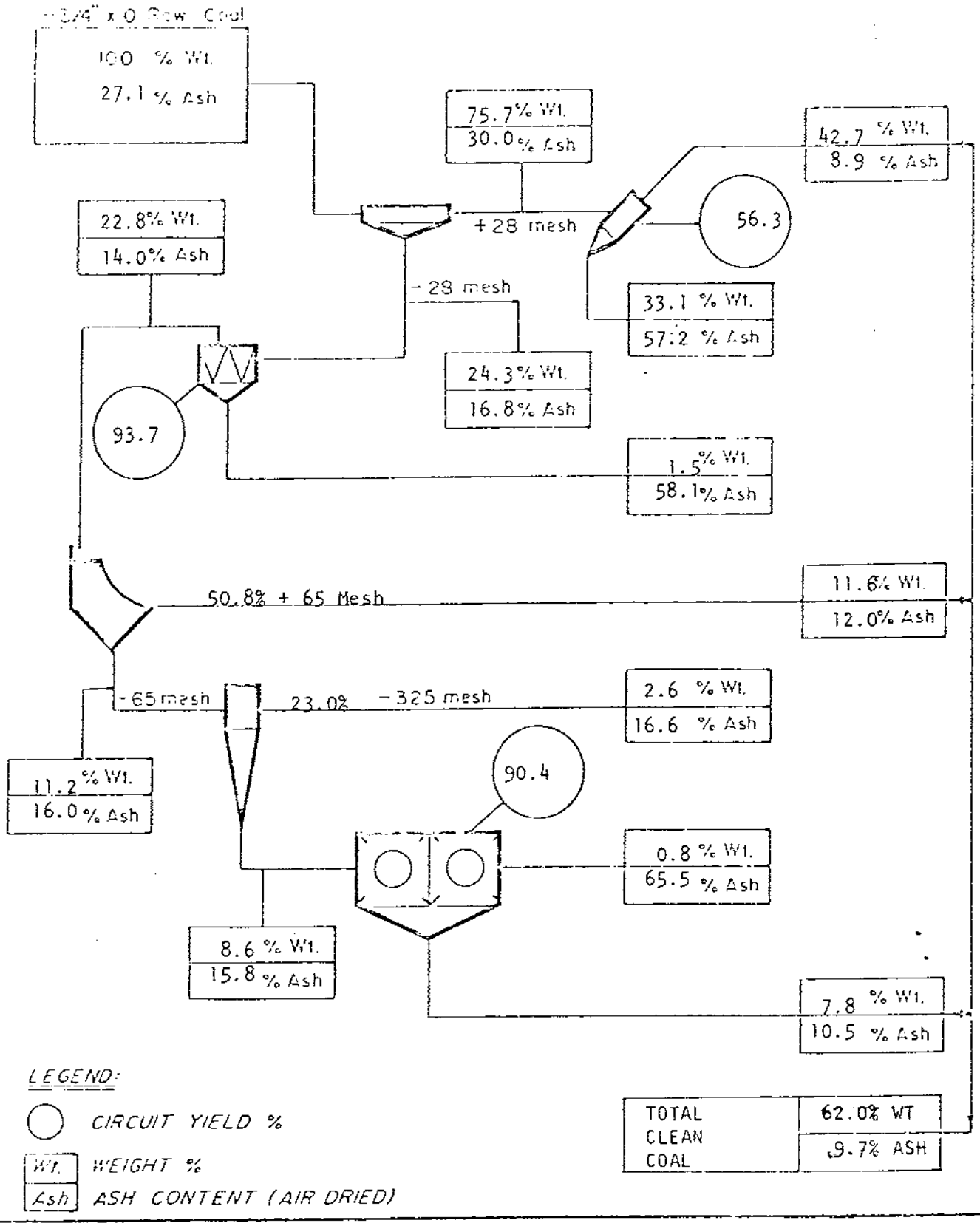
A – PRIMARY CURVE
B – CLEAN COAL CURVE
C – DISCARD CURVE
D — S.G. – YIELD CURVE
E — + 0.1 S.G. DISTRIBUTION CURVE

BIRTLEY COAL and MINERALS TESTING
calgary alberta

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: ADIT 13, SEAM 8 LOWER, HORSESHOE RIDGE

LAB NO: 5092 | DRAWN BY: A. | DATE: MAY 30, 1980



BIRTLEY COAL & MINERALS TESTING

Title PLANT BALANCE FLOW SHEET CROWS NEST RESOURCES LIMITED HORSHSHOE RIDGE BULK SAMPLE ADIT 13, SEAM 8 LOWER LAB NO. 5093	Date JUNE 5,1980 Drawn

SUMMARY - BULK WASHING DATA *

Bulk Sample HORSESHOE RIDGE ADIT 13, SEAM 8 LOWER Lab. No. 5093

Date Received May 16, 1980 Date Washed June 5, 1980

(a) RAW COAL

Delivered Weight 5.637 MT Washed Weight 4.968 MT

ADM % 1.1 ASH% 27.1 F.S.I. 3 1/2

(b) HEAVY MEDIA CIRCUIT: 3/4" x 28 Mesh= 75.7 % by weight

S.G. of Medium 1.32 Calculated Yield 56.3%

Sample	ASH %	F.S.I.
Feed	30.0	2 1/2
Clean Coal	8.9	5 1/2
Reject	57.2	1

(c) WATER -ONLY CYCLONE CIRCUIT : 28M x0 = 24.3 % by weight

V.F.C. #1 2.54 cm. #2 5.08 cm. Calculated Yield 93.7%

Sample	ASH %	F.S.I.
Feed	16.8	6 1/2
Overflow	14.0	7
Underflow	58.1	1
S.B.O.	12.0	7 1/2
S.B.U.	16.0	6 1/2

(d) FROTH FLOTATION CIRCUIT: 65M x0 11.2 %by Weight

4:1 =Kerosene: M.I.B.C. Calculated Yield 90.4%

Sample	ASH %	F.S.I.
T.C.O.	16.6	1
Feed (T.C.U.)	15.8	7
Concentrate	10.5	7 1/2
Tailings	65.5	1

(e) FILTER CAKE: S.B.O. + CONCENTRATE = 11.5 ASH% 7 1/2 FSI

* All weights and analysis are on an Air Dried Basis unless otherwise indicated.

Birtley Coal
& Minerals Testing

SUMMARY - BULK WASHING DATA (Cont.)

BULK SAMPLE HORSESHOE RIDGE ADIT 13, SEAM 8 LOWER LAB NO. 5093

(f) CLEAN COAL: H.M.C.C. + FILTER CAKE Calculated Yield 62.0%

	PROXIMATE								
ADM	RM%	ASH%	VM %	FC %	S		FSI		
4.4	0.4	9.7	21.3	68.6	0.38		6 1/2		

DILATATION TEST				
ST (°C)	MDT (°C)	MC %	MD %	G
419	491	20	-16	0.584

GIESELER FLUIDITY TEST		
	DDPM	TEMP (°C)
START	1	458
MAXIMUM	1	481
FINAL	0	500
RANGE		42

Birtley Coal
& Minerals Testing

BULK SAMPLE: HORSESHOE RIDGE ADIT 13, SEAM 8 LOWER LAB NO. 5093

SUMMARY BULK WASHING DATA (Cont.)

CLEAN COAL

SIZE ANALYSIS		
SIZE FRACTION	WT %	Cumulative WT%
+ 3/4 "		
3/4 " x 1/2 "		
1/2 " x 1/4 "		
1/4 " x 6 M		
6 M x 14 M		
14 M x 28 M		
28 M x 65 M		
65 M x 100 M		
100 M x 200 M		
200 M x 0		

CLEAN COAL INVENTORY

	SHIPPED		IN STOCK	
DATE	BBLS	M.T.	BBLS	M.T.
June 10,1980			16	2.865

Birtley Coal
& Minerals Testing

BULK WASHING DATA

BULK SAMPLE HORSESHOE RIDGE ADIT 13 LAB NO. 5093

SEAM 8 LOWER

HEAVY MEDIUM CIRCUIT

CYCLONE: 14" DSM operating @ 51.7 KPa.

MAGNETITE MEDIUM maintained @ 1.32 S.G.

1.	FEED(3/4 x 28 Mesh)	3.761	M.T.	30.0	ASH%	2 1/2	FSI
2.	CLEAN COAL	2.118	M.T.	8.9	ASH%	5 1/2	FSI
3.	REJECT	1.643	M.T.	57.2	ASH%	1	FSI

4. YIELD CLEAN COAL (Weighted) = $\frac{2.118}{3.761}$ = 56.3 %

5. YIELD CLEAN COAL (Calculated) = $\frac{57.2 - 30.0}{57.2 - 8.9}$ = 56.3 %

Birtley Coal
& Minerals Testing

BULK WASHING DATA

Bulk Sample HORSESHOE RIDGE ADIT 13, SEAM 8 LOWER LAB NO. 5093

WATER - ONLY CYCLONE CIRCUIT

Primary Cyclone: 6" DSM operating @ 137.9 KPa

Vortex Finder Clearance set @ 2.54 c m.

Secondary Cyclone: 4" DSM operating@ 34.5 KPa

Vortex Finder Clearance set @ 5.08 c m.

Sieve Bend : 65 Mesh

1.	Feed (28 Mesh x 0)	16.8	ASH	%	6 1/2	FSI
2.	Primary Cyclone Overflow	14.0	ASH	%	7	FSI
3.	Secondary Cyclone Underflow	58.1	ASH	%	1	FSI
4.	Sieve Bend Overflow(S.B.O.)	12.0	ASH	%	7 1/2	FSI
5.	Sieve Bend Underflow(S.B.U.)	16.0	ASH	%	6 1/2	FSI

6. Yield (W.O. Cyclone) $\frac{58.1 - 16.8}{58.1 - 14.0}$ = 93.7 %

7. WT% 28Mx65M in Primary Cyclone Overflow = 50.8 %

8. Estimated Yield of 28M x65M (S.B.O. , as % of 28 M x 0 Feed) = 47.6 %

Birtley Coal
& Minerals Testing

BULK WASHING DATA

BULK SAMPLE HORSESHOE RIDGE ADIT 13, SEAM 8 LOWER LAB NO. 5093

FROTH FLOTATION CIRCUIT

Flotation Cell: two(2) Birtley -Humboldt Multi-Wobble Impellers in series.

Reagent : 4:1 = Kerosene:M.I.B.C.

Thickening Cyclone : 20° - 8" cyclone Hayl-Patterson

1. Thickening Cyclone Overflow (T.C.O. -325M) 16.6 ASH% 1 FSI

2. Flotation Feed(Thickening Cyclone Underflow) 15.8 ASH% 7 FSI

3. Concentrate 10.5 ASH% 7 1/2 FSI

4. Tailings 65.5 ASH% 1 FSI

5. Yield Concentrate $\frac{65.5 - 15.8}{65.5 - 10.5}$ = 90.4 %

Birtley Coal
& Minerals Testing

LAB NO. 5093 DATE June 18,1980

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE I.D. cm

STARTING TEMP. °C 350

SOFTENING TEMP. °C 419

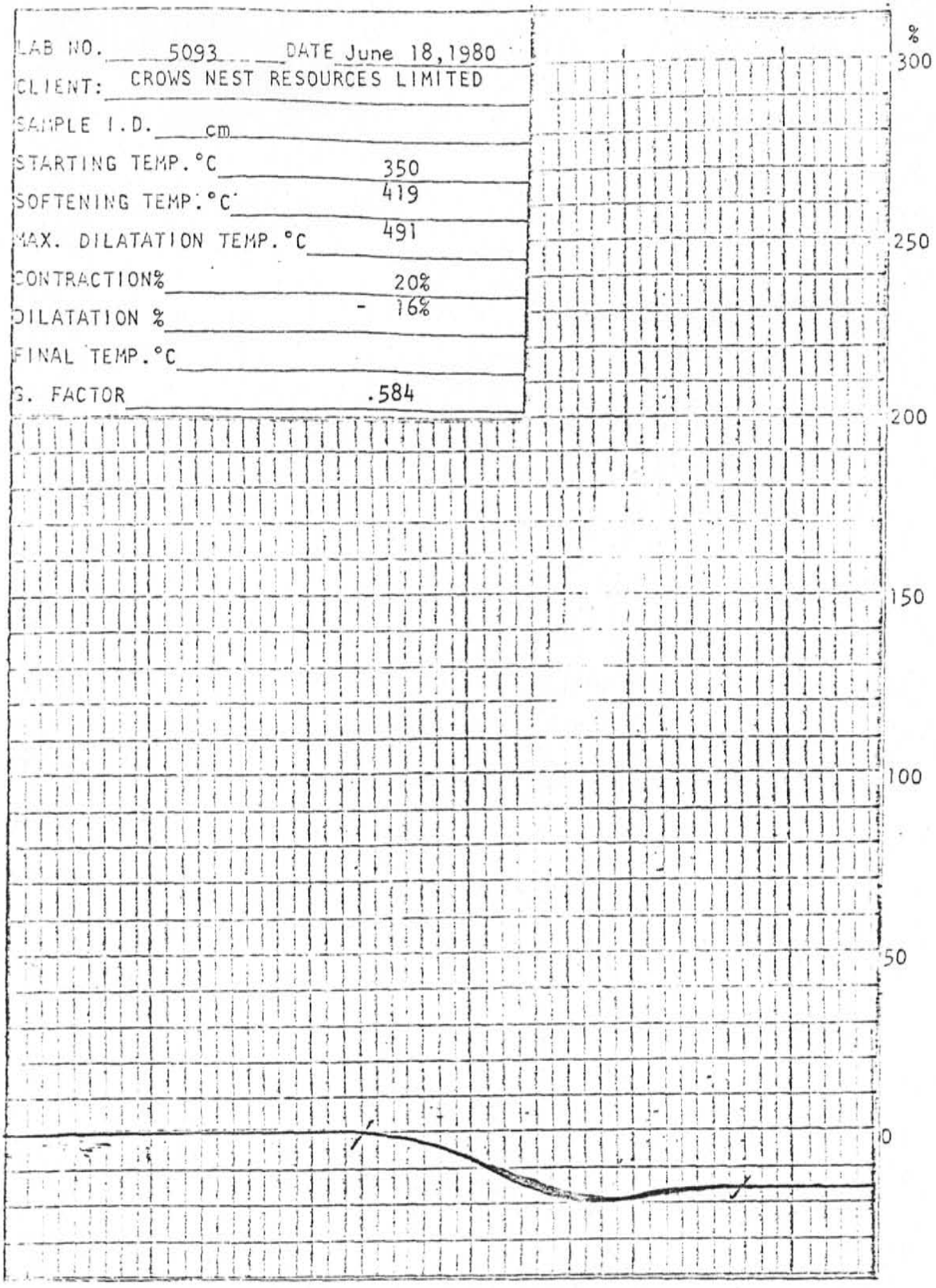
MAX. DILATATION TEMP. °C 491

CONTRACTION% 20%

DILATATION % - 16%

FINAL TEMP. °C

G. FACTOR .584



RUHR DILATOMETER TEST

Birtley Coal
& Minerals Testing

CLIENT : CROWS NEST RESOURCES LIMITED

PROJECT: HORSESHOE RIDGE BULK SAMPLE

ADIT 14 SEAM 8 RIDER

LAB NO : 5094

HEAD RAW ANALYSIS

ADM%	MOISTURE	ASH%	VOL%	F.C.%	S%	F.S.I.	CALC BASIS
0.9	0.6	24.6	19.6	55.2	0.71	6	a.d.b.
	1.5	24.4	19.4	54.7	0.70	-	a.r.b.
		24.7	19.7	55.6	0.71	-	d.b.

SIZE AND RAW ANALYSIS, a.d.b.

SIZE FRACTION	WT%	RM%	ASH%	VM%	FC%	S%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
2" x 1/4"	48.7	0.6	28.7	18.8	51.9	0.63	4 1/2	48.7	28.7
1/4" x 28M	40.4	0.7	21.3	20.2	57.8	0.66	7 1/2	89.1	25.3
28M x 65M	6.5	0.9	15.5	20.0	63.6	0.83	8 1/2	95.6	24.7
65M x 0	4.4	0.7	15.7	20.7	62.9	0.82	7	100.0	24.3

WT% + 2" = 15.1 -crushed to pass 2"

SINK-FLOAT ANALYSIS,a.d.b.: 2" x 1/4"(WT% =48.7)

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
- 1.30	6.9	3.1	9	6.9	3.1
1.30 - 1.35	19.9	7.3	7 1/2	26.8	6.2
1.35 - 1.40	11.4	11.9	5	38.2	7.9
1.40 - 1.45	10.3	16.7	3	48.5	9.8
1.45 - 1.50	9.6	20.5	1 1/2	58.1	11.6
1.50 - 1.55	6.6	25.5	1	64.7	13.0
1.55 - 1.60	4.6	31.1	1	69.3	14.2
1.60 - 1.70	5.4	37.4	1	74.7	15.9
1.70 - 1.80	3.4	47.0	1	78.1	17.2
+1.80	21.9	73.2	N.A.	100.0	29.5

Birtley Coal
& Minerals Testing

CLIENT : CROWS NEST RESOURCES LIMITED

PROJECT: HORSESHOE RIDGE BULK SAMPLE

ADIT 14 SEAM 8 RIDER

LAB NO. : 5094

SINK-FLOAT ANALYSIS, a.d.b.: 1/4" x 28M(WT% 40.4)

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
- 1.30	31.0	2.1	9	31.0	2.1
1.30 - 1.35	17.5	7.7	8	48.5	4.1
1.35 - 1.40	8.0	12.0	5	56.5	5.2
1.40 - 1.45	7.4	16.4	3	63.9	6.5
1.45 - 1.50	5.2	21.3	1 1/2	69.1	7.6
1.50 - 1.55	4.8	26.2	1 1/2	73.9	8.8
1.55 - 1.60	3.1	31.5	1	77.0	9.8
1.60 - 1.70	4.2	38.6	1	81.2	11.3
1.70 - 1.80	3.7	49.6	1	84.9	12.9
+1.80	15.1	70.3	N.A.	100.0	21.6

SINK - FLOAT ANALYSIS,a.d.b.: 28M x 65M(WT% =6.5)

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
- 1.30	48.7	1.5	9	48.7	1.5
1.30 - 1.35	12.0	6.0	8	60.7	2.4
1.35 - 1.40	7.8	10.4	3 1/2	68.5	3.3
1.40 - 1.45	5.9	14.9	2	74.4	4.2
1.45 - 1.50	4.3	20.4	1 1/2	78.7	5.1
1.50 - 1.55	3.1	25.1	1	81.8	5.9
1.55 - 1.60	2.3	30.8	1	84.1	6.5
1.60 - 1.70	2.7	38.2	1	86.8	7.5
1.70 - 1.80	2.3	47.4	1	89.1	8.6
+1.80	10.9	70.4	N.A.	100.0	15.3

Birtley Coal
& Minerals Testing

CLIENT : CROWS NEST RESOURCES LIMITED

PROJECT: HORSESHOE RIDGE BULK SAMPLE

ADIT 14 SEAM 8 RIDER

LAB NO.: 5094

FROTH FLOTATION TEST, a.d.b.: 65M X 0

PRODUCT	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
STAGE 1	69.1	9.5	8	69.1	9.5
STAGE 11	10.7	14.8	7 1/2	79.8	10.2
TAILINGS	20.2	37.1	2 1/2	100.0	15.6

FROTH FLOTATION PARAMETERS

Pulp Density	= 10%
Reagent	= 4:1= Kerosene: MIBC
Dosage	= 0.48 lb/T.D.S.
Conditioning Time	= 60 seconds
Stage 1	= 1st minute froth
Stage 11	= 2nd minute froth

Birtley Coal
& Minerals Testing

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: HORSESHOE RIDGE ADIT 14, SEAM 8 RIDER BULK

LAB NO: 5094

COMPOSITE WASHABILITY DATA: 2"x65M RAW COAL FROM SINK FLOAT ANALYSIS

SPECIFIC GRAVITY FRACTION	DIRECT		% WT. of Ash of Total	Cum. Wt.of Ash %	CUMULATIVE FLOATS		SINK WT.of ASH%	CUMULATIVE SINKS		+0.1 S.G. DISTRIBUTION	
	WT%	ASH%			WT%	ASH%		WT %	ASH%	S.G.	WT%
-1.30	19.9	2.2	0.4	0.4	19.9	2.2	24.8	80.1	31.0		
1.30 -1.35	18.3	7.4	1.4	1.8	38.2	4.7	23.4	61.8	37.9		
1.35 -1.40	9.7	11.9	1.2	3.0	47.9	6.2	22.2	52.1	42.6	1.40	44.2
1.40 -1.45	8.8	16.5	1.4	4.4	56.7	7.8	20.8	43.3	48.0	1.45	31.5
1.45 -1.50	7.4	20.7	1.5	5.9	64.1	9.3	19.3	35.9	53.8	1.50	25.6
1.50 -1.55	5.6	25.7	1.4	7.3	69.7	10.6	17.9	30.3	59.1	1.55	18.1
1.55 -1.60	3.8	31.2	1.2	8.5	73.5	11.6	16.7	26.5	63.0	1.60	14.1
1.60 -1.70	4.7	37.9	1.8	10.3	78.2	13.2	14.9	21.8	68.3	1.70	8.2
1.70 -1.80	3.5	48.2	1.7	12.0	81.7	14.7	13.2	18.3	72.1		
+1.80	18.3	72.1	13.2	25.2	100.0	25.2					

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: HORSESHOE RIDGE ADIT 14, SEAM 8 RIDER BULK

LAB NO: 5094

WASHABILITY DATA: 2" x 1/4" RAW COAL FROM SINK FLOAT ANALYSIS

SPECIFIC GRAVITY FRACTION	DIRECT		% WT. of Ash of Total	Cum. Wt. of Ash %	CUMULATIVE FLOATS		SINK WT. of ASH%	CUMULATIVE SINKS		+0.1 S.G. DISTRIBUTION	
	WT%	ASH%			WT%	ASH%		WT %	ASH%	S.G.	WT%
-1.30	6.9	3.1	0.2	0.2	6.9	3.1	29.3	93.1	31.5		
1.30 -1.35	19.9	7.3	1.5	1.7	26.8	6.2	27.8	73.2	38.0		
1.35 -1.40	11.4	11.9	1.4	3.1	38.2	7.9	26.4	61.8	42.7	1.40	51.2
1.40 -1.45	10.3	16.7	1.7	4.8	48.5	9.8	24.7	51.5	48.0	1.45	37.9
1.45 -1.50	9.6	20.5	2.0	6.8	58.1	11.6	22.7	41.9	54.2	1.50	31.1
1.50 -1.55	6.6	25.5	1.7	8.5	64.7	13.0	21.0	35.3	59.5	1.55	21.2
1.55 -1.60	4.6	31.1	1.4	9.9	69.3	14.2	19.6	30.7	63.8	1.60	16.6
1.60 -1.70	5.4	37.4	2.0	11.9	74.7	15.9	17.6	25.3	69.6	1.70	8.8
1.70 -1.80	3.4	47.0	1.6	13.5	78.1	17.2	16.0	21.9	73.2		
+1.80	21.9	73.2	16.0	29.5	100.0	29.5					

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: HORSESHOE RIDGE ADIT 14, SEAM 8 RIDER BULK

LAB NO: 5094

WASHABILITY DATA: 1/4"x28M RAW COAL FROM SINK FLOAT ANALYSIS

SPECIFIC GRAVITY FRACTION	DIRECT		% WT. of Ash of Total	Cum. Wt. of Ash %	CUMULATIVE FLOATS		SINK WT. of ASH%	CUMULATIVE SINKS		+0.1 S.G. DISTRIBUTION	
	WT%	ASH%			WT%	ASH%		WT %	ASH%	S.G.	WT%
-1.30	31.0	2.1	0.7	0.7	31.0	2.1	20.9	69.0	30.3		
1.30 -1.35	17.5	7.7	1.3	2.0	48.5	4.1	19.6	51.5	38.1		
1.35 -1.40	8.0	12.0	1.0	3.0	56.5	5.2	18.6	43.5	42.8	1.40	38.1
1.40 -1.45	7.4	16.4	1.2	4.2	63.9	6.5	17.4	36.1	48.2	1.45	25.4
1.45 -1.50	5.2	21.3	1.1	5.3	69.1	7.6	16.3	30.9	52.8	1.50	20.5
1.50 -1.55	4.8	26.2	1.3	6.6	73.9	8.8	15.0	26.1	57.5	1.55	16.0
1.55 -1.60	3.1	31.5	1.0	7.6	77.0	9.8	14.0	23.0	60.9	1.60	12.1
1.60 -1.70	4.2	38.6	1.6	9.2	81.2	11.3	12.4	18.8	66.0	1.70	7.9
1.70 -1.80	3.7	49.6	1.8	11.0	84.9	12.9	10.6	15.1	70.3		
+1.80	15.1	70.3	10.6	21.6	100.0	21.6					

CLIENT: CROWS NEST RESOURCES LIMITED

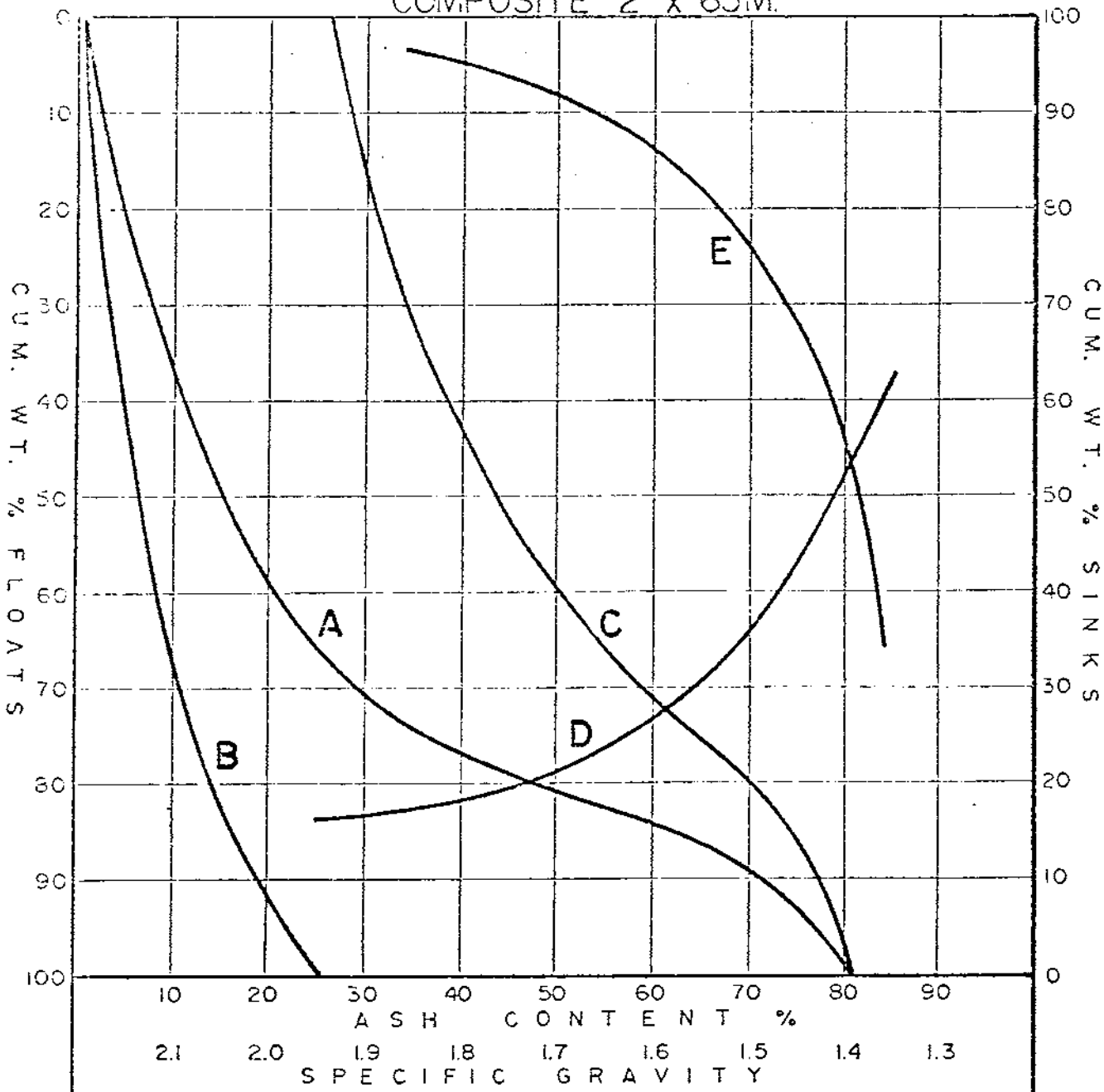
SAMPLE: HORSESHOE RIDGE ADIT 14, SEAM 8 RIDER BULK'

LAB NO: 5094

WASHABILITY DATA: 28M x 65M RAW COAL FROM SINK FLOAT ANALYSIS

SPECIFIC GRAVITY FRACTION	DIRECT		% WT. of Ash of Total	Cum. Wt. of Ash %	CUMULATIVE FLOATS		SINK WT. of ASH%	CUMULATIVE SINKS		+0.1 S.G. DISTRIBUTION	
	WT%	ASH%			WT%	ASH%		WT %	ASH%	S.G.	WT%
-1.30	48.7	1.5	0.7	0.7	48.7	1.5	14.6	51.3	28.5		
1.30 -1.35	12.0	6.0	0.7	1.4	60.7	2.4	13.9	39.3	35.4		
1.35 -1.40	7.8	10.4	0.8	2.2	68.5	3.3	13.1	31.5	41.6	1.40	30.0
1.40 -1.45	5.9	14.9	0.9	3.1	74.4	4.2	12.2	25.6	47.7	1.45	21.1
1.45 -1.50	4.3	20.4	0.9	4.0	78.7	5.1	11.3	21.3	53.1	1.50	15.6
1.50 -1.55	3.1	25.1	0.8	4.8	81.8	5.9	10.5	18.2	57.7	1.55	11.2
1.55 -1.60	2.3	30.8	0.7	5.5	84.1	6.5	9.8	15.9	61.6	1.60	8.1
1.60 -1.70	2.7	38.2	1.0	6.5	86.8	7.5	8.8	13.2	66.7	1.70	5.0
1.70 -1.80	2.3	47.4	1.1	7.6	89.1	8.6	7.7	10.9	70.4		
+1.80	10.9	70.4	7.7	15.3	100.0	15.3					

WASHABILITY CURVES
COMPOSITE 2" x 65M.



A – PRIMARY CURVE
B – CLEAN COAL CURVE
C – DISCARD CURVE
D — S.G. – YIELD CURVE
E — + 0.1 S.G. DISTRIBUTION CURVE

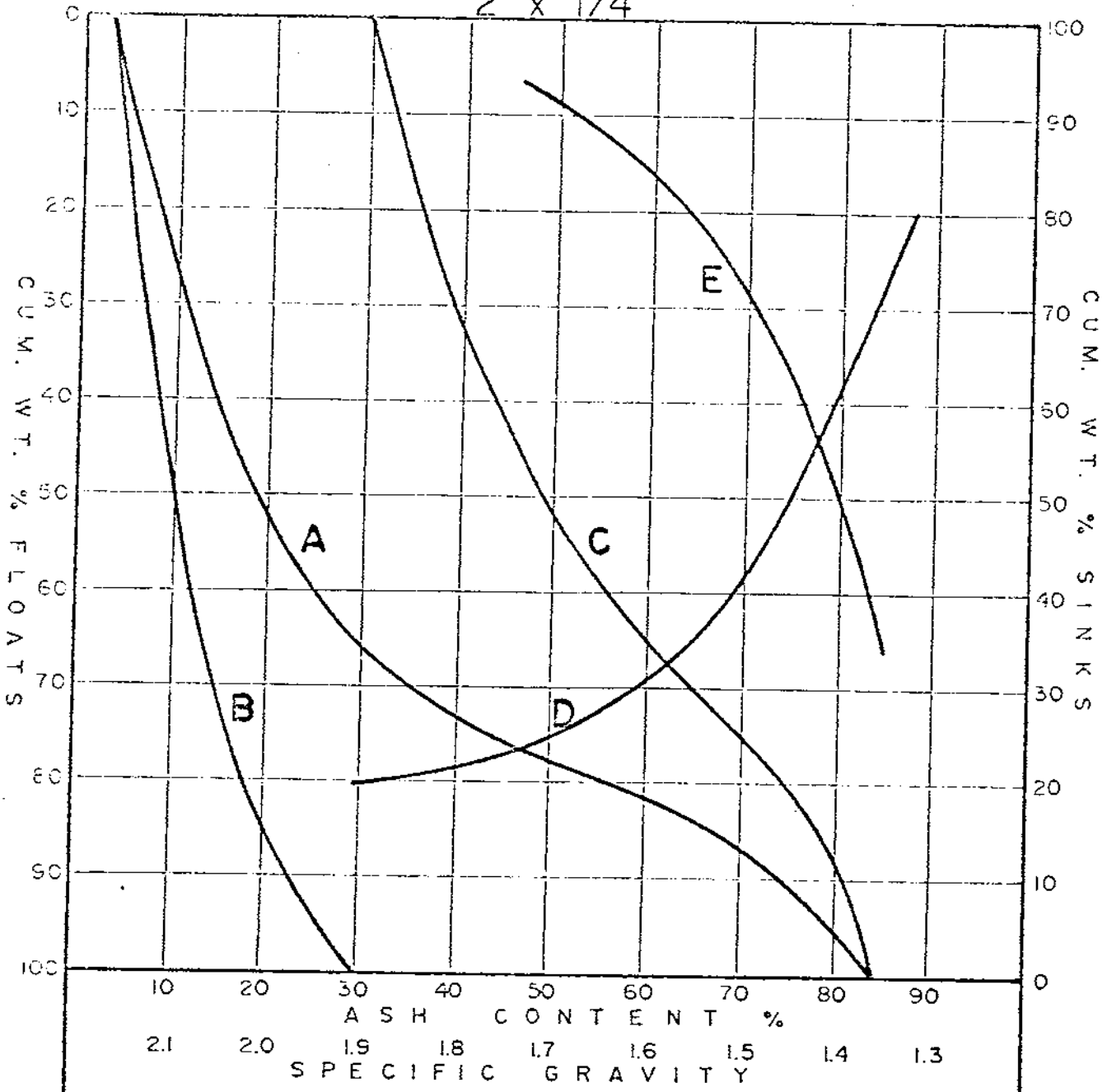
BIRTLEY COAL and MINERALS TESTING
calgary alberta

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: ADIT 14, SEAM 8 RIDER, HORSESHOE RIDGE

LAB NO: 5094 | DRAWN BY: JA | DATE: JUNE 2, 1980

WASHABILITY CURVES
2" x 1/4"



A – PRIMARY CURVE
B – CLEAN COAL CURVE
C – DISCARD CURVE
D — S.G. – YIELD CURVE
E — ÷ 0.1 S.G. DISTRIBUTION CURVE

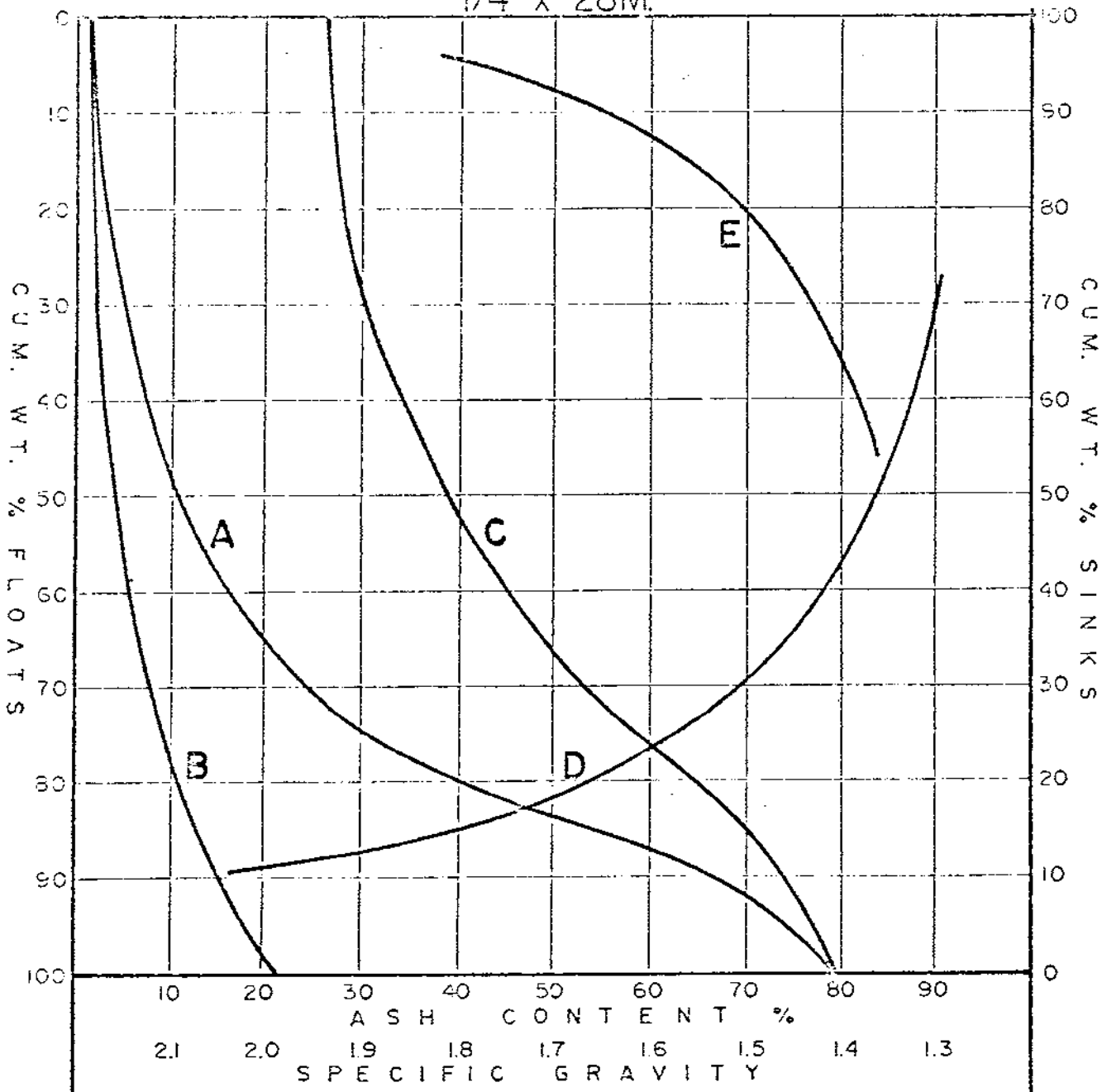
BIRTLEY COAL and MINERALS TESTING
calgary alberta

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: ADIT 14, SEAM 8 RIDER, HORSESHOE RIDGE

LAB NO: 5094 | DRAWN BY: A. | DATE: JUNE 2, 1980

WASHABILITY CURVES
1/4" x 28M.



A – PRIMARY CURVE
B – CLEAN COAL CURVE
C – DISCARD CURVE
D — S.G. – YIELD CURVE
E — + 0.1 S.G. DISTRIBUTION CURVE

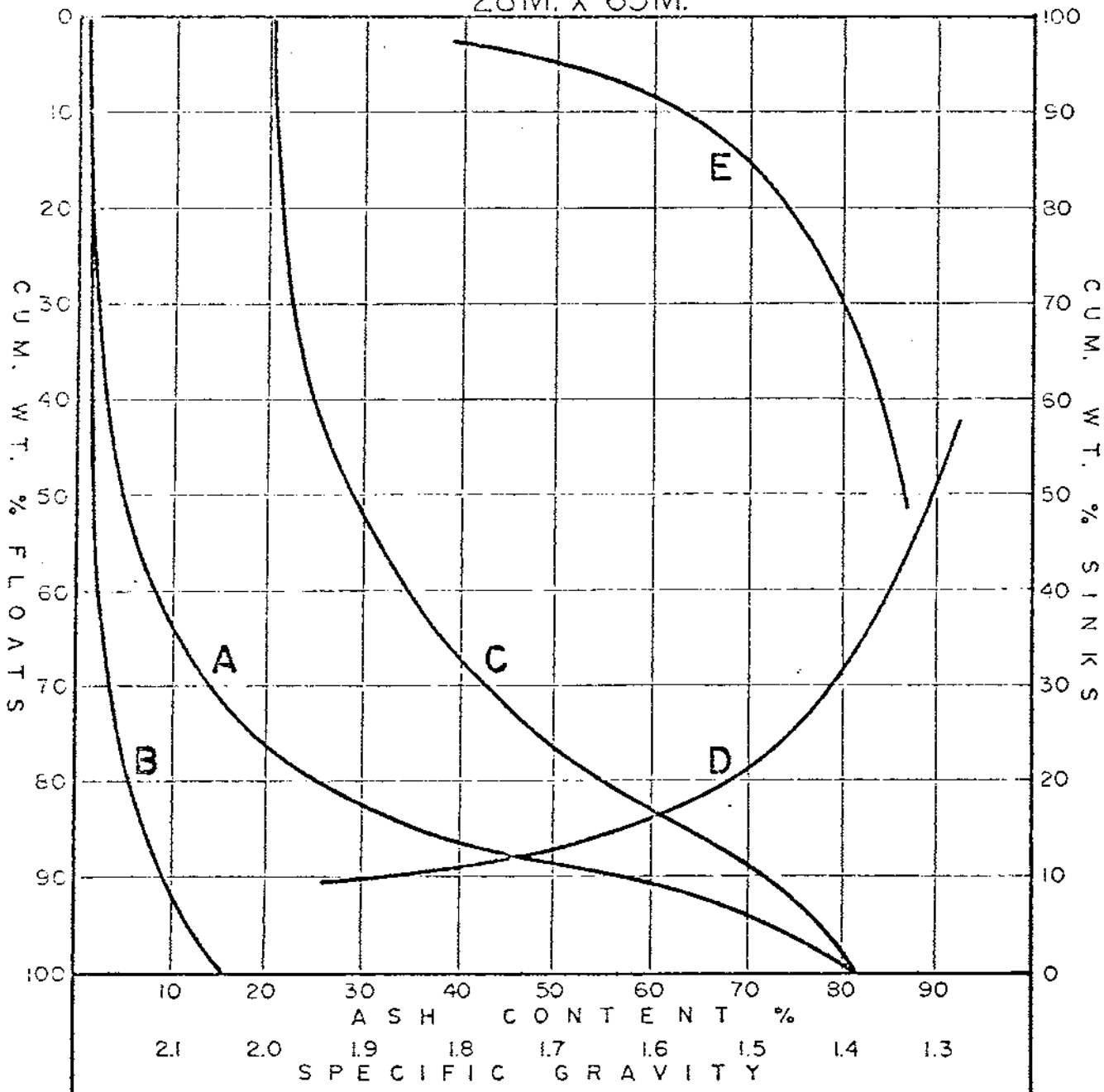
BIRTLEY COAL and MINERALS TESTING
calgary alberta

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: ADIT 14, SEAM 8 RIDER, HORSESHOE RIDGE

LAB NO: 5094 | DRAWN BY: A. | DATE: JUNE 2, 1980

WASHABILITY CURVES
28M. x 65M.



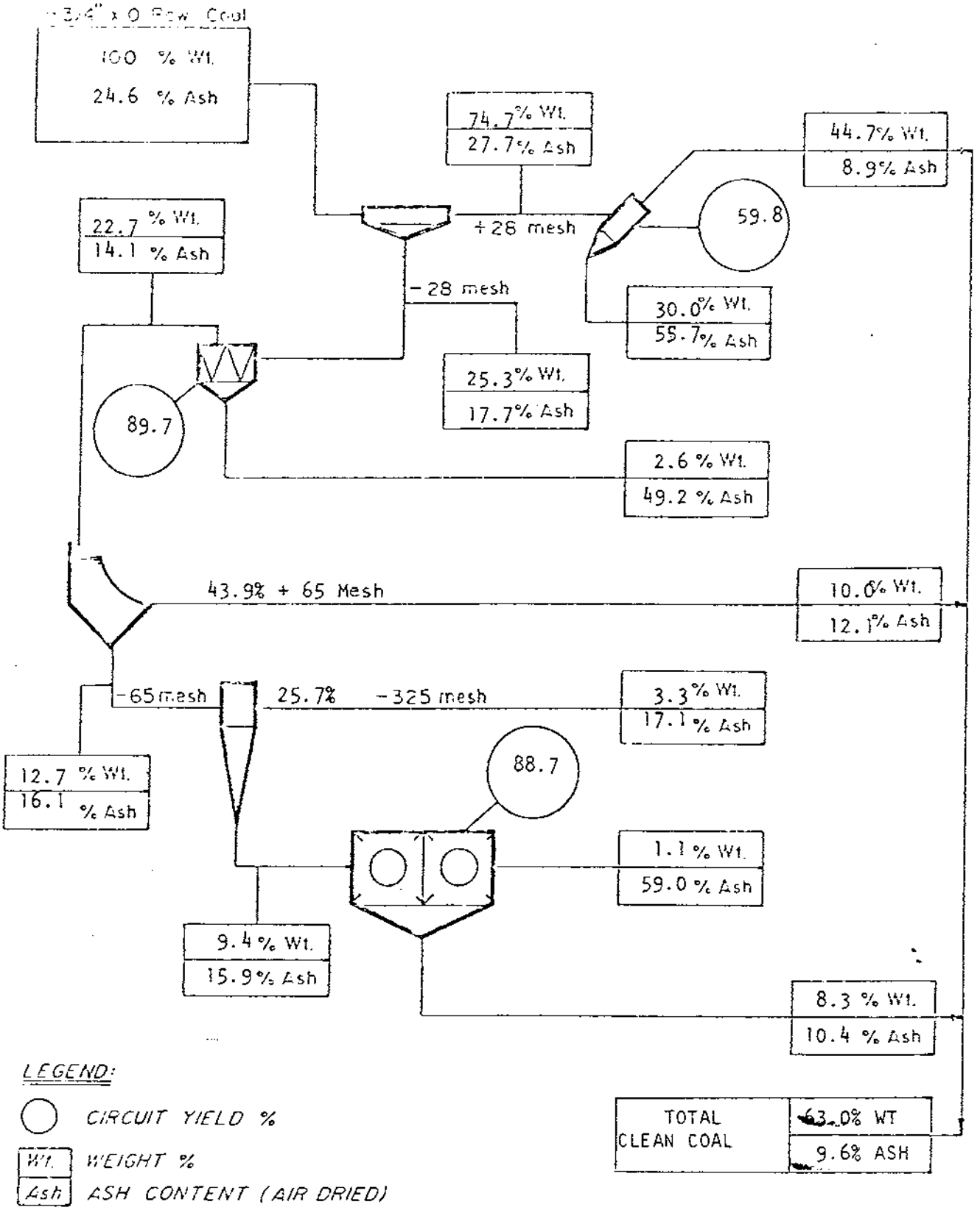
A – PRIMARY CURVE
B – CLEAN COAL CURVE
C – DISCARD CURVE
D — S.G. – YIELD CURVE
E — + 0.1 S.G. DISTRIBUTION CURVE

BIRTLEY COAL and MINERALS TESTING
calgary alberta

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE: ADIT 14, SEAM 8 RIDER, HORSESHOE RIDGE

LAB NO: 5094	DRAWN BY: A.	DATE: JUNE 2, 1980



BIRTLEY COAL & MINERALS TESTING

Title PLANT BALANCE FLOW SHEET CROWS NEST RESOURCES LIMITED HORSESHOE RIDGE BULK SAMPLE ADIT 14, SEAM 8 RIDER LAB NO. 5095	Date June 11, 1980 Drawn

SUMMARY - BULK WASHING DATA *

Bulk Sample HORSESHOE RIDGE ADIT 14, SEAM 8 RIDER Lab. No. 5095

Date Received May 16, 1980 Date Washed June 10, 1980

(a) RAW COAL

Delivered Weight 5.658 MT Washed Weight 5.339 MT

ADM % 0.9 ASH% 24.6 F.S.I. 6

(b) HEAVY MEDIA CIRCUIT: 3/4" x 28 Mesh= 74.7 % by weight

S.G. of Medium 1.32 Calculated Yield 59.8%

Sample	ASH %	F.S.I.
Feed	27.7	5
Clean Coal	8.9	7 1/2
Reject	55.7	1

(c) WATER -ONLY CYCLONE CIRCUIT :28M x0 = 25.3 % by weight

V.F.C. #1 5.08 cm. #2 5.08 cm. Calculated Yield 89.7%

Sample	ASH %	F.S.I.
Feed	17.7	7
Overflow	14.1	8
Underflow	49.2	1
S.B.O.	12.1	8 1/2
S.B.U.	16.1	7 1/2

(d) FROTH FLOTATION CIRCUIT: 65M x0 12.7 %by Weight

4:1 =Kerosene: M.I.B.C. Calculated Yield 88.7 %

Sample	ASH %	F.S.I.
T.C.O.	17.1	2
Feed (T.C.U.)	15.9	7 1/2
Concentrate	10.4	8 1/2
Tailings	59.0	1

(e) FILTER CAKE: S.B.O. + CONCENTRATE = 11.5 ASH% 8 1/2 FSI

* All weights and analysis are on an Air Dried Basis unless otherwise indicated.

Birtley Coal
& Minerals Testing

SUMMARY - BULK WASHING DATA (Cont.)

BULK SAMPLE HORSESHOE RIDGE ADIT 14, SEAM 8 RIDER LAB NO. 5095

(f) CLEAN COAL: H.M.C.C. + FILTER CAKE Calculated Yield 63.0%

ADM	PROXIMATE				S		FSI		
	RM%	ASH%	VM %	FC %					
6.8	0.4	9.7	21.0	68.9	0.65		8		

DILATATION TEST				
ST (°C)	MDT (°C)	MC %	MD %	G
407	479	23	35	1.017

GIESELER FLUIDITY TEST		
	DDPM	TEMP (°C)
START	1	452
MAXIMUM	54	484
FINAL	0	516
RANGE		64

Birtley Coal
& Minerals Testing

BULK SAMPLE: HORSESHOE RIDGE ADIT 14, SEAM 8 RIDER LAB NO. 5095

SUMMARY BULK WASHING DATA (Cont.)

CLEAN COAL

SIZE ANALYSIS		
SIZE FRACTION	WT %	Cumulative WT%
+ 3/4 "		
3/4 " x 1/2 "		
1/2 " x 1/4 "		
1/4 " x 6 M		
6 M x 14 M		
14 M x 28 M		
28 M x 65 M		
65 M x 100 M		
100 M x 200 M		
200 M x 0		

CLEAN COAL INVENTORY

DATE	SHIPPED		IN STOCK	
	BBLS	M.T.	BBLS	M.T.
June 13, 1980			18	3.138

Birtley Coal
& Minerals Testing

BULK WASHING DATA

BULK SAMPLE HORSESHOE RIDGE ADIT 14, SEAM 8 RIDER LAB NO. 5095

HEAVY MEDIUM CIRCUIT

CYCLONE: 14" DSM operating @ 51.7 KPa.

MAGNETITE MEDIUM maintained @ 1.32 S.G.

1. FEED(3/4 x 28 Mesh) 3.986 M.T. 27.7 ASH% 5 FSI

2. CLEAN COAL 2.359 M.T. 8.9 ASH% 7 1/2 FSI

3. REJECT 1.627 M.T. 55.7 ASH% 1 FSI

4. YIELD CLEAN COAL (Weighted) = $\frac{2.359}{3.986}$ = 59.2 %

5. YIELD CLEAN COAL (Calculated)= $\frac{55.7 - 27.7}{55.7 - 8.9}$ = 59.8 %

Birtley Coal
& Minerals Testing

BULK WASHING DATA

Bulk Sample HORSESHOE RIDGE ADIT 14, SEAM 8 RIDER LAB NO. 5095

WATER - ONLY CYCLONE CIRCUIT

Primary Cyclone: 6" DSM operating @ 137.9 KPa

Vortex Finder Clearance set @ 5.08 c m.

Secondary Cyclone: 4" DSM operating @ 34.5 KPa

Vortex Finder Clearance set @ 5.08 c m.

Sieve Bend : 65 Mesh

1.	Feed (28 Mesh x 0)	17.7	ASH	%	7	FSI
2.	Primary Cyclone Overflow	14.1	ASH	%	8	FSI
3.	Secondary Cyclone Underflow	49.2	ASH	%	1	FSI
4.	Sieve Bend Overflow(S.B.O.)	12.1	ASH	%	8 1/2	FSI
5.	Sieve Bend Underflow(S.B.U.)	16.1	ASH	%	7 1/2	FSI

6. Yield (W.O. Cyclone) $\frac{49.2 - 17.7}{49.2 - 14.1}$ = 89.7 %

7. WT% 28Mx65M in Primary Cyclone Overflow = 43.9 %

8. Estimated Yield of 28M x65M (S.B.O. , as % of 28 M x 0 Feed) = 39.4 %

Birtley Coal
& Minerals Testing

BULK WASHING DATA

BULK SAMPLE HORSESHOE RIDGE ADIT 14 LAB NO. 5095
SEAM 8 RIDER

FROTH FLOTATION CIRCUIT

Flotation Cell: two(2) Birtley -Humboldt Multi-Wobble impellers in series.

Reagent : 4:1 = Kerosene:M.I.B.C.

Thickening Cyclone : 20° - 8" cyclone Hayl-Patterson

1. Thickening Cyclone Overflow (T.C.O. -325M) 17.1 ASH% 2 FSI

2. Flotation Feed(Thickening Cyclone Underflow) 15.9 ASH% 7 1/2 FSI

3. Concentrate 10.4 ASH% 8 1/2 FSI

4. Tailings 59.0 ASH% 1 FSI

5. Yield Concentrate $\frac{59.0 - 15.9}{59.0 - 10.4}$ = 88.7 %

Birtley Coal
& Minerals Testing

LAB NO. 5095 DATE June 18, 1980

CLIENT: CROWS NEST RESOURCES LIMITED

SAMPLE I.D. cm

STARTING TEMP. °C 350

SOFTENING TEMP. °C 407

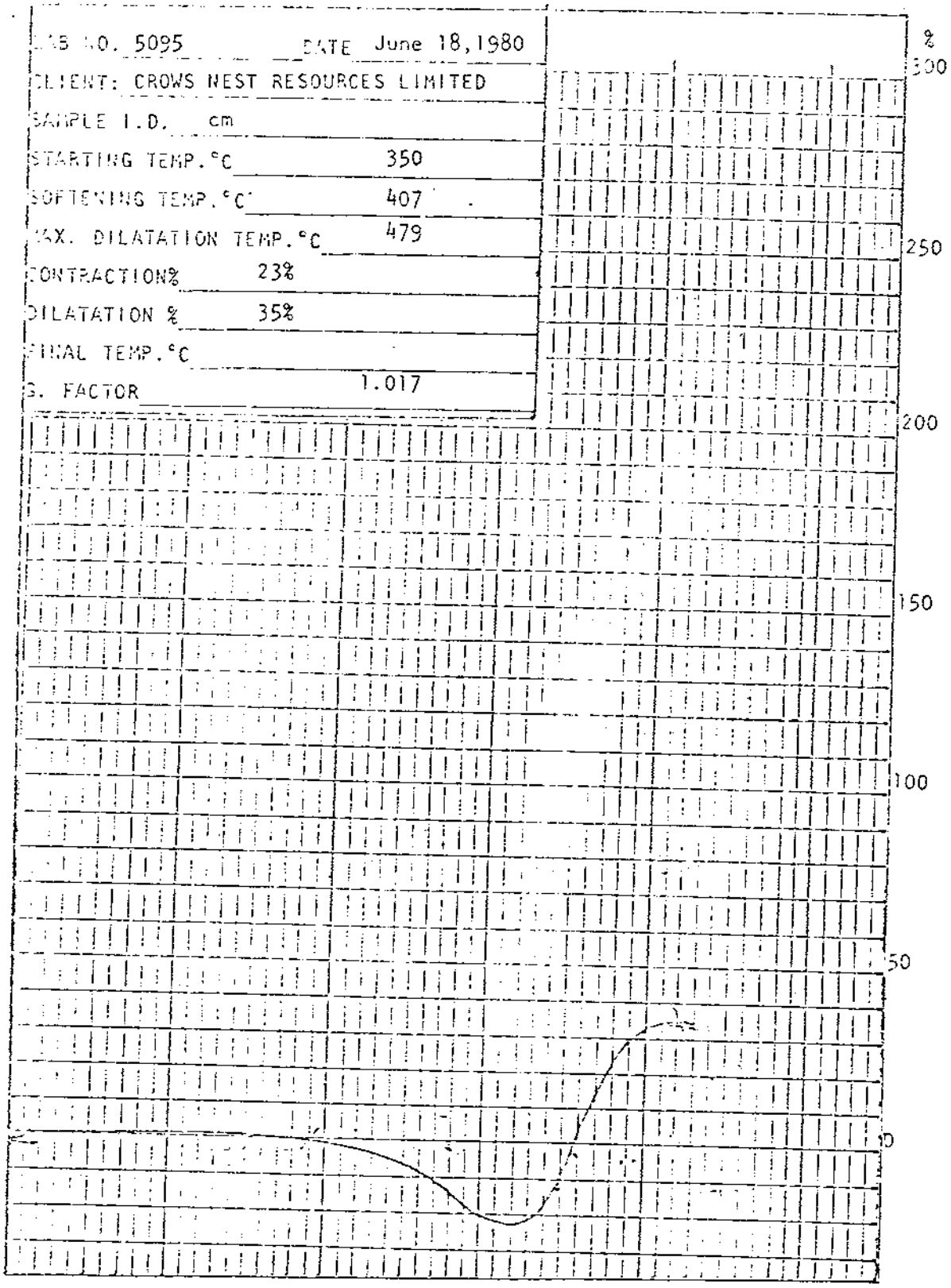
MAX. DILATATION TEMP. °C 479

CONTRACTION% 23%

DILATATION % 35%

FINAL TEMP. °C

G. FACTOR 1.017



RUHR DILATOMETER TEST

Birtley Coal
& Minerals Test

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST COAL INDUSTRIES LTD

A REPORT TO
CROWS NEST RESOURCES LTD.
ON THE WASHABILITY AND PILOT PLANT WASHING
OF THE ADIT 19, SEAM 7, BULK SAMPLE FROM THE
HORSESHOE RIDGE PROJECT

OCTOBER, 1980

Respectfully Submitted by,

Frank J. Horvat
General Manager

BIRTLEY COAL & MINERALS TESTING

Report No. BC- 0149

505 - 50th Avenue S.E., P.O. Box 5488, Station "A", Calgary, Alberta T2H 1X9 Telephone (403) 253-8273

Birtley Coal
& Minerals Testing

A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

A REPORT TO

CROWS NEST RESOURCES LTD.

ON THE WASHABLILTY AND PILOT PLANT WASHING

OF THE ADIT 19, SEAM 7, BULK SAMPLE FROM THE

HORSESHOE RIDGE PROJECT

OCTOBER , 1980
REPORT NO. BC -0149

INTRODUCTION:

The bulk sample was delivered to the Birtley Coal and Minerals Testing plant site in Calgary, Alberta on Sept. 16,1980 in 58 forty-five gallon steel drums.

The coal was weighed and thoroughly homogenized, and a representative sample of 7 barrels was extracted for head raw analysis and washability work. The washability data and curves are contained in this report.

The remaining coal was washed using the heavy media, two stage water cyclone, and froth flotation circuits. The plant balance sheet provides a summary of the wash results of which the clean coal analysis forms a part.

505 - 50th Avenue S.E., P.O. Box 5488, Station "A", Calgary, Alberta T2H 1X9 Telephone (403) 253-8273

PILOT PLANT WASHING

Figure 1 is the flowsheet of the BIRTLEY COAL & MINERALS TESTING pilot plant. Raw coal is dumped by front end loader into a feeder unit consisting of a hopper with a 2" slot grizzly across the top, a syntron vibrating feed control and a belt conveyor. The 2" oversize coal is crushed to pass 2" by means of an auxiliary crusher, but "rock" is usually collected in barrels and reported as breaker reject.

The discharge end of the belt conveyor serves as a convenient point for taking the plant feed sample. The feed rate can be adjusted to a maximum of 7.5 metric tons per hour. This feed is conveyed by the bucket elevator to the third deck and discharged into a 3/4" rotary screen. The 3/4" oversize falls via a chut into a 5" x 8" jaw crusher where it is crushed to minus 3/4" and is recycled through the feed system via screw conveyors. The 3/4" x 0 screen underflow is washed with water onto a 28 mesh sieve bend and slot screen for desliming.

HEAVY MEDIA OPERATION

The 3/4" x 28 mesh coal is the feed to the 14" DSM Heavy Media cone on the second deck. The correct medium is adjusted to the required gravity by adding magnetite or diluting with water. The slurry of coal and correct medium is pumped to the cyclone from the mixing tube at a pressure of 9 to 10 psi. The overflow and underflow products are discharged onto a common, but split, 28 mesh drain and rinse screen preceded by a 28 mesh sieve bend where the magnetite is washed off into the correct and dilute medium tanks directly below. Additional clean spray water and baffles across the clean coal stream ensure that a minimum of magnetite is retained in the clean coal product. The coal and shale are collected in barrels by means of individual chutes for weighing.

The dilute medium is pumped to a thickening cone on the third deck from where it is fed to a 30" magnetic separator. The recovered magnetite is sluiced back to the correct medium tank. The specific gravity of the medium is monitored manually, using a density meter, and adjusted for loss by adding cyclone grade magnetite directly to the correct medium tank.

LARGE DIAMETER WATER-ONLY CYCLONE OPERATION (14")

The W.O.C. is operated by draining the heavy media system of all magnetite but using the same pumps and water as the medium. The cut point of the W.O.C. is altered by adjusting the vortex finder relative to its proximity to the apex of the cone. The function of the drain and rinse screens, when the W.O.C. is used, is for dewatering only. The heavy media recovery circuit is not utilized.

FINES (28M x 0) TREATMENT

The 28 mesh x 0 coal collected in the slimes tank ground level is pumped to the thickening cone on the third deck. From this point it can be fed directly to the froth circuit, or as is usual, to the two stage water-only cyclone system.

Coal to the 6" DSM water-only primary cyclone is pumped at a pulp density of 10% to 20% from the cyclone feed tank at a pressure of 20 psi, and a flow rate of 85 Imperial gallons per minute. A mechanically adjustable vortex finder facilitates settings for a desired ash content. The primary cyclone underflow with make-up water is fed to a similarly adjustable secondary 4" unit. The overflow is directed back to the primary cyclone feed tank with the underflow being the waste product.

The waste product is routed to the static thickener while the primary underflow is fed by gravity to a rapped 0.25 mm sieve bend. The sieve bend is the water-only cyclone product at approximately 65 mesh oversize, and is directed to the Eimco disc filter for dewatering.

The sieve bend underflow passes by gravity to the thickening cyclone feed tank, from where it is pumped to the 20° - 8" cyclone. This thickening cone serves a dual purpose: 1) it removes undesirable -325 mesh slimes from the

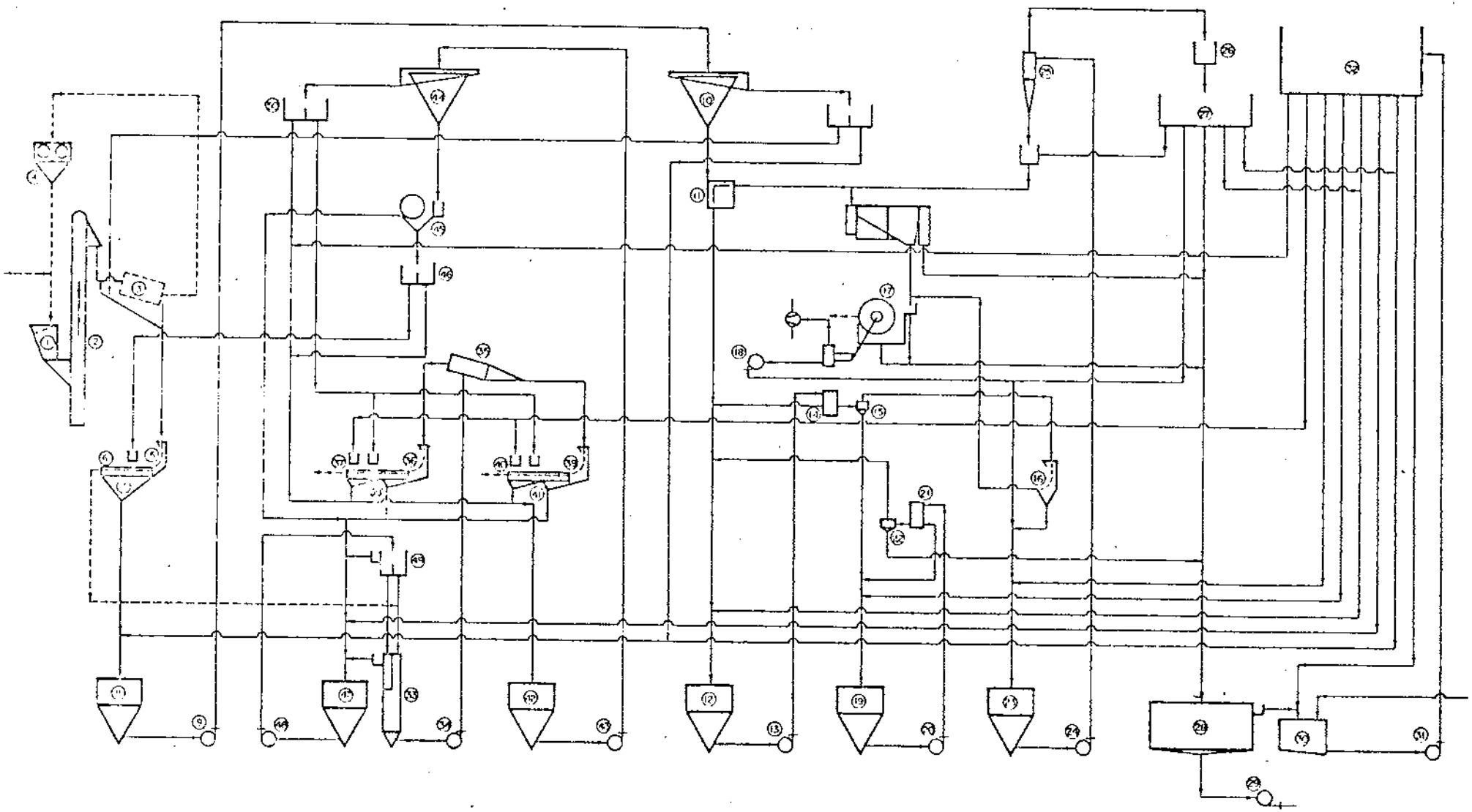
flotation feed; 2) it provides a feed of proper density (15% - 25% solids) to the froth cells. The overflow with the -325 mesh slimes flows to the static thickener.

The flotation circuit consists of two (2) Birtley - Humboldt Multi-Wobble Cells in series. Since these cells were installed on September 12, 1976 there appears to be a marked improvement in tailings ash contents, indicating excellent recovery of froth product. A rotary reagent feeder introduces 4:1 Kerosene: Methylisobutylcarbinol into the circuit at the feed entry point for better conditioning.

The tailings join the water-only cyclone underflow and thickener cone overflow to form the thickener tails. The froth enters the Eimco disc filter and is dewatered along with the sieve bend overflow to form the filter cake or fines product. This and the coarse clean coal are combined to form the clean coal product or clean mix.

Each circuit is sampled for feed, product, and waste in addition to the 0.25mm sieve bend overflow, and analyzed for ash content. The primary water-only cyclone overflow product is screened at 65 mesh as the plus 65 mesh figure is used to calculate the yield of the water-only cyclone circuit.

The heavy media clean coal is "drained" of extraneous moisture before being combined and homogenized with the partially dried filter cake. This partial drying is accomplished by spreading the fines product on a pad, heated electrically at 20°C, and reducing the moisture content from 22 - 28% to less than 12%.

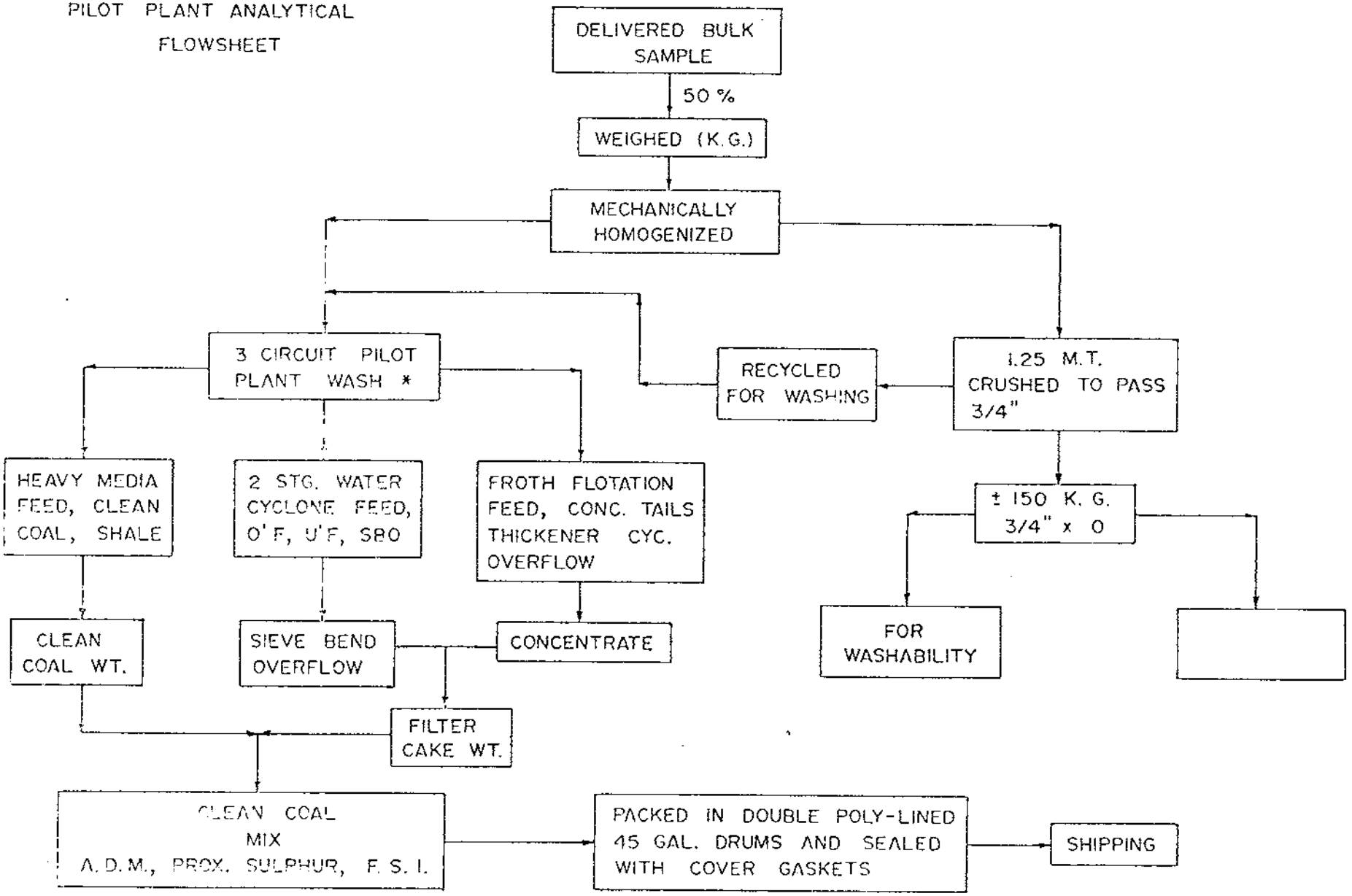


1. Feed Bin
2. Elevator
3. Rotary Screen
4. Jaw Crusher
5. Sieve Bend
6. Destoning Screen
7. Underflow Collector
8. 28M-0 Raw Coal Collection Tank
9. Pump
10. Settling Cone
11. Diverter
12. Primary Water Only Cyclone Feed Tank
13. Pump
14. Distributor
15. Primary Water Only Cyclone
16. Sieve Bend
17. Vacuum Filter
18. Filtrate Water Pump
19. Secondary Water Only Cyclone Feed Tank
20. Pump
21. Distributor
22. Secondary Water Only Cyclone
23. Thickening Cyclone Feed Tank
24. Pump
25. Thickening Cyclone
26. Overflow Distributor
27. Head Box
28. Thickener
29. Waste Disposal Pump
30. Clarified Water Collection Tank
31. Clarified Water Pump
32. Clarified Water Head Box
33. Cyclone Feed Tank
34. Pump
35. DSM Cyclone
36. Sieve Bend
37. C.C. Drain and Rinse Screen
38. Underflow Collector
39. Sieve Bend
40. Discard Drain and Rinse Screen
41. Underflow Collector
42. Dilute Medium Tank
43. Pump
44. Settling Cone
45. Magnetic Separator
46. Splitter Box
47. Correct Medium Tank
48. Pump
49. Distribution Box
50. Splitter Box

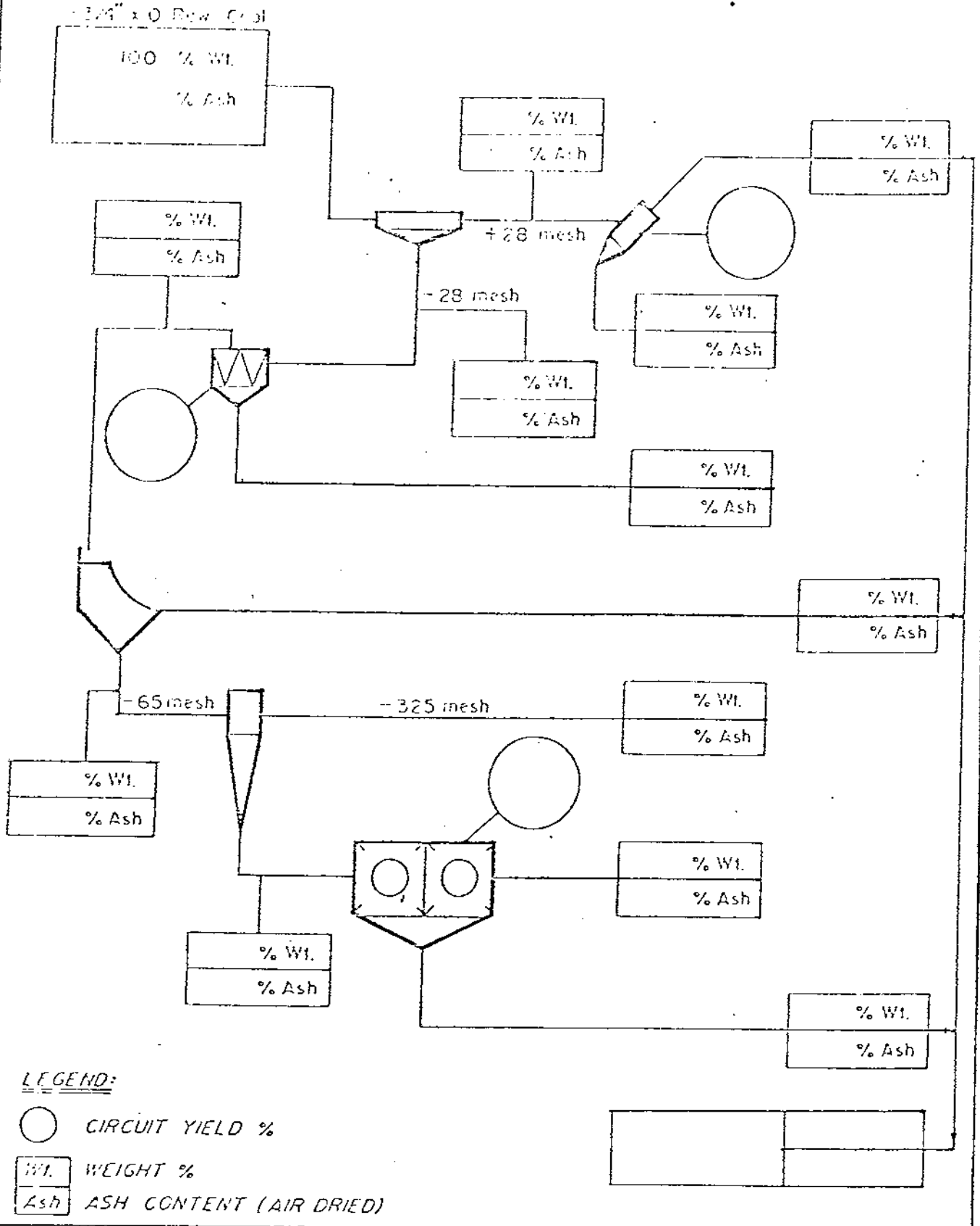
TEST PLANT FLOWSHEET

BIRTLEY COAL & MINERALS TESTING

PILOT PLANT ANALYTICAL FLOWSHEET



* ALL PLANT SAMPLES ANALYSED FOR ASH AND F. S. I.



BIRTLEY COAL & MINERALS TESTING

Title	Date
	Drawn

BIRTLEY COAL & MINERALS TESTING

SPECIAL PROCEDURES FOR HANDLING OF BULK SAMPLES

HEAD RAW PREPARATION

The order of preference for delivery of bulk samples is: 1) bulk truck loads. 2) poly-lined jute bags or re-enforced plastic bags. 3)barrels. The coal is dumped onto a steel mixing plate (32' x 60') and subjected to a preliminary mixing by means of a small front end loader and placed in a conical heap in the centre of the plate. (The bucket capacity is about 1 1/2 drums of coal).

Four (4) sampling points (quadrants) are selected along the perimeter of this central pile identified for clarity as Sites #1, #2, #3, #4, (see attached sketch) from which is withdrawn successive bucket loads of coal and placed in "quarter" conical piles relative to the sampling sites. However, to minimize the possibility of bias, on the second sampling pass, coal withdrawn from Site #1 is placed in pile #2, coal withdrawn from Site #2 is placed in pile #3 and so on until the central pile has been transferred into the 4 quartered piles.

Now the coal from the quartered piles is returned to the central location by taking bucket loads successively from piles A, B, C, and D to reform the central conical heap. Four (4) sampling sites are relocated and the whole procedure is repeated three (3) more times after which a head raw sample is extracted, by taking small increments from each of the "quartered" piles of such quantity that four (4) increments will fill two (2) - 45 gallon drums using a portable loading hopper. This hopper is designed in such a way that two (2) barrels are filled simultaneously by means of a split chute. The quantity of sample extracted is dependent on the top size of the coal and must conform to ASTM specifications for sampling of coal.

CLEAN COAL PREPARATION (Clean Mix)

After a preliminary moisture reduction of the heavy media clean coal and the fines filter cake to the desired levels, the products are homogenized as follows:

The heavy media clean coal is spread in a thin layer on the meticulously clean mixing plate. The filter cake is "seeded" over the surface of the coarse coal by means of the front end loader. This total mass is subjected to a preliminary mixing routine and a central conical heap formed.

From this point on the procedures outlined for homogenizing the raw coal are strictly followed.

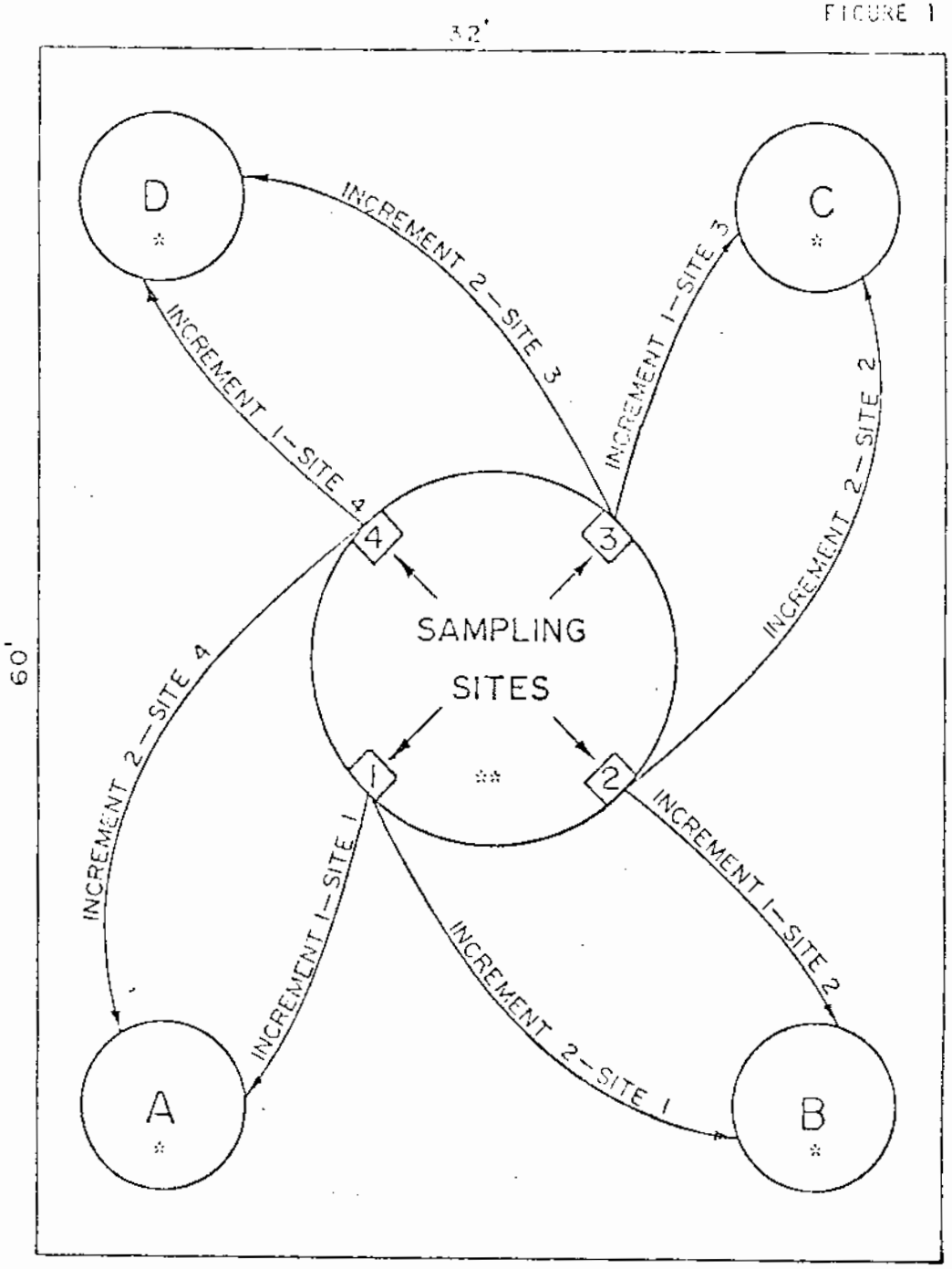
From the final four (4) quarter, double poly-lined barrels are filled by exactly the same procedure as outlined for the raw coal sample extraction. The coal is tamped into the barrels so that each barrel contains about 180 kg including moisture.

During the barrel filling procedure, a minimum of 60 increments are taken from the bucket load quantities with a small square mouth shovel. Each increment is of such quantity that a minimum fo 100 kg of coal are retained for analytical purposes.

Finally the plastic liners are tied off and an identifying tag affixed inside the drum. The lid, with a gasket, is firmly attached to seal the barrel and the barrel is stencilled as to contents and destination.

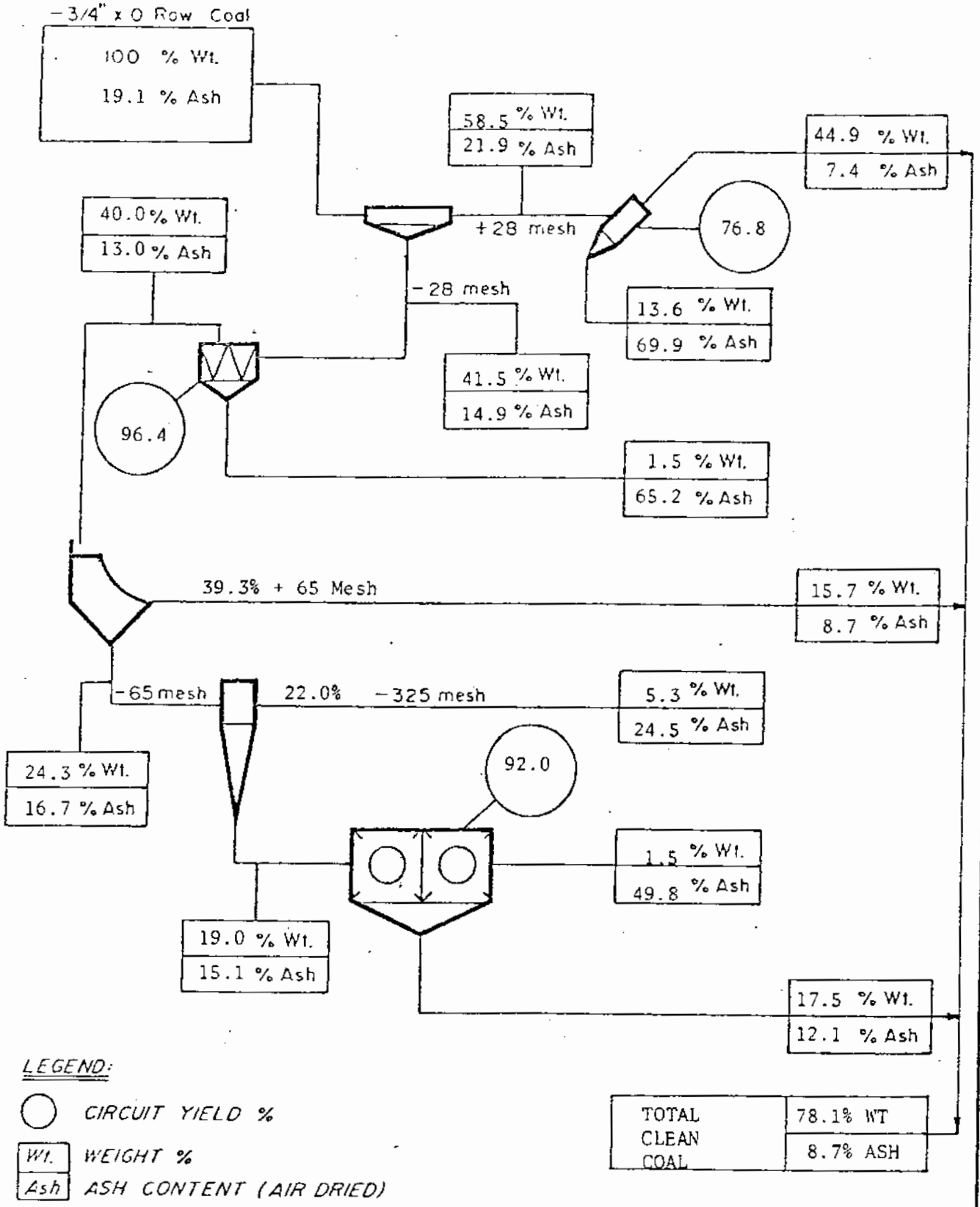
SCHEMATIC OF RAW AND CLEAN COAL HOMOGENIZATION

FIGURE 1



* "Quarter" Piles ** Central Pile

Continue moving increments until all of the central pile is transferred to the "Quarter" piles A,B,C, and D, i.e. increment 3, site 1 to C, increment 3, site 2 to D, increment 3, site 3 to A, increment 3, site 4 to B etc.



BIRTLEY COAL & MINERALS TESTING

Title	PLANT BALANCE FLOW SHEET CROWS NEST RESOURCES LTD. ADIT 19, SEAM 7 BULK SAMPLE HORSESHOE RIDGE PROJECT LAB NO. 6295	Date Oct./80 Drawn

SUMMARY - BULK WASHING DATA *

Bulk Sample HORSESHOE RIDGE- ADIT 19/SEAM 7 Lab. No. 6295

Date Received _____ Date Washed Oct. 10/80

(a) RAW COAL

Delivered Weight 9.470 MT Washed Weight 7.020 MT

ADM % 6.7 ASH% 19.1 F.S.I. 8

(b) HEAVY MEDIA CIRCUIT: 3/4" x 28 Mesh= 58.5 % by weight

S.G. of Medium 1.42 Calculated Yield 76.8 %

Sample	ASH %	F.S.I.
Feed	21.9	8
Clean Coal	7.4	8 1/2
Reject	69.9	1/2

(c) WATER -ONLY CYCLONE CIRCUIT :28M x0 = 41.5 % by weight

V.F.C. #1 2 cm. #2 5 cm. Calculated Yield 96.4 %

Sample	ASH %	F.S.I.
Feed	14.9	8 1/2
Overflow	13.0	9
Underflow	65.2	1
S.B.O.	8.7	9
S.B.U.	16.7	8

(d) FROTH FLOTATION CIRCUIT: 65M x0 24.3 %by Weight

4:1 =Kerosene: M.I.B.C. Calculated Yield 92.0 %

Sample	ASH %	F.S.I.
T.C.O.	24.5	2
Feed (T.C.U.)	15.1	8 1/2
Concentrate	12.1	9
Tailings	49.8	1 1/2

(e) FILTER CAKE: S.B.O. + CONCENTRATE = 10.9 ASH% 9 FSI

* All weights and analysis are on an Air Dried Basis unless otherwise indicated.

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

SUMMARY -BULK WASHING DATA (Cont.)

BULK SAMPLE HORSESHOE RIDGE ADIT 19/SEAM 7 LAB NO. 6295

(f) CLEAN COAL: H.M.C.C. + FILTER CAKE Calculated Yield 78.1 %

ADM	PROXIMATE				S	BTU	FSI		
	RM%	ASH%	VM %	FC %					
16.2	0.5	8.7	24.3	66.5	0.66	14030	9		

DILATATION TEST				
ST (°C)	MDT (°C)	MC %	MD %	G
386	469	26	84	1.054

GIESELER FLUIDITY TEST		
	DDPM	TEMP (°C)
START	1	438
MAXIMUM	137	476
FINAL	0	505
RANGE		67

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

BULK SAMPLE HORSESHOE RIDGE ADIT 19/SEAM 7 LAB NO. 6295

SUMMARY BULK WASHING DATA (Cont.)

CLEAN COAL INVENTORY

DATE	SHIPPED		IN STOCK	
	BBLS	M.T.	BBLS	M.T.
Oct. 14/80	-	-	29	5.204

Birtley Coal
& Minerals Testing

BULK WASHING DATA

BULK SAMPLE HORSESHOE RIDGE ADIT19/SEAM7 LAB NO. 6295

HEAVY MEDIUM CIRCUIT

CYCLONE: 14" DSM operating @ 52 KPa.

MAGNETITE MEDIUM maintained @ 1.42 S.G.

1. FEED(3/4 x 28 Mesh) 4.104 M.T. 21.9 ASH% 8 FSI

2. CLEAN COAL 3.143 M.T. 7.4 ASH% 8 1/2 FSI

3. REJECT 0.961 M.T. 69.9 ASH% 1/2 FSI

4. YIELD CLEAN COAL (Weighted) = $\frac{3.143}{4.104}$ = 76.6 %

5. YIELD CLEAN COAL (Calculated) = $\frac{69.9 - 21.9}{69.9 - 7.4}$ = 76.8 %

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

BULK WASHING DATA

Bulk Sample HORSESHOE RIDGE ADIT 19/SEAM 7 LAB NO. 6295

WATER - ONLY CYCLONE CIRCUIT

Primary Cyclone: 6" DSM operating @ 138 KPa

Vortex Finder Clearance set @ 2 c.m.

Secondary Cyclone: 4" DSM operating@ 35 KPa

Vortex Finder Clearance set @ 5 c.m.

Sieve Bend : 65 Mesh

1.	Feed (28 Mesh x 0)	14.9	ASH	%	8 1/2	FSI
2.	Primary Cyclone Overflow	13.0	ASH	%	9	FSI
3.	Secondary Cyclone Underflow	65.2	ASH	%	1	FSI
4.	Sieve Bend Overflow(S.B.O.)	8.7	ASH	%	9	FSI
5.	Sieve Bend Underflow(S.B.U.)	16.7	ASH	%	8	FSI

6. Yield (W.O. Cyclone) $\frac{65.2 - 14.9}{65.2 - 13.0}$ = 96.4 %

7. WT% 28Mx65M in Primary Cyclone Overflow = 39.3 %

8. Estimated Yield of 28M x65M (S.B.O. , as % of 28 M x 0 Feed) = 37.9 %

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

BULK WASHING DATA

BULK SAMPLE HORSESHOE RIDGE ADIT19/SEAM7 LAB NO. 6295

FROTH FLOTATION CIRCUIT

Flotation Cell: two(2) Birtley -Humboldt Multi-Wobble impellers in series.

Reagent : 4:1 = Kerosene:M.I.B.C.

Thickening Cyclone : 20° - 8" cyclone Hayl-Patterson

1. Thickening Cyclone Overflow (T.C.O. -325M) 24.5 ASH% 2 FSI

2. Flotation Feed(Thickening Cyclone Underflow) 15.1 ASH% 8 1/2 FSI

3. Concentrate 12.1 ASH% 9 FSI

4. Tailings 49.8 ASH% 1 1/2 FSI

5. Yield Concentrate $\frac{49.8 - 15.1}{49.8 - 12.1}$ = 92.0 %

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

CLIENT : CROWS NEST RESOURCES LIMITED

PROJECT: HORSESHOE RIDGE ADIT 19/ SEAM 7 BULK SAMPLE

LAB NO.: 6262

SINK-FLOAT ANALYSIS,a,d,b,:1/4"x28M					
S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
- 1.30	49.8	2.3	9	49.8	2.3
1.30 - 1.35	14.7	7.3	8	64.5	3.4
1.35 - 1.40	8.5	12.0	4 1/2	73.0	4.4
1.40 - 1.45	4.7	17.1	3 1/2	77.7	5.2
1.45 - 1.50	2.9	22.1	2	80.6	5.8
1.50 - 1.55	2.3	27.2	1 1/2	82.9	6.4
1.55 - 1.60	1.9	31.7	1	84.8	7.0
1.60 - 1.70	2.4	40.1	1	87.2	7.9
1.70 - 1.80	1.3	47.3	1/2	88.5	8.5
+ 1.80	11.5	74.1	N.A.	100.0	16.0

SINK-FLOAT ANALYSIS,a.d.b.:28Mx65M					
S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
- 1.30	55.3	2.2	9	55.3	2.2
1.30 - 1.35	17.7	6.4	8 1/2	73.0	3.2
1.35 - 1.40	6.4	13.3	4	79.4	4.0
1.40 - 1.45	1.8	18.2	3 1/2	81.2	4.3
1.45 - 1.50	3.7	22.1	1 1/2	84.9	5.1
1.50 - 1.55	2.1	28.4	1 1/2	87.0	5.7
1.55 - 1.60	1.4	32.9	1	88.4	6.1
1.60 - 1.70	1.9	39.3	1	90.3	6.8
1.70 - 1.80	1.4	46.9	1/2	91.7	7.4
+ 1.80	8.3	72.8	N.A.	100.0	12.8

Birtley Coal
& Minerals Testing

GNP HD. BESHOE RIDGE ADIT 1975 CAM 7 LAB 6262 1/4 . 28M

--FEED--			--CUM FLOATS--			--CUM SINKS--			+-0.1 DISTR		
S.G.	WT>	ASH>	ASH	WT> CUM WT> ASH>		ASH>	SINK WT WT>	ASH>	S.G.	WT	
1	2	3	4	5	6	7	8	9	10	11	12
1.30	49.80	2.30	1.15	1.15	49.80	2.30	14.86	50.20	29.61	1.30	0.00
1.35	14.70	7.30	1.07	2.22	64.50	3.44	13.79	35.50	38.85	1.40	30.00
1.40	5.50	12.00	1.02	3.24	73.00	4.44	12.77	27.00	47.30	1.50	11.80
1.45	4.70	17.10	.80	4.04	77.70	5.20	11.97	22.30	53.67	1.60	6.60
1.50	2.90	22.10	.64	4.68	80.60	5.81	11.33	19.40	58.39	1.70	3.70
1.55	2.30	27.20	.63	5.31	82.90	6.40	10.70	17.10	62.58	1.80	0.00
1.60	1.90	31.70	.60	5.91	84.80	6.97	10.10	15.20	66.44	1.90	0.00
1.70	2.40	40.10	.96	6.87	87.20	7.08	9.14	12.80	71.38	2.00	0.00
1.80	1.30	47.30	.61	7.49	88.50	8.46	8.52	11.50	74.10	2.10	0.00
9.99	11.50	74.10	8.52	16.01	100.00	16.01	0.00	.00	0.00	2.20	0.00

BIRTLEY COAL AND MINERALS TESTING
13/11/80

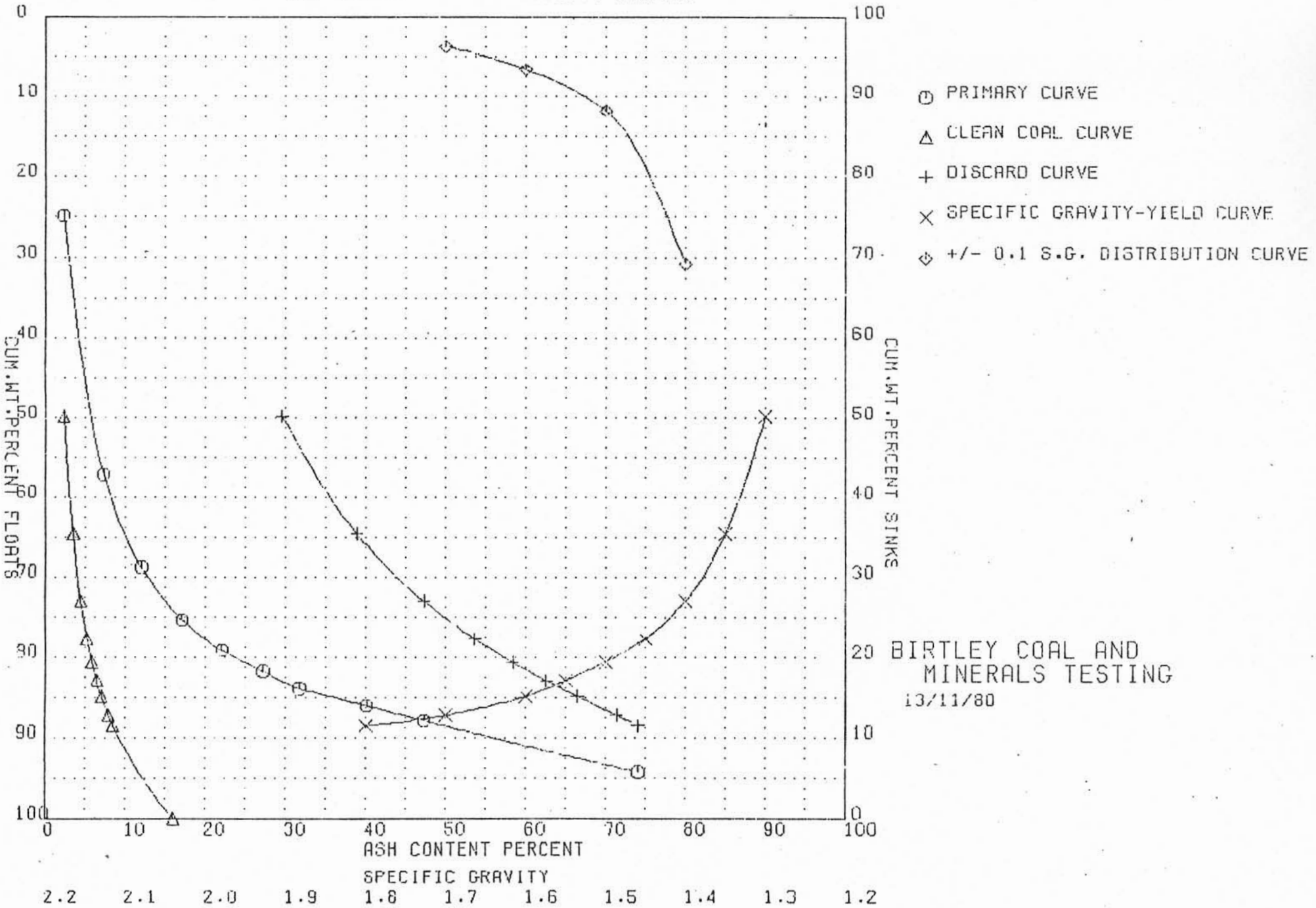
.5	15.0	.5	10.0	5.9	10.0	2.0	10.0	4.0	13.6
1.5	8.6	.7	7.1	7.5	7.1	3.0	7.1	6.0	17.6
2.4	6.2	.9	5.4	9.5	5.4	4.0	5.4	8.0	16.7
3.4	4.9	1.0	4.5	10.7	4.5	5.0	4.5	10.0	13.3
4.4	4.2	1.2	3.9	11.7	3.9	6.0	3.9	0.0	0.0
5.4	3.7	1.3	3.4	12.5	3.4	7.0	3.4	0.0	0.0
6.3	3.2	1.4	3.0	13.3	3.0	8.0	3.0	0.0	0.0
7.0	2.8	1.6	2.6	14.3	2.6	10.0	2.6	0.0	0.0
9.5	2.4	1.7	2.3	14.8	2.3	12.0	2.3	0.0	0.0
14.8	1.2	3.2	.0	0.0	.0	175.8	.0	0.0	0.0

PASS 1 10143
PASS 2 10 27
PASS 3 9 88
PASS 4 9100
PASS 5 4 60

MOORE SPEEDHEAD AND EYE TRACK PATENTED 1977 6

CNR HORSESHOE RIDGE ADIT 19 / SEAM 7 LAB 6262 1/4 X 28M

THE CLASSICAL WASHABILITY CURVES



BIRTLEY COAL AND MINERALS TESTING

13/11/80

CWR H SESHOE RIDGE ADIT 19 /SEAM 7 LAB 6262 2[illegible] . 656

--[illegible]T--				--CUM FLOATS--			--CUM SINKS--			+-0.1 DISTR	
S.G.	WT>	ASH>	ASH TP	ASH TT	WT>	ASH>	ASH>	WT>	ASH>	S.G.	WT
1	2	3	4	5	6	7	8	9	10	11	12
1.30	55.30	2.20	1.22	1.22	55.30	2.20	11.63	44.70	26.02	1.30	0.00
1.35	17.70	6.40	1.13	2.35	73.00	3.22	10.50	27.00	38.89	1.40	29.60
1.40	6.40	13.30	.85	3.20	79.40	4.03	9.65	20.60	46.83	1.50	9.00
1.45	1.80	18.20	.33	3.53	81.20	4.35	9.32	18.80	49.58	1.60	5.40
1.50	3.70	22.10	.82	4.35	84.90	5.12	8.50	15.10	56.31	1.70	3.30
1.55	2.10	28.40	.60	4.94	87.00	5.60	7.91	13.00	60.82	1.80	0.00
1.60	1.40	32.90	.46	5.40	88.40	6.11	7.45	11.60	64.19	1.90	0.00
1.70	1.90	39.30	.75	6.15	90.30	6.81	6.70	9.70	69.06	2.00	0.00
1.80	1.40	46.90	.66	6.81	91.70	7.42	6.04	8.30	72.80	2.10	0.00
9.99	8.30	72.80	6.04	12.85	100.00	12.85	0.00	.00	0.00	2.20	0.00

BIRTLEY COAL AND MINERALS TESTING
13/11/80

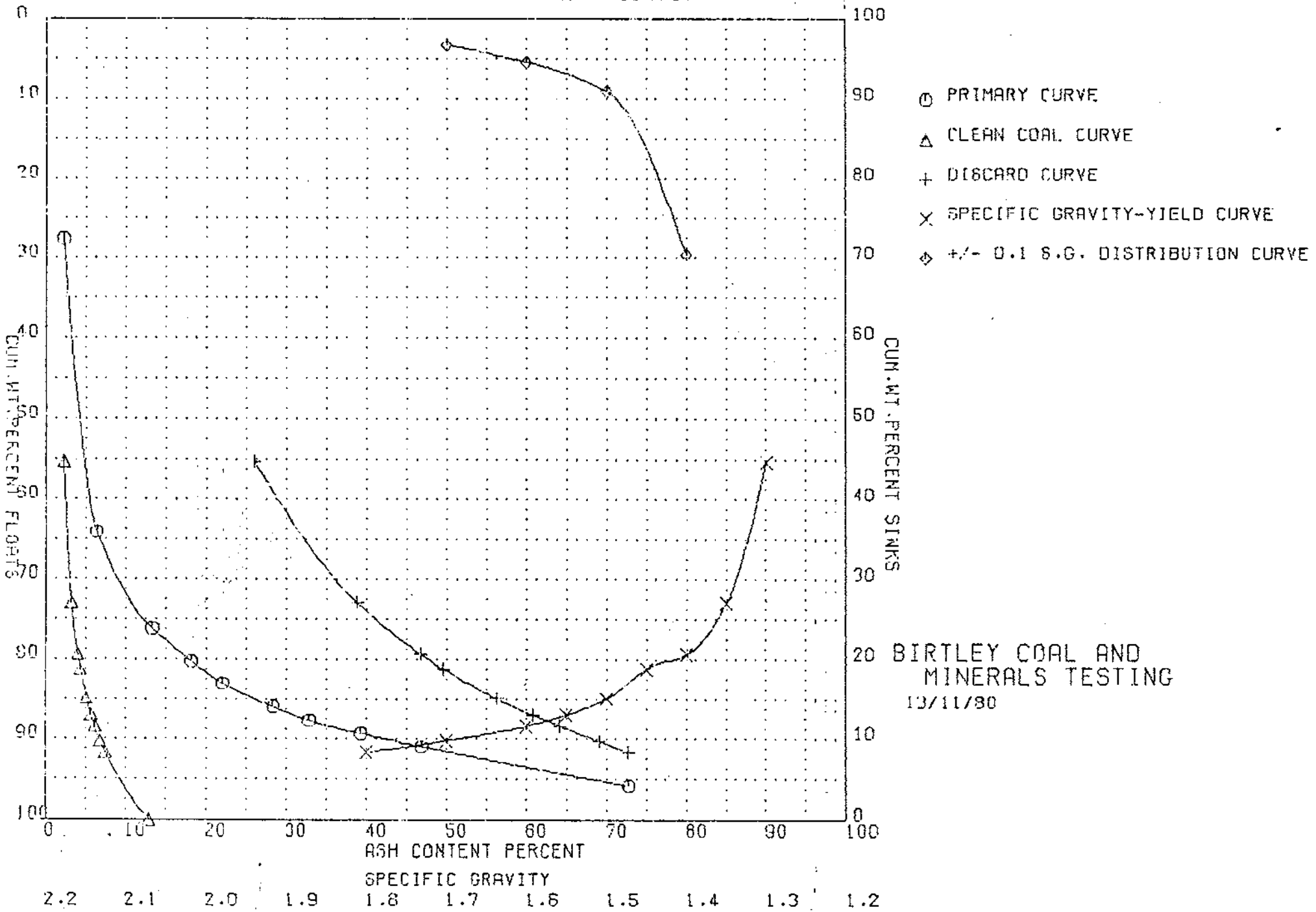
.4	14.5	.4	8.9	5.2	8.9	2.0	8.9	4.0	14.1
1.3	7.2	.6	5.4	7.[illegible]	5.4	3.0	5.4	6.0	18.2
2.7	4.6	.8	4.1	9.4	4.1	4.0	4.1	8.0	18.5
3.6	3.7	.8	3.[illegible]	[illegible]	3.[illegible]	5.0	3.[illegible]	10.0	19.3
4.4	3.4	1.0	3.0	11.3	3.0	6.0	3.0	0.0	0.0
5.7	2.[illegible]	1.1	2.6	12.2	2.6	7.0	2.6	0.0	0.0
6.6	2.5	1.2	2.3	12.[illegible]	2.3	8.0	2.3	0.0	0.0
7.9	2.1	1.4	1.[illegible]	13.[illegible]	1.9	10.0	1.[illegible]	0.0	0.0
9.4	1.8	1.5	1.7	14.6	1.7	12.0	1.7	0.0	0.0
14.6	.[illegible]	2.6	0.0	0.0	.0	175.[illegible]	0.0	0.0	0.0

PASS 1 10141
PASS 2 10 21
PASS 3 9 93
PASS 4 9100
PASS 5 4 60

MOORE SPEEDHEAD AND EYE TRACK PATENTED 1977 6

CNR HORSESHOE RIDGE ADIT 19 /SEAM 7 LAB 6262 28M X 65M

THE CLASSICAL WASHABILITY CURVES



BIRTLEY COAL AND MINERALS TESTING

13/11/80

CLIENT : CROWS NEST RESOURCES LTD.

PROJECT; HORSESHOE RIDGE ADIT 19 /SEAM 7 BULK SAMPLE

LAB NO.: 6262

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%		FSI	CALC. BASIS
6.7	0.7	19.1	22.8	58.2	0.65		8	a.d.b.
	7.4	17.8	21.3	53.5	0.51		-	a.r.b.
		19.2	23.0	58.6	0.65		-	d.b.

SIZE AND RAW ANALYSIS, a.d.b.

SIZE FRACTION	WT%	RM%	ASH%	VOL%	F.C.%	S%		F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
2 " x 1/4"	22.0	1.2	30.9	21.9	46.0	0.58		7	22.0	30.9
1/4"x 28M	47.0	0.5	16.5	23.0	60.0	0.65		8 1/2	69.0	21.1
28 Mx 65M	15.2	0.5	13.1	23.4	63.0	0.63		8 1/2	84.2	19.6
65 Mx 0	15.8	0.7	15.2	22.7	61.4	0.69		8	100.0	18.9

WT% +2" = 2.9 crushed to pass 2"

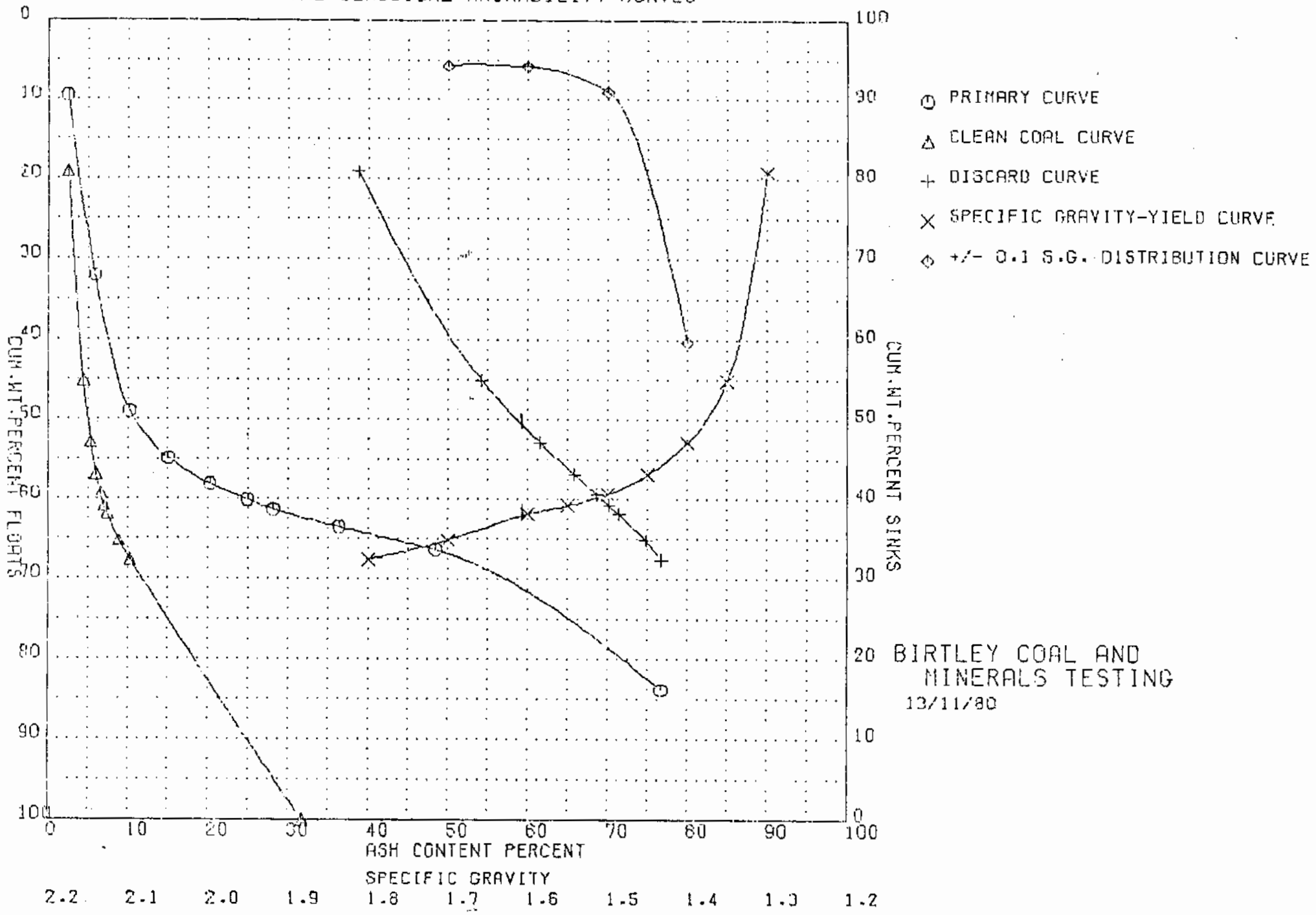
SINK-FLOAT ANALYSIS,a.d.b:: 2" x 1/4"

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
- 1.30	19.1	2.4	9	19.1	2.4
1.30 - 1.35	26.0	5.8	8	45.1	4.4
1.35 - 1.40	7.8	10.1	5 1/2	52.9	5.2
1.40 - 1.45	4.0	15.0	3	56.9	5.9
1.45 - 1.50	2.5	20.2	2	59.4	6.5
1.50 - 1.55	1.4	24.9	1 1/2	60.8	6.9
1.55 - 1.60	1.1	28.1	1	61.9	7.3
1.60 - 1.70	3.3	36.3	1	65.2	8.8
1.70 - 1.80	2.4	48.4	1/2	67.6	10.2
+1.80	32.4	76.7	N.A.	100.0	31.7

Birtley Coal
& Minerals Testing

CNR HORSESHOE RIDGE ADIT 17/SEAM 9 LAB 6262 2 X 1/4

THE CLASSICAL WASHABILITY CURVES



ONE HO DESHOE ~1000 ADIT 19 /SEAM/ LAB 6262 2 X 1/4

--FINEL CT--					--SINK FLOATS--					--CUM SINKS-- F-0.1 SISTR -		
S.G.	WT>	ASH>	ASH	WT> ASH> IT	WT>	ASH>	ASH>	WT>	ASH>	S.G.	WT
1	2	3	4	5	6	7	8	9	10	11	12
1.30	19.10	2.40	.46	.46	19.10	2.40	31.27	80.90	38.65	1.30	0.00
1.35	26.00	5.50	1.51	1.97	45.10	4.36	29.76	54.90	54.21	1.40	40.30
1.40	7.80	10.10	.79	2.75	52.90	5.21	28.97	47.10	61.51	1.50	9.00
1.45	4.00	15.00	.60	3.35	56.90	5.89	28.37	43.10	65.83	1.60	5.80
1.50	2.50	20.20	.51	3.86	59.40	6.50	27.87	40.60	68.64	1.70	5.70
1.55	1.40	24.90	.35	4.21	60.80	6.92	27.52	39.20	70.20	1.80	0.00
1.60	1.10	28.10	.31	4.52	61.90	7.30	27.21	38.10	71.42	1.90	0.00
1.70	3.30	36.30	1.20	5.71	65.20	8.77	26.01	34.80	74.75	2.00	0.00
1.80	2.40	48.40	1.16	6.87	67.60	10.17	24.85	32.40	76.70	2.10	0.00
9.99	32.40	76.70	24.85	31.73	100.00	31.73	0.00	.00	0.00	2.20	0.00

BIRTLEY COAL AND MINERALS TESTING
13/11/80

.5	18.1	.5	16.2	7.7	16.2	2.0	16.2	4.0	11.9
1.2	13.6	.9	11.0	10.8	11.0	3.0	11.0	6.0	13.2
2.0	10.2	1.0	9.4	12.3	9.4	4.0	9.4	8.0	18.8
3.0	9.0	1.2	8.6	13.2	8.6	5.0	8.6	10.0	19.9
4.0	8.4	1.3	8.1	13.7	8.1	6.0	8.1	0.0	0.0
5.0	8.0	1.4	7.8	14.0	7.8	7.0	7.8	0.0	0.0
5.6	7.7	1.5	7.6	14.3	7.6	8.0	7.6	0.0	0.0
7.3	7.3	1.8	7.0	14.9	7.0	10.0	7.0	0.0	0.0
9.7	6.7	2.0	6.5	15.3	6.5	12.0	6.5	0.0	0.0
15.3	3.2	6.3	.0	0.0	.0	175.0	.0	0.0	0.0

PASS 1 10 14.8
PASS 2 10 8
PASS 3 9 76
PASS 4 9 100
PASS 5 4 60

CLIENT : CROWS NEST RESOURCES LIMITED

PROJECT: HORSESHOE RIDGE ADIT 19/ SEAM 7 BULK SAMPLE

LAB NO.: 6262

FROTH FLOTATION TEST, adb:65Mx0					
				CUMULATIVE	
PRODUCT	WT%	ASH%	F.S.I.	WT%	ASH%
STAGE 1	55.7	10.6	8 1/2	55.7	10.6
STAGE 11	8.7	15.9	6 1/2	64.4	11.3
TAILINGS	35.6	21.5	5	100.0	14.9

F.F. PARAMETERS:

Pulp Density	= 10%
Conditioning	= 60 seconds
Reagent	= 4:1=Kerosene''MIBC
Dosage	= 0.48 lb/TDS
Stage 1	= 1st minute froth
Stage 11	= 2nd minute froth

Birtley Coal
& Minerals Testing

A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

CLIENT: CROWS NEST RESOURCES LTD.

PROJECT:HORSESHOE RIDGE ADIT 19, SEAM 7 BULK SAMPLE

LAB NO.:6262

COMPOSITE SINK-FLOAT ANALYSIS: 2"x65M					
				CUMULATIVE	
S.G. FRACTION	WT%	ASH%		WT%	ASH%
- 1.30	42.8	2.3		42.8	2.3
1.30 - 1.35	18.2	6.6		61.0	3.6
1.35 - 1.40	7.9	11.7		68.9	4.5
1.40 - 1.45	4.0	16.6		72.9	5.2
1.45 - 1.50	2.9	21.7		75.8	5.8
1.50 - 1.55	2.0	27.0		77.8	6.4
1.55 - 1.60	1.6	31.2		79.4	6.9
1.60 - 1.70	2.6	38.7		82.0	7.9
1.70 - 1.80	1.6	47.7		83.6	8.6
+ 1.80	16.4	75.3		100.0	19.6

Sent to Geodigit for Washability Curves.

Birtley Coal
& Minerals Testing

-CNR HORSESHOE RIDGE LAB NO 6262 ADIT 19 SEEM 7 2 X 65M

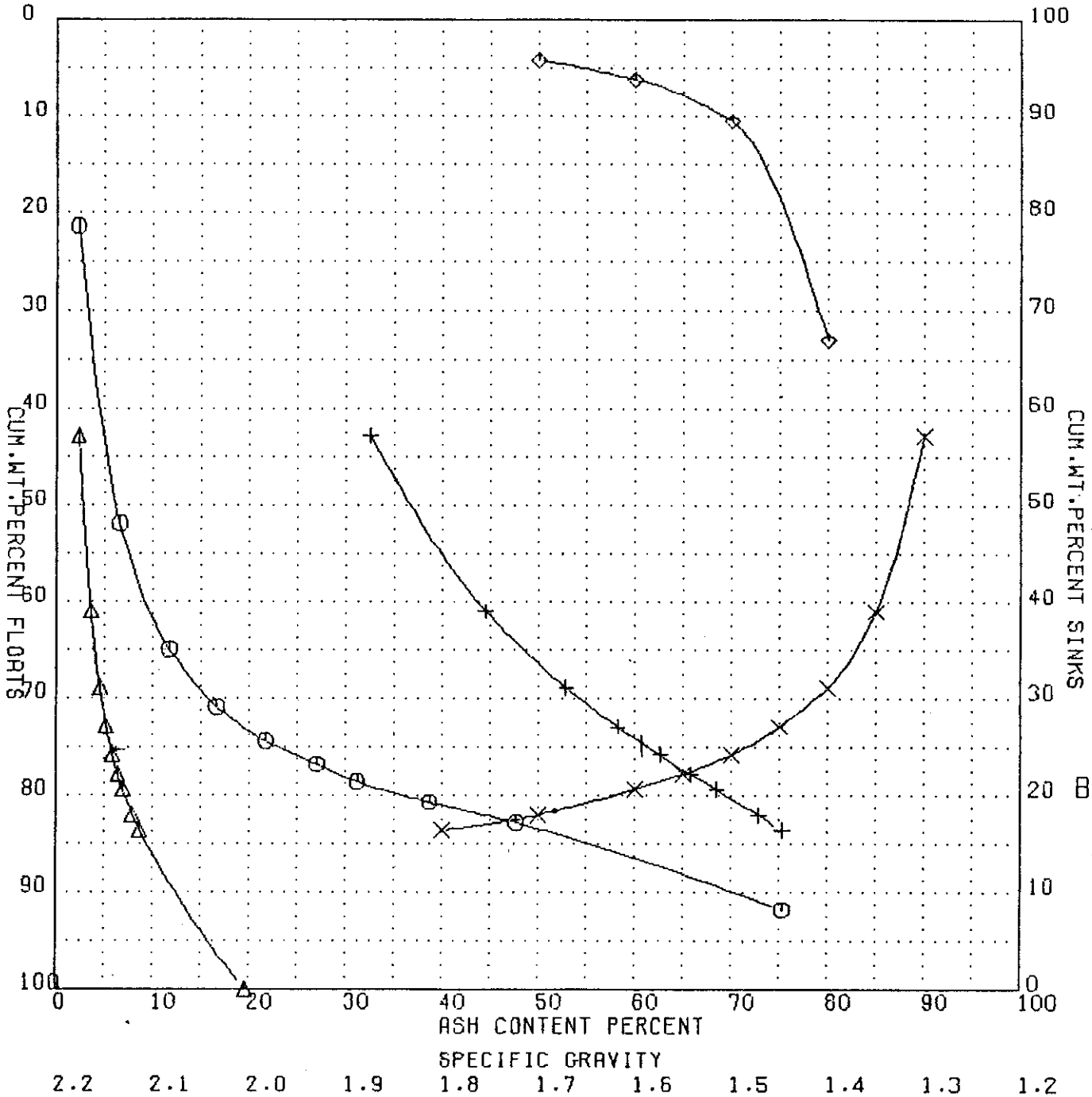
--DIRECT--					--CUM FLOATS--			--CUM SINKS--		+-0.1 DISTR	
S.G.	WT>	ASH>	ASH WT	WT> CUM ASH WT	WT>	ASH>	ASH>	SINK WT WT>	ASH>	S.G.	WT
1	2	3	4	5	6	7	8	9	10	11	12
1.30	42.80	2.30	.98	.98	42.80	2.30	18.58	57.20	32.48	1.30	0.00
1.35	18.20	6.60	1.20	2.19	61.00	3.58	17.38	39.00	44.55	1.40	33.00
1.40	7.90	11.70	.92	3.11	68.90	4.51	16.45	31.10	52.90	1.50	10.50
1.45	4.00	16.60	.66	3.77	72.90	5.18	15.79	27.10	58.25	1.60	6.20
1.50	2.90	21.70	.63	4.40	75.80	5.81	15.16	24.20	62.64	1.70	4.20
1.55	2.00	27.00	.54	4.94	77.90	6.35	14.62	22.20	65.85	1.80	0.00
1.60	1.60	31.20	.50	5.44	79.40	6.85	14.12	20.60	68.54	1.90	0.00
1.70	2.60	38.70	1.01	6.45	82.00	7.86	13.11	18.00	72.85	2.00	0.00
1.80	1.60	47.70	.76	7.21	83.60	8.63	12.35	16.40	75.30	2.10	0.00
9.99	16.40	75.30	12.35	19.56	100.00	19.56	0.00	.00	0.00	2.20	0.00

BIRTLEY COAL AND MINERALS TESTING
10/10/80

	.5	15.7	.5	11.4	6.5	11.4	2.0	11.4	4.0	13.4	
	1.3	9.6	.7	7.6	8.9	7.8	3.0	7.8	6.0	17.9	
	2.3	7.0	.9	6.2	10.6	6.2	4.0	6.2	8.0	13.8	
	3.3	5.8	1.0	5.4	11.7	5.4	5.0	5.4	10.0	19.2	
	4.3	5.1	1.2	4.8	12.5	4.8	6.0	4.8	0.0	0.0	
	5.4	4.6	1.3	4.4	13.2	4.4	7.0	4.4	0.0	0.0	
	6.2	4.3	1.4	4.1	13.7	4.1	9.0	4.1	0.0	0.0	
	7.7	3.9	1.6	3.6	14.6	3.6	10.0	3.6	0.0	0.0	
	9.5	3.4	1.7	3.3	15.1	3.3	12.0	3.3	0.0	0.0	
	15.1	1.6	3.9	.0	0.0	.0	175.8	.0	0.0	0.0	
PASS	1	10145									
PASS	2	10 34									
PASS	3	9 95									
PASS	4	9100									
PASS	5	4 60									

CNR HORSESHOE RIDGE LAB NO 6262 ADIT 19 SEEM 7 2 X 65M

THE CLASSICAL WASHABILITY CURVES



PRIMARY CURVE

CLEAN COAL CURVE

DISCARD CURVE

SPECIFIC GRAVITY-YIELD CURVE

+/- 0.1 S.G. DISTRIBUTION CURVE

BIRTLEY COAL AND MINERALS TESTING

10/10/80

CLIENT: CROWS NEST RESOURCES LIMITED

PROJECT: HORSESHOE RIDGE SEAM #7, ADIT 19, Grab Sample Feb. 18/81

LAB NO.: 7007 (formerly 6295) Canmet 2 barrels

ANALYSIS OF CLEAN COAL

MOIST%	ASH%	VOL%	FC%	S%		F.S.I.		CALC. BASIS
0.3	8.7	24.1	66.9	0.58		8 1/2		a.d.b.
	8.7	24.2	67.1	0.58		-		d.b.

Horse Shoe Ridge

DILATATION TEST				
ST(°C)	MDT(°C)	M.C.%	M.D.%	G. NO.
389	470	26	64	1.041

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	438
MAXIMUM	117	472
FINAL	0	505
RANGE =		67

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD.

CLIENT: CROWS NEST RESOURCES LIMITED

PROJECT:HORSESHOE RIDGE BLEND CLEAN COAL

LAB NO.:6523

ADM%	PROXIMATE				S%	BTU/LB	F.S.I.		CALC. BASIS
	MOIST%	ASH%	VOL%	F.C.%					
8.4	0.5	9.0	22.0	68.5	0.53	13990	6 1/2		adb
		9.0	22.1	68.9	0.53	14060	-		db

DILATATION TEST				
ST(°C)	MDT(°C)	MC %	MD %	G. NO.
404	482	20	0	0.919

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	455
MAXIMUM	4	486
FINAL	0	513
RANGE =		58

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

SHELL
K-HORSESHOE RIDGE 80(4)A

April 30/81

HORSESHOE RIDGE
COAL PROJECT
SHELL CANADA RESOURCES LTD.
CL # 295, 296, 299, 368,
369, 373 ANALYSIS

Dave Hendley

404

GEOLOGICAL BRANCH
ASSESSMENT REPORT

00 404

OPEN FILE

TABLE 1

AVERAGE ANALYSIS OF HORSESHOE RIDGE COAL - 1979

(Compiled from Rotary and Diamond Drill Sample Analyses)

* Samples have been washed at S.G. 1.5 and Analyzed on an air dried basis

Seam No.	Moisture (%)	Ash (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	CALORIFIC VALUE (BTU/LB)
3	1.53	4.73	26.38	67.36	1		74	
4 Upper	1.04	4.86	26.19	67.91	1 1/2		75	
4 Lower	1.01	6.54	25.10	67.35	0		19	
5	0.91	5.00	26.59	67.50	3 1/2		72	
6	0.61	6.41	24.95	68.02	4		52	
7 Upper	0.43	5.77	26.43	67.38	8		77	
7 Lower	0.33	7.84	25.03	66.97	7		77	
8 Upper	0.47	6.63	24.05	68.88	6		68*	
8 Lower	0.41	7.03	22.93	68.88	5		57	
9	0.54	6.46	22.93	70.07	7		77	
10	0.55	8.24	21.13	69.72	4		83*	

* Core samples only where used for the yield value.

2/Tc.1

TABLE 2

HSR - 1979 SEAM 3

(Diamond Core Only)

SAMPLED IN DIAMOND HOLE	SAMPLE INTERVAL (m)	AIR DRIED BASIS	MOISTURE (%)	ASH (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	BTU/LB
HSR - D - 204	30.6 - 31.4 (0.80)	Raw 1.5 Float	0.74 1.09	13.47 5.95	26.38	66.58	1 1		76	
	32.8 - 34.5 (1.70)	Raw 1.5 Float	0.85 1.74	17.49 4.16	26.38	67.72	1/2 1/2		73	
Weighted Average		Raw 1.5 Float	0.82 1.53	16.20 4.73	26.38	67.36	1 1		74	

2/Tc.2

TABLE 3

HSR - 1979 SEAM 4 LOWER

(Diamond Core Only)

SAMPLED IN DIAMOND HOLE	SAMPLE INTERVAL (m)	AIR DRIED BASIS	MOISTURE (%)	ASH (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	BTU/LB
HSR - D - 204	61.2 - 65.2 (4.0)	Raw 1.5 Float	0.60 1.01	64.99 6.54	25.10	67.35	0		19	

SEAM 4 UPPER

(Diamond Core Only)

HSR - D - 204	57.6 - 59.1 (1.5)	Raw 1.5 Float	0.70 1.04	19.41 4.86	26.19	67.91	1 1/2 1 1/2		75	

TABLE 4

HSR - 1979 SEAM 5

(Diamond Core Only)

SAMPLED IN DIAMOND HOLE	SAMPLE INTERVAL (m)	AIR DRIED BASIS	MOISTURE (%)	ASH (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	BTU/LB
HSR - D - 204	61.2 - 65.2 (4.0)	Raw 1.5 Float	0.89 1.07	19.16 4.50	26.18	68.25	1 1/2 1 1/2		71	
	72.8 - 74.6 (1.8)	Raw 1.5 Float	0.54 0.56	6.11	27.51	65.82	4 8		73	
Weighted Average		Raw 1.5 Float	0.78 0.91	5.00	26.59	67.50	3 3 1/2		72	

TABLE 5

HSR - 1979 SEAM 6 UPPER
(Diamond Core)

SAMPLED IN DIAMOND HOLE	SAMPLE INTERVAL (m)	AIR DRIED BASIS	MOISTURE (%)	ASH (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	BTU/LB
HSR - D - 204	99.0 - 104.0 (5.0)	Raw 1.5 Float	0.67 0.51	34.18 6.05	25.69	67.75	4 1/2 8		56	

SEAM 6 LOWER
(Diamond Core Only)

HSR - D - 204	107.2 - 110.7 (3.5)	Raw 1.5 Float	1.01 0.39	40.22 6.62	25.08	67.41	0 1 1/2		39	

SEAM 6
(Diamond Core) (No 6 Upper and Lower in this hole)

HSR - D - 205	10.75 - 16.05 (5.30)	Raw 1.5 Float	1.10 0.43	23.39 6.57	24.09	68.91	1 1/2 1 1/2		62	

Average of Seam 6 (all of the above)		Raw 1.5 Float	0.93 0.61	32.60 6.41	24.95	68.02	2 4		52	

TABLE 6

HSR - 1979 SEAM 7 UPPER

(Drill Core Only)

SAMPLED IN DIAMOND HOLE	SAMPLE INTERVAL (m)	AIR DRIED BASIS	MOISTURE (%)	ASH (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	BTU/LB
HSR - D - 204	149.3 - 155.20 (4.9)	Raw 1.5 Float	0.70 0.56	23.33 6.12	26.44	66.88	7 8		71	
HSR - D - 205	57.80 - 66.40 (8.60)	Raw 1.5 Float	0.83 0.29	11.24 5.41	26.42	67.88	7 1/2 8		83	
Average of Holes 204 and 205		Raw 1.5 Float	0.77 0.43	17.29 5.77	26.43	67.38	7 1/2 8		77	

2/Tc.7

TABLE 7

HSR - 1979 SEAM 7 LOWER
(Drill Core Only)

SAMPLED IN DIAMOND HOLE	SAMPLE INTERVAL (m)	AIR DRIED BASIS	MOISTURE (%)	ASH (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	BTU/LB
HSR - D - 204	162.3 - 164.30 (2.0)	Raw	0.57	23.14			5 1/2			
		1.5 Float	0.47	7.73	24.51	67.29	7 1/2		69	
	172.2 - 173.9 (1.7)	Raw	0.52	21.32			3			
		1.5 Float	0.25	10.52	22.43	66.80	5 1/2		68	
	Weighted Average	Raw	0.55	22.30			4 1/2			
		1.5 Float	0.37	9.01	23.55	67.06	6 1/2		69	
HSR - D - 205	69.20 - 70.50 (1.30)	Raw	0.93	7.05			7 1/2			
		1.5 Float	0.22	5.23	26.36	68.19	8		92	
	75.3 - 76.1 (0.8)	Raw	0.75	19.96			7			
		1.5 Float	0.39	8.58	26.18	64.85	7 1/2		70	
	78.60 - 79.65 (1.05)	Raw	0.46	9.38			7			
		1.5 Float	0.38	6.98	25.88	66.76	8		88	
	Weighted Average	Raw	0.73	11.11			7			
		1.5 Float	0.32	6.66	26.51	66.87	8		85	
Average of Weighted Averages of 204 and 205		Raw	0.64	16.71			6			
		1.5 Float	0.33	7.84	25.03	66.97	7		77	

2/Tc.6

HSR - 1979 SEAM 8 UPPER
(Drill Core)

TABLE 8

SAMPLED IN DIAMOND HOLE	SAMPLE INTERVAL (m)	AIR DRIED BASIS	MOISTURE (%)	ASH (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	BTU/LB
HSR - D - 204	243.7 - 251.50 (7.8)	Raw 1.5 Float	0.58 0.76	19.56 6.45	21.84	70.95	2 1/2 4		73	
HSR - D - 205	152.9 - 161.4 (8.5)	Raw 1.5 Float	0.50 0.44	16.86 6.15	23.01	70.40	2 1/2 3 1/2		76	
HSR - D - 210	64.66 - 65.84 (1.18)	Raw 1.5 Float	0.51 0.59	19.66 5.44	26.12	67.85	5 8 1/2		66	
	65.84 - 66.74 (0.90)	Raw 1.5 Float	0.57 0.51	78.60 6.37	25.68	67.44	0 7			
	66.74 - 70.41 (3.67)	Raw 1.5 Float	0.71 0.44	28.40 5.55	24.44	69.57	6 1/2 8 1/2		53	
	Weighted Average	Raw 1.5 Float	0.65 0.48	34.46 5 66	24.98	68.88	5 8 1/2		56	
Average of Holes 204 and 205, 210		Raw 1.5 Float	0.58 0.56	23.63 6.09	23.28	70.08	3 1/2 5 1/2		68	

2/Tc.8

HSR - 1979 SEAM 8 UPPER
(Drill Cuttings)

TABLE 9

SAMPLED IN ROTARY HOLES	SAMPLE INTERVAL (m)	AIR DRIED BASIS	MOISTURE (%)	ASH (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	BTU/LB
HSR - R - 202	39.5 - 43.3.50 (3.8)	Raw	0.49	45.52	17.13	36.86	4			
		1.5 Float	0.55	6.53	26.92	66.00	8		45	
	43.3 - 46.8.4 (3.5)	Raw	0.34	45.93	17.39	36.34	5 1/2			
		1.5 Float	0.45	5.87	27.56	66.12	8		44	
	46.8 - 51.3 (3.5)	Raw	0.41	10.89	25.72	62.98	7			
		1.5 Float	0.64	5.07	27.19	67.10	8		87	
	51.3 - 58.0 (6.7)	Raw	0.49	31.15	22.68	45.68	5 1/2			
		1.5 Float	0.42	6.42	26.80	66.36	8		58	
	58.0 - 63.0 (5.0)	Raw	0.63	15.83	24.72	58.82	4			
		1.5 Float	0.44	5.18	27.47	66.91	7 1/2		80	
	63.0 - 70.0 (7.0)	Raw	0.46	38.33	19.20	42.10	3 1/2			
		1.5 Float	0.08	5.61	27.35	66.96	8		53	
	Weighted Average	Raw	0.48	31.46	21.22	46.87	5			
		1.5 Float	0.39	5.81	27.20	66.61	8		60-65	
HSR - R - 201	10.0 - 28.0 (18.0)	Raw	0.50	46.84	15.07	37.59	1	0.5		7,692
		1.5 Float	0.35	8.51	22.41	68.73	4 1/2	0.5	33	14,049
Average of Holes 201 and 202		Raw	0.49	39.15	18.15	42.23	3	0.5		7,692
		1.5 Float	0.37	7.16	24.81	67.67	6	0.5	47	14,049

HSR - 1979 SEAM 8 LOWER
(Drill Cuttings)

TABLE 10

SAMPLED IN ROTARY HOLES	SAMPLE INTERVAL (m)	AIR DRIED BASIS	MOISTURE (%)	ASH (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	BTU/LB
HSR - R - 201	54.0 - 78.0 (24.0)	Raw	0.40	42.37	15.82	41.41	1	0.5		8,379
		1.5 Float	0.26	7.79	22.41	69.54	4	0.5	50	14,174
HSR - R - 202	90.0 - 94.0.4 (4.0)	Raw	0.44	34.44	19.58	45.54	4			
		1.5 Float	0.24	6.97	25.75	67.04	7		59	
	100.0 - 103.0 (3.0)	Raw	0.39	36.94	19.26	43.41	3 1/2			
		1.5 Float	0.14	8.02	25.63	66.21	7		49	
	111.0 - 118.0 (7.0)	Raw	0.11	23.47	21.21	55.21	2 1/2			
		1.5 Float	0.30	9.30	23.78	66.62	5 1/2		68	
	Weighted Average	Raw	0.26	29.50	20.33	49.92	3			
		1.5 Float	0.25	8.36	24.74	66.65	6 1/2		61	
Average of Holes 201 and 202		Raw	0.33	35.94	18.08	45.67	2	0.5		8,379
		1.5 Float	0.26	8.08	23.58	68.10	5 1/2	0.5	56	14,174

2/Tc.12

HSR - 1979 SEAM 8 LOWER
(Drill Core)

TABLE 11

SAMPLED IN DIAMOND HOLES	SAMPLE INTERVAL (m)	AIR DRIED BASIS	MOISTURE (%)	ASH (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	BTU/LB
HSR - D - 204	259.9 - 260.9 (1.0)	Raw	0.67	15.38			1 1/2			
		1.5 Float	0.95	5.79	20.63	72.63	1 1/2		76	
	261.5 - 268.3 (1.8)	Raw	0.51	19.32			1			
		1.5 Float	0.72	8.12	21.15	70.01	3 1/2		67	
	271.7 - 273.4 (1.7)	Raw	0.44	39.84			1			
		1.5 Float	0.59	8.02	22.72	68.67	7 1/2		37	
	Weighted Average	Raw	0.52	26.19			1			
		1.5 Float	0.72	7.56	21.63	70.09	4 1/2		58	
HSR - D - 205	165.3 - 166.35 (1.05)	Raw	0.50	15.72			2			
		1.5 Float	0.45	4.48	23.06	72.01	3		77	
	168.35 - 170.35 (2.0)	Raw	0.39	31.87			1			
		1.5 Float	0.40	7.18	22.84	69.58	4		49	
	171.6 - 175.75 (4.15)	Raw	0.35	26.16			1 1/2			
		1.5 Float	0.35	8.37	22.93	68.35	3 1/2		57	
	Weighted Average	Raw	0.38	26.22			1 1/2			
		1.5 Float	0.39	7.47	22.92	69.22	3 1/2		58	
Average of Weighted Averages of Holes 204 and 205		Raw	0.45	26.21			1 1/2			
		1.5 Float	0.56	5.98	22.28	69.66	4		58	

2/Tc.13

TABLE 12

HSR - 1979 SEAM 9

(Drill Core Only)

SAMPLED IN DIAMOND HOLES	SAMPLE INTERVAL (m)	AIR DRIED BASIS	MOISTURE (%)	ASH (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	BTU/LB
HSR - D - 205	245.85 - 247.0 (1.15)	Raw	0.42	12.88						
		1.5 Float	0.56	6.30	22.59	70.55	6 1/2		82	
	247.75 - 248.55 (0.80)	Raw	0.52	18.04						
		1.5 Float	0.52	6.68	23.43	69.37	8		70	
	Weighted Average	Raw	0.46	15.00						
		1.5 Float	0.54	6.46	22.93	70.07	7		77	

TABLE 13

HSR - 1979 SEAM 10

(Drill Core Only)

SAMPLED IN DIAMOND HOLES	SAMPLE INTERVAL (m)	AIR DRIED BASIS	MOISTURE (%)	ASH (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	BTU/LB
HSR - D - 205	272.0 - 274.75 (2.75)	Raw 1.5 Float	0.46 0.74	12.78 6.93	22.14	70.19	2 1/2 3 1/2		83	

TABLE 14

HSR - 1979 SEAM 10
(Drill Cuttings)

SAMPLED IN ROTARY HOLES	SAMPLE INTERVAL (m)	AIR DRIED BASIS	MOISTURE (%)	ASH (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	BTU/LB
HSR - R - 201	263.0 - 265.0 (2.0)	Raw	0.37	49.52	21.40	28.71	1	0.5		6,522
		1.5 Float	0.33	10.19	20.76	68.72	5	0.5	32	13,813
	266.5 - 274.0 (7.5)	Raw	0.38	42.85	18.37	38.40	1	0.5		7,948
		1.5 Float	0.22	9.72	19.74	70.32	2 1/2	0.5	37	13,910
	Weighted Average	Raw	0.38	44.25	19.00	36.36	1	0.5		7,648
		1.5 Float	0.24	9.82	19.95	69.98	3	0.5	36	13,890
HSR - R - 203	68.5 - 69.0 (1.50)	Raw	0.53	34.24			3 1/2			
		1.5 Float	0.54	10.52	20.68	68.26	6		55	
	69.0 - 69.5 (0.50)	Raw	0.38	52.78			1 1/2			
		1.5 Float	0.51	11.18	21.75	66.56	8		28	
	76.0 - 77.0 (1.0)	Raw	0.34	50.59			1			
		1.5 Float		NO	SAMPLE (so?)					
	79.5 - 80.0 (0.50)	Raw	0.20	34.85			1			
		1.5 Float	0.61	10.02	20.09	69.28	3		50	
	82.5 - 83.5 (1.0)	Raw	0.27	65.41			1/2			
		1.5 Float	0.37	14.06	19.80	65.77	3		14	
	87.5 - 88.0 (0.50)	Raw	0.23	33.25			2			
		1.5 Float	0.32	10.70	20.66	68.32	3		64	
	96.5 - 97.0 (0.50)	Raw	0.42	55.50			1			
		1.5 Float	0.31	10.62	22.22	66.85	8		21	

HSR - 1979 SEAM 10 (continued)
(Drill Cuttings)

SAMPLED IN ROTARY HOLES	SAMPLE INTERVAL (m)	AIR DRIED BASIS	MOISTURE (%)	ASH (%)	V.M. (%)	F.C. (%)	FSI	SULPHUR (%)	YIELD (%)	BTU/LB
	Weighted Average of Hole 203	Raw 1.5 Float	0.37 0.37	46.46 9.29	20.71	67.48	2 5		40	
HSR - R - 209	138.0 - 162.0 (24.0)	Raw 1.5 Float	0.56 0.48	52.01 9.55	19.69	70.28	1 5 1/2		30	
Average of Weighted Averages of holes 201, 203, 209		Raw 1.5 Float	0.44 0.36	47.57 9.55	20.12	69.25	1 1/2 4 1/2		35	