Geochemical and magnetic susceptibility analyses of samples collected from the Gladys Lake area, near Atlin, northwest British Columbia (NTS 104N/11, 13, 14, and 15)

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Front cover: In the foreground are red-weathering ultramafic rocks of the Nahlin suite and dark weathering mafic volcanic and hypassal rocks of the Nakina Formation. In the background, the cream-weathering peaks expose the Surprise Lake plutonic suite. View towards the east. **Photo by Mitch Mihalynuk.**

Back cover: Megacrystic K-Feldspar granodiorite, Como phase of the fourth of July batholith, exposed on the peaks of Mount Carter. View towards the southwest. **Photo by Mitch Mihalynuk.**

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1. Overview

Geofile 2024-10 contains magnetic susceptibility data and the results, methods, and quality control data from geochemical analyses of samples collected during fieldwork in the Atlin area near the British Columbia-Yukon border (Fig. 1).

Bedrock mapping and sampling during 2023 in the Gladys Lake area (Fig. 2; Mihalynuk et al., 2024) forms the first part of a two-year program updating a 30-km strip along the Yukon border last systematically mapped in the 1950s (Aitken, 1959). The mapping builds upon the work of Zagorevski et al. (2021)

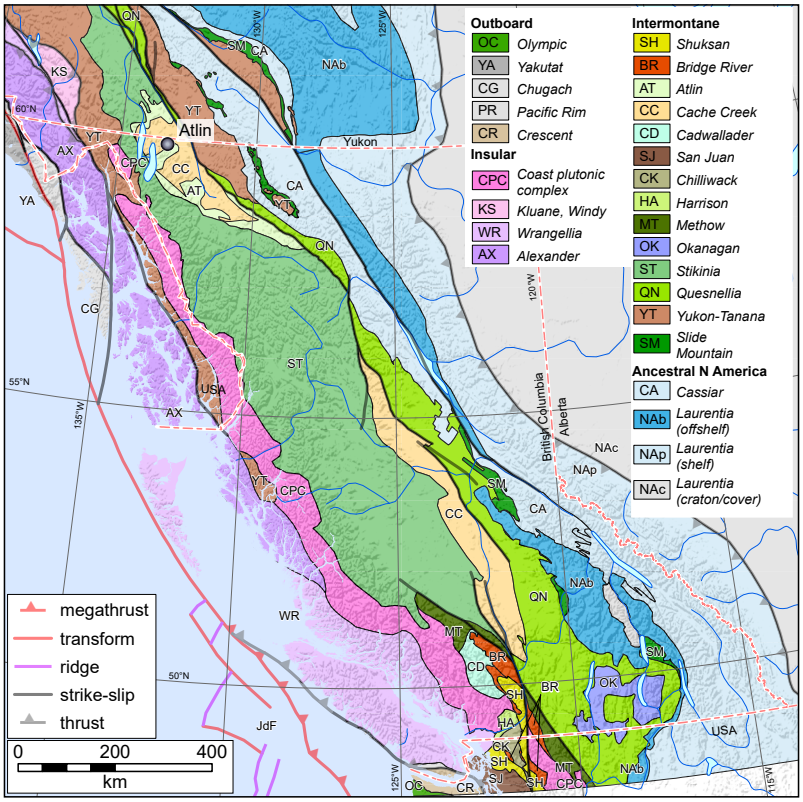

Fig. 1. Location of Gladys Lake-Atlin study area. Terranes after Colpron (2020) and Zagorevski et al. (2021).

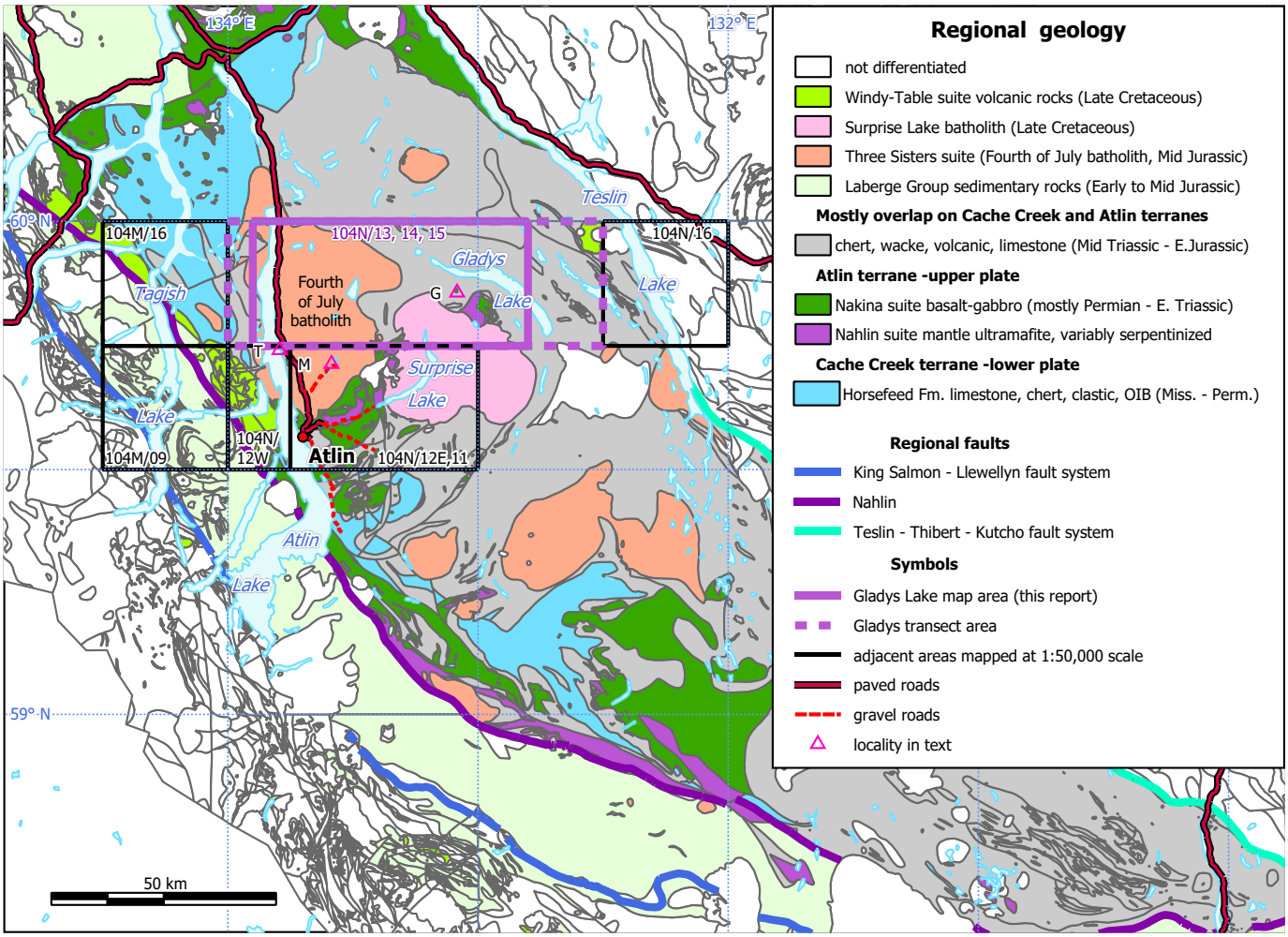

Fig. 2. Generalized geologic setting of the northern Cache Creek and Atlin terranes. Locality symbols: G, Gladys Lake property porphyry; M, McDonald lakes; T, Telegraph Bay.

in defining Permo-Triassic ophiolitic rocks, formerly part of the Cache Creek terrane, as the Atlin terrane. This revision allows for a reappraisal of the mineral potential of the Atlin terrane. The results of the mapping, geological context to samples, and broader implications of this work are discussed more fully in Mihalynuk et al. (2024) parts of which are summarized below.

The Gladys Lake map area includes the northern extent of the type locality for the newly defined Atlin ophiolitic terrane (Zagorevski et al., 2021). Well-exposed Atlin ophiolitic massifs, such as Mount Barham, preserve evidence for pre-obduction extensional tectonism including detachment faulting (Zagorevski et al., 2021). Mapping in 2023 across the detachment surface led to the identification of Ag, Zn, Pb, and Cu-bearing sulphides in samples (MMI23-23-04, 05) taken from within hemipelagic strata (BCGS_GF2024-10.zip). The current working hypothesis is that this mineralization represents distal hydrothermal precipitates derived from ultramafic-associated massive sulphide fields formed on extended ocean crust, on exhumed, cooling mantle. Because evidence for extensional tectonism in the Atlin terrane persists for ~400 km along strike, the possible development of ultramafic associated massive sulphides along it represents a significant untested mineralizing environment. Planned work in 2024 will consider the extent of pre-obduction extensional tectonism in the Atlin terrane, and the related potential metallogenetic significance.

2. Geochemical methods

Outcrops with evidence for mineralization were sampled for analysis (Fig. 3). Samples were submitted to Bureau Veritas Laboratories (Vancouver, British Columbia) for sample preparation and analysis. Samples were dried and then crushed to ≥70% passing 2mm. A 250 g split was pulverized using a steel mill to ≥85% passing 75µm sieve (Bureau Veritas, 2023; PRP70-250). A 30-gram split of the resulting pulp was digested via modified aqua regia partial digestion (Bureau Veritas, 2023; AQ252-EXT). An aliquot of the resulting analyte was analyzed by inductively-coupled plasma mass spectroscopy (ICP-MS).

3. Magnetic susceptibility methods

Magnetic susceptibility measures the magnetic response of a material on interaction with a magnetic field. It can be a useful physical property to aid in distinguishing otherwise similar units during geological mapping. For example it can assist in characterizing and understanding magmatic rock petrogenesis

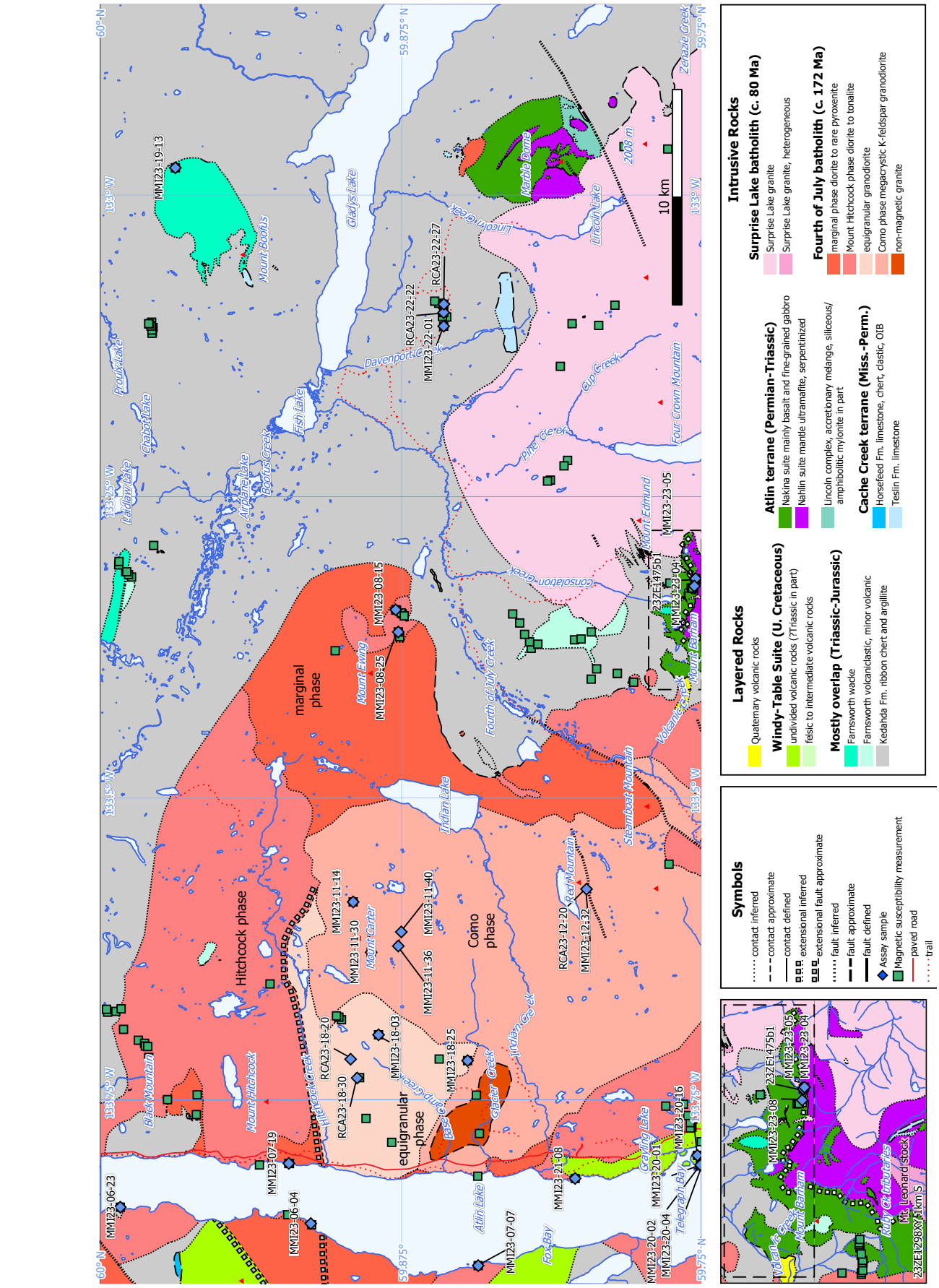

Fig. 3. Simplified geology of the Gladys Lake area including locations of samples for which assay and magnetic susceptibility results are reported (modified from Mihalynuk et al. 2024).

as recorded in variations of magnetite and ilmenite contents (e.g., magnetite or ilmenite series; Ishihara, 2004).

Rock samples collected in the field were measured using the Exploranium KT-9 Kappmeter. Ten measurements were taken for each sample and the mean value recorded. Magnetic susceptibility data in the Atlin area were previously collected to help interpret the aeromagnetic survey conducted at the time (Dumont et al., 2001a-f). A summarized form of this dataset and a discussion of the relationship to aeromagnetic data was published by Lowe and Anderson (2002); sample location data were provided by Lowe (2003).

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