Marksmen Partnership: potential for shallow submarine VMS (Eskay-style) and intrusive-related gold mineralization, Tutshi Lake area

Geofile 2003-9

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At the Nula showing, disseminated arsenopyrite (~1% As, 0.5g Ag) was discovered over a stratigraphic interval of several metres within felsic ash tuff. This mineralization may be syngenetic, but also appears spatially related to a flow-banded rhyolite dike.

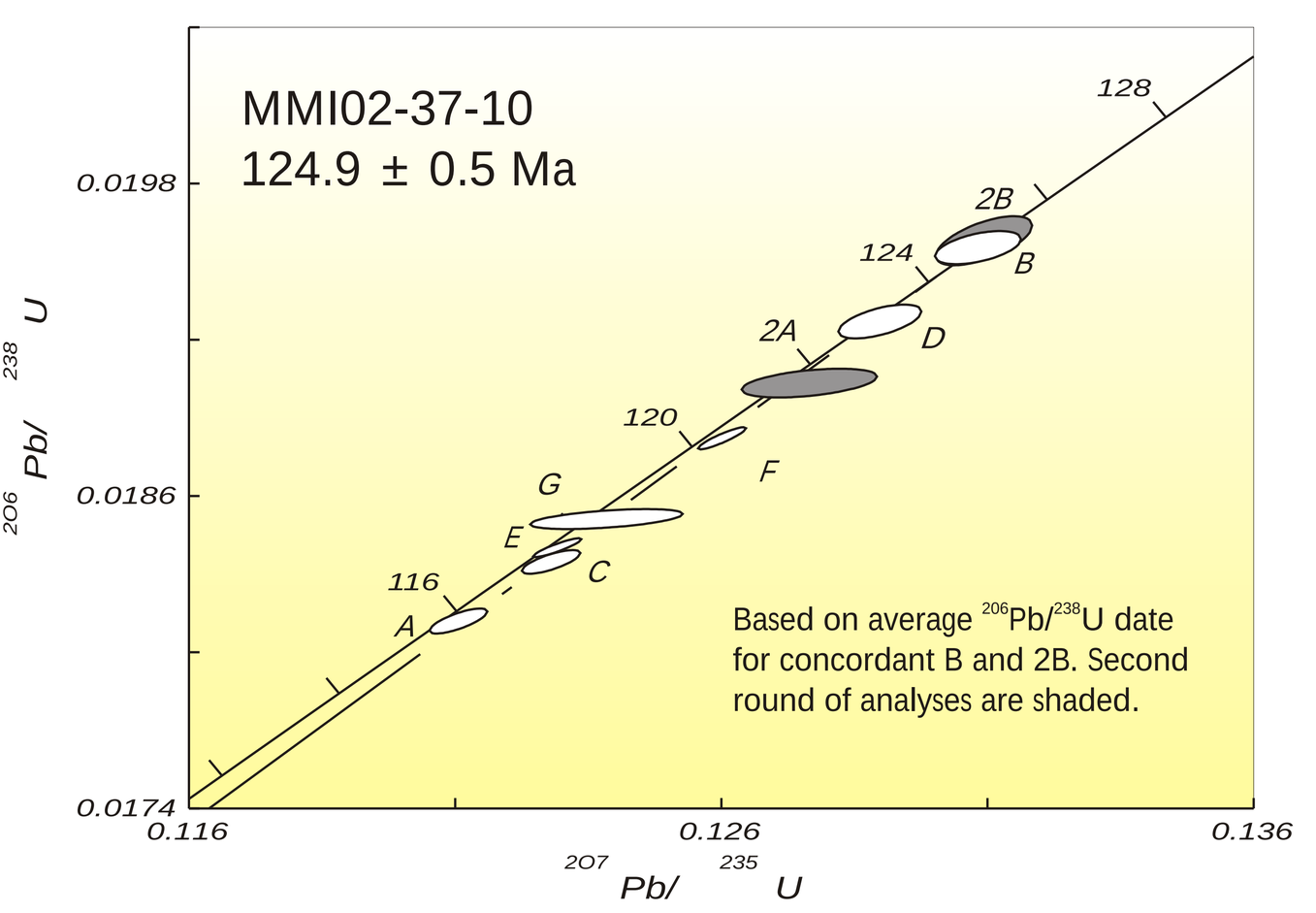
Summary

Eskay Creek is a rich Au-Ag deposit with principal ore-forming horizons located at the interface between Middle Jurassic argillaceous strata and felsic volcanic units in the Bowser Basin. Sedimentary strata in the Whitehorse Trough overlap the age of those in the Bowser Basin and the two basins were probably linked in the Middle Jurassic as they received sediment from the same eastern source area. Volcanic strata of Middle Jurassic age are rare in the Bowser Basin and are unknown in the Whitehorse Trough. Previously undated volcanic units in the Tutshi Lake area were thought to be Middle Jurassic in age based upon a gradational contact with argillaceous strata that are similar to nearby strata containing late Early Jurassic ammonites (Mihalynuk, 1999). We have confirmed a gradational contact between the volcanic rocks and the underlying sedimentary strata at “Middle Ridge”, but the age of the sediments are apparently as young middle Early Cretaceous, based upon a new U-Pb age of 124.9 ±0.5 Ma on intercalated volcanic rocks.

Eskay-type mineralization is interpreted to have formed in a subaqueous, near-shore, hot spring environment, in an active arc setting. Volcanic textures well preserved in the Tutshi Lake area suggest a similar transition from submarine to subaerial volcanism. If new U-Pb data are correctly interpreted, the volcanic rocks are about 50 m.y. younger than submarine volcanic strata within the mineralized section at Eskay Creek. We tentatively correlate both the volcanic and sedimentary rocks with the Douglas Island volcanics of the Gravina belt (e.g. Gehrels, 2003). Intraformational detrital zircons from magmatic rocks of the Gravina belt show age clusters at 105-120Ma and 140-165Ma, (Kapp and Gehrels, 1998), prompting the suggestion of a magmetic lull at 120-140Ma. Volcanics of “Middle Ridge” fall within this “lull”. The volcanic strata are coincident with a regional geochemical province displaying elevated Au-Sb-As (stream sediment) signature; a geochemical fingerprint also seen in belts hosting shallow submarine VMS (Eskay-style) deposits.

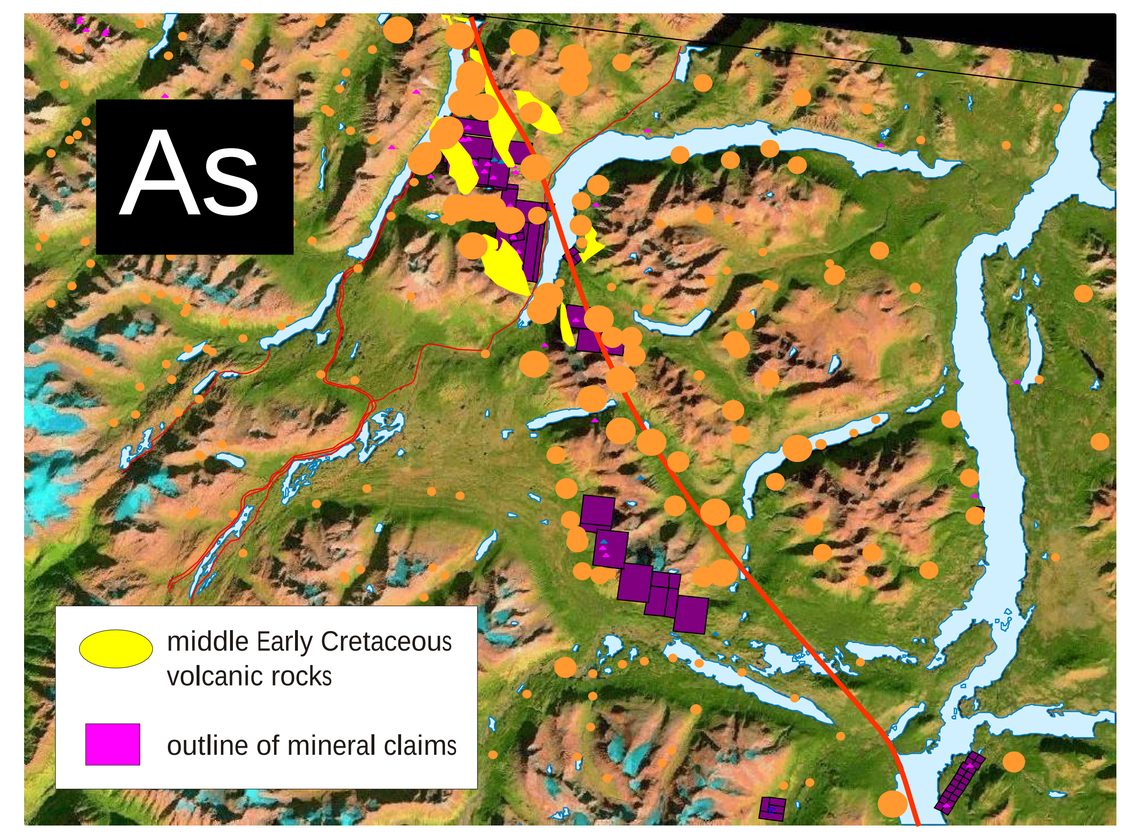
A similar geochemical fingerprint is displayed by intrusive-related gold mineralization (plus Bi, Mo, W; Logan, 2002). We report Au values of up to 18 ppm from arsenopyrite-stibnite-veined zones developed in the high elevation portions of the "Middle Ridge" intrusion. This intrusion may be an apophysis of a body that continues for many kilometres to the southeast. Dikes of similar composition are spatially associated with disseminated arsenopyrite at the Nula showing (~1% As, 0.5g Ag); however, a syngentic origin for the Nula showing cannot be ruled out at this time. Association of similar mineralization is not reported in the intrusive body southeast of Tutshi Lake, even though the belt of elevated Au-Sb-As RGS values continues across the lake. Discovery of broad mineralized zones such as the Nula showing (photo above), highlight the need for more prospecting in the region.

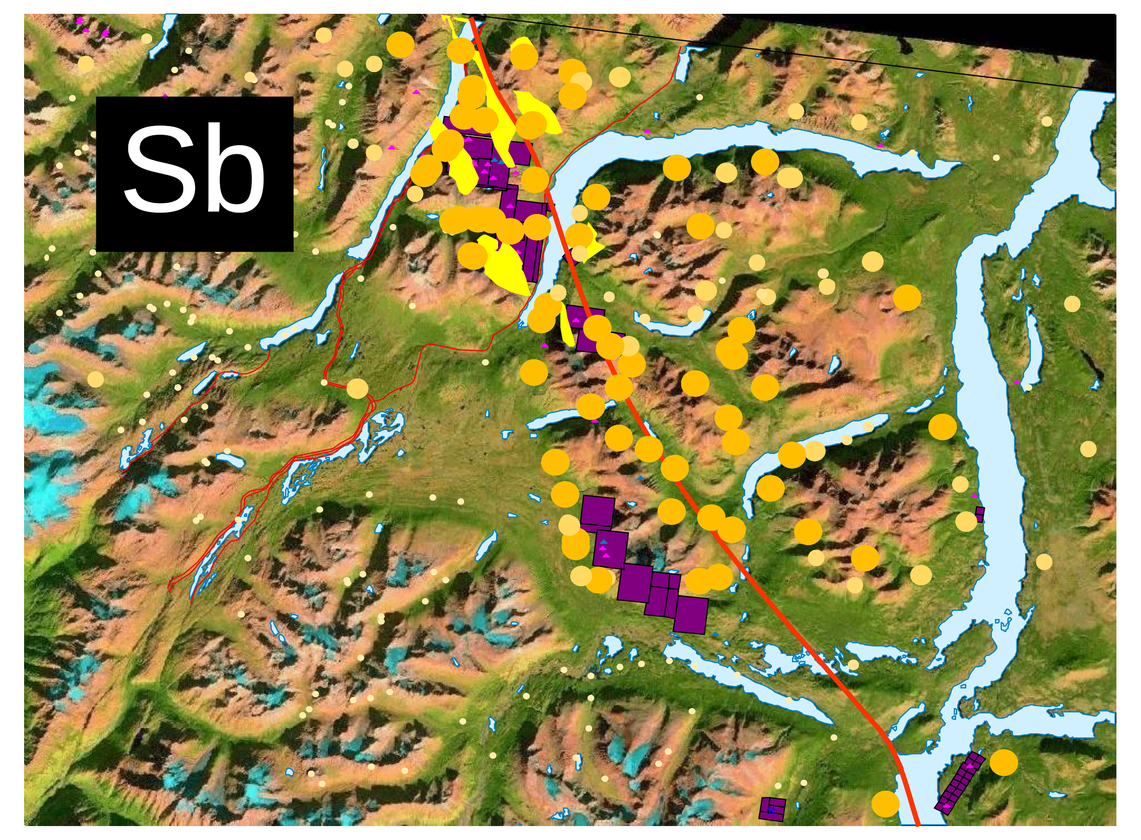
Geochronology

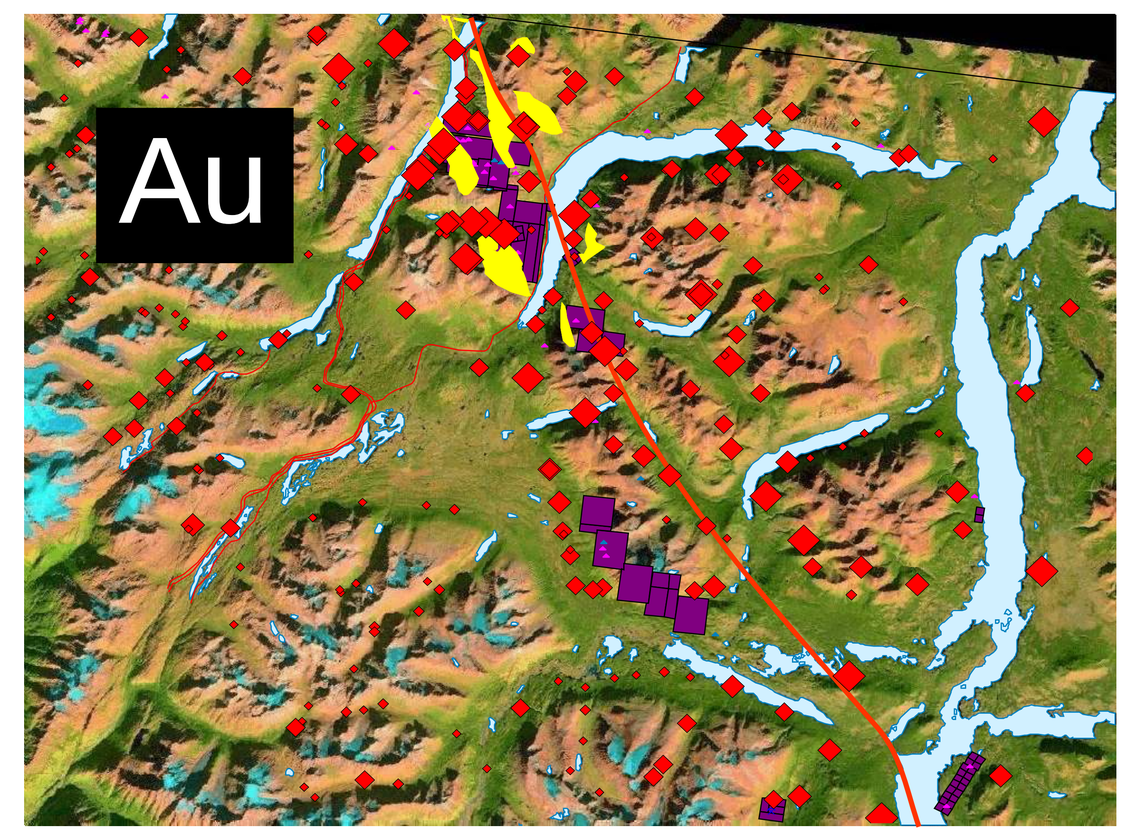


Middle Ridge volcanic strata yielded clear, pale pink, euhedral, prismatic zircons. Nine analyzed multigrain fractions gave concordant to slightly discordant results. The best estimate for the crystallization age of the rock is based upon the average $^{206}Pb/^{238}U$ age of concordant fractions B and 2B at 124.9 ±0.5 Ma (see plot). Seven other fractions define a quasi-linear array, likely the result of minor lead loss.

Regional Geochem

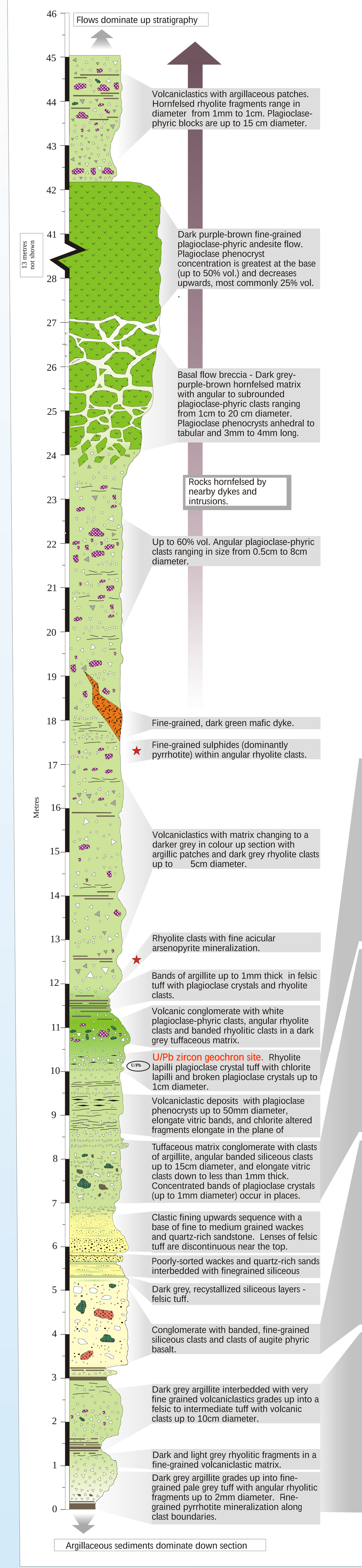


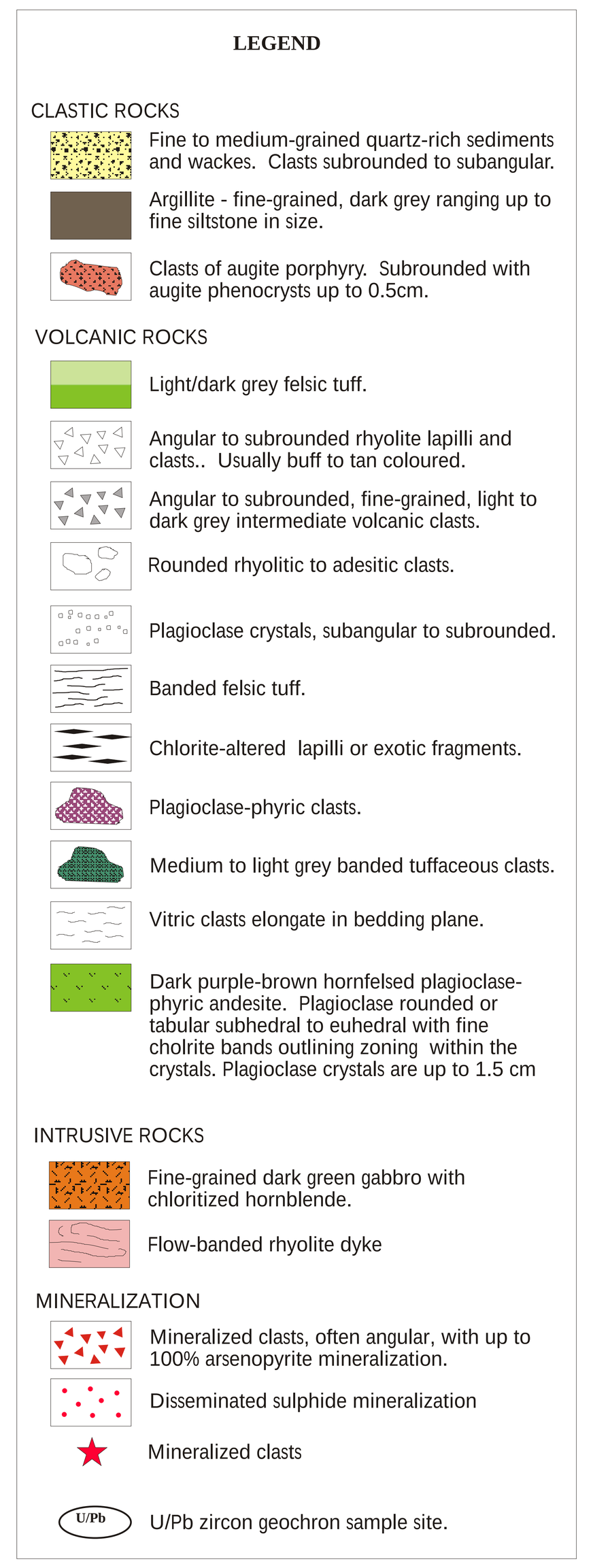


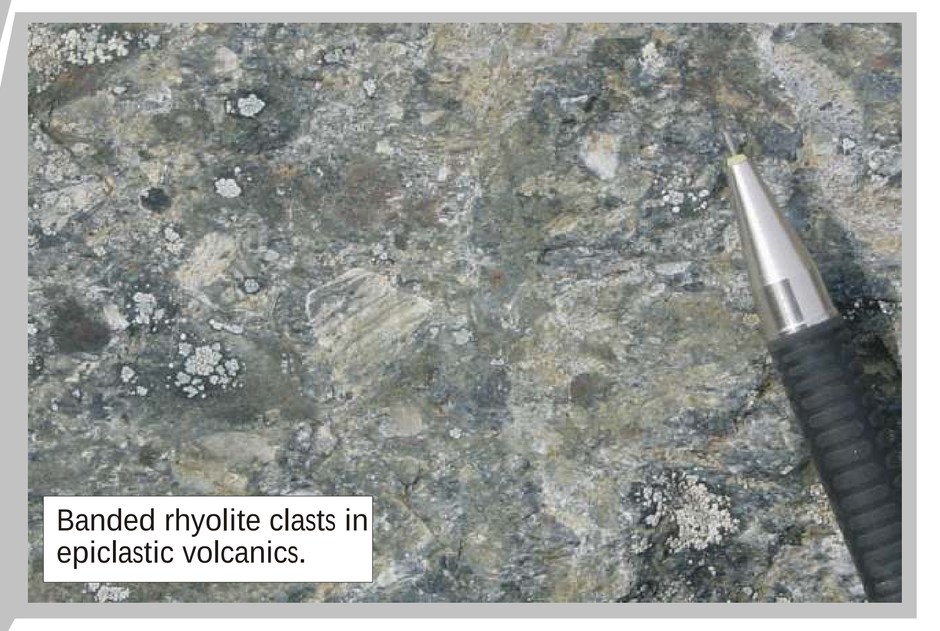


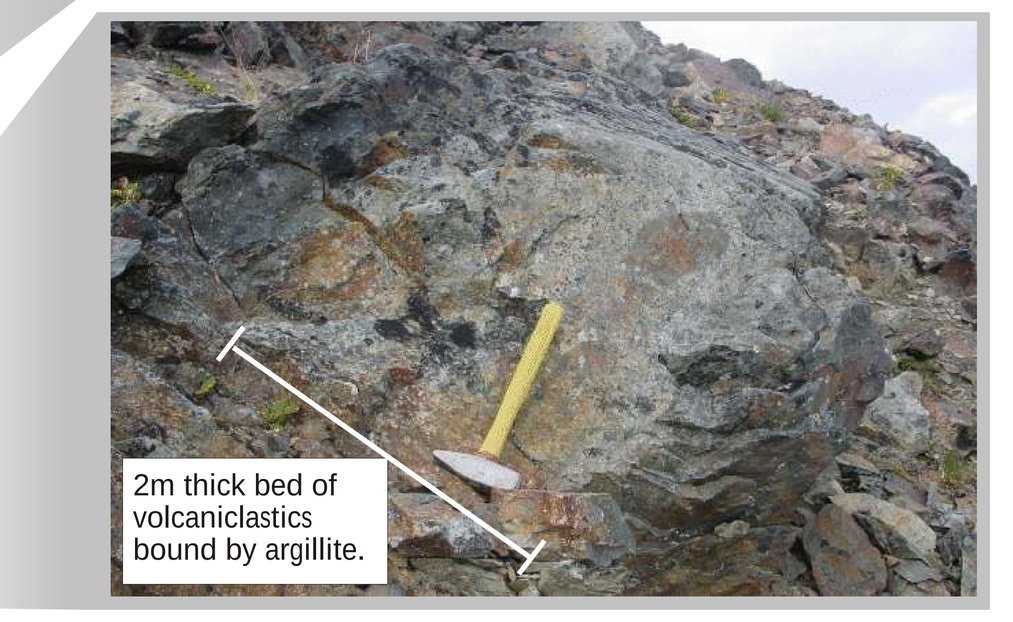
The Llewellyn fault zone marks the western margin of thick accumulations of Lower to early Middle Jurassic sediment of the Whitehorse Trough. West of the fault are metamorphosed pericratonic arc rocks unconformably overlain by Early Cretaceous argillite and siltstone and volcanic tuff and flows. These are spatially coincident with a geochemical province of correlated high As-Sb-Au RGS values (Jackaman, 1993)- incentive for a regional mapping program launched in 1987.

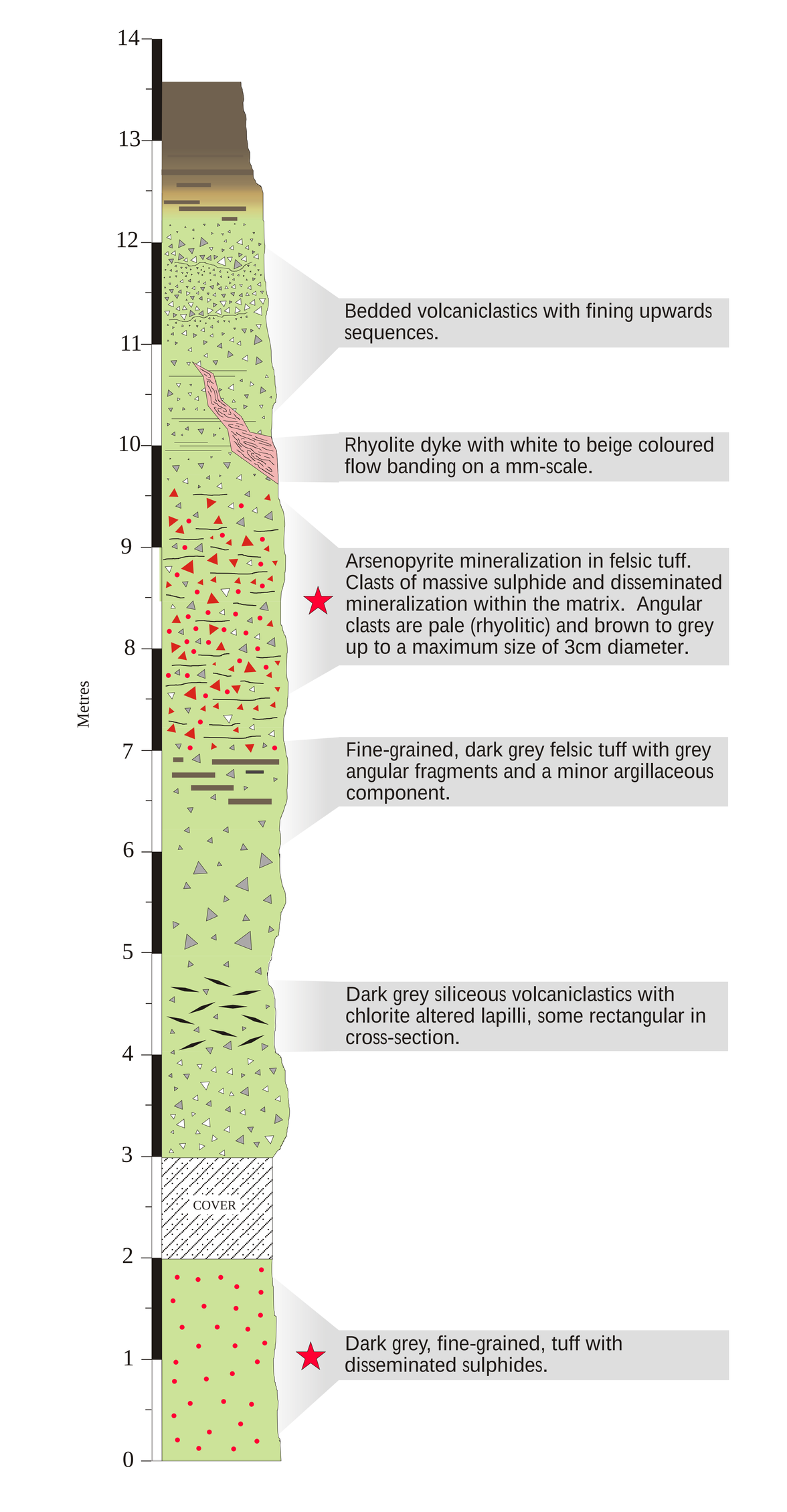
“Middle Ridge” stratigraphy











Volcanic stratigraphy at the Nula showing.

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Acknowledgments:

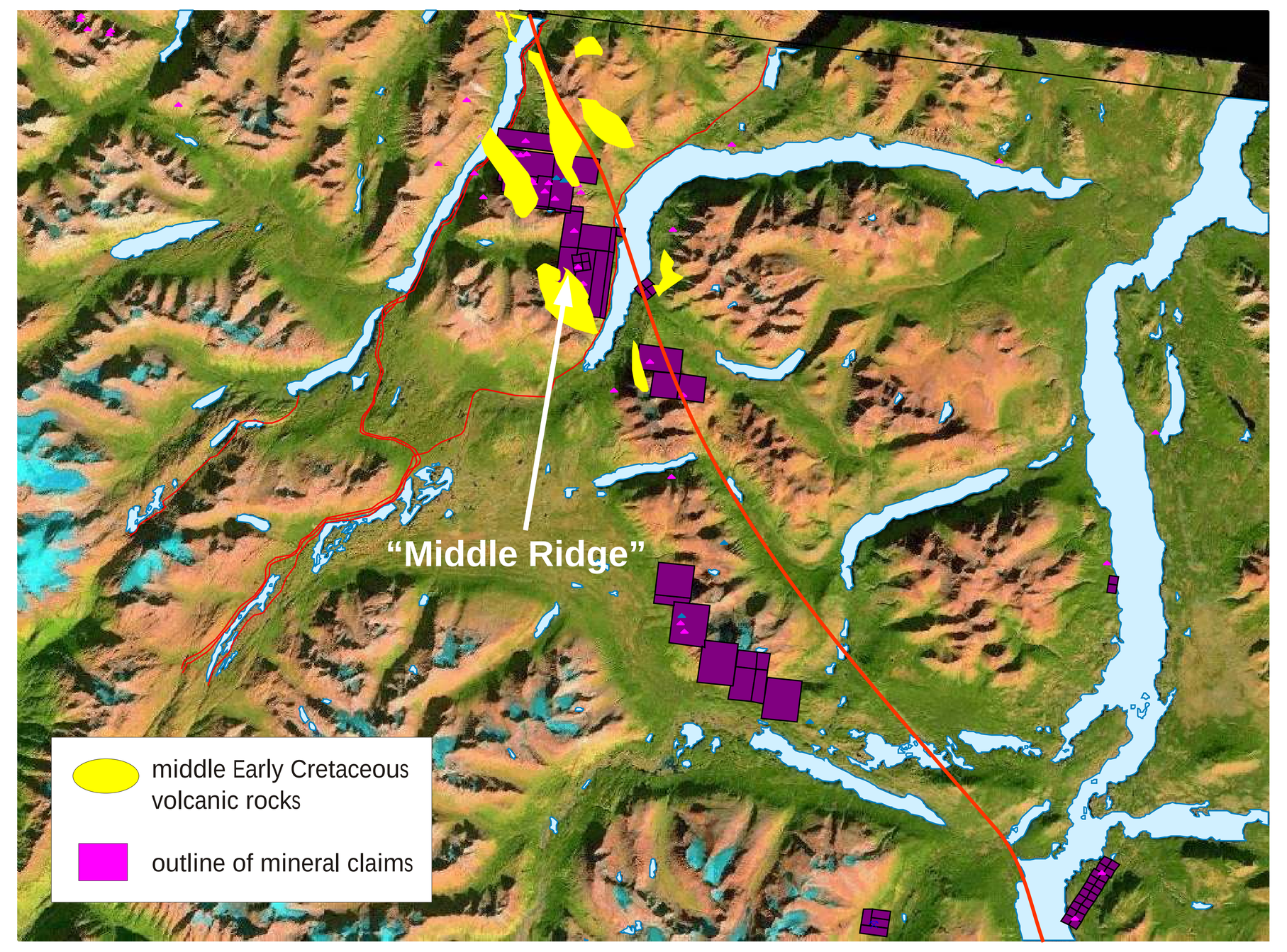
It has been our pleasure (MM & FD) to share our knowledge and, especially, to learn from the people involved with the Golden Eagle partnership. The partnership was conceived in concert with Drs. Ron McMillan (Mining Geologist, Victoria) and Kieran Downes (President of Marksmen Resources Ltd., Nanaimo). Approximately 1.5 days spent on mapping and sampling on tenured ground around the Tannis prospect was conducted in concert with R. McMillan and J. Nebocat.

Introduction

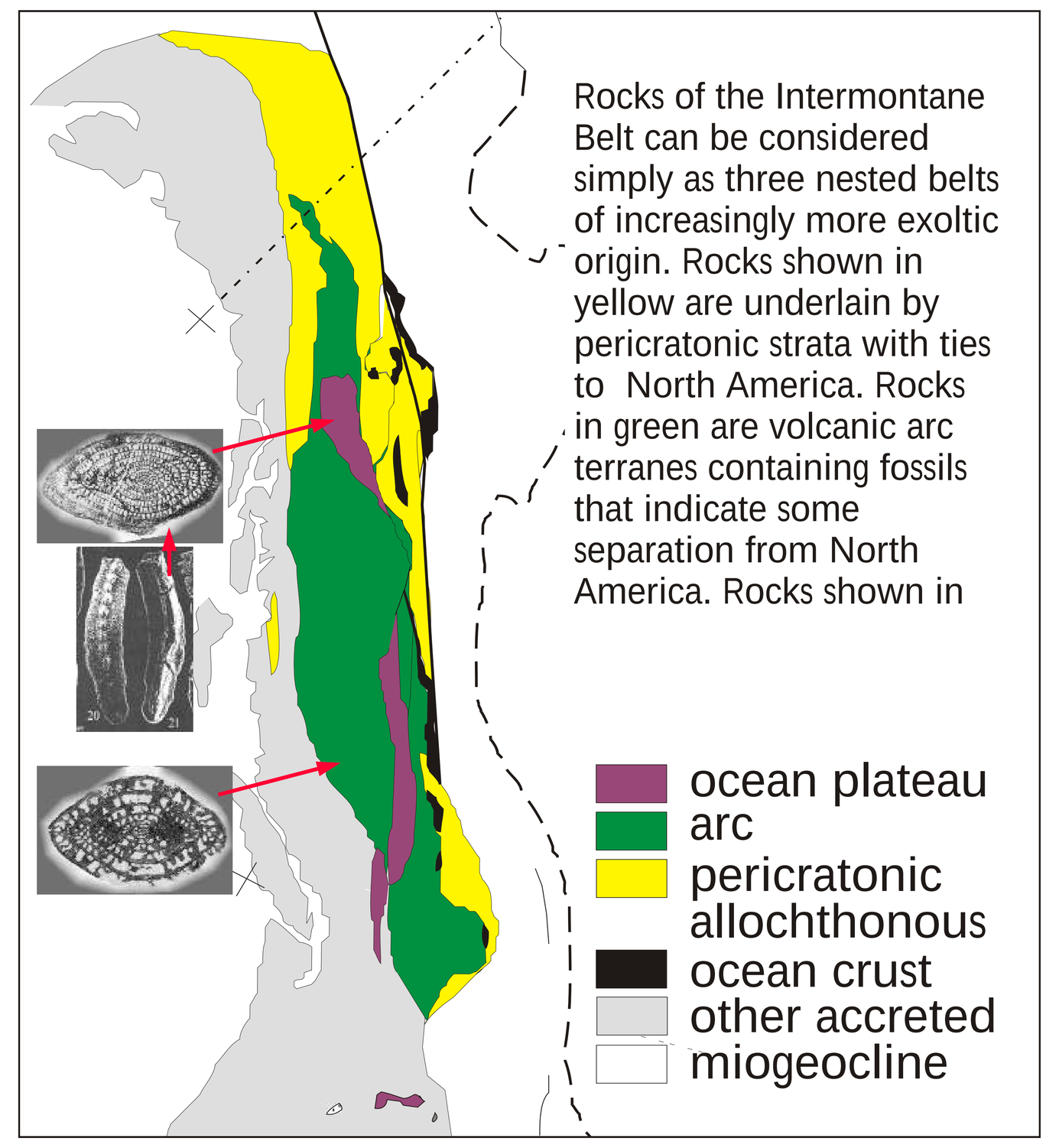
The Golden Eagle Project is a public-private partnership between the BC Ministry of Energy and Mines and the Marksmen Resources Ltd. It is a field-based geological mapping and sampling program aimed evaluating the potential for shallow submarine, volcanogenic Eskay-style mineralization and intrusive-related gold mineralization in the Tutshi Lake (see Location). It provides an update to a provincial regional mapping program conducted in 1987 that was to evaluate a geochemical province that displays elevated Sb-As-Au values (*see* Regional Geochemistry; Schroeter, 1986; Jackaman, 1993). It parallels a major crustal structure known as the Llewellyn fault (red line).

In reporting the results of the 1987 mapping program, Mihalynuk and Rouse (1988) described felsic volcanic rocks that appeared intercalated with uppermost sediments of the Whitehorse Trough, at the time believed to be as young as late Early Jurassic (Toarcian). It was later discovered that strata of the northern Whitehorse Trough can get much younger, ranging up to Bajocian in age (Mihalynuk et al., 1995; Mihalynuk et al., 1999a), ~174-170Ma (Okulitch, 1999), overlapping the age of host strata at the rich Eskay Creek deposit, which was discovered in 1989 within a geochemical province displaying elevated Sb-As-Au values. Thus, the volcanic-sedimentary contact zone at Tutshi Lake, with its lithologic and temporal similarities to the host rocks at Eskay Creek, deserved careful reevaluation.

One of the best sections of the volcanic-sedimentary contact lies northwest of Tutshi Lake (yellow unit), adjacent to the Tannis intrusive-related gold prospect operated by Marksmen Resources. Southeast of Tutshi Lake. Here we report on our preliminary findings northwest of Tutshi Lake: the reevaluated contact section as well as the results of mapping around the adjacent Tannis prospect. New geochronologic data from the base of the volcanic unit indicate an Early Cretaceous age (124.9 ±0.5Ma), not a Middle Jurassic age as interpreted by Mihalynuk (1999; *see* Geochronology).

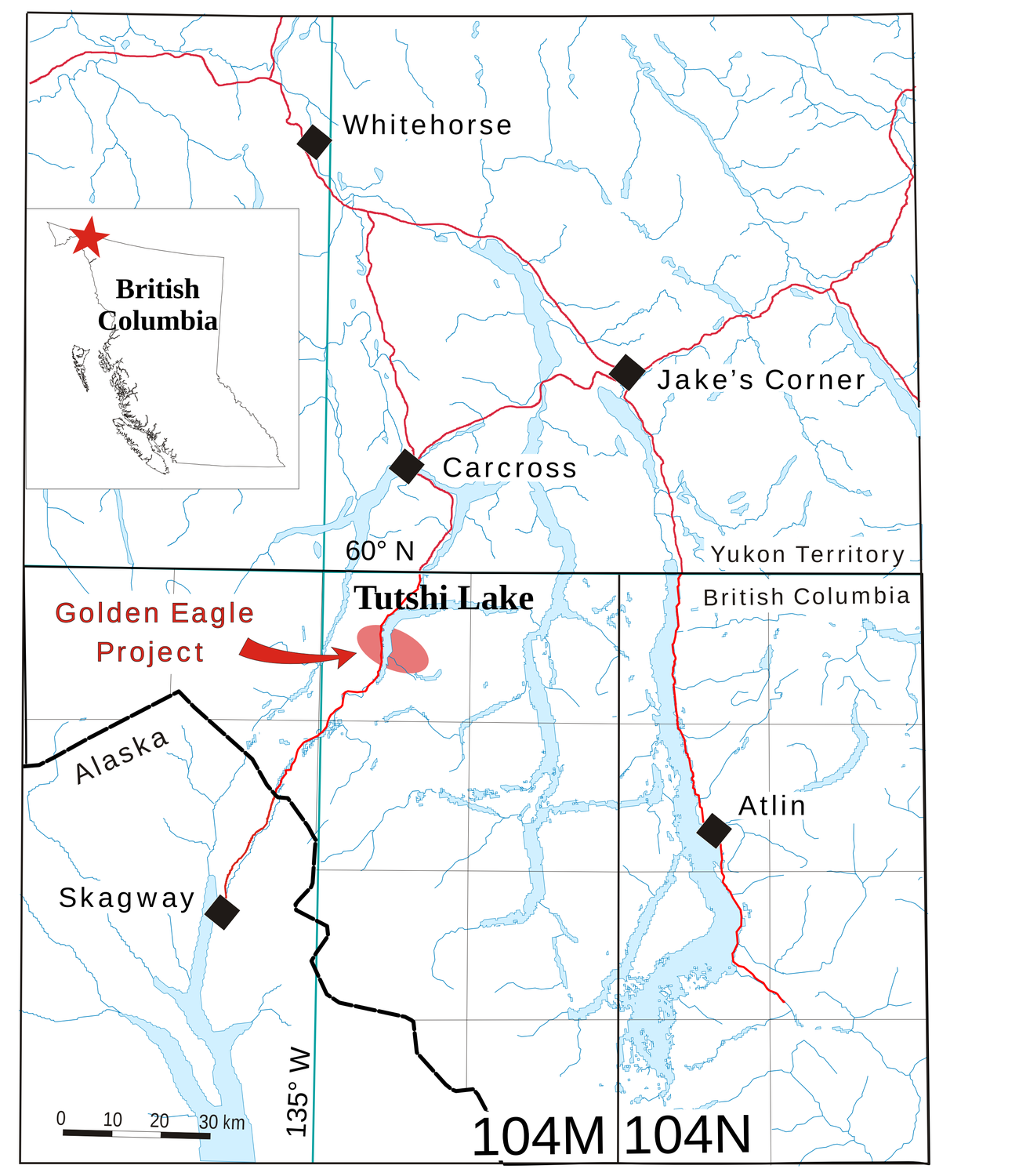


Tectonic Setting & Location


Rocks of the Intermontane Belt can be considered simply as three nested belts of increasingly more exoltic origin. Rocks shown in yellow are underlain by pericratonic strata with ties to North America. Rocks in green are volcanic arc terranes containing fossils that indicate some separation from North America. Rocks shown in
ocean plateau
arc
pericratonic allochthonous
ocean crust
other accreted
miogeocline

purple are oceanic crustal strata of the Cache Creek Terrane (including the Nakina area). Some of the Permian and Triassic fossils within the Cache Creek Terrane, like the spiral fusulinid and conodont jaw plate shown at left (from Monger, 1975; Orchard et al., 2001), occur nowhere else in North America, but are the dominant species in the Tethyan realm of central Asia (Himalaya to Mediterranean). Just how these exotic rocks came to be enclosed by increasingly less exotic rocks has been the focus of several tectonic models. One explanation is that the pericratonic and arc belts (yellow and green) formed a more-or-less continuous belt that was subsequently folded around the Cache Creek terrane in oroclinal fashion (Mihalynuk et al., 1994). The Golden Eagle project is located at the boundary between the “outboard” Stikinian volcanic arc belt and pericratonic arc rocks of the Yukon-Tanana terrane.

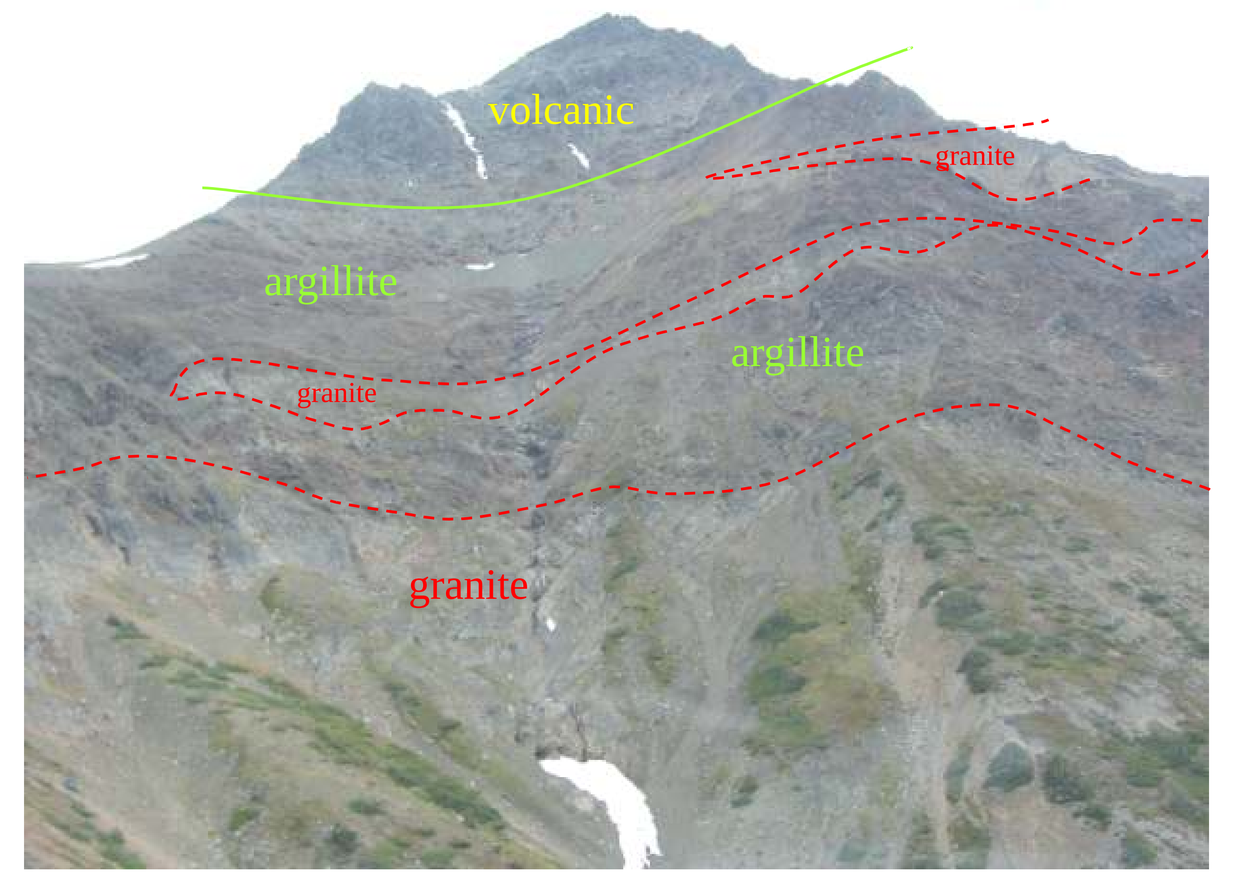
It is possible to drive to the Golden Eagle property via the Klondike Highway (Figure right) about 120 km from Whitehorse. The highway bisects the property. In 2002 a drive-in field camp was established on the western shore of Tutshi Lake. Heli-copter transport was used to gain access to parts of the property southeast of the lake or the rugged mountainside above the lake to the west.



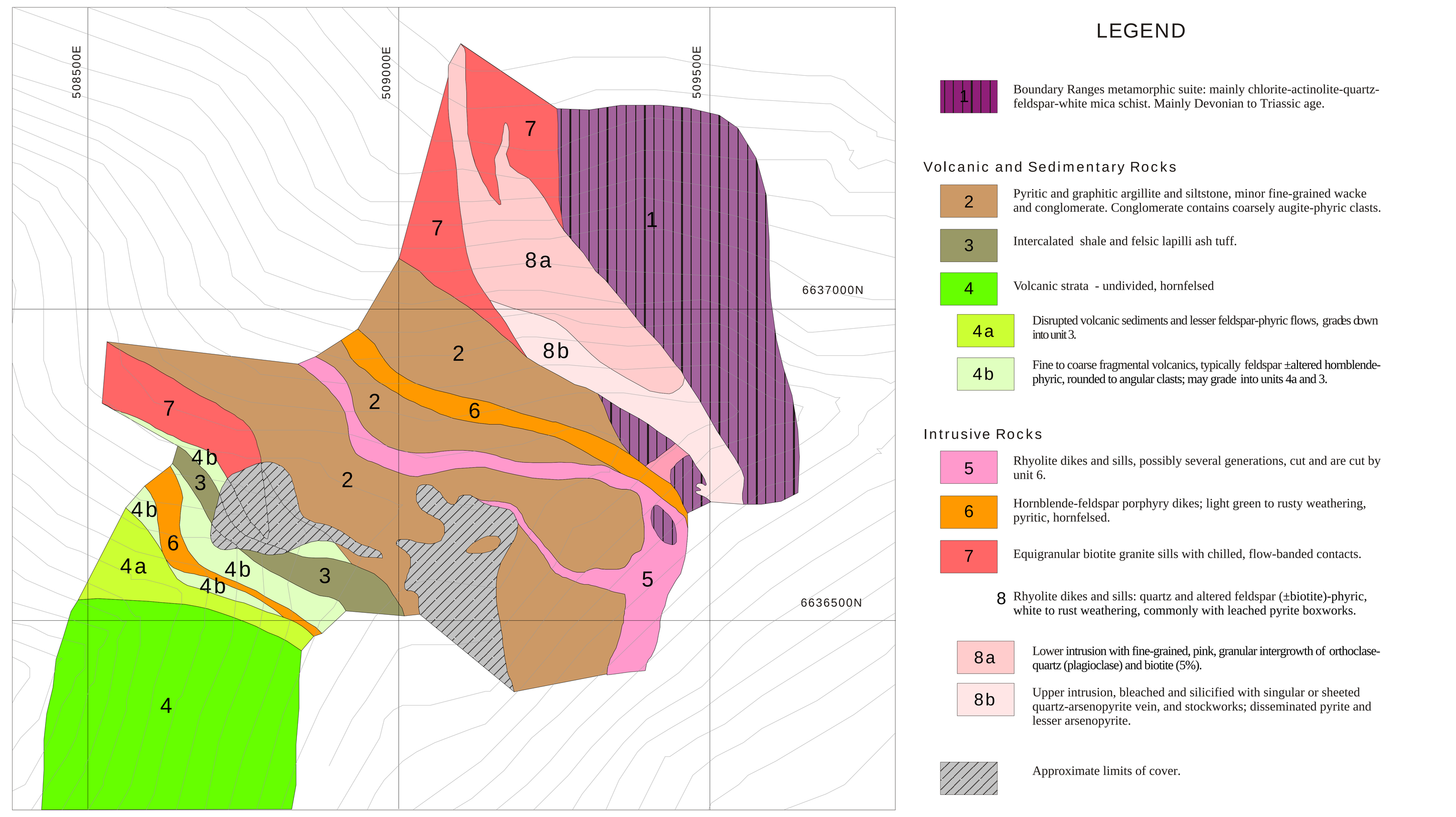
“Middle Ridge” geology

“Middle Ridge” is located west of southern Tutshi Lake where it extends from the northeastern flank of the highest peak (el. 7100+) in the area It has been a focus of exploration since the early 1900's when two adits and trenches were driven on arsenopyrite mineralization (MINFILE 104M 074). Tenure holdings that currently cover the ridge are named the Tannis claims. "Middle Ridge" is underlain by argillaceous strata of presumed middle Lower Cretaceous age, which are in fault contact with metamorphic rocks to the northeast and are intercalated and overlain by volcanic rocks to the southwest. Bedding has been folded, but in the contact section mainly dips moderately southwest. Approximately 45m of the well-exposed section across the volcanic-sedimentary contact was measured along the crest of "Middle Ridge" .

A tabular, fine to coarse-grained, polyphase granitic body intrudes the Cretaceous sediments (nearground in Photo above) at their contact with metamorphic rocks, about 500m northeast of the base of the measured section (unit 7 on Map). It is an apophysis of the large body underlying Paddy Pass, and it is interpreted to extend beneath "Middle Ridge" in subsurface to where it is exhumed again in the Tutshi Lake valley (Mihalynuk, 1997; Figure 2). A sample collected from the east shore of Tutshi Lake is dated by the K-Ar method as 80.0 ±1.6 Ma (Bultman, 1979 in Mihalynuk et al., 1999). The "Middle Ridge" apophysis is elongated



parallel with the structural fabric of the region. Grain size generally decreases with increasing elevation to the southeast in the latest cross-cutting phases. Auriferous arsenopyrite-scorodite (FeAsO4.2H2O) mineralization at the Tannis claims is restricted to fine-grained intrusive phases. Its northeastern contact is sharp and straight, extending north from the ridge crest at 1440m to below tree line at 1060m. The upper (southwestern) contact is less well defined, with several generations of rhyolite dykes anastomosing and converging to form the intrusive complex (Figures above and right). Arsenopyrite mineral-ization encountered at elevations as low as ~1300m in brecciated, fine-grained quartz-eye porphyry. It consists of a quartz vein stockwork comprising 5% of the rock and sulphide within 3mm thick veinlets. Intense veining within quartz-eye porphyry occurs at an elevation of ~1400m. One zone


LEGEND
Volcanic and Sedimentary Rocks
Intrusive Rocks
8a Lower intrusion with fine-grained, pink, granular intergrowth of orthoclase-quartz (plagioclase) and biotite (5%).
8b Upper intrusion, bleached and silicified with singular or sheeted quartz-arsenopyrite vein, and stockworks; disseminated pyrite and lesser arsenopyrite.
Approximate limits of cover.

located ~5m from the northern contact, is comprised of banded quartz-arsenopyrite-scorodite veins. A sample was collected from a section of 2-5cm thick veins of semi-massive arsenopyrite that occur over a width of 2m. It returned 18 ppm Au and 17% As. Massive arsenopyrite mineral-ization also occurs on the opposite (southeast) side of "Middle Ridge" where it has been explored with two adits.