

NORTHERN COAL MINES LTD.

report by

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BW-Bowron River 67(1)B

INTRODUCTION

This property has been reported on many times previously. This report brings together much of the material contained in earlier reports. Since January exploration has continued successfully. Three diamond drill holes have been completed after intersecting the main seam or other commercial seams. The main slope has been advanced a total of 600' and has exposed two commercial seams. An entry has been driven 70' southeast on the upper one and from that point a short crosscut has been driven to the lower seam. Even though it is wet at this point, the swelling index of coal from here is higher than it was closer to the surface.

CONCLUSIONS

Indicated and probable reserves have been substantially increased and now are over 20,000,000 tons. The seams thicken towards the centre of the sedimentary basin. Most of the area expected to be underlain by coal remains to be explored.

The coal cokes and the increase of the swelling index at the present deepest level to 2 and $2\frac{1}{2}$ from the 1 and $1\frac{1}{2}$ closer to the surface, indicates that at greater depths an even higher swelling index may be expected. No gas has been detected underground.

The most direct way to obtain samples from the coal at greater depth for swelling index tests is by driving a slope down on the upper seam exposed in the main slope.

Research into the two main types of resin that occur in the seams has shown that they have many useful qualities and possible markets.

RECOMMENDATIONS

1. Drive a slope from the new entry at -12° in the seam for 350' to 400', at which point it should be more than 180' below the bedrock surface and more than 200' below the surface. Presumably the coal at this point will be drier and less weathered and more representative of the reserves than any sample available till now. This slope will approach the seams exposed in the workings at the river bank but will be more than 200' deeper.

2. That a large central area now underlain by a probable reserve be explored by three deep drill holes, 1,700' to 1,800' apart.

3. That exploration be continued toward the southeast.

4. That research into separation and recovery processes for the resins be completed and markets considered.

LOCATION

The property is on Bowron River about 35 miles east of Prince George which is a rapidly growing rail and industrial centre. The property is now reached from Prince George over a total distance of 50 miles of highway and road. It is only 5 miles south of a new highway constructed eastward from Prince George, which is now being paved.

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HISTORY

Coal seams outcrop in the banks of the Bowron River just above the present camp and were discovered about 1870. Some exploration was carried out just before 1914. Then very little was done until 1946. In most years since then some exploration has been carried on by a series of companies. In the last four years exploration has been successful in tracing seams for a distance of two miles and to a depth of 1,300 feet.

PROPERTY

The property includes 133 mineral claims and 3 coal licenses, covering Lots 9591, 9592 and 9593. These cover a length of about 27,000' along the base of the sedimentary series where the coal seams occur. Of this length, less than one half has been explored and the remainder is a logical target for exploration.

GEOLOGY

Most of the area is covered by overburden and seams outcrop only in the banks of the river. Most of the information has been obtained from an examination of drill cores.

A volcanic series of unknown thickness and extent underlies the coal basin. It comprises agglomerate, tuff and greenstone of uncertain origin. Some volcanic activity, resulting here in the accumulation of volcanic ash, continued after the beginning of the deposition of the sedimentary series that includes the coal. In some areas volcanic, ashy material stood up above the level of the floor of the sea in which the sediments accumulated and sediments could not accumulate in these areas. These elevations of volcanic material may have been only a few tens of feet high but were sufficiently high in at least two points around the edge of the basin to prevent the accumulation of the lower seam.

Such elevations may also have occurred centrally in the basin but it is more likely that they were most extensive and occurred as peninsulas near the margin of the basin and this is the area that has been most intensively explored.

Overlying this volcanic sequence, is a thick sedimentary series. It contains many coal seams in its lower part. This part of the series is characteristically fine-grained. It comprises chiefly dark shales and grey sandstones although coarser beds such as grit, conglomerate and sedimentary agglomerate are common, as are coal seams. Most of the coal seams are thin but as many as three are over 5' thick and in places are as much as 20' thick. A little greywacke and tuff are present. Most of the beds are thin - only a fraction of an inch thick. The thickest beds, the conglomerates and agglomerates, are only a few feet thick.

This lower part of the sedimentary series, in the vicinity of the camp, appears to be a few hundred feet thick. Towards the southeast it thickens and, also, it thickens towards the centre of the basin and at Wire Line Hole #7 it is more than 1,000' thick and, possibly, is more than 1,200' thick.

Coal seams are found only in the lower 200' or 300' of it.

Overlying this finegrained sequence is a sequence that comprises predominantly coarse members such as grit, conglomerate and sedimentary agglomerate. Shales and sandstones occur in this sequence also but are a minor part of it. The beds in this sequence also are thin. Coal is practically absent. The upper part of this sequence is not exposed and its total thickness is unknown. In the southeast, it is at least 550' thick and possibly is over 700' thick and in the northwest it is also 700' thick or more.

The thinness of the beds suggests seasonal deposition and the many coarse beds suggest that the basin was a lake or sea close to the mountains.

Fragmentary fossil leaves found in the coal some years ago indicated a tertiary age for the series. However, the sediments are only slightly younger than the volcanic series and not separated from it by any significant interval. Also, the unknown but considerable thickness of the combined volcanic-sedimentary series (probably several thousand feet) and the folding which has occurred, makes it appear that the entire series can more likely be correlated with a cretaceous series than any known tertiary one.

COAL & RESIN

Most of the work done so far has been on seams 7' to 12' thick. The coal is bright and of good appearance. It is a high volatile, bituminous, coking coal. Clean coal contains generally 6% to 12% ash, 30% to 40% volatiles and 45% to 55% fixed carbon and, generally, between 11,500 and 13,500 B.T.U.'s per pound.

The only seam exposed for a considerable distance is the one in the ventilation slope which has been followed for over 600'. Some of this seam was bulk sampled and found to contain close to 4% soluble resin. This resin has been named "Canadian" by the Battelle Institute and reports from that institute compared favorably with "Congo" resin which has a well-established place in world markets. In addition, the Institute reports that in some samples, visible, insoluble resin is almost as abundant as soluble resin.

In the two seams most recently exposed, the visible resin is as abundant as in any exposure previously seen. The upper seam is 8' to 10' thick and the lower one is 6' to 7' thick.

DRILLING RESULTS

In the last 3½ years, 42 holes have been drilled from the surface (a total of about 18,000') and one underground. The last eight holes from the surface have been drilled with a wire line and, generally, have been much deeper than the earlier holes. These holes have explored the coal basin along one margin for a length of 2 miles and a width of about ½ mile and to a depth of 1,900'. Most of these holes and one from earlier drilling, are shown on the accompanying plan.

Wire Line Hole #7, completed in July, is the deepest drilled to date. In its upper part, it cored coarse, friable beds which tended to slough into the hole and caused the drilling to be done very slowly. Measurements of the inclination of this hole, showed that near the bottom it was 8° from vertical. A section CD through it shows this inclination and on the plan is shown the point at which the main seam was intersected more than 100' from the collar of the hole.

Underground hole #1 was drilled to explore the ground ahead of the slope. It cored a 6' seam near the collar and, at 80', entered volcanics, showing that here the sedimentary series was interrupted by volcanic rock, part of a ridge or island, projecting above the floor of the sedimentary basin. The relationships are shown on Section AB.

STRUCTURE

The seams so far exposed and cored, dip northeastward. In the southeast they dip as much as 65° to 70° and, in the central area, at about 45° and in the northwest somewhat less. These are the attitudes near the margin of the basin. Closer to the centre of the basin, the seams dip less steeply (perhaps only 10° to 20°) and, towards the northeast, probably flatten out. On the northeast margin of the basin they may dip towards the southwest. In detail, the attitude is not uniform and is complicated by minor rolls and some faults.

A major fault is exposed in the ventilation slope and crosscut and its probable location near there is indicated by some drill holes. It dips steeply. Within this fault zone, which is 50' to 60' wide, the seams are broken and mixed with the other sediments so they cannot be mined. No information is available as to the continuation of this fault but it is shown on the accompanying figure as if it continued indefinitely maintaining its attitude.

The alignment of seams on opposite sides of the fault, suggests that there has been a considerable movement to the right along it. The results of the drilling near the ventilation workings, suggest also that the block northeast of the fault has moved downward relative to the block southwest of it. The extent of the two movements is unknown and may not be uniform throughout the length of the fault.

Section AB has been prepared, showing no vertical movement at the fault, because the coal intersections as shown are consistent with no movement but the structure is probably more complex.

Some faults that probably are branches from this major fault, are exposed in core from holes drilled near the fault.

In the ventilation slope some minor faults strike northeastward and dip steeply northwest. On these there has been a left hand movement of about 10'.

SURFACE WORK

A new, larger air line was installed in the main slope. A new compressor house was built and occupied. A loading hopper was built in to permit trucks

to be loaded directly from the tippie without the use of a front end loader.

The property has been surveyed and the location and elevation of workings and drill holes have been established.

RESERVES

These have been calculated as indicated or probable. Indicated reserves are based on drill core intersections plus information where available from seams exposed. Probable reserves are in areas without an exposure or a drill hole but which are believed to be underlain by coal because a coal seam or seams extend under adjoining ground, either along the strike (as in area A) or down the dip and along the strike (as in area B), on at least two sides.

One area is exceptional inasmuch as it has had some holes drilled in it but these (possibly not deep enough) did not core coal. This area is up dip from Possible Reserve A and between indicated reserves 7 and 6. For present estimates, it has been assumed to contain no coal, although it is probable that further exploration will find coal in it.

The area explored is about one square mile and several square miles are not yet explored. Only coal more than 100' below the surface and outside of the fault zone has been included in the estimates. The reserves are calculated by determining the area of the seam or seams within the limits under discussion by multiplying the strike length by the slope length and getting the area in square feet. This is multiplied by the thickness assumed for the seams in the area, which gives the number of cubic feet of coal. This product is divided by 25 (the approximate number of cubic feet in a ton of coal) to give the reserve in tons. Calculations are rounded to the nearest thousand.

Indicated Reserves

No. 1	$\frac{1525 \times 2050 \times 21}{25} =$	2,626,000 tons
" 2	$\frac{1425 \times 1200 \times 6.5}{25} =$	444,000 "
" 3	$\frac{1060 \times 1850 \times 29}{25} =$	2,213,000 "
" 4	$\frac{1400 \times 650 \times 8}{25} =$	291,000 "
" 5	$\frac{1000 \times 440 \times 14}{25} =$	246,000 "
" 6	$\frac{1700 \times 210 \times 9}{25} =$	129,000 "
" 7	$\frac{3270 \times 3600 \times 19}{25} =$	<u>6,211,000</u> "
	Gross total:	12,160,000 "

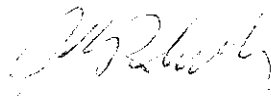
Note re indicated reserve #4. This reserve is calculated on the lower seam as if it extended over the whole area. However, it is absent in an area which is outlined on the accompanying figure. But within an area that is approximately as large, are one or two other seams which together contain more coal than the

lower one would if it were present. However, because of uncertainty about the limits of the three seams in this area, the reserve has been calculated though it is probable that this particular estimate is low.

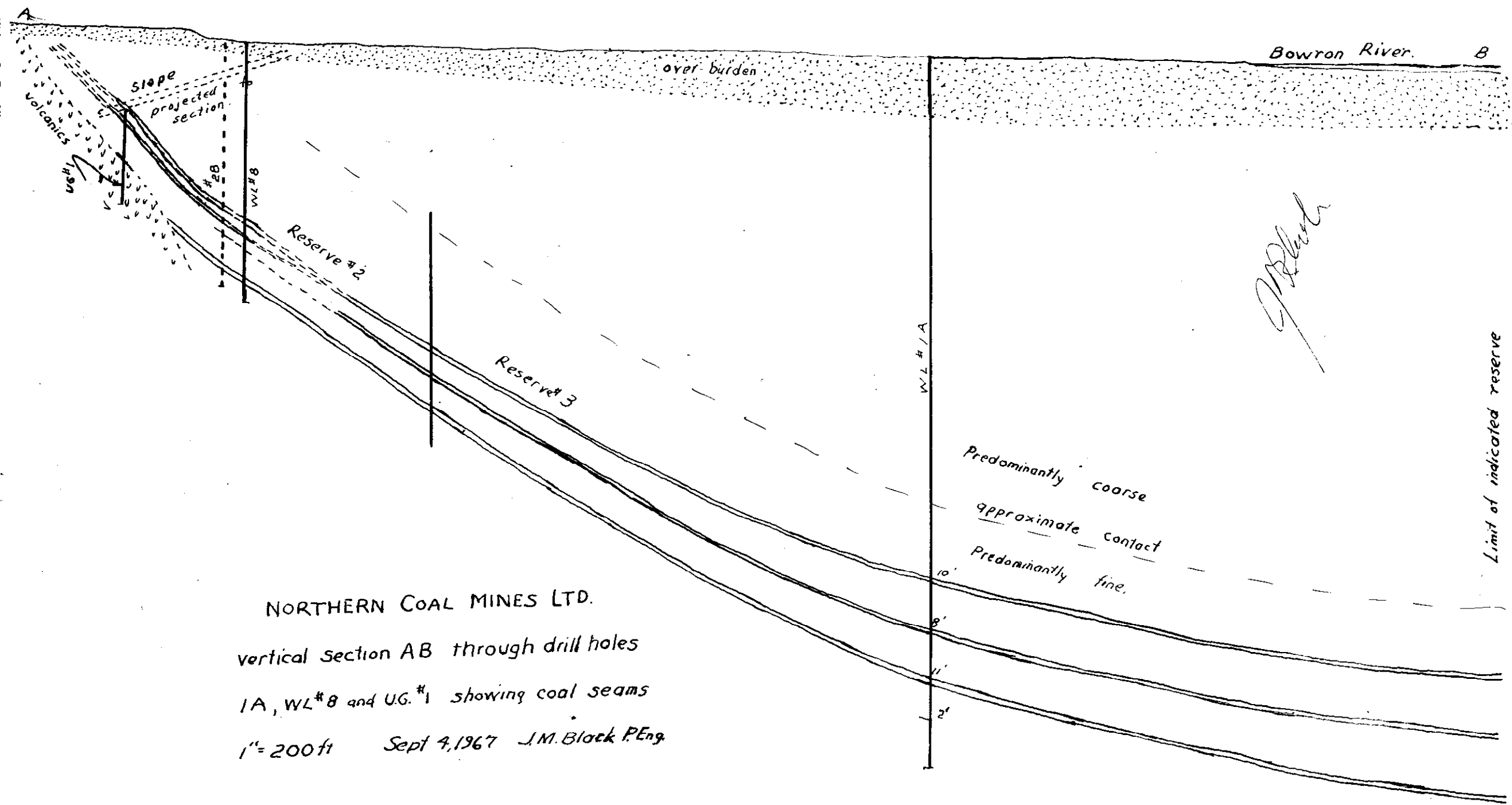
Probable Reserves

A	$\frac{5700 \times 2250 \times 19}{25} =$	9,747,000	tons
B	$\frac{1740 \times 1150 \times 6.5}{25} =$	520,000	"
	Gross total:	10,267,000	"
	Gross total, indicated and probable:	22,427,000	"

However, a deduction must be made from this to allow for islands or ridges on the floor of the sea that may have prevented accumulation of coaly material, also for coal that may have been destroyed at unknown faults or by erosion. It is assumed that 10% is a sufficient allowance for these unknown factors. This amounts to 2,242,000 tons which, deducted from the gross figure above, leaves a net total of indicated and probable reserves of 20,185,000 tons.

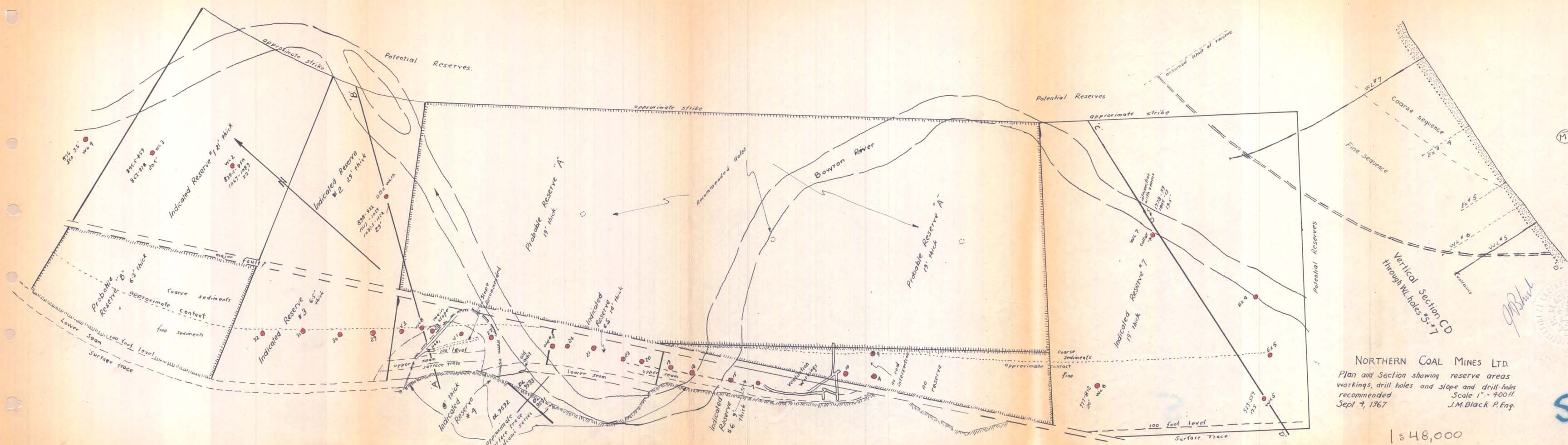


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NORTHERN COAL MINES LTD.
 vertical section AB through drill holes
 1A, WL#8 and UG.#1 showing coal seams
 1" = 200ft Sept 4, 1967 J.M. Black P.Eng.

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NORTHERN COAL MINES LTD.
 Plan and Section showing reserve areas
 workings, drill holes and slope of drill holes
 recommended
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