Eskay Rift Project (NTS 103O, P, 104A, B, G, H), Northwestern British Columbia

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INTRODUCTION

Located in northwestern British Columbia, the Eskay Rift is the geological setting for the world's richest volcanogenic massive sulphide deposit: the Eskay Creek gold-silver mine (Fig. 1). The rift structure was first recognized by Geological Survey of Canada geologists (Anderson and Thorkelson, 1990), and they extended the structure southward in 1998 (Evenchick *et al.*, 1998; Evenchick and McNicoll, 2002).

The BC Geological Survey began detailed mapping of the northern half of the rift in 2003, combined with lithogeochemical studies at Dalhousie University. A series of reports (Alldrick *et al.*, 2005a, b; Barresi *et al.*, 2005; Barresi and Dostal, 2005; Alldrick *et al.*, 2004a, b) and coloured maps (Alldrick *et al.*, 2006a, b; Alldrick *et al.*, 2005a, b; Alldrick *et al.*, 2004a, b) present the field and laboratory work completed to date.

REGIONAL GEOLOGY

The Eskay Rift is a fault-bounded basin hosting thick accumulations of bimodal basalt and rhyolite flows, with intercalated sedimentary rocks. Rift strata record the final eruptive events of the Early to Middle Jurassic Hazelton Group, an island-arc complex that extends from the Yukon to Washington state. The rift hosts 60 VMS deposits and prospects, including two new VMS prospects discovered in outcrop in 2004.

2005 FIELD PROGRAM

This year's field program continued stratigraphic investigations within the rift (Mount Shirley, Sixpack Range, Todagin Plateau, Klastline Plateau, Mount Madge, Arctic Grid); reconnaissance investigation of Upper Hazelton strata beyond the Eskay Rift, where rift-indicator features had been noted (Treaty Glacier, Tim Williams Glacier, Oweegee Dome, Bait Range, Mount Dilworth); and examination of prospects and gossans (Table Mountain, Smitty, Knipple Glacier, Tim Williams Glacier, Bait North). Seven sites of economic interest deserve follow-up: a pyritic siltstone member within the Eskay-age basalt in the central Bait Range; the eastern stratigraphic extensions of the RAM prospect; the Timbit gossan east of Castle Rock; a recently exposed dacite cryptodome within pyritic Salmon River siltstone on Mount Dilworth; pyritic carbonate laminae with sandstone and siltstone members between basalt flows northeast of the toe of Tim Williams glacier; the Zinc Moss – Dome – Compass – Griz trend of prospects on Table Mountain; and pyritic rhyolite with minor intercalated basalt on northwestern Oweegee Dome.

Areas identified for investigations next season include the following:

- Upper Hazelton stratigraphy north and east of Smithers
- An unmapped area with polymetallic prospects northeast of the Red Chris property and west of the Klappan River
- Rhyolite and pillow basalt within the Georgie River pendant
- Pyritic dacite in the upper Kitsault River valley
- The setting of the VMS prospects at Seneca, west of Harrison Lake
- Eskay-equivalent sedimentary strata outlined by Souther on the eastern flank of Mount Edziza
- The Eskay mine – Mount Madge corridor
- The area surrounding the Dome prospect on Table Mountain

SUMMARY

The Eskay Rift is preserved as a narrow, discontinuous, 250 km long belt extending from Klastline Plateau in the north to Anyox in the south (Fig. 1; Alldrick, 2000). There are 25 individual segments of these rift-fill-sequence rocks preserved. Detailed mapping along the northern half of the rift shows that most segments have generally similar lithological characteristics, but proportions of key rock types within and between rift segments vary widely. Some rift-fill sequences were clearly deposited in isolation from those of adjacent rift segments, suggesting that they occupied nearby but unconnected basins. Paleowater depth varied between these different rift segments, ranging from subaerial, to shallow to moderate water depth (0–500 m), to deep-water ocean floor settings (>1000 m). Associated VMS deposits reflect these varying water depths.

Exhalitive mineral deposits and prospects are known in three rift segments: Eskay Creek, Anyox and Table Mountain. The Eskay Creek and Anyox rift segments host producing and past-producing mines; the several exhalitive prospects in the Table Mountain rift segment were recently discovered, have limited outcrop exposure and have so far

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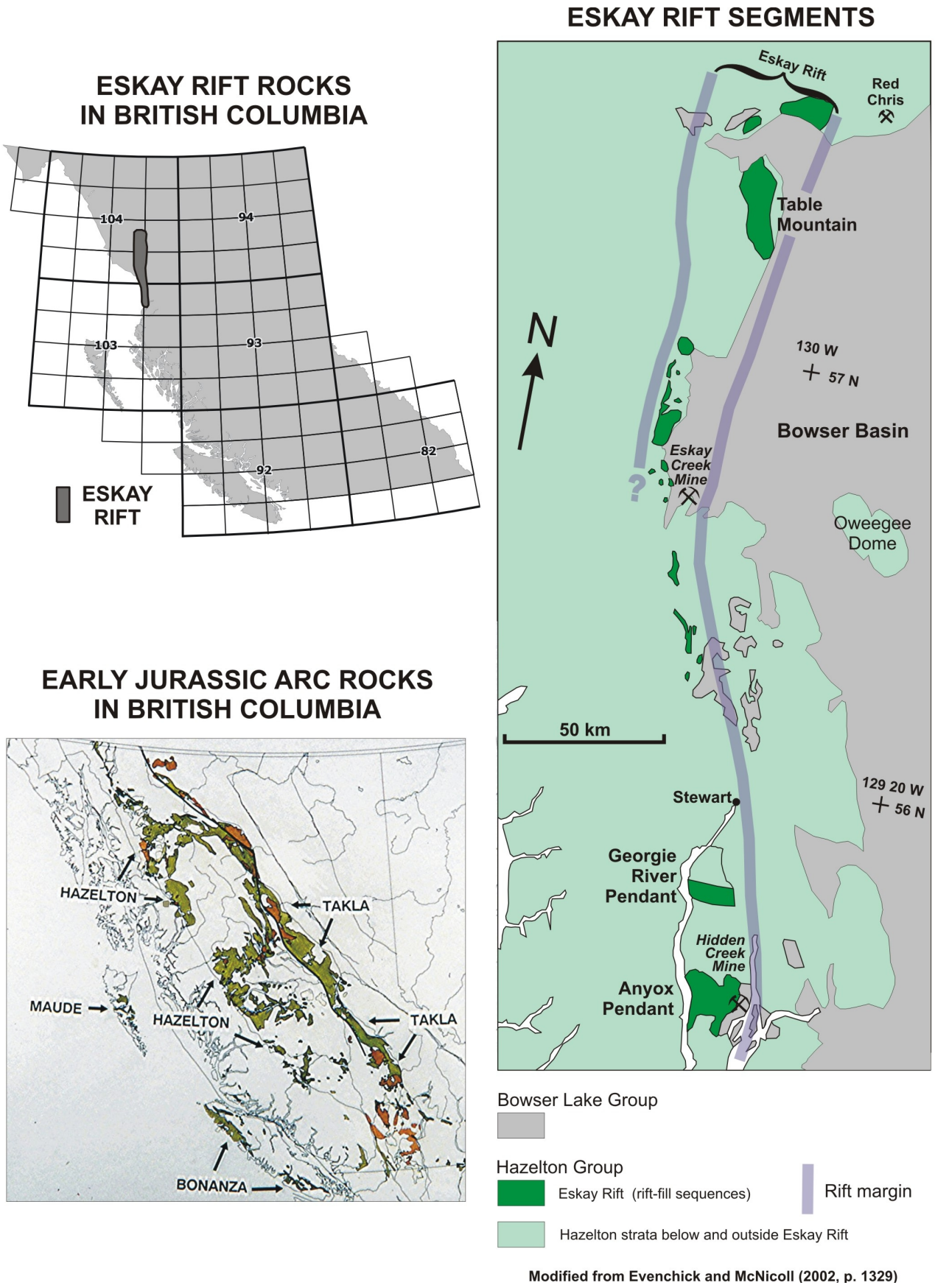

Modified from Evenchick and McNicoll (2002, p. 1329)

Figure 1. Distribution of Eskay Rift strata in northwestern British Columbia.

yielded subeconomic assays. These exhalitive deposits and prospects developed at a range of water depths, accounting for pronounced differences in mineralogy and metal associations, and requiring different exploration strategies. The Georgie River and Downpour Creek rift segments have had limited exploration work to date and deserve further investigation due to their favourable lithological associations and prominent felsic volcanic centres. The five small, remote rift segments between Frank Mackie Icefield and the Granduc mine were last mapped and explored in the mid-1960s.

The Eskay Rift has been regarded as the final, brief (176–174 Ma) episode of Hazelton Arc history, but new mapping and dates from the Sixpack Range suggest that the onset of rifting may have started in early Hazelton time (191 Ma). In this particular rift segment, rift-fill strata rest directly on metamorphosed Paleozoic substrate.

The Eskay Rift records a major Early to Middle Jurassic crustal break that extended from a subaerial setting within island-arc rocks at its northern end to a near-continent, mid-ocean-ridge setting at its southern end. Analogous settings are preserved in Triassic arc rocks of the southeastern Alaska panhandle and along the east-trending arm of the Great African Rift.

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