

Not a Write-off

*When Noranda built Goldstream in '82, copper prices were in the toilet.
Now that they've doubled, two juniors are profiting.*

by CMJ Staff

GOLDSTREAM, ONE OF THE smaller copper producers in Canada, has had a short, roller-coaster life. Developed by Noranda Inc. in 1983 at a cost of \$62 million, it shut down the following year and stayed closed until May, 1991 when two juniors — Bethlehem Resources and Goldnev Resources — turned the 1,350-tonne-per-day mill over once again.

Both companies have a 50% interest in the operation and Noranda retains a 12.5% net profit interest.

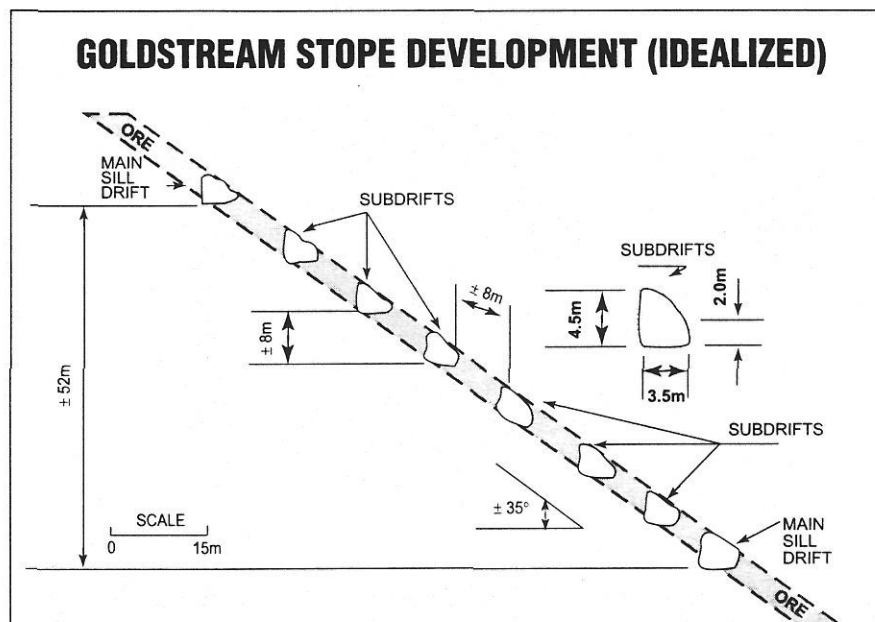
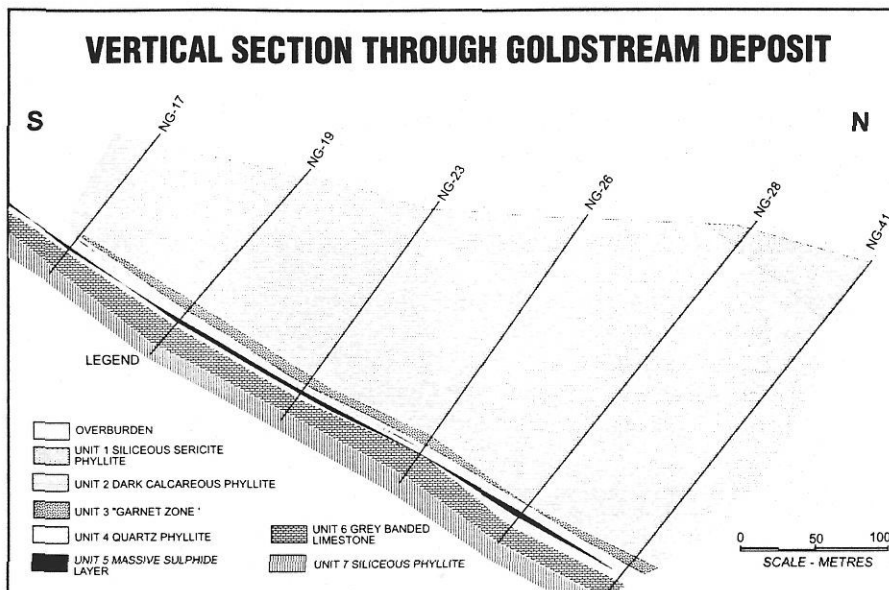
Debt financing came via Nippon Mining and Sumitomo Corp. of Japan who gave access to a maximum of \$7 million: \$4.53 million was appropriated for capital expense and \$1.72 million for working capital for a total cost of \$6.25 million.

The Goldstream mine is located in a region of outstanding grandeur, 108 km north of Revelstoke, B.C. in the Columbia River valley — a 97-km stretch of which is now a lake created by hydro-power development. CMJ visited the mine in August, 1991.

The ore body is a low-dipping, stratiform sheet of massive sulphide (see accompanying diagram). The mineable section of the ore is about 350 metres long and 2 to 3 metres thick. It is open at depth and has a 350-metre dip length so far as presently developed. Wall rocks are siliceous and calcareous phyllites and the sequence rests on a bed of banded limestone.

The principal sulphides are pyrrhotite, chalcopyrite and sphalerite. Pyrite is uncommon. The footwall of the ore is generally sharp but the hanging-wall is gradational and commercial values can persist well into the wall rock. The ore dips at about 35°. This is an average figure as the ore tends to roll on both strike and dip.

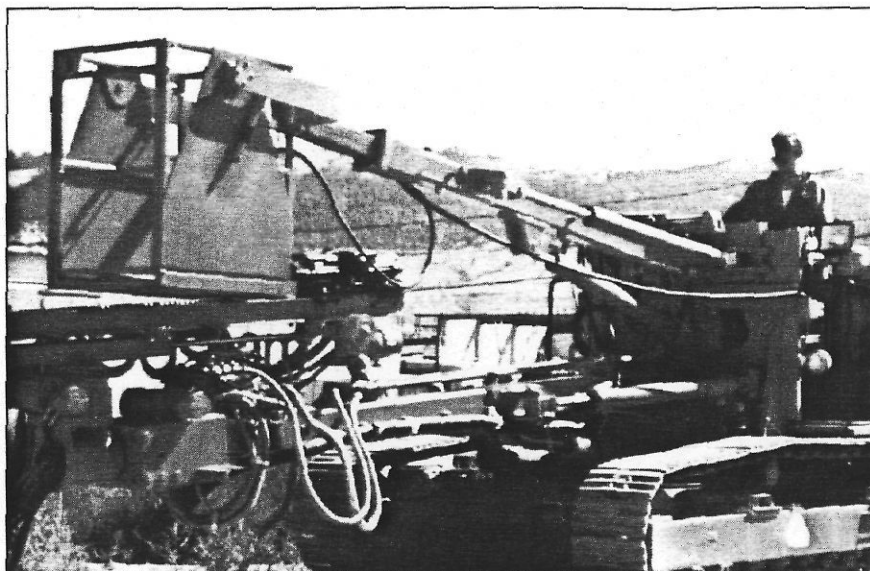
The new owners re-calculated ore reserves using a cut-off of 3.0% copper,



(Noranda had used 2.0%) and a dilution factor of 30%. At the start of production, reserves were 1.86 million tonnes grading 4.81% copper and 3.06% zinc, sufficient for about five years.

About 250 metres down plunge, two

drill holes have intersected 6% copper over 3-metre widths. Little more is known about this new zone or whether in fact it is an extension of the present ore zone. Exploration expenditures have been pruned but the prospects for an ex-



Custom-built longhole rig consisting of a Cat 225 backhoe chassis, Tamrock 550 air drill and basket for operator.

tension of life beyond the scheduled five years is clearly encouraging.

Copper concentrates are shipped to one of Nippon's smelters in Japan. A zinc concentrate is not being produced at the

moment because of low prices but this could change within the next six months. A flotation circuit is available at the mill and Noranda did produce a low grade, 40%, zinc concentrate. An excessively

high iron content reduced grades significantly and partially oxidized mineralization lowered zinc recoveries.

Noranda developed the deposit from a series of adits, connecting these with a ramp and establishing principal levels at about 50-metre vertical intervals. The mining plan was to recover the ore by drift and slash, that is, by driving a drift on strike from one raise opening (or decline) to the next. Then driving a second drift under the first and so on until the ore block was mined out. Support would have been provided by random pillars, (part of the ore would be left in place), rock bolts and post-fill derived from development muck.

Noranda's system never received a sustained trial because of the short period the mine was in operation. With a strong hanging wall and ore widths of three metres, the method can be assessed as being capable of generating high productivities with little loss of ore. At lesser ore widths, planned dilution would increase dramatically because of the need to cut deeper into the 35° foot-

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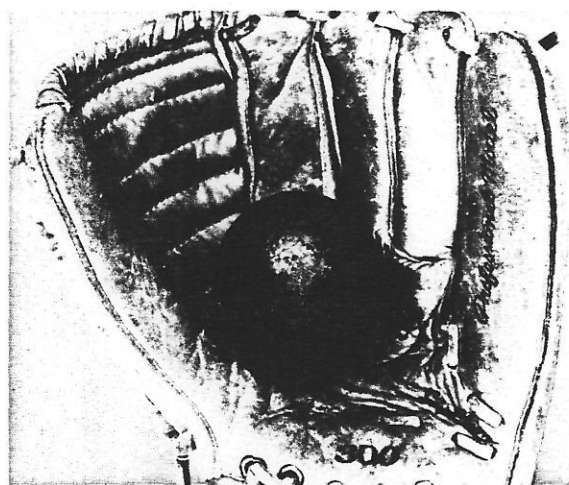
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wall. This notching of the footwall would be needed to maintain a flat road bed. At ore widths of two metres, planned foot-wall dilution would be 48%, at widths of three metres, 12%.

Tonto Mining, a division of Dynatec International, has been contracted by the Bethlehem-Goldneve joint-venture to mine the deposit for its new owners. A long hole, sublevel method is used.

MINING METHODS

In its essentials, a series of closely spaced sublevels split the ore block into a number of long, horizontal, strike ribs (see accompanying diagram). The ribs are then recovered by longholing. Roof support is by random pillars where conditions dictate. Split sets are used routinely for subdrift and ramp support.

In practice, sublevels are driven at 8-metre vertical intervals. The short interval ensures blast holes are drilled accurately. The 5.7-cm-diameter holes are generally little more than 8 metres long and deviation is minimal.

A second reason for the close interval

is the need to reduce two-stage mucking. Thus, a given longhole blast throws most of the muck into the lower drift where it is loaded by 3.5 or 4.0-cu.-yd. LHDs. Only a small amount remains on the footwall, and this is moved with a portable slusher.

Both the slusher arrangement and the longhole drill were custom-built by the contractor for the specific operating conditions at Goldstream. They are excellent examples of how quickly a contractor can react to a particular set of circumstances and then transform the resulting wish-list into reality. This capability was once a common-place of Canadian mining, but regrettably, it is not so often seen today.

The slusher is a 3-drum unit converted to hydraulic drive. The slusher hoist is so constructed that it can be fitted onto the bucket of a LHD or removed from it, in little more than 20 minutes. Tonto has adapted a 2.5 and a 3.5-cu.-yd machine for this purpose. Once arrived in the subdrift, the slusher can be roped and ready to go in the same time or less.

The longhole drill comprises two in-

dependent booms incorporated into a Cat 225 backhoe chassis. One boom mounts a Tamrock 550 air drill, the other a basket to carry the operator and controls.

The main problem was to devise a mobile, heavy duty drill which was capable of drilling low inclination holes in a confined drift. The jumbo is electro-hydraulic with diesel backup.

According to Joe Kennedy, Tonto superintendent, they are very pleased with the rig. At its extreme limit, and in circumstances rarely encountered underground, it can collar a minus 38° hole 7.0 metres above the drift floor.

Present performance is 150 to 240 metres per 10-hr. shift and varies according to the number of moves that have to be made, hole depths and general operating conditions.

Longhole break starts at a 1.3 x 1.3 metre drop raise connecting two subdrifts. Blastholes are most often downholes in a 1.0 x 1.0 metre pattern and blasting is restricted to two rings at a time to throw the muck as far as possible into the subdrift

Continued on page 29



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What a difference a decade makes

REGIONALLY, the area around Goldstream is well mineralized. In fact, during the middle 1860s it was the stomping ground for an estimated 10,000 gold seekers — some of them hardrock prospectors looking for the Mother Lode. How much placer gold was panned will never be known. Copper and zinc were also found but it wasn't until recent years that these base metals aroused much interest. The country was just too rugged and too difficult to enter.

By the 1970s, the massive Columbia River hydro development provided access and what is now the Goldstream mine was staked in 1973. Noranda optioned the ground the following year and with reserves of 3.9 million tonnes undertook to move into production at the rate of 1,350 tonnes per day. Production was scheduled for November, 1982. The grade was 3.69% copper, 2.67% zinc and 19 g (0.56 oz.) silver per tonne.

But copper prices did not cooperate. At an all-time low — after allowing for depreciation of the currency — they were at levels that hadn't been seen since the depths of the 1930s depression.

Noranda postponed production until May, 1983 hoping for better prices. But their luck wasn't in. They milled just over 293,000 tonnes and then shut down the operation in April, 1984, scarcely a year later.

Copper was then US 63¢ a pound. A significant proportion of the ore milled was taken from a small open pit and the extensive underground development was barely used. It was another misfortune for Noranda that the open pit ore was partly oxidized and metal recoveries were poor. The company had spent an estimated \$62 million in underground development, building a mill and bringing the mine into production.

Despite a marked increase in copper prices — US\$1.10 in 1987 and a high of US\$1.40 in 1988 — Goldstream remained idle. Then, in late 1989, Bethlehem and Goldneve stepped into the picture and purchased the property for \$5.75 million.

Continued from page 25

below. Holes are drilled to breakthrough if possible and consequently can be loaded with Nilite FR. If the holes do not breakthrough and are wet, 32 x 400 Dynamite A stick powder is used.

Lateral development is undertaken with a twin boom, Tamrock, electro-hydraulic jumbo. A twin boom, MJM 20B pneumatic jumbo is available as back up.

Tonto's mucking fleet comprises eight LHDs ranging down from 6 cu. yd. to 4 and 3.5 cu. yd., the latter two the most commonly used. There are also two, 27-tonne trucks (DUX) and four, 14-tonners (two Wagner, two Eimco Jarvis Clark).

The contractor works a three-shift system. Each shift comprises 15 men with two crews on the site at any one time.

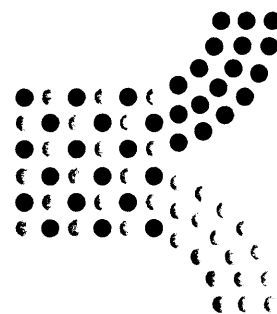
Each shift works 28 shifts of 10 hr. followed by 14 days off. The mill and ancillary services are run by Bethlehem and they have their own shift schedule. There are a total of 105 people on the site.

Milling is carried out via a conventional rod mill-ball mill circuit and two flotation lines. As noted earlier, only the copper circuit is operating now but a resumption of zinc flotation is a strong possibility in the near future.

Mill heads for the first few weeks after start-up were in the range 4.1% to 4.2% copper. They have since improved with the increasing proportion of longhole muck and are now 4.5% to 4.6% copper.

Despite the pyrrhotite content of the ore, the ore also contains a major percentage of carbonate, and acid generation problems are not expected. **CMJ**

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