PRELIMINARY REPORT ON THE SILVANA MINE AND OTHER Ag-Pb-Zn VEIN DEPOSITS, NORTHERN KOKANEE RANGE, BRITISH COLUMBIA (82F, 82K)

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INTRODUCTION

More than 100 years ago, the Bluebell deposit was located by R.E. Sproule on the east shore of Kootenay Lake. This drew interest to the area and led, in 1883, to the staking of silver-lead prospects around Ainsworth. The discovery of the Payne vein in 1891, by Eli Carpenter and John L. Seaton, was followed by a staking rush and the development of the Sandon and Slocan areas into one of the more prominent mining districts in Canada at the turn of the century.

All but a few of the deposits selected for study in this project are located in the northern Kokanee Range; the remainder are in the southern Goat Range. The study area is north of Nelson, and is bounded on the west by Slocan Lake and on the east by Kootenay Lake (Figure 2-3-1). There are 370 silver-lead-zinc vein and replacement deposits within this area, the majority of which are clustered in three former mining camps: Slocan (Sandon area), Slocan City and Ainsworth (Sinclair, 1979). Although most of the deposits yielded low tonnages of high-grade ore, 39 of them produced over 10 000 tonnes of ore. At present, only the Silvana Division of Dickenson Mines Limited is operating. The deposits have a wide distribution, occurring both within the Nelson batholith and surrounding Phanerozoic sedimentary and volcanic rocks up to 12 kilometres from surface exposures of the batholith.

Regional mapping and mineral deposit investigations in the study area began in the late 1880s (Dawson, 1890) and have been described in numerous reports by the British Columbia Geological Survey Branch and the Geological Survey of Canada (Schofield, 1920; Cairnes, 1934, 1935; Macrauchie, 1940; Hedley, 1945, 1952; Little 1960; Fyles, 1967; Hoy, 1980). These reports comprise regional geological maps and extensive mineral deposit descriptions which remain the basic source of information on Kokanee Range geology and mineral deposits. More recently, Brown and Logan (1988) mapped the geology of Kokanee Glacier Park area and evaluated its mineral potential.

The spatial distribution of the deposits led previous geologists to almost unanimously link mineralization genetically with emplacement of the Nelson batholith (c. 165 Ma). However, geological evidence in the Ainsworth area indicates mineralization is younger than mid-Cretaceous (95 Ma) metamorphism and deformation (Fyles, 1967; Archibald et al., 1984). A fluid inclusion Rb-Sr isochron at Bluebell suggests that the mineralizing event is Miocene (c. 19 Ma; Changkakoti et al., 1988). Although granite-related silver-lead-zinc vein systems commonly display some zoning outward from a nearby intrusion, previous attempts to define such zoning in the study area resulted in conflicting zoning patterns (Sinclair, 1967; LeCouteur, 1973; Lynch, 1988).

The large number and areal distribution of deposits, all of which are described and coded in the MINFILE database, provide a good opportunity for a regional research project. The intent of the project is to investigate zoning patterns of metals and metal ratios, minerals, fluid inclusion temperatures and salinities, and stable and radiogenic isotope ratios between the deposits and relative to the Nelson batholith, and to determine age(s) of mineralization.

METHODOLOGY

Because the study area covers parts of six 1:50 000 map sheets (82F/10, 11, 14, 15; 82K/2, 3), there is no single geological map covering the area at this scale (1:50 000). This has impeded the investigation and comparison of mineral deposits on a regional basis. Consequently, as part of this project, a new 1:50 000 regional geology map of the study area has been compiled from previous work and will be available as an Open File (Beaudoin, in prep.).

During six months of field work in the summers of 1988 and 1989, 55 deposits (Figure 2-3-1, Table 2-3-1) were selected for study. These included the 39 deposits with more than 10 000 tonnes production each: the remainder were chosen either because they were a focus of exploration activity during the project or were required to produce a more even sampling distribution for zoning studies. Samples were selected to represent the deposit paragenesis observed in outcropping veins or reported by previous investigators. In many instances, outcropping mineralization has been mined out and samples from the dump are the only material available. Alteration is rare in sedimentary but common in granitic hostrocks. Where present, alteration zones were sampled for petrographic and chemical analyses. Five weeks of detailed underground mapping and sampling were carried out in the Silvana mine (No. 50, Figure 2-3-1) over the two field seasons.
Figure 2-3-1. Location of deposits selected for the study. Numbers refer to deposits indexed in Table 2-3-1.
A major problem to be addressed in this metallogenic study is the age(s) of the mineralizing event. This is being investigated by Ar-Ar dating of micas from mineralized veins and sericitic alteration in adjacent wallrocks. Further constraints on the age(s) of mineralization are being sought by K-Ar dating of lamprophyric and gabbroic dikes, some of which are younger, and others older, than the veins.

GEODESY OF THE SILVANA MINE

The Silvana mine is located near Sandon, about 10 kilometres east of New Denver. Cumulative production as of June 1988 was 376 750 tonnes of ore from which 194 million grams of silver (514.7 g/t), 21.7 million kilograms of lead (5.8% Pb), and 19.3 million kilograms of zinc (5.1% Zn) were recovered.

The mine is situated in about the middle of the Main Lode fault zone which has been traced from the Standard deposit on the west (No. 180, Figure 2-3-1) to the Richmond-Eureka deposit on the east (No. 54, Figure 2-3-1). The Main Lode is a zone of faulting and brecciation up to 50 metres wide. In the currently producing eastern part of Silvana orebody, it is a rather narrow and well-defined fault zone with little, if any, penetrative fabric at its margins. The western part of the orebody, now mostly inaccessible, consists, in contrast, of a wide zone of sheared graphitic rocks. The Main Lode strikes east with a shallow dip to the south, averaging 45°; the average dip of the Silvana orebody, within the Main Lode, is about 35°. The Main Lode fault zone displays a normal and left-handed sense of movement but the amount of displacement is poorly constrained because of a lack of markers (Hedley, 1952). Although a normal and left-handed sense of shear was also determined in many locations in the eastern part of the Silvana orebody, using shear bands, the displacement could not be estimated.

DESCRIPTION OF MINERALIZATION

The orebody consists of siderite, galena and sphalerite lenses which rapidly pinch and swell in all directions. The lenses are within, and parallel with, the Main Lode fault zone. The footwall of the fault zone commonly contains subvertical siderite-sphalerite tension veins with minor galena. Hangingwall rocks rarely contain mineralized tension veins.

A plate illustrating siderite (SD) vein (about 30 cm thick) with a band of sphalerite (SP) at the upper margin. Contained within the siderite are scattered grains of sphalerite and galena. The lower part of the sphalerite band is cut by a fault (F) subparallel to the vein wall. An s-shaped tension opening in the siderite vein is filled by coarse-grained galena (GN). The galena is sheared (SGN) close to the fault plane. (GSC photo 205017)
The ore lenses are usually less than 2 metres thick with down-dip and strike lengths up to tens of metres. They are separated by thin (<10 cm) intervals of weakly mineralized barren fault zones of variable length. The core of a lens may consist of massive siderite with scattered grains of sphalerite and galena (Plate 2-3-1) or massive galena (Plate 2-3-2), whereas the margins of the ore lenses are commonly composed of alternating or intergrown centimetre-wide bands of siderite and sphalerite (Plate 2-3-3). Paragenetic sequences are difficult to decipher because late movement in the fault zone has resulted in deformation of the ore lenses. Particular examples, such as illustrated in Plate 2-3-1, suggest that an initial stage of scattered galena in siderite was followed by opening of the lens and precipitation of coarse-grained galena. Late deformation resulted in sheared galena near the plane of movement, but not in areas sheltered by massive siderite and sphalerite. Foliation in galena wraps around siderite-sphalerite fragments ripped from the lens and
which now "float" in foliated galena. In hand specimen, foliated galena may mold undeformed euhedral siderite prisms intergrown with, and overgrown by, sphalerite, or contain chaotic aggregates of dislocated grains of sphalerite and siderite (Plate 2-3-3). The foliation in galena is consistent with oblique normal and left-handed movement, similar to the direction of movement on the Main Lode fault zone.

Sphalerite is finely banded (Plate 2-3-4) whether it forms bands or intergrowths with siderite. Colour banding in Cairnes, C.E. (1934): Slocan Mining Camp British Columbia; Geological Survey of Canada, Memoir 173, 137 pages.

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References


