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**GEOLOGICAL SURVEY OF CANADA**  
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**GEOLOGY AND REGIONAL SETTING OF MAJOR  
MINERAL DEPOSITS IN SOUTHERN  
BRITISH COLUMBIA**

**[FIELD TRIP 12]**

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**8TH IAGOD SYMPOSIUM**  
**FIELD TRIP GUIDEBOOK**

### Chapter 3: THE SULLIVAN OREBODY<sup>1</sup>

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#### INTRODUCTION

The Sullivan sulphide orebody, hosted by the Middle Proterozoic Aldridge Formation, is estimated to have originally contained 160,000,000 tonnes of 6% lead, 6% zinc, 28% iron and 67 gm per tonne silver. The ore-body overlies a feeder system, represented by a zone of fragmental rocks, boron alteration, and sulphide-rich veins. The feeder system formed as result of penecontemporaneous tectonic disturbance and submarine hydrothermal activity within an otherwise stable sedimentary environment. Pyrite-chlorite alteration of ore and albite-chlorite-pyrite alteration of hanging wall rocks indicate hydrothermal activity continued subsequent to deposition of sulphides.

#### GEOLOGICAL SETTING (Fig. 2)

The Aldridge Formation in the Purcell mountains is divided into Lower, Middle and Upper. The Lower Aldridge comprises at least 1500 m of rhythmically graded thin- to medium-bedded very fine grained wacke. The Middle Aldridge contains 2000 m of medium to thick-bedded wacke and quartzitic wacke. Most of these rocks were deposited as turbidites. The Upper Aldridge consists of 300 m of thin-bedded to laminated argillite. The Aldridge Formation has been metamorphosed to lower and middle greenschist facies. It has been folded into generally broad, open north-plunging folds of the Purcell Anticlinorium. The Sullivan orebody lies conformably at the top of the Lower Aldridge on the east side of the Purcell Anticlinorium (Fig. 1).

The Moyie gabbroic intrusions total up to 700 m of thickness in the Lower Aldridge and up to 400 m in the Middle Aldridge. Some gabbro bodies are coarse-grained and thick, indicating intrusion at substantial depths; others are chilled and erratic in a

manner that suggests intrusion into wet sediment (Hoy, 1984a).

Zircons from differentiates of a sill near the top of the Lower Aldridge have uranium-lead ages of  $1433 \pm 10$  Ma (Zartman et al., 1982). LeCouteur (1973) determined lead isotope ages of 1200 to 1400 Ma on galena from the Sullivan orebody; Godwin (1982) subsequently reinterpreted this data and obtained an age of 1490 Ma. Biotite in the zone of associated hanging wall alteration has a K/Ar age of 1436 Ma (LeCouteur, 1979).

#### PRE-ORE FEATURES

##### Bedded Sediments

The interval of Lower Aldridge sediments immediately underlying the orebody consists of 150 m of thin and medium-bedded, very fine grained wacke. The main mineral constituents are quartz, sericite, biotite, pyrrhotite and minor carbonate. Near the top these rocks are interbedded with pyrrhotite laminated wacke.

##### Fragmentals

Bodies of discordant and conformable fragmental sedimentary rocks underlie much of the orebody and extend several kilometres south. Where unaltered, composition of matrix and clasts of the fragmentals is indistinguishable from enclosing Lower Aldridge strata.

Isolated near-vertical discordant fragmental bodies up to several metres wide and transecting several tens of metres of strata have been mapped adjacent to a major and central fragmental complex that is almost 1 km wide and cuts in excess of 100 m of strata under the central part of the orebody (Figs. 3 and 4; Delaney and Hauser, 1983). Clasts in these

<sup>1</sup> modified from Hoy et al., 1985