GWS

BIRTLEY ENGINEERING (CANADA) LTD.

Subsidiary of Great West Steel Industries Ltd.

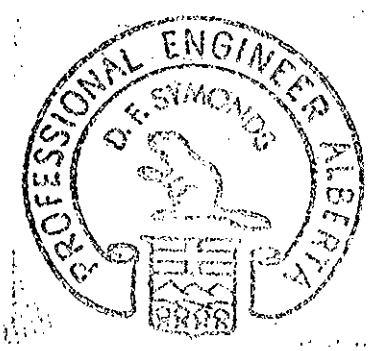
5112 - 3rd ST. S.E., CALGARY, ALBERTA T2H 1J6 PHONE 403-253-3719

REPORT NO. CS0094

A REPORT TO B.C. HYDRO AND POWER AUTHORITY ON THE ANALYSIS AND BENEFICATION OF BULK SAMPLES "A", "B", AND "C" FROM THE HAT CREEK DEPOSIT

1976

604H-M009.



Submitted By:

BIRTLEY ENGINEERING (CANADA) LTD.

Dr. D. F. Symonds, P.Eng.
General Manager

&

Coal Science & Minerals Testing Division

Frank J. Horvat,
Manager

August 13, 1976.

CONCLUSIONS AND RECOMMENDATIONS

The following six diagrams summarize the results of the washing program on Samples A, B, and C, and indicate the quality of the raw, clean and discard products. Figures (i) to (iii) represent the products from the June washing programme, i.e. the clean coal was composed of the Heavy Media cyclone overflow, and the 65mesh sieve bend overflow. It can be seen, however, from Figures (iv) to (vi) that if all of the water-only cyclone underflow material is included, then the clean coal yield values can be substantially increased with only a moderate reduction in clean coal quality. We would anticipate that the final flowsheet and corresponding coal quality would fall somewhere in between the two circuits as shown in Figures (i) to (vi) since the clay slimes in the water-only cyclone overflow could be removed by means of, say, a thickening cyclone. It can be seen that the above flowsheet modification would allow an increase in BTU recovery of between 8 and 25%.

If sample 'B' is considered to be typical of the whole property, we can see that a clean coal can be produced at a yield of 70-75%, an ash content (a.r.) of 16-19%, and a calorific value of approximately 7000 BTU/lb. The BTU recovery from the washing process is in excess of 90% of the raw coal value and there is less than half the quantity of ash to be collected and disposed of.

The testing programme has shown that the Hat Creek coals can be upgraded by conventional washing techniques. We suggest that the samples received by us exhibited worse washing characteristics than can be expected in the full scale operation due to the following reasons:

a) The samples had to be collected by means of 3' dia. auger, which churned up the samples and created more fine coal than would be encountered in practice. Fines have an adverse effect upon the washing process.

b) The coal was crushed to minus 3/4" in the pilot plant - again creating fines.

c) All of the raw coal was processed through the plant where as we expect that a fair proportion of the clay would be removed prior to feeding it to a full scale wash plant (by means of, say, a rotary breaker).

There is no doubt that the presence of clay in the Hat Creek coals will cause problems in washing and materials handling circuits. However, these problems can be minimized if they are recognized in the early stages of the project, exhaustively studied through the development stage and adequate counter measures are encorporated in the plant design.

We suggest that the following areas must be studied further:

a) Handling, screening and crushing of the clay in the run of mine coal (this applies to the materials handling circuit at Hat Creek regardless of whether the coal is washed or not).

b) Methods of removing clay prior to feeding it to the plant, i.e. rotary breakers, selective crushing and screening etc.

c) Dense medium recovery circuits (reduction of slimes contamination).

d) Tailings disposal and plant water recovery. The clay type must be identified and flocculation tests should be performed on the fine reject material, primarily for environmental reasons.

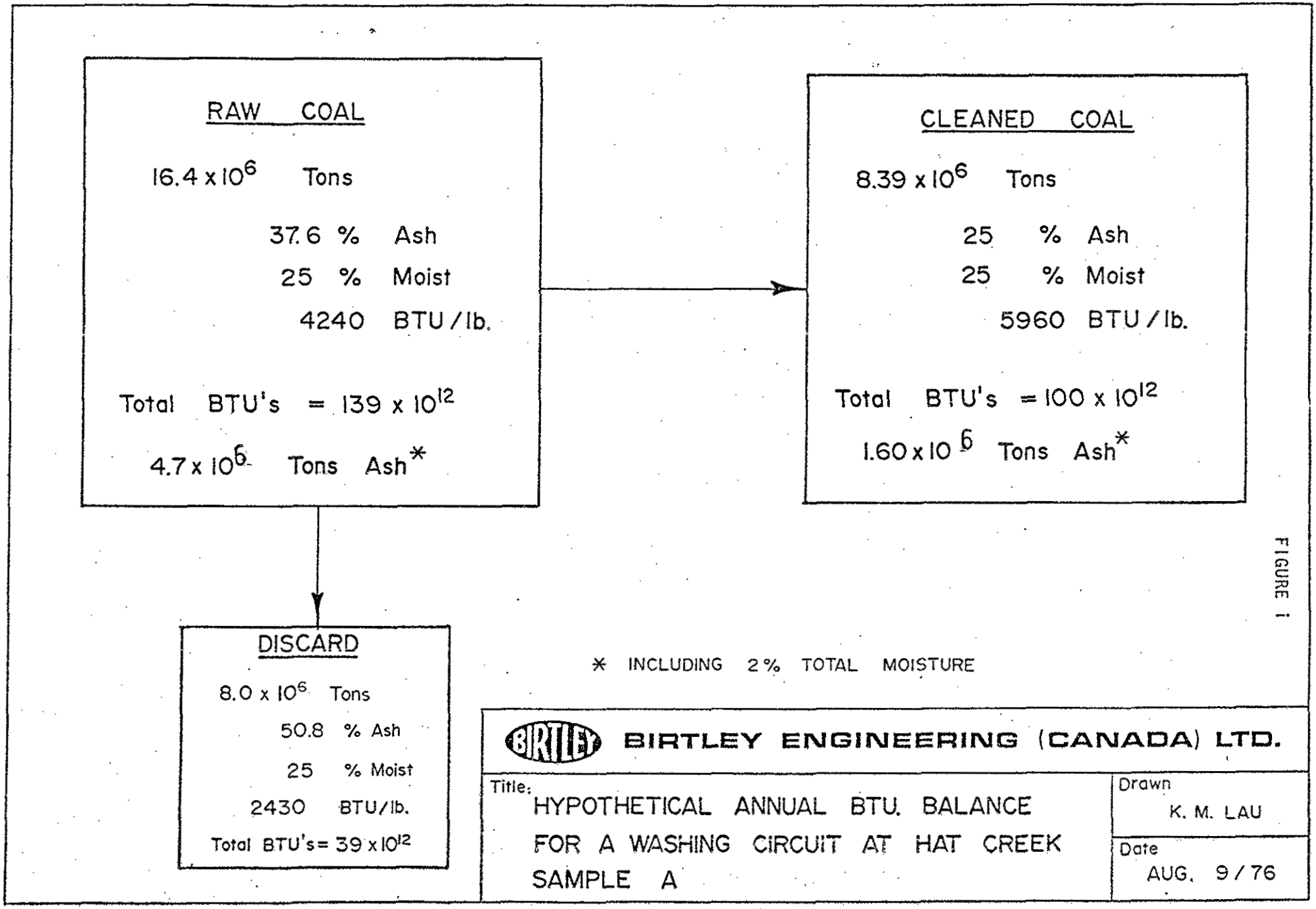

RAW COAL
16.4 x 10^6 Tons
37.6 % Ash
25 % Moist
4240 BTU / lb.
Total BTU's = 139 x 10^12
4.7 x 10^6 Tons Ash*
CLEANED COAL
8.39 x 10^6 Tons
25 % Ash
25 % Moist
5960 BTU / lb.
Total BTU's = 100 x 10^12
1.60 x 10^6 Tons Ash*
DISCARD
8.0 x 10^6 Tons
50.8 % Ash
25 % Moist
2430 BTU/lb.
Total BTU's = 39 x 10^12
* INCLUDING 2% TOTAL MOISTURE
BIRTLEY ENGINEERING (CANADA) LTD.
Title: HYPOTHETICAL ANNUAL BTU. BALANCE FOR A WASHING CIRCUIT AT HAT CREEK SAMPLE A
Drawn K. M. LAU
Date AUG. 9/76

FIGURE 1

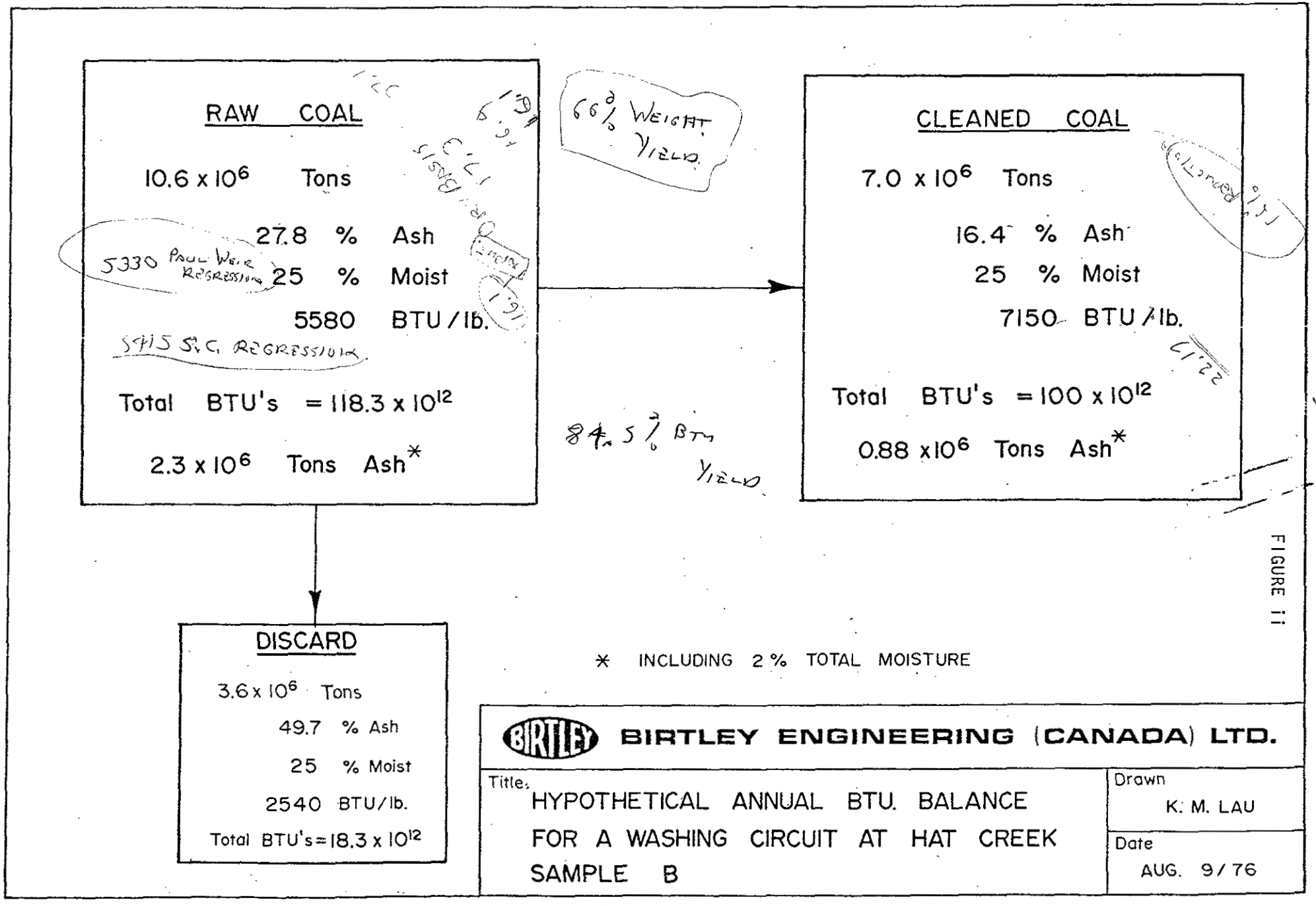

RAW COAL
10.6 x 10^6 Tons
27.8 % Ash
25 % Moist
5580 BTU / lb.
Total BTU's = 118.3 x 10^12
2.3 x 10^6 Tons Ash*
66% WEIGHT YIELD
84.5% BTU YIELD
CLEANED COAL
7.0 x 10^6 Tons
16.4 % Ash
25 % Moist
7150 BTU / lb.
Total BTU's = 100 x 10^12
0.88 x 10^6 Tons Ash*
DISCARD
3.6 x 10^6 Tons
49.7 % Ash
25 % Moist
2540 BTU/lb.
Total BTU's = 18.3 x 10^12
* INCLUDING 2 % TOTAL MOISTURE
BIRTLEY ENGINEERING (CANADA) LTD.
Title: HYPOTHETICAL ANNUAL BTU. BALANCE FOR A WASHING CIRCUIT AT HAT CREEK SAMPLE B
Drawn K. M. LAU
Date AUG. 9/76

FIGURE 11

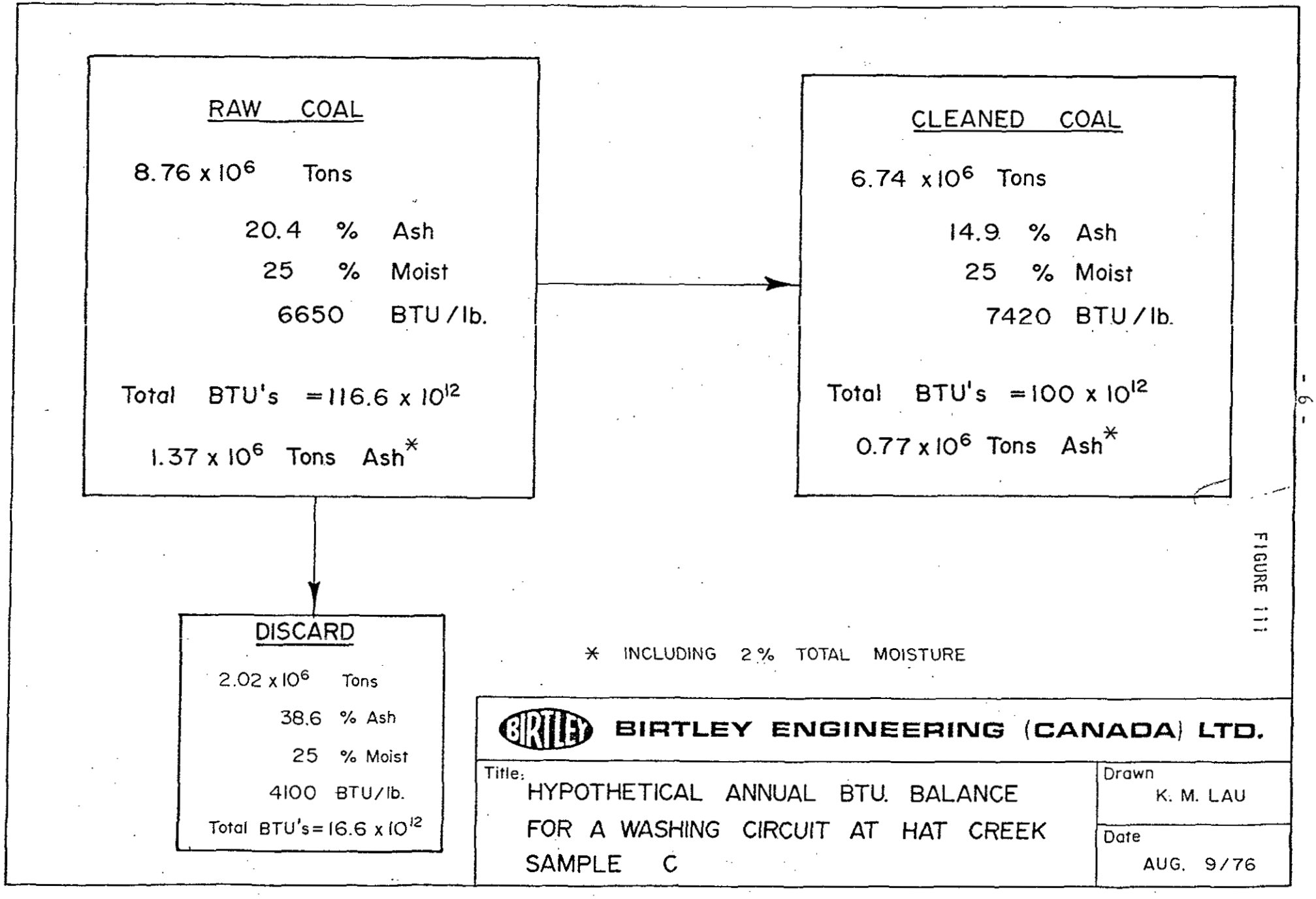
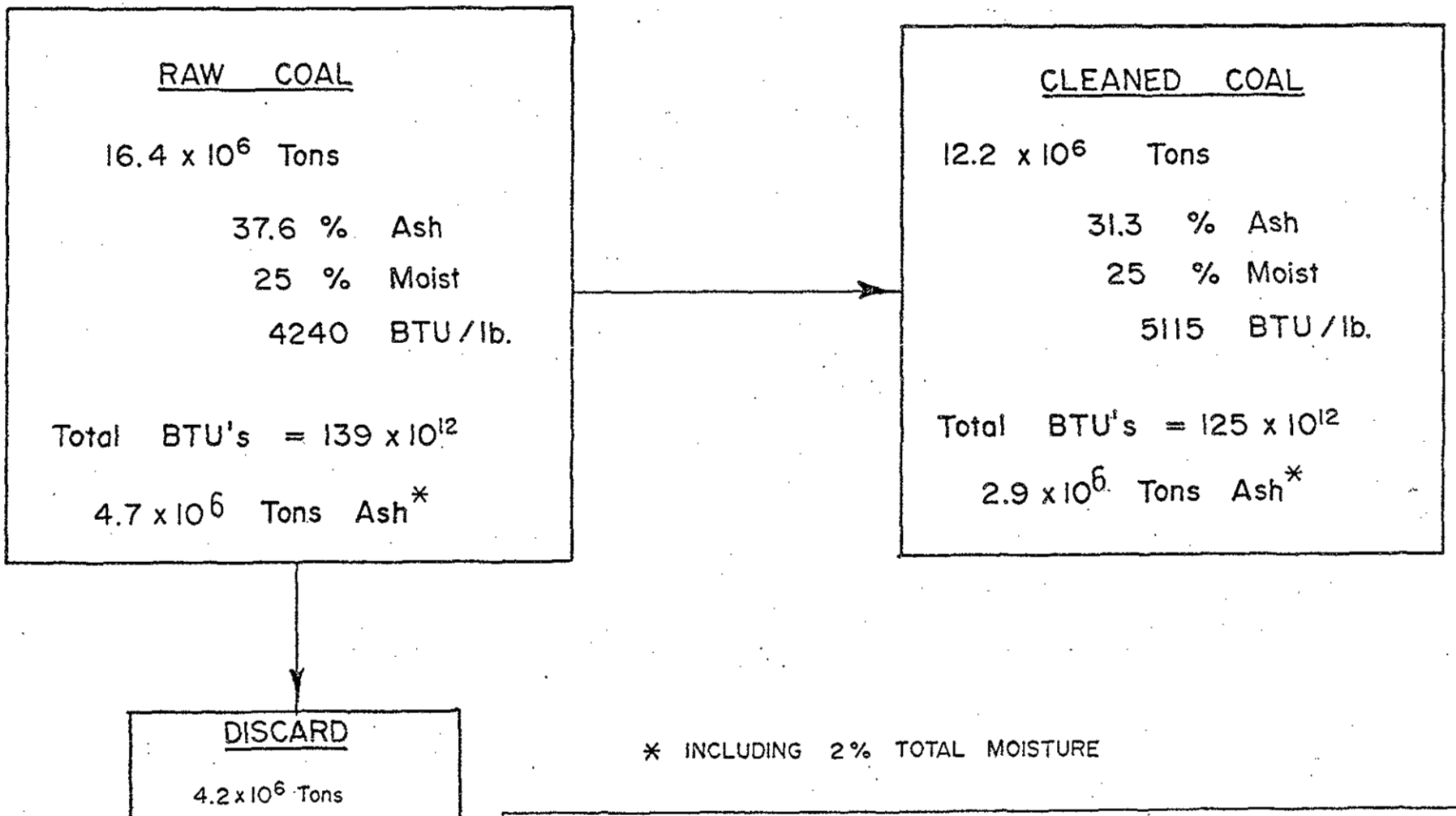

RAW COAL
8.76 x 10^6 Tons
20.4 % Ash
25 % Moist
6650 BTU / lb.
Total BTU's = 116.6 x 10^12
1.37 x 10^6 Tons Ash*
CLEANED COAL
6.74 x 10^6 Tons
14.9 % Ash
25 % Moist
7420 BTU / lb.
Total BTU's = 100 x 10^12
0.77 x 10^6 Tons Ash*
DISCARD
2.02 x 10^6 Tons
38.6 % Ash
25 % Moist
4100 BTU/lb.
Total BTU's = 16.6 x 10^12
* INCLUDING 2% TOTAL MOISTURE
BIRTLEY ENGINEERING (CANADA) LTD.
Title: HYPOTHETICAL ANNUAL BTU. BALANCE FOR A WASHING CIRCUIT AT HAT CREEK SAMPLE C
Drawn K. M. LAU
Date AUG. 9/76

FIGURE 111



* INCLUDING 2% TOTAL MOISTURE

FIGURE iv

BIRTLEY ENGINEERING (CANADA) LTD.

Title: HYPOTHETICAL ANNUAL BTU. BALANCE FOR A WASHING CIRCUIT AT HAT CREEK SAMPLE A — INCLUDING W.O. CYC. O/F.

Drawn: K. M. LAU

Date: AUG. 12/76

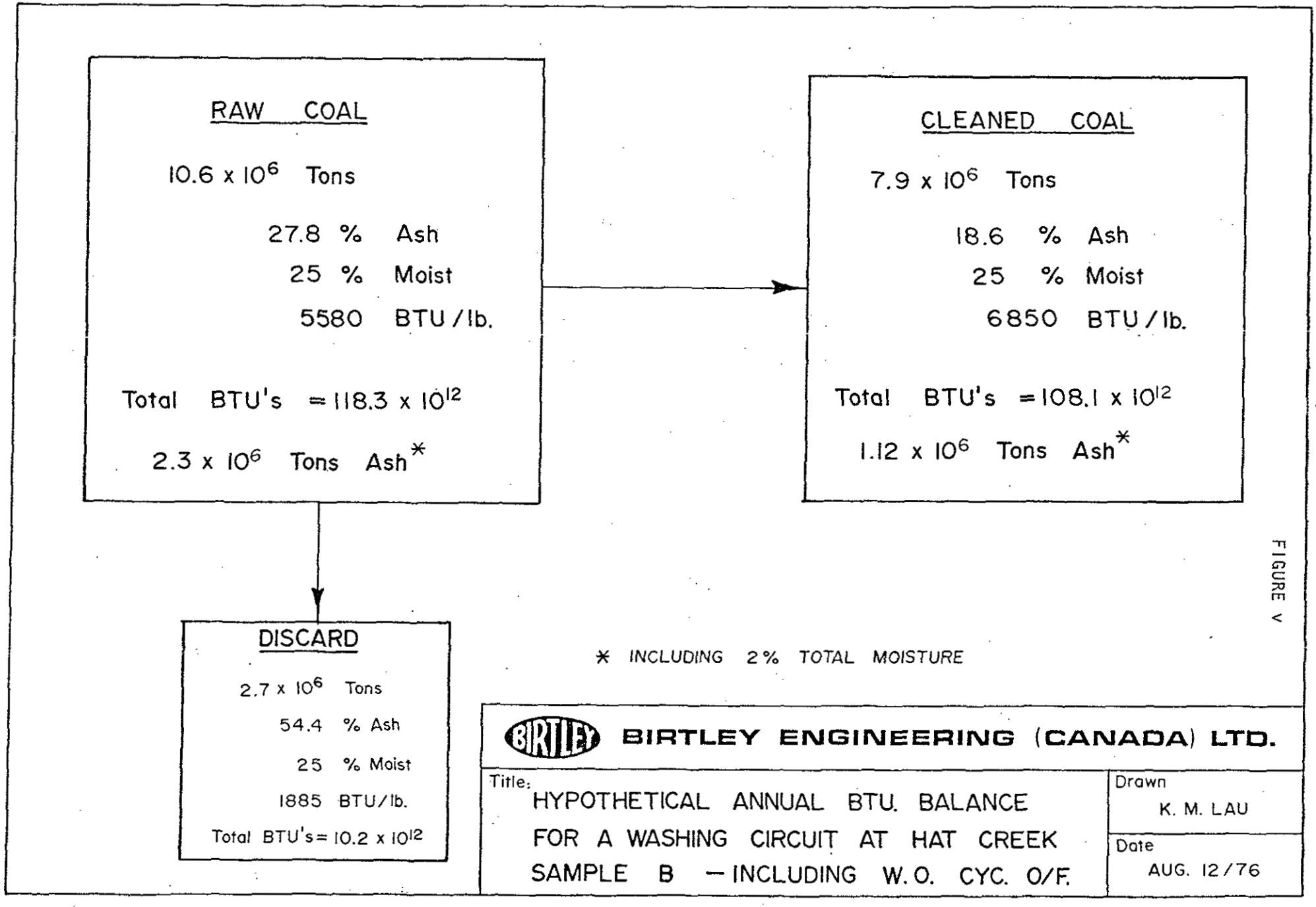

RAW COAL
10.6 x 10^6 Tons
27.8 % Ash
25 % Moist
5580 BTU / lb.
Total BTU's = 118.3 x 10^12
2.3 x 10^6 Tons Ash*
CLEANED COAL
7.9 x 10^6 Tons
18.6 % Ash
25 % Moist
6850 BTU / lb.
Total BTU's = 108.1 x 10^12
1.12 x 10^6 Tons Ash*
DISCARD
2.7 x 10^6 Tons
54.4 % Ash
25 % Moist
1885 BTU/lb.
Total BTU's = 10.2 x 10^12
* INCLUDING 2% TOTAL MOISTURE
BIRTLEY ENGINEERING (CANADA) LTD.
Title: HYPOTHETICAL ANNUAL BTU. BALANCE FOR A WASHING CIRCUIT AT HAT CREEK SAMPLE B — INCLUDING W.O. CYC. O/F.
Drawn K. M. LAU
Date AUG. 12/76

FIGURE V

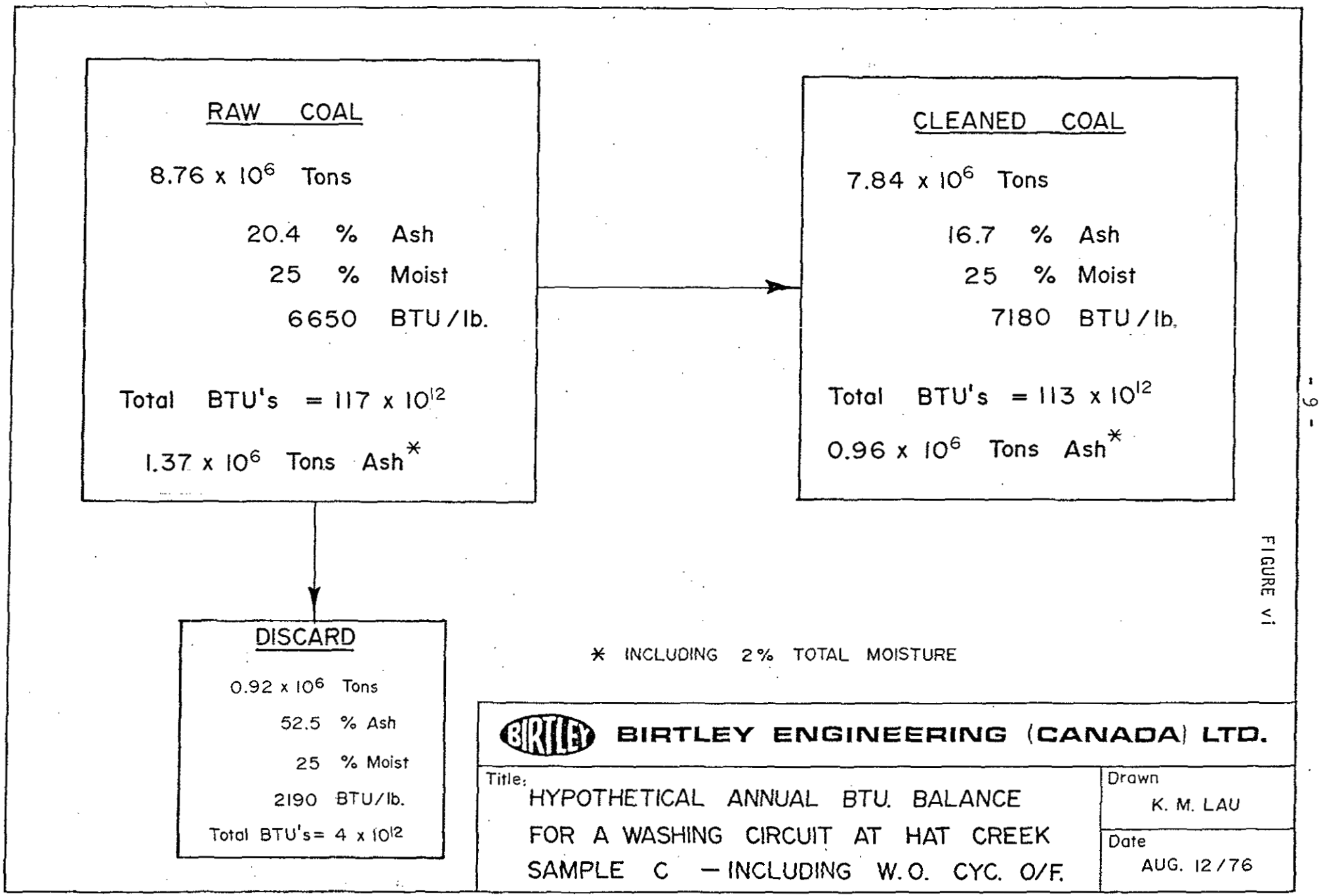

RAW COAL
8.76 x 10^6 Tons
20.4 % Ash
25 % Moist
6650 BTU/lb.
Total BTU's = 117 x 10^12
1.37 x 10^6 Tons Ash*
CLEANED COAL
7.84 x 10^6 Tons
16.7 % Ash
25 % Moist
7180 BTU/lb.
Total BTU's = 113 x 10^12
0.96 x 10^6 Tons Ash*
DISCARD
0.92 x 10^6 Tons
52.5 % Ash
25 % Moist
2190 BTU/lb.
Total BTU's = 4 x 10^12
* INCLUDING 2% TOTAL MOISTURE
BIRTLEY ENGINEERING (CANADA) LTD.
Title: HYPOTHETICAL ANNUAL BTU. BALANCE FOR A WASHING CIRCUIT AT HAT CREEK SAMPLE C — INCLUDING W.O. CYC. O/F.
Drawn K. M. LAU
Date AUG. 12/76

FIGURE vi

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Subsidiary of Great West Steel Industries Ltd.
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A REPORT TO
B.C. HYDRO AND POWER AUTHORITY
ON THE ANALYSIS AND BENEFICIATION OF
BULK SAMPLES "A", "B", AND "C"
FROM THE HAT CREEK DEPOSIT

1. INTRODUCTION

Three bulk samples labelled "A", "B" and "C" were delivered to Birtley Engineering's pilot plant and coal testing facility in Calgary, Alberta in June, 1976. Initially the samples weighed approximately 20 tons each (as received) but a further 10 tons were required for each sample when the analytical programme was subsequently modified.

The purposes of this part of the programme were:

a) To extract representative raw coal samples and ship them to the Federal Government's Combustion Research Centre in Ottawa.

b) To examine the raw coal and washability characteristics of the samples (the degree of sophistication of the sink-float wash increased as the programme progressed).

c) To prepare representative clean coal samples for further analysis by the Combustion Research Centre.

d) To examine the yield and clean coal quality from commercial scale equipment.

e) To gain an insight into some of the problems that may be encountered when washing and handling these coals.

Due to the variable nature of the deposit at Hat Creek and the difficulty in obtaining one single "representative" sample, three samples were delivered to our plant. They were labelled "A", "B" and "C" and were an attempt to represent the "worst", "most likely" and "best" run of mine coal according to calorific value.

The expected BTU levels of each sample were as follows:

"A"	3300 - 3600 BTU/lb. (as rec'd)
"B"	5000 - 5500 BTU/lb. (as rec'd)
"C"	6300 - 6700 BTU/lb. (as rec'd)

2. PROCEDURE

2.1 WASHABILITY AND ANALYTICAL WORK

Originally, a work flow scheme was drawn up by Birtley Engineering (Canada) Ltd. following discussions between D.F. Symonds and M. French to this effect. The program, slated for Samples "A", "B" and "C", consisted basically of three stages, namely:

a) extraction of a 5 ton raw coal sample, crushed to -2" and shipped in polyethylene lined barrels, to C.C.R.L. in Ottawa.

b) two circuit pilot plant wash (DMC and hydrocyclone) to produce enough clean coal product of about 5 tons for C.C.R.L. in Ottawa.

c) washability tests, including size analysis at 4", 1/2", 28 M and 100 M and subsequent sink-float analysis on back of the size fractions 4" x 1/2", 1/2" x 28 M, and 28 M x 100 M at 1.30 S.G. through to 2.20 S.G.

Sample "C" was not processed according to (c) above because the washability results for Samples "A" and "B" proved unreliable. It was determined at this point that the continuous straight sink-float process of floating the sinks from a lower S.G. into the next higher S.G. caused breakdown of the coal, thereby adversely affecting the distribution at the different S.G. ranges. After discussions between Birtley Engineering and B.C. Hydro and PDNCB personnel, it was decided that a modified sink-float analysis programme be conducted on a gross sample of 3/4" x 28 M coal (all coal crushed to minus 3/4") a size range conforming with the Heavy Media pilot plant wash requirements. One representative sample split was used for each S.G. i.e. 9 head samples at the total amount from each sample floated at one of the nine gravities (see flowsheet 11).

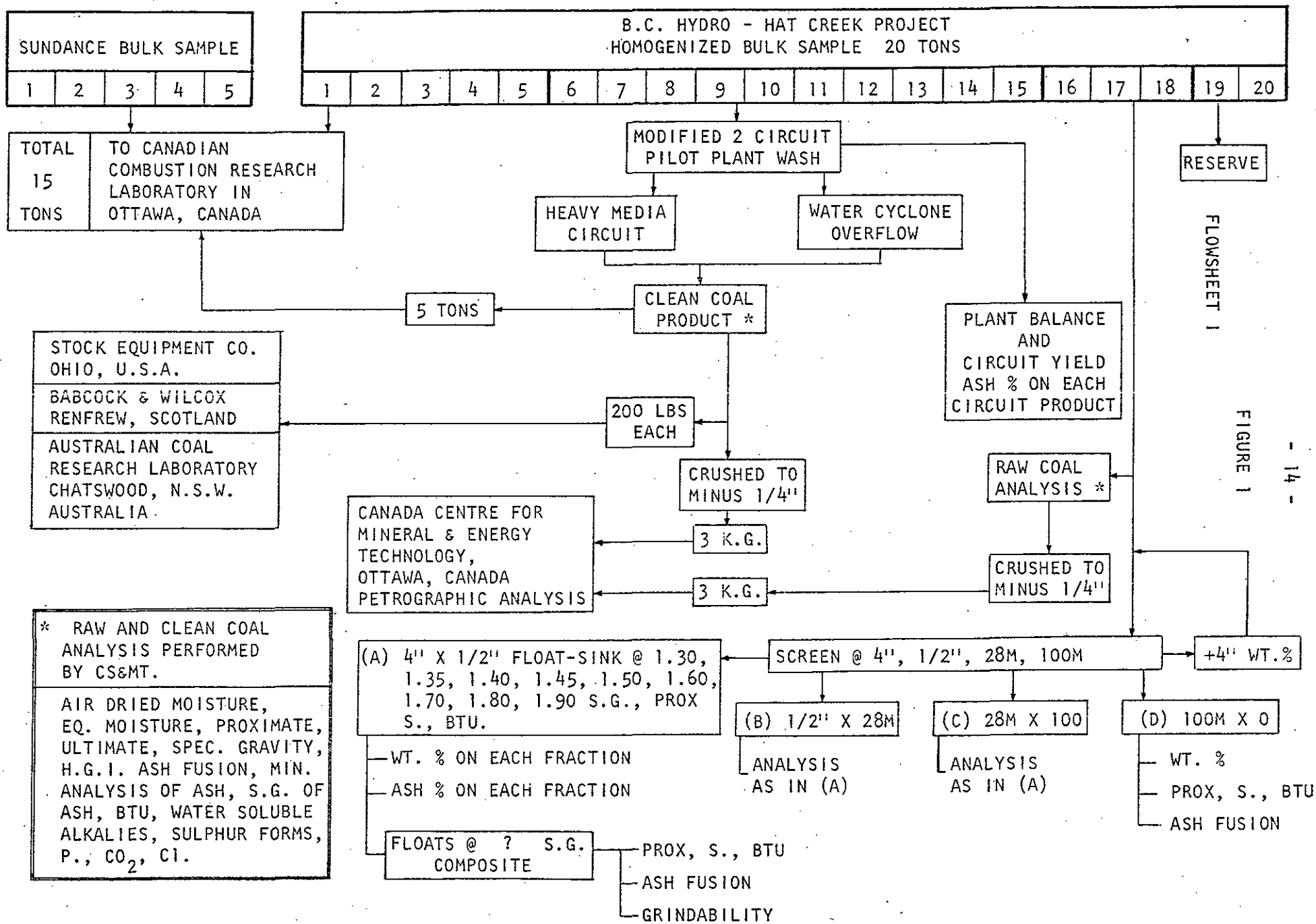
A meeting was called at the Birtley Engineering (Canada) Ltd. offices on 16 June, 1976 attended by personnel representing Ebasco, B.C. Hydro, PD-NCB, Dolmage Campbell and Birtley Engineering and amongst other things, the initial washability problems encountered in Section I

above were discussed. Washability results using Flowsheet II above were presented by Birtley and with its viability confirmed, a further modified washability program was therefore finalized, patterned after Flowsheet II. Utilizing all the available raw coal samples left over from prior tests, Samples "A", "B" and "C" were each analyzed as per Flowsheet III. The concept of using one representative sample for each S.G. in the sink-float process to minimize breakdown of this raw rank coal was found to be satisfactory, with the exception of Sample "A" which is known to contain appreciable amounts of plastic clay.

Anomalous results are inevitably encountered when sink-float work is carried out on low rank coal samples containing high proportions of damp plastic clays. The coal samples have to be air dried prior to screening and immersion in the organic liquids and the combination of air drying, handling, breakage in the organic liquids, rehandling, forced air drying to evaporate the adhering or absorbed organic liquids results in slight inconsistencies in the cumulative yield ash curve. This curve is by far, the most important when assessing the overall washability characteristics of a particular coal. Certain other curves are useful, however, and generally require a knowledge of the instantaneous ash value for the particular gravity fraction eg. 1.35 - 1.40 S.G. It will be noticed that if the instantaneous ash values are calculated back from the cumulative values for Sample "A", definite erroneous results are encountered. Such results are unavoidable when sink-float work is carried out on coals with the following combination: coarse particle size (+1/4"), low rank coal, high proportion of clay material much of which is finely interbedded with the coal and sink-float wash executed on like samples at differing gravities.

We therefore recommend that in the case of the 2" x 0 washability wash on Sample "A" that the reader consider the above when casting a jaundiced eye upon some of the results.

Due to the anomalies in calculated elementry ash for Sample "A", when using the flowsheet III approach, we decided to draw the best smooth yield-ash curve and then for each yield value recalculate the elementary ash (see figure 4.)



FLOWSHEET 1

FIGURE 1

Birtley Engineering
Subsidiary of Great West Steel Industries

B.C. HYDRO - HAT CREEK PROJECT

FLOWSHEET II

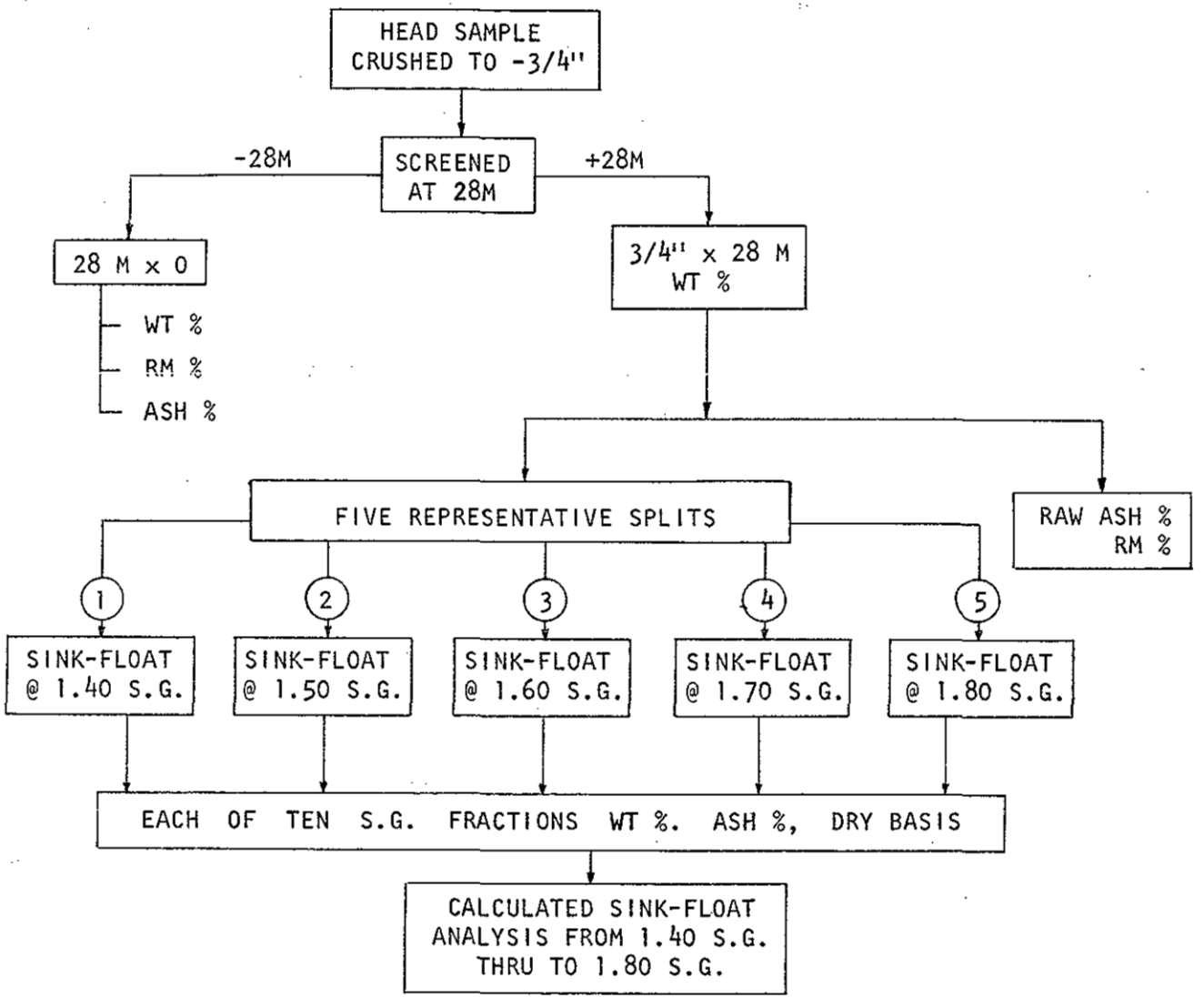


FIGURE 2

B.C. HYDRO - HAT CREEK PROJECT

FLOWSHEET III

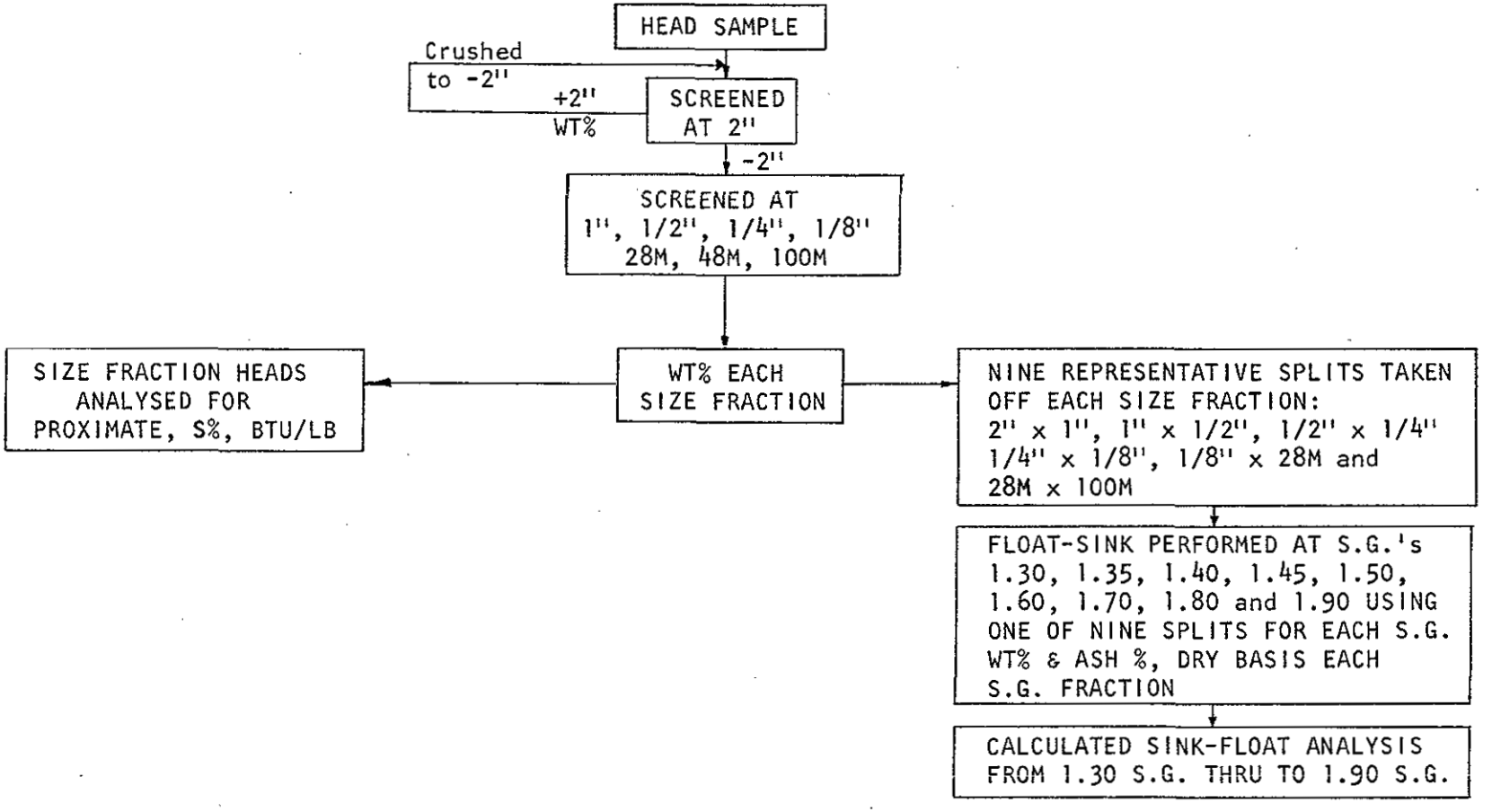
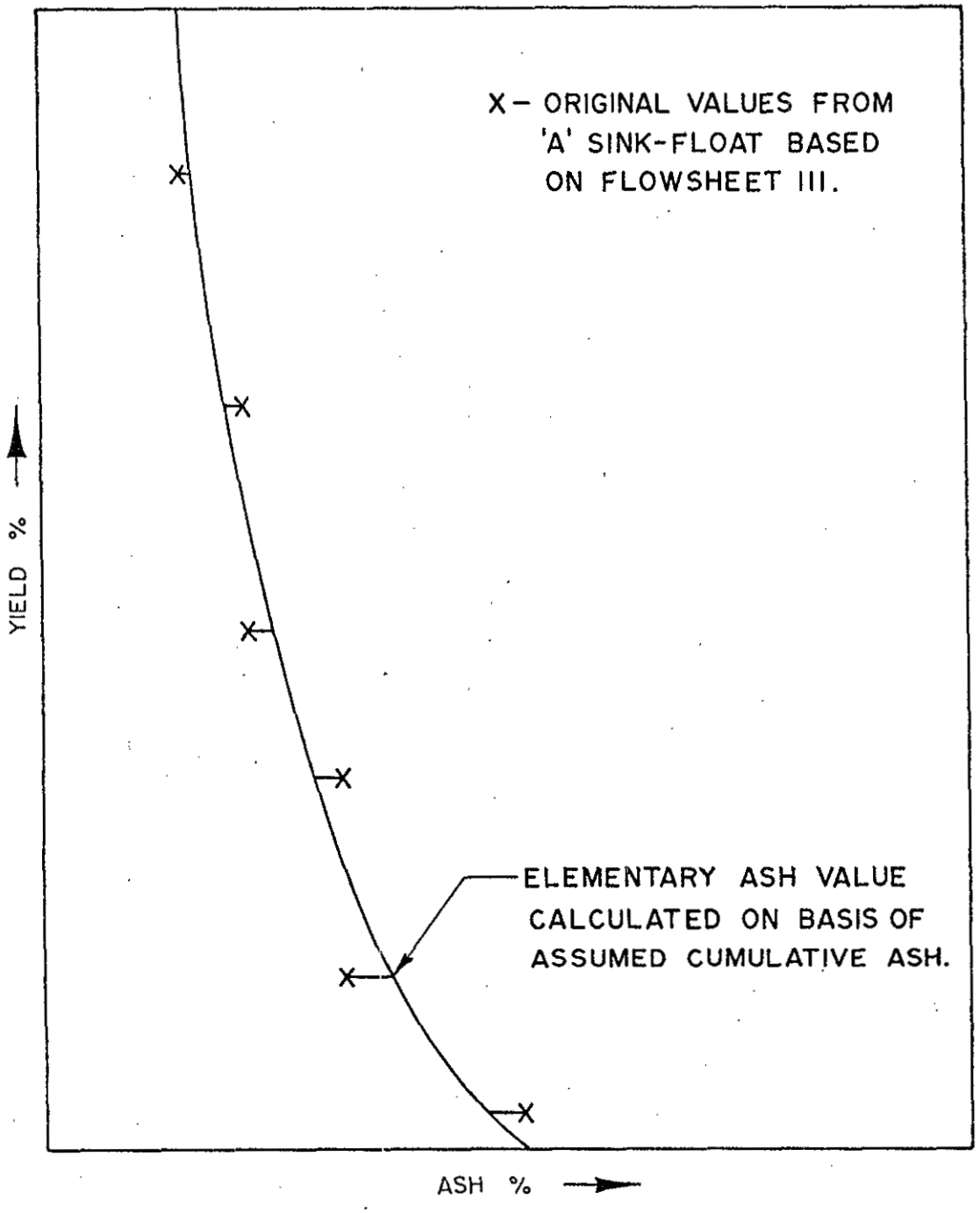


FIGURE 3

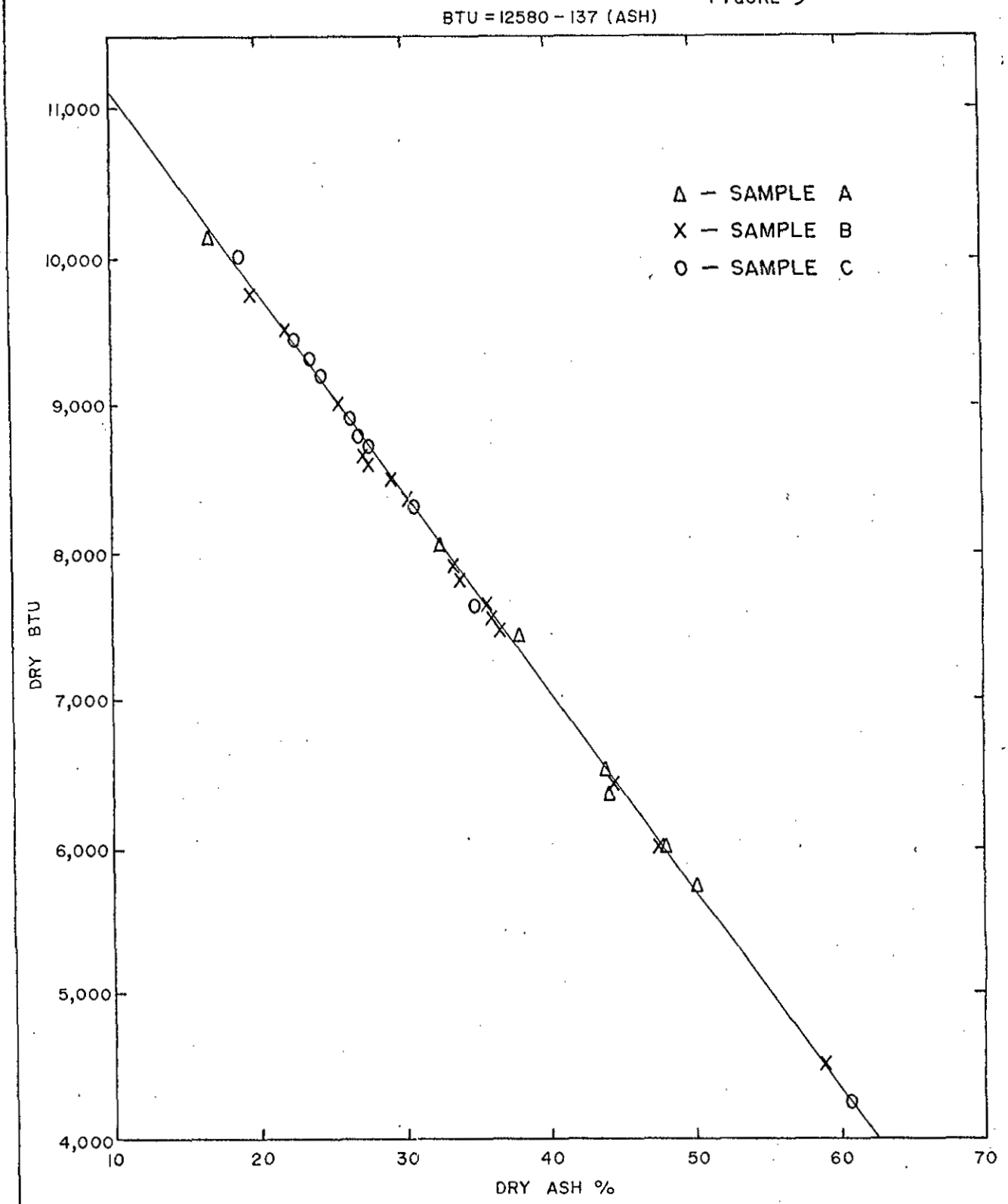
FIGURE 4



BIRTLEY ENGINEERING (CANADA) LTD.

Title	Date
B.C. HYDRO - HAT CREEK PROJECT DIAGRAM SHOWING THE METHOD OF CALCULATING THE REVISED WASHABILITY RESULTS FOR 2"x 28m SINK-FLOAT SAMPLE 'A' FLOWSHEET III	JULY 22/76
	Drawn

FIGURE 5



BIRTLEY ENGINEERING (CANADA) LTD.

Title	Date
B. C. HYDRO – HAT CREEK PROJECT DRY BTU vs DRY ASH RELATIONSHIP	AUG. 13/76
	Drawn K. M. LAU

2.2 BULK WASHING TESTS

The coal samples were fed into the CS & MT pilot plant (see fig. 6) Essentially, the circuit consisted of the following:

a) Crushing all of the run of mine coal to minuw 3/4"

b) Desliming at 28Mesh

c) Passing the 3/4" X 28Mesh through a dense medium cyclone

d) Passing the 28Mesh X 0 through a water-only cyclone, the overflow from which was passed over a rapped sieve bend with 0.25mm openings

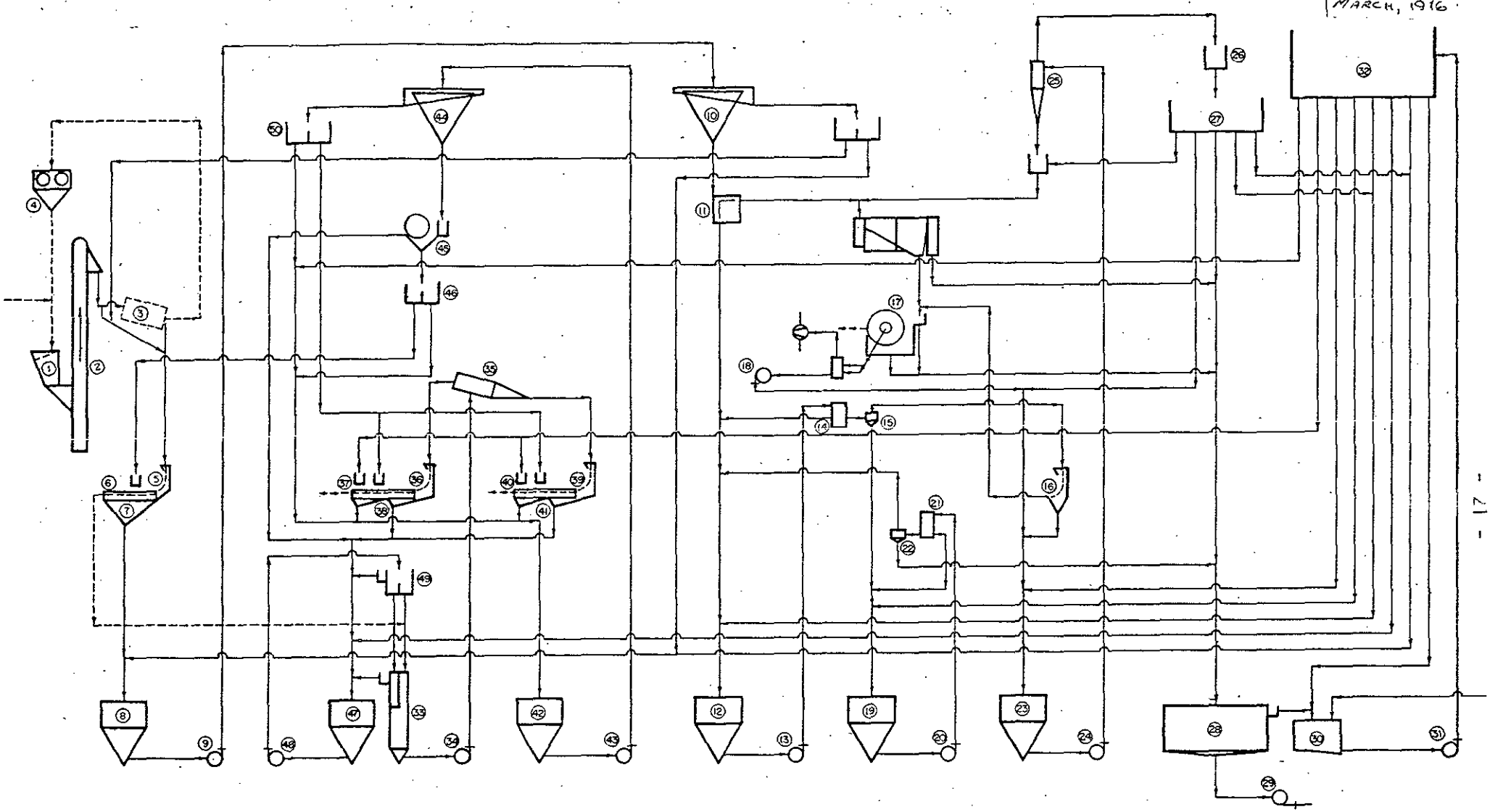
e) The 0.25mm sieve bend underflow was discarded to the thickness as was the water-only cyclone underflow.

Comprehensive testing of all the plant products was undertaken.

Birtley had initially suggested that each of the samples be washed to produce a clean coal with an ash content of 15%. However, at a joint meeting in Calgary on June 16, 1976, B. C. Hydro's consultants requested that the coals be washed at a common separating gravity of 1.65 with the result that the clean coal ash content was different for each sample. Birtley reluctantly agreed to this procedure, and pointed out that the ash content of the clean coal sample would be high, particularly for sample "A". (a small proportion of Sample "A" had already been washed at 1.40 S.G. prior to this decision). Certain analyses were performed on this sample and they can be seen in the section 'Plant Sample Results for Sample "A"'.

NOTE: Due to the high clay content of Sample "A", the oversize clay material from the 2 1/4" grizzly ahead of the plant was picked out and manually reduced to -2 1/4". It was felt that this was necessary to prohibit plugging of the jaw crusher treating the 2 1/4" X 3/4" material. In addition, the jaw crusher feed was lanced with water to further inhibit clogging of the crusher feed chute.

MARCH, 1976



1. Feed Bin
2. Elevator
3. Rotary Screen
4. Jaw Crusher
5. Sieve Bend
6. Desliming Screen
7. Underflow Collector
8. 28M-O 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

FIGURE 6

TEST PLANT FLOWSHEET

COAL SCIENCE & MINERALS TESTING

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

RESULTS

BULK SAMPLE "A"

TABLE 1

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7366

SIZE ANALYSIS: OF GROSS SAMPLE CRUSHED TO -4" WT% +4" = 0.7%										
								CUMULATIVE		
SIZE FRAC.	WT.%	RM%	ASH%	VM%	FC%	S%	BTU/LB	WT%	ASH%	BTU/LB
4" x 1/2"	34.4	13.4	37.9	24.4	24.3	1.11	5646	34.4	37.9	5646 adb
	31.2	-	43.8	28.2	28.0	1.28	6520	31.2	43.8	6520 db
1/2" x 28M	48.8	9.5	45.6	23.3	21.6	0.94	5163	83.2	42.4	5362 adb
	50.9	-	50.4	25.7	23.9	1.04	5705	82.1	47.9	6015 db
28M x 100M	12.4	7.8	58.4	19.9	13.9	0.90	3780	95.6	44.5	5157 adb
	13.2	-	63.3	21.6	15.1	0.98	4100	95.3	50.0	5750 db
100 M x 0	4.4	7.4	58.8	20.2	13.6	0.96	3783	100.0	45.1	5097 adb
	4.7	-	63.5	21.8	14.7	1.04	4085	100.0	50.7	5671 db

ASH FUSION TEMP. (°F): 100M x 0				
ATMOS.	INITIAL DEFORMATION	SOFTENING	HEMISPHERICAL	FLUID
Oxid.	2650+	-	-	-
Reduc.	2610	2650+	-	-

NOTE: db = Dried Basis

adb = Air Dried Basis

TABLE 2

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7366

SINK-FLOAT ANALYSIS (Dried Basis) 4" x 1/2" (Wt% = 34.4% a.d.)				
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.30	6.6	3.4	6.6	3.4
1.30-1.35	9.2	6.6	15.8	5.3
1.35-1.40	8.7	16.7	24.5	9.3
1.40-1.45	14.2	25.8	38.7	15.4
1.45-1.50	13.5	36.1	52.2	20.7
1.50-1.60	13.4	50.9	65.6	26.9
1.60-1.70	0.9	55.2	66.5	27.3
1.70-1.80	0.4	60.3	66.9	27.5
1.80-1.90	5.8	66.0	72.7	30.5
1.90-2.00	17.7	78.9	90.4	40.0
2.00-2.10	0.6	76.7	91.0	40.3
2.10-2.20	2.3	82.5	93.3	41.3
+2.20	6.7	79.5	100.0	43.9

TABLE 3

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7366

ANALYSIS ON 4" x 1/2" FLOATS @ 1.50 S.G.

PROXIMATE						
RM %	ASH %	VM %	FC %	S %	BTU/LB	H.G.I.
18.1	17.0	30.6	34.3	0.99	7716	35 adb
	20.8	37.4	41.8	1.21	9421	- db

ASH FUSION TEMPERATURES (°F)				
ATMOS.	INITIAL DEFORMATION	SOFTENING	HEMISPHERICAL	FLUID
Oxid.	2580	2650+	-	-
Red.	2480	2630	2650	2650+

TABLE 4

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7366

SINK-FLOAT ANALYSIS (Dried Basis) 1/2" x 28M (Wt% = 48.8 a.d.)				
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.30	0.5	3.9	0.5	3.9
1.30-1.35	4.9	4.7	5.4	4.6
1.35-1.40	4.8	7.3	10.2	5.9
1.40-1.45	4.6	14.1	14.8	8.4
1.45-1.50	5.7	18.9	20.5	11.3
1.50-1.60	24.1	34.4	44.6	23.8
1.60-1.70	1.2	36.1	45.8	24.1
1.70-1.80	5.6	47.6	51.4	26.7
1.80-1.90	9.3	56.1	60.7	31.2
1.90-2.00	5.8	64.6	66.5	34.1
2.00-2.10	11.0	72.0	77.5	39.5
2.10-2.20	6.2	78.5	83.7	42.4
+2.20	16.3	84.1	100.0	49.2

TABLE 5

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7366

ANALYSIS ON 1/2" x 28 FLOATS @ 1.50 S.G.

PROXIMATE						
RM %	ASH %	VM %	FC %	S %	BTU/LB	H.G.I.
9.0	10.4	35.8	44.8	1.01	9614	36 adb
	11.4	39.3	49.3	1.11	10565	- db

ASH FUSION TEMPERATURES (°F)				
ATMOS.	INITIAL DEFORMATION	SOFTENING	HEMISPHERICAL	FLUID
Oxid.	2290	2360	2400	2430
Red.	2200	2260	2280	2350

TABLE 6

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7366

SINK-FLOAT ANALYSIS (Dried Basis) 28M x 100 M (Wt% = 12.4 a.d.)				
S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	Nil	-	-	-
1.30-1.35	Nil	-	-	-
1.35-1.40	Nil	-	-	-
1.40-1.45	2.9	8.3	2.9	8.3
1.45-1.50	3.8	14.9	6.7	12.0
1.50-1.60	2.4	21.6	9.1	14.6
1.60-1.70	6.1	29.5	15.2	20.6
1.70-1.80	7.3	40.2	22.5	26.9
1.80-1.90	8.1	50.2	30.6	33.1
1.90-2.00	8.9	58.9	39.5	38.9
2.00-2.10	8.8	65.8	48.3	43.8
2.10-2.20	18.5	73.6	66.8	52.1
+2.20	33.2	82.5	100.0	62.2

TABLE 7

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7366

ANALYSIS ON 28Mx100M FLOATS @ 1.50 S.G.

PROXIMATE						
RM %	ASH %	VM %	FC %	S %	BTU/LB	H.G.I.
8.9	10.8	35.4	44.9	0.89	9558	-
	11.9	38.9	49.2	0.98	10492	-

ASH FUSION TEMPERATURES (°F)				
ATMOS.	INITIAL DEFORMATION	SOFTENING	HEMISPHERICAL	FLUID
Oxid.	2260	2320	2360	2400
Red.	2220	2260	2280	2330

TABLE 8

CLIENT: B.C. HYDRO
SAMPLE: "A" Raw Coal crushed to -3/4" and screened @ 28M
LAB NO.: 7366

SIZE ANALYSIS 3/4" Raw Coal Dry Basis					
SIZE FRACTION	WT %	RM %	ASH %	CUM WT %	CUM ASH %
3/4" x 28 M	80.9	21.6	40.0	80.9	40.0 adb
	80.6	-	51.0	80.6	51.0 db
28M x 0	19.1	20.0	40.6	100.0	42.0 adb
	19.4	-	50.8	100.0	51.0 db

SINK-FLOAT ANALYSIS (Dried Basis) 3/4" x 28M				
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.40	28.6	15.7	28.6	15.7
+1.40	71.4	63.2	100.0	49.6
-1.50	42.8	22.6	42.8	22.6
+1.50	57.2	69.6	100.0	49.5
-1.60	52.7	28.4	52.7	28.4
+1.60	47.3	74.4	100.0	50.2
-1.70	64.8	35.7	64.8	35.7
+1.70	35.2	78.2	100.0	50.7
-1.80	73.1	40.5	73.1	40.5
+1.80	26.9	79.0	100.0	50.9

NOTE: Refer to Flowsheet II

TABLE 9

CLIENT: B.C. HYDRO
SAMPLE: "A" Raw Coal crushed to -3/4" & screened @ 28M
LAB NO.: 7366

SINK-FLOAT ANALYSIS (Dried Basis) 3/4" x 28M				
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.40	28.6	15.7	28.6	15.7
1.40-1.50	14.2	36.5	42.8	22.6
1.50-1.60	9.9	53.5	52.7	28.4
1.60-1.70	12.1	67.5	64.8	35.7
1.70-1.80	8.3	78.0	73.1	40.5
+1.80	26.9	79.0	100.0	50.9

ASH FUSION TEMPERATURES FLOATS @ 1.40 S.G.				
ATMOS.	INITIAL DEFORMATION	SOFTENING	HEMISPHERICAL	FLUID
Oxid.	NO ANALYSIS DONE			
Red.	2360	2450	2480	2520

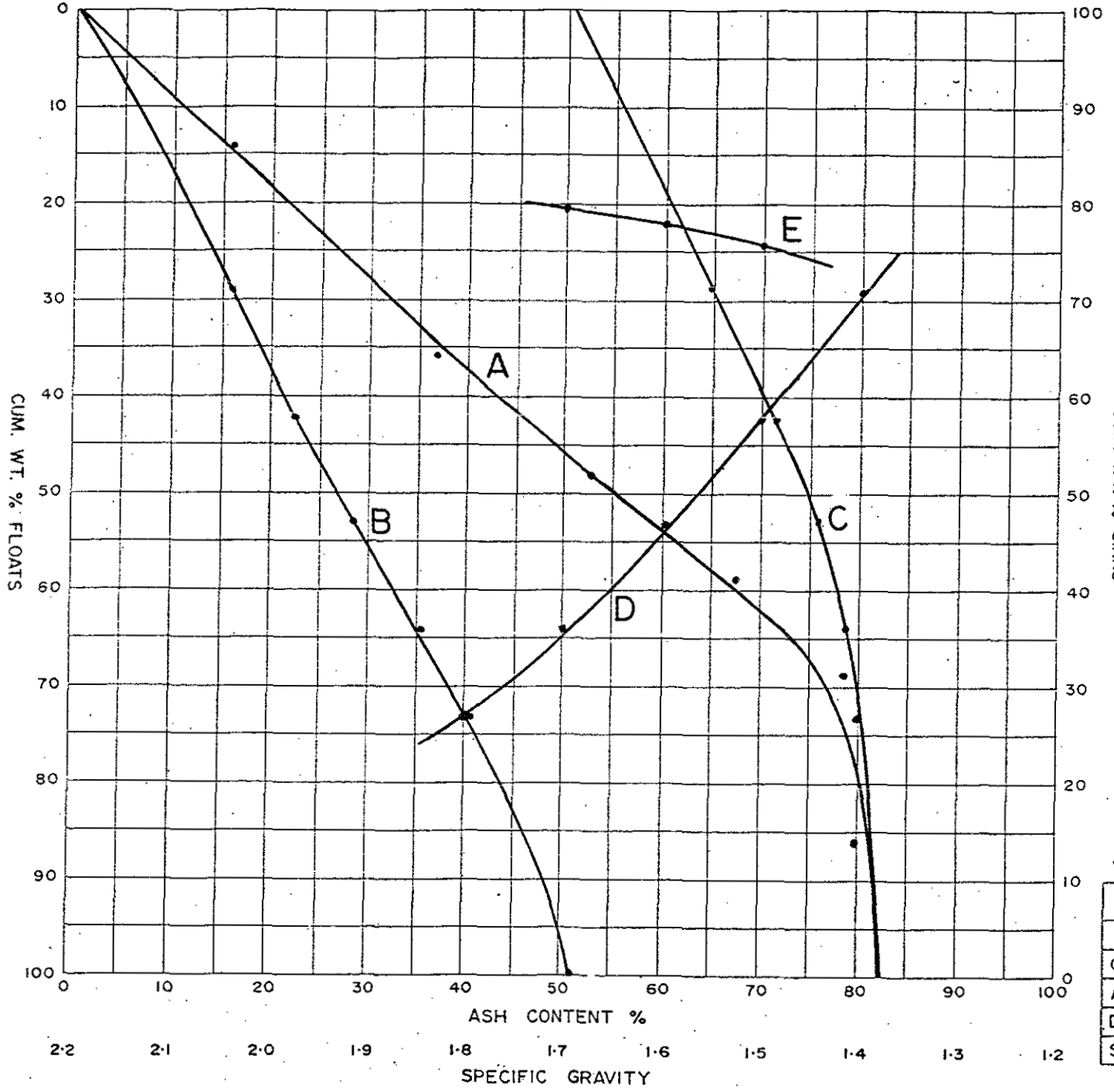
TABLE 10

B. C. HYDRO SAMPLE A LAB.7366 3/4" X 28M

--DIRECT--			--CUM FLOATS--			--CUM SINKS--				+-0.1 DISTR	
S.G.	WT>	ASH>	WT> ASH	CUM WT> ASHTT	ASHTT	WT>	ASH>	SINK WT ASH>	WT>	ASH>	S.G.	WT>
1	2	3	4	5	6	7	8	9	10	11	12	
1.40	28.60	15.70	4.49	4.49	28.60	15.70	46.37	71.40	64.95	1.40	0.00	
1.50	14.20	36.50	5.18	9.67	42.80	22.60	41.19	57.20	72.01	1.50	24.10	
1.60	9.90	53.50	5.30	14.97	52.70	28.41	35.89	47.30	75.88	1.60	22.00	
1.70	12.10	67.50	8.17	23.14	64.80	35.71	27.73	35.20	78.76	1.70	20.40	
1.80	8.30	78.00	6.47	29.61	73.10	40.51	21.25	26.90	79.00	1.80	0.00	
9.99	26.90	79.00	21.25	50.86	100.00	50.86	0.00	.00	0.00	1.90	0.00	

BIRTLEY ENGINEERING
20/07/76

THE CLASSICAL WASHABILITY CURVES



A Primary Curve

B Clean Coal Curve

C Discard Curve

D Specific Gravity – Yield Curve

E ± 0·1 S. G. Distribution Curve

FIGURE 7

BIRTLEY ENGINEERING (CANADA) LTD.	
COAL SCIENCE & MINERALS TESTING	
CLIENT	B. C. HYDRO LAB 7366
ADIT/SEAM NO.	SAMPLE A 3/4" x 28M
DATE	JUL. 21/1976
SIGNED	K. M. LAU

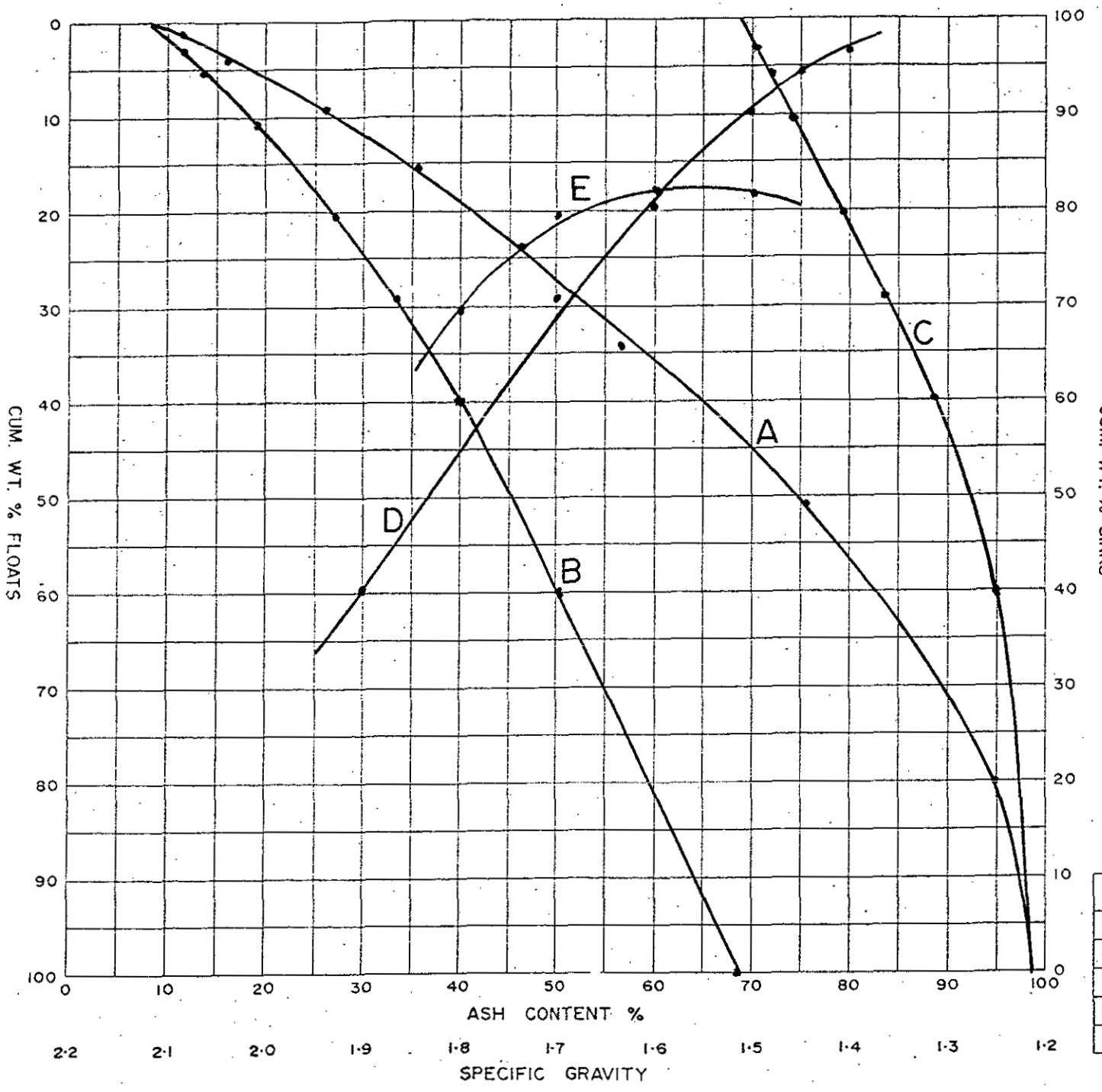
TABLE 11

B. C. HYDRO SAMPLE A LAB.7374 28M X 100M

--DIRECT--					--CUM FLOATS--			--CUM SINKS--		+-0.1 DISTR	
S.G.	WT>	ASH>	WT> ASH	CUM WT> ASH TT	WT>	ASH>	SINK WT ASH>	WT>	ASH>	S.G.	WT>
1	2	3	4	5	6	7	8	9	10	11	12
1.40	2.60	11.50	.30	.30	2.60	11.50	68.20	97.40	70.02	1.40	0.00
1.45	3.40	15.90	.54	.84	6.00	13.99	67.66	94.00	71.98	1.50	17.90
1.50	4.70	25.40	1.19	2.03	10.70	19.00	66.47	89.30	74.43	1.60	18.30
1.60	9.80	35.50	3.48	5.51	20.50	26.89	62.99	79.50	79.23	1.70	20.50
1.70	8.50	46.00	3.91	9.42	29.00	32.49	59.08	71.00	83.21	1.80	31.10
1.80	12.00	56.10	6.73	16.15	41.00	39.40	52.34	59.00	88.72	1.90	0.00
1.90	19.10	75.60	14.44	30.59	60.10	50.91	37.91	39.90	95.00	2.00	0.00
9.99	39.90	95.00	37.91	68.50	100.00	68.50	0.00	0.00	0.00	2.10	0.00

BIRTLEY ENGINEERING
20/07/76

THE CLASSICAL WASHABILITY CURVES



A Primary Curve

B Clean Coal Curve

C Discard Curve

D Specific Gravity – Yield Curve

E ± 0·1 S. G. Distribution Curve

FIGURE 8

BIRTLEY ENGINEERING (CANADA) LTD.	
COAL SCIENCE & MINERALS TESTING	
CLIENT	B.C. HYDRO LAB 7374
ADIT/SEAM NO.	SAMPLE A 28 M x 100 M
DATE	JUL. 21 / 1976
SIGNED	K. M. Lau

TABLE 12

CLIENT: B.C. HYDRO
SAMPLE: "A" (3300 - 3600 BTU)
LAB NO.: 7366

ANALYSIS OF
HEAD RAW

PROXIMATE					BTU/LB	S.G. OF COAL	H.G.I.	EQUIL. MOIST. %	
A.D.M. %	RM %	ASH %	VM %	FC %					
21.1	9.9	45.5	23.2	21.4	5136	1.75	63	28.5	air dry basis
-	28.9	35.9	18.3	16.9	4052	-	-	-	as rec. basis
-	-	50.5	25.7	23.8	5700	-	-	-	dry basis

S.G. OF ASH	ASH FUSION TEMPERATURES (°F)					SULFUR FORMS (adb)			
	ATMOS.	INITIAL DEFORM.	SOFTEN-ING	HEMISPHER-ICAL	FLUID	TOTAL S %	SULPHATE S %	SULFIDE S %	ORGANIC S %
2.66	Oxid.	2650+	-	-	-	1.07	0.04	0.52	0.51
-	Red.	2350	2650+	-	-	-	-	-	-

MINERAL ANALYSIS OF ASH											
Na_2O	K_2O	MgO	CaO	Fe_2O_3	Al_2O_3	SiO_2	SO_3	P_2O_5	TiO_2	Mn_3O_4	V_2O_5
0.58	0.71	1.59	1.85	6.01	28.22	57.44	1.39	0.07	1.15	0.03	0.12

ULTIMATE ANALYSIS							(adb) % P ON COAL	(adb) % CO2 ON COAL	(adb) % Cl ON COAL
% H_2O	% C	% H	% N	% S	% ASH	% O DIFF.			
9.16	29.09	3.42	0.56	1.07	45.27	11.43	0.02	0.68	4.91

	RUHR DILATOMETER TEST					WATER SOLUBLE ALKALIES
F.S.I.	SOFTENING TEMP °C	MAXIMUM DILATATION TEMP °C	MAXIMUM CONTRACTION %	MAX. DILAT. %	G. NO.	as % Na_2O
N.A.	NO REACTIVITY					0.04

NOTE: Refer to Flowsheet I

TABLE 13

CLIENT: B. C. HYDRO
SAMPLE: "A"
LAB. NO.: 7374 - Revised Washability Programme (See Flowsheet III)

SIZE ANALYSIS: OF GROSS SAMPLE CRUSHED TO -2" WT.% +2"= 5.0%										
								CUMULATIVE		
SIZE FRAC.	WT.%	RM%	ASH%	VM%	FC%	S.%	BTU/LB	WT.%	ASH%	BTU/LB
2" X 1"	11.1	15.4	36.3	25.3	23.0	1.28	5664	11.1	36.3	5664
	10.8	-	42.9	29.9	27.2	1.51	6695	10.8	42.9	6695
1" X 1/2"	16.4	17.5	37.2	23.4	21.9	1.16	5268	27.5	36.8	5428
	15.5	-	45.1	28.4	26.5	1.41	6385	26.3	44.2	6512
1/2" X 1/4"	10.0	10.4	39.7	25.2	24.7	1.03	5824	37.5	37.6	5533
	10.2	-	44.3	28.1	27.6	1.15	6500	36.5	44.2	6509
1/4" X 1/8"	13.6	15.0	40.7	22.5	21.8	0.98	5108	51.1	38.4	5420
	13.2	-	47.9	26.5	25.6	1.15	6010	49.7	45.2	6376
1/8" X 28M	33.7	6.9	50.5	22.1	20.5	0.90	4785	84.8	43.2	5168
	35.9	-	54.2	23.7	22.1	0.97	5140	85.6	49.0	5858
28M X 48M	7.3	17.0	53.9	17.2	11.9	0.77	3038	92.1	44.1	4999
	6.9	-	64.9	20.7	14.4	0.93	3660	92.5	50.2	5694
48M X 100M	4.9	17.2	51.5	18.3	13.0	0.74	3320	97.0	44.4	4914
	4.6	-	62.2	22.1	15.7	0.89	4010	97.1	50.7	5614
100M X 0	3.0	15.9	55.3	17.3	11.5	0.85	2956	100.0	44.8	4855
	2.9	-	65.8	20.6	13.6	1.01	3515	100.0	51.2	5553

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Top Line figures for each size fraction are on air dried basis.
Bottom line fitures are on a dry basis.

TABLE 14

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7374

SINK-FLOAT ANALYSIS
2" x 1"
(One Sample Used For Each Of Nine (9) S.G.'s)

* Dry Basis

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	18.1	7.9	18.1	7.9	-1.60	69.4	27.5	69.4	27.5
+1.30	81.9	49.8	100.0	42.2	+1.60	30.6	75.9	100.0	42.3
-1.35	27.0	12.5	27.0	12.5	-1.70	76.2	30.6	76.2	30.6
+1.35	73.0	55.2	100.0	43.7	+1.70	23.8	80.1	100.0	42.4
-1.40	43.3	17.9	43.3	17.9	-1.80	86.3	35.7	86.3	35.7
+1.40	56.7	62.2	100.0	43.0	+1.80	13.7	81.5	100.0	42.0
-1.45	55.7	21.2	55.7	21.2	-1.90	90.5	39.5	90.5	39.5
+1.45	44.3	66.5	100.0	41.3	+1.90	9.5	80.9	100.0	43.4
-1.50	61.0	21.8	61.0	21.8					
+1.50	39.0	69.9	100.0	40.6					

Refer to Flowsheet III

TABLE 15

CLIENT: B. C. HYDRO
SAMPLE: "A"
LAB. NO.: 7374

ACTUAL SINK-FLOAT ANALYSIS: 2" X 1"*		
S.G. FRACTION	CUMULATIVE WT.%	CUMULATIVE ASH%
-1.30	18.1	7.9
1.30-1.35	27.0	12.5
1.35-1.40	43.3	17.9
1.40-1.45	55.7	21.2
1.45-1.50	61.0	21.8
1.50-1.60	69.4	27.5
1.60-1.70	76.2	30.6
1.70-1.80	86.3	35.7
1.80-1.90	90.5	39.5
+1.90	100.0	43.4

* Dry Basis

NOTE: Refer to Flowsheet III

TABLE 16

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7374

* Dry Basis

SINK-FLOAT ANALYSIS
1" x 1/2"
(One Sample Used For Each Of Nine (9) S.G.'s)

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	14.6	7.4	14.6	7.4	-1.60	69.5	29.8	69.5	29.8
+1.30	85.4	51.8	100.0	45.3	+1.60	30.5	76.4	100.0	44.0
-1.35	24.9	12.2	24.9	12.2	-1.70	78.8	34.4	78.8	34.4
+1.35	75.1	56.8	100.0	45.7	+1.70	21.2	80.2	100.0	44.1
-1.40	36.8	18.4	36.8	18.4	-1.80	88.7	39.7	88.7	39.7
+1.40	63.2	61.5	100.0	45.6	+1.80	11.3	82.0	100.0	44.5
-1.45	47.6	21.4	47.6	21.4	-1.90	95.5	44.1	95.5	44.1
+1.45	52.4	66.8	100.0	45.3	+1.90	4.5	79.8	100.0	45.7
-1.50	62.0	25.7	62.0	25.7					
+1.50	38.0	75.0	100.0	44.4					

NOTE: Refer to Flowsheet III

TABLE 17

CLIENT: B. C. HYDRO
SAMPLE: "A"
LAB. NO.: 7374

ACTUAL SINK-FLOAT ANALYSIS: 1" X 1/2"		
S.G. FRACTION	CUMULATIVE WT.%	CUMULATIVE ASH%
-1.30	14.6	7.4
1.30-1.35	24.9	12.2
1.35-1.40	36.8	18.4
1.40-1.45	47.6	21.4
1.45-1.50	62.0	25.7
1.50-1.60	69.5	29.8
1.60-1.70	78.8	34.4
1.70-1.80	88.7	39.7
1.80-1.90	95.5	44.1
+1.90	100.0	45.7

* Dry Basis

NOTE: Refer to Flowsheet III

TABLE 18

CLIENT: B. C. HYDRO
SAMPLE: "A"
LAB. NO.: 7374

ACTUAL SINK-FLOAT ANALYSIS: 1/2" X 1/4"		
S.G. FRACTION	CUMULATIVE WT.%	CUMULATIVE ASH%
-1.30	17.1	8.2
1.30-1.35	24.2	10.8
1.35-1.40	37.4	16.0
1.40-1.45	45.0	19.5
1.45-1.50	46.2	21.8
1.50-1.60	63.1	27.0
1.60-1.70	70.5	32.2
1.70-1.80	79.1	36.1
1.80-1.90	89.4	40.1
+1.90	100.0	44.7

* Dry Basis

NOTE: Refer to Flowsheet III

TABLE 19

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7374

SINK-FLOAT ANALYSIS
1/2" x 1/4"
(One Sample Used For Each Of Nine (9) S.G.'s)

* Dry Basis

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	17.1	8.2	17.1	8.2	-1.60	63.1	27.0	63.1	27.0
+1.30	82.9	52.6	100.0	45.0	+1.60	36.9	73.2	100.0	44.0
-1.35	24.2	10.8	24.2	10.8	-1.70	70.5	32.2	70.5	32.2
+1.35	75.8	57.8	100.0	46.4	+1.70	29.5	78.0	100.0	45.7
-1.40	37.4	16.0	37.4	16.0	-1.80	79.1	36.1	79.1	36.1
+1.40	62.6	61.1	100.0	44.2	+1.80	20.9	80.1	100.0	45.3
-1.45	45.0	19.5	45.0	19.5	-1.90	89.4	40.1	89.4	40.1
+1.45	55.0	64.8	100.0	44.4	+1.90	10.6	83.2	100.0	44.7
-1.50	46.2	21.8	46.2	21.8					
+1.50	53.8	65.6	100.0	45.4					

NOTE: Refer to Flowsheet III

TABLE 20

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7374

SINK-FLOAT ANALYSIS

* Dry Basis

1/4" x 1/8"

(One Sample Used For Each Of Nine (9) S.G.'s)

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	11.6	7.5	11.6	7.5	-1.60	55.0	27.3	55.0	27.3
+1.30	88.4	52.5	100.0	47.2	+1.60	45.0	72.5	100.0	47.6
-1.35	22.0	10.1	22.0	10.1	-1.70	67.0	32.8	67.0	32.8
+1.35	78.0	56.1	100.0	46.0	+1.70	33.0	77.1	100.0	47.4
-1.40	30.4	15.4	30.4	15.4	-1.80	77.4	39.2	77.4	39.2
+1.40	69.6	61.4	100.0	47.4	+1.80	22.6	79.8	100.0	48.4
-1.45	37.4	17.7	37.4	17.7	-1.90	89.8	42.0	89.8	42.0
+1.45	62.6	65.6	100.0	47.7	+1.90	10.2	82.9	100.0	46.2
-1.50	42.6	21.6	42.6	21.6					
+1.50	57.4	67.3	100.0	47.8					

NOTE: Refer to Flowsheet III

TABLE 21

CLIENT: B. C. HYDRO
SAMPLE: "A"
LAB. NO.: 7374

ACTUAL SINK-FLOAT ANALYSIS: 1/4" X 1/8"		
S.G. FRACTION	CUMULATIVE WT.%	CUMULATIVE ASH%
-1.30	11.6	7.5
1.30-1.35	22.0	10.1
1.35-1.40	30.4	15.4
1.40-1.45	37.4	17.7
1.45-1.50	42.6	21.6
1.50-1.60	55.0	27.3
1.60-1.70	67.0	32.8
1.70-1.80	77.4	39.2
1.80-1.90	89.8	42.0
+1.90	100.0	46.2

* Dry Basis

NOTE: Refer to Flowsheet III

TABLE 22

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7374

SINK-FLOAT ANALYSIS
* Dry Basis 1/8" x 28 M
(One Sample Used For Each Of Nine (9) S.G.'s)

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	4.4	7.4	4.4	7.4	-1.60	38.5	26.9	38.5	26.9
+1.30	95.6	56.1	100.0	54.0	+1.60	61.5	71.2	100.0	54.1
-1.35	10.5	10.5	10.5	10.5	-1.70	50.4	34.4	50.4	34.4
+1.35	89.5	59.2	100.0	54.1	+1.70	49.6	74.7	100.0	54.4
-1.40	16.5	14.2	16.5	14.2	-1.80	74.1	44.0	74.1	44.0
+1.40	83.5	62.0	100.0	54.1	+1.80	25.9	79.8	100.0	53.3
-1.45	20.7	17.6	20.1	17.6	-1.90	81.8	47.0	81.8	47.0
+1.45	79.3	64.9	100.0	55.1	+1.90	18.2	81.1	100.0	53.2
-1.50	27.8	21.2	27.8	21.2					
+1.50	72.2	66.9	100.0	54.2					

NOTE: Refer to Flowsheet III

TABLE 23

CLIENT: B. C. HYDRO
SAMPLE: "A"
LAB. NO.: 7374

ACTUAL SINK-FLOAT ANALYSIS: 1/8" X 28M		
S.G. FRACTION	CUMULATIVE WT.%	CUMULATIVE ASH%
-1.30	4.4	7.4
1.30-1.35	10.5	10.5
1.35-1.40	16.5	14.2
1.40-1.45	20.7	17.6
1.45-1.50	27.8	21.2
1.50-1.60	38.5	26.9
1.60-1.70	50.4	34.4
1.70-1.80	74.1	44.0
1.80-1.90	81.8	47.0
+1.90	100.0	53.2

* Dry Basis

NOTE: Refer to Flowsheet III

TABLE 24

CLIENT: B.C HYDRO
SAMPLE: "A"
LAB NO.: 7374

SINK-FLOAT ANALYSIS

* Dry Basis

28 M x 100 M

(One Sample Used For Each Of Nine (9) S.G.'s)

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	Nil				-1.60	20.5	25.9	20.5	25.9
+1.30	100.0	62.8	100.0	62.8	+1.60	79.5	71.1	100.0	61.8
-1.35	Nil				-1.70	29.0	34.0	29.0	34.0
+1.35	100.0	62.6	100.0	62.6	+1.70	71.0	74.1	100.0	62.5
-1.40	2.6	11.5	2.6	11.5	-1.80	41.0	41.8	41.0	41.8
+1.40	97.4	63.7	100.0	62.3	+1.80	59.0	77.1	100.0	62.6
-1.45	6.0	15.8	6.0	15.8	-1.90	60.1	50.9	60.1	50.9
+1.45	94.0	65.5	100.0	62.5	+1.90	39.9	8.1	100.0	62.9
-1.50	10.7	17.0	10.7	17.0					
+1.50	89.3	67.3	100.0	61.9					

NOTE: Refer to Flowsheet III

TABLE 25

CLIENT: B. C. HYDRO
SAMPLE: "A"
LAB. NO.: 7374

ACTUAL SINK-FLOAT ANALYSIS: 28M X 100M		
S.G. FRACTION	CUMULATIVE WT.%	CUMULATIVE ASH%
-1.30	-	-
1.30-1.35	-	-
1.35-1.40	2.6	11.5
1.40-1.45	6.0	15.8
1.45-1.50	10.7	17.0
1.50-1.60	20.5	25.9
1.60-1.70	29.0	34.0
1.70-1.80	41.0	41.8
1.80-1.90	60.1	50.9
+1.90	100.0	62.9

* Dry Basis

NOTE: Refer to Flowsheet III

TABLE 26

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7274

* Dry Basis

CALCULATED SINK-FLOAT ANALYSIS
2" x 1"

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	18.1	7.9	18.1	7.9
1.30-1.35	8.9	20.3	27.0	12.0
1.35-1.40	16.3	26.6	43.3	17.5
1.40-1.45	12.4	40.0	55.7	22.5
1.45-1.50	5.3	45.5	61.0	24.5
1.50-1.60	8.4	51.8	69.4	27.8
1.60-1.70	6.8	65.9	76.2	31.2
1.70-1.80	10.1	72.2	86.3	36.0
1.80-1.90	4.2	81.2	90.5	38.1
+1.90	9.5	93.9	100.0	43.4

TABLE 27

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7274

* Dry Basis

CALCULATED SINK-FLOAT ANALYSIS
1" x 1/2"

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	14.6	7.4	14.6	7.4
1.30-1.35	10.3	19.0	24.9	12.2
1.35-1.40	11.9	25.5	36.8	16.5
1.40-1.45	10.8	37.2	47.6	21.2
1.45-1.50	14.4	47.5	62.0	27.3
1.50-1.60	7.5	58.8	69.5	30.7
1.60-1.70	9.3	63.7	78.8	34.6
1.70-1.80	9.9	78.5	88.7	39.5
1.80-1.90	6.8	92.9	95.5	43.3
+1.90	4.5	96.6	100.0	45.7

TABLE 28

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7274

* Dry Basis	CALCULATED SINK-FLOAT ANALYSIS 1/2" x 1/4"			
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.30	17.1	8.2	17.1	8.2
1.30-1.35	7.1	17.1	24.2	10.8
1.35-1.40	13.2	27.5	37.4	16.7
1.40-1.45	7.6	35.0	45.0	19.8
1.45-1.50	1.2	39.4	46.2	20.3
1.50-1.60	16.9	46.8	63.1	27.4
1.60-1.70	7.4	61.7	70.5	31.0
1.70-1.80	8.6	62.3	79.1	34.4
1.80-1.90	10.3	74.3	89.4	39.0
+1.90	10.6	92.8	100.0	44.7

TABLE 29

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7274

* Dry Basis

CALCULATED SINK-FLOAT ANALYSIS
1/4" x 1/8"

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	11.6	7.5	11.6	7.5
1.30-1.35	10.4	17.0	22.0	12.0
1.35-1.40	8.4	24.3	30.4	15.4
1.40-1.45	7.0	29.9	37.4	18.1
1.45-1.50	5.2	42.6	42.6	21.1
1.50-1.60	12.4	43.7	55.0	26.2
1.60-1.70	12.0	59.7	67.0	32.2
1.70-1.80	10.4	68.0	77.4	37.0
1.80-1.90	12.4	80.4	89.8	43.0
+1.90	10.2	92.0	100.0	48.0

TABLE 30

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7274

* Dry Basis

CALCULATED SINK-FLOAT ANALYSIS
1/8" x 28M

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	4.4	7.4	4.4	7.4
1.30-1.35	6.1	15.3	10.5	12.0
1.35-1.40	6.0	20.5	16.5	15.1
1.40-1.45	4.2	27.5	20.7	17.6
1.45-1.50	7.1	31.7	27.8	21.2
1.50-1.60	10.7	41.7	38.5	26.9
1.60-1.70	11.9	52.7	50.4	33.0
1.70-1.80	23.7	65.8	74.1	43.5
1.80-1.90	7.7	80.8	81.8	47.0
+1.90	18.2	81.1	100.0	53.2

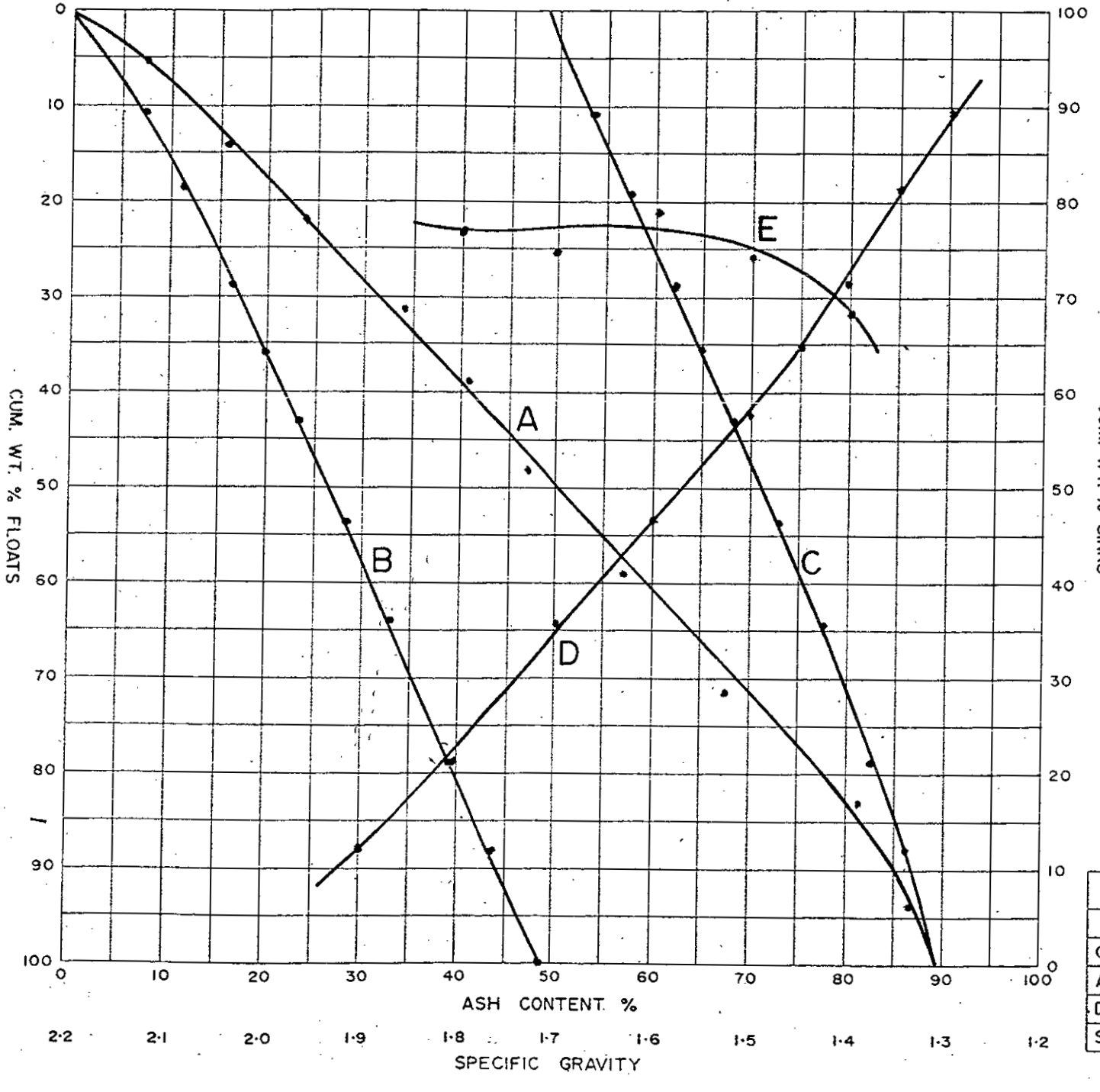
TABLE 31

B. C. HYDRO SAMPLE A LAB.7374 2" X 28M

--DIRECT--					--CUM FLOATS--		--CUM SINKS--		+-0.1 DISTR	
S.G.	WT>	ASH>	WT> CUM WT> ASH TT ASHTT		WT>	ASH>	SINK WT ASH>	WT>	ASH>	S.G.	WT>
1	2	3	4	5	6	7	8	9	10	11	12
1.30	10.71	7.68	.82	.82	10.71	7.68	47.90	89.29	53.64	1.30	0.00
1.35	8.04	17.44	1.40	2.22	18.76	11.86	46.49	81.24	57.23	1.40	32.29
1.40	9.66	24.63	2.38	4.61	28.42	16.20	44.11	71.58	61.63	1.50	25.38
1.45	7.34	34.18	2.51	7.11	35.76	19.89	41.60	64.24	64.76	1.60	21.04
1.50	7.24	40.19	2.91	10.02	43.00	23.31	38.69	57.00	67.88	1.70	25.72
1.60	10.80	46.24	5.00	15.02	53.80	27.92	33.70	46.20	72.95	1.80	23.61
1.70	10.24	57.76	5.91	20.93	64.04	32.69	27.78	35.96	77.27	1.90	0.00
1.80	15.48	67.86	10.51	31.44	79.52	39.53	17.28	20.48	84.38	2.00	0.00
1.90	8.13	81.65	6.64	38.07	87.65	43.44	10.64	12.35	86.17	2.10	0.00
9.99	12.35	86.17	10.64	48.72	100.00	48.72	0.00	.00	0.00	2.20	0.00

BIRTLEY ENGINEERING
20/07/76

THE CLASSICAL WASHABILITY CURVES



A Primary Curve

B Clean Coal Curve

C Discard Curve

D Specific Gravity – Yield Curve

E ± 0·1 S. G. Distribution Curve

FIGURE 9

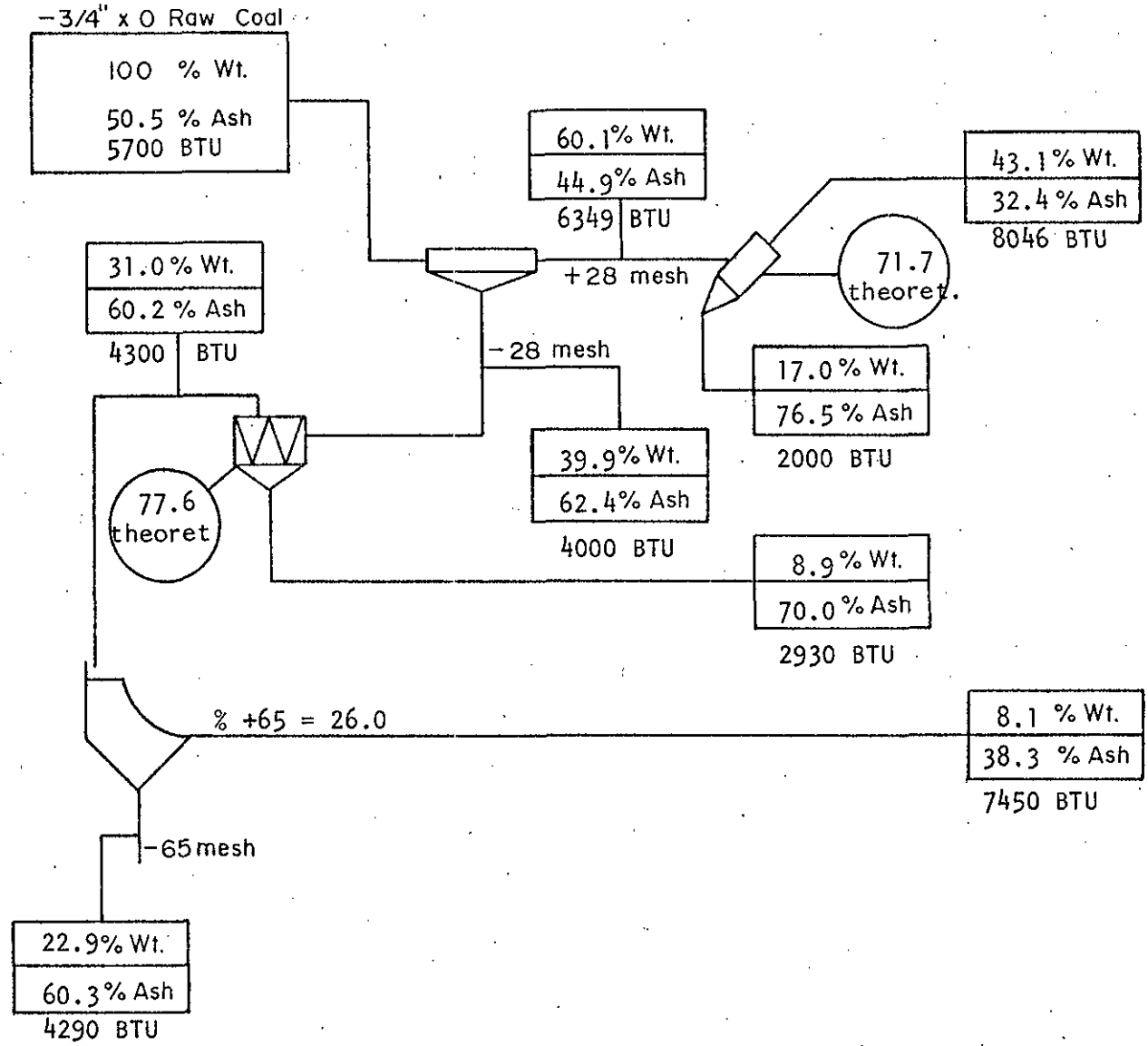
BIRTLEY ENGINEERING (CANADA) LTD.	
COAL SCIENCE & MINERALS TESTING	
CLIENT	B. C. HYDRO LAB 7374
ADIT/SEAM NO.	SAMPLE A 2" x 28 M
DATE	JUL. 21/1976
SIGNED	K. M. Lau

TABLE 32

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7274

* Dry Basis	CALCULATED SINK-FLOAT ANALYSIS 28M x 100M			
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.30	NO ANALYSIS WAS DONE ON THIS SIZE FRACTION			
1.30-1.35	NO ANALYSIS WAS DONE ON THIS SIZE FRACTION			
1.35-1.40	2.6	11.5	2.6	11.5
1.40-1.45	3.4	15.9	6.0	14.0
1.45-1.50	4.7	25.4	10.7	19.0
1.50-1.60	9.8	35.5	20.5	26.9
1.60-1.70	8.5	46.0	29.0	32.5
1.70-1.80	12.0	56.1	41.0	39.4
1.80-1.90	19.1	75.6	60.1	50.9
+1.90	39.9	95.0	100.0	68.5

FIGURE 10



OVERALL YIELD = Actual = 51.2 @ 33.3 Ash, 7952 BTU

LEGEND:

○ *CIRCUIT YIELD %*

Wt.	*WEIGHT %*
Ash	*ASH CONTENT* (Dry Basis)

All figures are on "Dry Basis"

BIRTLEY ENGINEERING (CANADA) LTD.

Title	Date
PLANT BALANCE B.C. HYDRO SAMPLE "A" WASH H.M. S.G. @ 1.65 LAB NO. 7365	
	Drawn

TABLE 33

BIRTLEY ENGINEERING (CANADA) LTD.

Coal Science & Minerals Testing Div.

BULK WASHING DATA* @ 1.65 S.G.

ADIT Sample "A" LAB. NO. 7365 DATE OF WASH June 17, 1976

Raw Coal Analysis: A.D.M. 21.1 Ash% 50.5 F.S.I. N.A. H.G.I. 63 (adb)

Delivered Bulk Weight - Metric Tons

Washed Weight 6.807 Metric Tons

* All weight and analyses are on ~~XXXXXXXXX~~ Dry Basis unless otherwise indicated.

NOTE: N.A. = Non Agglutinating

TABLE 34

BULK WASHING DATA

HEAVY MEDIUM CIRCUIT

ADIT Sample "A" LAB. NO. 7365

1. S.G. of Separation 1.65
2. Feed Ash Content 44.9 %
3. Clean Coal Estimated Weight 2.810 M.T.
4. Clean Coal Analysis - Ash 32.4 %
5. Reject Estimated Weight 1.283 M.T.
6. Reject Analysis - Ash 76.5 %
7. Estimated 3/4" X 28M in Circuit 4.093 M.T. 60.1 Wt.%
8. Yield Clean Coal (Weighted): $\frac{3}{3+5}$ 68.7 %
9. Yield Clean Coal (Calculated Ash Balance) - $\frac{6-2}{6-4}$ 71.7 %

Yield, Wt, and Ash figures are on dry basis.

TABLE 35

BULK WASHING DATA

WATER ONLY CYCLONE CIRCUIT

ADIT Sample "A" LAB. NO. 7365

1. Vortex Finder Clearance (VFC) 8.89 CM 3 1/2 Inches
2. Feed Pressure 1.4 KG/CM^2 2.0 P.S.I.
3. Feed Rate 23.2 $M^3/Hr.$ 8.5 LG/Min.
4. Feed Pulp Density 150-180 g/l. 15-18 Solids W/V
5. Sample Analysis:- Dry Basis

	SCREEN SIZE	WT. %	ASH %	F.S.I.	CUM WT. %	CUM ASH %	HEAD ASH %
FEED	-	-	-	-	-	-	62.4
O'FLOW	+65M	24.4	-	-	24.4	-	
	65M X O	75.6	-	-	100.0	-	60.2
U'FLOW	-	-	-	-	-	-	70.0
S B O	-	-	-	-	-	-	38.3
T C O*	+325M		NO ANALYSIS DONE				-
	325M X O		NO ANALYSIS DONE				

6. Yield - Total W.O. Cyclone Circuit = 77.6
7. Est. Yield of 28 X 65 Mesh Coal = 8.1
   (as % of 28 Mesh X O Feed)
8. Est. 28M X O in circuit (Plant Feed - HM Products) 2.714 M.T. 39.9 %

* Thickner Cyclone Overflow

TABLE 36

BULK WASHING DATA

ADIT Sample "A" LAB. NO. 7365 DATE OF WASH June 17, 1976

a) Raw Coal

Ash % = 50.5

Estimated Washed Wt. = 6.807 M.T.

b) Heavy Media Circuit

Estimated Proportion of +28 Mesh in Feed = 60.1%

Effective S.G. = 1.65

Raw Feed	44.9	%Ash
Clean Coal	32.4	%Ash
Reject	76.5	%Ash

Calculated Yield = 71.7

Weighed Yield = 68.7

c) Water-Only Cyclone Circuit

Raw Feed	62.4	%Ash
Overflow	60.2	%Ash
Underflow	70.0	%Ash

Calculated Yield = 77.6

% of +65 Mesh in O/F = 26.0

Sieve Bend Overflow 38.3 %Ash

Wt %, Ash %, Yield are on dry basis.

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7365

TABLE 37

PLANT WASH SAMPLES								
PLANT PRODUCT	% A.D.M.	% RM % TOTAL MOIST.	ASH %	VOL %	F.C. %	S. %	BTU/LB	CALC. FACTORS
Heavy Media Feed	-	20.0	35.9	-	-	-	5079	air dry basis
	-	-	-	-	-	-	-	as rec'd basis
	-	-	44.9	-	-	-	6349	dry basis
H.M. Clean Coal @ 1.40 S.G.	8.0	28.4	12.2	28.7	30.7	0.84	7292	air dry basis
	-	34.1	11.2	26.4	28.3	0.77	6709	as rec'd basis
	-	-	17.0	40.1	42.9	1.17	10184	dry basis
H.M. Clean Coal @ 1.65 S.G.	27.3	17.1	26.9	27.1	28.9	1.02	6670	air dry basis
	-	39.7	19.6	19.7	21.0	0.74	4849	as rec'd basis
	-	-	32.4	32.7	34.9	1.23	8046	dry basis
H.M. Reject @ 1.65 S.G.	28.0	5.5	72.3	-	-	-	(1890)	air dry basis
	-	32.0	52.1	-	-	-	(1361)	as rec'd basis
	-	-	76.5	-	-	-	(2000)	dry basis
Water Only Cyclone Feed	-	5.3	59.1	-	-	-	(3788)	air dry basis
	-	-	-	-	-	-	-	-
	-	-	62.4	-	-	-	(4000)	dry basis
Water Only Cyclone Overflow	-	5.5	56.9	-	-	-	(4064)	air dry basis
	-	-	-	-	-	-	-	-
	-	-	60.2	-	-	-	(4300)	dry basis
Water Only Cyclone Underflow	-	9.1	63.6	-	-	-	(2663)	air dry basis
	-	-	-	-	-	-	-	-
	-	-	70.0	-	-	-	(2930)	dry basis
Sieve Bend Overflow	-	6.3	35.9	-	-	-	6981	air dry basis
	-	-	-	-	-	-	-	-
	-	-	38.3	-	-	-	7450	dry basis
Sieve Bend Underflow	-	13.7	52.0	-	-	-	(3702)	air dry basis
	-	-	-	-	-	-	-	-
	-	-	60.3	-	-	-	(4290)	dry basis
Thickener Solids	-	1.9	63.7	-	-	-	(3630)	air dry basis
	-	-	-	-	-	-	-	-
	-	-	64.6	-	-	-	(3700)	dry basis

(Figures in parentheses are taken from Ash-BTU Curve)

TABLE 38

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO. 7365

SIZE AND SINK-FLOAT ANALYSIS - PLANT PRODUCTS		
SIZE ANALYSIS OF W.O.C. OVERFLOW		
SIZE FRACTION	WT %	CUM WT %
+ 65 M	24.4	24.4
- 65 M	75.6	100.0
SINK-FLOAT ANALYSIS: + 65M W.O.C. OVERFLOW		
S.G.	WT %	CUM WT %
- 1.65	41.2	41.2
+ 1.65	58.8	100.0
SIZE ANALYSIS OF W.O.C. UNDERFLOW		
SIZE FRACTION	WT %	CUM WT %
+ 65 M	53.6	53.6
- 65 M	46.4	100.0
SINK-FLOAT ANALYSIS: + 65 M W.O.C. UNDERFLOW		
S.G.	WT %	CUM WT %
- 1.65	13.4	13.4
+ 1.65	86.6	100.0
SINK-FLOAT ANALYSIS: H.M. C.C. (- 1.65 S.G.)		
S.G.	WT %	CUM WT %
- 1.65	81.9	81.9
+ 1.65	18.1	100.0
SINK-FLOAT ANALYSIS: H.M. REJECT (@ 1.65 S.G.)		
S.G.	WT %	CUM WT %
- 1.65	0.3	0.3
+ 1.65	99.7	100.0

TABLE 39

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7365

ANALYSIS OF
CLEAN COAL (C.C. @ 1.65 + Sieve Bend Overflow)

PROXIMATE					BTU/LB	S.G. OF COAL	H.G.I.	EQUIL. MOIST. %	
A.D.M. %	RM %	ASH %	VM %	FC %					
13.5	21.9	25.3	26.0	26.8	6343	1.48	40	29.2	air dry basis
-	32.4	21.9	22.5	23.2	5487	-	-	-	as rec. basis
-	-	32.4	33.3	34.3	8122	-	-	-	dry basis

S.G. OF ASH	ASH FUSION TEMPERATURES (°F)					SULFUR FORMS (adb)			
	ATMOS.	INITIAL DEFORM.	SOFTENING	HEMISPHERICAL	FLUID	TOTAL S %	SULPHATE S %	SULFIDE S %	ORGANIC S %
2.59	Oxid.	2540	2650+	-	-	1.08	0.14	0.36	0.58
-	Red.	2330	2560	2600	2620	-	-	-	-

MINERAL ANALYSIS OF ASH											
Na_2O	K_2O	MgO	CaO	Fe_2O_3	Al_2O_3	SiO_2	SO_3	P_2O_5	TiO_2	Mn_3O_4	V_2O_5
0.82	0.82	1.91	3.08	8.22	25.16	55.98	1.69	Trace	1.49	0.03	0.10

ULTIMATE ANALYSIS							(adb) % P ON COAL	(adb) % CO2 ON COAL	(adb) % Cl ON COAL
% H_2O	% C	% H	% N	% S	% ASH	% O DIFF.			
17.76	38.10	4.86	0.71	1.08	25.82	11.67	0.01	0.53	0.04

F.S.I.	RUHR DILATOMETER TEST TABLE 51					WATER SOLUBLE ALKALIES as % Na_2O
	SOFTENING TEMP °C	MAXIMUM DILATATION TEMP °C	MAXIMUM CONTRACTION %	MAX. DILAT. %	G. NO.	
N.A.	NO REACTIVITY					0.04

TABLE 40

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7365

ASH FUSION TEMPERATURES (°F)					
SAMPLE DESCRIPTION	ATMOS	INITIAL DEFORMATION	SOFTENING	HEMISPHERICAL	FLUID
H.M. C.C. @ 1.40 S.G.	Oxidizing	2300	2460	2490	2520
	Reducing	2170	2290	2320	2360
H.M. C.C. @ 1.65 S.G.	Oxidizing	2640	2650+	-	-
	Reducing	2400	2650	2650+	-
Sieve Bend Overflow	Oxidizing	2500	2650+	-	-
	Reducing	2290	2580	2620	2650

CLIENT: B.C. HYDRO
SAMPLE: "A"
LAB NO.: 7365

MINERAL ANALYSIS OF ASH												
SAMPLE	$\%Na_2O$	$\%K_2O$	%MgO	%CaO	$\%Fe_2O_3$	$\%Mn_3O_4$	$\%Al_2O_3$	$\%SiO_2$	$\%SO_3$	$\%P_2O_5$	$\%TiO_2$	$\%V_2O_5$
H.M. C.C. @ 1.40	1.12	0.75	2.49	5.04	7.36	0.03	23.46	51.52	5.07	Trace	2.50	0.25
H.M. C.C. @ 1.65	0.82	0.77	1.99	3.22	8.36	0.03	26.92	54.86	0.69	Trace	1.48	0.10
S.B.O.	0.69	0.88	1.82	2.94	5.86	0.03	26.16	56.68	2.92	Trace	1.41	0.07

All results done on dried basis

TABLE 41

BULK SAMPLE "B"

TABLE 42

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7368

SIZE ANALYSIS: OF GROSS SAMPLE CRUSHED TO -4" WT% +4" = 1.1%											
								CUMULATIVE			
SIZE FRAC.	WT.%	RM%	ASH%	VM%	FC%	S%	BTU/LB	WT%	ASH%	BTU/LB	
4" x 1/2"	37.2	19.5	22.2	30.5	27.8	0.86	6957	37.2	22.2	6957	adb
	34.0		27.6	37.9	34.5	1.07	8642	34.0	27.6	8642	db
1/2" x 28M	59.3	8.8	33.5	28.9	28.8	0.91	6835	96.5	29.1	6882	adb
	62.3		36.7	31.7	31.6	1.00	7495	96.3	33.5	7900	db
28M x 100M	2.7	6.5	46.5	26.4	20.6	1.34	5423	99.2	29.6	6842	adb
	2.9		49.7	28.2	22.1	1.43	5800	99.2	34.0	7839	db
100 M x 0	0.8	6.0	53.1	24.2	16.7	1.55	4568	100.0	29.8	6825	adb
	0.8		56.5	25.7	17.8	1.65	4955	100.0	34.1	7816	db

(adb) Air Dry Basis (db) Dry Basis

ASH FUSION TEMP. (°F): 100M x 0				
ATMOS.	INITIAL DEFORMATION	SOFTENING	HEMISPHERICAL	FLUID
Oxid.	2650+	-	-	-
Reduc.	2420	2650+	-	-

d.b. = dried basis

a.d.b. = air dried basis

TABLE 43

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7368

SINK-FLOAT ANALYSIS (Dried Basis)
4" x 1/2"

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	2.3	2.3	2.3	2.3
1.30-1.35	7.5	4.1	9.8	3.7
1.35-1.40	10.6	9.6	20.4	6.8
1.40-1.45	29.2	13.3	49.6	10.6
1.45-1.50	21.1	21.5	70.8	13.9
1.50-1.60	6.5	33.0	77.3	15.5
1.60-1.70	2.8	36.1	80.1	16.2
1.70-1.80	3.1	47.2	83.2	17.4
1.80-1.90	1.9	54.1	85.1	18.2
1.90-2.00	3.0	63.7	88.1	19.7
2.00-2.10	2.4	70.5	90.5	21.1
2.10-2.20	3.0	76.3	93.5	22.8
+2.20	6.5	76.8	100.0	26.4

TABLE 44

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7368

SINK-FLOAT ANALYSIS (Dried Basis) 1/2" x 28 M				
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.30	4.5	4.0	4.5	4.0
1.30-1.35	10.7	7.3	15.2	6.3
1.35-1.40	3.9	10.4	19.1	7.2
1.40-1.45	3.1	12.3	22.2	7.9
1.45-1.50	7.4	16.6	29.6	10.1
1.50-1.60	16.0	23.1	45.6	14.6
1.60-1.70	10.6	34.1	56.2	18.3
1.70-1.80	11.5	46.3	67.7	23.1
1.80-1.90	5.9	52.2	73.6	25.4
1.90-2.00	7.4	60.4	81.0	28.6
2.00-2.10	5.9	67.0	86.9	31.2
2.10-2.20	3.7	73.9	90.6	32.9
+2.20	9.4	76.3	100.0	37.0

TABLE 45

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7368

SINK-FLOAT ANALYSIS (Dried Basis) 28 M x 100 M				
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.30	Nil	-	-	-
1.30-1.35	Nil	-	-	-
1.35-1.40	2.6	6.5	2.6	6.5
1.40-1.45	4.7	9.8	7.3	8.6
1.45-1.50	5.1	13.2	12.4	10.5
1.50-1.60	11.3	21.8	23.7	15.9
1.60-1.70	8.6	31.7	32.3	20.1
1.70-1.80	8.9	40.5	41.2	24.5
1.80-1.90	12.6	50.2	53.8	30.5
1.90-2.00	14.9	58.2	68.7	36.5
2.00-2.10	9.6	64.7	78.3	40.0
2.10-2.20	6.7	70.7	85.0	42.4
+2.20	15.0	76.9	100.0	47.6

TABLE 46

CLIENT: B.C. HYDRO
SAMPLE: "B" Raw Coal crushed to -3/4" and screened @ 28M
LAB NO.: 7368

SIZE ANALYSIS						
SIZE FRACTION	WT %	RM %	ASH %	CUM WT %	CUM ASH %	
3/4" x 28 M	97.3	12.8	29.9	97.3	29.9	adb
	97.3		34.3	97.3	34.3	db
28M x 0	2.7	12.8	42.8	100.0	30.2	adb
	2.7		49.1	100.0	34.7	db

SINK-FLOAT ANALYSIS
(Dried Basis) TABLE 60

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.40	40.9	14.9	40.9	14.9
+1.40	59.1	46.4	100.0	33.5
-1.50	57.7	19.4	57.7	19.4
+1.50	42.3	56.9	100.0	35.3
-1.60	71.2	23.3	71.2	23.3
+1.60	28.8	60.7	100.0	34.1
-1.70	81.9	26.6	81.9	26.6
+1.70	18.1	67.7	100.0	34.0
-1.80	84.2	27.6	84.2	27.6
+1.80	15.8	69.9	100.0	34.3

(adb) Air Dry Basis (db) Dry Basis

TABLE 47

CLIENT: B.C. HYDRO
SAMPLE: "B" Raw Coal crushed to -3/4" and screened @ 28M
LAB NO.: 7368

SINK-FLOAT ANALYSIS (Dried Basis) 3/4" x 28M				
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.40	40.9	14.9	40.9	14.9
1.40-1.50	16.8	30.4	57.7	19.4
1.50-1.60	13.5	40.0	71.2	23.3
1.60-1.70	10.7	48.6	81.9	26.6
1.70-1.80	2.3	63.2	84.2	27.6
+1.80	15.8	69.9	100.0	34.3

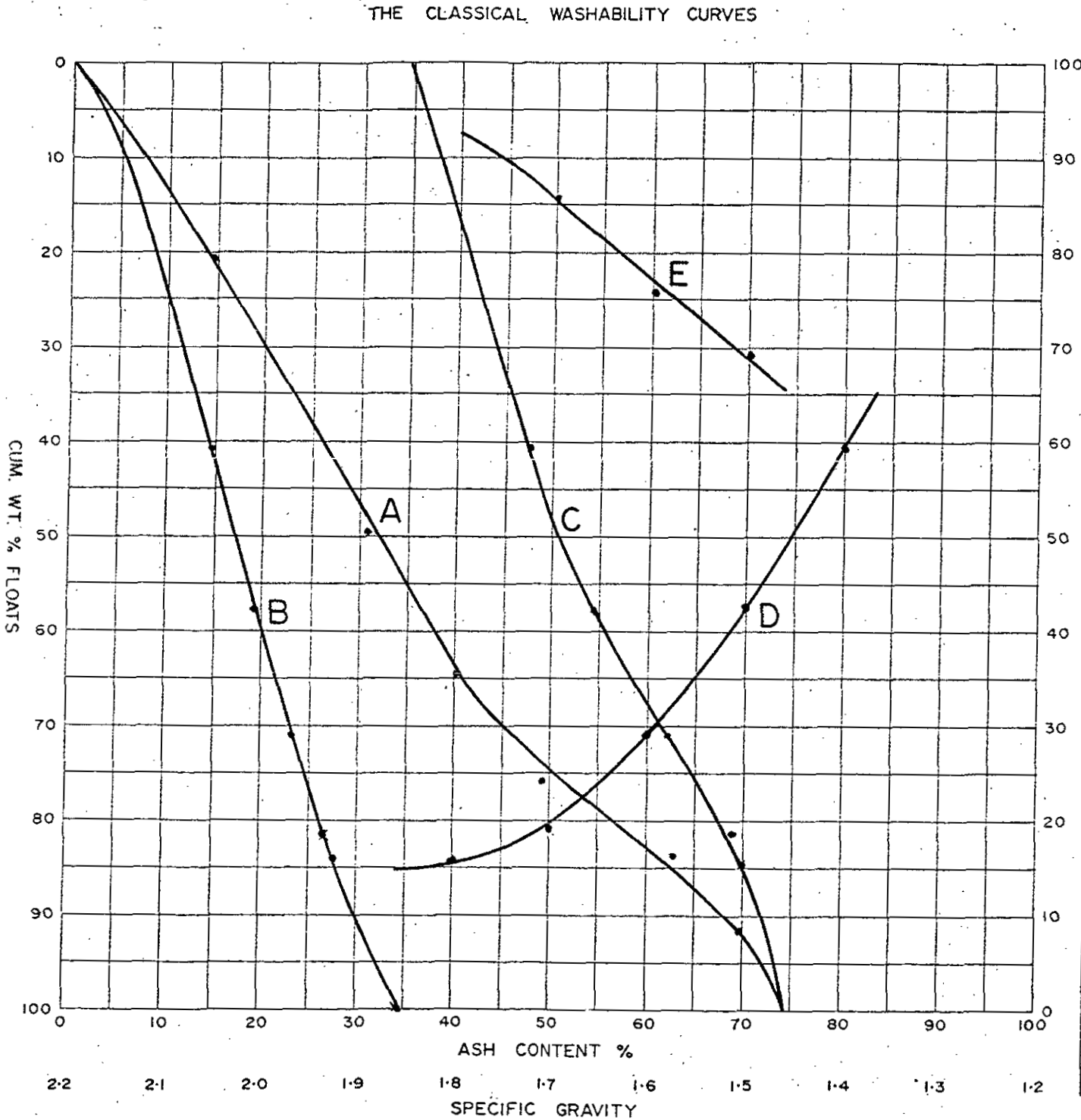
ASH FUSION TEMPERATURES FLOATS @ 1.40 S.G.				
ATMOS.	INITIAL DEFORMATION	SOFTENING	HEMISPHERICAL	FLUID
Oxid.				
Red.	2380	2550	2580	2610

TABLE 48

B. C. HYDRO SAMPLE B LAB.7368 3/4" X 28M

--DIRECT--					--CUM FLOATS--			--CUM SINKS--		+-0.1 DISTR	
S.G.	WT>	ASH>	WT> ASH	CUM WT> TT ASH	TT	WT>	ASH>	SINK WT ASH>	WT>	ASH>	S.G.	WT>
1	2	3	4	5		6	7	8	9	10	11	12
1.40	40.90	14.90	6.09	6.09		40.90	14.90	28.21	59.10	47.72	1.40	0.00
1.50	16.80	30.40	5.11	11.20		57.70	19.41	23.10	42.30	54.61	1.50	30.30
1.60	13.50	40.00	5.40	16.60		71.20	23.32	17.70	28.80	61.45	1.60	24.20
1.70	10.70	48.60	5.20	21.80		81.90	26.62	12.50	18.10	69.05	1.70	13.00
1.80	2.30	63.20	1.45	23.26		84.20	27.62	11.04	15.80	69.90	1.80	0.00
9.99	15.80	69.90	11.04	34.30		100.00	34.30	0.00	.00	0.00	1.90	0.00

BIRTLEY ENGINEERING
20/07/76



A Primary Curve

B Clean Coal Curve

C Discard Curve

D Specific Gravity – Yield Curve

E ± 0·1 S. G. Distribution Curve

FIGURE 11

BIRTLEY ENGINEERING (CANADA) LTD.	
COAL SCIENCE & MINERALS TESTING	
CLIENT	B. C. HYDRO LAB 7368
ADIT/SEAM NO.	SAMPLE B 3/4" x 28 M
DATE	JUL. 21/1976
SIGNED	K. M. LAU

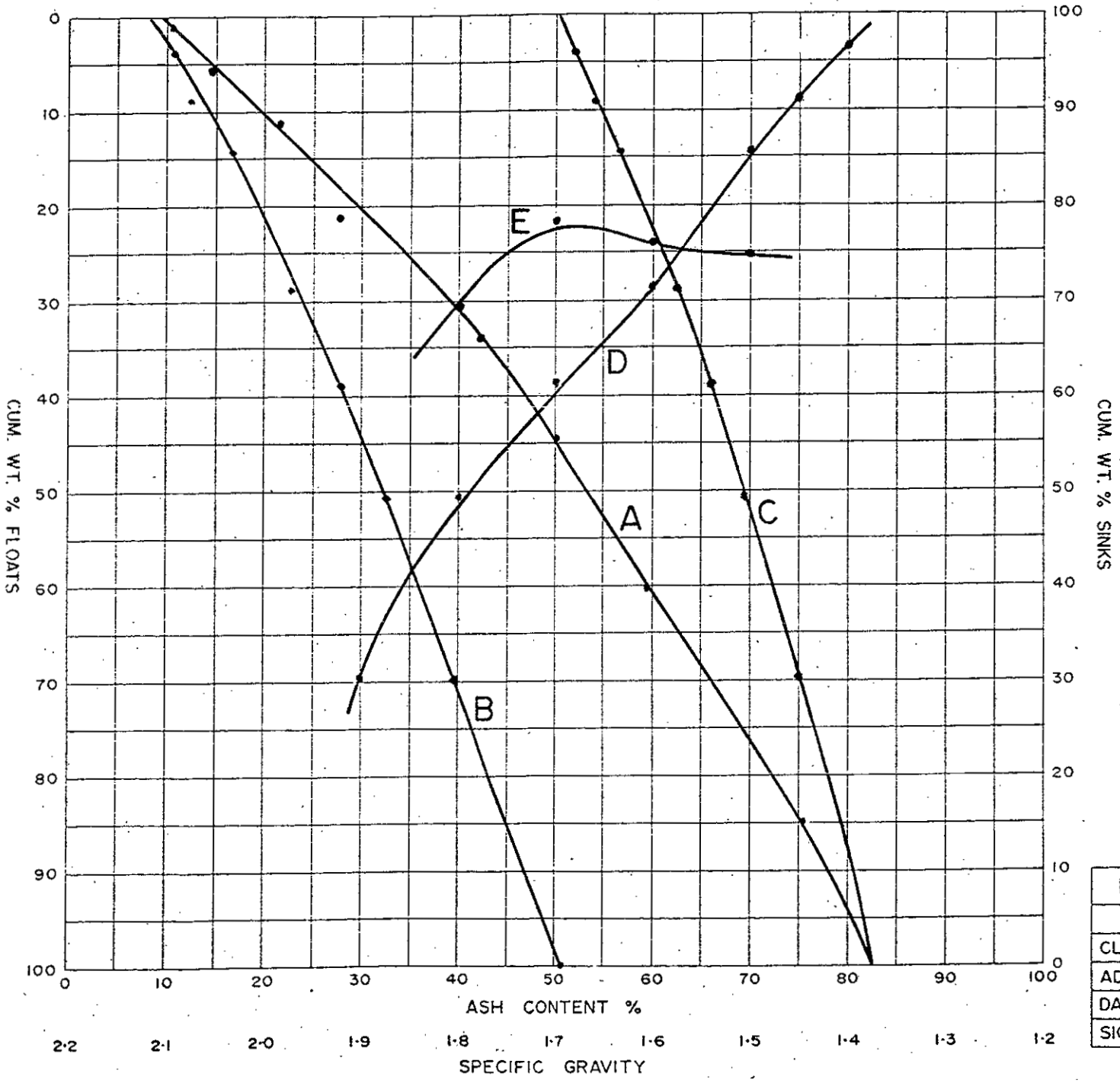
TABLE 49

B. C. HYDRO SAMPLE B LAB.7375 28M X 100M

--DIRECT--					--CUM FLOATS--		--CUM SINKS--			+-0.1 DISTR	
S.G.	WT>	ASH>	WT> ASH	CUM WT> TT ASH	TT WT>	ASH>	SINK WT ASH>	WT>	ASH>	S.G.	WT>
1	2	3	4	5	6	7	8	9	10	11	12
1.40	3.60	10.10	.36	.36	3.60	10.10	50.34	96.40	52.22	1.40	0.00
1.45	4.70	14.30	.67	1.04	8.30	12.48	49.67	91.70	54.16	1.50	25.40
1.50	6.10	22.40	1.37	2.40	14.40	16.68	48.30	85.60	56.42	1.60	24.50
1.60	14.60	27.60	4.03	6.43	29.00	22.18	44.27	71.00	62.35	1.70	21.70
1.70	9.90	42.20	4.18	10.61	38.90	27.27	40.09	61.10	65.62	1.80	31.00
1.80	11.80	50.10	5.91	16.52	50.70	32.59	34.18	49.30	69.33	1.90	0.00
1.90	19.20	59.50	11.42	27.95	69.90	39.98	22.76	30.10	75.60	2.00	0.00
9.99	30.10	75.60	22.76	50.70	100.00	50.70	0.00	.00	0.00	2.10	0.00

BIRTLEY ENGINEERING
20/07/76

THE CLASSICAL WASHABILITY CURVES



A Primary Curve

B Clean Coal Curve

C Discard Curve

D Specific Gravity – Yield Curve

E ± 0·1 S. G. Distribution Curve

FIGURE 12

BIRTLEY ENGINEERING (CANADA) LTD.	
COAL SCIENCE & MINERALS TESTING	
CLIENT	B. C. HYDRO LAB 7375
ADIT/SEAM NO.	SAMPLE B 28M x 100 M
DATE	JUL. 21/1976
SIGNED	K. M. Lau

TABLE 50

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7368

ANALYSIS OF
HEAD RAW

PROXIMATE					BTU/LB	S.G. OF COAL	H.G.I.	EQUIL. MOIST. %	
A.D.M. %	RM %	ASH %	VM %	FC %					
19.8	12.5	30.3	29.9	27.3	6819	1.57	41	38.0	air dry basis
-	29.8	24.3	24.0	21.9	5469	-	-	-	as rec. basis
-	-	34.6	34.2	31.2	7793	-	-	-	dry basis

S.G. OF ASH	ASH FUSION TEMPERATURES (°F)					SULFUR FORMS (adb)			
	ATMOS.	INITIAL DEFORM.	SOFTEN-ING	HEMISPHER-ICAL	FLUID	TOTAL S %	SULPHATE S %	SULFIDE S %	ORGANIC S %
2.62	Oxid.	2650+	-	-	-	0.94	0.01	0.47	0.46
-	Red.	2500	2620	2650	2650+	-	-	-	-

MINERAL ANALYSIS OF ASH											
Na_2O	K_2O	MgO	CaO	Fe_2O_3	Al_2O_3	SiO_2	SO_3	P_2O_5	TiO_2	Mn_3O_4	V_2O_5
0.50	0.46	1.66	4.37	8.41	27.16	52.14	3.64	0.20	1.14	0.10	0.06

ULTIMATE ANALYSIS							(adb) % P ON COAL	(adb) % CO2 ON COAL	(adb) % Cl ON COAL
% H_2O	% C	% H	% N	% S	% ASH	% O DIFF.			
11.84	40.07	4.32	0.75	0.94	30.57	11.51	0.03	1.38	2.17

	RUHR DILATOMETER TEST TABLE 69					WATER SOLUBLE ALKALIES
F.S.I.	SOFTENING TEMP °C	MAXIMUM DILATATION TEMP °C	MAXIMUM CONTRACTION %	MAX. DILAT. %	G. NO.	as % Na_2O
N.A.	NO REACTIVITY					0.03

TABLE 51

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB. NO.: 7375

SIZE ANALYSIS: OF GROSS SAMPLE CRUSHED TO -2" WT.% +2"= 5.9											
								CUMULATIVE			
SIZE FRAC.	WT.%	RM%	ASH%	VM%	FC%	S.%	BTU/LB	WT.%	ASH%	BTU/LB	
2" X 1"	10.9	18.1	21.1	30.7	30.1	0.85	7373	10.9	21.1	7373	adb
	10.0	-	25.8	37.5	36.7	1.04	9002	10.0	25.8	9002	db
1" X 1/2"	15.7	17.8	24.7	29.2	28.3	0.85	6936	26.6	23.2	7115	adb
	14.6	-	30.0	35.5	34.5	1.03	8438	24.6	28.3	8667	db
1/2" X 1/4"	11.7	10.1	28.4	31.1	30.4	0.80	7381	38.3	24.8	7196	adb
	11.9	-	31.6	34.6	33.8	0.89	8210	36.5	29.4	8518	db
1/4" X 1/8"	18.1	9.5	29.8	30.5	30.2	0.92	7308	56.4	26.4	7232	adb
	18.5	-	32.9	33.7	33.4	1.02	8075	55.0	30.6	8369	db
1/8" X 28M	32.3	7.2	37.3	27.1	28.4	1.00	6549	88.7	30.4	6983	adb
	33.8	-	40.2	29.2	30.6	1.08	7057	88.8	34.2	7870	db
28M X 48M	5.3	13.0	43.7	23.8	19.5	1.13	4970	94.0	31.1	6870	adb
	5.2	-	50.2	27.4	22.4	1.30	5713	94.0	35.1	7750	db
48M X 100M	3.5	11.9	47.2	22.7	18.2	1.26	4616	97.5	31.7	6789	adb
	3.5	-	53.6	25.8	20.6	1.43	5240	97.5	35.8	7660	db
100M X 0	2.5	9.9	52.7	21.6	15.8	1.35	4088	100.0	32.2	6721	adb
	2.5	-	58.5	24.0	17.5	1.50	4537	100.0	36.3	7582	db

11.2

* adb (Air Dry Basis)
* db (Dry Basis)

TABLE 52

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7375

SINK-FLOAT ANALYSIS
2" x 1"
(One Sample Used For Each Of Nine (9) S.G.'s)
* Dry Basis

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	23.8	9.8	23.8	9.8	-1.60	88.2	20.5	88.2	20.5
+1.30	76.2	34.0	100.0	28.2	+1.60	11.8	66.7	100.0	26.0
-1.35	44.1	12.9	44.1	12.9	-1.70	91.6	21.8	91.6	21.8
+1.35	55.9	41.3	100.0	28.8	+1.70	8.4	66.9	100.0	25.6
-1.40	71.1	16.5	71.1	16.5	-1.80	92.9	22.4	92.9	22.4
+1.40	28.9	49.7	100.0	26.1	+1.80	7.1	68.3	100.0	25.7
-1.45	78.6	17.6	78.6	17.6	-1.90	95.5	23.5	95.5	23.5
+1.45	21.4	58.7	100.0	26.4	+1.90	4.5	69.6	100.0	25.6
-1.50	86.1	19.8	86.1	19.8					
+1.50	13.9	61.5	100.0	25.6					

NOTE: Refer to Flowhseet III

TABLE 53

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7375

* Dry Basis

CALCULATED SINK-FLOAT ANALYSIS
2" x 1"

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	23.8	9.8	23.8	9.8
1.30-1.35	20.3	16.5	44.1	12.9
1.35-1.40	27.0	22.4	71.1	16.5
1.40-1.45	7.5	28.0	78.6	17.6
1.45-1.50	7.5	42.9	86.1	19.8
1.50-1.60	2.1	49.2	88.2	20.5
1.60-1.70	3.4	55.5	91.6	21.8
1.70-1.80	1.3	61.4	92.9	22.4
1.80-1.90	2.6	65.0	95.5	23.5
+1.90	4.5	69.6	100.0	25.6

NOTE: Refer to Flowsheet III

TABLE 54

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7375

SINK-FLOAT ANALYSIS
* Dry Basis 1" x 1/2"
(One Sample Used For Each Of Nine (9) S.G.'s)

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	18.1	7.5	18.1	7.5	-1.60	87.2	24.7	87.2	24.7
+1.30	81.9	34.3	100.0	29.4	+1.60	12.8	67.2	100.0	30.1
-1.35	40.8	11.6	40.8	11.6	-1.70	91.5	26.3	91.5	26.3
+1.35	59.2	41.9	100.0	29.5	+1.70	8.5	71.3	100.0	30.1
-1.40	61.0	17.1	61.0	17.1	-1.80	93.7	27.2	93.7	27.2
+1.40	39.0	49.2	100.0	29.6	+1.80	6.1	70.9	100.0	29.8
-1.45	71.4	20.0	71.4	20.0	-1.90	95.3	27.9	95.3	27.9
+1.45	28.6	54.6	100.0	29.9	+1.90	4.7	72.3	100.0	30.0
-1.50	80.6	22.5	80.6	22.5					
+1.50	19.4	60.3	100.0	29.8					

NOTE: Refer to Flowsheet III

TABLE 55

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7375

* Dry Basis — CALCULATED SINK-FLOAT ANALYSIS
1" x 1/2"

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	18.1	7.5	18.1	7.5
1.30-1.35	22.7	14.9	40.8	11.6
1.35-1.40	20.2	28.2	61.0	17.1
1.40-1.45	10.4	37.0	71.4	20.0
1.45-1.50	9.2	41.9	80.6	22.5
1.50-1.60	6.6	51.4	87.2	24.7
1.60-1.70	4.3	58.6	91.5	26.3
1.70-1.80	2.2	66.6	93.7	27.2
1.80-1.90	1.6	69.3	95.3	27.9
+1.90	4.7	72.3	100.0	30.0

NOTE: Refer to Flowsheet III

TABLE 56

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7375

SINK-FLOAT ANALYSIS
* Dry Basis
1/2" x 1/4"
(One Sample Used For Each Of Nine (9) S.G.'s)

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	16.4	7.5	16.4	7.5	-1.60	80.8	23.1	80.8	23.1
+1.30	83.6	35.6	100.0	31.0	+1.60	19.2	68.0	100.0	31.7
-1.35	39.5	12.3	39.5	12.3	-1.70	85.2	24.8	85.2	24.8
+1.35	60.5	43.9	100.0	31.4	+1.70	14.8	69.8	100.0	31.5
-1.40	58.0	16.0	58.0	16.0	-1.80	91.3	27.4	91.3	27.4
+1.40	42.0	48.8	100.0	29.8	+1.80	8.7	73.3	100.0	31.4
-1.45	66.4	18.2	66.4	18.2	-1.90	95.6	29.3	95.6	29.3
+1.45	33.6	56.8	100.0	31.2	+1.90	4.4	74.3	100.0	31.3
-1.50	73.2	20.3	73.2	20.3					
+1.50	26.8	63.8	100.0	32.0					

NOTE: Refer to Flowsheet III

TABLE 57

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7375

* Dry Basis	CALCULATED SINK-FLOAT ANALYSIS 1/2" x 1/4"			
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.30	16.4	7.5	16.4	7.5
1.30-1.35	23.1	15.7	39.5	12.3
1.35-1.40	18.5	24.0	58.0	16.0
1.40-1.45	8.4	33.0	66.4	18.2
1.45-1.50	6.8	40.6	73.2	20.3
1.50-1.60	7.6	50.5	80.8	23.1
1.60-1.70	4.4	56.9	85.2	24.8
1.70-1.80	6.1	63.5	91.3	27.4
1.80-1.90	4.3	70.0	95.6	29.3
+1.90	4.4	74.3	100.0	31.3

NOTE: Refer to Flowsheet III

TABLE 58

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7375

SINK-FLOAT ANALYSIS
* Dry Basis
1/4" x 1/8"
(One Sample Used For Each Of Nine (9) S.G.'s)

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	9.0	8.4	9.0	8.4	-1.60	76.2	24.4	83.2	24.4
+1.30	91.0	36.7	100.0	34.2	+1.60	23.8	63.9	100.0	33.8
-1.35	28.7	11.3	28.7	11.3	-1.70	84.9	27.3	84.9	27.3
+1.35	71.3	43.4	100.0	34.2	+1.70	15.1	69.7	100.0	33.7
-1.40	49.2	15.4	49.2	15.4	-1.80	90.0	29.1	90.0	29.1
+1.40	50.8	50.1	50.8	33.0	+1.80	10.0	74.4	100.0	33.6
-1.45	55.7	17.1	55.7	17.1	-1.90	92.9	30.3	92.9	30.3
+1.45	44.3	53.5	100.0	33.2	+1.90	7.1	75.2	100.0	33.5
-1.50	61.8	19.3	61.8	19.3					
+1.50	38.2	56.6	100.0	33.5					

NOTE: Refer to Flowsheet III

TABLE 59

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7375

* Dry Basis	CALCULATED SINK-FLOAT ANALYSIS 1/4" x 1/8"			
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.30	9.0	8.4	9.0	8.4
1.30-1.35	19.7	12.6	28.7	11.3
1.35-1.40	20.5	21.1	49.2	15.4
1.40-1.45	6.5	30.0	55.7	17.1
1.45-1.50	6.1	39.5	61.8	19.3
1.50-1.60	14.4	46.5	76.2	24.4
1.60-1.70	8.7	52.7	84.9	27.3
1.70-1.80	5.1	57.7	90.0	29.1
1.80-1.90	2.9	68.6	92.9	30.3
+1.90	7.1	75.2	100.0	33.5

NOTE: Refer to Flowsheet III

TABLE 60

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7375

SINK-FLOAT ANALYSIS

* Dry Basis

1/8" x 28 M
(One Sample Used For Each Of Nine (9) S.G.'s)

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	2.3	6.5	2.3	6.5	-1.60	57.8	24.9	57.8	24.9
+1.30	97.7	40.0	100.0	39.2	+1.60	42.2	63.0	100.0	41.0
-1.35	12.7	10.6	12.7	10.6	-1.70	71.8	29.8	71.8	29.8
+1.35	87.3	45.7	100.0	41.2	+1.70	28.2	67.0	100.0	40.3
-1.40	22.4	14.0	22.4	14.0	-1.80	79.9	32.3	79.9	32.3
+1.40	77.6	49.1	100.0	41.2	+1.80	20.1	72.1	100.0	40.3
-1.45	31.4	16.3	31.4	16.3	-1.90	85.4	34.4	85.4	34.4
+1.45	68.6	52.3	100.0	41.0	+1.90	14.6	75.1	100.0	40.3
-1.50	47.2	20.6	47.2	20.6					
+1.50	52.8	58.2	100.0	40.5					

NOTE: Refer to Flow Sheet III

TABLE 61

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7375

* Dry Basis — CALCULATED SINK-FLOAT ANALYSIS
1/8" x 28 M

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	2.3	6.5	2.3	6.5
1.30-1.35	10.4	11.5	12.7	10.6
1.35-1.40	9.7	18.5	22.4	14.0
1.40-1.45	9.0	22.0	31.4	16.3
1.45-1.50	15.8	29.1	47.2	20.6
1.50-1.60	10.6	44.0	57.8	24.9
1.60-1.70	14.0	50.1	71.8	29.8
1.70-1.80	8.1	54.3	79.9	32.3
1.80-1.90	5.5	64.9	85.4	34.4
+1.90	14.6	75.1	100.0	40.3

NOTE: Refer to Flowsheet III

TABLE 62

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7375

SINK-FLOAT ANALYSIS
28 M x 100 M
(One Sample Used For Each Of Nine (9) S.G.'s)

* Dry Basis

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	Nil	-	-	-	-1.60	29.0	22.2	29.2	22.2
+1.30	Nil	-	-	-	+1.60	71.0	62.8	100.0	51.0
-1.35	Nil	-	-	-	-1.70	38.9	27.3	38.9	27.3
+1.35	Nil	-	-	-	+1.70	61.1	66.6	100.0	51.3
-1.40	3.6	10.1	3.6	10.1	-1.80	50.7	32.6	50.7	32.6
+1.40	96.4	52.4	100.0	50.9	+1.80	49.3	69.9	100.0	51.0
-1.45	8.3	12.5	8.3	12.5	-1.90	69.9	40.0	69.9	40.0
+1.45	91.7	53.8	100.0	50.4	+1.90	30.1	75.6	100.0	50.7
-1.50	14.4	16.7	14.4	16.7					
+1.50	85.6	57.1	100.0	51.3					

NOTE: Refer to Flowsheet 111

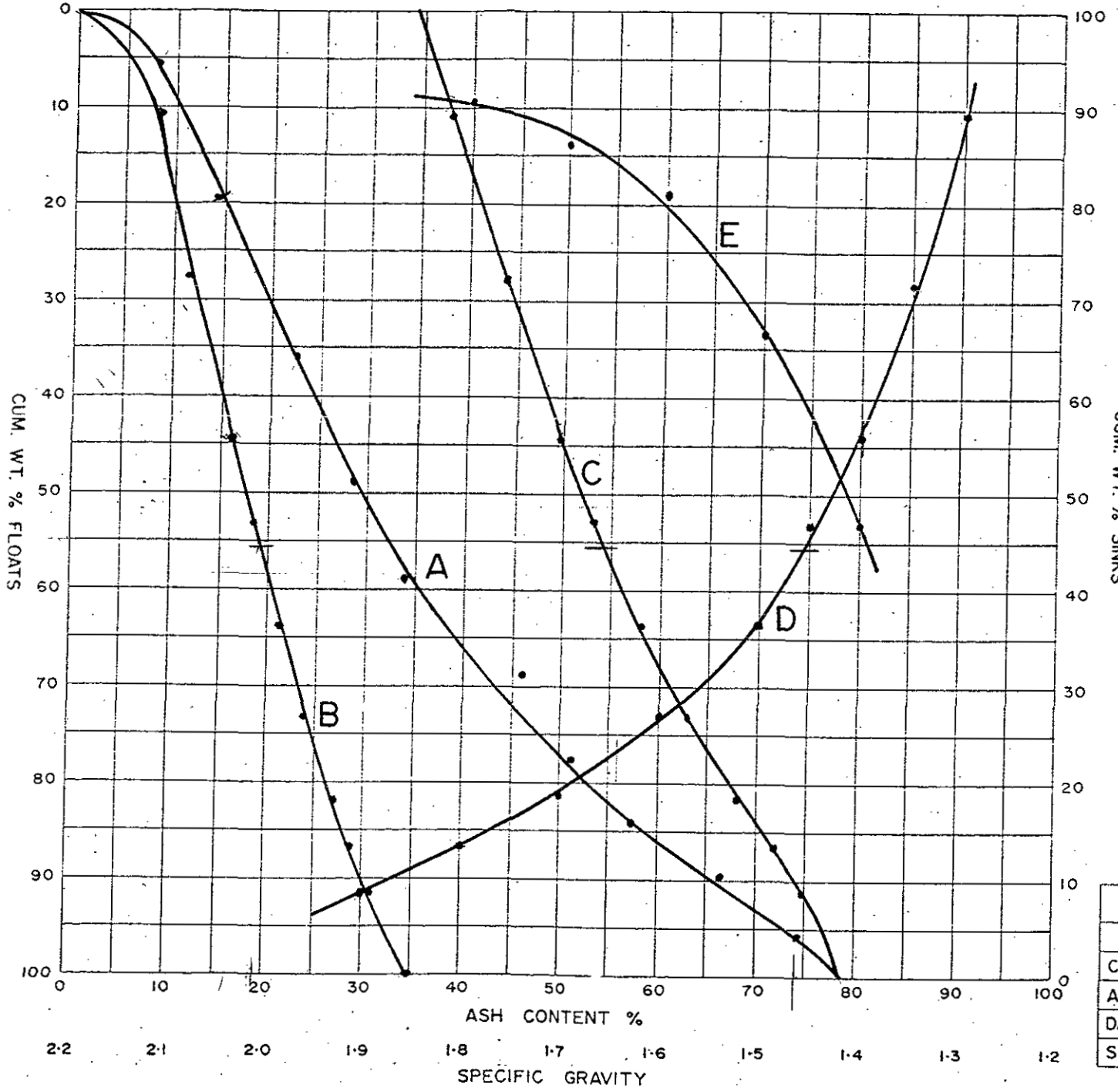
TABLE 63

B. C. HYDRO SAMPLE B LAB.7375 2" X 28M

--DIRECT--			--CUM FLOATS--				--CUM SINKS--		+-0.1 DISTR	
S.G.	WT>	ASH>	WT> ASH	CUM WT> ASH TT	WT>	ASH>	SINK WT ASH>	WT>	ASH>	S.G.	WT>
1	2	3	4	5	6	7	8	9	10	11	12
1.30	10.60	8.16	.87	.87	10.60	8.16	33.47	89.40	37.45	1.30	0.00
1.35	17.18	13.92	2.39	3.26	27.78	11.72	31.08	72.22	43.04	1.40	52.99
1.40	16.80	22.60	3.80	7.05	44.58	15.82	27.29	55.42	49.24	1.50	28.39
1.45	8.46	28.37	2.40	9.45	53.04	17.82	24.89	46.96	53.00	1.60	18.20
1.50	10.55	34.28	3.62	13.07	63.60	20.55	21.27	36.40	58.42	1.70	14.29
1.60	9.37	46.49	4.36	17.43	72.97	23.89	16.91	27.03	62.56	1.80	9.30
1.70	8.82	52.00	4.59	22.02	81.79	26.92	12.32	18.21	67.68	1.90	0.00
1.80	5.47	57.34	3.14	25.16	87.26	28.83	9.18	12.74	72.12	2.00	0.00
1.90	3.83	66.56	2.55	27.70	91.09	30.41	6.64	8.91	74.51	2.10	0.00
9.99	8.91	74.51	6.64	34.34	100.00	34.34	0.00	0.00	0.00	2.20	0.00

BIRTLEY ENGINEERING
20/07/76

THE CLASSICAL WASHABILITY CURVES



A Primary Curve

B *Clean Coal Curve*

C Discard Curve

D Specific Gravity – Yield Curve

E ± 0·1 S. G. Distribution Curve

FIGURE 13

BIRTLEY ENGINEERING (CANADA) LTD.	
COAL SCIENCE & MINERALS TESTING	
CLIENT	B. C. HYDRO LAB 7375
ADIT/SEAM NO.	SAMPLE B 2" x 28 M
DATE	JUL. 21 / 1976
SIGNED	K. M. Lau

TABLE 64

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7375

* Dry Basis

CALCULATED SINK-FLOAT ANALYSIS
28M x 100M

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	Nil	-	-	-
1.30-1.35	Nil	-	-	-
1.35-1.40	3.6	10.1	3.6	10.1
1.40-1.45	4.7	14.3	8.3	12.5
1.45-1.50	6.1	22.4	14.4	16.7
1.50-1.60	14.6	27.6	29.0	22.2
1.60-1.70	9.9	42.2	38.9	27.3
1.70-1.80	11.8	50.1	50.7	32.6
1.80-1.90	19.2	59.5	69.9	40.0
+1.90	30.1	75.6	100.0	50.7

NOTE: Refer to Flowsheet III

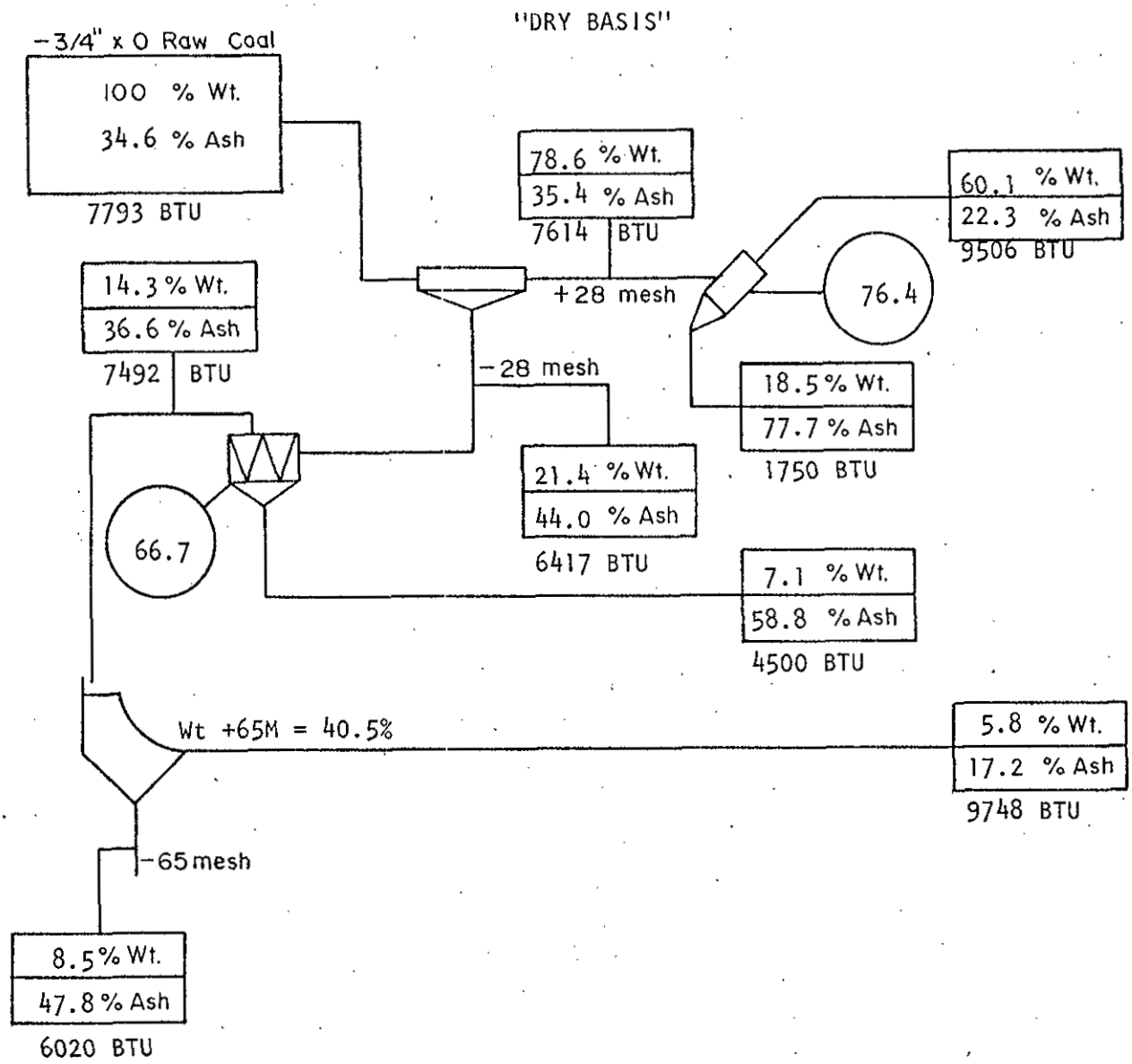
CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7367

TABLE 65

PLANT WASH SAMPLES								
PLANT PRODUCT	% A.D.M.	% RM % TOTAL MOIST.	ASH %	VOL %	F.C. %	S. %	BTU/LB	CALC. FACTORS
Heavy	23.8	14.2	30.4	-	-	-	6533	air dry basis
Media	-	34.6	23.2	-	-	-	4978	as rec'd basis
Feed	-	35.4	-	-	-	-	7614	dry basis
H.M.	18.4	15.6	18.8	32.8	32.8	0.67	8023	air dry basis
Clean Coal	-	31.1	15.3	26.8	26.8	0.55	6547	as rec'd basis
@ 1.65 S.G.	-	-	22.3	38.9	38.8	0.79	9506	dry basis
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
H.M.	17.1	4.4	74.3	-	-	-	(1673)	air dry basis
Reject	-	20.7	61.6	-	-	-	(1387)	as rec'd basis
@ 1.65 S.G.	-	-	77.7	-	-	-	(1750)	dry basis
Water Only Cyclone Feed	-	12.3	38.6	-	-	-	5628	air dry basis
	-	-	-	-	-	-	-	-
	-	-	44.0	-	-	-	6417	dry basis
Water Only Cyclone Overflow	-	8.1	33.6	-	-	-	6886	air dry basis
	-	-	-	-	-	-	-	-
	-	-	36.6	-	-	-	7492	dry basis
Water Only Cyclone Underflow	-	7.6	54.3	-	-	-	(4158)	air dry basis
	-	-	-	-	-	-	-	-
	-	-	58.8	-	-	-	(4500)	dry basis
Sieve Bend Overflow	-	12.6	17.2	-	-	-	8520	air dry basis
	-	-	-	-	-	-	-	-
	-	-	19.7	-	-	-	9748	dry basis
Sieve Bend Underflow	-	5.4	45.2	-	-	-	(5695)	air dry basis
	-	-	-	-	-	-	-	-
	-	-	47.8	-	-	-	(6020)	dry basis
Thickener Solids	-	3.7	62.9	-	-	-	(3467)	air dry basis
	-	-	-	-	-	-	-	-
	-	-	65.3	-	-	-	(3600)	dry basis

(Figures in parentheses are taken from BTU/Ash Curve)

FIGURE 14



OVERALL YIELD = Actual = 65.9%, 21.9 ash, 9527 BTU

LEGEND:

○ *CIRCUIT YIELD %*

Wt.	*WEIGHT %* (Dry Basis)
Ash	*ASH CONTENT*

BIRTLEY ENGINEERING (CANADA) LTD.

Title: PLANT BALANCE B.C. HYDRO SAMPLE "B" LAB NO. 7367	Date Drawn

TABLE 66

BIRTLEY ENGINEERING (CANADA) LTD.

Coal Science & Minerals Testing Div.

BULK WASHING DATA*

ADIT Sample "B" LAB. NO. 7367 DATE OF WASH 22 June, 1976

Raw Coal Analysis: A.D.M.% 19.8 Ash% 34.6 F.S.I. - H.G.I. 41 (adb)

Delivered Bulk Weight - Metric Tons

Washed Weight 5.249 Metric Tons

* All weight and analyses are on ~~AXXXRXXXX~~ Dry Basis unless otherwise indicated.

TABLE 67

BULK WASHING DATA

HEAVY MEDIUM CIRCUIT

ADIT Sample "B" LAB. NO. 7367

1. S.G. of Separation 1.64
2. Feed Ash Content 35.4 %
3. Clean Coal Estimated Weight 3.455 M.T.
4. Clean Coal Analysis - Ash 22.3 %
5. Reject Estimated Weight 0.672 M.T.
6. Reject Analysis - Ash 77.7 %
7. Estimated 3/4" X 28M In Circuit 4.127 M.T. 78.6 Wt.%
8. Yield Clean Coal (Weighted): $\frac{3}{3 + 5}$ 83.7 %
9. Yield Clean Coal (Calculated Ash Balance) - $\frac{6 - 2}{6 - 4}$ 76.4 %

Yield, Wt and Ash on dry basis

TABLE 68

BULK WASHING DATA

WATER ONLY CYCLONE CIRCUIT

ADIT Sample "B" LAB. NO. 7367

1. Vortex Finder Clearance (VFC) 8.89 CM 3 1/2 Inches
2. Feed Pressure 1.4 KG/CM^2 20 P.S.I.
3. Feed Rate 23.2 $M^3/Hr.$ 8.5 LG/Min.
4. Feed Pulp Density 100-110 g/l. 10-11 Solids W/V
5. Sample Analysis:- Dry Basis

	SCREEN SIZE	WT. %	ASH %	F.S.I.	CUM WT. %	CUM ASH %	HEAD ASH %
FEED	-	-	-	-	-	-	44.0
O'FLOW	+65M	40.5	-	-	40.5	-	
	65M X O	59.5	-	-	100.0	-	36.6
U'FLOW	-	-	-	-	-	-	58.8
S B O	-	-	-	-	-	-	19.7
T C O*	+325M	-	-	-	-	-	-
	325M X O	-	-	-	-	-	

6. Yield - Total W.O. Cyclone Circuit = 66.7
7. Est. Yield of 28 X 65 Mesh Coal = 5.8 (as % of 28 Mesh X O Feed)
8. Est. 28M X O in circuit (Plant Feed - HM Products) 1,122 M.T. 21.4 %

* Thickner Cyclone Overflow

TABLE 69

BULK WASHING DATA

ADIT Sample "B" LAB. NO. 7367 DATE OF WASH 22 June, 1976

a) Raw Coal

Ash % = 34.6

Estimated Washed Wt. = 5.249 M.T.

b) Heavy Media Circuit

Estimated Proportion of +28 Mesh in Feed = 78.6

Effective S.G. = 1.64

Raw Feed	35.4	%Ash
Clean Coal	22.3	%Ash
Reject	77.7	%Ash

Calculated Yield = 76.4

Weighed Yield = 83.7

c) Water-Only Cyclone Circuit

Raw Feed	44.0	%Ash
Overflow	36.6	%Ash
Underflow	58.8	%Ash

Calculated Yield = 66.7

% of +65 Mesh in O/F = 40.5

Sieve Bend Overflow 19.7 %Ash

Dry Basis

TABLE 70

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO. 7367

SIZE AND SINK-FLOAT ANALYSIS - PLANT PRODUCTS		
SIZE ANALYSIS OF W.O.C. OVERFLOW		
SIZE FRACTION	WT %	CUM WT %
+ 65 M	40.5	40.5
- 65 M	59.5	100.0
SINK-FLOAT ANALYSIS: + 65M W.O.C. OVERFLOW		
S.G.	WT %	CUM WT %
- 1.65	83.0	83.0
+ 1.65	17.0	100.0
SIZE ANALYSIS OF W.O.C. UNDERFLOW		
SIZE FRACTION	WT %	CUM WT %
+ 65 M	50.7	50.7
- 65 M	49.3	100.0
SINK-FLOAT ANALYSIS: + 65 M W.O.C. UNDERFLOW		
S.G.	WT %	CUM WT %
- 1.65	48.7	48.7
+ 1.65	51.3	100.0
SINK-FLOAT ANALYSIS: H.M. C.C. (- 1.65 S.G.)		
S.G.	WT %	CUM WT %
- 1.65	91.9	91.9
+ 1.65	8.1	100.0
SINK-FLOAT ANALYSIS: H.M. REJECT (@ 1.65 S.G.)		
S.G.	WT %	CUM WT %
- 1.65	4.3	4.3
+ 1.65	95.7	100.0

TABLE 71

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7367

ANALYSIS OF
CLEAN COAL MIX

PROXIMATE					BTU/LB	S.G. OF COAL	H.G.I.	EQUIL. MOIST. %	
A.D.M. %	RM %	ASH %	VM %	FC %					
22.5	22.1	17.7	30.6	29.6	7339	1.42	37	34.2	air dry basis
-	39.7	13.7	23.7	22.9	5688	-	-	-	as rec. basis
-	-	22.7	39.3	38.0	9421	-	-	-	dry basis

S.G. OF ASH	ASH FUSION TEMPERATURES (°F)					SULFUR FORMS			
	ATMOS.	INITIAL DEFORM.	SOFTEN-ING	HEMISPHER-ICAL	FLUID	TOTAL S %	SULPHATE S %	SULFIDE S %	ORGANIC S %
2.58	Oxid.	2650	2650+	-	-	0.67	0.05	0.18	0.44
-	Red.	2510	2630	2650	2650+	-	-	-	-

MINERAL ANALYSIS OF ASH											
Na_2O	K_2O	MgO	CaO	Fe_2O_3	Al_2O_3	SiO_2	SO_3	P_2O_5	TiO_2	Mn_3O_4	V_2O_5
0.73	0.45	2.32	5.04	5.86	29.32	50.86	3.67	0.10	1.41	0.07	0.07

ULTIMATE ANALYSIS							(adb) % P ON COAL	(adb) % CO2 ON COAL	(adb) % Cl ON COAL
% H_2O	% C	% H	% N	% S	% ASH	% O DIFF.			
19.91	42.61	5.53	0.95	0.67	18.35	11.98	0.02	0.19	0.04

F.S.I.	RUHR DILATOMETER TEST TABLE 92					WATER SOLUBLE ALKALIES as % Na_2O
	SOFTENING TEMP °C	MAXIMUM DILATATION TEMP °C	MAXIMUM CONTRACTION %	MAX. DILAT. %	G. NO.	
N.A.	NO REACTIVITY					0.02

TABLE 72

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7367

ASH FUSION TEMPERATURES (°F)					
SAMPLE DESCRIPTION	ATMOS	INITIAL DEFORMATION	SOFTENING	HEMISPHERICAL	FLUID
H.M. C.C. @ 1.65 S.G.	Oxidizing	2650+	-	-	-
	Reducing	2550	2650+	-	-
Sieve Bend Overflow	Oxidizing	2370	2450	2500	2650+
	Reducing	2300	2370	2400	2470

CLIENT: B.C. HYDRO
SAMPLE: "B"
LAB NO.: 7367

MINERAL ANALYSIS OF ASH												
SAMPLE	%Na_2O	%K_2O	%MgO	%CaO	%Fe_2O_3	%Mn_3O_4	%Al_2O_3	%SiO_2	%SO_3	%P_2O_5	%TiO_2	%V_2O_5
H.M. C.C. @ 1.65	0.82	0.45	2.24	4.90	5.69	0.07	28.57	51.58	3.36	0.27	1.36	0.07
S.B.O.	0.49	0.37	2.65	7.28	5.69	0.10	28.12	47.92	4.89	0.24	1.71	0.13

Results done on a dried basis.

TABLE 73

BULK SAMPLE "C"

TABLE 74

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7370

SIZE ANALYSIS: OF GROSS SAMPLE CRUSHED TO -4" WT% +4" = 1.3%											
								CUMULATIVE			
SIZE FRAC.	WT.%	RM%	ASH%	VM%	FC%	S%	BTU/LB	WT%	ASH%	BTU/LB	
4" x 1/2"	39.2	25.1	17.0	29.8	28.1	0.57	7091	39.2	17.0	7091	adb
	36.9	-	22.7	39.8	37.5	0.76	9467	36.9	22.7	9467	db
1/2" x 28M	48.9	18.0	24.1	29.4	28.5	0.60	6941	88.1	20.9	7008	adb
	50.5	-	29.4	35.9	34.7	0.73	8485	87.4	26.6	8900	db
28M x 100M	7.2	16.5	30.5	27.9	25.1	0.60	6271	95.3	21.7	6952	adb
	7.6	-	33.0	33.4	33.6	0.72	7510	95.0	27.1	8788	db
100 M x 0	4.7	15.3	32.5	27.7	24.5	0.74	6183	100.0	22.2	6916	adb
	5.0	-	38.4	32.7	28.9	0.87	7300	100.0	27.7	8714	db

ASH FUSION TEMP. (°F): 100M x 0				
ATMOS.	INITIAL DEFORMATION	SOFTENING	HEMISPHERICAL	FLUID
Oxid.	2650+	-	-	-
Reduc.	2650+	-	-	-

TABLE 75

CLIENT: B.C. HYDRO
SAMPLE: "C" Raw Coal crushed to -3/4" and screened @ 28M
LAB NO.: 7370

SIZE ANALYSIS 3/4" x 28M						
SIZE FRACTION	WT %	RM %	ASH %	CUM WT %	CUM ASH %	
3/4" x 28 M	81.9	21.2	20.6	81.9	20.6	adb
	81.4		26.1	81.4	26.1	db
28M x 0	18.1	19.0	29.4	100.0	22.2	adb
	18.6		36.3	100.0	28.0	db

SINK-FLOAT ANALYSIS (Dried Basis) 3/4" x 28M				
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.40	65.9	11.9	65.9	11.9
+1.40	34.1	52.8	100.0	25.8
-1.50	76.1	14.3	76.1	14.3
+1.50	23.9	68.5	100.0	27.3
-1.60	80.2	15.8	80.2	15.8
+1.60	19.8	69.9	100.0	26.5
-1.70	83.9	17.9	83.9	17.9
+1.70	16.1	73.8	100.0	26.9
-1.80	88.3	20.5	88.3	20.5
+1.80	11.7	75.5	100.0	26.9

TABLE 76

CLIENT: B.C. HYDRO
SAMPLE: "C" Raw Coal crushed to -3/4" and screened @ 28 M
LAB NO.: 7370

SINK-FLOAT ANALYSIS (Dried Basis) 3/4" x 28 M				
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.40	65.9	11.9	65.9	11.9
1.40-1.50	10.2	29.8	76.1	14.3
1.50-1.60	4.1	43.6	80.2	15.8
1.60-1.70	3.7	63.4	83.9	17.9
1.70-1.80	4.4	69.5	88.3	20.5
+1.80	11.7	75.5	100.0	26.9

ASH FUSION TEMPERATURES FLOATS @ 1.40 S.G.				
ATMOS.	INITIAL DEFORMATION	SOFTENING	HEMISPHERICAL	FLUID
Oxid.	NO ANALYSIS DONE			
Red.	2500	2650+	-	-

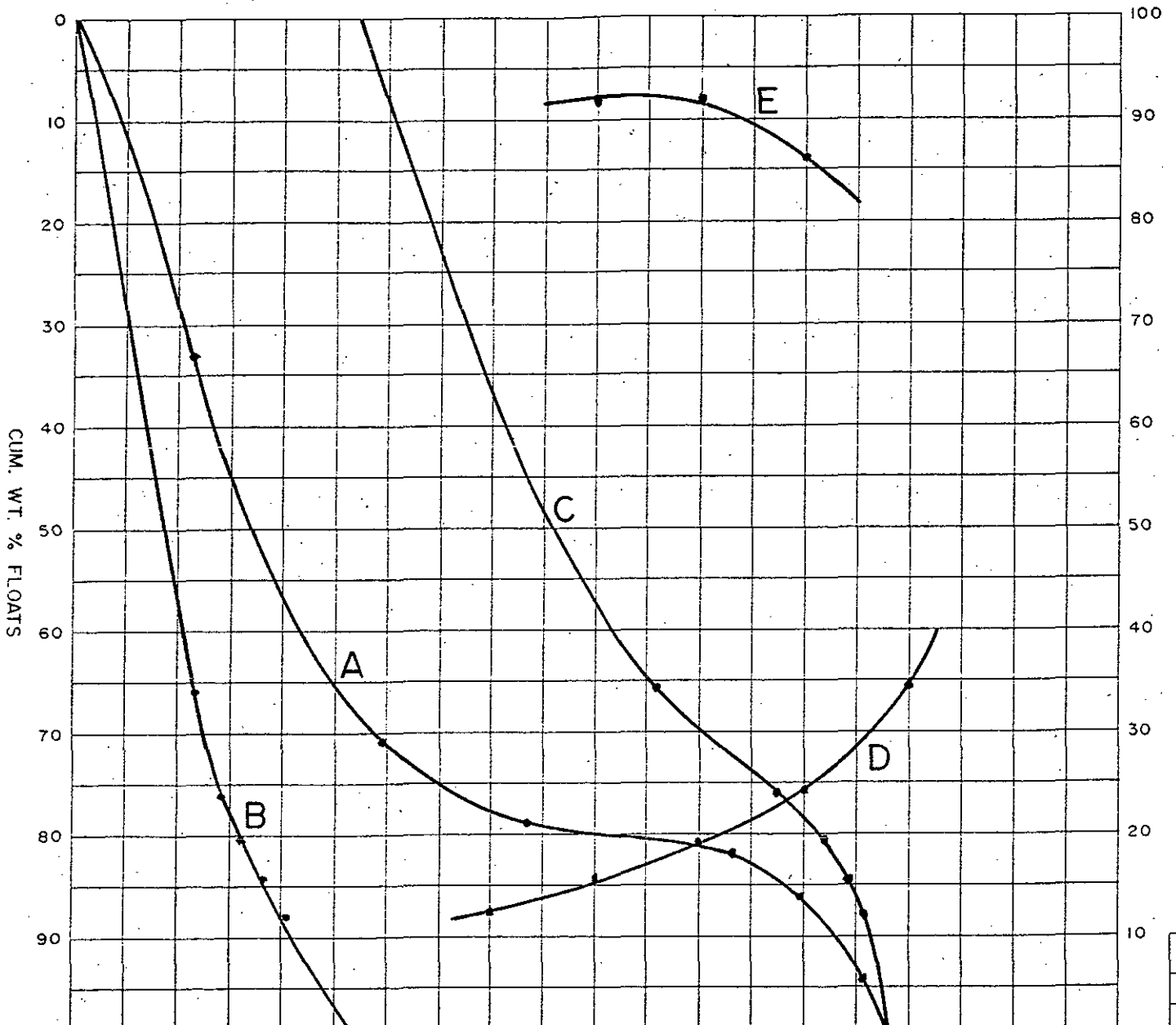
TABLE 77

B. C. HYDRO SAMPLE C LAB.7370 3/4" X 28M

--DIRECT--			--CUM FLOATS--				SINK WT	--CUM SINKS--		+-0.1 DISTR	
S.G.	WT>	ASH>	WT> CUM WT> ASH TT ASHTT		WT>	ASH>	ASH>	WT>	ASH>	S.G.	WT>
1	2	3	4	5	6	7	8	9	10	11	12
1.40	65.90	11.90	7.84	7.84	65.90	11.90	19.06	34.10	55.91	1.40	0.00
1.50	10.20	29.80	3.04	10.88	76.10	14.30	16.02	23.90	67.05	1.50	14.30
1.60	4.10	43.60	1.79	12.67	80.20	15.80	14.24	19.80	71.91	1.60	7.80
1.70	3.70	63.40	2.35	15.02	83.90	17.90	11.89	16.10	73.86	1.70	8.10
1.80	4.40	69.50	3.06	18.07	88.30	20.47	8.83	11.70	75.50	1.80	0.00
9.99	11.70	75.50	8.83	26.91	100.00	26.91	0.00	.00	0.00	1.90	0.00

BIRTLEY ENGINEERING
20/07/76

THE CLASSICAL WASHABILITY CURVES



A Primary Curve

B Clean Coal Curve

C Discard Curve

D Specific Gravity – Yield Curve

E ± 0·1 S. G. Distribution Curve

FIGURE 15

BIRTLEY ENGINEERING (CANADA) LTD.	
COAL SCIENCE & MINERALS TESTING	
CLIENT	B. C. HYDRO LAB 7370
ADIT/SEAM NO.	SAMPLE C 3/4" x 28M
DATE	JUL. 21/1976
SIGNED	K. M. Law

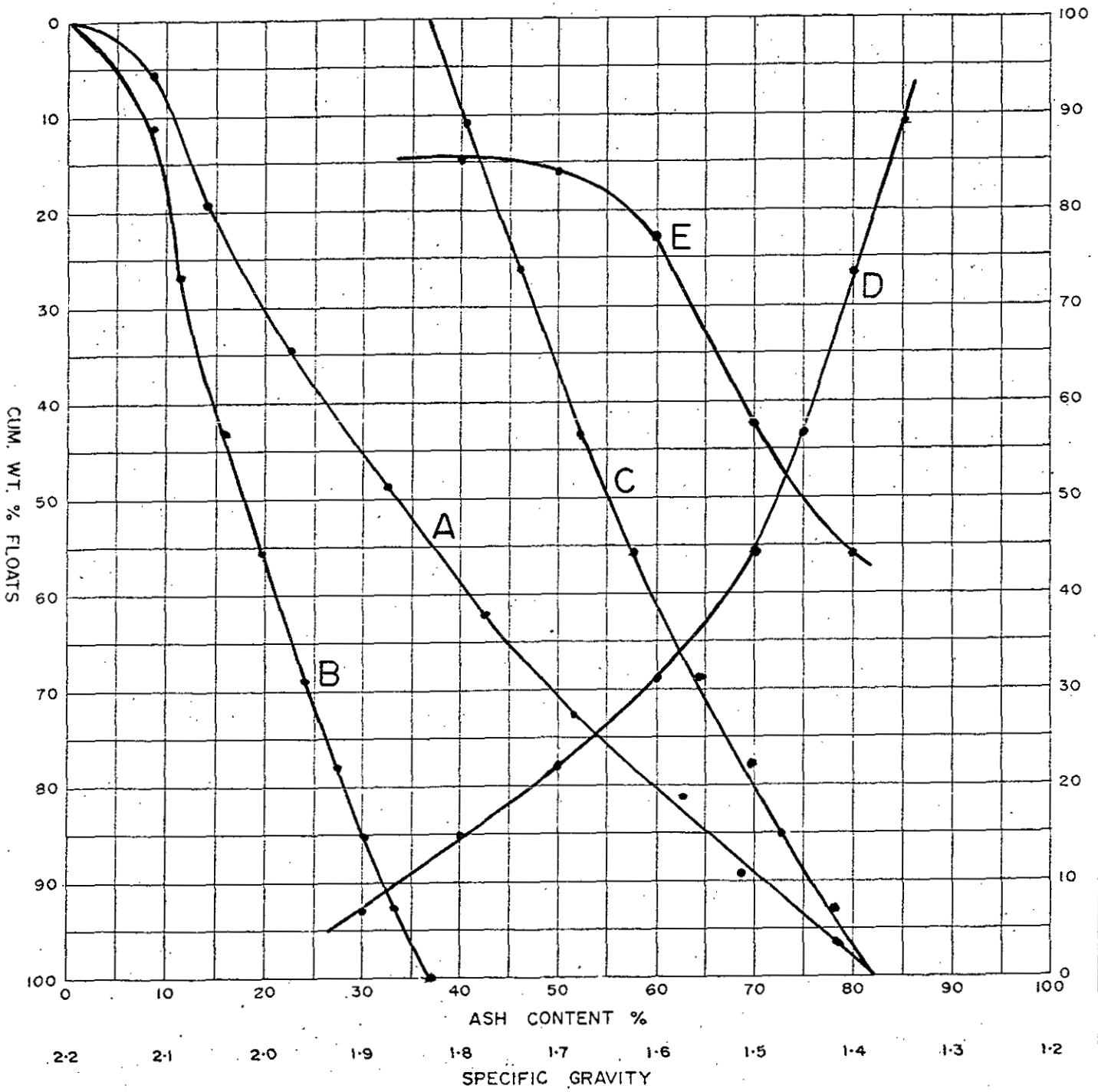
TABLE 78

B. C. HYDRO SAMPLE C LAB.7376 28M X 100M

--DIRECT--					--CUM FLOATS--			--CUM SINKS--		+-0.1 DISTR	
S.G.	WT>	ASH>	WT> ASH	CUM WT> ASH TT	WT>	ASH>	SINK WT ASH>	WT>	ASH>	S.G.	WT>
1	2	3	4	5	6	7	8	9	10	11	12
1.30	0.00	0.00	0.00	0.00	0.00	I	36.68	100.00	36.68	1.30	0.00
1.35	11.70	8.60	1.01	1.01	11.70	8.60	35.67	88.30	40.40	1.40	55.50
1.40	15.00	14.10	2.12	3.12	26.70	11.69	33.56	73.30	45.78	1.50	42.20
1.45	16.20	22.60	3.66	6.78	42.90	15.81	29.90	57.10	52.36	1.60	22.30
1.50	12.60	32.10	4.04	10.83	55.50	19.51	25.85	44.50	58.09	1.70	16.20
1.60	13.40	42.60	5.71	16.54	68.90	24.00	20.14	31.10	64.77	1.80	15.10
1.70	8.90	52.00	4.63	21.16	77.80	27.20	15.52	22.20	69.89	1.90	0.00
1.80	7.30	63.30	4.62	25.78	85.10	30.30	10.89	14.90	73.12	2.00	0.00
1.90	7.80	68.40	5.34	31.12	92.90	33.50	5.56	7.10	78.30	2.10	0.00
9.99	7.10	78.30	5.56	36.68	100.00	36.68	0.00	.00	0.00	2.20	0.00

BIRTLEY ENGINEERING
22/07/76

THE CLASSICAL WASHABILITY CURVES



A Primary Curve

B Clean Coal Curve

C Discard Curve

D Specific Gravity – Yield Curve

E ± 0·1 S. G. Distribution Curve

FIGURE 16

BIRTLEY ENGINEERING (CANADA) LTD.	
COAL SCIENCE & MINERALS TESTING	
CLIENT	B. C. HYDRO LAB 7376
ADIT/SEAM NO.	SAMPLE C 28M x 100M
DATE	JUL. 21/1976
SIGNED	K. M. Lau

TABLE 79

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7370

ANALYSIS OF
HEAD RAW

PROXIMATE					BTU/LB	S.G. OF COAL	H.G.I.	EQUIL. MOIST. %	
A.D.M. %	RM %	ASH %	VM %	FC %					
10.0	20.8	21.9	29.3	28.0	6942	1.48	43	29.2	air dry basis
-	28.7	19.7	26.4	25.2	6248	-	-	-	as rec. basis
-	-	27.7	37.0	35.3	8765	-	-	-	

S.G. OF ASH	ASH FUSION TEMPERATURES (°F)					SULFUR FORMS			
	ATMOS.	INITIAL DEFORM.	SOFTENING	HEMISPHERICAL	FLUID	TOTAL S %	SULPHATE S %	SULFIDE S %	ORGANIC S %
2.75	Oxid.	2650+	-	-	-	0.60	0.01	0.13	0.46
-	Red.	2650	2650+	-	-	-	-	-	-

MINERAL ANALYSIS OF ASH											
Na_2O	K_2O	MgO	CaO	Fe_2O_3	Al_2O_3	SiO_2	SO_3	P_2O_5	TiO_2	Mn_3O_4	V_2O_5
0.71	0.48	1.77	3.08	6.23	30.92	52.74	2.40	0.23	1.16	0.14	0.07

ULTIMATE ANALYSIS							(adb) % P ON COAL	(adb) % CO2 ON COAL	(adb) % Cl ON COAL
% H_2O	% C	% H	% N	% S	% ASH	% O DIFF.			
20.06	41.48	5.06	0.85	0.60	22.12	9.83	0.02	0.75	0.80

F.S.I.	RUHR DILATOMETER TEST TABLE 107					WATER SOLUBLE ALKALIES as % Na_2O
	SOFTENING TEMP °C	MAXIMUM DILATATION TEMP °C	MAXIMUM CONTRACTION %	MAX. DILAT. %	G. NO.	
N.A.	NO REACTIVITY					0.04

TABLE 80

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB. NO.: 7376

SIZE ANALYSIS: OF GROSS SAMPLE CRUSHED TO -2" WT.% +2"= 2.9											
								CUMULATIVE			
SIZE FRAC.	WT.%	RM%	ASH%	VM%	FC%	S.%	BTU/LB	WT.%	ASH%	BTU/LB	
2" X 1"	6.2	18.8	19.9	30.0	31.3	0.57	7470	6.2	19.9	7470	adb
	6.1	-	24.5	36.9	38.6	0.70	9200	6.1	24.5	9200	db
1" X 1/2"	10.8	22.4	17.3	29.8	30.5	0.32	7372	17.0	18.2	7408	adb
	10.2	-	22.3	38.4	39.3	0.41	9500	16.3	23.1	9388	db
1/2" X 1/4"	15.4	14.9	20.8	31.2	33.1	0.59	7832	32.4	19.5	7609	adb
	16.0	-	24.4	36.7	38.9	0.69	9203	32.3	23.8	9296	db
1/4" X 1/8"	13.8	17.0	21.6	29.7	31.7	0.55	7468	46.2	20.1	7567	adb
	14.0	-	26.0	35.8	38.2	0.66	8998	46.3	24.4	9206	db
1/8" X 28M	32.4	15.3	25.6	29.5	29.6	0.54	7120	78.6	22.4	7383	adb
	33.4	-	30.2	34.8	35.0	0.64	8406	79.7	26.9	8871	db
28M X 48M	9.2	22.3	29.1	25.5	23.1	0.50	5750	87.8	23.1	7212	adb
	8.7	-	37.5	32.8	29.7	0.64	7400	88.4	27.9	8726	db
48M X 100M	8.0	22.1	29.5	25.6	22.8	0.54	5726	95.8	23.6	7088	adb
	7.6	-	37.9	32.8	29.3	0.69	7350	96.0	28.7	8617	db
100M X 0	4.2	22.0	30.4	25.6	22.0	0.66	5646	100.0	23.9	7027	adb
	4.0	-	39.0	32.8	28.2	0.85	7238	100.0	29.1	8562	db

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* adb (Air Dry Basis)
* db (Dry Basis)

TABLE 81

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7376

SINK-FLOAT ANALYSIS
2" x 1"
(One Sample Used For Each Of Nine (9) S.G.'s)

* Dry Basis

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	40.9	9.8	40.9	9.8	-1.60	89.0	17.9	89.0	17.9
+1.30	59.1	34.4	100.0	24.3	+1.60	11.0	71.3	100.0	23.8
-1.35	64.8	12.5	64.8	12.5	-1.70	90.8	18.7	90.8	18.7
+1.35	35.2	44.2	100.0	23.7	+1.70	9.2	74.9	100.0	23.9
-1.40	78.8	15.0	78.8	15.0	-1.80	91.6	19.1	91.6	19.1
+1.40	21.2	53.8	100.0	23.2	+1.80	8.4	75.8	100.0	23.9
-1.45	84.7	16.4	84.7	16.4	-1.90	92.6	19.7	92.6	19.7
+1.45	15.3	59.7	100.0	23.0	+1.90	7.4	78.3	100.0	24.0
-1.50	86.7	17.0	86.7	17.0					
+1.50	13.3	65.2	100.0	23.4					

NOTE: Refer to Flowsheet III

TABLE 82

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7376

* Dry Basis	CALCULATED SINK-FLOAT ANALYSIS 2" x 1"			
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.30	40.9	9.8	40.9	9.8
1.30-1.35	23.9	17.1	64.8	12.5
1.35-1.40	14.0	26.6	78.8	15.0
1.40-1.45	5.9	35.1	84.7	16.4
1.45-1.50	2.0	42.4	86.7	17.0
1.50-1.60	2.3	51.8	89.0	17.9
1.60-1.70	1.8	58.3	90.8	18.7
1.70-1.80	0.8	64.5	91.6	19.1
1.80-1.90	1.0	74.7	92.6	19.7
+1.90	7.4	78.3	100.0	24.0

NOTE: Refer to Flowsheet III

TABLE 83

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7376

* Dry Basis

SINK-FLOAT ANALYSIS
1" x 1/2"
(One Sample Used For Each Of Nine (9) S.G.'s)

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	47.7	8.7	47.7	8.7	-1.60	89.0	16.6	89.0	16.6
+1.30	52.3	35.4	100.0	22.7	+1.60	11.0	71.4	100.0	22.6
-1.35	64.0	10.0	64.0	10.0	-1.70	90.9	17.4	90.9	17.4
+1.35	36.0	45.5	100.0	22.8	+1.70	9.1	72.3	100.0	22.4
-1.40	75.1	12.5	75.1	12.5	-1.80	94.0	18.8	18.8	18.8
+1.40	24.9	53.0	100.0	22.6	+1.80	6.0	74.0	100.0	22.1
-1.45	84.2	14.9	84.2	14.9	-1.90	94.8	19.2	94.8	19.2
+1.45	15.9	61.1	100.0	22.3	+1.90	5.2	75.0	100.0	22.1
-1.50	86.2	15.5	86.2	15.3					
+1.50	13.8	68.3	100.0	22.8					

NOTE: Refer to Flowsheet III

TABLE 84

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7376

* Dry Basis — CALCULATED SINK-FLOAT ANALYSIS
1" x 1/2"

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	47.7	8.7	47.7	8.7
1.30-1.35	16.3	13.8	64.0	10.0
1.35-1.40	11.1	26.9	75.1	12.5
1.40-1.45	9.1	34.7	84.2	14.9
1.45-1.50	2.0	40.8	86.2	15.5
1.50-1.60	2.8	50.5	89.0	16.6
1.60-1.70	1.9	54.9	90.9	17.4
1.70-1.80	3.1	59.9	94.0	18.8
1.80-1.90	0.8	66.2	94.8	19.2
+1.90	5.2	75.0	100.0	22.1

NOTE: Refer to Flowsheet III

TABLE 85

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7376

SINK-FLOAT ANALYSIS
1/2" x 1/4"
(One Sample Used For Each Of Nine (9) S.G.'s)

* Dry Basis

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	41.7	7.9	41.7	7.9	-1.60	85.7	16.9	85.7	16.9
+1.30	58.3	37.5	100.0	25.2	+1.60	14.3	71.8	100.0	24.8
-1.35	63.4	10.8	63.4	10.8	-1.70	87.9	17.9	87.9	17.9
+1.35	36.5	48.2	100.0	24.4	+1.70	12.1	74.7	100.0	24.8
-1.40	71.2	12.5	71.2	12.5	-1.80	90.7	19.3	90.7	19.3
+1.40	28.8	55.8	100.0	25.0	+1.80	9.3	76.9	100.0	24.7
-1.45	79.6	14.8	79.6	14.8	-1.90	93.5	20.9	93.5	20.9
+1.45	20.4	61.2	100.0	24.3	+1.90	6.5	78.2	100.0	24.6
-1.50	83.6	16.1	83.6	16.1					
+1.50	16.4	66.5	100.0	24.4					

NOTE: Refer to Flowsheet III

TABLE 86

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7376

* Dry Basis

CALCULATED SINK-FLOAT ANALYSIS
1/2" x 1/4"

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	41.7	7.9	41.7	7.9
1.30-1.35	21.7	16.4	63.4	10.8
1.35-1.40	7.8	26.3	71.2	12.5
1.40-1.45	8.4	34.3	79.6	14.8
1.45-1.50	4.0	42.0	83.6	16.1
1.50-1.60	2.1	48.7	85.7	16.9
1.60-1.70	2.2	56.9	87.9	17.9
1.70-1.80	2.8	63.3	90.7	19.3
1.80-1.90	2.8	72.7	93.5	20.9
+1.90	6.5	78.2	100.0	24.6

NOTE: Refer to Flowsheet III

TABLE 87

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7376

* Dry Basis

SINK-FLOAT ANALYSIS
1/4" x 1/8"
(One Sample Used For Each Of Nine (9) S.G.'s)

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	35.9	6.9	35.9	6.9	-1.60	83.6	17.1	83.6	17.1
+1.30	64.1	36.8	100.0	26.1	+1.60	16.4	72.0	100.0	26.1
-1.35	56.2	10.4	56.2	10.4	-1.70	85.0	17.8	85.0	17.8
+1.35	43.8	47.7	100.0	26.7	+1.70	15.0	74.7	100.0	26.3
-1.40	66.1	11.9	66.1	11.9	-1.80	88.9	19.9	88.9	19.9
+1.40	33.9	54.8	100.0	26.4	+1.80	11.1	76.7	100.0	26.2
-1.45	71.5	13.0	71.5	13.0	-1.90	92.5	21.9	92.5	21.9
+1.45	28.5	61.6	100.0	26.9	+1.90	7.5	78.2	100.0	26.1
-1.50	78.2	14.9	78.2	14.9					
+1.50	21.8	67.6	100.0	26.4					

NOTE: Refer to Flowsheet III

TABLE 88

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7376

* Dry Basis — CALCULATED SINK-FLOAT ANALYSIS
1/4" x 1/8"

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	35.9	6.9	35.9	6.9
1.30-1.35	20.3	16.6	56.2	10.4
1.35-1.40	9.9	20.4	66.1	11.9
1.40-1.45	5.4	26.5	71.5	13.0
1.45-1.50	6.7	35.2	78.2	14.9
1.50-1.60	5.4	49.0	83.6	17.1
1.60-1.70	1.4	59.6	85.0	17.8
1.70-1.80	3.9	65.7	88.9	19.9
1.80-1.90	3.6	71.3	92.5	21.9
+1.90	7.5	78.2	100.0	26.1

NOTE: Refer to Flowsheet III

TABLE 89

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7376

SINK-FLOAT ANALYSIS

* Dry Basis

1/8" x 28 M

(One Sample Used For Each Of Nine (9) S.G.'s)

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	21.7	6.1	21.7	6.1	-1.60	75.2	18.5	75.2	18.5
+1.30	78.3	39.4	100.0	32.2	+1.60	24.8	68.0	100.0	30.8
-1.35	42.5	9.8	42.5	9.8	-1.70	79.4	20.6	79.4	20.6
+1.35	57.5	48.4	100.0	32.0	+1.70	20.6	70.8	100.0	30.9
-1.40	56.6	11.9	56.6	11.9	-1.80	87.0	24.4	87.0	24.4
+1.40	43.4	54.7	100.0	30.5	+1.80	13.0	75.3	100.0	31.0
-1.45	60.2	12.9	60.2	12.9	-1.90	91.0	26.4	91.0	26.4
+1.45	39.8	59.1	100.0	31.3	+1.90	9.0	76.7	100.0	30.9
-1.50	71.0	16.7	71.0	16.7					
+1.50	29.0	65.2	100.0	30.8					

NOTE: Refer to Flowsheet III

TABLE 90

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7376

* Dry Basis — CALCULATED SINK-FLOAT ANALYSIS
1/8" x 28 M

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	21.7	6.1	21.7	6.1
1.30-1.35	20.8	13.7	42.5	9.8
1.35-1.40	14.1	18.2	56.6	11.9
1.40-1.45	3.6	28.6	60.2	12.9
1.45-1.50	10.8	37.9	71.0	16.7
1.50-1.60	4.2	48.9	75.2	18.5
1.60-1.70	4.2	58.2	79.4	20.6
1.70-1.80	7.6	64.3	87.0	24.4
1.80-1.90	4.0	69.9	91.0	26.4
+1.90	9.0	76.7	100.0	30.9

NOTE: Refer to Flowsheet III

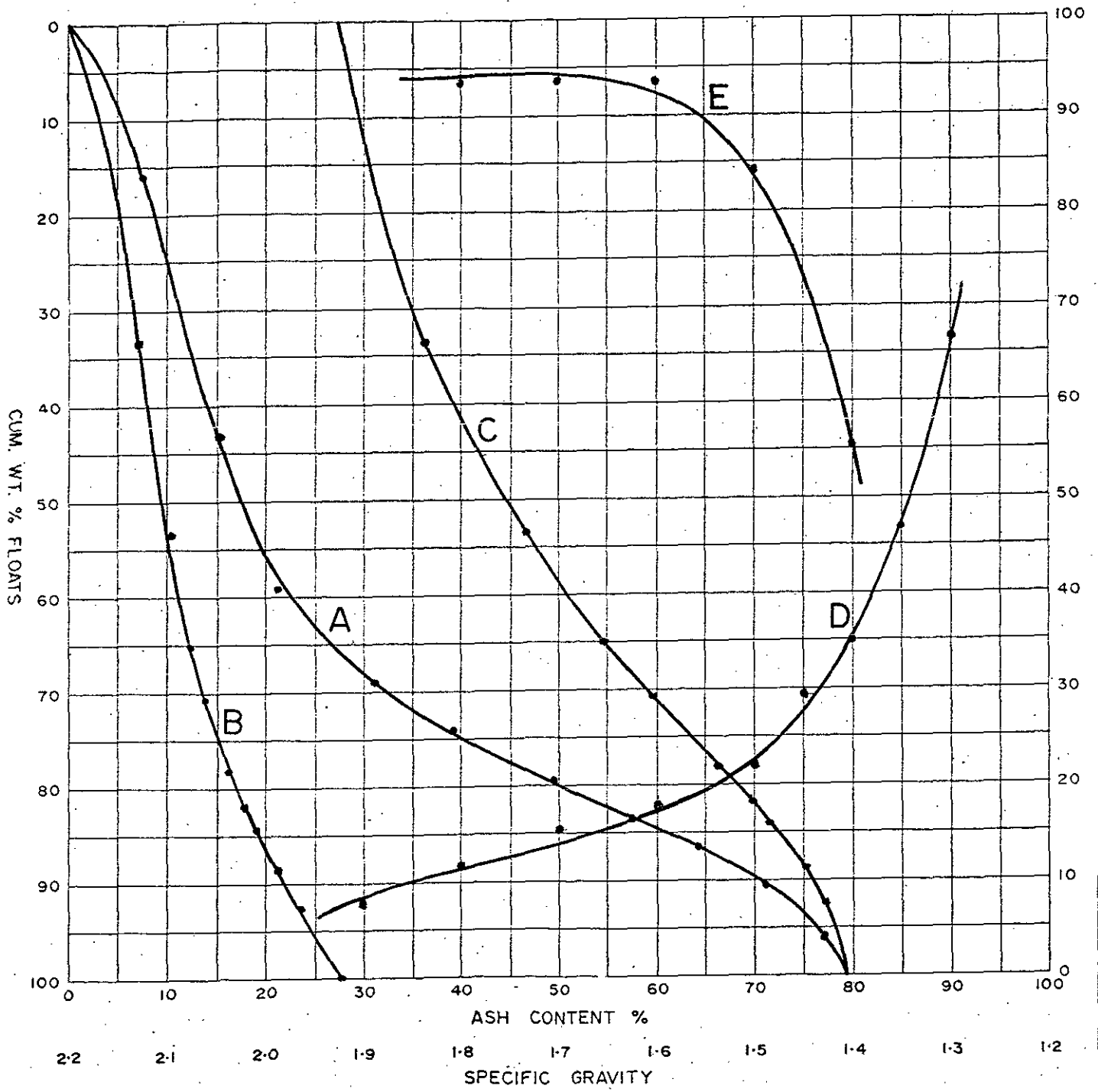
TABLE 91

B. C. HYDRO SAMPLE C LAB.7376 2" X 28M

--DIRECT--			--CUM FLOATS--				--CUM SINKS--			+-0.1 DISTR	
S.G.	WT>	ASH>	WT> ASH	CUM WT> ASH TT	ASHTT	WT>	ASH>	SINK WT ASH>	WT>	ASH>	S.G.	WT>
1	2	3	4	5	6	7	8		9	10	11	12
1.30	33.01	7.54	2.49	2.49	33.01	7.54	24.67		66.99	36.83	1.30	0.00
1.35	20.55	15.09	3.10	5.59	53.56	10.44	21.57		46.44	46.45	1.40	44.93
1.40	11.71	21.44	2.51	8.10	65.27	12.41	19.06		34.73	54.88	1.50	16.34
1.45	5.76	31.67	1.82	9.92	71.03	13.97	17.24		28.97	59.50	1.60	6.49
1.50	6.91	38.12	2.64	12.56	77.94	16.11	14.60		22.06	66.20	1.70	7.72
1.60	3.66	49.20	1.80	14.36	81.61	17.60	12.80		18.39	69.59	1.80	7.94
1.70	2.83	57.50	1.63	15.99	84.43	18.94	11.17		15.57	71.78	1.90	0.00
1.80	4.89	64.03	3.13	19.12	89.32	21.40	8.04		10.68	75.33	2.00	0.00
1.90	3.05	70.70	2.16	21.28	92.37	23.03	5.89		7.63	77.19	2.10	0.00
9.99	7.63	77.19	5.89	27.16	100.00	27.16	0.00		0.00	0.00	2.20	0.00

BIRTLEY ENGINEERING
20/07/76

THE CLASSICAL WASHABILITY CURVES



A Primary Curve

B Clean Coal Curve

C Discard Curve

D Specific Gravity – Yield Curve

E ± 0·1 S. G. Distribution Curve

FIGURE 17

BIRTLEY ENGINEERING (CANADA) LTD.	
COAL SCIENCE & MINERALS TESTING	
CLIENT	B. C. HYDRO LAB 7376
ADIT/SEAM NO.	SAMPLE C 2" x 28 M
DATE	JUL. 21/1976
SIGNED	K. M. LAU

TABLE 92

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7376

SINK-FLOAT ANALYSIS
28 M x 100M
(One Sample Used For Each Of Nine (9) S.G.'s)

* Dry Basis

S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %	S.G. FRACTION	WT %	ASH %	CUMULATIVE WT %	CUMULATIVE ASH %
-1.30	Nil	-	-	-	-1.60	68.9	24.0	68.9	24.0
+1.30	Nil	-	-	-	+1.60	31.1	66.1	100.0	37.1
-1.35	11.7	8.6	11.7	8.6	-1.70	77.8	27.2	77.8	27.2
+1.35	88.3	40.3	100.0	36.6	+1.70	22.2	70.7	100.0	36.9
-1.40	26.7	11.7	26.7	11.7	-1.80	85.1	30.3	85.1	30.3
+1.40	73.3	45.4	100.0	36.4	+1.80	14.9	74.3	100.0	36.9
-1.45	42.9	15.8	42.9	15.8	-1.90	92.9	33.5	92.9	33.5
+1.45	57.1	51.7	100.0	36.3	+1.90	7.1	78.3	100.0	36.7
-1.50	55.5	19.5	55.5	19.5					
+1.50	44.5	58.9	100.0	37.0					

NOTE: Refer to Flowsheet III

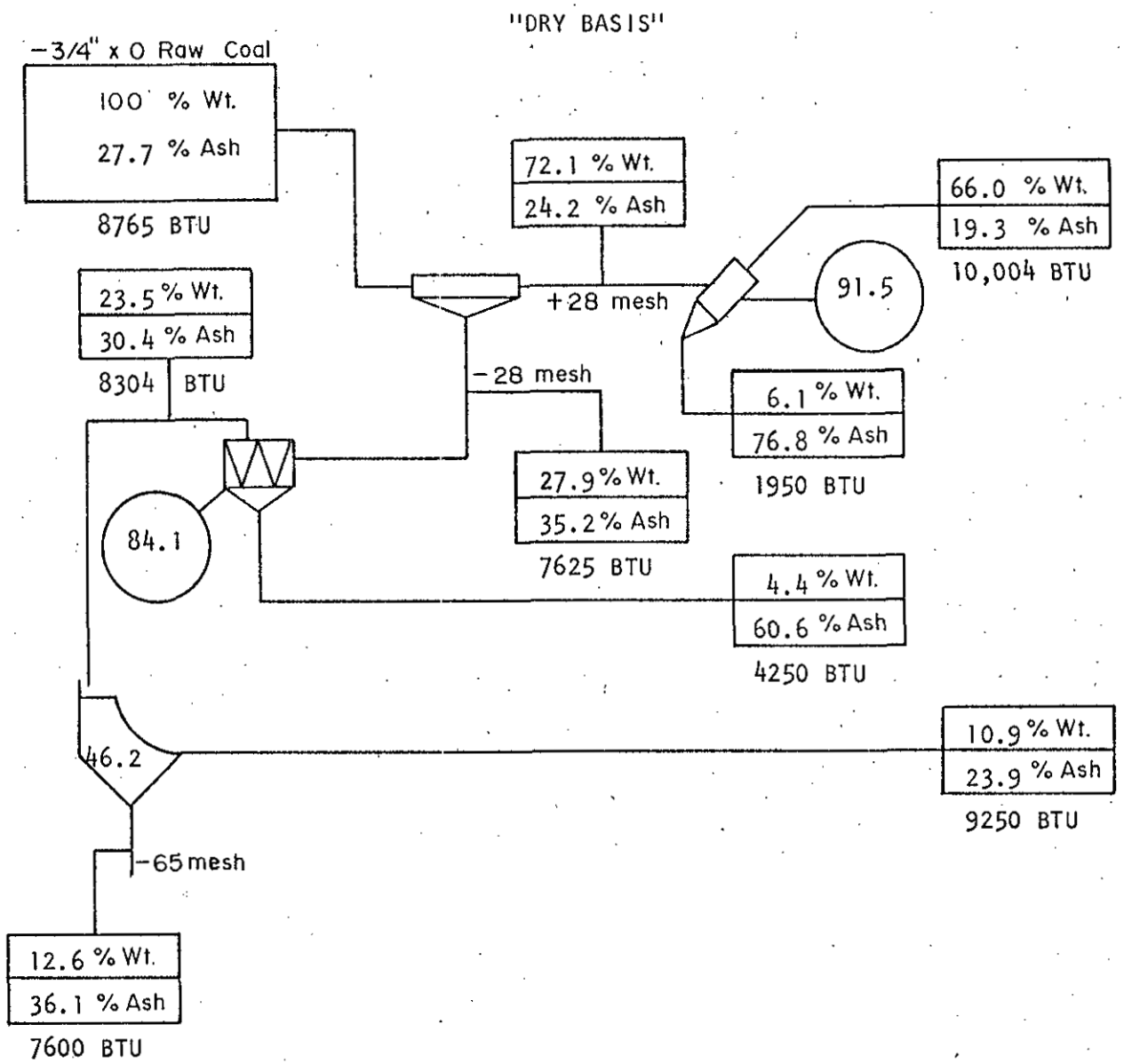
TABLE 93

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7376

* Dry Basis	CALCULATED SINK-FLOAT ANALYSIS 28 M x 100 M			
			CUMULATIVE	
S.G. FRACTION	WT %	ASH %	WT %	ASH %
-1.30	Nil	-	-	-
1.30-1.35	11.7	8.6	11.7	8.6
1.35-1.40	15.0	14.1	26.7	11.7
1.40-1.45	16.2	22.6	42.9	15.8
1.45-1.50	12.6	32.1	55.5	19.5
1.50-1.60	13.4	42.6	68.9	24.0
1.60-1.70	8.9	52.0	77.8	27.2
1.70-1.80	7.3	63.3	85.1	30.3
1.80-1.90	7.8	68.4	92.9	33.5
+1.90	7.1	78.3	100.0	36.7

NOTE: Refer to Flowsheet III

FIGURE 18



OVERALL YIELD = Actual = 76.9% @ 19.9 ash, 9897 BTU

LEGEND:

○ *CIRCUIT YIELD %* db

Wt. *WEIGHT %* Dry Basis

Ash *ASH CONTENT* (~~AR~~ ~~ADB~~ ~~MF~~)

BIRTLEY ENGINEERING (CANADA) LTD.

Title	Date
PLANT BALANCE B.C. HYDRO SAMPLE "C" LAB NO. 7369	
	Drawn

TABLE 94

BIRTLEY ENGINEERING (CANADA) LTD.

Coal Science & Minerals Testing Div.

BULK WASHING DATA*

ADIT Sample "C" LAB. NO. 7369 DATE OF WASH 24 June, 1976

Raw Coal Analysis: A.D.M. 10.0 Ash% 27.7 F.S.I. - H.G.I. 43 (adb)

Delivered Bulk Weight - Metric Tons

Washed Weight 4.748 Metric Tons

* All weight and analyses are on ~~AXXXXXXX~~ Dry Basis unless otherwise indicated.

TABLE 95

BULK WASHING DATA

HEAVY MEDIUM CIRCUIT

ADIT Sample "C" LAB. NO. 7369

1. S.G. of Separation 1.55
2. Feed Ash Content 24.2 %
3. Clean Coal Estimated Weight 3.149 M.T.
4. Clean Coal Analysis - Ash 19.3 %
5. Reject Estimated Weight 0.273 M.T.
6. Reject Analysis - Ash 76.8 %
7. Estimated 3/4" X 28M in Circuit 3.422 M.T. 72.1 Wt.%
8. Yield Clean Coal (Weighted): $\frac{3}{3+5}$ 92.0 %
9. Yield Clean Coal (Calculated Ash Balance) - $\frac{6-2}{6-4}$ 91.5 %

TABLE 96

BULK WASHING DATA

WATER ONLY CYCLONE CIRCUIT

ADIT Sample "C" LAB. NO. 7369

1. Vortex Finder Clearance (VFC) 6.35 CM 2 1/2 Inches
2. Feed Pressure 1.4 KG/CM^2 20 P.S.I.
3. Feed Rate 23.2 $M^3/Hr.$ 85 LG/Min.
4. Feed Pulp Density 150-200 g/l. 15-20 Solids W/V
5. Sample Analysis:- Dry Basis

	SCREEN SIZE	WT. %	ASH %	F.S.I.	CUM WT. %	CUM ASH %	HEAD ASH
FEED	-	-	-	-	-	-	35.2
O'FLOW	+65M	46.2	-	-	46.2	-	
	65M X O	53.8	-	-	100.0	-	30.4
U'FLOW	-	-	-	-	-	-	60.6
S B O	-	-	-	-	-	-	23.8
T C O*	+325M	-	-	-	-	-	-
	325M X O	-	-	-	-	-	

6. Yield - Total W.O. Cyclone Circuit = 84.1
7. Est. Yield of 28 X 65 Mesh Coal = 10.9 (as % of 28 Mesh X O Feed)
8. Est. 28M X O in circuit (Plant Feed - HM Products) 1.326 M.T. 27.9 %

* Thickner Cyclone Overflow

TABLE 97

BULK WASHING DATA

ADIT Sample "C" LAB. NO. 7369 DATE OF WASH 24 June, 1976

a) Raw Coal

Ash % = 27.7

Estimated Washed Wt. = 4.748 M.T.

b) Heavy Media Circuit

Estimated Proportion of +28 Mesh in Feed = 72.1

Effective S.G. = 1.55

Raw Feed	24.2	%Ash
Clean Coal	19.3	%Ash
Reject	76.8	%Ash

Calculated Yield = 91.5

Weighed Yield = 92.0

c) Water-Only Cyclone Circuit

Raw Feed	35.2	%Ash
Overflow	30.4	%Ash
Underflow	60.6	%Ash

Calculated Yield = 84.1

% of +65 Mesh in O/F = 46.2

Sieve Bend Overflow 23.8 %Ash

Wt., ash, yield on dry basis

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7369

TABLE 98

PLANT WASH SAMPLES

PLANT PRODUCT	% A.D.M.	% RM % TOTAL MOIST.	ASH %	VOL %	F.C. %	S. %	BTU/LB	CALC. FACTORS
Heavy	-	19.5	19.5	-	-	-	7430	air dry basis
Media	-	-	-	-	-	-	-	-
Feed	-	-	24.2	-	-	-	9230	dry basis
H.M.	9.1	27.1	14.1	29.9	28.9	0.54	7293	air dry basis
Clean Coal	-	33.7	12.8	27.2	26.3	0.49	6629	as rec'd basis
@ 1.55 S.G.	-	-	19.3	41.0	39.7	0.74	10004	dry basis
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
H.M.	10.2	12.9	67.0	-	-	-	(1698)	air dry basis
Reject	-	21.8	60.2	-	-	-	(1525)	as rec'd basis
@ 1.55 S.G.	-	-	76.8	-	-	-	(1950)	dry basis
Water Only Cyclone Feed	5.2	33.4	-	-	-	-	7228	air dry basis
	-	-	-	-	-	-	-	-
	-	35.2	-	-	-	-	7625	dry basis
Water Only Cyclone Overflow	-	5.6	28.7	-	-	-	7839	air dry basis
	-	-	-	-	-	-	-	-
	-	-	30.4	-	-	-	8304	dry basis
Water Only Cyclone Underflow	-	3.6	58.4	-	-	-	(4097)	air dry basis
	-	-	-	-	-	-	-	-
	-	-	60.6	-	-	-	(4250)	dry basis
Sieve Bend Overflow	-	5.9	22.4	-	-	-	8704	air dry basis
	-	-	-	-	-	-	-	-
	-	-	23.8	-	-	-	9250	dry basis
Sieve Bend Underflow	-	5.1	34.3	-	-	-	7212	air dry basis
	-	-	-	-	-	-	-	-
	-	-	36.1	-	-	-	7600	dry basis
Thickener Solids	-	6.7	42.8	-	-	-	(5869)	air dry basis
	-	-	-	-	-	-	-	-
	-	-	45.9	-	-	-	(6290)	dry basis

BTU values in brackets taken off Ash BTU Curve

TABLE 99

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO. 7369

SIZE AND SINK-FLOAT ANALYSIS - PLANT PRODUCTS		
SIZE ANALYSIS OF W.O.C. OVERFLOW		
SIZE FRACTION	WT %	CUM WT %
+ 65 M	46.2	46.2
- 65 M	53.8	100.0
SINK-FLOAT ANALYSIS: + 65M W.O.C. OVERFLOW		
S.G.	WT %	CUM WT %
- 1.65	74.7	74.7
+ 1.65	25.3	100.0
SIZE ANALYSIS OF W.O.C. UNDERFLOW		
SIZE FRACTION	WT %	CUM WT %
+ 65 M	59.5	59.5
- 65 M	40.5	100.0
SINK-FLOAT ANALYSIS: + 65 M W.O.C. UNDERFLOW		
S.G.	WT %	CUM WT %
- 1.65	25.3	25.3
+ 1.65	74.7	100.0
SINK-FLOAT ANALYSIS: H.M. C.C. (- 1.65 S.G.)		
S.G.	WT %	CUM WT %
- 1.65	93.6	93.6
+ 1.65	6.4	100.0
SINK-FLOAT ANALYSIS: H.M. REJECT (@ 1.65 S.G.)		
S.G.	WT %	CUM WT %
- 1.65	1.5	1.5
+ 1.65	98.5	100.0

TABLE 100

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7369

ANALYSIS OF
CLEAN COAL MIX

PROXIMATE					BTU/LB	S.G. OF COAL	H.G.I.	EQUIL. MOIST. %	
A.D.M. %	RM %	ASH %	VM %	FC %					
22.5	12.4	17.8	34.3	35.5	8608	1.45	37	27.3	air dry basis
-	32.1	13.8	26.6	27.5	6671	-	-	-	as rec. basis
-	-	20.3	39.2	40.5	9827	-	-	-	dry basis

S.G. OF ASH	ASH FUSION TEMPERATURES (°F)					SULFUR FORMS (adb)			
	ATMOS.	INITIAL DEFORM.	SOFTENING	HEMISPHERICAL	FLUID	TOTAL S %	SULPHATE S %	SULFIDE S %	ORGANIC S %
2.63	Oxid.	2590	2650+	-	-	0.72	0.03	0.13	0.56
-	Red.	2460	2650+	-	-	-	-	-	-

MINERAL ANALYSIS OF ASH											
Na_2O	K_2O	MgO	CaO	Fe_2O_3	Al_2O_3	SiO_2	SO_3	P_2O_5	TiO_2	Mn_3O_4	V_2O_5
0.73	0.54	1.99	3.64	5.86	29.32	52.84	3.30	0.25	1.32	0.03	0.05

ULTIMATE ANALYSIS							(adb) % P ON COAL	(adb) % CO2 ON COAL	(adb) % Cl ON COAL
% H_2O	% C	% H	% N	% S	% ASH	% O DIFF.			
10.53	49.46	4.96	1.10	0.72	18.13	15.10	0.02	0.19	0.19

F.S.I.	RUHR DILATOMETER TEST TABLE 130					WATER SOLUBLE ALKALIES as % Na_2O
	SOFTENING TEMP °C	MAXIMUM DILATATION TEMP °C	MAXIMUM CONTRACTION %	MAX. DILAT. %	G. NO.	
N.A.	NO REACTIVITY					0.03

TABLE 101

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7369

ASH FUSION TEMPERATURES (°F)					
SAMPLE DESCRIPTION	ATMOS	INITIAL DEFORMATION	SOFTENING	HEMISPHERICAL	FLUID
H.M. C.C. @ 1.55 S.G.	Oxidizing	2650+	-	-	-
	Reducing	2480	2620	2650	2650+
Sieve Bend Overflow	Oxidizing	2580	2650+	-	-
	Reducing	2430	2550	2580	2660

CLIENT: B.C. HYDRO
SAMPLE: "C"
LAB NO.: 7369

MINERAL ANALYSIS OF ASH												
SAMPLE	$\%Na_2O$	$\%K_2O$	%MgO	%CaO	$\%Fe_2O_3$	$\%Mn_3O_4$	$\%Al_2O_3$	$\%SiO_2$	$\%SO_3$	$\%P_2O_5$	$\%TiO_2$	$\%V_2O_5$
H.M. C.C. @ 1.55	0.69	0.54	2.07	3.92	5.69	0.03	29.62	51.78	3.64	0.22	1.45	0.11
S.B.O.	0.54	0.56	1.91	3.50	4.90	0.03	30.32	52.68	3.24	0.17	1.38	0.08

Results done on adried basis.

TABLE 102

4. DISCUSSION OF RESULTS

4.1 LABORATORY ANALYSES AND WASHABILITY DATA

It has already been mentioned that difficulties were encountered when sink-floating Sample "A" due to the combination of low rank coal and high proportions of intergrown and finely banded clay material. The washability curves for "A" were redrawn after smoothing and certain anomalous bumps which were attributable to the above and the necessity of resorting to the sink-float procedures described in Section 2. The assumed washability curves for "A" are shown in Tables 26 to 32 and Figure 9.

4.1.1 GENERAL WASHABILITY CHARACTERISTICS

Samples "A" and "B" possessed poor washability characteristics i.e. high proportions of near gravity material and difficult yield-ash results showing that the coal is "dirty" coal and that the inert material is finely spread throughout the coal itself and not just restricted to shale or clay bands.

The similarity between the washability characteristics of the -2" X 28Mesh and the -3/4" X 28Mesh (Compare Figures 7 and 9 for "A" and 11 and 13 for "B" and 15 and 17 for "C") and the very poor characteristics of the 28 X 100M fractions show that it would not be advantageous to crush this coal to liberate additional coal.

Due to the problems created by varying moisture levels, all of the washability results have been shown on a dry basis.

4.1.2 YIELD-ASH CHARACTERISTICS

Summarized in Tables 104 and 105.

The linear nature of the S.G. yield curves (particularly for "A" and "B") does make the selection of an optimum clean coal yield and ash value most difficult, i.e. there is no point at which the yield levels off for increase in S.G. An alternative approach is to select a reject ash level of say 70% and then determine the S.G. of separation and clean coal yield and ash content (see page 140).

RESULTS SUMMARY

	RAW COAL					CLEAN COAL				
SAMPLE	ASH %	BTU/LB	S%	I.D.T.(R)*	YIELD %	ASH %	BTU/LB	S%	I.D.T.(O)	BASIS
A	35.9	4052	-	-	-	21.9	5487	-	-	a.r.b.
	50.5	5700	1.07	2350	51.2	32.4	8122	1.08	2330	d.b.
B	24.3	5469	-	-	-	13.7	5688	-	-	a.r.b.
	34.6	7793	0.94	2500	65.9	22.7	9421	0.67	2510	d.b.
C	19.7	6248	-	-	-	13.8	6671	-	-	a.r.b.
	27.7	8765	0.60	2650	76.9	20.3	9827	0.72	2460	d.b.

* Initial Deformation Temp. °F Reducing Atmosphere

a.r.b. - As Received Basis

d.b. - Dry Basis

TABLE 103

SUMMARY OF WASHABILITY RESULTS FOR THE
2" x 28 MESH FRACTION OF THE RAW COAL CRUSHED TO MINUS 2"

SAMPLE	ASH %	YIELD %	ASH OF SINKS %	S.G. OF SEPARATION	AMOUNT ON NEAR GRAVITY MATERIAL	ESTIMATED DRY CALORIFIC VALUE BTU/LB	EST. CALORIFIC VALUE WITH 25% TOT. MOIST.
A	15	26.0	60.0	1.39	32.5	10,525	7,894
	20	37.0	65.0	1.47	26.0	9,840	7,380
	25	47.5	70.0	1.54	24.0	9,155	6,870
	30	58.0	74.0	1.78	23.0	8,470	6,350
B	15	40.0	48.0	1.38	62.0	10,525	7,894
	20	58.0	56.0	1.47	35.0	9,840	7,380
	25	77.0	67.0	1.64	12.0	9,155	6,870
	30	91.0	75.0	1.90	9.0	8,470	6,350
C	15	75.0	64.0	1.47	18.0	10,525	7,894
	20	87.0	74.0	1.70	6.0	9,840	7,380
	25	92.0	77.0	1.90	6.0	9,155	6,870
	30	100.0	79.0	+2.2	6.0	8,470	6,350

* Results on a dry basis unless stated otherwise

TABLE 104

SUMMARY OF WASHABILITY RESULTS FOR THE
3/4" x 28 MESH FRACTION OF THE RAW COAL CRUSHED TO MINUS 3/4"

SAMPLE	ASH %	YIELD %	ASH OF SINKS %	S.G. OF SEPARATION	AMOUNT ON NEAR GRAVITY MATERIAL	ESTIMATED DRY CALORIFIC VALUE BTU/LB	EST. CALORIFIC VALUE WITH 25% TOT. MOIST.
A	15	27.5	64.0	1.37	27.5	10,525	7,894
	20	37.5	68.0	1.47	25.0	9,840	7,380
	25	47.5	74.0	1.54	23.0	9,155	6,870
	30	56.0	77.0	1.62	22.0	8,470	6,350
B	15	42.5	47.5	1.40	40.0	10,525	7,894
	20	60.0	56.0	1.51	31.0	9,840	7,380
	25	77.5	67.0	1.67	17.5	9,155	6,870
	30	90.0	72.5	+2.2	5.0	8,470	6,350
C	15	77.5	69.0	1.52	14.0	10,525	7,894
	20	88.0	71.0	1.83	8.0	9,840	7,380
	25	97.0	75.5	2.12	8.0	9,155	6,870
	30	100.0	76.0	2.2	8.0	8,470	6,350

* Results on a dry basis unless stated otherwise

TABLE 105

TABLE 106

CUT POINT DERIVED FROM 70% ASH CONTENT OF SINKS
(3/4" x 28 Mesh Results)

SAMPLE	ASH % OF SINKING	S.G. OF SEPARATION	CLEAN COAL	
			ASH %	YIELD %
A	70	1.47	20	38
B	70	1.73	27	83
C	70	1.83	15	78

* Dry Basis

4.2 BULK WASHING RESULTS

The bulk washing results are summarized for Samples "A", "B", and "C" on Figs. 10 ,14 and 18 respectively. A further summary of the as shipped results can be seen in Table 137, these figures assume 25% total moisture in the raw coal and 30% total moisture in the clean coal. Assumed figures were necessary for the clean coal moisture content since the surface moisture content of the clean coal can be varied depending upon the method of drying. In addition, our pilot plant is not equipped with a basket centrifute to dewater the clean coal.

The pilot plant wash did reveal some important facts which would be extremely helpful when considering the feasibility and design of a preparation plant to wash the Hat Creek coals:

a) The proportion of minus 28 Mesh coal from the pilot plant actual screening work was much greater than the indicated proportion from the laboratory air drying and dry screening. This clearly shows that certain portions of the raw coal, in particular the clays, break down in the water circuits.

SUMMARY OF PILOT PLANT WASHING RESULTS ON AN "AS SHIPPED" BASIS

SAMPLE	RAW COAL*			CLEAN COAL**		
	WT %	ASH %	C.V. BTU/LB	WT %	ASH %	C.V. BTU/LB
A	100	37.9	4275	54.8	22.7	5690
B	100	26.0	5840	70.6	15.9	6590
C	100	20.8	6574	82.4	14.2	6880

* Containing 25% Total Moisture

** Containing 30% Total Moisture

TABLE 107

b) As a follow up to the above, the clays broke down whilst in the dense medium cyclone circuit and unusually high proportions of non-magnetics were noted in the magnetics fraction of the recovery circuit. Sophisticated magnetic recovery circuits would therefore be necessary in a dense medium system particularly if the raw coal quality is to be similar to "A".

c) The yield values from the dense medium cyclone circuit above were higher than the theoretical values as indicated by the sink-float data. This phenomenon is mainly attributed to breakage of clay particles in the water reporting to the minus 28Mesh fractions and thus reducing the ash content of the Heavy Medium Cyclone feed.

d) The oversize clay particles from the 2 1/4" feed scalping screen were extremely difficult to crush and handle. Similar problems can be expected in a commercial scale plant. We suggest that further work be carried out to study the possibilities of removing as much clay as possible prior to feeding the raw coal into a plant. (Our 3/4" opening trommel screen finally blinded after 6 hours when washing "A" sample).

e) Additional work is necessary in the field of dewatering the minus 28Mesh material otherwise massive tailings lagoons will have to be constructed for the proposed plant.

f) Due to the high proportion of fine material in the plant feed, it will probably prove worthwhile to beneficate the minus 28M coal to some extent. (The initial sink-float work suggested that cleaning the fines was probably not advantageous).

g) Due to the amounts of near gravity material, dense medium washing circuits, particularly for "A" and "B" will probably be necessary.

APPENDIX A

CORE LABORATORIES - CANADA LTD.
Petroleum Reservoir Engineering

P. O. BOX 5670, POSTAL STATION "A"
CALGARY, ALBERTA T2H 1Y1
TELEPHONE: 253-3391

July 7, 1976

Birtley Engineering (Canada) Ltd.
P. O. Box 5488, Postal Station "A"
Calgary, Alberta
T2H 1X9

Attention: Mr. Don F. Symonds

Re: Analysis of Clay Samples from
B.C. Hydro Sample A-7365/66
Our File Number: 7061-6268

Gentlemen:

The analysis of the above samples showed the following.

Sample 1:

Water Content	6.3%
Mineral Content	83.3%

X-Ray Diffraction Analysis of Mineral Portion

Quartz	14
Feldspar	9
Pyrite	6
Siderite	4
Kaolinite	57
Montmorillonite	10

Sample 2:

Water Content	6.3%
Mineral Content	83.8%

X-Ray Diffraction Analysis of Mineral Portion

Quartz	18
Feldspar	9
Pyrite	5
Siderite	5
Kaolinite	50
Montmorillonite	13

....2

Birtley Engineering (Canada) Ltd. 7061-6268

Sample 3: Water Content 7.6%
Mineral Content 80.7%

X-Ray Diffraction Analysis of Mineral Portion

Quartz	16
Feldspar	8
Pyrite	Trace
Siderite	Nil
Kaolinite	60
Montmorillonite	16

Sample 4: Water Content 4.0%
Mineral Content 94.8%

X-Ray Diffraction Analysis of Mineral Portion

Quartz	25
Feldspar	20
Pyrite	Nil
Siderite	Nil
Kaolinite	48
Montmorillonite	7

The samples were dried in a constant humidity oven at 145°F and 50% relative humidity for four days. A Dean and Stark analysis was performed to measure the remaining water; an ash analysis to determine the mineral content and an x-ray diffraction analysis to determine the type and quantity of the clay components.

Assuming that all the water present is intramicellar (inter-layer) water associated with the montmorillonite, the ratio of water to montmorillonite is 0.756/1, 0.579/1, 0.589/1 and 0.602/1 for sample one to four, respectively. By calculating, the molecular ratio between the water and montmorillonite are 15.1, 11.6, 11.8 and 12.0 for samples one to four, respectively.

The above calculations are based on the assumption that all the water is present as intramicellar water associated with the montmorillonite. The ratio of water to montmorillonite is higher than published values (0.15 to 0.20/1) for samples dried at 145°F and 50% relative humidity. This may indicate that all the free water had not been removed or that a portion of the water had been present as intermicellar (inter-particle) being adsorbed between the montmorillonite particles rather than being adsorbed within the particles.

Yours truly,
CORE LABORATORIES-CANADA LTD.

J. R. Jackson

JRJ:lr

CHEMEX
LABS (ALBERTA) LTD.

July 28, 1976
Project No.: 90-04-02

ANALYSES OF EFFLUENTS

FROM PLANT WASHES OF SAMPLES A, B, AND C

FROM THE

HAT CREEK PROJECT

FOR

B.C. HYDRO AND POWER AUTHORITY

EDMONTON 230 - 10150 - 100 STREET, EDMONTON, CANADA T5J 0P6 TEL: (403) 424-0314
CALGARY 2021 - 41 AVENUE N.E., CALGARY, CANADA T2E 6P2 TEL: (403) 276-9627 TELEX: 038-25541

CERTIFICATE OF ANALYSIS

CHEMEX
LABS (ALBERTA) LTD.
ANALYTICAL AND CONSULTING CHEMISTS

2021 - 41 AVE. N.E.
Calgary, Canada T2E 6P2
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Coal Science & Minerals Testing

PROJECT NO. 90-04-02

SEMI QUANTITATIVE SPECTROGRAPHIC ANALYSES
Static Thickener O/F/O
Supernatant Liquid

Sample No.:	Lower Concentration Limit (ppb)	A	B	C
Antimony	50	bcl	bcl	bcl
Arsenic	50	bcl	bcl	bcl
Barium	5	100	250	250
Beryllium	5	bcl	bcl	bcl
Bismuth	5	bcl	bcl	bcl
Boron	20	300	500	500
Cadmium	20	bcl	bcl	bcl
Calcium	0.05 ppm	30	30	25
Chromium	10	bcl	bcl	bcl
Cobalt	10	bcl	bcl	bcl
Copper	1	2	2	5
Gallium	2	bcl	bcl	2
Germanium	20	bcl	bcl	bcl
Iron	0.05 ppm	0.30	0.15	1.5
Lead	5	15	10	5
Magnesium	0.02 ppm	30	30	25
Manganese	5	2	5	5
Molybdenum	10	20	10	10
Nickel	5	2	bcl	5
Niobium	50	bcl	bcl	bcl
Silver	1	bcl	bcl	bcl
Strontium	20	200	200	50
Tantalum	200	bcl	bcl	bcl
Tellurium	200	bcl	bcl	bcl
Thorium	100	bcl	bcl	bcl
Tin	10	bcl	bcl	bcl
Titanium	5	30	20	100
Vanadium	10	20	10	20
Zinc	50	bcl	20	20
Zirconium	20	bcl	bcl	5

>5000 ppb = >5000 ppb
5000 ppb = 2500-10000ppb
2000 ppb = 1000-4000 ppb
1000 ppb = 500-2000 ppb
500 ppb = 250-1000 ppb
200 ppb = 100-400 ppb
100 ppb = 50-200 ppb

50 ppb = 25-100 ppb
20 ppb = 10-50 ppb
10 ppb = 5-20 ppb
5 ppb = 2-10 ppb
2 ppb = 1-4 ppb
1 ppb = 0.5-2 ppb
bcl = below concentration limit

Ranges for Iron, Calcium & Magnesium are reported in ppm.

CTA MEMBER CANADIAN TESTING ASSOCIATION

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Coal Science & Minerals Testing

PROJECT NO. 90-04-02

SEMI QUANTITATIVE SPECTROGRAPHIC ANALYSES
Slimes Cone Tank
Supernatant Liquid

Sample No.:	Lower Concentration Limit (ppb)	A	B	C
Antimony	50	bcl	bcl	bcl
Arsenic	50	bcl	bcl	50
Barium	5	200	500	500
Beryllium	5	bcl	bcl	bcl
Bismuth	5	bcl	bcl	bcl
Boron	20	500	500	50
Cadmium	20	bcl	bcl	bcl
Calcium	0.05 ppm	35	35	2.5
Chromium	10	bcl	bcl	50
Cobalt	10	bcl	bcl	bcl
Copper	1	5	bcl	20
Gallium	2	bcl	bcl	20
Germanium	20	bcl	bcl	bcl
Iron	0.05 ppm	2.0	0.35	10
Lead	5	10	5	10
Magnesium	0.02 ppm	18	35	7.5
Manganese	5	bcl	10	10
Molybdenum	10	40	10	bcl
Nickel	5	10	bcl	20
Niobium	50	bcl	bcl	bcl
Silver	1	bcl	bcl	bcl
Strontium	20	100	200	50
Tantalum	200	bcl	bcl	bcl
Tellurium	200	bcl	bcl	bcl
Thorium	100	bcl	bcl	bcl
Tin	10	bcl	bcl	bcl
Titanium	5	75	2	500
Vanadium	10	25	20	50
Zinc	50	bcl	20	30
Zirconium	20	10	bcl	30

>5000 ppb = >5000 ppb
5000 ppb = 2500-10000 ppb
2000 ppb = 1000-4000 ppb
1000 ppb = 500-2000 ppb
500 ppb = 250-1000 ppb
200 ppb = 100-400 ppb
100 ppb = 50-200 ppb
50 ppb = 25-100 ppb
20 ppb = 10-50 ppb
10 ppb = 5-20 ppb
5 ppb = 2-10 ppb
2 ppb = 1- 4 ppb
1 ppb = 0.5-2 ppb
bcl = below concentration limit

Rnages for Iron, Calcium & Magnesium are reported in ppm.

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Certified by H. Bradley

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PROJECT NO. 90-04-02

WATER ANALYSES

Parameter		Static Thickener O/F/O Supernatant Liquid		
		A	B	C
pH		7.7	8.0	7.7
Conductivity	µmho/cm	420	400	350
Alkalinity	ppmas $CaCO_3$	85.2	82.2	64.2
Acidity	ppmas $CaCO_3$	--	--	--
Total Dissolved Solids	ppm	304	304	284
Fluoride	ppm	0.17	0.21	0.22
Cadmium	ppm	<0.001	<0.001	<0.001
Beryllium	ppm	<0.005	<0.005	<0.005
Selenium	ppm	<0.001	<0.001	<0.001
Mercury	ppm	<0.0001	<0.0001	<0.0001
Lead	ppm	0.010	0.001	0.003
Vanadium	ppm	0.018	0.008	0.015
Lithium	ppm	0.017	0.011	0.008
Copper	ppm	0.002	0.003	0.005
Arsenic	ppm	<0.005	<0.005	<0.005
Strontium	ppm	0.230	0.150	0.070

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WATER ANALYSES

Parameter		Slimes Cone Tank Supernatant Liquid		
		A	B	C
pH		8.0	7.5	2.3
Conductivity	µmho/cm	520	450	600
Alkalinity	ppmas $CaCO_3$	79.2	93.6	--
Acidity	ppmas $CaCO_3$	--	--	85.3
Total Dissolved Solids	ppm	372	348	488
Fluoride	ppm	0.17	0.25	0.63
Cadmium	ppm	<0.001	<0.001	<0.001
Beryllium	ppm	<0.005	<0.005	<0.005
Selenium	ppm	0.002	<0.001	0.003
Mercury	ppm	0.0005	0.0005	0.0003
Lead	ppm	0.001	0.003	0.021
Vanadium	ppm	0.026	0.020	0.060
Lithium	ppm	0.025	0.011	0.020
Copper	ppm	0.004	0.003	0.060
Arsenic	ppm	<0.005	<0.005	0.048
Strontium	ppm	0.170	0.200	0.080

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PROJECT NO. 90-04-02

96 HOUR STATIC FISH BIOASSAY

Sample: Static Thickner O/F/P Supernatant Liquid "A"

Date Sampled: July 7, 1976

Fish Species: Salmo gairdneri (Fingerling Rainbow Trout)

Number of Fish per Tank: 10

Fish Size: 3 - 4 cm. length. Average 1 gram wt.

Fish Condition: Healthy

Fish Source: Tacoma, Washington Hatchery, U.S.A.

Conditions of Test: The fish were acclimatized for over 30 days in dilution water with less than 5% mortalities, and no appearance of abnormatlities. Dilution was City of Calgary tap water. The sample was aerated for the duration of the test.

pH: 7.7

Dissolved Oxygen: 9.0

Temperature: 14°C

Results of the Test:

100% Sample - 96 Hours = T_L100

All fish appeared healthy at completion of the test.

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PROJECT NO. 90-04-02

96 HOUR STATIC FISH BIOASSAY

Sample: Static Thickner O/F/P Supernatant Liquid "B"

Date Sampled: July 7, 1976

Fish Species: Salmo gairdneri (Fingerling Rainbow Trout)

Number of Fish per Tank: 10

Fish Size: 3 - 4 cm. length. Average 1 gram wt.

Fish Condition: Healthy

Fish Source: Tacoma, Washington Hatchery, U.S.A.

Conditions of Test: The fish were acclimatized for over 30 days in dilution water with less than 5% mortalities, and no appearance of abnormatlities. Dilution was City of Calgary tap water. The sample was aerated for the duration of the test.

pH: 8.0

Dissolved Oxygen: 9.0

Temperature: 14°C

Results of the Test:

100% Sample - 96 Hours = T_L100

All fish appeared healthy at completion of the test.

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96 HOUR STATIC FISH BIOASSAY

Sample: Static Thickner O/F/P Supernatant Liquid "C"

Date Sampled: July 7, 1976

Fish Species: Salmo gairdneri (Fingerling Rainbow Trout)

Number of Fish per Tank: 10

Fish Size: 3 - 4 cm. length. Average 1 gram wt.

Fish Condition: Healthy

Fish Source: Tacoma, Washington Hatchery, U.S.A.

Conditions of Test: The fish were acclimatized for over 30 days in dilution water with less than 5% mortalities, and no appearance of abnormatlities. Dilution was City of Calgary tap water. The sample was aerated for the duration of the test.

pH: 7.7

Dissolved Oxygen: 9.5

Temperature: 14°C

Results of the Test:

100% Sample - 96 Hours = T_L100

All fish appeared healthy at completion of the test.

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PROJECT NO. 90-04-02

96 HOUR STATIC FISH BIOASSAY

Sample: Slimes Cone Tank Supernatant Liquid "A"

Date Sampled: July 7, 1976

Fish Species: Salmo gairdneri (Fingerling Rainbow Trout)

Number of Fish per Tank: 10

Fish Size: 3 - 4 cm. length. Average 1 gram wt.

Fish Condition: Healthy

Fish Source: Tacoma, Washington Hatchery, U.S.A.

Conditions of Test: The fish were acclimatized for over 30 days in dilution water with less than 5% mortalities, and no appearance of abnormatlities. Dilution was City of Calgary tap water. The sample was aerated for the duration of the test.

pH: 8.0

Dissolved Oxygen: 9.5

Temperature: 14°C

Results of the Test:

100% Sample - 96 Hours = T_L100

All fish appeared healthy at completion of the test.

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96 HOUR STATIC FISH BIOASSAY

Sample: Slimes Cone Tank Supernatant Liquid "B"

Date Sampled: July 7, 1976

Fish Species: Salmo gairdneri (Fingerling Rainbow Trout)

Number of Fish per Tank: 10

Fish Size: 3 - 4 cm. length. Average 1 gram wt.

Fish Condition: Healthy

Fish Source: Tacoma, Washington Hatchery, U.S.A.

Conditions of Test: The fish were acclimatized for over 30 days in dilution water with less than 5% mortalities, and no appearance of abnormatlities. Dilution was City of Calgary tap water. The sample was aerated for the duration of the test.

pH: 7.5

Dissolved Oxygen: 10.0

Temperature: 14°C

Results of the Test:

100% Sample - 96 Hours = T_L100

All fish appeared healthy at completion of the test.

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PROJECT NO. 90-04-02

96 HOUR STATIC FISH BIOASSAY

Sample: Slimes Cone Tank Supernatant Liquid "C"

Date Sampled: July 7, 1976

Fish Species: Salmo gairdneri (Fingerling Rainbow Trout)

Number of Fish per Tank: 10

Fish Size: 3 - 4 cm. length. Average 1 gram wt.

Fish Condition: Healthy

Fish Source: Tacoma, Washington Hatchery, U.S.A.

Conditions of Test: The fish were acclimatized for over 30 days in dilution water with less than 5% mortalities, and no appearance of abnormatlities. Dilution was City of Calgary tap water. The sample was aerated for the duration of the test.

pH: 2.3

Dissolved Oxygen: 8.5

Temperature: 14°C

Results of the Test:

100% Sample - 96 Hours = T_L100

All fish appeared healthy at completion of the test.

Certified by .....