H. G. STEPHENSON
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Preliminary Comments

Sukunka Property

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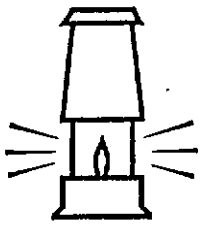

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22nd Nov. 1974.

Dr. C.B. Newmarch,

Brascan Resources Ltd.,

Bow Valley Square,

202 6th Ave. S.W.

Calgary.

Dear Dr. Newmarch,

As suggested by you I visited the coal property at Sukunka earlier this month and, although my time there was limited, I was able to get a good idea of the nature of the topography, the outcrops which have been exposed and the amount of exploration work which has been done. This will of course be a great help in preparing preliminary mining plans for the two areas you have in mind as soon as sufficient information is available from the drilling programmes under way at present.

I can never resist a trip underground and took the liberty of spending a couple of hours in the Chamberlain seam workings while I was at the mine.

As my visit was so short and details from the drilling are not yet available my comments, which are enclosed with this letter, should be viewed as being first impressions

without any study of detailed information. I have made very brief comments on the following :-

I. SURFACE MINING POSSIBILITIES IN PLATE I SUB AREA A.

II. SURFACE MINING POSSIBILITIES IN THE MIDDLE COAL.

III. PROSPECTS FOR AUGER MINING.

IV. ROOF CONTROL IN UNDERGROUND MINING AT SUKUNKA.

I do hope these comments will be of some value pending a more detailed study of some of the subjects.

Sincerely,

H.G. Stephenson. P. Eng.

I. SURFACE MINING POSSIBILITIES IN PLATE I. Sub Area A.

A drilling programme has been laid out for this area and is at present in progress. This will consist of drilling on three parallel sections running approximately at right angles to the outcrop of the seams. The sections will be about 800' apart and the holes will be drilled at 400' intervals on the two outer sections and at 200' intervals on the central section. The programme will consist of 12 - 15 holes of which about four will be cored and the rest will be open holes. This is the smallest programme which can be considered sufficient for preliminary planning of a surface mine in relatively simple geological conditions. If a noticeable variation occurs between the structures on the three sections it will be necessary to carry out additional drilling in this area to prepare reasonably accurate plans and sections.

Nothing was noticed during my visit which would prevent surface mining of the 2 seams in this sub area providing the structures allow sufficient reserves to be recovered at economic ratios. One of the most important considerations when strip mining in seams which are as thin as Sukunka coals must be to obtain the best possible recovery of coal by minimising losses. Two factors appear to be favourable in this respect.

a) The coal, even at the outcrop, is fairly hard and blocky. This will facilitate the removal of the overburden from immediately above the seam without excessive contamination of the raw coal.

b) Recovery will also be assisted if the strata above the seam is fairly soft. At the outcrop

of the Chamberlain seam there was 1' - 2' of loose material immediately above the seam due to faulting which had taken place along the bedding plane. Above this were siltstones and mudstones which were comparitively weak and thinly bedded. Both of the holes already drilled in the area (C30 and C31) show similar strata. The advantage of this from a mining point of view is that coal losses from the roof of the Chamberlain can be minimised by blasting a bench to within 3 feet of the seam and using a dozer equipped with a ripper to break the rest of the siltstone and then to doze this broken material and the fault debris off the top of the seam. It will probably be advisable to use quite a small dozer or loader to clean the last few inches of loose material away in order to avoid coal losses and ensure the raw coal is as clean as possible. The hard sandstone floor of the Chamberlain will also be an asset in mining clean coal.

The Skeeter seam outcrop has not been exposed in this area and the two drill holes show different strata above the Skeeter. Hole C. 31 shows a thin bed of fine grained sandstone immediately above the top of the coal seam

which may cause some problems. Hole C. 30 shows a 3'3" bed of claystone which should be easy to remove and a sandstone underlying the seam which is an advantage. The siltstone bands in the Skeeter seam will have to be separated during mining if possible.

From an environmental point of view there should not be any serious problems. There are no water courses of any consequence crossing the area so providing the ground water is made to bypass the mine water pollution can be prevented. The soil in the area consists mainly of silt and clay with a few inches of peat on the surface. My impression is that mixing the peat with some of the silt may actually improve the top soil. At the elevation of the site reclamation should be easy.

II. SURFACE MINING POSSIBILITIES IN THE MIDDLE COAL.

Preliminary drilling which has been carried out in the area to be considered for strip mining the Middle Coal has indicated variable seam thicknesses and faulted conditions. These results are confirmed by the conditions exposed in the trenching at the outcrop. From a very preliminary study of the few holes drilled at the time of my visit, it would appear that a dense pattern of drilling will be required in this area to ensure that the best pit design is adopted so as to arrive at the best combination of coal recovery and economic stripping ratios. A pattern of holes drilled on a 150' grid may be necessary for this purpose.

III. PROSPECTS FOR AUGER MINING.

Auger mining in dipping seams and in geologically disturbed areas requires very careful consideration. The bulk of the auger mining done in the United States has been carried out in level or almost level seams with a minimum of geological disturbance and there has been very little experience gained in conditions similar to those at Sukunka.

Some of the main considerations in considering auger mining at Sukunka will be :-

a) To have sufficient power on the machine to cope with the gradient. This applies not so much to the power required to convey coal out of the hole against the gradient as to the difficulties encountered when withdrawing a full string of auger sections from the hole.

b) To ensure that the machine is designed so that it can be aligned accurately to the same gradient as the seam and that when augering commences the machine is stable enough to ensure that this alignment is not disturbed.

c) The degree of uniformity of gradient, seam section and dirt bands within the seam are important. If the seam is subject to too much variation in any of these conditions it may be impossible to drill a hole length which justifies the expense of preparing for augering. A variable seam section can also

mean that a hole pattern which is satisfactory at the outcrop may not be satisfactory at depth.

d) Hard rock bands may be a problem or an asset. If they are too strong to cut, and are consistently in the centre of the seam so that holes can be drilled above and below the band they may help to keep the auger in line. If they are too strong to be cut by the auger and vary in position they may prevent augering from being successful.

e) A reasonably strong coal is an asset since it allows holes to be placed quite close together without the hole being drilled joining up with the previous hole. This improves coal recovery since thick ribs need not be left. If the coal is very friable and holes join up due to collapse of the rib, the coal being cut will not all reach the surface since much of it will flow into the vacant hole. In addition there will be a tendency for the auger sections to jam.

f) A correct choice of pitch for the flights of the auger is particularly important when mining to the dip so that coal is transported smoothly out of the hole.

As long as these factors are taken into consideration and an accurate assessment is made of seam conditions the use of an auger at Sukunka may turn out to be an efficient and profitable operation.

IV. ROOF CONTROL IN UNDERGROUND MINING AT SUKUNKA.

Having only spent two hours underground during my visit I hesitate to offer any detailed comments on roof control in the Chamberlain seam since clearly there is a great deal I do not know about the problems that have been met. The two main points I have noted were as follows :-

1) That, of the four systems of roof support employed, only one had been consistently successful in supporting the roof. This was the use of roof bolts with planks set to the roof, adequate lagging between planks, and posts set as supplementary supports under each end of the plank.

The least successful method was of course single roof bolts set without timber and with the roof bolt plate bearing directly on the roof which had, in most cases broken round the edge of the plate, and had fallen away for a height of 12" - 18" leaving the roof bolt doing nothing.

The use of square sets, stringers and posts but without roof bolts, had generally been a failure. With this system it is almost impossible to prevent bed separation, particularly when centre posts cannot be set due to the use of shuttle cars when of course the stringer is certain to flex.

The only other method which had been reasonably successful, but not so much as the use of planks, was where square sets had been used in conjunction with roof bolts. However, even in this case the use of round timbers as stringers had prevented a large area of timber bearing on the roof and the rock had broken away badly in places.

2) The second thing I noticed was that only two short lengths of roadway showed signs of any excessive weight which might have accounted for bad roof conditions. If present the weight would have been easy to see due to crushing of the lagging, deep flexing of stringers or impaction of the posts into the stringer. This does seem to indicate that the problem lies with bed separation in the layer of roof immediately above the seam assisted by weathering of the siltstones along their irregular and thin bedding.

If work recommences under these conditions it does appear that the plank and roof bolt offers the best chance of success. It would be very important also to ensure that supports are set as close to the face as possible since once bed separation has been allowed to start it becomes almost impossible to stop. This will of course limit miner productivity with the rotary ripper type of continuous miner which is in use.

Resin roof bolts may be worth trying. They are expensive but they do have the advantage that they do not have

to be tensioned where full column grouting is employed. This may make a difference and of course if the resin has been brought right down to the mouth of the hole this might reduce the tendency of the mudstones to weather and break up. If resin bolts are tried they should be installed very carefully to ensure proper mixing of the resin and catalyst, correct hole diameter, correct time interval for curing of resin before the bolt is loaded etc. Correct installation takes a little time at first but rapidly becomes a habit.