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MINERAL DEPOSITS IN THE CALLAGHAN CREEK AREA, SOUTHWESTERN B.C.***

by

J.H.L. Miller*, A.J. Sinclair*, A.H. Manifold** and D. Wetherell*

*Department of Geological Sciences, University of British Columbia Vancouver
**Mining Technology, B.C. Institute of Technology, Burnaby

Polymetallic sulphide deposits in the Callaghan Creek area of southwestern British Columbia occur in a roof pendant of pyroclastic rocks surrounded by various masses of the Coast Plutonic Complex (figure 1). These coarse-grained pyroclastic rocks are divisible into five easily mappable units of rhyolitic to andesitic composition. The units dip steeply to the east, strike northerly or slightly west of northerly, and appear to form a homoclinal succession with tops to the east. The sequence has been correlated tentatively with the Gambier Group (Lower Cretaceous) by others on the basis of general lithologic similarities with type sections of the Gambier rocks to the south. A crystal tuff (Unit 3) in the sequence has been cut by what are thought to be genetically related horneblende-rich dykes for which a single K-Ar date on hornblende is 124 $\pm$ 4 m.y. A brief description of principal rock units follows and is keyed to the geological map of figure 1.

Greenstone (unit 1):	'Acidic,' fine-grained volcaniclastic rock, commonly extensively sheared, generally pale green in colour.
Agglomerate(unit 2):	Massive volcanic fragmental rock with fragments up to 50 centimetres in diameter in a tuffaceous matrix that is 5 to 40 per cent of the rock.
Crystal Tuff (unit 3):	Medium-grained pyroclastic rock containing abundant plagioclase fragments and less abundant hornblende fragments. Locally well layered.

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NORTHAIR (CALLAGHAN CK)

Acidic volcanic rock (unit 4):	Principally dacitic and rhyolitic tuffaceous rocks with rare large fragments. Locally contains up to 5 per cent pyrite.
Tuffaceous aggomerate (unit 5):	Massive pyroclastic unit, principally tuffaceous material near the base and predominantly rounded volcanic fragments higher in the section. Near the base this unit contains a 60-metre-thick marker bed of volcanic breccia with abundant fragments mostly 3 to 5 centimetres in diameter.
Coast Plutonic Complex (unit 6):	Includes quartz monzonite, quartz diorite, and hornblende diorite.
Tertiary volcanic rocks (unit 7):	Fresh, blocky basalt for the major flow in the map-area, and elsewhere much smaller amounts of more acidic composition. Correlations with Garibaldi calc-alkalic volcanic suites.

Seven mineral occurrences are known, two of which, the Warman and Manifold zones are in production by Northair Mines Ltd. Minor production has come from two of the more southerly occurrences, the "Tedi" and Silver Tunnel zones of Van Silver Explorations Ltd. (now defunct). Known mineral occurrences of Van Silver are confined to the lowermost unit (acidic) and those of Northair Mines to unit 5 (intermediate). Individual occurrences and their general forms are listed below. Numbers in brackets refer to numbered areas in figure 1.

Northair Mines Ltd.:

Discovery (north) zone - massive and veinlets (5)
Warman zone - massive, disseminated and veins (5)
Manifold (south) zone - veins and disseminated (5)

Van Silver Exploration Ltd.:

Silver tunnel - veins and disseminated (2)
Millsite - veins and disseminated (3)
Tedi pit - massive, disseminated (1)
Zone 4 - massive and disseminated (4)

The four deposits of Van Silver, taken as a whole, have textural and structural characteristics that suggest all have formed prior to metamorphism and

deformation, and could be of volcanogenic origin. Some associated veinlets appear to be post-metamorphism and thus may have formed by mobilization during emplacement of Coast Plutonic rocks.

The three mineralized zones of Northair Mines are near vertical with average widths of about 6, 8 and 17 feet respectively from south to north (figure 2). Ore grades differ progressively from zone to zone. In general the southern (Manifold) zone is high in precious metals and low in base metals. The converse is true for the Discovery zone and the Warman zone is intermediate in character. Similarly, the form of mineralization varies from south to north. In the south (Manifold) zone sulphides are disseminated in a bedded siliceous carbonate layer and in the north (Discovery) zone sulphides are layered and massive in form. Again the Warman zone is intermediate in character.

The three zones could represent faulted segments of a single mineral-rich sheet, although underground investigations thus far have not verified this suggestion. Never-the-less, it is a suggestion that warrants close consideration because of the gradational characteristics of the ore if all three zones are reconstructed to a single body. Characteristics of both the Discovery and Manifold zones extend to the respective adjacent parts of the Warman zone. Futhermore, it seems likely that the mineral-rich zones in detail parallel bedding although abundant faults have strewn segments out in such a manner that the general trend of the zones appears to crosscut the regional trend of bedding. Later sulphide-bearing veinlets are superposed on this tabular mineral-rich zone.

A fairly comprehensive study of polished sections shows evidence of deformation and recrystallization in layered massive ores and little in the way of deformational textures and structures in vein sulphides.

In idealized form the model that we propose is a distal volcanogenic model in which a local marine basin formed during a hiatus in explosive andesitic volcanism (figure 3). Ore fluids were fed to the water-sediment interface from a pipe zone, not now known, to contribute base and precious metals to the basin of chemical sedimentation. Further explosive andesitic volcanism followed.

The deposit was deformed and metamorphosed to greenschist facies during subsequent emplacement of Coast plutonic rocks and it was in this interval that post-deformational, sulphide-bearing quartz veinlets formed by mobilization of originally syngenetic material. Similar quartz veinlets removed from known mineral zones are free of sulphides. Consequently, small veinlets containing minor proportions of sulphides may well represent an important exploration parameter in this and other pendants within the Coast Plutonic Complex.

The deposit was later disrupted by northerly trending faults, many with significant strike-slip components.

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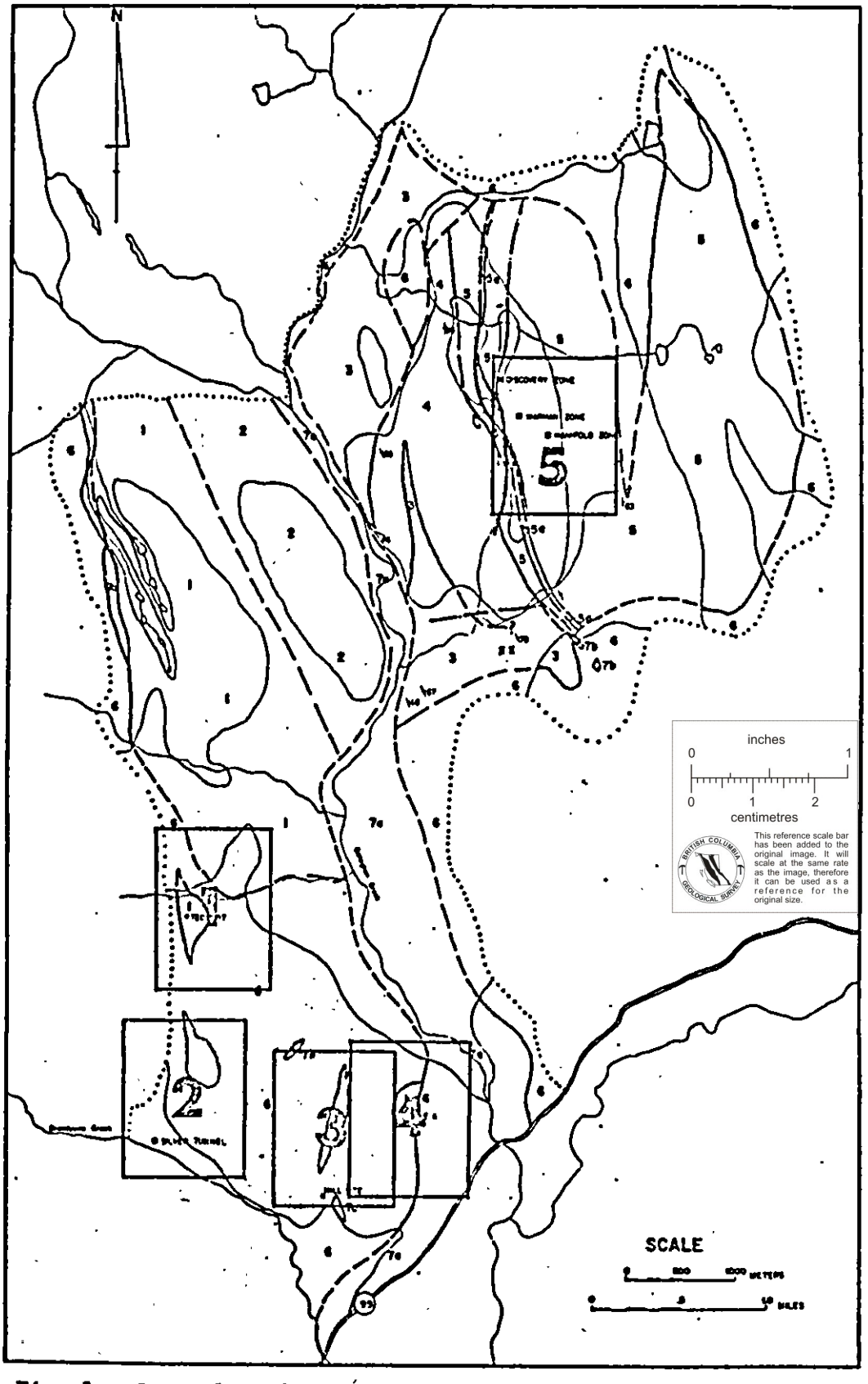

Fig. 1: General geology of part of the Callaghan Creek pendant (after Miller and Sinclair, 1978). Geological units numbered 1 to 7 are described in the text. Numbered rectangles enclose the main mineral occurrences referenced in the text. Dotted lines are limits of mapping, dashed lines are geological contacts.

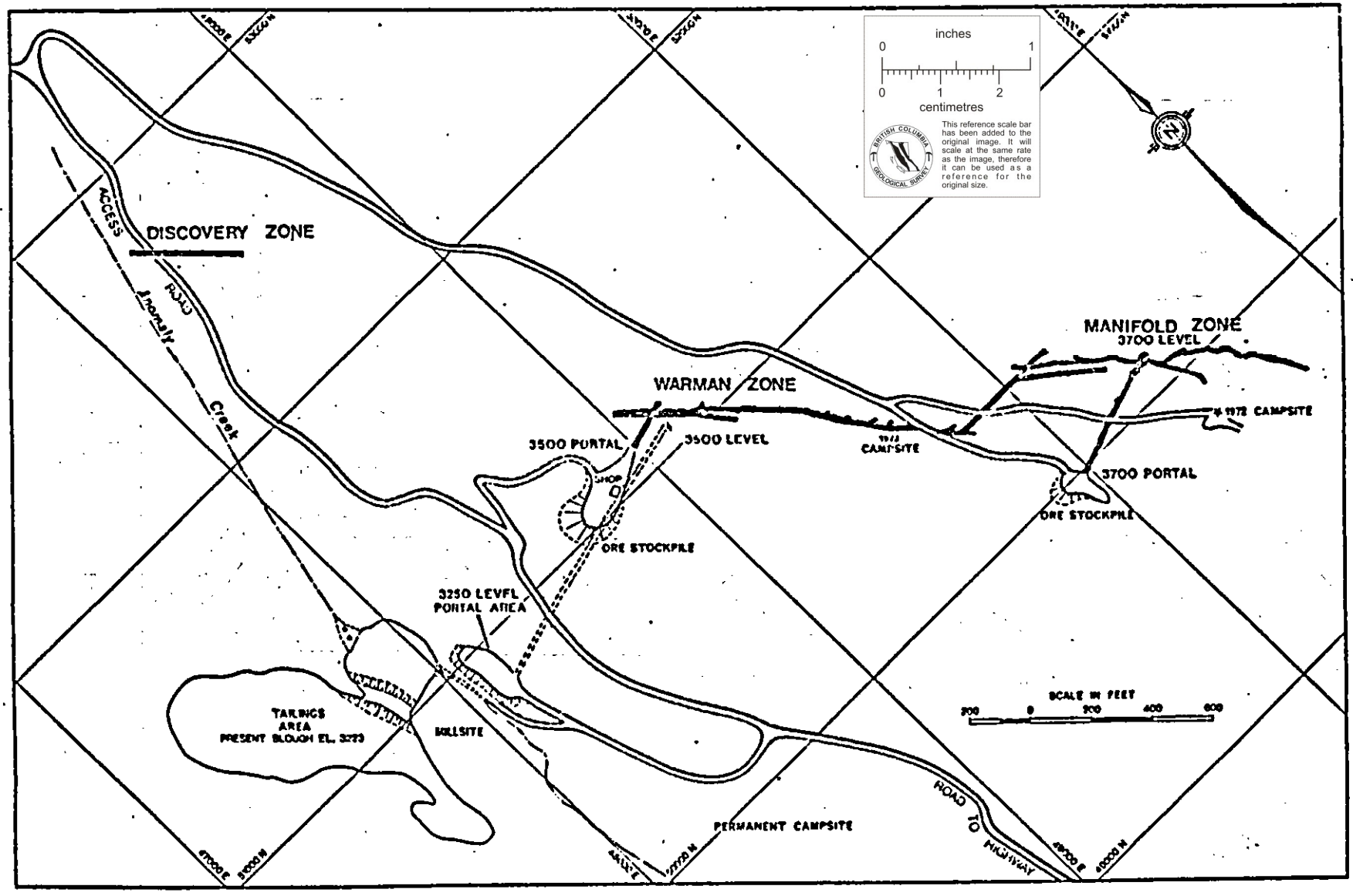

Fig. 2: Generalized surface and underground development, Northair Mines, showing relative position of the three main mineralized zones.

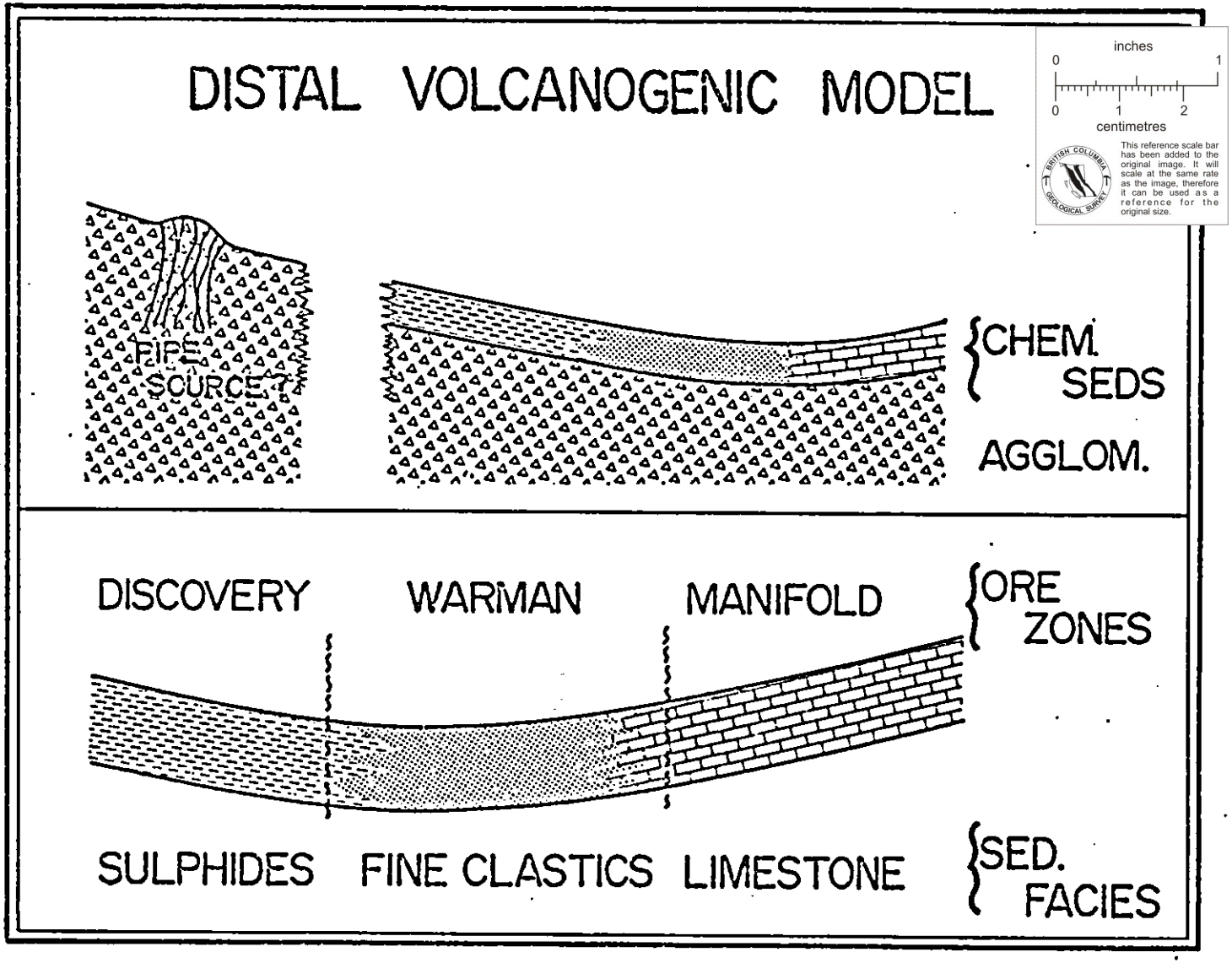

Fig. 3: Conceptual model for genesis of the three main mineralized zones of Northair Mines. A later period of formation of sulphide-bearing veinlets is attributed to mobilization during metamorphism accompanying emplacement of Coast Plutonic rocks.