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THE CONSOLIDATED MINING & SMELTING COMPANY
OF CANADA LIMITED

92I/14W
92I/NW-1

Flint Chrome Property

Ashcroft M.D.

Section No. 48

Mine Series Geological Report No. 1

SUMMARY:

1. The showings consist of a number of small lenses of high-grade chrome, largely mined out, and slightly larger bodies of lower-grade banded and disseminated chrome, in crushed and sheared serpentine. The tonnage exposed is insignificant, and it is unlikely that further work would do anything more than expose more of the same sort of material.

2. Tests made in the past have indicated that the chromite itself, even when freed from gangue, is of poor quality, and that its Cr:Fe ratio is too low to be suitable for ferrochrome.

3. I do not think that the showing warrants any further work on our part.

4. Mr. D.B. Sterrett has asked for a 30-day option to examine the property, with a view to leasing it on a royalty-on-production basis. Since the Government is anxious to obtain chrome, and since Mr. Sterrett appears to intend to finance the project without help from us, I recommend that the option be given.

HISTORY:

The property consists of eight claims on Chrome and Scottie Creeks, on the east slope of the Bonaparte River valley. A narrow side-road leaves the Cariboo Highway 19 miles north of Ashcroft, and runs eastward up the gorge of Scottie Creek to the property, a distance of 4 miles. The actual workings are on Chrome Creek, just above its junction with Scottie Creek.

The showings were discovered in 1901, but no real work was done until 1918, when the war-time demand for chrome stimulated exploration. In that year about 500 tons of chrome-bearing rock of various grades was mined from small open-cuts, but it was not shipped. In 1927 C. M. & S. Co. optioned three claims (two of them on Ferguson Creek, about 3 miles south) and staked the intervening ground. Various electric furnace and concentration tests were done on ore taken from the stock-piles, and several short tunnels were driven. The results were unpromising, for two reasons; the metallurgical tests indicated that the chromite was so high in iron that even perfect concentration would hardly yield a product satisfactory in Cr_2O_3 content or in chrome:iron ratio. The exploration showed a number of small pods of medium-grade chromite ore and low-grade disseminated, but established no tonnages even of this material. Work was stopped early in 1931, and eventually the whole south end of the property (including the Bear and Granular claims on Ferguson Creek) was abandoned. The eight northern claims were crown-granted in 1939.

GENERAL GEOLOGY:

According to Geological Survey reports, a band of rocks of the Lower Cache Creek series (carboniferous) runs along the east side of Bonaparte Valley, flanked on the east by the younger volcanic rocks of the Bonaparte plateau. It consists mainly of greenstone and interbedded sediments, but includes also some serpentine belts. The lower gorge of Scottie Creek has outcrops of all these rocks, as well as of younger volcanics. On the property itself the geological picture is obscure. The claims, so far as we examined them, are drift-covered except in the valleys of Scottie and Chrome Creeks. These run northwest and southwest respectively, forming a "V" whose apex lies just west of the property. Scottie Creek for some distance above the junction flows through a gorge walled by cliffs of a very thick-bedded volcanic agglomerate, and similar rocks are found north of Chrome Creek. They form a band running along the western side of the claims and dipping west. On Chrome Creek, east of the volcanics, serpentine is found in a number of large outcrops which form cliffs

and pinnacles on both sides of the creek. The showings occur in this group of outcrops, which are surrounded on the north, east and south by large areas of drift.

The strike and extent of the serpentine are therefore quite uncertain. It may well be an island of older rock completely surrounded by younger volcanics (which certainly make up most of the higher ground to the east). Judging by the topography, it is probably separated by volcanics from the Ferguson Creek showing (Bear and Granular claims) three miles to the south, but neither this showing nor the intervening ground was examined.

The serpentine itself is a badly-altered, structureless mass, presumably derived like other serpentines from the alteration of an ultra-basic intrusive. In the field two main types can be distinguished. The first is a light-green or yellow-green rock, rather granular, with the massive uniform look of an intrusive. It seems at first sight to be a comparatively unaltered peridotite, but closer inspection shows it to be completely serpentinized, with no trace of the original minerals. This is borne out by Reinecke's microscopical work, which showed the rock to consist wholly of serpentine, carbonate, and small amounts of chromite and/or magnetite.. The second is a more normal bottle-green serpentine, dense, translucent and waxy. This type seems to represent a more complete alteration, with entire obliteration of the original textures. The two varieties are badly mixed. In general the bottle-green type penetrates the rock masses irregularly, probably along fracture planes, leaving residual areas of the yellow-green variety, but these relations have been much complicated by crushing and faulting of the whole mass. The yellow-green is much the more abundant, and many outcrops show little or none of the bottle-green material. On the other hand the bottle-green areas usually have visible residuals of the yellow-green, which form lenses and pods of various sizes, often bounded by slip-planes.

CHROMITE:

The chromite mineralization occurs within the serpentine. There are three main phases, which grade into one another:

(1) Lenses of "massive" chromite. This material, while it appears homogeneous, is generally a fine-grained aggregate of chromite and gangue, whose Cr_2O_3 content may vary within wide limits.

(2) Banded ore. This is a rather coarse interbanding of the massive or granular chromite with yellow-green serpentine. It appears, in some cases at least, to consist of roughly parallel veins of serpentine cutting and to some extent granulating the chromite; the ratio of serpentine to chromite varies widely.

(3) Disseminated ore. In its most conspicuous form this is a dissemination of small chromite grains in a light-coloured matrix (probably serpentine with considerable quartz and carbonate). This is usually very low-grade. In addition, chromite is distributed widely as a minor accessory mineral in both types of serpentine.

The occurrence of the chromite is not governed by any obvious structures. The main showings are found along a curving east-west line, convex to the south, roughly following the slope of the hill between the 2800 and 2900 contours. This, however, may be largely accidental, since it is within this belt that most of the rock outcrops occur. Most of the showings and workings lie within a small area, 500 ft. east-west by 100 ft, north-south, straddling the east line of the Barbara claim. The lenses of high-grade and the banding of the low-grade have a general tendency to dip northwesterly into the hill, but they are so patchy and so badly cut up by later movement that it is difficult to tell whether they ever formed part of a larger continuous body.

Chromite deposits are normally considered to form by magmatic segregation in an ultrabasic intrusive; that is, they accumulate by gravity near the bottom of the still molten mass, and should therefore originally have formed more or less continuous sheets. The later alteration of the intrusive to serpentine does not affect the chromite chemically; in this case it is found indifferently in both types of serpentine; however, the volume-changes attending serpentinization are in themselves sufficient to produce considerable crushing and physical movement, which may be increased by later faulting due to regional stresses.

In this deposit there is no evidence as to the original shape of the intrusive. It may be a sill, but if so the bottom is not exposed, and the only other rocks in the vicinity are younger volcanics. There are other belts of serpentine in the Cache Creek series, and these have been described as narrow dike-like bodies. We do not know, therefore, that there is any sort of footwall structure which would have served as a catchment basin for important amounts of chromite. As already indicated, nothing more than purely local structures (such as banding) can be seen in the workings, and attempts to establish continuity for the chromite have not had any great success. The tonnage thus far obtained has apparently come from a few small lenses of high-grade, each more or less mined out. The lower-grade material, while perhaps more abundant, seems to be equally spotty, and no continuity could be assumed between workings more than a few feet apart. I do not think that any systematic sampling is feasible, nor that any tonnage estimate would have any meaning.

WORKINGS:

The central group of workings is shown on the 20-scale plan, which also shows the location of various samples taken while the tunnels were being driven. Nos. 1, 2 and 3 tunnels, the long open-cut south of them, and the outcrops between them follow a zone running diagonally down the hillside; it is well exposed, and shows chromite of all the three types described above. No. 4 tunnel was driven as a crosscut to this zone, and several stub drifts, an inclined raise, and a short winze were driven from it in an attempt to extend the ore shown in No. 3. This work, which is all on Flint No. 2 M.C., was done by C. M. & S. Co. in 1930. North of the tunnels is a line of cliffs. Near the top, about 1,000 ft. north, some more small showings occur. No. 5 tunnel was driven to get under these. It is partially blocked and we did not enter it, but according to reports nothing of importance was found in it.

The original discoveries were made on the Barbara claim (formerly the Artic), and the ore mined in 1918 came largely or entirely from this claim. Natural outcrops are not abundant, but the overburden is shallow along the hillside and several trenches and pits reached bedrock. Most of the chrome has been found near the east

boundary, apparently on the extension of the Flint No. 2 zone, but one good-sized pit farther to the northwest has a dump containing a few tons of ore. A short tunnel near this pit, now collapsed, was put in by C. M. & S. Co. in 1932, after we acquired the Barbara.

DISCUSSION:

The prospective value of the property depends on two interdependent factors, the grade and tonnage of the chrome. In spite of several tests in the past we are still uncertain about the grade. As in the case of all chromite deposits, the question of the exact composition of the chromite itself is of great importance. Chromite is a member of the spinel group of minerals, which have the generic formula $R''O.R_2'''O_3$. Spinel proper is $MgO.Al_2O_3$. Chromite theoretically is $FeO.Cr_2O_3$, but actually is (Fe, Mg)O. (Cr, Al, Fe)$_2O_3$, with wide variations in the amounts of chrome, ferrous and ferric iron, magnesia, and alumina. For the manufacture of ferrochrome, a Cr_2O_3 content of 48% is considered necessary, but the chief requirement is a high chromium-iron ratio - 3:1 is desired though not always obtained. A perfectly "pure" chromite, corresponding in analysis to the $FeO.Cr_2O_3$ formula and entirely free from gangue or other impurities, would have a ratio of less than 2:1, and would therefore be unsuitable for ferrochrome. What is needed is a variety high in magnesia (and therefore low in ferrous iron) and also high in chrome (and therefore low in alumina and ferric iron). That these variations in the composition of the chromite itself outweigh the effects of imperfect concentration can be shown by the following examples:

A chromite whose formula is $FeO.Cr_2O_3$ will have 68.0% Cr_2O_3 (unnecessarily high), and a chromium-iron ratio of 1.9:1 (much too low).

A chromite whose formula is $(Fe_1Mg_1)O.Cr_2O_3$ will contain 73.1% Cr_2O_3, and have a chromium-iron ratio of 3.8:1. This would be salable even with an admixture of 50% of gangue, provided the gangue were low in iron (serpentine, quartz, calcite).

A chromite whose formula is $(Fe_1Mg_1)O.(Cr_3Al_1)_2O_3$ will have 58.3% Cr_2O_3 and a chromium-iron ratio of 2.9:1. It will therefore be salable with 20% of iron-free gangue.

On the other hand, any ferric iron, either in the chromite molecule or as the closely related mineral magnetite (which is also a spinel, with the formula $FeO.Fe_2O_3$) would be deleterious.

The available analyses of Flint concentrates are not complete enough for an accurate calculation of the mineral composition, but they suggest that the chromite itself is fairly high in alumina and not very high in magnesia, that the chromium-iron ratio is about 2:1, and that the iron is nearly all in the ferrous state and contained in the chromite molecule. It is likely, therefore, that no form of mechanical concentration could make a product with a better chromium-iron ratio than this, nor with a Cr_2O_3 content much above 40%.

As for the tonnage. Work to date has indicated that the high-grade chromite occurs in a series of lenses up to a foot or two in thickness and only a few feet or tens of feet in their other dimensions. This is the only type which could be shipped direct or hand-sorted to shipping grade. As already stated, the lenses may line up into some sort of vague zone, and it is quite probable that further exploration would find more of them, but the cost of finding and mining them would be excessive.

The lower-grade banded and disseminated material would have to be concentrated, which means that an appreciable tonnage would have to be developed to justify erection of a mill. So far as the present exposures go, this low-grade is not very much more abundant than the high-grade, and the difficulty of finding enough to supply even a small mill would be at least as great as that of finding minable amounts of high-grade.

MR. STERRETT'S PROPOSALS:

The above remarks apply to the Flint showing on Scottie Creek. The Granular-Bear showing on Ferguson Creek was not visited. It was formerly owned by C.M. & S. Co., and was dropped because it was considered at least as unpromising as the Flint showing and was less accessible. A recent article by Mr. D. B. Sterrett (B. C. Miner, March 1941) describes the Granular-Bear. Mr. Sterrett computes a minimum of 14,300 tons, running 17% Cr_2O_3, in a right triangular block 4 ft. x 255 ft. x 325 ft. The calculation is based on 8 samples, over widths ranging from 6 inches to 8 feet, and assumes continuity under considerable stretches of cover. From his description, the showing appears to be of the same type as the Flint, with small lenses of high-grade and larger amounts of banded and disseminated ore, running in various directions in a crushed and sheared zone. The C. M. & S. tunnel, 167 ft. long, which forms the base of the triangle, cut only a little low-grade.

Mr. Sterrett's calculations appear optimistic. More recently, however, he has approached the Company with a

request for a 30-day option for a lease on the Flint property, suggesting as a basis 10% royalty on price received for the ore, less freight and sales charge. He apparently expects to be able to finance operations without help from us. We have no information as to the present status of the Granular-Bear.

I do not consider that the Flint property is worth any further expenditure on our part. Since the Government is anxious to obtain chrome, and since Mr. Sterrett wishes to try to develop it (provided results of his preliminary examination are satisfactory), I see no reason why we should not cooperate with him by giving him a lease on the terms he proposes. We have nothing to lose and might gain something. Mr. Sterrett mined chrome in Quebec in the last war and should therefore be capable of handling the operation.

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Orig: RWD

cc: File (2)
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"G.G"
G. Gilbert

GCNL #202 21 OCT 1986

VALHALLA ENERGY CORPORATION (VLA-V) 92INW
GRANGES EXPLORATION LTD. (GXL-T, AMEX, London) GEN

SILT SAMPLING STARTED - Mike Muzylowski, president of Granges Exploration Ltd. and Jarl Aa.B. Whist, chairman of Valhalla Energy Corporation, announce that a program of extensive silt sampling and heavy metal concentration of silts has been started on the Scottie Creek platinum property in the Scottie Creek and Bonaparte River area near Cache Creek, B.C. The aim is to confirm samples of chromite ore obtained from deposits on Chrome Creek which returned values of 3.4 and 0.69 grams per tonne platinum. Pan samples from bars and old diggings on Scottie Creek returned values of 4.8 and 1.37 grams per tonne platinum. Two further samples taken on Chrome Creek produced 64.07 grams per tonne platinum each (2.06 oz. platinum/ton. These results were reported in "Occurrences and Distribution of Platinum-Group Elements in British Columbia", compiled and issued by the provincial Ministry of Energy, Mines & Petroleum Resources in June 1986.

ON PLATINUM PROSPECT 92I/14

Valhalla and Granges are each 50% joint venture partners in the property which consists of 8 converted crown grants and 2 claims comprising 20 units. Granges is the operater and Valhalla contributes 50% of the cost.

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