



MINFILE NTS 082KNE - INVERMERE

Original release date: April 2003

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The Invermere map area lies in the southeastern part of the province and contains 83 documented mineral occurrences. Over three quarters of the map area, in which almost all of the area's mineral deposits are found, lies within the boundaries of the Omineca Tectonic belt. The northeast section of the map area lies within the Foreland belt and is divided from the Omineca belt by the Rocky Mountain Trench. The physiography to the northeast of the trench consists of the Continental Ranges while the to the southeast it is almost entirely within the domain of the Purcell Mountains. A sliver of the Purcell Trench at the southwest corner of the map area is defined by Duncan Lake. The rocks of the map area belong entirely within the Ancestral North American Terrane. The community of Invermere is located along the Columbia River at the southeast corner of the map area and the town of Spillimacheen is situated along the river further to the north.

The Purcell Mountains constitute a major north-plunging culmination, known as the Purcell anticlinorium, a parautochthonous terrane of Middle Proterozoic through Middle Devonian strata. The stratigraphy of the Purcell anticlinorium consists of four epicratonic megasequences: the Middle Proterozoic Belt-Purcell Supergroup, the Upper Proterozoic Windermere Supergroup and the Lower and Upper Paleozoic sequences of the Cordilleran miogeocline. Spatial distribution, thickness and facies variations of Middle Proterozoic through Middle Devonian strata have indicated that sedimentation was controlled by extensional fault systems relating to a high standing block. This block is generally referred to as the Windermere high recorded in the Windermere Supergroup and the Lower Paleozoic succession.

The Purcell anticlinorium consists of a series of broad, northwest trending open folds that are generally upright. The dominant regional schistosity is axial planar to the folds; locally developed shear zones are parallel to the foliation. Several near-vertical, north trending normal faults are common in the Purcell anticlinorium. The structure of the Mount Forster area, in the central regions of the map area, is dominated by the Mount Forster-Steamboat fault, one of a series of Mesozoic thrust faults, that carries folded Middle and Upper Proterozoic strata over folded Upper Proterozoic and Paleozoic strata. Rocks of the Purcell anticlinorium have undergone regional metamorphism to lower greenschist facies.

The Middle Proterozoic Purcell Supergroup, represented by the Dutch Creek, Mount Nelson and Frances Creek formations, is a thick sequence of shallowing-upwards, marine-deposited strata which are unconformably overlain by Upper Proterozoic continental deposits of the Horsethief Creek Group and the Toby Formation of the Windermere Supergroup.

The Dutch Creek formation is the oldest strata in the map-area and is well exposed in the ridge tops. The exposed thickness is in excess of 300 metres. The formation comprises recessive weathering interbedded quartzites, shales and laminated dolomites. The overlying Mount Nelson Formation comprises varicoloured quartzites, shales and dolomites and varies in thickness from 500 to 1950 metres, achieving its greatest thickness on Starbird Ridge. The Frances Creek Formation (informal) is a newly recognized formation comprising strata that were formerly included in the uppermost Mount Nelson Formation. It consists of orthoquartzite, grey dolomites, sandstone, shale and conglomerate. The Frances Creek Formation overlies the Mount Nelson Formation with a sharp discordance and locally with an angular unconformity of 10 degrees or less. The formation is 1020 metres thick on Starbird Ridge in the west and 750 metres thick in the hanging wall of the Mount Forster Fault to the east.

The Toby Formation is a highly variable sequences of diamictites, conglomerates, sandstones, shales, dolomites, breccias and volcanic rocks. It rest unconformably on the Purcell Supergroup, with an angular discordance of 3 to 20 degrees. The formation exhibits thickness variations from 95 to 440 metres over a distance of 5 kilometres within the same thrust sheet. The Horsethief Creek group, conformably overlies the Toby Formation. It comprises a series of interbedded, thinly laminated, grey shales, massive, thick-bedded grits, white and brown

quartzites and grey, black and buff-weathering limestone and dolomites. This group attains a thickness of at least 500 metres in the map area.

The Lower Paleozoic strata, from oldest to youngest, is comprised of the Cranbrook and Jubilee formations, the McKay Group, and the Beaverfoot, Mount Forster and Starbird formations. The Cranbrook Formation overlies the eroded Horsethief Creek Group. It thins southward from a 250-metre thickness and is entirely absent at Mount Forster. It is made up of quartzites and quartz grits. The Middle Upper Cambrian Jubilee Formation is a massive dolomite unconformably overlying the Cranbrook Formation and Horsethief Creek Group. The formation thins southward from 700 metres to 250 metres.

The McKay Group consists of Upper Cambrian to Middle Ordovician shales, sandstones, and dolomitic biowackestones that conformably overlies the Jubilee Formation. The McKay group has a variable thickness, reaching 700 metres on Steamboat Mountain, but is absent near the Grotto property at Horsethief Creek. The Middle Ordovician to Silurian Beaverfoot Formation rest unconformably on the McKay Group and on the Jubilee Formation. It thins to the southwest across the map area, from 500 metres on Steamboat mountain to 80 metres on the Grotto property. The strata consist of quartzite, biowackestones and peloidal mudstones. The top of the formation is eroded beneath the Middle Devonian Mount Forster Formation. Karst features, coarse recrystallization, silicification, breccias and base metal mineralization are developed adjacent this unconformity. The Mount Forster Formation is a distinctive sequence of red, green and buff-weathering dolomites, dolomitic shales, laminated shales, grits and quartzites, fine sandstones and conglomerates. The formation reaches up to 300 metres in thickness on Mount Forster and thickens westward to 400 metres on the Grotto property. The Upper Devonian Starbird Formation unconformably overlies the Mount Forster Formation. The strata consist of thin to medium-bedded dolomitic biowackestone. The formation reaches 45 metres in thickness on Mount Forster.

Two large zoned, more or less oval batholiths intruded the strata in the Cretaceous. The Bugaboo Batholith is divided into two distinct units consisting of a western fine- to medium-grained, uniform textured hornblende-biotite granodiorite and an eastern quartz monzonite. The Horsethief Creek Batholith consists dominantly of porphyritic biotite quartz monzonite containing large, euhedral potassium feldspar phenocrysts. Green metadiabase dikes also occur in the map area and are correlated with Upper Proterozoic Toby volcanics and may be up to 20 metres thick.

Economic Geology

Mineralization in the map area consists in large part of base metal occurrences. Four types of base metal mineralization may be present: 1) stratabound manto (replacement); 2) vein; 3) Mississippi Valley Type (MSV) (replacement) and; 4) stratiform disseminated. Typically, carbonate-hosted lead-zinc mineralization (manto and MSV) occur within irregular breccia bodies of the Lower Paleozoic carbonates. These are characterized by open space fillings within solution breccias, colloform growths and simple mineralogy of galena, sphalerite, pyrite and marcasite. All of these deposits were deformed and remobilized to some degree during the Mesozoic.

The available mineralogic descriptions for specific deposits make it difficult to discern a definite deposit type in many instances. A best fit is offered in the MINFILE descriptions.

Numerous vein-replacement showings and prospects occur on faults and fractures. They are often marked by brown-weathering surfaces and undeformed sulphide assemblages in ankerite, dolomite, siderite and quartz gangue.

Twenty occurrences have tentatively been given a Mississippi Valley Type designation. The only notable deposit of this type is Silver Giant (082KNE018) which was first reported on in 1883. From 1947 to 1957 it produced in excess of 19 million grams of silver, 29 million kilograms of lead and 3 million tonnes of zinc, as well as copper, antimony and cadmium. From 1959 to 1983, Baroid of Canada Limited extracted 188,000 tonnes of barite from the property.

There are 13 occurrences in the map area classified as polymetallic veins, 9 occurring within the Horsethief Creek Group and 4 within the Mount Nelson Formation. By far the most significant in this map area is the Ruth-Vermont (082KNE009) which was in production primarily from 1970 to 1983, but also having some intermittent

production in 5 years from 1892 to 1965. Records indicate that a total of 176,276 tonnes of ore were mined from which 17,247,989 grams of silver, 9,405 grams of gold, 23,137 kilograms of cadmium, 55,693 kilograms of copper, 3,253,956 kilograms of lead and 5,947,422 kilograms of zinc were recovered.

Eight occurrences are classified as Copper (+/- silver) quartz veins. These occur primarily in rocks of the Horsethief Creek Group. The most significant are the Delos (082KNE030) and Pretty Girl (082KNE025), both having some minor copper-silver production in the early part of the century.

Ten porphyry molybdenum occurrences received limited exploration in the early 1970s by Canadian Johns-Manville Company in the Horsethief Creek Batholith area. Examples include the S (082KNE002), Stan (082KNE040) and Molly Lake 1 and 2 (082KNE050, 051)

Non metallic minerals are found mainly along the Rocky Mountain Trench, most commonly barite, mined either for itself or as a byproduct of metal mining, magnesite and silica in a few localities west of Brisco. At the Brisco Barite (082KNE013), barite had been exposed across an average width of 7.6 metres for 238 metres along a northerly striking breccia zone within dolomite of the Beaverfoot Formation. Production from this operation began in 1952 and continued to 1980, producing in excess of 133,000 tonnes of barite. At Brisco Silica (082KNE012), across the Columbia River to the east, 2450 tonnes of silica were quarried and shipped in 1964.

Black sand placer concentrations containing uranium- and niobium-bearing minerals occur in the outwash gravels from glacier action in the Bugaboo Batholith area in the western part of the map sheet. These deposits were first mapped and explored by Quebec Metallurgical Industries from 1954 to 1957. The Vowell Creek deposit (082KNE007) is about 7400 metres long and averages 250 metres wide. Indicated reserves are 15,292,000 cubic metres grading 18.1 grams per cubic metre uranium and 196.28 grams per cubic metre niobium. The Malloy Creek deposit (082KNE008) is about 2700 metres long and 300 metres average width. It contains about 9,330,000 cubic metres of gravel grading 19.6 grams per cubic metre uranium, 97.85 grams per cubic metre Nb₂O₅, 68.8 grams per cubic metre thorium oxide, 8 kilograms per cubic metre magnetite, and 0.59 kilogram per cubic metre ilmenite.

Black sand placer concentrations containing uranium- and columbium-bearing minerals also occur in the outwash gravels from glacier action in the Horsethief Batholith. The placer concentrations occur intermittently along Forster Creek (082KNE005) and its tributaries for 12 kilometres. Radioactive veins high in uranium, thorium and related minerals have been identified in the Horsethief Batholith. The Stan (082KNE040) and Slide (082KNE066) are two examples of these.

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