SECOND INTERIM REPORT

BABCOCK AREA

MAY 1973

VOLUME II

GEOLOGY RESERVES AND QUALITY

Prepared by the

Quintette Joint Venture

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U. S. A.

(Includes pgs. 1 - 56
Summary
Geology
Reserves
Quality)

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VOLUME II

SECOND INTERIM REPORT

BABCOCK AREA

SUMMARY

Within the relatively flat-lying Lower Cretaceous Gates Formation at Babcock Mountain in Northeastern British Columbia, 302 million short tons of proven coal have been located in six seams of some economic significance. These seams, designated D,E,F,G,I, and J, range in thickness from 5 to 22 feet although the important upper ones, D,E and F are usually 6 to 10 feet thick while seam J ranges from 14 to 22 feet in thickness.

The present reserve area encompasses a broad monocline on Babcock Mountain. The seams dip up to 15^{c} but are usually less than 10^{o}. Although the reserve area is bounded by a fault on one side and a fold on the other, structeral disturbances within the reserve area are rare. The major fold which marks the southwest side of the reserve area is itself a major asset as it has real potential for the development of hydraulic mining.

Of the 302 million tons of coal in place at least 90-100 million tons are expected to be produced as clean coal through any particular mining plan. The sink-float and washability analysis indicate that it should be possible to produce medium volatile bituminous coking coal with 7% ash and good to excellent coking properties, while maintaining acceptable yields (65-75%)

Coke tests both in Canada and Japan have confirmed the acceptability of this coal product. Average J.I.S. indices range from 92.8 to 93.4 on pure coal samples and the performance of these coals in coke oven blends has also been more than satisfactory.

GEOLOGY

GEOLOGY

GEOLOGY OF THE BABCOCK AREA

Since all of the proven coal in the Babcock area is found in seams within the Gates Formation, only the stratigraphy of that unit will be treated in the present report. The regional stratigraphy is summarized in figure II-1. For more detailed information on the stratigraphy of the Babcock area, the reader is referred to the first Interim Report dated December 31, 1971. To accompany the following descriptive text, a generalized section showing the Gates Formation and its related stratigraphic units, has been constructed from the logs of drill holes number 7102, 7204 and 7217 and is presented in figure 2.

BABCOCK STRATIGRAPHY

Gates Formation

Quintette Member:

There has been some discussion on the advisability of placing the base of the Gates Member at the base of the Moosebar transition zone and limiting the definition of the Moosebar to those sediments derived from a restricted marine environment. While the transition zone does mark the change to a more active environment of deposition (flaser bedding, worm burrows, churning), the practical value of this marker is reduced by the fact that it almost invariably covered in outcrop and the change in lithology is not even distinct enough to provide an expression on air photos. For this reason, and to conform to historical precedent, the base of the Gates Formation is taken as the first persistent sandstone. This sandstone and those following it are generally considered to have been formed in a near-shore marine environment during a major regression of the Lower Cretaceous sea. In

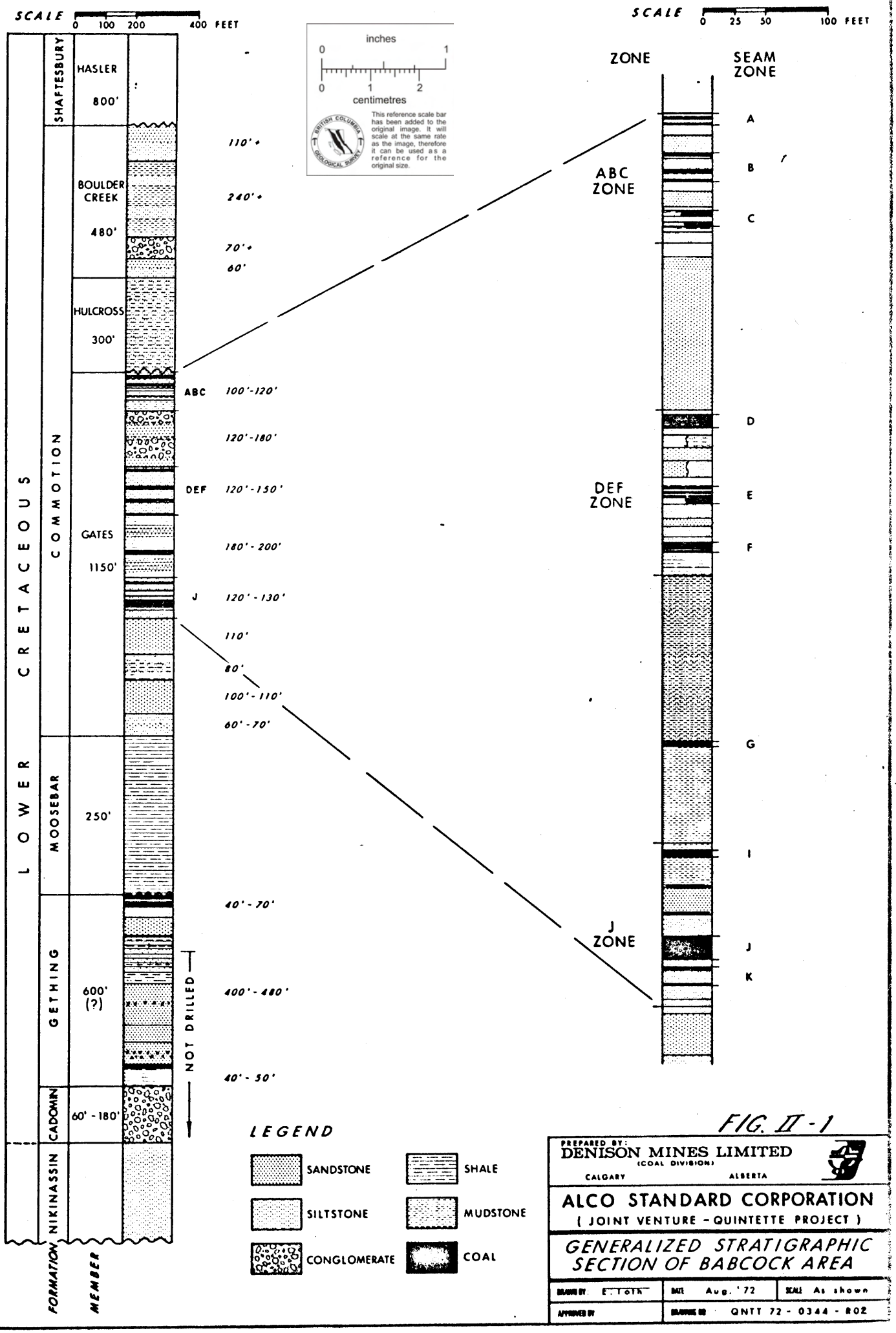

FIG. II-1

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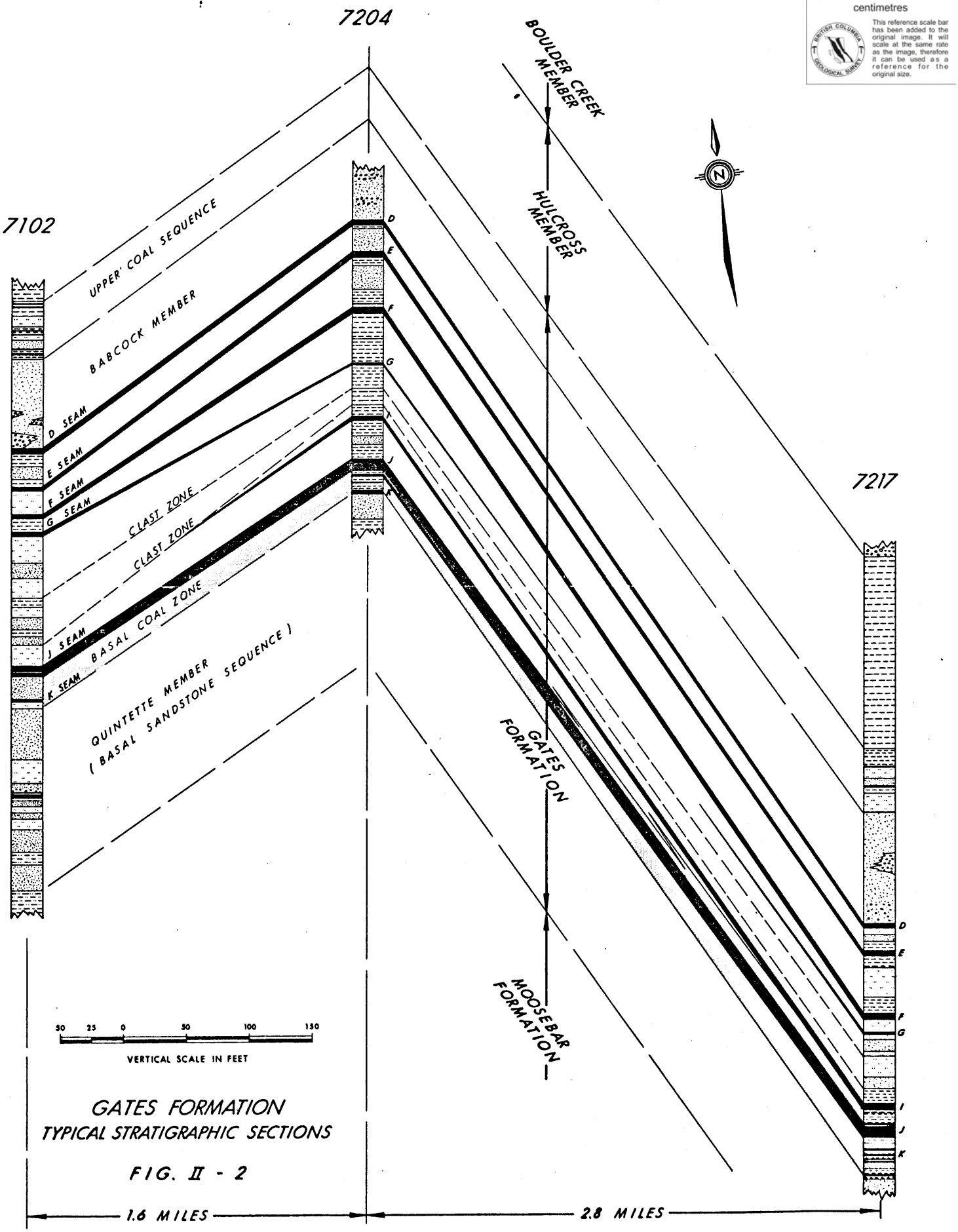
DENISON MINES LIMITED
(COAL DIVISION)
CALGARY ALBERTA

ALCO STANDARD CORPORATION
(JOINT VENTURE - QUINTETTE PROJECT)

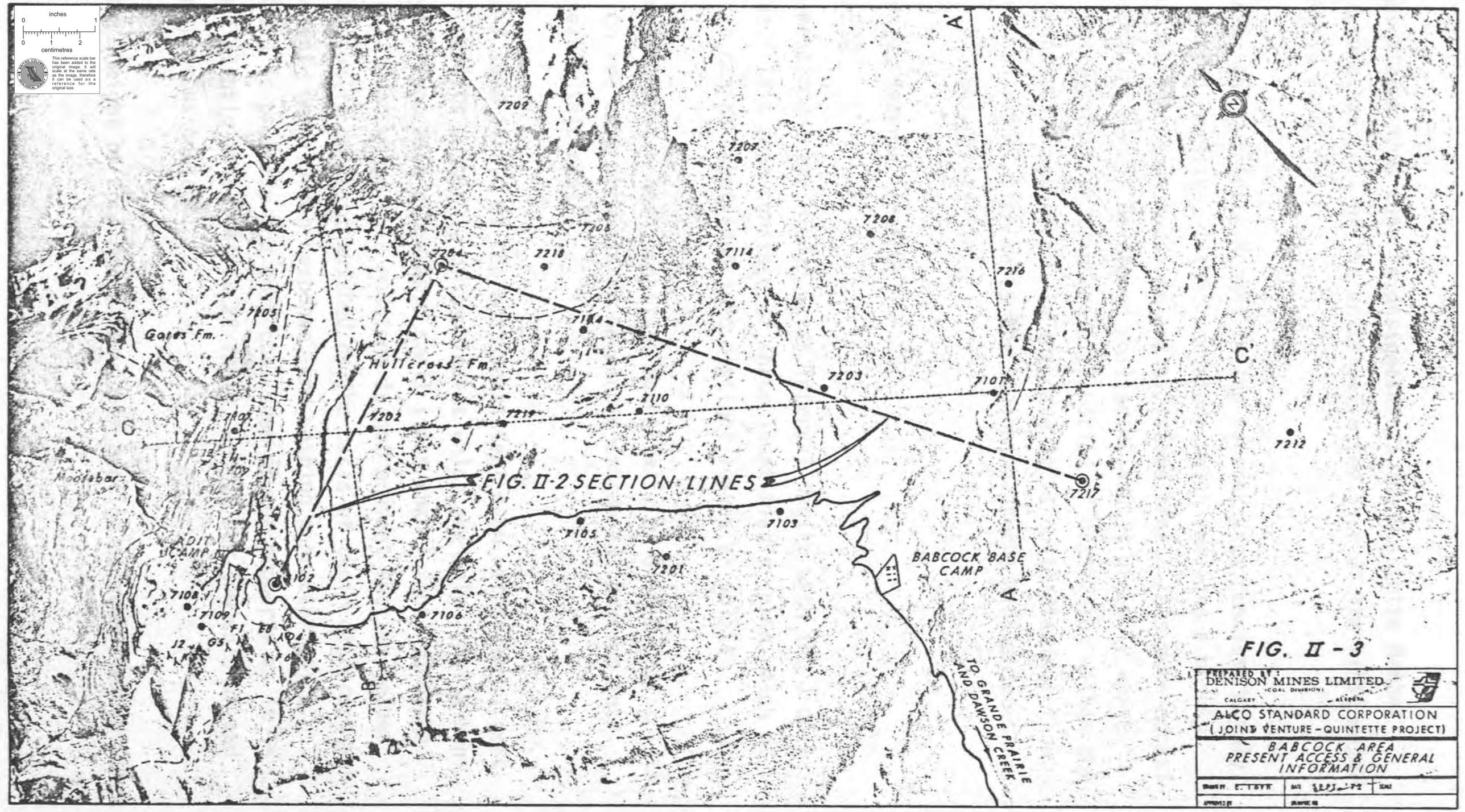
GENERALIZED STRATIGRAPHIC SECTION OF BABCOCK AREA

DRAWN BY: E. Toth	DATE: Aug. '72	SCALE: As shown
APPROVED BY:	DRAWING NO: QNTT 72 - 0344 - R02	



GATES FORMATION
TYPICAL STRATIGRAPHIC SECTIONS

FIG. II - 2


inches
0 1
0 1 2
centimetres
This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.
7209
7207
7208
7206
7204
7218
7114
7216
7205
Gates Fm.
7104
Hulcross Fm.
7203
7101
7110
7202
7219
C
C'
7212
Moosebar
FIG. II-2 SECTION LINES
7217
7103
7105
7201
ADIT CAMP
BABCOCK BASE CAMP
102
7108
7109
7106
F1
E8
G5
12
A
A'
TO GRANDE PRAIRIE AND DAWSON CREEK
B
B'
FIG. II - 3
PREPARED BY:
DENISON MINES LIMITED
(COAL DIVISION)
CALGARY
ALCO STANDARD CORPORATION
(JOINT VENTURE - QUINTETTE PROJECT)
BABCOCK AREA
PRESENT ACCESS & GENERAL INFORMATION
DRAWN BY
DATE SEPT 72
SCALE
APPROVED BY
DRAWING NO.

the Babcock area this zone is designated as the Quintette Member and it encompasses all of the units up to the base of the first major coal zone (J zone).

As defined, the Quintette Member in the Babcock area consists mainly of well sorted, massive, lithic sandstone which includes a poorly developed carbonaceous mudstone and siltstone zone. This zone occasionally contains poorly developed coal seams and it probably represents a small hiatus or transgressive period of deposition within the overall regressive sequence. In any case it is quite distinct from the basal coal zone which marks the beginning of the Middle Gates interval of coal deposition.

Middle Gates Interval (Member):

J Zone

As mentioned, the Middle Gates interval begins with the J coal zone. This zone consists of three identifiable seams, each of which can be subdivided into distinct leaves or splits.

The lowermost K seam, consists essentially of 3 or 4 coal splits which are only irregularly developed and do not develop into mineable thicknesses.

The J seam itself is the most persistent seam within the J zone. It consists primarily of two leaves which are only locally separated from each other by a small (less than 1 foot) mudstone band. Even where this mudstone is not present the two leaves can usually be distinguished on the basis of their different ash content, density log response, and washing characteristics. Seam J is probably the best coal seam on the property as it is consistantly thick (14 to 22 feet), and it has low sulphur and phosphorous content.

Seam I might be considered the upper portion of seam J except that

it diverges markedly from J in the vicinity of hole 7202 and 7204 where it consists of 4 distinct splits. In other areas only 2 or 3 splits are distinguishable. It is apparent that seam I has a different depositional history than seam J even though it may coalesce with it in some areas. Whereas seam J is a broad, widespread seam that probably represents the middle of a depositional cycle, seam I, on the other hand, was formed on top of interfluvial deposits which covered J seam. As such, it probably represents coal deposition along an oscillating, but generally transgressive shoreline. This would account for the larger number of splits and suggests that a given split of seam I may not be internally continuous from one area to another. That is, the upper split in one area may be a lower split in another area.

DEF Zone

In the vicinity of hole 7202 (Northwest area of Babcock) seam I is terminated by a distinct clast zone which marks an erosional hiatus within a zone of interfluvial and deltaic sedimentation. This marks the upper unit of the J zone and above this active zone, the first seam of the DEF coal zone is encountered. This seam, seam G, is a very local development which, where it is thick, has a 1/2 to 1 foot mudstone to silty mudstone roof. Laterally, the mudstone roof begins to predominate until the seam has been totally replaced by this mudstone - siltstone assemblage. The washability data obtained from 2 adits in seam G, further demonstrate the close facies association of this seam with the mudstone and siltstone deposition. The results show that seam G has the highest proportion of near gravity material of any seam in the project area. It is not expected that this seam will be mined.

The remaining seams in the DEF coal zone constitute the basis of the upper coal reserves in the Babcock area. All three seams, D, E and F, have excellent lateral continuity, consistent stratgraphic position, and characteristic log responses which provide

a very high degree of certainty in correlation. Since there is no question regarding the identity of the seams, only minor problems of correlating bony layers, or mudstone bands remain.

Seam F has a bony coal zone (1-2 feet) at the roof which becomes a carbonaceous mudstone toward the southwest side of the property. It also contains a mudstone 1 1/2 - 2 feet from the floor in the northwest corner of Babcock Mountain. This mudstone is not present in most of the remainder of the reserve area.

In the Northwest end of the Babcock area, Seam E is divided into three splits by two mudstone layers 1 - 1 1/2 feet thick. The upper mudstone persists throughout the entire project area but the lower one grades from mudstone to bony coal and coal towards the east and southeast. In addition, one other thinner mudstone and bony coal band appears to the southeast and it is suggested that this simply represents a splitting of the lower layer.

Seam D contains two carbonaceous mudstone - bony coal layers near the base of the seam which do not appear to follow any particular pattern in their development. These mudstones sometimes form the expected mining floor although in development the lower coal split may have to be mined.

As the above descriptions are very general, reference must be made to the roof and seam facies maps (in map box) for specific detail as to the thickness and quality of the seams and expected dilution as they might affect a particular mining plan.

Babcock Member:

Seam D is terminated by a massive, well sorted, somewhat conglomeratic, sandstone some 120 - 200 feet thick. This sandstone has been designated as the Babcock Member.

The base of the Babcock member usually consists of up to 1 1/2 feet of conglomerate although locally this may be as much as 40 feet. It does not appear that there was significant erosion of seam D when this unit was deposited. In some places seam D is still capped by a few inches of mudstone and shale and no washouts have been observed to date. However, it is still possible that washouts may occur locally and allowance must be made for this in mining plans.

Beyond the conglomerate, the Babcock member is a clean well sorted, coarse-grained lithic sandstone with occasional lenses of conglomerate.

Upper Gates Interval (Member):

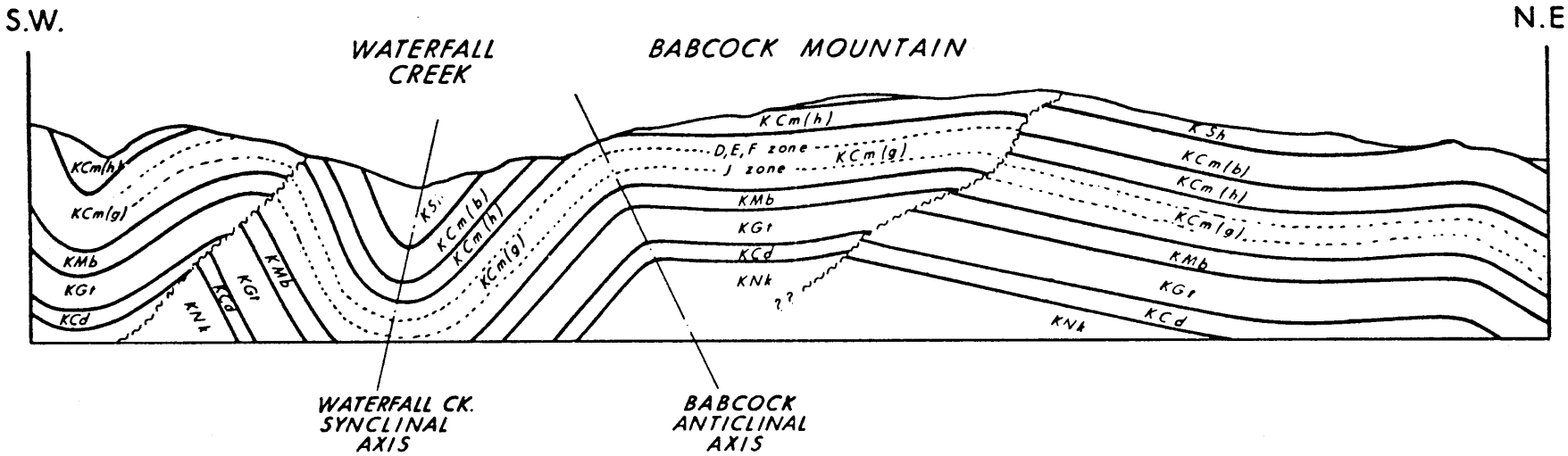
As mentioned in the regional stratigraphy, the upper Gates interval contains a third coal zone which is generally referred to as the A B C zone at Babcock. This zone contains three smaller seam zones which are poorly developed and rarely attain a thickness of 5 feet. The B seam or zone is perhaps the best developed of the three since approximately 4 intersections 5 feet thick or more were obtained. However, these points are not adjacent to each other and it can only be concluded that this development is too sporadic to be of consequence.

Besides the coal zone, the upper Gates interval reflects mostly interfluvial and deltaic sedimentation. No coal reserves are assigned to this interval and it is terminated by the Hulcross marine transgression.

BABCOCK STRUCTURE

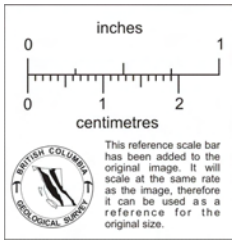
General

The structural setting at Babcock Mountain is illustrated in Figure II-4.



CRETACEOUS

KSh	SHAFTESBURY FORMATION		
KCm(b)	COMMOTION	"	(BOULDER CK MEMBER)
KCm(h)	"	"	(HULLCROSS MEMBER)
KCm(g)	"	"	(GATES MEMBER)
KMb	MOOSEBAR	"	
KGt	GETHING	"	
KCd	CADOMIN	"	
KNk	NIKANASSIN	"	



SCHEMATIC REPRESENTATION OF BABCOCK AREA STRUCTURE

Scale: 2" = 1 mile

FIG. II-4

The Waterfall Creek Syncline, where hydraulic mining reserves are expected to be developed, is the major structural element as its conjugate anticline is not fully developed. This gives rise to the anomalous monocline on the northeast limb of the anticline. It is in this monoclinal structure (sometimes referred to as a broad, gently plunging syncline) that the "flat" coal reserves of the Babcock area have been outlined.

At present the direction of plunge on the Waterfall Syncline is not known although it is judged to be either essentially flat or to plunge slightly to the northwest. The Babcock anticline dies out to the southeast as the upper beds plunge in that direction.

It is expected that this structural setting will be ideal in regard to the development of coal in the Babcock area from the Murray River Valley. Hydraulic reserves may be developed on the flank of Babcock Mountain and this development should provide excellent access to the major Babcock reserves. For more detailed structure within the Babcock reserve area reference should be made to the geological map sections in the map box and the structure contour maps in the map folder accompanying this report.

Quintette Trend - Waterfall Creek

Along Waterfall Creek the geology of the southwest limb of the syncline is uncertain. However from the headwaters of Waterfall Creek to the southern boundary of the property, a distance of approximately 12 miles, this limb of the syncline forms a long, prominent topographic feature known as the Quintette Trend. There is absolutely no visible warping, drag folding or cross faulting along this structure and it is confidently expected that hydraulic reserves will extend into this area.

Probable and Possible Reserves:

The ideal location of the Waterfall Creek area, adjacent to the main Babcock reserve, and the distinct possibility of extending it into the Quintette Trend make it a potentially ideal location for hydraulic mining. Along the northeast side of the Waterfall Creek area, six of the drill holes which were used at the fringe of the Babcock reserve area, are also close enough to the Waterfall Creek area to be used in calculating an indicated reserve of coal in place. From these drill holes and adit locations on the face of Babcock Mountain as well as a seam measurement in Waterfall Creek itself (14 ft.), it is estimated that 35 million tons of raw coal in place are present. Of this amount, up to 18 million tons of coal may be available as clean product in a seam 14 to 22 feet thick, to a depth of 1,500 feet (450 meters). In addition to this probable reserve, which needs only less than ten drill holes to raise it to the proven category, possible reserves in excess of 75 million tons in place are expected in the Quintette Trend on the basis of there being just one seam 20 feet thick.

As has been discussed in the main reserve section, Seam J has the best overall product quality in the Babcock area. It has particularly low sulphur (.21) and phosphorous (.03) and it can be washed to 7% with yields in the order of 70%. This quality is confidently expected to persist in the hydraulic mining reserves.

RESERVES

RESERVES

SUMMARY

The proven reserves of the Babcock area are summarized in tables II-A and II-B on the following page. Although 118 million tons of clean coal are estimated to be available at 7% ash, it is unlikely that Seams G and I will be mined unless Seam G is augered to some extent. Omitting these seams will reduce the reserves to 98 million tons and if part of Seam E must also be abandoned they might be further reduced to approximately 90 million tons. In any case, the reserves are more than sufficient to support a 2 - 3 million ton per year operation for 20 years.

SUMMARY

RESERVES IN PLACE

TABLE II-A

(Weighted Averages Where Applicable)

Seam	Reserve Thickness (Feet)	Raw Coal Ash %	Raw Coal Specific Gravity[1]	Total Probable Dilution (Feet)[2]	Area of Influence $Ft.^2 \times 10^6$	In Place Reserves Less 10% Geological Factors[3] Raw Coal 10^6 S. Tons	In Place Reserves Less 10% Geological Factors[3] Probable Dilution Tons 10^6	Estimated Mining Recovery	Total Probable Dilution Mined 10^6 S. Tons	Raw Coal Mined 10^6 S. Tons	Comments
											Equivalent lbs. raw coal per cubic foot
D	7.80	18.56	1.45	1.09	154.216	49.036	11.215	57%	6.401	28.008	90.5
E	6.65	24.45	1.51	0.84	156.193	45.528	8.773	65%	5.703	29.593	97.4
F	8.4	18.72	1.46	1.30	155.452	59.118	14.770	55%	8.123	32.514	91.1
G	6.86	17.87	1.44	1.67	11.769	3.120	1.313	60%	.787	1.873	89.9
I	9.45	18.87	1.45	1.05	114.700	44.136	8.013	65%	5.209	28.690	90.5
J	16.60	16.51	1.43	1.42	151.980	101.359	7.367	41.18%	1.921	41.736	89.3
TOTALS					744.310	302.297	51.451	53.72%	29.144	162.414	

Total coal in place 302.297 million short tons.
Weighted average recovery of coal 53.72%.
Net raw coal mined 162.414 million short tons.

(1) The specific gravity of raw coal in place is obtained from the equation : Spa = .010069 x % Ash +1.262.

(2) Total probable dilution assumes room and pillar extraction with continuous miners, and therefore may, in effect, be considered a maximum.

(3) Ten percent deduction for undefined faults, folds, washouts, etc. This is in addition to the deletion of reserves assigned to the area pf influence of hole 7205 (an additional 4%).

RESERVE SUMMARY
NOMINAL 7% ASH PRODUCT - ANALYSES BY SEAM

TABLE II-B

Weighted Averages Based on Actual Analyses of Combined +28 and -28 Mesh Products

Seam	Plant Product Theor. Yield: (+28,-28 M.) Less 4%	As Received Proximate Analysis of Product						Tons x 10^6					
		Ash	Vol.	T.M.	F.C.	S.	F.S.I.	Raw Tons Mined (Allowing 10% Geol. Deduction)	Total Probable Dilution (Contin. Mining)	Total Tons Mined & Probable Dilution	Net Clean Tons (Theor. Yield x Raw Tons)	Probable Yield Assuming Total Dilution*	Comments
D	76.90	7.07	24.42	5%	63.60	.65	5½	28.008	6.401	34.409	21.539	62.59	
										YIELD - NO DILUTION:		76.90	
E	64.36	7.06	23.50	5%	64.47	.24	7	29.593	5.703	35.296	19.165	54.29	
										YIELD - NO DILUTION:		64.76	
F	78.40	6.80	20.84	5%	65.13	.23	7½	32.514	8.123	40.637	25.493	62.73	
										YIELD - NO DILUTION:		78.40	
G	59.02	7.74	22.74	5%	64.49	.42	7½	1.872	.787	2.659	1.105	41.55	Not used in Interim Report #2 Mining Plan
										YIELD - NO DILUTION:		59.02	
I	68.30	7.04	21.10	5%	66.82	.27	7½	28.690	5.208	33.898	19.598	57.81	Not used in Interim Report #2 Mining Plan
										YIELD - NO DILUTION:		68.30	
J	74.59	6.80	21.14	5%	66.95	.21	7	41.736	2.921	44.657	31.133	69.71	
										YIELD - NO DILUTION:		74.59	
TOTAL PRODUCT								162.413			118.033		Yield 72.67 (No dilution)
TOTAL (EXCLUDING G, I)								131.851	23.148	154.999	97.330		Yield 73.81 (No dilution) Yield 62.79 (With dilution)

SAMPLING AND ANALYSIS

Drill Holes

The lithologies and coal intersections in each drill hole were visually logged and all observations were recorded on the drill logs in the field. At the same time each hole was logged at a scale of 1 inch = 20 ft. with radioactive sondes and counters. The intervals corresponding to seam intersections were then re-logged with this equipment at a scale of 1 inch = 2 ft. The responses measured were natural gamma radiation (i.e. potassium or clays), neutron (i.e. porosity as a function of hydrogenion concentration) and density as a function of induced gamma bombardment. These three logs have an excellent response to coal and were invaluable in determining seam characteristics where recovery was poor and particularly in rotary drill holes.

In addition to the geological logging, the core representing the roof of each seam intersection was also examined by the engineering staff to determine the probable dilution under room and pillar, continuous mining conditions.

After considering the above data, a decision was made as to what interval constituted the most likely full mining height, including in-seam dilution and roof dilution where this was considered to be an obvious contaminant. This subjective procedure has given rise to some anomalies in that certain out-of-seam sections are included in the sample in one case but not in another. The result is a conservative estimate of plant recovery where mining plans are now expected to rely on other less diluting methods. In future work, it is suggested that more incremental analysis be done and that compositing according to specific mine plans be done by computer. In any case, all of the sample intervals used in this instance are documented on the data summary sheets.

In the case of diamond drill samples, very little adjustment for lost core

recovery was necessary and the usual procedure was to take the seam thickness as it was determined by the density log and to relate the sample proportionately to it. The rotary drilling samples themselves were less precise than the diamond cores since the drillers had difficulty accurately defining the top and bottom of the seam and because sample material tended to lodge in the inner, reverse circulation pipe. For these reasons the radiation logs were used exclusively to define the seam and sample intervals on rotary holes.

Once the samples had been obtained, they were shipped to the laboratory and analyzed according to flow sheets No. 1 and 2. (Figures II-5 and II-6). The prime purpose of the rotary and diamond drill sample flow sheets was to obtain a sample which would closely resemble the product which might be obtained from the seam. Since the rotary samples contain a disproportionate amount of fines, this product data was obtained from sink/float analysis of the entire sample (¼ x 0 mesh) while, for diamond drill core, an actual 7% ash product was prepared from the coarse (+28m) fraction and combined with the froth flotation product from the fines before being analyzed as a nominal 7% ash product. The data summary sheets in the map box summarize the sampling data for each seam intersection.

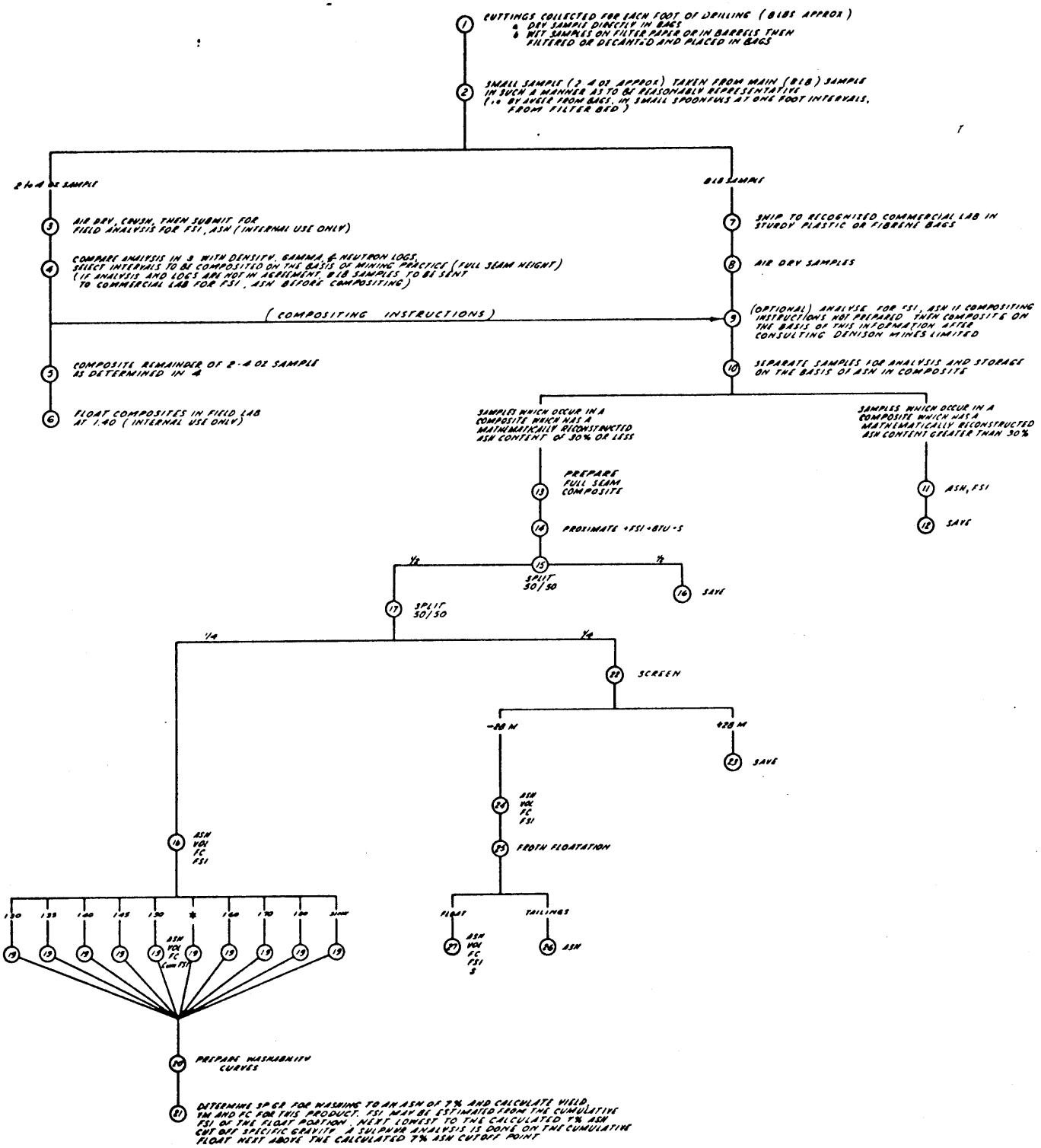
Note on Rotary and Diamond Drilling

In the Babcock area both HQ and NQ diamond drilling and rotary drilling have been used. The average core recovery for diamond drilling was approximately 85% but there was a distinct difference between the HQ which gave excellent recoveries of about 91% and the NQ drilling which resulted in core recoveries of only 82%. The recoveries on the rotary drilling were much more difficult to measure since there was considerable driller error in measuring the one foot increments. Some supposedly one foot increments had 150% recovery indicating that part of the previous sample remained in the drill pipe. The overall recovery, though, appears to have been similar (80 - 90%) to the diamond drilling. Besides the overcrushing which is discussed later in this report, the main problem

with rotary drilling was the lack of precision in seam thickness measurements. In all cases it was necessary to use the electric logs to determine the seam thickness in rotary holes. In future drilling programs only HQ diamond drilling can be recommended where analysis of the seam is necessary. There is also no cost saving with rotary drilling in the Gates sequence.

Adit Samples

As the adits were being driven, samples were taken at 10 to 20 foot intervals to test for ash and F.S.I. Once a consistent F.S.I. was obtained (usually 3 samples), the face was logged and a bulk 5 to 6 ton sample was taken. The samples were placed in bags and then the bags were, in turn, placed in drums for shipment to the laboratory for analysis as outlined in Flow Sheet #3. After the samples were washed in a heavy media and water cyclone circuit, the product was shipped to Ottawa for coke tests. The adit samples sent to Japan were cleaned in Japan.



* SEPARATION AT SP GR 1.55 ONLY TO BE DONE IF 1.50-1.60 FRACTION EXCEEDS 7%

FIG. II-5

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FLOW SHEET No. 1
ROTARY DRILLING (Preliminary)

DRAWN BY [illegible]	DATE SEPT '71
APPROVED BY	DRAWING No. MISC 71-0196-R02

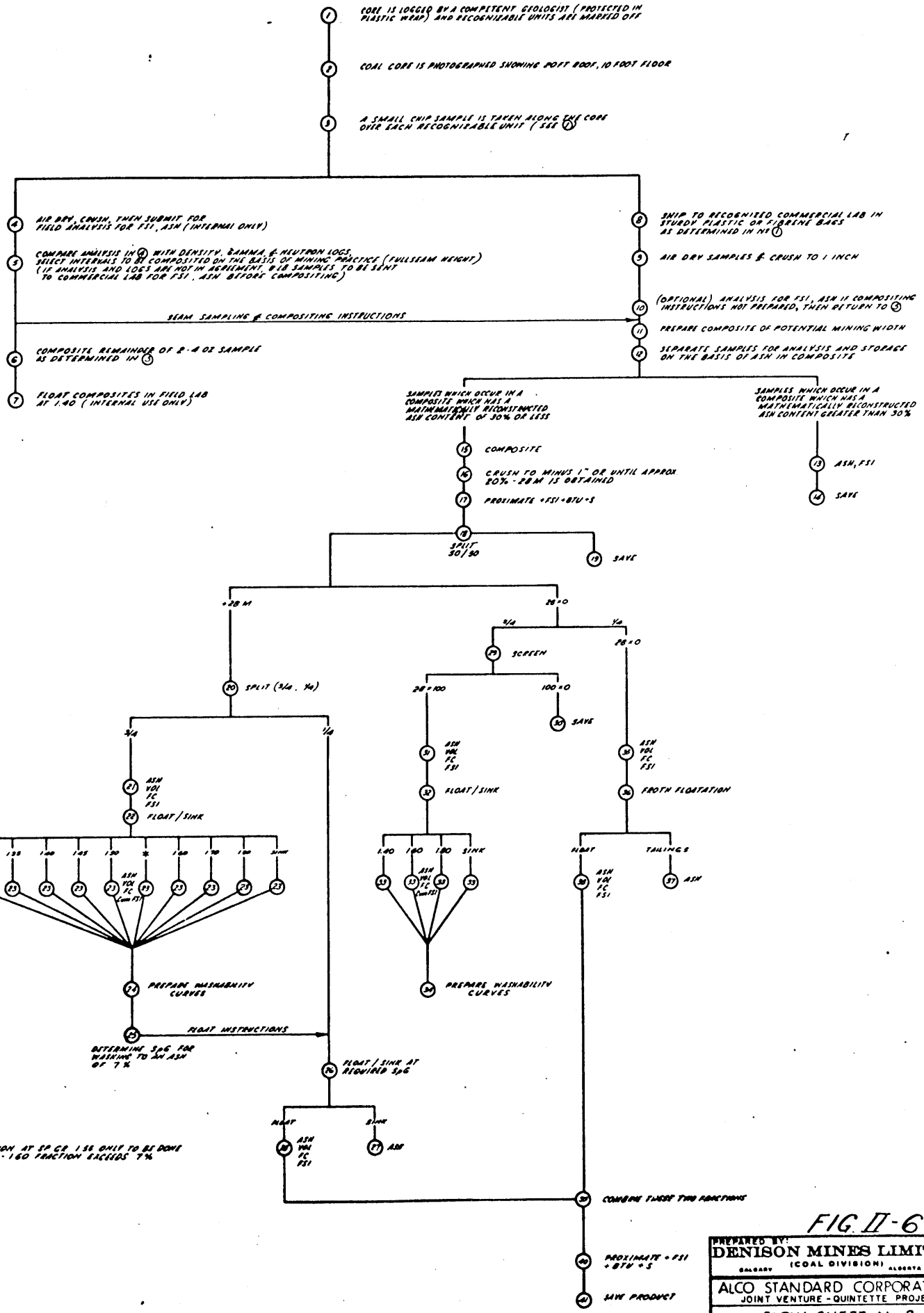

FIG. II-6

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CALGARY ALBERTA

ALCO STANDARD CORPORATION
JOINT VENTURE - QUINTETTE PROJECT

FLOW SHEET No. 2
DIAMOND DRILLING (Preliminary)

DRAWN BY: [illegible] DATE: SEPT '71 SCALE: ——
APPROVED BY: DRAWING No: MISC 71 - 0197 - 802

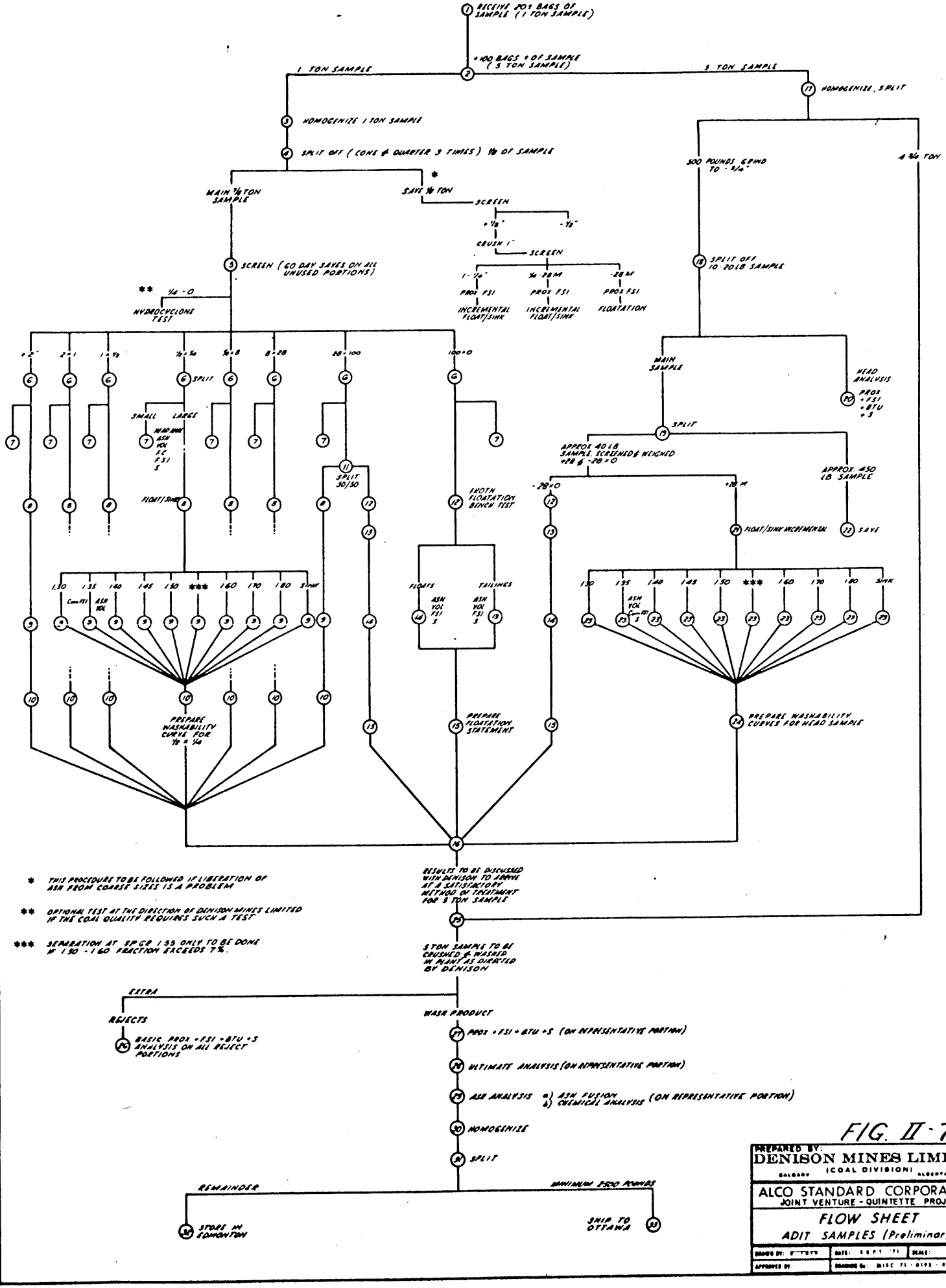


FIG. II-7

PREPARED BY:
DENISON MINES LIMITED
(COAL DIVISION)
CALGARY ALBERTA

ALCO STANDARD CORPORATION
JOINT VENTURE - QUINTETTE PROJECT

FLOW SHEET
ADIT SAMPLES (Preliminary)

DRAWN BY: [illegible] DATE: SEPT '71 SCALE: ——
APPROVED BY: DRAWING No: MISC 71 - 0105 - 003

CALCULATION OF RESERVES

Summary

The reserves dealt with in this report are only those which are considered to be proven in the closely defined, relatively flat area at Babcock. The reserve limits are inclinations of 25%, depth of 1500 feet (approx. 450 meters), and the seam outcrop. The steeper, inferred reserves on the Waterfall Creek flank of the Babcock Monocline are not considered in detail at this time.

The basic method of reserve calculation has been to first define an area of influence for each hole or data point (adits) and then to subdivide each area of influence by contouring the seam thickness and using the area between contour intervals as the sub-area in which the thickness is defined as being the average of the two bounding contour values.

Each of the sub-areas in each area of influence was assigned the ash value of the corresponding hole. This percentage of ash was used to determine the appropriate specific gravity of coal in place to convert the area and coal thickness in each sub-area to tons of coal in place. The weighted average thickness and the total tons for the area of influence represented by the drill hole were then determined.

The probable dilution was calculated in a similar fashion, although a constant specific gravity (2.37) was used.

The amount of coal to be obtained as mined product was calculated on the assumption that extraction would be by room and pillar using continuous miners. Individual mining plans may differ from this, but it is expected that the mining recoveries would usually be greater and dilution less by other methods.

CALCULATION OF RESERVES

Reserve Limits

On the structure contour map for each seam, the points at which the seam inclination exceeds 25% have been plotted and the resultant line has been used as the primary reserve limit. This effectively excludes reserves which have potential for hydraulic mining. In addition to this limitation and the seam outcrop, the 1500' depth of cover line has been chosen as a cut off. An examination of the Seam D depth of cover map will demonstrate the fact that most of the reserve area which is likely to be mined in the first 20 or 30 years is under less than 800 ft. of cover (1100 ft. for Seam J). Consequently, extending the reserve cut off to 2000 ft. is not considered necessary at this time. (See plan in map folder for specific details)

Determination of Thickness

As has been mentioned in the sampling procedure, the primary sources of information for seam thickness are the radiation logs and the core logs. On the Data Summary Sheets, three thickness measurements are given. The Geological Thickness does not refer to reserves or mining. It is simply the distance between two convenient markers which have been used in internal discussions regarding correlation and variation within the seam. In some cases the geological thickness may correspond to either the reserve thickness or the production thickness but this is not of particular consequence.

The Reserve Thickness, as shown on the data summary sheets, corresponds to the thickness which has been used to calculate the tons of coal in place. As such, it is the thickness which the mined coal will come from and seam mining recovery figures in the tables are based on the proportion of this coal which will be extracted. Consequently, the Reserve Thickness has been referred to as the Mining Thickness on the isopach maps even though the actual production section or thickness may be different.

The Production Thickness is also shown on the data summary sheets. The amount of coal to be removed from this thickness is prorated over the Reserve Thickness to obtain the net proportion of raw coal to be extracted in the mining plans which accompany this report. This volume of the report deals basically with gross reserves based on continuous mining (in benches where necessary) over the full measured height.

In summary, the Reserve Thickness or Mining Thickness defines the primary coal section which is used in the reserve calculation. In particular mining plans, the Production Thickness may vary within the Reserve or Mining Thickness and this may change the figures for net tons mined somewhat.

Roof and Seam Facies Maps

Before the isopach maps of mining and dilution thickness could be constructed, it was necessary to prepare facies interpretation maps of each seam and the immediate roof (map box). In doing this, both the detailed radiation logs and core logs were used as well as the analytical data. The resultant facies maps graphically present the variations in roof and seam conditions and they clearly demonstrate some trends in the seam facies in the Babcock reserve area. For this reason, the facies maps were used as a guide to contouring both dilution and Mining Thickness data and the trends evident in them were used to override the rigid rules of mathematical interpolation.

Isopachs of Mining and Dilution Thickness

As has been explained, the mining thickness on these maps is equivalent to the reserve thickness and, as such, it does not always correspond to the production section which is used in the mining plans accompanying this report or which may be developed at a later date. Nor is the probable dilution indicated by these maps necessarily a true measure of what might be expected in a given mining plan, since a lower section of a seam might be selected for mining, thus eliminating rock dilution. Most problems of this nature will occur in Seam J since the lower bench

of the seam is distinctly better than the upper bench. The better mining and cleaning plant recoveries in the thinner section though, should compensate for the loss of the top coal where the decision is made to mine only the lower bench.

Specific Gravity of Coal in Place

Since there is a fairly wide variation in raw ash of the coals in the Babcock area, an empirical curve of ash versus specific gravity was developed from the washability data on increments of the adit samples (Fig. II-8). This graph is based on the assumption that the coal and ash in each "mixture" are of constant quality or specific gravity. Even though this is known to be an over simplification, the cumulative effect of variations due to such things as fluctuation in volatile content does not appear to be significant. Consequently the lower limit of the range of values has been used to estimate the SPG. of coal in place and the projection of the line through the upper limit to 100% ash has been used to estimate the SPG. of dilution. The fact that this upper projection gives a value of 2.37 for pure rock (siltstone - shale) is a good indication that the procedure is sound, or at least conservative as the curve should probably level off somewhat in the higher ash regions. The calculated specific gravities are shown in the tables of Reserves in Place for each seam and the equivalent value in pounds per cubic foot for the weighted average specific gravities for each seam are shown as comments in the Reserve Summary Table. The weight used for coal ranges from 88 to 94 pounds per cubic foot. (Table II-A)

The equation used to calculate the specific gravity of coal in place at Babcock is SPG = (.010069 x % ash + 1.262).

Areas of Influence

The areas of influence which control the calculation of reserves were constructed around each drill hole and adit. This was done by first triangulating all the data points and then dividing each triangle so

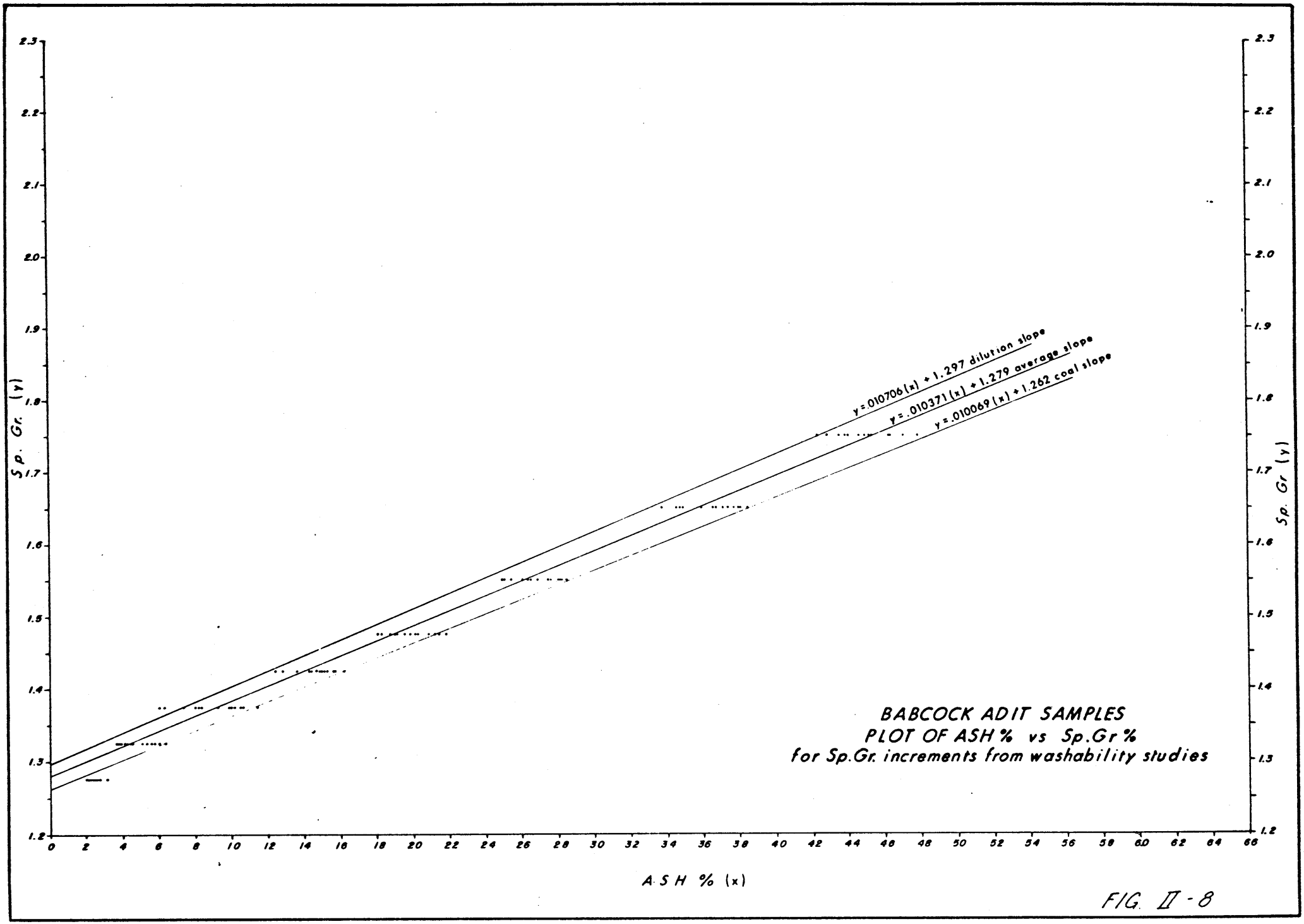

y = .010706 (x) + 1.297 dilution slope
y = .010371 (x) + 1.279 average slope
y = .010069 (x) + 1.262 coal slope
Sp. Gr. (y)
ASH % (x)
BABCOCK ADIT SAMPLES
PLOT OF ASH % vs Sp.Gr %
for Sp.Gr. increments from washability studies

FIG. II-8

formed into three equal area quadralaterals by joining the bisectrix of each side to the opposite apex or data point and using the mid-point so determined as a common point to the three quadralaterals. On the fringe of the reserve area, the right bisectrix of the line joining two "outside" points was extended to the 1500 ft. depth line or to the 25% slope line to close off each area of influence. This subject is treated more fully in Appendix C. (See also area of influence plans in map folder)

The first part of this procedure produced the seam nets which were used as the basis for all subsequent contouring of analytical data including the isopachs of mining and dilution thickness. These isopachs were also used in conjunction with the areas of influence, constructed in the second part of the procedure, to calculate the amount of coal reserves in place and the total probable dilution.

Subdivision of Areas of Influence

Although the specific gravity, that is quality or percent ash, was considered constant throughout each area of influence, the thickness of the seam was treated as being variable. Each area of influence was therefore subdivided into sub-areas bounded by isopach lines from the contour maps of mining (reserve) thickness. The seam thickness in each sub-area was considered to be the average of its two boundary values.

Each sub-area was carefully measured with a planimeter and the sum of the sub-areas was determined within 1% of the measured total for each area of influence before any minor corrections were made in averaging out discrepancies between the two values. (work done by Burnette Resource Surveys Ltd.)

A similar procedure was used for subdividing each area of influence for the calculation of total probable dilution.

This procedure of subdividing the area of influence means that measured

thicknesses are not used directly in the reserve calculations, instead the amount of coal in each increment of the area of influence is calculated and the weighted average thicknesses, which differs slightly from the measured thicknesses is obtained.

Calculation of Tons-in-Place

For each increment or sub-area, the number of tons of coal was calculated in the following manner.

$$\text{Short Tons coal in place} = \frac{\text{Area (ft.}^2\text{)} \times \text{Thickness (ft.)} \times \text{SpG.} \times 62.4283}{2{,}000} \text{ tons of water per cubic foot}$$

$$\text{Where thickness} = \frac{\text{(Lower Contour + Upper Contour)}}{2}$$

In those cases when the upper or lower contour was undefined, then the thickness was taken as one half of a contour interval above or below the last defined contour.

After all the increments had been calculated, they were added to give the total for the area of influence, then all the areas of influence were summed to provide the total reserve. This is documented in the various reserve tables.

Geological Deductions

Ten percent of each area of influence was deducted for geological errors due to any unobserved faults, rolls, washouts etc. In addition to this, the reserve associated with hole 7205, representing some 4% of the total, was not included because faulting was observed in this hole. It is felt that this faulting is well understood but one or two additional holes may be required before mining commences. Even though mining is confidently planned in this area, the reserves were still omitted from the proven totals for these reasons.

Probable Dilution

As has been mentioned, the probable dilution represents that amount of roof rock and dirty coal which was not included in the sample and which our engineering and geological staff consider would probably be too weak to hold up as roof in a room and pillar, continuous mining system. Dilution tonnage is kept separate in the various tables accompanying this report since it may obviously be decreased significantly with the choice of different mining methods. The method of calculating the total dilution is similar to that for coal-in-place. Each drill hole area of influence is divided into increments of dilution thickness and the sum of these is the total for the area. The specific gravity of dilution is considered to be constant at 2.37 (see discussion of SpG. page).

TABLE II-C-1

RESERVES IN PLACE

SEAM D

Hole or Adit No.	Seam Thickness (Feet) Meas'd In Drill Hole	Seam Thickness (Feet) Weighted Av. For A. of Infl.	Raw Coal Ash %	Raw Coal Specific Gravity	Probable Dilution Thickness (Feet) Meas'd In Drill Hole	Probable Dilution Thickness (Feet) Weighted Av. For A. of Infl.	Area of Influence $Ft.^2 \times 10^6$	In Place Reserves Less 10% Geological Factors Raw Coal 10^6 S. Tons	In Place Reserves Less 10% Geological Factors Probable Dilution Tons 10^6	Estimated Mining Recovery	Total Probable Dilution Mines 10^6 S. Tons	Raw Coal Mined 10^6 S. Ton
QBD 7101	6.1	7.0	12.78	1.39	0.5	0.8	13.443	3.667	.678	64%	.434	2.347
QBD 7102	9.0	8.6	31.47	1.57	2.0	2.3	6.364	2.457	.968	62%	.600	1.523
QBR 7103	9.4	9.2	9.64	1.36	1.0	0.8	9.222	3.230	.512	57%	.292	1.841
QBD 7104	6.5	7.7	32.88	1.59	1.5	1.4	4.806	1.641	.438	65%	.281	1.051
QBR 7105	8.0	7.5	25.05	1.51	1.5	1.5	8.764	2.804	.870	57%	.496	1.598
QBR 7106*	6.7	7.1	25.05	1.51	2.0	2.0	8.985	2.716	1.192	59%	.703	1.602
QBR 7107	Drill hole started below seam's stratigraphic level.											
QBR 7108	Drill hole started below seam's stratigraphic level.											
QBR 7109	Drill hole started below seam's stratigraphic level.											
QBR 7110	14.4	11.5	14.34	1.40	Nil	0.5	9.990	4.511	.303	48%	.145	2.165
QBR 7114	7.1	7.1	13.75	1.46	Nil	0.5	9.862	2.852	.347	62%	.215	1.768
QBD 7201	8.0	8.9	11.02	1.37	0.5	0.8	4.109	1.415	.222	61%	.148	.863
QBD 7202	9.0	8.4	19.26	1.46	1.8	1.6	11.593	3.998	1.231	53%	.652	2.120
QBD 7203	7.3	7.4	14.81	1.41	Nil	0.3	11.260	3.306	.199	59%	.118	1.947
QBD 7204	7.3	7.3	14.74	1.41	1.1	1.1	7.472	2.165	.527	70%	.369	1.515
QBD 7205*	6.4	6.7	24.33	1.51	Nil	0.4	7.704	2.198	.195	60%	.216	1.319
QBD 7206	Drill hole started below seam's stratigraphic level.											
QBD 7207	Drill hole shut down before seam stratigraphic level; not in reserve area.											
QBD 7208	6.0	5.7	37.04	1.64	Nil	0.25	4.003	1.043	.066	57%	.037	.594
QBD 7209	8.1	-	-	-	1.5	-	Not in reserve area.	-	-	-	-	-
QBD 7212	8.3	7.5	19.41	1.46	2.4	1.6	12.390	3.897	1.295	44%	.570	1.715
QBD 7213	Drill hole shut down before seam stratigraphic level - not in reserve area.											
QBD 7216	5.7	6.1	11.85	1.38	Nil	0.4	8.147	1.917	.215	54%	.117	1.035
QBD 7217	7.6	7.9	9.98	1.36	1.2	1.6	8.230	2.490	.862	50%	.431	1.246
QBD 7218	9.8	8.9	13.79	1.40	1.2	1.3	3.507	1.233	.291	70%	.203	.863
QBD 7219	6.3	7.6	18.51	1.45	1.8	1.3	5.626	1.735	.485	52%	.252	.902
ADIT D4	7.0	9.9	24.00	1.50	2.3	2.3	1.760	.735	.262	62%	.162	.456
ADIT D9*	10.5	7.7	20.60	1.47	0.5	1.0	3.849	1.224	.252	70%	.176	.857
WEIGHTED AVERAGES & TOTALS LESS 7205C:		7.8	18.56	1.45		1.09	154.216	49.036	11.215	57%	6.401	28.008

*QBR 7106 Raw analysis from R7105, poor recovery.
*QBD 7205 Raw analysis from D seam, lower fault block.
* ADIT D9 Encompasses area of influence of R7107.

TABLE II-C-2

RESERVES IN PLACE

SEAM E

Hole or Adit No.	Seam Thickness (Feet) Meas'd In Drill Hole	Seam Thickness (Feet) Weighted Av. For A. of Infl.	Raw Coal Ash %	Raw Coal Specific Gravity	Probable Dilution Thickness (Feet) Meas'd In Drill Hole	Probable Dilution Thickness (Feet) Weighted Av. For A. of Infl.	Area of Influence $Ft.^2 \times 10^6$	In Place Reserves Less 10% Geological Factors Raw Coal 10^6 S. Tons	In Place Reserves Less 10% Geological Factors Probable Dilution Tons 10^6	Estimated Mining Recovery	Total Probable Dilution Mines 10^6 S. Tons	Raw Coal Mined 10^6 S. Ton
QBD 7101	7.0	7.4	18.41	1.45	Nil	0.5	13.305	4.016	.485	65%	.315	2.610
QBD 7102	5.5	5.5	25.21	1.52	1.0	1.0	7.379	1.729	.473	65%	.307	1.124
QBR 7103	6.7	7.4	60.89	1.86	1.0	1.0	10.176	3.957	.646	65%	.420	2.572
QBD 7104	6.0	6.3	5.58	1.32	Nil	0.4	4.806	1.120	.135	65%	.088	.730
QBR 7105	5.7	5.8	17.55	1.44	2.0	1.7	9.011	2.129	1.041	65%	.677	1.383
QBR 7106	6.0	5.8	29.99	1.56	1.8	1.6	8.800	2.240	.945	65%	.614	1.456
QBR 7107*	5.5	5.5	29.45	1.56	Nil	0.3	3.756	.899	.067	65%	.044	.584
QBR 7108		Drill hole started below stratigraphic level of seam.										
QBR 7109		Drill hole started below stratigraphic level of seam.										
QBR 7110	6.2	6.8	21.19	1.48	1.0	0.9	9.990	2.815	.579	65%	.377	1.830
QBR 7114	9.5	9.0	19.10	1.45	Nil	0.3	10.182	3.723	.168	65%	.110	2.420
QBD 7201	6.5	6.5	32.43	1.59	1.5	1.5	4.096	1.182	.418	65%	.272	.768
QBD 7202	5.5	5.5	26.98	1.53	1.0	1.0	11.689	2.796	.797	65%	.519	1.817
ABD 7203	8.8	8.2	25.37	1.52	Nil	0.4	11.261	3.945	.266	65%	.176	2.565
QBD 7204	6.0	5.6	17.27	1.44	Nil	0.6	7.382	1.653	.309	65%	.201	1.075
QBD 7205*	5.6	5.5	22.51	1.49	0.5	0.4	8.410	1.928	.200	65%	.130	1.254
QBD 7206		Drill hole started below stratigraphic level of seam.										
QBD 7207		Not in reserve area.										
QBD 7208	7.0	7.7	16.80	1.43	Nil	0.4	4.768	1.462	.117	65%	.076	.950
QBD 7209	6.2	Not in reserve area.			Nil							
QBD 7212		Seam too deep for drill used.										
QBD 7213		Not in reserve area.										
QBD 7216	7.8	7.5	21.54	1.48	2.0	1.3	10.045	3.141	.887	65%	.576	2.041
QBD 7217	7.1	7.5	26.54	1.53	1.1	0.7	17.389	5.518	.818	65%	.532	3.587
QBD 7218	8.0	8.1	24.33	1.51	0.5	0.3	3.552	1.226	.070	65%	.045	.796
QBD 7219	5.8	5.5	21.69	1.48	1.5	1.2	5.626	1.290	.456	65%	.296	.839
ADIT E8	5.5	5.6	19.38	1.46	Nil	0.5	2.233	.508	.078	65%	.050	.330
ADIT E10	5.2	5.5	29.45	1.56	Nil	0.3	.748	.179	.012	65%	.008	.116
WEIGHTED AVERAGES & TOTALS LESS 7205C:		6.65	24.45	1.51		0.84	156.193	45.528	8.773	65%	5.703	29.593

*QBR 7107 Raw analysis from E10, recovery poor.
*QBD 7205 Not in proven reserves.

RESERVES IN PLACE

RABLE II-C-3

SEAM F

Hole or Adit No.	Seam Thickness (Feet) Meas'd In Drill Hole	Seam Thickness (Feet) Weighted Av. For A. of Infl.	Raw Coal Ash %	Raw Coal Specific Gravity	Probable Dilution Thickness (Feet) Meas'd In Drill Hole	Probable Dilution Thickness (Feet) Weighted Av. For A. of Infl.	Area of Influence $Ft.^2 \times 10^6$	In Place Reserves Less 10% Geological Factors Raw Coal 10^6 S. Tons	In Place Reserves Less 10% Geological Factors Probable Dilution Tons 10^6	Estimated Mining Recovery	Total Probable Dilution Mines 10^6 S. Tons	Raw Coal Mined 10^6 S. Ton
QBD 7101	7.9	9.5	11.12	1.37	1.0	1.4	12.992	4.831	1.222	55%	.673	2.657
QBD 7102	9.3	9.5	24.23	1.50	1.0	1.0	7.706	3.113	.526	55%	.289	1.711
QBR 7103	15.0	13.0	6.82	1.33	2.0	1.8	10.080	4.877	1.198	55%	.660	2.682
QBD 7104	6.5	7.4	11.80	1.38	1.0	2.2	4.797	1.399	.695	55%	.382	.769
QBR 7105	9.0	8.9	31.63	1.58	0.5	0.7	8.816	3.497	.427	55%	.235	1.923
QBR 7106	10.0	10.0	16.65	1.43	1.0	0.9	8.704	3.491	.532	55%	.293	1.920
QBR 7107	9.8	9.8	20.38	1.47	2.5	2.0	3.955	1.578	.519	55%	.285	.868
QBR 7108		Drill hole started below stratigraphic position of seam.										
QBR 7109		Drill hole started below stratigraphic position of seam.										
QBR 7110	7.8	8.2	22.30	1.51	0.6	0.8	10.131	3.544	.531	55%	.292	1.949
QBR 7114	7.9	8.2	14.30	1.40	1.5	1.3	10.006	3.178	.873	55%	.480	1.748
QBD 7201	10.0	10.0	19.89	1.46	1.5	1.4	4.067	1.664	.371	55%	.204	.915
QBD 7202	9.3	9.7	20.19	1.47	Nil	0.6	11.773	4.654	.496	55%	.273	2.560
QBD 7203	9.5	9.0	23.98	1.50	0.5	1.2	11.459	4.385	.910	55%	.500	2.412
QBD 7204	11.9	10.4	12.68	1.39	4.0	3.0	6.989	2.838	1.376	55%	.757	1.561
QBD 7205*	7.6	8.0	23.15	1.50	2.8	2.7	9.190	3.054	1.646	55%	.905	1.680
QBD 7206		Drill hole started below stratigraphic position of seam.										
QBD 7207		Not in reserve area.										
QBD 7208	10.4	9.0	18.56	1.45	1.0	1.0	4.339	1.601	.279	55%	.153	.881
QBD 7209	8.8	Not in reserve area			4.0							
QBD 7212		Too deep for drill used.										
QBD 7213		Not in reserve area.										
QBD 7216	9.0	8.9	17.86	1.44	1.9	1.7	11.424	4.161	1.305	55%	.718	2.289
QBD 7217	9.6	9.7	11.99	1.38	1.8	2.1	15.424	5.821	2.132	55%	1.172	3.201
QBD 7218	10.0	9.3	24.84	1.51	1.0	2.6	3.296	1.310	.558	55%	.307	.721
QBD 7219*	9.0	9.0	11.80	1.38	1.5	1.3	5.658	1.993	.491	55%	.270	1.096
ADIT F1	9.2	8.3	15.1	1.42	0.5	1.3	1.389	.460	.117	55%	.064	.253
ADIT F6	6.2	7.2	22.67	1.49	0.5	0.8	1.426	.426	.080	55%	.044	.235
ADIT F11	7.9	7.8	20.82	1.47	2.5	2.2	.912	.297	.132	55%	.072	.163
WEIGHTED AVERAGES & TOTALS LESS 7205C:		8.4	18.72	1.46		1.3	155.452	59.118	14.770	55%	8.123	32.514

*QBD 7205 Not in proven reserve.
*QBD 7219 Poor recovery data from 7104.

TABLE II-C-4

RESERVES IN PLACE

SEAM G

Hole or Adit No.	Seam Thickness (Feet) Meas'd In Drill Hole	Seam Thickness (Feet) Weighted Av. For A. of Infl.	Raw Coal Ash %	Raw Coal Specific Gravity	Probable Dilution Thickness (Feet) Meas'd In Drill Hole	Probable Dilution Thickness (Feet) Weighted Av. For A. of Infl.	Area of Influence Ft.^{2} x 10^6	In Place Reserves Less 10% Geological Factors Raw Coal 10^6 S. Tons	In Place Reserves Less 10% Geological Factors Probable Dilution Tons 10^6	Estimated Mining Recovery	Total Probable Dilution Mines 10^6 S. Tons	Raw Coal Mined 10^6 S. Ton
QBD 7101			Hole shut down before stratigraphic level of seam.									
QBD 7102	6.9	6.4	17.62	1.44	2.1	1.9	3.725	.968	.459	60%	.275	.581
QBR 7103			No seam intersection.									
QBD 7104			No seam intersection.									
QBR 7105			No seam intersection.									
QBR 7106			No seam intersection.									
QBR 7107*	6.3	6.1	26.01	1.52	3.3	2.8	2.947	.738	.538	60%	.323	.442
QBR 7108			Hole started below stratigraphic level of seam.									
QBR 7109			Hole started below stratigraphic level of seam.									
QBR 7110			No seam intersection.									
QBR 7114			No seam intersection.									
QBD 7201			No seam intersection.									
QBD 7202			No seam intersection.									
QBD 7203			No seam intersection.									
QBD 7204	5.0		1.5	Seam too poor a quality to be economic.								
QBD 7205*	4.2	6.1	26.01	1.52	3.2	1.7	.870	.225	.103	60%	.062	.135
QBD 7206			Hole started below stratigraphic level of seam.									
QBD 7207			Hole shut down before stratigraphic level of seam - not in reserve area.									
QBD 7208			No seam intersection.									
QBD 7209			Hole shut down before stratigraphic level of seam - not in reserve area.									
QBD 7212			Hole shut down before stratigraphic level of seam.									
QBD 7213			Hole shut down before stratigraphic level of seam - not in reserve area.									
QBD 7216			Seam too thin to be economic.									
QBD 7217			No seam intersection.									
QBD 7218			No seam intersection.									
QBD 7219			No seam intersection.									
ADIT G5	6.7	7.5	16.26	1.43	1.4	1.1	3.091	.929	.233	60%	.140	.558
ADIT G12	8.3	8.4	20.23	1.47	Nil	0.8	1.430	.485	.083	60%	.049	.291
WEIGHTED AVERAGES & TOTALS LESS 7205C:		6.86	17.87	1.44		1.67	11.769	3.120	1.313	60%	.787	1.872

*QBR 7107 Poor recovery, used analysis of 7205.
*QBD 7205 Not in proven reserves.

RESERVES IN PLACE

TABLE II-C-5

SEAM I_1

Hole or Adit No.	Seam Thickness (Feet) Meas'd In Drill Hole	Seam Thickness (Feet) Weighted Av. For A. of Infl.	Raw Coal Ash %	Raw Coal Specific Gravity	Probable Dilution Thickness (Feet) Meas'd In Drill Hole	Probable Dilution Thickness (Feet) Weighted Av. For A. of Infl.	Area of Influence $Ft.^2 \times 10^6$	In Place Reserves Less 10% Geological Factors Raw Coal 10^6 S. Tons	In Place Reserves Less 10% Geological Factors Probable Dilution Tons 10^6	Estimated Mining Recovery	Total Probable Dilution Mines 10^6 S. Tons	Raw Coal Mined 10^6 S. Ton
QBD 7101		Not drilled to seam depth.										
QBD 7102		Seam not intersected.										
QBR 7103	22.3	18.8	15.47	1.42	Nil	0.5	9.856	7.394	.312	65%	.203	4.806
QBD 7104	6.8	7.0	16.42	1.43	2.7	2.4	5.046	1.410	.801	65%	.521	.917
QBR 7105	7.7	8.2	20.40	1.47	Nil	0.1	7.085	2.371	.054	65%	.035	1.541
QBR 7106	10.0	8.5	27.12	1.54	Nil	0.0	9.990	3.672	0	65%	0	2.387
QBR 7107		Seam not intersected.										
QBR 7108		Seam not intersected.										
QBR 7109		Seam not intersected.										
QBR 7110	8.3	8.9	12.87	1.39	1.5	1.4	9.991	3.455	.946	65%	.615	2.246
QBR 7114	7.5	7.9	21.87	1.48	2.5	2.4	8.262	2.736	1.293	65%	.840	1.778
QBD 7201	10.6	10.8	15.12	1.41	Nil	0.3	3.923	1.697	.087	65%	.057	1.103
QBD 7202	10.9	8.5	18.35	1.45	Nil	0.5	7.847	2.725	.251	65%	.163	1.771
QBD 7203	12.4	10.0	15.23	1.42	1.6	1.3	15.427	6.138	1.309	65%	.851	3.990
QBD 7204	6.2	6.6	21.98	1.48	5.3	2.6	1.615	.448	.277	65%	.180	.291
QBD 7205		Seam not intersected.										
QBD 7206*	8.1	7.1	12.64	1.39	4.0	2.5	1.197	.338	.198	65%	.129	.220
QBD 7207		Not drilled to seam depth - not in reserve area.										
QBD 7208*	5.5	6.2	12.64	1.39	0.5	0.5	7.290	1.790	.253	65%	.164	1.164
QBD 7209		Not drilled to seam depth - not in reserve area.										
QBD 7212		Not drilled to seam depth.										
QBD 7213		Not drilled to seam depth - not in reserve area.										
QBD 7216		Seam not intersected.										
QBD 7217	11.1	9.2	25.45	1.52	1.9	1.3	16.662	6.512	1.448	65%	.941	4.233
QBD 7218	6.5	6.7	12.64	1.39	2.0	2.5	2.339	.612	.380	65%	.247	.398
QBD 7219	8.4	8.5	18.89	1.45	0.2	0.75	8.170	2.838	.404	65%	.263	1.845
WEIGHTED AVERAGES AND TOTALS:		9.45	18.87	1.45		1.05	114.700	44.136	8.013	65%	5.209	28.690

* QBD 7206 & QBD 7208 Poor recovery use analysis 7218.

TABLE II-C-6

RESERVES IN PLACE

SEAM J

Hole or Adit No.	Seam Thickness (Feet) Meas'd In Drill Hole	Seam Thickness (Feet) Weighted Av. For A. of Infl.	Raw Coal Ash %	Raw Coal Specific Gravity	Probable Dilution Thickness (Feet) Meas'd In Drill Hole	Probable Dilution Thickness (Feet) Weighted Av. For A. of Infl.	Area of Influence $Ft.^2 \times 10^6$	In Place Reserves Less 10% Geological Factors Raw Coal 10^6 S. Tons	In Place Reserves Less 10% Geological Factors Probable Dilution Tons 10^6	Estimated Mining Recovery	Total Probable Dilution Mines 10^6 S. Tons	Raw Coal Mined 10^6 S. Tons
QBD 7101		Drill hole shut down before stratigraphic level attained.										
QBD 7102	16.1	16.1	26.31	1.53	Nil	0.1	7.462	5.122	.045	45%	.020	2.305
QBR 7103	19.9	18.8	10.41	1.37	2.0	1.7	9.856	7.035	1.136	34%	.386	2.392
QBD 7104	16.0	18.0	14.58	1.41	1.0	1.1	5.046	3.622	.370	43%	.159	1.557
QBR 7105	17.7	18.6	18.33	1.45	Nil	0.6	7.085	5.380	.295	46%	.136	2.475
QBR 7106	22.2	20.8	20.59	1.47	0.5	0.6	10.707	9.274	.418	42%	.176	3.895
QBR 7107	19.7	18.8	27.22	1.54	1.0	0.4	7.498	6.135	.202	53%	.107	3.252
QBR 7108*	6.2	8.2	36.44	1.63	0.5	0.6	4.550	1.690	.166	50%	.083	.845
QBR 7109		Oxidized coal - hole in area of influence of 7108.										
QBR 7110	22.5	21.0	20.72	1.47	1.5	1.5	9.990	8.736	1.022	34%	.347	2.970
QBR 7114**	19.5	19.3	16.20	1.43	2.0	1.6	8.262	6.364	.904	42%	.380	2.673
QBD 7201**	16.8	18.1	11.41	1.38	2.0	1.7	3.923	2.773	.451	42%	.189	1.165
QBD 7202**	19.2	18.3	16.60	1.43	0.2	0.3	8.330	6.068	.176	34%	.060	2.063
QBD 7203**	19.6	17.8	14.57	1.41	1.0	0.7	14.716	10.467	.648	38%	.246	3.977
QBD 7204**	19.2	16.7	14.84	1.41	1.0	0.7	5.712	3.813	.274	44%	.121	1.678
QBD 7205***	7.6	10.8	28.05	1.55	Nil	0.3	10.880	5.216	.188	48%	.090	2.504
QBD 7206*	20.6	19.7	13.20	1.40	1.0	1.1	1.658	1.273	.122	48%	.059	.611
QBD 7207		Drill hole shut down before stratigraphic level attained - not in reserve area.										
QBD 7208	10.0	12.4	13.54	1.40	Nil	0.3	5.245	2.529	.087	45%	.039	1.138
QBD 7209		Drill hole shut down before stratigraphic level attained - not in reserve area.										
QBD 7212		Seam too deep for drill used.										
QBD 7213		Drill hole shut down before stratigraphic level attained - not in reserve area.										
QBD 7216	10.0	11.0	10.36	1.37	Nil	0.0	12.288	5.146	0	45%	0	2.316
QBD 7217	10.0	11.4	6.11	1.32	Nil	0.2	16.966	7.172	.196	42%	.082	3.012
QBD 7218	18.3	18.3	15.46	1.42	0.6	0.9	2.576	1.879	.146	45%	.066	.846
QBD 7219	17.3	18.2	14.00	1.40	1.5	1.1	8.170	5.803	.598	34%	.203	1.973
ADIT J14	15.4	14.3	12.00	1.38	1.0	0.9	1.939	1.078	.112	55%	.062	.593
WEIGHTED AVERAGES & TOTALS LESS 7205:		16.60	16.51	1.43		1.42	151.980	101.359	7.367	41.18%	2.921	41.736

* Lower J
** Upper & Lower J combined
*** Not in proven reserves

CALCULATION OF NET CLEAN COAL

Summary

The reserves of clean coal are expressed on the basis of a product with approximately 7% ash. In the drill hole analytical procedures, this was obtained by compositing the float product at 7% ash with the froth floatation product as it occurred. The result is products with ash ranging generally from 6.5% to 7.5%. The theoretical yield for the plant product was obtained by deducting 4% from the combined theoretical yield of these coarse and fine products. In the case of rotary drill samples, the full sample (¼ x 0, sink/float recovered portion) was used. The analysis shown are, therefore, actual analyses of products which have been prepared in such a way that they simulate the expected plant product as nearly as possible. As it is felt that each drill hole analyses represents approximately a year's production from any seam, no weighted average washabilities from the seams were prepared. Instead, predicted quarterly products have been calculated as part of the mining plan and they are presented in that part of the report. Although wide variations in specific gravity are indicated within individual seams, they should be quite gradual and the washabilities from blended feed are not expected to have even that much variability.

Since data for sink-float products at 1.60 are not given in the data summary sheets, and the mining plans have assumed this cut-off as a convenient approximation of the ultimate plant operating point, reserve data has also been calculated and quality tables prepared for coal cleaned by this procedure. The gross yield of net clean coal and the product quality do not differ much from the nominal 7% ash products, indicating again that a fairly consistent setting will be possible for blended raw coal coming into the plant.

Nominal 7% Ash Products

The section on sampling and analytical procedures adequately covers the methods used to obtain quality data for the nominal 7% ash products. The variation in this data is due solely to the variation in the froth floatation products. At present, a computer program is being developed to provide data on a move precise product-ash base, however this refinement is not necessary at the present time and will provide only extrapolated data, whereas the present method has provided a reasonably accurate and realistic simulation of variations which may have to be dealt with.

Specific Gravity of Separation

The specific gravity of the cleaning plant medium for nominal 7% ash products has been obtained from the sink-float analysis. The variations are due both to inherent variations in the coal, and also, to differences in sampling decisions and proportions of roof dilution which were included in the sample.

Theoretical Yield

The theoretical yield used for the plant product is the proportionately combined sink-float yield of the +28m fraction with the corresponding floatation yield from the -28m fraction, discounted by 4% for plant inefficiencies. The decision to reduce the theoretical yield by 4% is based on the observation that the washing efficiency curves (see Vol. III, preparation section) indicate that approximately 1 1/2 to 4% of the product will be lost in water only systems operating at 1.60 specific gravity (r=0.10). If it is necessary to wash a part of the Babcock coal at lower specific gravities, then heavy media circuits (1.50 to 1.55) may be necessary since the losses in a water-only plant would exceed 5%. In any case, for the purpose of reserve calculation, it is presumed that the plant will be designed to minimize washing loss. To be safe, a total of 4% has been deducted. Allowance for the possible interference effect of near gravity material from the probable

dilution, has been made by assuming that the dilution has a high specific gravity (2.37).

The predicted wash plant efficiency data is more fully discussed in the section on cleaning plant design.

The yields from the diamond drill samples may be considered reasonably representative since the coal was crushed to yield approximately 20-25% of -28m material before it was analyzed. Also, it can be generally considered that soft clean coal is more easily lost in drilling than hard coal or shales. On the average, rotary drill sample yields were distinctly lower (up to 8%) than the diamond drill yields. This is probably due to contaminants in the sample and to poor sink-float separations due to overcrushing. Despite these observations the rotary yields have been used as measured as there is no certain method of correcting them (there are not enough data points to conclude with certainty that the recoveries should be higher). The result is a conservative estimate of plant recovery.

Moisture

In the nominal 7% ash product, total moisture is set at 5% to reflect the quality of a shipped or received product. In the first Quality Comparison table, the moisture in the weighted average 1.60 products is also set at 5% for comparison. In the second table, both products are stated on an air dry basis for ease of comparison with other similar coals. (Residual moisture is assumed to be the same in each product). (Page). The clean coal product tonnages have not been increased to reflect the weight of moisture.

Net Clean Tons

In the reserve tables, the figures for net clean tons have been obtained by reducing the raw tons mined by the theoretical yield (previously adjusted by 4%). The product thus stated is in millions of short tons.

Probable Yield Assuming Total Dilution

As an estimate of the most conservative expectation, the probable yield assuming total dilution has been calculated. Regardless of the mining system used, dilution can be expected to be of this order. As has been explained previously various systems may be selected which could significantly reduce this dilution. For this reason, the other extreme (no dilution) has also been summarized on each table along with the total dilution summary. Although more detailed interpretation may be made in the future, mine planning and plant designing should make appropriate allowances for this range of possibilities.

In estimating the total probable dilution which will be mined with the product coal, it is assumed that this will be in direct proportion to the amount of coal which may be mined and to the mining recovery factor which has been used for the coal.

Products at 1.60 Specific Gravity

The tables for the coal product at 1.60 are generally self explanatory. They are similar to those for the nominal 7% ash product except that the diamond drill data are calculated on an air dry basis and are derived from mathematical composites of the +28m float portion at a specific gravity of 1.60 and the -28 mesh froth floatation product. Consequently the F.S.I. values are estimated.

For rotary holes, sample results were taken directly from the analytical data since sink-float analysis was done directly on the ¼ x 0 head sample.

In the case of Seam E, where the section analyzed was greater than the section to be mined (i.e. when the lower shale band is to be used as the floor and the lower coal leaf is to be abandoned). The recovery was adjusted on the assumption that it would be improved in

proportion to the amount of rock and coal left out. For example: If the original recovery was 50% on 8 total feet including 3 feet of rock, and the production section is 5 feet with only 1 foot of rock, then the recovery on the remaining 5 feet is

$$R = \frac{4}{5} \times .50 \times \frac{8}{5} = 64\%$$

The quality of the product is assumed to be the same as it was on the original sample since the density logs indicate that the lower coal split in the seam is generally of poorer quality than the upper two splits.

In the case of Seam J, where the mining height is represented by two analytical samples, the mathematical composite was obtained simply by calculating each sample as indicated above and then combining them in proportion to their individual sample thickness and calculated recoveries at 1.60 SPG.

The amount of sulphur in the 1.60 product was estimated by extrapolating on a straight line basis between the ash and sulphur content of the head sample to the ash and sulphur content of the nominal 7% ash product since these are the only two data points that are available which contain both +28m and -28m portions.

TABLE II-G

COMPARISON OF QUALITY
DRY BASIS

Weighted Average Analyses
1.60 SPG. and Nominal 7% Ash Products

Seam	Product	Ash	Vols.	F.C.	S.	Moisture
D	1.60	7.25	25.11	66.78	.67	.83
	7	7.44	25.49	66.35	.61	.83 est.
E	1.60	7.70	24.52	66.91	.26	.84
	7	7.40	24.64	67.15	.25	.84 est.
F	1.60	4.86	24.51	69.49	.32	.90
	7	7.10	23.99	67.97	.34	.90 est.
G	1.60	10.97	22.34	65.87	.49	.78
	7	8.08	23.75	67.35	.42	.78 est.
I	1.60	9.06	21.44	68.46	.31	.98
	7	7.33	21.99	69.65	.27	.98 est.
J	1.60	7.57	21.98	69.58	.23	.85
	7	7.13	22.14	69.79	.22	.85 est.

TABLE II-H

COMPARISON OF QUALITY
PRODUCT BASIS AS RECEIVED AT 5% TOTAL MOISTURE

Weighted Average Analyses
1.60 SPG. and Nominal 7% Ash Products

Seam	Product	Ash	Vols.	F.C.	S.	Moisture
D	1.60	6.94	24.05	63.97	.67	5
	7	7.09	24.43	63.58	.61	5
E	1.60	7.37	23.50	64.10	.26	5
	7	7.09	23.61	64.33	.25	5
F	1.60	4.65	23.49	66.61	.32	5
	7	6.81	23.00	65.15	.34	5
G	1.60	10.50	21.39	63.06	.49	5
	7	7.74	22.74	64.49	.42	5
I	1.60	8.69	20.57	65.68	.31	5
	7	7.04	21.10	66.82	.27	5
J	1.60	7.24	21.07	66.67	.23	5
	7	6.84	21.21	66.87	.22	5

NOMINAL 7% ASH PRODUCT - ANALYSES BY DRILL HOLE

TABLE II-D-1

SEAM D

Actual Analyses on Combined +28 and -28 Mesh Products

Hole or Adit No.	Plant Product Sp.G. of Recovery +28 M.	Plant Product Theor. Yield: (+28,-28 M.) Less 4%	As Received Proximate Analysis of Product Ash	Vol.	T.M.	F.C.	S.	F.S.I.	Tons x 10^6 Raw Tons Mined (Allowing 10% Geol. Deduction)	Total Probable Dilution (Contin. Mining)	Total Tons Mined & Probable Dilution	Net Clean Tons (Theor. Yield x Raw Tons)	Probable Yield Assuming Total Dilution*	Comments
QBD 7101	1.69	84.0	6.96	25.77	5%	62.27	.56	7½	2.347	.434	2.781	1.971	70.9	
QBD 7102	1.55	64.0	7.06	23.92	5%	64.02	.51	6	1.523	.600	2.123	.975	45.9	
QBR 7103	1.85	91.5	6.68	23.50	5%	64.82	.27	9	1.841	.292	2.133	1.685	79.0	
QBD 7104	1.58	50.0	8.05	23.81	5%	63.14	.41	6	1.051	.281	1.332	.526	39.5	
QBR 7105	1.58	64.0	6.69	23.14	5%	65.17	.59	7½	1.598	.496	2.094	1.023	48.8	
QBR 7106	1.58	64.0	6.69	23.14	5%	65.17	.59	7½	1.602	.703	2.305	1.025	44.5	Wash data from R7105, poor recovery
QBR 7107		Drill hole spudded below seam's stratigraphic level.												
QBR 7108		Drill hole spudded below seam's stratigraphic level.												
QBR 7109		Drill hole spudded below seam's stratigraphic level.												
QBR 7110	1.85	86.5	6.72	27.12	5%	61.16	.24	9	2.165	.145	2.310	1.873	81.1	
QBR 7114	2.00	87.6	6.69	25.17	5%	63.14	.35	7	1.768	.215	1.983	1.549	78.1	
QBD 7201	1.68	86.6	6.58	23.74	5%	64.68	.45	5	.863	.148	1.011	.747	74.1	
QBD 7202	1.45	64.5	8.59	22.49	5%	63.92	.77	5	2.120	.652	2.772	1.367	49.3	
QBD 7203	1.94	82.1	6.45	24.18	5%	64.37	2.06	5	1.947	.118	2.065	1.598	77.4	
QBD 7204	1.57	77.7	6.75	22.37	5%	65.88	.58	7	1.515	.369	1.884	1.177	62.5	
QBD 7205C	1.56	64.0	7.92	25.26	5%	61.82	1.26	5½	1.319	.216	1.535	.844	50.0	Not in proven reserves Lower fault block
QBD 7206		Drill hole spudded below seam's stratigraphic level.												
QBD 7207		Drill hole shut down before seam's stratigraphic level - not in reserve area.												
QBD 7208	1.56	57.7	9.57	24.87	5%	66.56	1.30	5½	.594	.037	.631	.343	54.4	
QBD 7209		Not in reserve area, seam intersected.												
QBD 7212	1.47	72.1	8.66	24.68	5%	61.66	.25	6½	1.715	.570	2.285	1.237	54.1	
QBD 7213		Not in reserve area, hole shut down before stratigraphic level of seam.												
QBD 7216	1.70	86.6	6.90	24.93	5%	63.17	.83	4½	1.035	.117	1.152	1.021	77.7	
QBD 7217	1.64	87.2	6.68	25.00	5%	63.32	.57	4½	1.246	.431	1.677	1.087	64.8	
QBD 7218	1.70	82.6	7.08	23.30	5%	64.62	.86	4½	.863	.203	1.066	.713	66.9	
QBD 7219	1.55	74.8	7.38	23.09	5%	64.52	.79	6	.902	.252	1.154	.675	58.5	
Adit D4	1.51	63.0	6.68	24.47	5%	63.85	.43	7	.456	.162	.618	.287	46.4	
Adit D9	1.80	77.0	6.73	24.23	5%	64.04	1.46	5½	.857	.176	1.033	.660	63.8	
WEIGHTED AVERAGES & TOTALS LESS 7205C:		76.45	7.07	24.42	5%	63.60	.65	5½	28.008	6.401	34.409	21.539	62.59	
											YIELD - NO DILUTION:		76.90	

* Probable Yield = (Net Clean Tons/Total Tons Extracted) x 100

NOMINAL 7% ASH PRODUCT - ANALYSES BY DRILL HOLE

TABLE II-D-2

SEAM E

Actual Analyses on Combined +28 and -28 Mesh Products

Hole or Adit No.	Plant Product Sp.G. of Recovery +28 M.	Plant Product Theor. Yield: (+28,-28 M.) Less 4%	As Received Proximate Analysis of Product Ash	Vol.	T.M.	F.C.	S.	F.S.I.	Tons x 10^6 Raw Tons Mined (Allowing 10% Geol. Deduction)	Total Probable Dilution (Contin. Mining)	Total Tons Mined & Probable Dilution	Net Clean Tons (Theor. Yield x Raw Tons)	Probable Yield Assuming Total Dilution*	Comments
QBD 7101	1.55	73.50	6.88	24.32	5%	63.80	.31	7	2.610	.315	2.925	1.918	65.55	
QBD 7102	1.53	65.54	7.55	22.80	5%	64.65	.21	7½	1.124	.307	1.431	.737	51.44	
QBR 7103	1.50	55.46	6.68	23.03	5%	65.29	.20	8	2.572	.420	2.992	1.426	47.66	
QBD 7104	1.67	90.75	7.59	23.36	5%	64.05	.28	7½	.730	.088	.818	.662	81.51	
QBR 7105	1.65	70.02	6.69	23.04	5%	65.27	.28	7½	1.383	.677	2.060	.968	47.01	
QBR 7106	1.54	53.20	6.69	22.47	5%	65.27	.19	8½	1.456	.614	2.070	.775	37.40	
QBR 7107	1.63	61.00	6.71	22.33	5%	65.96	.51	6½	.584	.044	.628	.356	56.73	(Poor recovery, (E10 analysis used
QBR 7108			Hole started below seam's stratigraphic position.											
QBR 7109			Hole started below seam's stratigraphic position.											
QBR 7110	1.53	65.82	6.72	24.48	5%	63.80	.22	8½	1.830	.377	2.207	.384	54.58	
QBR 7114U	1.67	75.80	6.70	24.49	5%	63.81	.25	7½	2.420	.110	2.530	1.834	84.65	
QBD 7201	1.61	57.44	6.72	23.16	5%	65.12	.21	8	.768	.272	1.040	.441	42.40	
QBD 7202U	1.67	65.46	8.36	22.08	5%	64.56	.26	6	1.817	.519	2.336	1.189	50.90	
QBD 7203	1.50	61.16	7.15	24.07	5%	63.78	.24	7	2.565	.176	2.741	1.569	57.23	
QBD 7204	1.45	67.53	7.29	23.38	5%	64.33	.20	8½	1.075	.201	1.276	.726	56.86	
QBD 7205 E_2	1.80	72.54	6.88	23.39	5%	64.73	.28	7	1.254	.130	1.384	.910	65.72	Not proven reserve
QBD 7206			Hole started below seam's stratigraphic position.											
QBD 7207			Hole shut down; seam too deep for drill used.											
QBD 7208	1.55	77.75	7.74	23.33	5%	63.93	.20	7	.950	.076	1.026	.739	72.00	
QBD 7209			Hole not in reserve area.											
QBD 7212			Hole shut down; seam too deep for drill used.											
QBD 7213			Hole shut down; not in reserve area.											
QBD 7216	1.62	71.94	7.15	24.53	5%	63.32	.25	6½	2.041	.576	2.617	1.468	56.09	
QBD 7217U	1.91	69.00	7.02	23.12	5%	64.86	.19	6	3.587	.532	4.119	2.475	60.09	
QBD 7218U	1.67	72.85	6.84	23.11	5%	65.05	.23	5½	.796	.045	.841	.580	68.89	
QBD 7219	1.68	75.12	7.01	22.57	5%	65.42	.26	6½	.839	.296	1.135	.630	55.54	
ADIT E8	1.72	78.00	7.00	22.81	5%	69.23	.54	3	.330	.050	.380	.257	67.72	
ADIT E10	1.63	61.00	6.71	22.33	5%	65.96	.51	6½	.116	.008	.124	.071	57.25	
WEIGHTED AVERAGES & TOTALS LESS 7205C:		64.76	7.06	23.50	5%	64.47	.24	7	29.593	5.703	35.296	19.165	54.29	
												YIELD - NO DILUTION:	64.76	

* Probable Yield = (Net Clean Tons/Total Tons Extracted) x 100

SEAM F

NOMINAL 7% ASH PRODUCT - ANALYSES BY DRILL HOLE

Actual Analyses on Combined +28 and -28 Mesh Products

TABLE II-D-3

Hole or Adit No.	Plant Product: Sp.G. of Recovery +28 M.	Plant Product: Theor. Yield: (+28,-28 M.) Less 4%	As Received Proximate Analysis of Product: Ash	Vol.	T.M.	F.C.	S.	F.S.I.	Tons x 10^6: Raw Tons Mined (Allowing 10% Geol. Deduction)	Total Probable Dilution (Contin. Mining)	Total Tons Mined & Probable Dilution	Net Clean Tons (Theor. Yield x Raw Tons)	Probable Yield Assuming Total Dilution*	Comments
QBD 7101	1.93	90.00	6.51	23.19	5%	65.30	.28	7½	2.657	.673	3.330	2.391	71.81	
QBD 7102	1.73	57.50	6.96	22.77	5%	65.27	.26	8½	1.711	.289	2.000	.984	49.19	
QBR 7103	Raw	96.00	6.82	22.84	5%	65.34	.56	8	2.682	.660	3.342	2.575	77.05	Babcock Ash vs Sp.G
QBD 7104	2.11	88.60	6.39	22.60	5%	66.01	.27	8	.769	.382	1.151	.681	59.23	Curve: Sp.G. 1.33 est.
QBR 7105	1.59	44.50	6.70	23.09	5%	65.21	.34	2	1.923	.235	2.158	.856	39.65	
QBR 7106	1.87	82.00	6.70	22.37	5%	65.93	.32	8½	1.920	.293	2.213	1.574	71.18	
QBR 7107	2.06	84.00	6.70	22.97	5%	65.33	.27	8½	.868	.285	1.153	.729	63.23	
QBR 7108		Drill started below stratigraphic level of seam.												
QBR 7109		Drill started below stratigraphic level of seam.												
QBR 7110	2.00	81.50	6.52	22.44	5%	65.49	.27	7	1.949	.292	2.241	1.588	70.88	
QBR 7114	1.91	92.00	6.69	23.93	5%	64.38	.24	7½	1.748	.480	2.228	1.608	72.18	
QBD 7201	1.65	75.59	6.70	22.63	5%	65.67	.54	8	.915	.204	1.119	.692	61.78	
QBD 7202	1.79	74.10	7.69	22.78	5%	64.53	.23	7	2.560	.273	2.833	1.897	66.97	
QBD 7203	1.69	67.91	7.25	22.83	5%	64.92	.37	8	2.412	.500	2.912	1.638	56.22	
QBD 7204	1.92	87.00	6.41	24.93	5%	63.66	.30	6	1.561	.757	2.318	1.358	58.60	
QBD 7205C	1.91	71.04	6.57	23.21	5%	65.22	.21	7	1.680	.905	2.585	1.193*	46.16	Not in proven reserve
QBD 7206		Drill started below stratigraphic level of seam.												
QBD 7207		Seam too deep for drill used.												
QBD 7208	1.67	52.59	7.43	22.67	5%	64.90	.31	7½	.881	.153	1.034	.463	44.79	
QBD 7209		Out of reserve area.												
QBD 7212		Seam too deep for drill used.												
QBD 7213		Out of reserve area.												
QBD 7216	1.79	75.79	7.13	22.61	5%	65.26	.23	7	2.289	.718	3.007	1.735	57.70	
QBD 7217	1.79	85.74	6.53	23.40	5%	65.07	.23	7½	3.201	1.172	4.373	2.745	62.76	
QBD 7218	1.86	71.22	7.96	22.70	5%	64.34	.24	7	.721	.307	1.028	.513	49.85	
QBD 7219	2.11	88.60	6.39	22.60	5%	66.01	.27	8	1.096	.270	1.366	.971	71.08	Poor recovery data
Adit F1	1.67	73.20	6.46	23.04	5%	65.50	.37	8	.253	.064	.317	.185	58.41	from D7104
Adit F6	1.55	78.00	5.64	22.61	5%	66.75	.60	8	.235	.044	.279	.183	65.70	
Adit F11	1.98	78.00	5.53	22.16	5%	65.39	.40	7½	.163	.072	.235	.127	53.84	
WEIGHTED AVERAGES & TOTALS LESS 7205C:		78.40	6.80	20.84	5%	65.13	.23	7½	32.514	8.123	40.637	25.493	62.73	
												YIELD - NO DILUTION:	78.40	

* Probable Yield = (Net Clean Tons/Total Tons Extracted) x 100

NOMINAL 7% ASH PRODUCT - ANALYSES BY DRILL HOLE

TABLE II-D-4

SEAM G

Actual Analyses on Combined +28 and -28 Mesh Products

Hole or Adit No.	Plant Product Sp.G. of Recovery +28 M.	Plant Product Theor. Yield: (+28,-28 M.) Less 4%	As Received Proximate Analysis of Product Ash	Vol.	T.M.	F.C.	S.	F.S.I.	Tons x 10^6 Raw Tons Mined (Allowing 10% Geol. Deduction)	Total Probable Dilution (Contin. Mining)	Total Tons Mined & Probable Dilution	Net Clean Tons (Theor. Yield x Raw Tons)	Probable Yield Assuming Total Dilution*	Comments
QBD 7101			Hole shut down before stratigraphic level reached.											
QBD 7102	1.44	59.00	7.81	22.64	5%	64.55	.34	8	.581	.275	.856	.343	40.00	
QBR 7103			No seam intersection.											
QBD 7104			No seam intersection.											
QBR 7105			No seam intersection.											
QBR 7106			No seam intersection.											
QBR 7107	1.43	53.84	9.45	23.47	5%	62.07	.43	7½	.442	.323	.765	.238	31.70	Poor recovery & qual. Used 7205C analysis
QBR 7108			Hole started below stratigraphic position of seam.											
QBR 7109			Hole started below stratigraphic position of seam.											
QBR 7110			No seam intersection.											
QBR 7114			No seam intersection.											
QBD 7201			No seam intersection.											
QBD 7202			No seam intersection.											
QBD 7203			No seam intersection.											
QBD 7204			Seam too thin to be economic.											
QBD 7205C	1.43	53.84	9.46	23.47	5%	62.07	.43	7½	.135	.062	.197	.073	37.11	Not in reserve area
QBD 7206			Hole started below stratigraphic position of seam.											
QBD 7207			Drill shut down before stratigraphic level reached.											
QBD 7208			No seam intersection.											
QBD 7209			Drill shut down before stratigraphic level reached.											
QBD 7212			Drill shut down before stratigraphic level reached.											
QBD 7213			Drill shut down before stratigraphic level reached.											
QBD 7216			Seam too thin to be economic.											
QBD 7217			No seam intersection.											
QBD 7218			No seam intersection.											
QBD 7219			No seam intersection.											
ADIT G5	1.49	69.00	6.96	22.97	5%	65.07	.39	7	.558	.140	.698	.385	55.12	
ADIT G12	1.41	48.00	6.69	21.05	5%	67.05	.69	8½	.291	.049	.340	.139	40.88	
WEIGHTED AVERAGES & TOTALS LESS 7205C:		59.02	7.74	22.74	5%	64.49	.42	7½	1.872	.787	2.659	1.105	41.55	
												YIELD - NO DILUTION:	59.02	

* Probable Yield = (Net Clean Tons/Total Tons Extracted) x 100

NOMINAL 7% ASH PRODUCT - ANALYSES BY DRILL HOLE

TABLE II-D-5

SEAM I_1

Actual Analyses on Combined +28 and -28 Mesh Products

Hole or Adit No.	Plant Product Sp.G. of Recovery +28 M.	Plant Product Theor. Yield: (+28,-28 M.) Less 4%	As Received Proximate Analysis of Product Ash	Vol.	T.M.	F.C.	S.	F.S.I.	Tons x 10^6 Raw Tons Mined (Allowing 10% Geol. Deduction)	Total Probable Dilution (Contin. Mining)	Total Tons Mined & Probable Dilution	Net Clean Tons (Theor. Yield x Raw Tons)	Probable Yield Assuming Total Dilution*	Comments
QBD 7101			Not drilled to seam depth.											
QBD 7102			Seam not intersected.											
QBR 7103	1.52	76.07	6.72	20.60	5%	67.68	.21	8½	4.806	.203	5.009	3.656	72.91	
QBD 7104	1.56	77.15	7.01	20.55	5%	67.44	.30	7½	.917	.521	1.438	.707	50.45	
QBR 7105	1.40	54.00	6.70	20.65	5%	67.65	.32	8	1.541	.035	1.576	.832	52.80	
QBR 7106	1.58	57.50	6.70	19.81	5%	68.52	.26	8½	2.387	0	2.387	1.373	57.51	
QBR 7107			Seam not intersected.											
QBR 7108			Seam not intersected.											
QBR 7109			Seam not intersected.											
QBR 7110	1.53	71.32	6.72	20.60	5%	67.34	.24	6	2.246	.615	2.861	1.602	55.96	I_1 plus I_2 analysis combined
QBR 7114	1.53	66.00	6.69	21.74	5%	66.57	.20	8	1.778	.840	2.618	1.173	44.82	
QBD 7201	1.43	67.48	7.21	21.34	5%	66.45	.33	6	1.103	.057	1.160	.744	64.20	
QBD 7202	1.45	72.97	8.40	21.45	5%	65.14	.36	8½	1.771	.163	1.934	1.292	66.84	
QBD 7203	1.45	71.01	7.04	22.48	5%	65.48	.21	6½	3.990	.851	4.841	2.833	58.50	
QBD 7204	1.43	52.38	7.08	21.96	5%	65.96	.47	8	.291	.180	.471	.152	32.26	
QBD 7205C			Seam not intersected.											
QBD 7206	1.54	82.58	6.83	20.54	5%	66.14	.28	8	.220	.129	.349	.182	52.02	Poor recovery, used analysis for 7218
QBD 7207			Drill shut down before stratigraphic position of seam.											
QBD 7208	1.54	82.58	6.83	20.54	5%	67.63	.28	8	1.164	.163	1.327	.927	72.40	Poor recovery, used analysis for 7218
QBD 7209			Drill shut down before stratigraphic position of seam.											
QBD 7212			Drill shut down before stratigraphic position of seam.											
QBD 7213			Drill shut down before stratigraphic position of seam.											
QBD 7216			Seam not intersected.											
QBD 7217	1.47	58.83	7.40	21.46	5%	66.14	.30	8	4.233	.941	5.174	2.490	48.12	
QBD 7218	1.54	82.58	6.83	20.54	5%	67.63	.28	8	.398	.247	.645	.329	50.93	
QBD 7219	1.50	70.77	7.34	20.85	5%	66.81	.37	7½	1.845	.263	2.108	1.306	61.96	
WEIGHTED AVERAGES & TOTALS:		68.30	7.04	21.10	5%	66.82	.27	7½	28.690	5.208	33.898	19.598	57.81	
												YIELD - NO DILUTION:	68.30	

* Probable Yield = (Net Clean Tons/Total Tons Extracted) x 100

NOMINAL 7% ASH PRODUCT - ANALYSES BY DRILL HOLE

TABLE II-D-6

SEAM J

Actual Analyses on Combined +28 and -28 Mesh Products

Hole or Adit No.	Plant Product: Sp.G. of Recovery +28 M.	Plant Product: Theor. Yield: (+28,-28 M.) Less 4%	As Received Proximate Analysis of Product: Ash	Vol.	T.M.	F.C.	S.	F.S.I.	Tons x 10^6: Raw Tons Mined (Allowing 10% Geol. Deduction)	Total Probable Dilution (Contin. Mining)	Total Tons Mined & Probable Dilution	Net Clean Tons (Theor. Yield x Raw Tons)	Probable Yield Assuming Total Dilution*	Comments
QBD 7101			Drill shut down before stratigraphic level reached.											
QBD 7102F	1.43	57.00	8.97	22.38	5%	63.65	.21	8½	2.305	.020	2.325	1.313	56.51	
QBR 7103F	1.88	91.00	6.72	21.69	5%	66.59	.38	5	2.392	.386	2.778	2.177	78.35	
QBD 7104F	1.64	77.50	6.78	21.31	5%	66.91	.18	7	1.557	.159	1.716	1.207	70.32	
QBR 7105	1.45	68.00	6.71	20.31	5%	68.80	.27	7½	2.475	.136	2.611	1.683	64.44	
QBR 7106F	1.49	68.00	6.70	19.50	5%	66.42	.21	8½	3.895	.176	4.071	2.649	65.06	
QBR 7107F	1.54	67.00	6.72	21.86	5%	67.30	.19	8½	3.252	.107	3.359	2.179	64.83	
QBR 7108F	1.46	46.00	6.70	21.00	5%	68.10	.24	6	.845	.083	.928	.389	41.91	
QBR 7109			Oxidized coal.											
QBR 7110F	1.73	76.00	6.52	20.86	5%	67.62	.23	5½	2.970	.347	3.317	2.257	68.04	
QBR 7114F	1.56	68.85	6.68	20.96	5%	67.33	.15	7	2.673	.380	3.053	1.840	60.27	U & L combined
QBD 7201F	1.63	84.51	6.71	20.59	5%	67.70	.19	7	1.165	.189	1.354	.985	72.70	
QBD 7202F	1.44	74.01	7.60	21.39	5%	66.09	.21	7½	2.063	.060	2.123	1.527	71.96	U & L combined
QBD 7203F	1.48	76.59	6.70	22.05	5%	66.24	.14	7½	3.977	.246	4.223	3.046	72.55	U & L combined
QBD 7204F	1.46	76.65	6.85	21.67	5%	66.48	.24	7½	1.678	.121	1.799	1.286	71.50	U & L combined
QBD 7205C	1.51	62.00	7.56	21.13	5%	66.31	.18	6	2.504	.090	2.594	1.552	59.83	Not in pr. reserves, U & L combined Lower J
QBD 7206F	1.48	75.19	6.87	21.04	5%	67.09	.24	6	.611	.059	.670	.459	68.57	
QBD 7207			Not in reserve area; drill shut down before stratigraphic level attained.											
QBD 7208L	1.57	77.07	7.17	20.88	5%	66.94	.30	5½	1.138	.039	1.177	.877	74.50	Lower J
QBD 7209			Not in reserve area; drill shut down before stratigraphic level attained.											
QBD 7212			Too deep for drill equipment used.											
QBD 7213			Not in reserve area; drill shut down before stratigraphic level attained.											
QBD 7216L	1.70	81.60	6.77	21.33	5%	66.90	.13	7	2.316	0	2.316	1.890	81.60	Lower J
QBD 7217L	1.80	93.50	5.88	21.40	5%	67.72	.24	6½	3.012	.082	3.094	2.816	91.00	Lower J
QBD 7218F	1.44	72.60	7.51	19.33	5%	67.89	.19	6	.846	.066	.912	.614	67.40	U & L combined
QBD 7219F	1.46	75.32	6.94	20.71	5%	67.36	.15	6	1.973	.203	2.176	1.486	68.49	U & L combined
ADIT J14	1.47	76.42	6.61	20.56	5%	67.84	.38	7½	.593	.062	.655	.453	69.23	U & L combined
WEIGHTED AVERAGES & TOTALS LESS 7205C:		74.59	6.80	21.14	5%	66.95	.21	7	41.736	2.921	44.657	31.133	69.71	
											YIELD - NO DILUTION:		74.59	

* Probable Yield = (Net Clean Tons/Total Tons Extracted) x 100

RESERVE SUMMARY

PRODUCT AT 1.60 SPECIFIC GRAVITY - ANALYSES BY SEAM

TABLE II-E

Weighted Averages Based on Mathematically Combined Actual Analyses of +28 and -28 Mesh Products

Seam	Plant Product Theor. Yield: (+28, -28 M.) Less 4%	Dry Basis Proximate Analysis of Product						Tons x 10^6				Probable Yield Assuming Total Dilution*	Comments
		Ash	Vol.	R.M.	F.C.	S.	F.S.I.	Raw Tons Mined (Allowing 10% Geol. Deduction)	Total Probable Dilution (Contin. Mining)	Total Tons Mined & Probable Dilution	Net Clean Tons (Theor. Yield x Raw Tons)		
D	76.77	7.22	25.12	.82	66.81	.71	5	28.008	6.401	34.409	21.513	62.52	
										YIELD - NO DILUTION:		76.81	
E	67.70	7.68	24.46	.84	66.69	.25	7	29.593	5.703	35.296	20.037	56.76	
										YIELD - NO DILUTION:		67.70	
F	73.16	5.02	25.06	.89	69.37	.30	8	32.514	8.123	40.637	23.784	58.53	
										YIELD - NO DILUTION:		73.16	
G	75.32	10.97	22.34	.78	65.87	.49	6	1.872	.787	2.659	1.410	53.02	Not used in Interim Report #2 Mining Plan
										YIELD - NO DILUTION:		75.32	
I	75.30	9.06	21.44	.98	68.46	.31	7½	28.690	5.208	33.898	21.605	63.73	Not used in Interim Report #2 Mining Plan
										YIELD - NO DILUTION:		75.30	
J	78.69	7.66	21.95	.85	69.53	.22	7	41.736	2.921	44.657	32.846	73.55	
										YIELD - NO DILUTION:		78.69	
TOTAL PRODUCT								162.413			121.195		Yield 74.62 (No dilution)
TOTAL (EXCLUDING G, I)								131.851	23.148	154.999	98.180		Yield 74.46 (No dilution) Yield 63.34 (With dilution)

PRODUCT AT 1.60 SPECIFIC GRAVITY - ANALYSES BY DRILL HOLE

TABLE II-F-1

SEAM D

Mathematically Combined Actual Analyses of +28 and -28 Mesh Products (1)

Hole or Adit No.	Plant Product Theor. Yield: (+28, -28 M.) Less 4%	Dry Basis Proximate Analysis of Product						Tons x 10^6				Probable Yield Assuming Total Dilution*	Comments
		Ash	Vol.	R.M.	F.C.	S.	F.S.I.	Raw Tons Mined (Allowing 10% Geol. Deduction)	Total Probable Dilution (Contin. Mining)	Total Tons Mined & Probable Dilution	Net Clean Tons (Theor. Yield x Raw Tons)		
QBD 7101	83.79	6.85	26.96	.89	65.29	.56	7½	2.347	.434	2.781	1.966	70.70	
QBD 7102	66.63	7.87	25.00	.47	66.73	.52	5	1.523	.600	2.123	1.015	47.79	
QBR 7103D	85.88	5.05	24.93	.48	69.54	.42	9	1.841	.292	2.133	1.581	74.11	
QBD 7104	56.26	8.94	24.82	1.23	64.99	.41	6½	1.051	.281	1.332	.591	44.36	
QBR 7105	65.44	7.41	23.88	0.63	68.08	0.59	7½	1.598	.496	2.094	1.046	49.90	
QBR 7106	65.44	7.41	23.88	0.63	68.08	0.59	7½	1.602	.703	2.305	1.048	45.47	Wash data from R7105 poor recovery
QBR 7107		Drill hole spudded below seam's stratigraphic level.											
QBR 7108		Drill hole spudded below seam's stratigraphic level.											
QBR 7109		Drill hole spudded below seam's stratigraphic level.											
QBR 7110	82.84	5.70	24.86	.96	68.48	.61	7	2.165	.145	2.310	1.793	77.63	
QBR 7114	80.59	3.79	26.96	.72	68.53	.35	7½	1.768	.215	1.983	1.425	71.82	
QBD 7201	84.86	6.49	24.88	.65	67.96	.46	5	.863	.148	1.011	.732	72.41	
QBD 7202	74.33	11.06	23.26	.89	64.77	.83	4½	2.120	.652	2.772	1.576	56.81	
QBD 7203	82.83	6.03	25.56	.56	67.84	2.12	5½	1.947	.118	2.065	1.613	78.10	
QBD 7204	78.71	7.64	23.58	.90	67.86	.62	5	1.515	.369	1.884	1.194	63.28	
QBD 7205C	69.68	8.65	26.16	.82	64.91	1.32	5	1.319	.216	1.535	.919	59.80	Indicated reserves only due to geological factors
QBD 7206		Drill hole spudded below seam's stratigraphic level.											
QBD 7207		Drill hole spudded below seam's stratigraphic level.											
QBD 7208	56.56	10.71	25.72	0.93	62.61	1.36	5	.594	.037	.631	.336	53.11	
QBD 7209		Hole intersected seam not in reserve area.											
QBD 7212	77.40	10.33	25.61	1.39	62.65	.26	6	1.715	.570	2.285	1.327	58.08	
QBD 7213		No intersection hole shut down because of structural complications.											
QBD 7216	84.88	6.62	26.04	.98	66.33	.84	5	1.035	.117	1.152	.879	76.22	
QBD 7217	85.36	6.71	25.94	1.40	65.94	.58	5	1.246	.431	1.677	1.064	63.42	
QBD 7218	70.35	8.51	24.63	.86	65.97	.63	5½	.863	.203	1.066	.607	56.84	
QBD 7219	77.91	8.96	23.72	.52	66.67	.83	5	.902	.252	1.154	.703	60.85	
Adit D4	80.75	7.47	25.59	.64	66.19	.48	6	.456	.162	.618	.368	59.44	
Adit D9	75.71	6.13	25.54	.92	67.39	1.43	5½	.857	.176	1.033	.649	62.76	
WEIGHTED AVERAGES & TOTALS LESS 7205C:													
	76.77	7.22	25.12	.82	66.81	.71	5	28.008	6.401	34.409	21.513	62.52	
										YIELD - NO DILUTION:		76.81	

* Probable Yield = (Net Clean Tons/Total Tons Extracted) x 100

(1) For Rotary Holes, Product is Actual Analysis of Float/Sink of ¼ x 0 Mesh

PRODUCT AT 1.60 SPECIFIC GRAVITY - ANALYSES BY DRILL HOLE

TABLE II-F-2

SEAM E

Mathematically Combined Actual Analyses of +28 and -28 Mesh Products (1)

Hole or Adit No.	Plant Product Theor. Yield: (+28, -28 M.) Less 4%	Dry Basis Proximate Analysis of Product Ash	Vol.	R.M.	F.C.	S.	F.S.I.	Tons x 10^6 Raw Tons Mined (Allowing 10% Geol. Deduction)	Total Probable Dilution (Contin. Mining)	Total Tons Mined & Probable Dilution	Net Clean Tons (Theor. Yield x Raw Tons)	Probable Yield Assuming Total Dilution*	Comments
QBD 7101	76.06	6.85	25.42	.46	67.26	.32	7	2.610	.315	2.925	1.933	66.04	
QBD 7102	73.36	8.11	23.38	.49	68.00	.22	7½	1.124	.307	1.431	.825	57.65	
QBR 7103	61.35	8.69	23.75	.48	67.08	.21	7½	2.572	.420	2.992	1.578	52.74	
QBD 7104	89.42	7.71	24.37	1.27	66.64	.28	7½	.730	.088	.818	.653	79.82	
QBR 7105	67.70	6.63	24.19	.62	68.56	.28	8	1.383	.677	2.060	.936	45.43	
QBR 7106	56.90	8.10	23.36	.66	67.88	.21	8	1.456	.614	2.070	.828	40.00	
QBR 7107	52.05	7.63	23.90	.90	67.55	.55	6½	.584	.044	.628	.304	48.23	Poor recovery, E10 analysis used
QBR 7108		Hole started below seam stratigraphic position.											
QBR 7109		Hole started below seam stratigraphic position.											
QBR 7110	69.56	8.15	25.15	1.11	65.59	.23	8	1.830	.377	2.207	1.273	57.68	
QBR 7114U	69.02	7.99	25.39	.83	65.79	.23	8	2.420	.110	2.530	1.670	66.00	
QBD 7201	56.96	6.92	24.22	.68	68.16	.22	8	.768	.272	1.040	.437	42.01	
QBD 7202U	62.98	8.18	23.66	.92	67.22	.27	6	1.817	.519	2.336	1.144	48.96	
QBD 7203	64.55	8.64	24.84	.59	65.91	.25	7	2.565	.176	2.741	1.656	60.39	
QBD 7204	73.07	9.35	24.07	.83	65.34	.22	8	1.075	.201	1.276	.786	61.59	
QBD 7205 E_2	69.25	5.75	25.01	1.26	67.98	.24	7½	1.254	.130	1.384	.597	62.73	
QBD 7206		Hole started below seam stratigraphic position.											
QBD 7207		Seams too deep for drill used.											
QBD 7208	78.93	8.64	24.19	.96	66.19	.21	6	.950	.076	1.026	.750	73.09	
QBD 7209		Hole not in reserve area.											
QBD 7212		Seams too deep for drill used.											
QBD 7213		Seams too deep for drill used.											
QBD 7216	71.33	7.96	25.61	1.02	65.39	.26	6½	2.041	.576	2.617	1.456	55.59	
QBD 7217U	66.54	6.13	24.71	1.38	67.75	.20	6	3.587	.532	4.119	2.387	57.94	
QBD 7218U	71.03	6.70	24.32	.97	68.00	.24	6	.796	.045	.841	.597	66.86	
QBD 7219	72.35	6.72	23.76	.65	68.85	.27	7	.839	.296	1.135	.607	53.48	
ADIT E8	47.43	8.76	22.40	1.39	67.49	.50	4½	.330	.050	.380	.157	41.00	
ADIT E10	52.05	7.63	23.90	.90	67.55	.55	6½	.116	.008	.124	.060	51.67	
WEIGHTED AVERAGES & TOTALS LESS 7205C:	67.70	7.68	24.46	.84	66.69	.25	7	29.593	5.703	35.296	20.037	56.76	
											YIELD - NO DILUTION:	67.70	

* Probable Yield = (Net Clean Tons/Total Tons Extracted) x 100

(1) For Rotary Holes, Product is Actual Analysis of Float/Sink of ¼ x 0 Mesh

PRODUCT AT 1.60 SPECIFIC GRAVITY - ANALYSES BY DRILL HOLE

TABLE II-F-3

SEAM F

Mathematically Combined Actual Analyses of +28 and -28 Mesh Products (1)

Hole or Adit No.	Plant Product Theor. Yield: (+28, -28 M.) Less 4%	Dry Basis Proximate Analysis of Product						Tons x 10^6 Raw Tons Mined (Allowing 10% Geol. Deduction)	Total Probable Dilution (Contin. Mining)	Total Tons Mined & Probable Dilution	Net Clean Tons (Theor. Yield x Raw Tons)	Probable Yield Assuming Total Dilution*	Comments
		Ash	Vol.	R.M.	F.C.	S.	F.S.I.						
QBD 7101	82.87	4.40	24.98	.41	70.19	.23	8	2.657	.673	3.330	2.202	66.10	
QBD 7102	63.30	6.14	23.60	.44	69.90	.26	8	1.711	.289	2.000	1.083	54.12	
QBD 7103	89.24	3.18	24.62	.94	71.26	.56	8½	2.682	.660	3.342	2.393	71.61	
QBD 7104	83.15	3.96	24.63	1.17	70.21	.24	8	.769	.382	1.151	.639	55.55	
QBR 7105	45.73	7.17	24.11	.76	67.96	.55	2	1.923	.235	2.158	.879	40.75	Rotary hole; poor recovery
QBR 7106	63.60	5.56	23.86	.68	69.89	.31	8½	1.920	.293	2.213	1.221	55.16	
QBR 7107	76.66	4.67	24.88	.64	69.81	.28	9	.868	.285	1.153	.665	57.99	
QBR 7108		Drill hole started below stratigraphic position of seam.											
QBR 7109		Drill hole started below stratigraphic position of seam.											
QBR 7110	72.56	3.90	24.61	.86	70.63	.26	8½	1.949	.292	2.241	1.414	63.10	
QBR 7114	74.90	3.75	25.88	.67	69.70	.21	7½	1.748	.480	2.228	1.309	58.74	
QBD 7201	73.65	6.62	23.61	.82	68.93	.56	8	.915	.204	1.119	.674	60.16	
QBD 7202	70.58	6.45	24.14	1.09	68.31	.21	7	2.560	.273	2.833	1.807	63.66	
QBD 7203	61.92	5.96	24.38	.59	69.06	.37	8	2.412	.500	2.912	1.494	51.24	
QBD 7204	81.76	4.29	26.22	.80	68.68	.27	7	1.561	.757	2.318	1.276	55.03	
QBD 7205C	88.59	4.84	24.67	1.24	69.24	.22	7½	1.680	.905	2.585	1.488	57.57	Not in proven reserve
QBD 7206		Drill hole started below stratigraphic position of seam.											
QBD 7207		Seam too deep for Drill used.											
QBD 7208	73.75	6.67	23.79	.79	68.72	.31	8	.881	.153	1.034	.650	62.86	
QBD 7209		Drill hole out of Reserve Area.											
QBD 7212		Seam too deep for drill used.											
QBD 7213		Drill hole out of Reserve Area.											
QBD 7216	70.41	5.53	23.82	1.31	69.33	.23	8	2.289	.718	3.007	1.612	53.58	
QBD 7217	81.33	5.17	24.54	1.52	68.74	.22	7	3.201	1.172	4.373	2.603	59.52	
QBD 7218	66.66	6.57	23.87	1.18	68.36	.24	8	.721	.307	1.028	.481	46.62	
QBD 7219	83.15	3.96	24.63	1.17	70.21	.24	8	1.096	.270	1.366	.911	66.71	Poor recovery data
Adit F1	78.16	5.42	23.84	.71	69.92	.37	7	.253	.064	.317	.198	62.22	from D7104
Adit F6	64.98	5.34	23.79	.86	70.00	.41	8	.235	.044	.279	.153	54.51	
Adit F11	73.55	5.04	23.52	1.12	70.30	.53	8	.163	.072	.235	.120	50.85	
WEIGHTED AVERAGES & TOTALS LESS D7205C:													
	73.16	5.02	25.06	.89	69.37	.30	8	32.514	8.123	40.637	23.784	58.53	
									YIELD - NO DILUTION:			73.16	

* Probable Yield = (Net Clean Tons/Total Tons Extracted) x 100

(1) For Rotary Holes, Product is Actual Analysis of Float/Sink of ¼ x 0 Mesh

PRODUCT AT 1.60 SPECIFIC GRAVITY - ANALYSES BY DRILL HOLE

TABLE II-F-4

SEAM G

Mathematically Combined Actual Analyses of +28 and -28 Mesh Products (1)

Hole or Adit No.	Plant Product Theor. Yield: (+28, -28 M.) Less 4%	Dry Basis Proximate Analysis of Product						Tons x 10^6				Probable Yield Assuming Total Dilution*	Comments
		Ash	Vol.	R.M.	F.C.	S.	F.S.I.	Raw Tons Mined (Allowing 10% Geol. Deduction)	Total Probable Dilution (Contin. Mining)	Total Tons Mined & Probable Dilution	Net Clean Tons (Theor. Yield x Raw Tons)		
QBD 7101		Hole shut down before stratigraphic level of seam.											
QBD 7102	76.12	10.77	22.72	.45	66.04	.38	7½	.581	.275	.856	.442	51.52	
QBR 7103		No seam intersection.											
QBD 7104		No seam intersection.											
QBR 7105		No seam intersection.											
QBR 7106		No seam intersection.											
QBR 7107	66.91	13.51	22.48	1.26	62.73	.47	7	.442	.323	.765	.296	38.65	Poor recovery. Used 7205C analysis
QBR 7108		Hole started below stratigraphic level of seam.											
QBR 7109		Hole started below stratigraphic level of seam.											
QBR 7110		No seam intersection.											
QBR 7114		No seam intersection.											
QBD 7201		No seam intersection.											
QBD 7202		No seam intersection.											
QBD 7204		Seam too thin to be economic.											
QBD 7205C	66.91	13.51	22.48	1.26	62.73	.47	7	.135	.062	.197	.090	45.87	Not in proven reserves
QBD 7206		Hole started below stratigraphic level of seam.											
QBD 7207		Hole shut down before stratigraphic level of seam.											
QBD 7208		No seam intersection.											
QBD 7209		Hole shut down before stratigraphic level of seam.											
QBD 7212		Hole shut down before stratigraphic level of seam.											
QBD 7213		Hole shut down before stratigraphic level of seam.											
QBD 7216		Seam too thin to be economic.											
QBD 7217		No seam intersection.											
QBD 7218		No seam intersection.											
QBD 7219		No seam intersection.											
ADIT G5	81.35	9.11	22.76	.75	67.37	.57	5	.558	.140	.698	.454	65.07	
ADIT G12	74.87	11.68	20.52	.87	66.91	.63	6	.291	.049	.340	.218	63.82	
WEIGHTED AVERAGES & TOTALS LESS 7205C:													
	75.32	10.97	22.34	.78	65.87	.49	6	1.872	.787	2.659	1.410	53.02	
											YIELD - NO DILUTION:	75.32	

* Probable Yield = (Net Clean Tons/Total Tons Extracted) x 100

(1) For Rotary Holes, Product is Actual Analysis of Float/Sink of ¼ x 0 Mesh

PRODUCT AT 1.60 SPECIFIC GRAVITY - ANALYSES BY DRILL HOLE

TABLE II-F-5

SEAM I_1

Mathematically Combined Actual Analyses of +28 and -28 Mesh Products (1)

Hole or Adit No.	Plant Product Theor. Yield: (+28, -28 M.) Less 4%	Dry Basis Proximate Analysis of Product Ash	Vol.	R.M.	F.C.	S.	F.S.I.	Tons x 10^6 Raw Tons Mined (Allowing 10% Geol. Deduction)	Total Probable Dilution (Contin. Mining)	Total Tons Mined & Probable Dilution	Net Clean Tons (Theor. Yield x Raw Tons)	Probable Yield Assuming Total Dilution*	Comments
QBD 7101		Not drilled to seam depth.											
QBD 7102		Seam not intersected.											
QBR 7103	79.92	7.95	21.34	.87	69.84	.35	8	4.806	.203	5.009	3.841	76.67	
QBD 7104	77.61	7.96	21.22	1.26	69.53	.31	7	.917	.521	1.438	.712	49.47	
QBR 7105	76.47	10.67	20.84	0.64	67.85	.35	5	1.541	.035	1.576	1.178	74.71	
QBR 7106	66.85	9.16	20.33	0.77	69.74	.30	7	2.387	0	2.387	1.596	66.83	
QBR 7107		Seam not intersected.											
QBR 7108		Seam not intersected.											
QBR 7109		Seam not intersected.											
QBR 7110	75.38	7.80	20.84	0.99	69.93	.26	6	2.246	.615	2.861	1.693	59.13	I_1 plus I_2 analysis combined
QBR 7114	70.70	8.02	22.53	0.62	68.83	.20	7½	1.778	.840	2.618	1.257	47.98	
QBD 7201	81.69	10.60	21.46	1.01	66.93	.45	5½	1.103	.057	1.160	.901	81.64	
QBD 7202	77.72	9.87	21.79	1.31	67.11	.38	8	1.771	.163	1.934	1.376	71.16	
QBD 7203	77.73	9.86	21.79	1.30	67.03	.24	7½	3.990	.851	4.841	3.101	64.03	
QBD 7204	65.13	10.32	21.85	.62	67.21	.68	7	.291	.180	.471	.190	40.17	
QBD 7205C		Seam not intersected.											
QBD 7206	86.23	8.19	21.19	1.24	69.36	.31	8	.220	.129	.349	.190	54.04	Poor recovery, used analysis for 7218
QBD 7207		Drill shut down before stratigraphic position of seam.											
QBD 7208	86.23	8.19	21.19	1.24	69.36	.31	8	1.164	.163	1.327	1.003	75.51	Poor recovery, used analysis for 7218
QBD 7209		Drill shut down before stratigraphic position of seam.											
QBD 7212		Drill shut down before stratigraphic position of seam.											
QBD 7213		Drill shut down before stratigraphic position of seam.											
QBD 7216		Seam not intersected.											
QBD 7217	66.55	10.07	21.73	1.12	67.08	.44	7½	4.233	.941	5.174	2.817	54.42	
QBD 7218	86.23	8.19	21.19	1.24	69.36	.31	8	.398	.247	.645	.343	53.04	
QBD 7219	76.28	9.32	21.45	.58	68.63	.40	7½	1.845	.263	2.108	1.407	66.74	
WEIGHTED AVERAGES & TOTALS:													
	75.30	9.06	21.44	.98	68.46	.31	7	28.690	5.208	33.898	21.605	63.73	
										YIELD - NO DILUTION:		75.30	

* Probable Yield = (Net Clean Tons/Total Tons Extracted) x 100

(1) For Rotary Holes, Product is Actual Analysis of Float/Sink of ¼ x 0 Mesh

PRODUCT AT 1.60 SPECIFIC GRAVITY - ANALYSES BY DRILL HOLE

TABLE II-F-6

SEAM J

Mathematically Combined Actual Analyses of +28 and -28 Mesh Products (1)

Hole or Adit No.	Plant Product Theor. Yield: (+28, -28 M.) Less 4%	Dry Basis Proximate Analysis of Product Ash	Vol.	R.M.	F.C.	S.	F.S.I.	Tons x 10^6 Raw Tons Mined (Allowing 10% Geol. Deduction)	Total Probable Dilution (Contin. Mining)	Total Tons Mined & Probable Dilution	Net Clean Tons (Theor. Yield x Raw Tons)	Probable Yield Assuming Total Dilution*	Comments
QBD 7101		Drill shut down before stratigraphic level reached.											
QBD 7102F	77.68	10.09	22.98	.36	66.43	.22	8½	2.203	.020	2.325	1.791	77.00	
QBR 7103F	83.89	4.98	23.01	.98	71.03	.39	6	3.392	.386	2.778	2.007	75.99	
QBD 7104F	76.19	6.58	22.11	1.12	70.17	.18	7	1.557	.159	1.716	1.186	69.09	
QBR 7105F	77.97	9.34	20.76	.80	69.10	.29	7	2.478	.136	2.611	1.932	73.93	
QBR 7106F	74.61	8.63	20.10	.75	70.52	.23	7	3.895	.176	4.071	2.906	71.38	
QBR 7107F	69.61	7.63	22.68	.82	68.87	.20	8½	3.252	.107	3.359	2.264	67.39	
QBR 7108L	56.06	9.84	21.32	.62	68.22	.26	5	.845	.083	.928	.474	51.03	
QBR 7109		Oxidized coal.											
QBR 7110F	72.42	6.17	21.95	.86	71.02	.27	5½	2.970	.347	3.317	2.151	64.83	
QBR 7114F	71.13	7.30	21.94	.60	70.16	.15	7	2.673	.380	3.053	1.901	60.94	U & L combined
QBD 7201F	83.05	6.87	21.93	.66	70.52	.20	6½	1.165	.189	1.354	.968	71.38	
QBD 7202F	75.45	9.13	21.98	1.28	67.57	.22	7	2.063	.060	2.123	1.557	73.29	U & L combined
QBD 7203F	82.25	8.37	22.95	.79	67.87	.16	7	3.977	.246	4.223	3.271	77.91	U & L combined
QBD 7204F	86.56	8.45	22.34	.71	68.47	.26	7	1.678	.121	1.799	1.452	80.74	U & L combined
QBD 7205C	64.15	8.55	21.58	1.19	68.67	.19	6	2.504	.090	2.594	1.606	61.89	Not in pr. reser., Lower J
QBD 7206F	80.51	8.14	21.76	.93	69.13	.16	6	.611	.059	.670	.492	73.38	U & L combined
QBD 7207		Not in reserve area; drill shut down before stratigraphic level reached.											
QBD 7208	82.94	8.25	21.57	.88	69.27	.31	6	1.138	.039	1.177	.944	80.15	U & L combined
QBD 7209		Not in reserve area; drill shut down before stratigraphic level reached.											
QBD 7212		Too deep for drill used.											
QBD 7213		Not in reserve area; drill shut down before stratigraphic level reached.											
QBD 7216L	79.27	6.29	22.43	.91	70.35	.12	7	2.316	0	2.316	1.836	79.27	Lower J
QBD 7217L	93.35	4.88	21.95	1.26	71.89	.25	7½	3.012	.082	3.094	2.812	90.86	Lower J
QBD 7218F	82.43	9.54	20.52	1.22	68.69	.21	6	.846	.066	.912	.729	76.46	U & L combined
QBD 7219F	84.40	9.05	21.36	.55	69.02	.17	7	1.973	.203	2.176	1.665	76.71	U & L combined
ADIT J14	85.65	7.43	21.66	1.01	69.87	.38	8	.593	.062	.655	.508	77.54	U & L combined
WEIGHTED AVERAGES & TOTALS LESS 7205C:													
	78.69	7.66	21.95	.85	69.53	.22	7	41.736	2.921	44.657	32.846	73.55	
										YIELD - NO DILUTION:		78.69	

* Probable Yield = (Net Clean Tons/Total Tons Extracted) x 100

(1) For Rotary Holes, Product is Actual Analysis of Float/Sink of ¼ x 0 Mesh

QUALITY

COAL QUALITY

Summary

There is every indication that the Babcock coal will wash readily, at an acceptable yield, to provide excellent medium volatile coking coal with 7% ash. There may also be some advantages in producing some coals at a lower ash and others at higher ash but this would require dual circuits which may not be warranted during the early years of production. Product F.S.I.'s are expected to range generally from 7 to 8½ with the exception of coal from Seam D which has a wide range of indices (4½ to 9).

Volatiles from each seam can be expected to be very consistant. Sulphur is only a problem in Seam D but the average sulphur in a blended product is expected to be below 0.5%.

The phosphorous content of Seam E and F is somewhat high but not overly so when compared with other Canadian coals. The combined product is expected to average 0.05 to 0.06 phosphorous pentoxide.

Coal Washability and Yield

While the philosophy governing the analytical procedures, and much of the discussion in this report is based on the concept of producing a 7% ash product; it must be kept in mind that other ash specifications both higher and lower than this are possible provided economics of operation favour them. In this particular case, the choice of 7% ash appears to have been a fortunate one since average yields (discounted 4%) appear to be in the 65 to 75% range for those seams which will be mined. This product specification will also allow a relatively high range of cut-points in the wash plant (1.55 - 1.60) for blended coals.

Although there is a relatively wide range of ash indicated for the cleaned product for each seam when washed at a constant specific gravity, most of the values for each seam lie within a short 3 or 4% range (See Histograms of product ash at 1.60 SPG.). When mined concurrently with periodic adjustment of the cut-point the resulting range should be much narrower and it should be possible to attain the required ash level.

Although it is apparent that cleaning with water only at a relatively high specific gravity will yield an acceptable 7 to 8 per cent ash product, an improved product may be available if there is sufficient economic advantage in preparing it. The main problem in preparing a lower ash product is that a dual circuit wash plant would have to be designed and costly provision would have to be made for separating the mined coal underground and in providing extra stockpile capacity and/or alternate conveying systems to the plant. If this were economical it might be advantageous to consider one production plan for Seam F and the lower portion only of Seam J and another plan for Seams D and E. The F, J production could be washed in a water-only cicuit to provide low ash, low sulphur, medium volative (21 - 23%), high quality coking coal (FSI 6½ - 7½), while the D, E production could be washed at about 1.50 - 1.55 in a heavy media circuit to provide coal with 7% ash, medium volatiles (24 - 25%), reasonable sulphur (0.5), and better than average coking quality (FSI 5½ - 6½). The D, E product could be considered a reasonably average Canadian coal, whereas the F, J product would be of decidedly premium quality. While the present plan to mix the production from all four seams will produce a distinctly better than average coal, it would not be as good as the F, J product.

As an aid in visualizing the various quality ranges in the less optimistic case of a constant specific gravity setting; the ash, volatiles, F.S.I., and sulphur in the 1.60 products have been plotted on the plans in the accompanying map folder.

In addition to this, d.m.m.f. volatiles and the phosphorous content of nominal 7% ash coals have also been presented along with mining plan overlays so that quality may be related to the specific mining plans as they are presently envisaged.

Ash and Specific Gravity of Separation

The average raw ash of the coal seams at Babcock ranges from 16.5 to 24.5%. In the case of seams D, E, F and J this ash is expected to be reduced to approximately 7% or less in the clean coal product. The cut points required to attain this reduction vary significantly for each individual seam according to the data tabulations. (D 1.47 to 2.00; E 1.45 to 1.91; F 1.55 to 2.11; and J 1.42 to 1.88 - mostly full seam). It is not expected, however, that the weighted average specific gravity for the mined coal blends will vary much beyond the 1.55 to 1.60 range.

As ash is probably the most important criterion for estimating product quality once the overall quality of the coal has been determined, histograms of ash and contour plans of ash content in 1.60 SPG products have been prepared for Seams D, E, F, and J. It appears that rotary samples contribute somewhat to the low ash distribution of most seams, although many values are apparently normal and some are even high.

Seam D

Ash at 1.60 generally ranges from 6 to 8 per cent. It is generally high in the central and northwestern parts of the reserve area and moderately lower along the southwest side.

Seam E

Two apparent high ash trends indicating difficult cleaning conditions transect the centre of the northwest part and southeast portion of the reserve area. Seam quality is quite consistent with most values ranging from 6 to 9 per cent.

Seam F

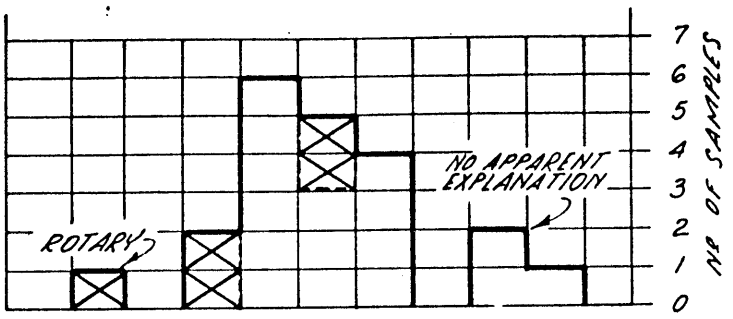
The histogram for Seam F is somewhat misleading as 5 values are shown in the 3 - 3.99% range. Actually most of these are 3.5% or more and, as demonstrated on the ash contour map, very little area is actually under 4% at 1.60 SPG. Most of the ash values are between 4 and 7% for the product from this seam and it should be relatively easy to prepare a 7% product from it.

Seam J

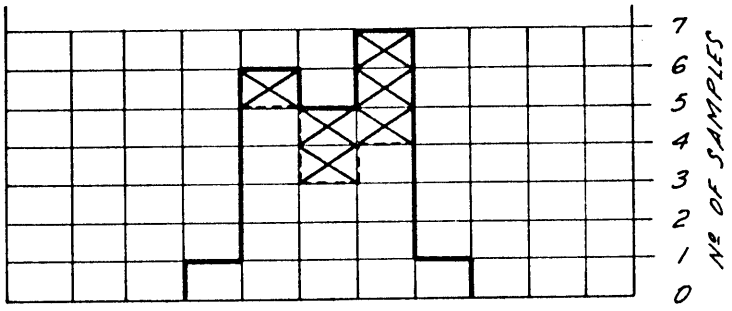
When all of J Seam is mined, it is apparent that the ash content may be relatively high (6 - 9%) if washed at 1.60 since the upper bench of the seam contains a disproportionate amount of near gravity coal and has distinctly different cleaning characteristics compared to the lower seam. Two high ash trends, similar to those in Seam E are indicated by the iso-ash contour plan.

Seam I

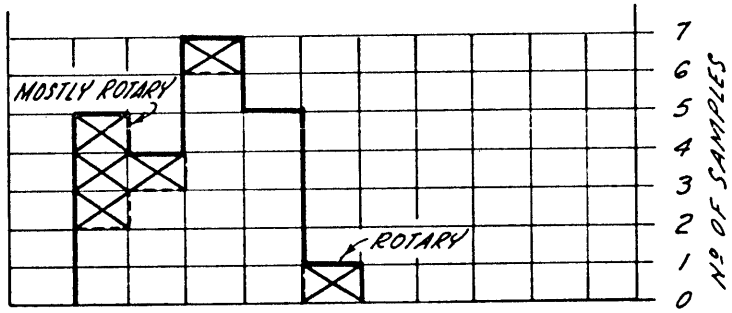
Although mining is not planned in Seam I, it is interesting to note that the weighted average ash at 1.60 is above 9% and the individual results are consistantly high. If this seam were mined it would require a heavy media plant with gravities between 1.45 and 1.55.



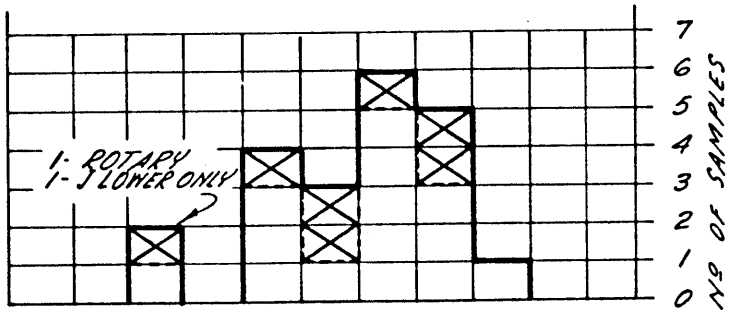
D SEAM



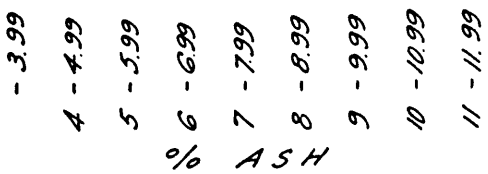
E SEAM



F SEAM



J SEAM



ROTARY DRILL SAMPLE

DIAMOND DRILL SAMPLE

FIG. II-9

PREPARED BY:
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(COAL DIVISION)
CALGARY ALBERTA

ALCO STANDARD CORPORATION
(JOINT VENTURE - QUINTETTE PROJECT)

HISTOGRAMS OF PRODUCT ASH
AT 1.60 Sp. Gr.

DRAWN BY E. Toth	DATE Mar '73.	SCALE ——
APPROVED BY	DRAWING NO BBCK 73-0413-R02	

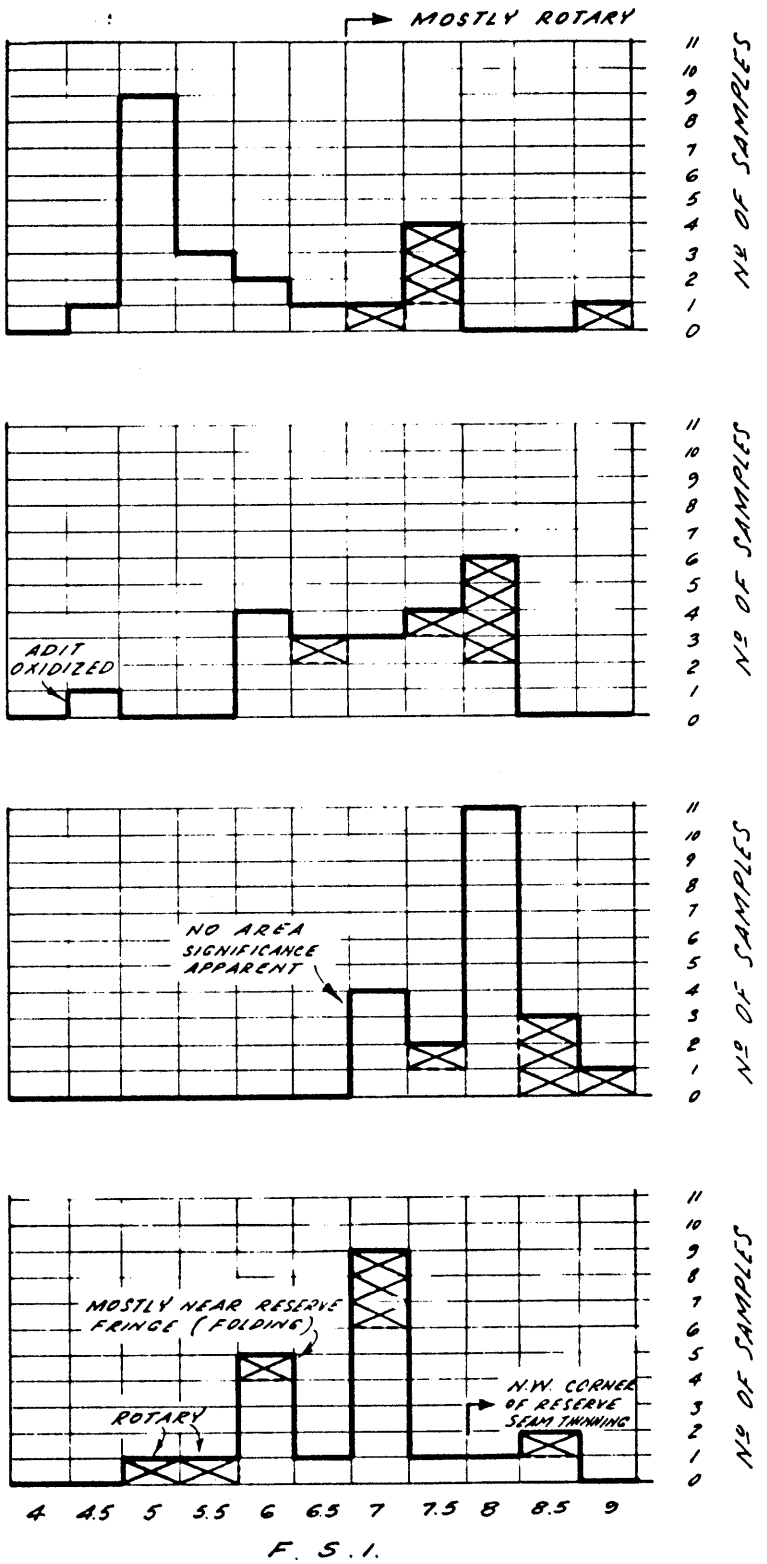
Free Swelling Index

The histograms of F.S.I. in 1.60 SPG products demonstrate that while moderately large overall ranges in quality occur, the majority of the values fall in reasonably narrow ranges. For example, in Seam D, the F.S.I. values which most commonly exceed the 5 to 5½ range are those from rotary holes. The F.S.I.'s on Seam J appear to have regional variations in that the highest values (8 to 8½) all occur from data points near the northwest corner of the reserve area. The lowest values (5-5½) are both from rotary holes and may be suspect on that basis. The results in the 6 to 6½ range are generally located near folding on the fringe of the reserve area and consequently may be the result of additional pressure on the seam. There are an equal number of "good" values though from similar locations so that nothing definite may be said on this subject. The F.S.I. on Seam J product at 1.60 will probably vary between 6 and 7 except in the northwest corner of the reserve area.

The 1.60 SPG. product F.S.I.'s for Seam E are also presented as contoured data to show regional variation. This has not been done for Seam F which is remarkably consistant, considering that all of the values over 8 are from rotary drill holes. The F.S.I. for Seam E generally ranges from 7 to 8½ for 7% ash products although some slightly lower values occur sporadically. One adit in particular (E8) was oxidized.

Volatiles

Although it is important to know the proportion of volatiles present in the expected coal product, trends or variations in volatile content can only be meaningfully studied on a dry, mineral-matter free basis (dmmf.). For these reasons, volatile content has been presented in two contour maps for each seam. The first plan of product volatiles at 1.60 reflects the effect of cleaning variations on both ash and volatile contents, while the second plan on which



ROTARY DRILL SAMPLE

DIAMOND DRILL SAMPLE

FIG. II·10

PREPARED BY:
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ALCO STANDARD CORPORATION
(JOINT VENTURE - QUINTETTE PROJECT)

HISTOGRAM OF F.S.I. IN PRODUCTS OF 1.60 Sp. Gr.

DRAWN BY E. Toth	DATE Mar. '73	SCALE ——
APPROVED BY	DRAWING NO BBCK 73-0414-R02	

dmmf. volatiles are contoured relates only to the natural volatile content of the coal. (Map folder)

Before trends within the volatile maps could be interpreted, the variation and standard deviation of the sampling and analytical procedures were estimated by calculating the standard deviation in dmmf. values of samples analyzed in six Japanese laboratories. (The analytical results are shown in table II-G)

These standard deviations were then compared with the standard deviations obtained from all of the seam data points. The surprising result was that all of the standard deviations of replicate laboratory analyses were essentially of the same order of magnitude as those of the seam data points. This would seem to indicate that no valid trends can be interpreted from the dmmf. volatile contour maps, since the error in sampling and analysis can be as much as the total variation shown in the results. The results of the standard deviation calculations are given below.

	Standard Deviation		
Seam	Replicate Analyses		Drill & Adit data Points
D	0.85		1.02
E	N/A		0.84
F	0.62		0.62
G	N/A		(1.08)*
I	N/A		0.63
J Upper	0.74	J Full	0.78
J Lower	0.46		

* Insufficient data for meaningful calculation.

Despite the above points, it is worth noting that there does appear to be a weak but persistent trend from lower volatiles in the northwest corner of the reserve area to slightly higher values to the southeast and still higher values to the east. Even though no

statistical significance can be suggested for these trends, it is possible that they relate to tectonic stress since the lows are adjacent to a sharply folded area and the slight increase to the southeast is coincident with a broadening of that structure.

Except for Seams I and J, the dmmf. volatiles show a distinct decrease in relation to stratigraphic depth or depth of original burial.

Seam	Weighted Average dmmf. Volatile
D	26.70
E	26.27
F	25.87
G	24.46
I	23.19
J	23.45

The volatile content of the coal products at their stated ashes are shown in the various reserve and reserve summary tables. On the contour maps of this data, there is an obvious enhancement of the dmmf. volatile trends. Naturally, this does not import any more significance to this observation.

Sulphur

Only the sulphur in Seam D has been presented graphically as contoured data (map folder) since the other seams have such low concentrations of the contaminant that analysis of the data would not be meaningful. The information is summarized in the reserve tables for each seam as well as on the plans in the map folder.

In Seam D, the weighted average sulphur at 1.60 is 0.67%. It would appear, from the data contouring, that the disproportionately high sulphur values are concentrated in two areas: one at the eastern corner of the northwest end of the reserve area; and the other in the

EXAMPLES OF REPLICATE SEAM ANALYSES
IN DIFFERENT LABORATORIES

TABLE II-J

	Moist (%)	Ash (%)	V.Matter (%)	dmmf. Vol.	F. Carbon (%)	Sulphur (%)
(J Upper)						
Lab 1	1.3	7.0	21.7	23.10	70.00	0.33
Lab 2	1.0	7.0	21.9	22.15	71.1	0.31
Lab 3	1.02	7.66	20.41	22.27	70.41	0.35
Lab 4	1.3	7.0	21.6	22.98	70.1	0.34
Lab 5	0.8	7.0	21.6	22.00	71.4	0.30
Lab 6	1.2	5.8	22.9	24.15	70.1	0.34
(J Lower)						
Lab 1	1.4	6.9	22.2	23.63	69.5	0.39
Lab 2	1.1	8.1	22.4	22.80	69.5	0.35
Lab 3	1.02	8.64	21.42	22.99	68.92	0.43
Lab 4	1.5	7.2	22.0	23.50	69.3	0.40
Lab 5	1.0	7.9	22.0	22.39	70.1	0.40
Lab 6	2.6	7.2	21.8	23.56	68.4	0.41
(F Upper)						
Lab 1	1.3	5.4	24.8	26.13	68.5	0.41
Lab 2	1.2	5.4	24.7	24.71	69.9	0.36
Lab 3	1.0	5.33	24.94	25.96	68.93	0.42
Lab 4	1.2	5.0	24.9	26.12	68.9	0.42
Lab 5	1.0	5.4	24.7	24.86	69.9	0.40
Lab 6	1.2	4.6	25.0	26.15	69.2	0.38
(D Upper)						
Lab 1	1.4	6.7	24.9	26.47	67.0	0.69
Lab 2	1.1	6.7	25.2	25.52	68.1	0.66
Lab 3	1.02	6.67	24.79	26.25	67.52	0.65
Lab 4	1.3	6.8	24.3	26.45	67.0	0.75
Lab 5	1.0	6.8	24.5	24.84	68.7	0.70
Lab 6	1.1	5.8	26.2	27.59	66.9	0.72

vicinity of holes 7208 and 7203 just south of the middle of the reserve area. It is possible, however that the distribution of sulphur in Seam D is more erratic than the data indicates. More random distribution of sulphur highs could give equally convincing patterns considering the number and spacing of the data points. Some support to the concept of regional or gradual variation is given by the apparent build-up of values towards holes 7203 and 7208 by the moderately high assay from hole 7216 (.84%). This is also true of the northwest high which is supported by values for holes 7202 (.83%) and 7219 (.83%).

The sulphur content of a number of Seam D samples has been investigated further to determine the proportion of organic sulphur. In the raw samples the organic sulphur ranges from 30 to 50% of the total sulphur. In the two clean samples (sink/float) tested, this proportion was just over 50%. This seems to indicate that some improvement may be possible in the reduction of pyritic sulphur, especially in the froth floatation product from a fines circuit.

Seams E, F, and J all have weighted average sulphur content below 0.25% and therefore the blended products are not expected to be unduly high in sulphur since Seam D will seldom make up more than 33% of production.

Phosphorous

Analyses of phosphorous pentoxide in the ash of nominal 7% ash products have been completed for most intersections. These have been converted to phosphorous in coal and the results have been contoured for each significant seam. Two seams, E and F, have relatively high arithmetic average phosphorous contents (Seam E, 0.10; Seam F, 0.08) and the two others, D and J, have reasonably low contents (Seam D, 0.04; Seam J, 0.03).