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R E P O R T

ON THE

CLEARWATER MICA MINE

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PROPERTY FILE

By R. G. Mellin, R. P. E.

M. C. I. M. M.

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(Note: This report was made before the total possibilities of the local market for ground mica had been investigated.)

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ON THE  
CLEARWATER MICA MINE

----- By R. G. Mellin, R.P.E.,  
M. C. I. M. M.  
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Dear Sir:

I submit as follows my report on the Clearwater Mica Mine, owned by you, together with a sketch map showing the topography, and a partial illustration of the geology. The property as it stands is but a raw prospect with one large and two small open cuts, and the extent of the deposit has not been fully uncovered. My opinion is that the property has merit, but that before any serious work is undertaken, a trial shipment of this product should be made for the purpose of determining its exact value.

Itinerary: Leaving Victoria at midnight on August 13th, I caught the steamer for Squamish on the following day at Vancouver at 9 a.m., and arrived at Exeter on the P.G.E. Railway at 4.20 a.m., on the 15th. After waiting for the mail carrier, who did not appear, I walked to the 100 Mile House, and from there telephoned to McNeil's farm at Canim Lake for a conveyance. On arriving there I found that the outfit was not ready owing to a shortage of horseshoes. A start was made on the following morning with two saddle horses, a pack-horse and an Indian, Johnny Sam. Following the North Shore of the lake, we camped at Boss Creek at 6.15, and at Swamp Camp on the 17th, reaching Mica Mountain at 1.30 on the 18th. This gave time for work until 8 p.m., and by putting in a long day on the 19th, the work was completed. As there are but two trains a week, a longer stay would have meant three more days, which, under the circumstances, seemed unnecessary. A different route was taken returning, via Hotfish and Mink Lakes, camping the first night at the junction of Deception and Spanish Creeks, and the second night at B. McNeil's ranch at the East end of Canim Lake. This was for the purpose of exploring a road grade from Deception Creek to Canim Lake via Mink Lake. The West end of Canim Lake was reached the following afternoon, and from there I proceeded to catch the train at Exeter at 1 a.m.

Property: The Clearwater Mineral Claim is an old location, made in the days when mineral claims were staked under the old apex law, and had a width of only 600 ft. as is the case in the United States today. The area therefore is but 21 acres.

Situation: It is situated on the Southwestern spur of Mica Mountain at the head of the East Fork of Deception Creek and some 4 or 5 mile east of Crooked Lake in the Cariboo District; the elevation of the claim ranges from 6,200 to 6,400 ft.

Accessibility: At present the property is reached by a rather tortuous trail, originally an Indian hunting trail, which, starting from the West end of Canim Lake, makes a fairly wide circle around the North Shore of the Lake, passing Hotfish Lake and crossing Deception Creek just above its junction with Spanish Creek. From there, the trail mounts the ridge between these two creeks, and, after gaining the level of the uplands plateau, passes Northwesterly around Saddle Mountain, passing through three-quarters of a circle to reach Mica Mountain. With all its windings, it is estimated that this route involves some .....miles of travel. ~~From observations made on this occasion, it appears that a direct route 36 miles in length is feasible, and of that distance 14 miles could be made by water.~~ The present trail is in fair condition, and there is plenty of feed.

Local Features: Mica Mountain forms part of the upland area bounded by Quesnel Lake on the North, and Clearwater Lakes on the East, and Canim and Mahood Lakes on the South, known locally as the Clearwater country. The upland valleys are wide, grassy openings at the average elevation of 5,000 ft. from which the mountain peaks rise to a further 1,500 to 2,000 ft. in slopes of an average angle of 20 degrees. These are covered with grass and dotted with clumps of Spruce and Balsam. There appears to be no danger from snowslides. At this elevation the open season is short, extending from the middle of June to the middle of October. There is a good supply of timber on the lower slopes, and a fair supply of water. As there is practically no reserve of snow or ice, there are no easily developed water power sites, though some of the smaller lakes might be dammed for that purpose. The only one of any size that suggests itself is the diversion of the waters of Deception Creek through the pass to Mink Lake, but this would be rather too large a development for the scope

of this undertaking.

Geology: The country rocks in this area are micaceous Schists, which, so far as noted, have a width of at least six miles. These rocks are so warped and distorted that it is difficult to determine their original structure, but examination of more massive specimens points to the probability that they are quartz monzonites, a fine-grained intrusive rock having many of the characteristics of a close-textured granite. These rocks are traversed by a number of quartz pegmatite dikes, varying in width from 5 to 30 ft. In most cases the course of these dikes conforms to the line of schistosity in the enclosing rocks, viz: S. 65° E., dipping Easterly at from 32° to 40° Easterly. In the vicinity of the Mica deposits, the course of the dikes is irregular, and marked by the occurrence of spurs and connecting dikes. This system of dikes is of wide extent, and the outlines of their outcrops may be noted traversing both flanks of Saddle Mountain two miles to the South of Mica Mountain, and extending also North-easterly for half a mile down the North slope of Mica Mountain. At many points in these dikes well developed crystals of mica may be noted, and it is possible that there may be more points in this series at which commercial deposits occur. The deposit under discussion occurs in a spur dike, the Southern portion of which has not yet been exposed, and around which the enclosing rocks are much harder and more massive than elsewhere. It is possible that the high development of the mica crystals is due to the slow cooling of the dike, due to the more impervious character of the enclosing rocks.

Description of Outcrops: A sketch plan is submitted showing the details of the outcrops exposed. They lie across a bare ridge, the Eastern spur of Mica Mountain, and extend, so far as the dikes are concerned, across and down both sides of the ridge for an exposed distance of three-quarters of a mile. The greatest development of Muscovite Mica is found at the southern brow of the ridge, where it is exposed by stripping and open cuts for a distance of 170 ft. the maximum width exposed being 21 feet and the average width 10 ft. At the Southern end of the outcrop is an open cut 21 ft. wide, 20 ft. long, and 10 ft. deep. As exposed in this cut, the Mica content of the rocks is from 25% to 30% of the whole. The same conditions are shown in the two smaller cuts to the North, in which the deposit is shown to be 12, 12 and 10 ft. wide, respectively. The Mica crystals vary in size from half an inch in diameter to large, wedge-shaped crystals 10 inches wide, 8 inches long and 4 inches thick. Nearly all the large crystals are of A type, triangular in shape, two adjacent sides being straight and the base irregular and curved. The crystals are jointed along lines parallel to the two adjacent sides, the leaves overlapping, so that the outer portion of the crystal becomes waste, and from

a crystal of an area of 40 sq. inches, not more than 6 or 8 sq. inches of a marketable product could be recovered. Many of the crystals are warped, this condition arising from movement and compression after their formation, and have therefore no commercial value. From the piles of spalls and fragments of high grade material which have been left at this point, it appears that most of the high grade Mica has been removed. However, some large crystals were on this occasion worked out. A test made of the possible recovery from these indicates that it would be possible to produce sheet mica of a maximum size of 8 sq. inches, a product which in its rough-trimmed state should command a price of about 70 cents per lb.

**Possible Production:** As has been intimated above, this property is merely a raw prospect developed by three small open cuts. The full extent of the outcrop to the South is not uncovered, and there is no means of estimating any tonnage at depth, and the persistence of the deposit in depth is a matter of surmise. One would judge from the length of the surface exposures that a depth of at least 90 ft. could be depended upon, which would give it an average presumed depth of 105 ft. However, taking the exposed depth below the lowest open cut as being actual, there is here a block of land 190 ft. long, averaging 10 ft. wide and 12 ft. deep. This measures up to 1,750 tons of which 25% is Mica. The ratio of marketable product would be above 6%, so that one might expect a production equivalent to 1 1/4% of the tonnage exposed, which would be some 21 tons, of an average value of \$1,400.00 per ton. Working this out backwards would give the rock in place an average value of \$17.00 per ton.

**Suggested Development:** The writer would suggest that a trial shipment of this product in its rough-trimmed state should be made before any plans are made for the development of the property, and that this should take the form of not less than half a ton of a marketable product. This would involve breaking and cobbing some 30 or 40 tons of rock, and trimming about 7 or 8 tons of mica-run Mica into suitable-sized blocks ready for the splitter. Later on, if this test proves the value of the product, the property can easily be opened up by means of an adit level driven from the South flank of the hill.

**Shipping Facilities:** Special attention was at this time given to the investigation of a more direct route to Canim Lake than the present one used, and also to the possibility of constructing a wagon road, to that point on an even grade. The route as outlined and as shown on the map submitted herewith would follow the East Fork of Deception Creek from Mica Mountain, and the right bank of the main creek to a point about 3 miles below its junction with Spanish Creek. At this point Deception Creek is some 400 ft.

higher than the level of Canim Lake. Leaving Deception Creek the route would follow the contour of the hillside until the divide between Deception Creek and Mink Lake, some 230 ft. above the level of Canim Lake is reached, and from there would follow down the West side of Mink Lake, and so by an easy grade to the shore of the East end of Canim Lake. The total distance of this stage would be 24 miles, and the elevation to be surmounted would be 5,730 ft., an average grade of a little less than 3%. Freight could be handled by water to the West end of Canim Lake, and from there to the P.C.E. Ry., 27 miles, by truck. It is possible that with a road provided up Deception Creek, freight could be landed from Mica Mountain to Exeter on the P. G. E. Ry. for \$14.00 per ton. This route has not been cruised in detail, but there appears to be no great difficulties in the way. The first mile from the mine drops abruptly into the course of the East Fork, but there seems to be plenty of room on the slopes above the creek in which to maintain a moderate grade, and none of the slopes are steeper than 30 deg.

Other Deposits: Deposits of Muscovite have been known to occur at several points in British Columbia. The chief of these are at Fort Grahame, Tete Jaune Cache, the Big Bend, and a fourth 30 miles from Sicamous. The Fort Grahame deposit is situated on the summit of Mica Mountain opposite Fort Grahame on the Finlay River. The elevation is 6,000 ft., and the property lies some 6 miles to the West of Fort Grahame. Some small shipments of sheet mica 2 in. x 3 in. have been made to New York. The remoteness of this property, which is 450 miles from Peace River Crossing, and 200 miles from Prince George, combined with the severe weather conditions, are a serious impediment to operation. Tete Jaune deposit is a day's travel by packhorse from the C. N. Ry. It is situated at an elevation of 7,000 ft., and is for the greater part of the year covered with snow. Occasional attempts have been made to operate it, and small shipments of a good quality were made. When last visited, the whole area in which these outcrops lie had been swept by snowslides. The deposits in the Big Bend of the Columbia are also very difficult to access, lying at a high elevation in a difficult country that is subject to a heavy snowfall. They are almost 75 miles North of Revelstoke.

Market: A limited market exists locally on the Coast for ground Mica for roofing purposes, which might be developed. The price paid for this material as shipped from Quebec is \$80.00 per ton, landed here, and total yearly consumption is said to be 200 tons. There is a steady market for rough-trimmed leaf mica in the United States, the price varying according to the area of the leaf and the quality. Clear Muscovite of this character, and having an average area of leaf of 5 in. would command a price of \$1.00 a lb., which would be subject to an import duty of 25%, making the net value 75¢ per lb. In

the production of 200 tons of ground mica, it is possible that the deposit would also produce 8 or 10 tons of trimmed mica, having a value of \$12,000. It is improbable that any market could be developed to the South in the United States, except in Washington, as there is an import duty of 20% on ground Mica. The State of Washington is mentioned for the reason that the nearest producer of roofing mica is in Colorado, which would give British Columbia mica an advantage in freight rates. Fully 60% of the ground mica produced is used in the manufacture of roofing and 21% in the manufacture of Wall-paper. The former is ground dry, and the latter wet, a more valuable product which commands \$125.00 per ton.

Method of Operation: If mining were restored to on the basis of first trimming out the sheet mica, the total production of the operation for the year would be 200 tons of ground mica valued at \$16,000 and 8 tons of trimmed mica valued at \$12,000, a total production of \$28,000 per year. Or, the Mine could produce 2 years' supply for the mill, which would increase the supply of trimmed mica, and make that source of revenue more readily available. As the mill would be using an almost finished product, that is to say, cobbled mica, there would be but little tailing or waste, and therefore the cobbled mica might as well be handled to the mill at any suitable point on the route, preferable to a point at a much lower elevation, where water power is available. Such a site presents itself at Bridge Creek, the outlet of Canim Lake, and it is probable considering the fact that the stream drops 570 ft. in 4½ miles, that a water power site is available there. On this basis of production of 200 tons a year, there is sufficient ore, viz: 1,700 tons, lying above the level of the open cuts, which should sort to 400 tons of mica, or sufficient for two year's run.

A small unit, treating from 6 to 8 tons a day, would probably serve as an initial plant, and the power requirements of such a plant would be small.

Probable Cost of Producing: The cost of open cut mining, that is to say, blasting by hand, would be about \$1.50 per ton, and it would take at least 4 tons to produce 1 ton of cobbled mica. Assuming that the mill were situated at Bridge Creek, 24 miles distant, the cost of developing cobbled mica at the mill would be as follows:

Breaking.....	\$6.00
Cobbing.....	4.00
Hauling.....	<u>4.80</u>

\$14.80

The cost of milling mica is not known to the writer, but it seems improbable that it would exceed \$7.00 per ton, including capital charges. There is also liable to be some loss, raising the cost of the initial feed, so that the final cost of milling and freight would be as follows:

Feed plus loss.....	\$16.30
Milling .....	7.00
Sacking .....	3.50
Hauling to rail.....	8.00
Railway freight .....	6.00
Overhead .....	4.20
	<u>\$45.00</u> total cost

Conclusion: If a definite and assured market can be fixed for the ground product at the price of \$80.00 per ton, there seems to be little doubt but that this undertaking could be developed into a commercial success. The actual reserve of ore is a matter of conjecture, and definite proof of this is the first thing that should be undertaken. It has been said above the one might assume a certain depth of 105 ft. but one cannot proceed on assumption in equipping property for production. With the mine developed by tunnel and upraise, it will then be time to consider the question of a millsite, and shipping facilities. All that can be said at present is that, granted a supply of ore, there are no great difficulties in the way of extraction, milling and shipment, and that the indicated margin on the finished product fully justifies the undertaking of this enterprise.

The foregoing is respectfully submitted,

(Sgd.) R. C. Mellin.

August 27th, 1930.



Crown Granted Mica Mine, registered title "Clearwater", situated 20 miles North of Mahood Lake, at Mica Mountain, and 85 miles North of Bridge Creek on Cariboo Road. The property is situated approximately 165 miles North of Canadian Pacific Railway and approached by wagon road to within 60 miles of Concession. By means of \$2,000.00 a good sleigh-road can be completed to the mine.

Report by A. J. Colquhoun, M.E. .... Late Managing Director School of Mines:

The Clearwater Mica Concession is situated on Mica Mountain 85 miles East of Bridge Creek on Government Cariboo Road, and 87 miles from Albright, a town on Main line C. P. R., from the railway to Bridge Creek this Government Road is kept in excellent repair. Thus every facility exists for the transport of plant and machinery to that point. The balance of the road can be put in at small outlay at later period.

#### TIMBER, ETC.

There is abundance of timber especially cedar, which can be manufactured into boxes for the transport of mica. Ample water for all purposes can be obtained on the property.

#### WORKINGS

There is a large body of Mica exposed on prominent ridge for the whole extent of the property. The workings consist of a shaft 12 ft. in depth, and an open cut 6 ft. x 10 ft. for an extent of 500 ft. The work has shown up a great amount of high grade mica, and I estimate there must be half a ton of that mica on the dump, separated from the matrix, besides a large quantity ready for trimming. There are also large masses of the veins blown out from previous operations, some weighing from 5 to 10 tons and containing blocks of merchantable mica. I should estimate the value of the mica in sight, trimmed and in the rock, at \$10,000.00

#### OCCURRENCE

The mineral occurs in a dyke of pegmatite 12 ft. wide, in contact with gneiss running E. and W. and dipping at an angle of 42°, conformably to strata.

The mica is found in coniform crystals of the white variety, known as Muscovite, which has the highest market value. The largest crystals are found in the hanging wall, and from the shots put in I obtained about 100 lbs. of sheet and bulk mica,

which, dressed, averaged 1 x 2 inches, 2 x 4 inches, and 6 x 8 inches: one sheet, dressed measured 12 x 16 inches.

The deposits of this belt extend over a large area, and are traceable for ten miles, regular, and well defined, and showing bunches of mica on the croppings.

#### QUALITY

The mica is white, transparent, and flexible, and pronounced by electrical firms to equal the Indian mica.

#### CONCLUSION

As the result of my examination, I have no hesitation in saying that the "Clearwater" property, according to the present prospects, will respond to development, and become a highly profitable proposition for capital invested. It is possible by exploration a shorter route may be found, probably the same route that cedar logs are floated to the Kamloops mill.

(Copy of report on "Clearwater" Mica Mine

By A. J. Calquhoun, M.E., etc.)

H. C. GUNSON  
Mechanical and Electrical Engineer,  
Machinist, Consultant  
511 Yates Street,  
Victoria, B. C.

Feb. 24, 1931.

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Dear Sir:

I have to thank you for the mica which you gave me. I am using ~~it for insulation in ignition~~ plugs and find it very satisfactory for the purpose.

With all good wishes,

I remain

Yours sincerely,

"H. C. Gunson"

PEACE RIVER LAND & COLONIZATION COMPANY LIMITED

Per: A. M. Benzanson

640 W. Hastings  
Pa. 6456