

## ALWIN

OWNERSHIP: Alwin Mining Co. Ltd.

Alwin is a high-grade deposit in which veins, striking northeast or easterly, appear to have formed by replacement along permeable crushed fault zones up to 9 metres wide. The veins are sharply defined and adjacent country rock is only slightly altered. However, thin mineralized fractures occur throughout the underground workings. Ore minerals are mainly bornite and chalcopyrite, but primary chalcocite is locally important. Quartz and sericite are the predominant gangue minerals in the veins, but feldspar, calcite, chlorite, hematite, and clay minerals also occur. The country rock is primarily Bethsaida quartz monzonite but includes one weakly mineralized quartz plagioclase porphyry dyke. The dyke is chilled against Bethsaida.

## BETHLEHEM COPPER

OWNERSHIP: Bethlehem Copper Corporation Ltd.

The Bethlehem Copper property straddles a complex digitated part of the contact between the Bethlehem and Guichon quartz diorites (see Fig. 19). It contains five separated low-grade deposits: the East Jersey, Jersey, Huestis, Iona, and White zones. Each deposit differs somewhat from the others but all have features in common. All lie close to the Bethlehem-Guichon contact, all are in areas of closely spaced joints and fractures, most are crossed by swarms of north striking porphyry dykes, several contain zones of intrusive breccia, and two are crossed by major northerly striking faults. In addition, the company shares a part of the Valley Copper orebody.

### Porphyry Dykes and Breccias

The Bethlehem property lies within a north-trending swarm of dacite and quartz latite porphyry dykes which is about 3 km wide in the vicinity of the property. The dykes have irregular borders, rarely reach 30 metres in width, are commonly digitate, and can rarely be traced more than 300 metres along strike. Intrusive breccias in the East Jersey, Jersey, Iona, and White zones are tabular bodies up to 15 metres wide and 250 metres deep which are attributed to emplacement of porphyry bodies. Volatile-rich porphyries were apparently intruded at shallow depth into cold, jointed country rock. Rapid crystallization occurred with consequent release of volatiles from the porphyry. If volatile pressure overcame hydrostatic pressure, volatiles were released ex-

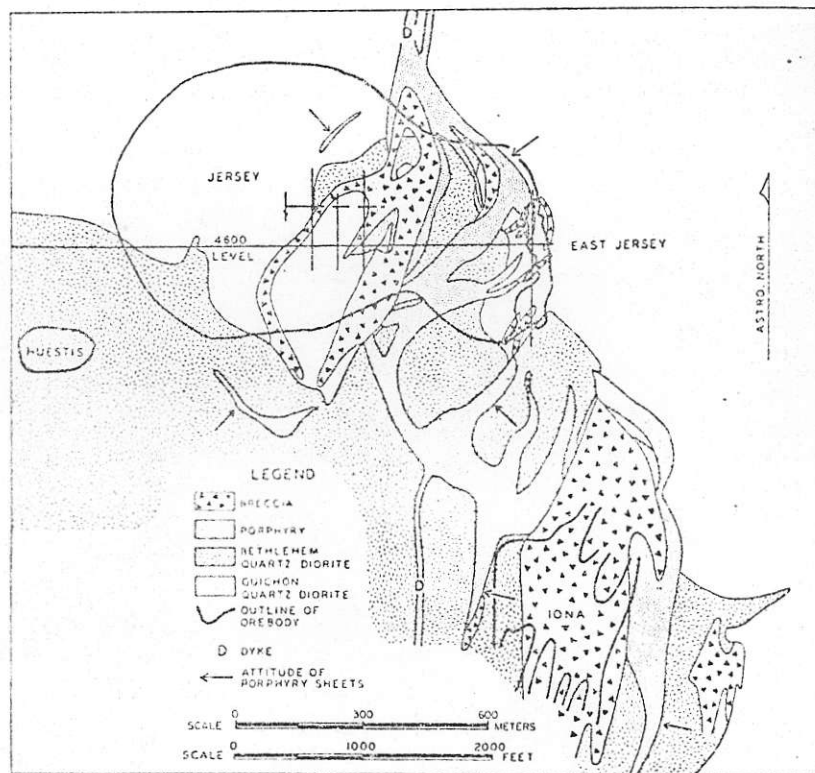


Fig. 19. Geology of Bethlehem.

plively, fracturing both the porphyry and the adjoining country rock. Breccia formation is apparently related to one episode of dyke emplacement and breccias are cut by two later phases of porphyry. Mineralization post-dates porphyry intrusion.

### Structure

The East Jersey and Jersey pits are crossed by major north-trending faults. Adjacent to the faults are zones up to 60 metres wide with intense alteration and associated ore of above average grade. Joints in the Bethlehem quartz diorite are well developed but of variable orientation. In the Guichon quartz diorite, however, three well-defined joint sets

have been found. These strike northeast and dip southeast, strike east-northeast and dip southeast, and strike west-northwest and are nearly vertical. Joints are variously filled or coated by quartz, epidote, aplite, pyrite, and copper sulphides.

Chalcopyrite and bornite are the ore minerals at Bethlehem Copper. Molybdenite, specularite, and rarely chalcocite and tetrahedrite also occur. Chalcopyrite is the main ore mineral. It occurs with pyrite in the central parts of quartz veins, as disseminated grains replacing chlorite and epidote adjacent to fractures, in fault gouge zones where it is often broken by post-mineralization movement, and as coatings on joint surfaces in association with bornite, pyrite, chlorite, epidote, zeolites, and chlorite. Bornite has similar modes of occurrence. Molybdenite is most abundant in breccia zones and is often seen on slickensided faults. It is associated with chalcopyrite, tourmaline, and secondary biotite.

Alteration and ore grade are apparently directly related to faults and fracture intensity. Studies of the Jersey orebody indicate that it has a central core characterized by a chlorite, sericite, clay mineral assemblages with a fringing zone characterized by epidote. Pyrite also forms an ill-defined halo around the Jersey orebody.

#### Oxidation Zone

Only the Iona deposit has an appreciable oxidation zone. Even at the surface primary minerals can be found but oxides persist to depth of 40 metres. Malachite, azurite, chrysocolla, goethite, jarosite, manganese oxide, ferrimolybdate, cuprite, native copper, chalcocite, powellite, and erythrite have been identified. No appreciable supergene enrichment occurred.

---

#### HIGHMONT

OWNERSHIP: Highmont Mining Corp. Ltd. (controlled by Teck Corporation).

The Highmont property is underlain chiefly by Bethlehem quartz diorite (*see* Fig. 20). The contact with the Bethsaida quartz monzonite crosses the westernmost part and a 120-metre wide composite dyke extends 3 km eastward from this contact across the property. The deposits consist of five large low-grade mineralized zones ranged on either side of the dyke. The zones have maximum dimensions of 360 to