GIANT MASCOT MINES

INTRODUCTION

The property of Giant Mascot Mines Limited is situated 5 miles west of the Trans-Canada Highway at Choate, some 8½ miles north of Hope, B.C. The main-haulage level, concentrator, and surface facilities are at an elevation of 2600 feet above sea level, near the headwaters of Texas Creek, in a steep-sided, heavily-forested valley.

The climate is moderate, below-zero weather being experienced for only a few days of the year. Precipitation however is heavy; rainfall averages 150 inches per year and snowfall is in the order of 30 to 40 feet at the 2600-foot level.

HISTORY

The property was discovered in 1923 by Carl Zofka, a trapper. The initial development work was carried out by B.C. Nickel Company Limited. After several false starts, finally in 1957 the mine was brought into production at 750 tons/day at a capital cost of $2 1/2 million. This operation was shortlived but in 1959 Giant Nickel Mines Limited brought the property into production. During the next 11 years the mine operated at capacities from 750 to 1500 tons/day.

The plant was completely destroyed by a fire on August 2, 1970. A new plant was designed and constructed and put into operation in May 1971. This feat was possible only because of the enthusiasm and cooperation of the parties concerned viz: Giant Mascot Mines, Commonwealth Construction and Wright Engineers.

GEOLOGY

The Giant Mascot property is situated in an ultra-basic complex along the eastern edge of the Coast Range granodiorite batholith and belt of acid intrusives, which collectively intrude northerly trending, metamorphosed Paleozoic sediments. Regional northwesterly and northeasterly striking fault systems have been mapped throughout the general area. All rock types, except granodiorite, and structural features have been recognized in the underground workings.

Several reports, dealing with various aspects of the mineralogy and geology of the property, dating back to 1924, have been published and all contribute to the gradual better understanding of geological and ore-making conditions. The surface expression of the main ultrabasic mass is approximately 1.8 miles east-west by 1.4 miles north-south. At least three satellite ultrabasic bodies are located immediately northwest and south of the main mass. Exploration northwesterly to Harrison Lake is revealing additional areas of ultrabasic intrusion. The most detailed geological information has been obtained from production underground workings in the westerly third of the main instrusive complex. In the past 1.5 years a partially completed longhole diamond drilling exploration program from the 3550, Chinaman (3275) and 2650 levels has provided important geological information beyond these workings which will contribute to the discovery of future ore bodies.

The ultrabasic rocks vary from a dark green, almost black peridotite to pyroxenites which range from a bronzititic, brownish-green medium grained rock through to a hornblendic greenish-black medium to coarse grained variety. Either the peridotite or pyroxenites may be ore hosts. Hornblendites, which to date have not hosted ore bodies, constitute the third main ultrabasic rock type, and occur as masses, or more commonly in dyke form, in which case they may cut all other ultrabasics and sulphide mineralization.

The feldspathic rocks are norite and diorite. The norite is grey-green to pinkish, equigranular, at times difficult to differentiate from a pyroxenite, and may be the most acid phase of the ultrabasic intrusive complex. The diorite on the other hand appears to have been intruded by the ultrabasics, although conflicting apparent contact relationships suggest that there may be more than one stage of diorite intrusion. No ore shoots have been found in either of these rock types, but both may exhibit prominent sulphide (pyrrhotite) mineralization.

The metamorphic recks consist of schists, hornfels and quartzites. Their importance is indirect as they are the only group that provide information on regional structural conditions.

Faulting is widespread throughout the underground workings and may be grouped into three broad categories. The first group strikes N45-50^{o}W with dips 50 - 75^{o} northeast. The second strikes from N25^{o}W to N25^{o}E with steep dips to the east or west. It is believed that these two fault systems represent final adjustments of zones of weakness that may have controlled intrusion of the ultrabasic rocks and the areas where the two sets intersect could control the deposition of sulphides in economic concentrations. Faults in the third group are quite strong in appearance, usually associated with 8 inches to two feet of crushed wall rock and gouge material and often characterized by the introduction of feldspathic and carbonate minerals, with bleaching of the crushed material. These faults are believed to be later in age than the other two groups, and exhibit post ore movement, being the terminus of some ore bodies.

There is very little evidence of secondary alteration within the intrusive complex. Exceptions to this are the development of secondary actinolite, talc, chlorite, serpentine and in some cases, magnetite in direct association with shearing and faulting and the development of talc and biotite in the "crumbly alteration" areas mainly within peridotites.

The recognition of ore controls is of primary importance as, compared to the extent of the ultrabasic intrusive complex, the size of individual ore bodies is relatively small. Examination of mine plans points up the obvious spatial distribution of ore shoots relative to embayments in the proximity to diorites and norites. The chemical and mineralogical environment of the ore bodies has been studied by independent geologists, but as yet no workable criteria are evident, although continued study in this direction is almost certain to make an important contribution to the overall interpretation of ore controls.

The widespread faulting throughout the underground workings is impressive, and although individually the faults may be of minor intensity, with probably little post-ore movement, they show distinct continuity. The relationships of intersecting fault systems with known ore bodies and mineralized zones presents interesting implications.

The geological interpretation on the accompanying map of the 3550 and Chinaman's Tunnel illustrates these concepts and demonstrates the value of the long-hole diamond drilling program in delineating structural and mineralization trends that with additional detailed exploration could result in the location of ore shoots. At least five northwesterly trending fault zones have been traced over strike lengths up to 2000 feet and all are associated with important mineralization or actual ore bodies. The area of the Brunswick ore bodies is cut by three northwesterly trending faults, as well as numerous generally north-south striking structures. It is of interest that mineralized ultrabasic rocks have been intersected southeast of the Brunswick zone along these fault structures, in areas previously believed to be occupied by non-productive diorites. Similar extensions of favourable zones may be found along the north-westerly structural trend that is closely associated with the 4600, 4400, 1900, 1600 and 1500 ore shoots. The Chinaman ore zone currently being developed from the 3050 level lies between two strong structures striking N30°W and N50°W respectively.

Further evidence of the importance of structural control is the fact that ore bodies may occur in either peridotite or pyroxenite, with the only obvious reason for selectivity being the presence of faulting and fracturing. The plunges or rakes of ore bodies mined to date may be variable even within the same ore body, suggesting change of ore control from one intersecting ore fault system to another.

The general conclusions which may be drawn to date are that structural trends, as exemplified by present fault patterns, have influenced the intrusion of the ultrabasic host rocks, with further controls on economic sulphide deposition being exerted by the intersection of the two main fault directions. The obvious spatial relationship of known ore bodies to the diorite - ultrabasic contacts cannot be ignored, and while no chemical or mineralogical reasons have as yet been diagnosed, it appears quite possible that particularly favourable structures within the ultrabasics could be developed adjacent to such contacts.

MINERALIZATION

Mineralization occurs almost exclusively in the ultrabasic rocks as disseminated and massive sulphides, pyrrhotite (iron), pentlandite (nickel) and chalcopyrite (copper). The pyrrhotite (pale nickeliferous variety) forms a coarse grained mosaic with irregular grains of pentlandite and chalcopyrite lying between and within the pyrrhotite grains.

In the disseminated ore, the sulphide minerals are interstitial to the silicates in the host rock and undoubtedly crystallized after the silicate minerals. In the massive sulphides, heavily fractured coarse pentlandite shows mutual boundaries with the massive host pyrrhotite. Chalcopyrite is in irregular patches or discrete areas on the contact of pentlandite and pyrrhotite and apparently is later than both the latter minerals.

The possibility of massive sulphide deposits representing magmatic sulphide injection and disseminated deposits being hydrothermal replacement has been suggested, but the relative constancy of the nickel-copper ratio throughout the mine does not support this theory.

MINING PRACTICE

The underground workings of the mine lie under Zofka ridge which separates the head waters of Texas Creek from Emory Creek. Access to the mine is from the Texas Creek side of the ridge by means of three adits at 2600, 3050, and 3550 elevations. The main haulage and principal entry to the mine is the 2600 level which extends some 7700 feet into the mountain. The other main levels of the mine, the 2950, 3250, 3400, and 3550 levels, are reached by means of an internal shaft inclined at plus 50 degrees equipped with a Stephens-Adamson 75 H.P. single-drum hoist and a ten-passenger skip.

The orebodies occur in pipe-like or irregular vertical forms, typically lenticular or elliptical in cross-section, within a complex array of ultrabasic rocks surrounded by diorites and granodiorites. The orebodies range in size from 50 feet by 50 feet to 350 feet by 200 feet and some have a known vertical extent of over 1200 feet. Due to the location of the orebodies a large amount of development must be maintained, normally about 800 to 1000 feet per month.

Stoping Methods

Because of the wide variation in tonnage dimensions, and grade of the orebodies, a set pattern of mining is impossible and each orebody has to be treated individually. However, the principal method of mining is by long-hole open stopes and occasionally open-shrinkage stopes.

Once an orebody has been defined, it is the normal practice to raise in or as close to the footwall as possible to the level above. This raise is then used for diamond-drilling stations with holes being driven at 50 foot intervals. Horizontal rings of diamond-drill holes are drilled with Boyles, J.V. type machines, to determine the outlines of the orebodies. With these ore outlines a three-dimensional picture of the stope can be produced and a mining plan formulated. There is normally no definite boundary between ore and waste and consequently the stopes must be mined to an assay cutoff that strikes the best possible balance between grade, tonnage, and the optimum pattern of longholes.