

GEOLOGY AND GEOCHEMISTRY OF THE TIN CREEK
ZINC-LEAD-SILVER SKARN PROSPECTS, FAREWELL
MINERAL BELT, SOUTHERN ALASKA RANGE, ALASKA

A
THESIS

Presented to the Faculty of the University of Alaska
in Partial Fulfillment of the Requirements
for the Degree of

MASTER OF SCIENCE

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May 1986

ABSTRACT

Numerous zinc-lead-silver-copper skarn and replacement bodies occur in a 750 km² area near Farewell, McGrath Quadrangle, Alaska. Interest in the extent and localization of these deposits led to detailed examination of skarns at Tin Creek, one of the mineralized areas.

Skarn deposits are of two types: 1) pyroxene (Hedenbergite¹⁵⁻⁸⁶) skarns with sphalerite and minor chalcopyrite, and 2) garnet (Andradite¹²⁻¹⁰⁰) skarns with chalcopyrite and minor sphalerite. Pyroxene skarns exhibit textural zoning. Garnets are compositionally zoned with aluminum-rich cores rimmed by progressively iron-rich garnet. Skarns are spatially zoned, with pyroxene-sphalerite skarns distal to and garnet-chalcopyrite skarns proximal to the dike swarm center. Ore minerals replace earlier formed calc-silicate minerals.

The Tin Creek skarn prospects compare favorably to zinc-lead skarns that form near dikes. Deposits have features, such as structural control of metasomatic fluids and textural and compositional zoning, common to zinc-lead skarns worldwide.

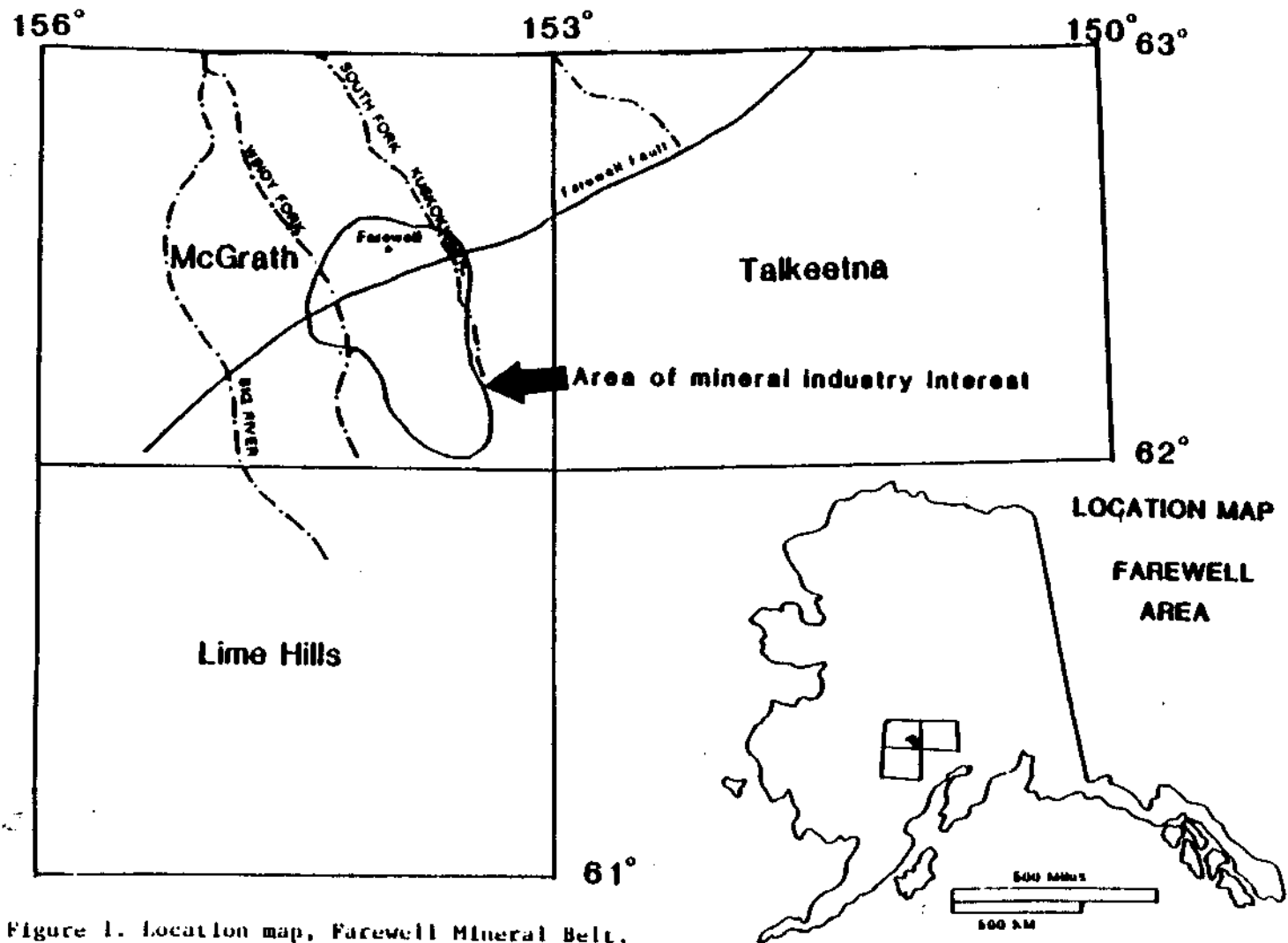


Figure 1. Location map, Farewell Mineral Belt.

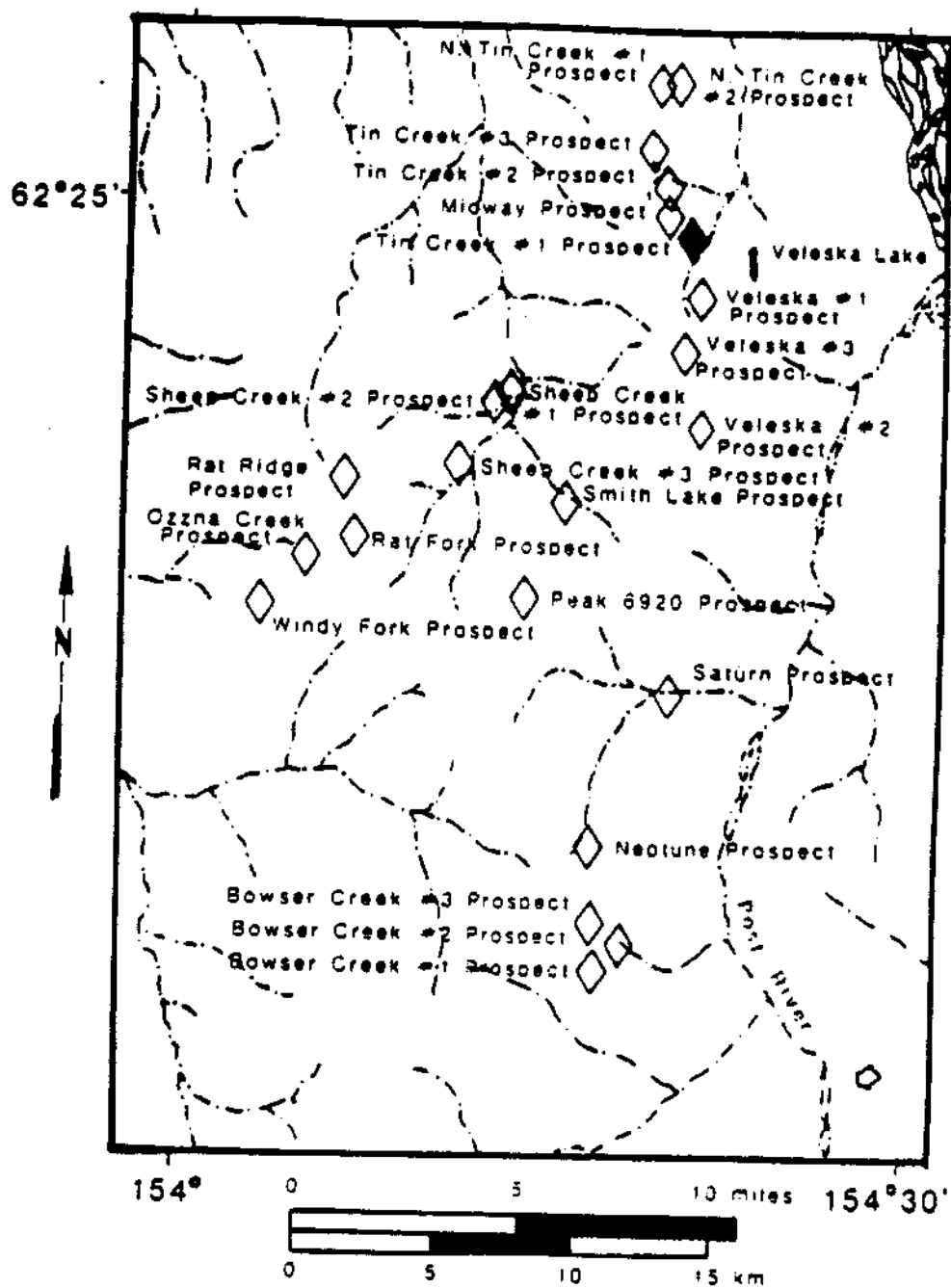


Figure 3. Regional geologic map of the Farewell area, Alaska.

The alteration of pyroxene to amphibole at Tin Creek is similar to alteration described in many Zn-Pb skarn districts. Fibrous amphibole derived from pyroxene is known as uralite, and the process is known as uralization. Uralization involves the oxidation of divalent to trivalent iron; a great loss of calcium; and a gain in silicon, alkalies, and in some localities a gain in magnesium (Allen and Faley, 1957). The oxidation of iron during uralization is indicated at Tin Creek by the occurrence of hematite, pyrrhotite, and chalcopyrite with the amphibole. Allen and Faley (1957) report that amphibole belonging to the cummingtonite-grunerite series replaces pyroxene in the zinc-lead skarn deposits of the Central Mining District, New Mexico. The amphibole from Tin Creek may also belong to this series because of the similarities in the formation of the amphibole.

MINERAL RESOURCE ESTIMATES OF THE FAREWELL AREA

Grade and Tonnage Estimates of a Zn-Pb-Ag Skarn Deposit

Estimation of the grade and tonnage of potential skarn deposits in the Farewell area is a challenging task. The Tin Creek skarn prospects are some of the best explored areas in the McGrath Quadrangle, yet to date there has been only limited drilling and detailed geologic mapping. Estimates based only on knowledge of the local area would be tentative at best due to the high uncertainties involved.

Grade-tonnage estimates for the Tin Creek area can be postulated by examining data from a worldwide collection of zinc-lead-silver skarn deposits. An inherent bias in this approach is the assumption that the Tin Creek area actually contains a skarn deposit and that this deposit is similar to an average of zinc-lead-silver skarn deposits.

Table 9 provides estimates on the grade and the tonnage potential for a zinc-lead-silver skarn deposit in the Farewell area. Data used for these estimations is from Singer and Mosier (1983). Numbers given in each column of table 10 are statistical parameters developed from the worldwide data base. The numbers in the 10th percentile column are minimum grades or tonnages for 10 percent of the zinc-lead skarns examined. The 50th percentile column corresponds to the mean or the average for these deposits.

Estimate of Number of Zn-Pb-Ag Skarn Deposits in the Farewell Area

A similar approach to grade-tonnage estimates can be taken to estimate the number of zinc-lead-silver deposits likely to be present in the Farewell Mineral Belt surrounding the Tin Creek prospects. The Darwin mining district in eastern California has been used in this approach due to the similarity of the geologic environment to the Farewell area, the presence of many zinc-lead-silver skarn deposits in an area comparable to the Farewell area, and the Darwin Quadrangle has been extensively explored.

Table 9.

Grade and tonnage parameters from 47 zinc-lead skarn deposits.

	10th <u>percentile</u>	50th <u>percentile</u>	90th <u>percentile</u>
Tonnage (million of tons)	18.0	2.1	0.25
Zinc grade (percent)	14.0	5.8	2.8
Lead grade (percent)	11.0	3.6	0.54
Silver grade (grams/ton)	390.0	98.0	--
Copper grade (percent)	1.2	0.079	--

