

Field mapping in the Puella Bay area, SE Wekusko Lake: Geological constraints from outcrop and aeromagnetic data

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Introduction

In the summer of 2019, a multiyear project was initiated to examine the bedrock geology southeast of Wekusko Lake. Bedrock geological mapping this summer was conducted at a 1:20 000 scale over an area of 8.5 x 11 km and will be combined with the mapping of another 8.5 x 11 km block to the north in 2020 to form a 17 km (north-south) by 11 km (east-west) map area. The lack of comprehensive mapping and the recent forestry activity (2008–2016), which resulted in significant new rock exposures and access, led to the selection of this area for bedrock geology mapping.

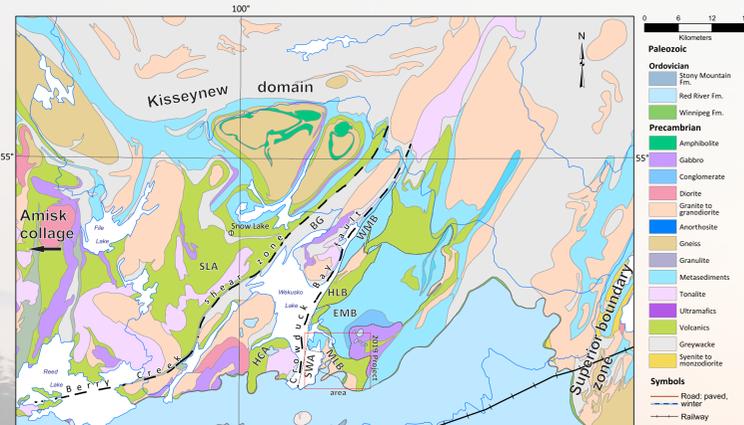


Figure 1: Map of the eastern segment of the Flin Flon domain (FFD) including the location of the 2019 project area (see red rectangle; map is modified from unpublished 1:250 000 scale provincial compilation). Note the Kisseynew domain to the north, the Superior boundary zone to the east and Paleozoic cover rocks to the south. Snow Lake arc assemblage (SLA), Hayward Creek arc assemblage (HCA), South Wekusko assemblage (SWA), McCafferty Lifterover fault block (MLB), Eastern Missi fault block (EMB), Herb Lake fault block (HLB), Western Missi fault block (WMB) and Burntwood group (BG) are shown relative to the Berry Creek shear zone and Crowduck Bay fault.

Regional Setting

Wekusko Lake is located in the eastern end of the FFD. Most of the lake is underlain by greywacke and mudstone turbidites of the Burntwood group from the Kisseynew domain to the northeast (Figure 1). Greywacke and mudstone extend to the southernmost part of the lake, separating arc volcanic rocks to the west from those to the east, and continue southwest under Phanerozoic platform carbonates for at least 30 km (Reid, 2017). Snow Lake and Hayward Creek arc assemblages lie on the west side of Wekusko Lake; these are separated north from south, respectively, by the Berry Creek shear zone. On the east side of Wekusko Lake, the Crowduck Bay fault juxtaposes Burntwood group rocks against ocean-floor basalts, evolved arc volcanic rocks, and Missi group fluvial-alluvial sedimentary rocks (Figure 1).

Objectives

The current geological mapping focuses on rocks southeast of Wekusko Lake; in particular, two previously identified fault bound blocks, the McCafferty Lifterover fault block and the Eastern Missi fault block (Ansdell et al., 1999; Connors et al., 1999). Primary objectives of the 2019 summer fieldwork include:

- updating and detailing the stratigraphic framework of the 1.88–1.83 Ga arc volcanic and sedimentary rocks east and southeast of Puella Bay,

- examining complex structural relationships between southwest-directed fold-and-thrust faulting (D2) and northwest-directed transpression (D3),

- incorporating high-resolution geophysical data with bedrock data to better constrain geological contacts and structures in poorly exposed areas, and

- using the lithostratigraphic and structural framework to evaluate the mineral potential of rocks southeast of Wekusko Lake.

Key Findings

- Where the Stuart Bay fault trends from south-southeast to east-southeast the fault is intruded by porphyritic granodiorite (unit L3). The nature of this late intrusion is uncertain, but its emplacement appears to postdate D2 folding and faulting but predate D3 deformation, and possibly is related to dilation during reactivation of the Stuart Bay fault.
- Unit S1 grades from clast-supported plagioclase-phyric andesite cobble and boulder conglomerate into plagioclase-phyric andesite (and local dacite) conglomerate supported by a dacite matrix near the contact with the overlying dacite units (unit S3a–c).
- A sequence of amygdaloidal pillowed basalt (unit S4) and mafic boulder conglomerate (unit S5), not previously described, occurs southeast of Puella Bay; the east- to northeast-younging directions indicated by these rocks suggest they may lie stratigraphically over dacite (unit S3) of the McCafferty Lifterover fault block.
- Fluvial-alluvial Missi group rocks (units M1, M2a–d) east of the Stuart Bay fault are an east-younging sequence, that is locally folded by D3 deformation. The succession records a transition from magnetite-rich trough crossbedded feldspathic arenite and polymictic conglomerate to medium- to fine-grained feldspathic arenite with more tabular bedforms, less magnetite, and increased biotite and muscovite.
- Late gabbro dikes (unit L2) cut the folded stratigraphy and upper beds of the Eastern Missi fault block indicating that they were emplaced after the ca. 1826 Ma minimum age for sedimentation, but the development of the S3 foliation within the dikes suggests intrusion before the final stages of D3 deformation.

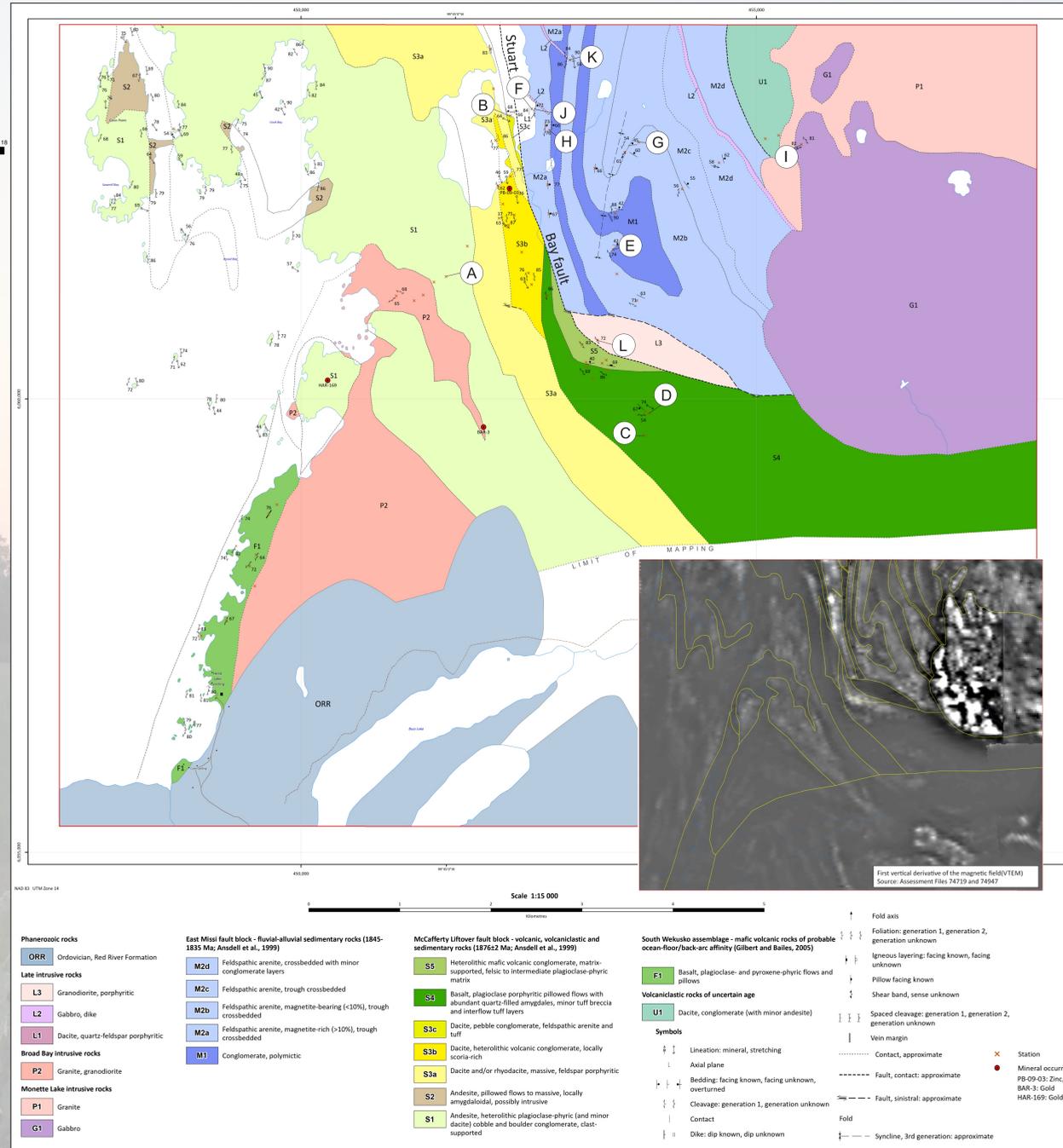


Figure 2: Geological map of the Puella Bay area, southeastern Wekusko Lake, based on 2019 mapping, compilation of data from Gilbert and Bailes (2005) and aeromagnetic data. For more detail see PMAP2019-4 (Reid, 2019).

Economic Considerations

Rocks of the McCafferty Lifterover fault block have the potential for both base metal (VMS) and gold mineralization. Although no pegmatites were mapped in the project area this summer, the area should be considered prospective as a number of lithium bearing pegmatites occur approximately 15 km to the north and northeast.

Highlights from three historical drillholes in the map area include:

PB-09-03 (AFN 74765) - intersected multiple base-metal intervals including 0.46% Pb, 1.66% Zn at 207.21–207.42 m, 0.5% Pb, 0.05% Cu, 2.49% Zn at 238.16–238.51 m and 0.47% Pb, 0.81% Cu, 2.19% Zn at 245.77–246.24 m.

BAR-3 (AFN 94374) - intersected 8.9 Au g/t at 41.7–42.7 m, 15.9 Au g/t at 46.7–47.7 m, 19.6 Au g/t at 54.8–55.3 m and 32.5 Au g/t at 69.2–69.7 m.

HAR-169 (AFN 93516) - intersected 11.6 Au g/t at 45.3–45.8 m, 58.8 Au g/t at 54.6–55.0 m and 5.6 Au g/t at 56.7–57.0 m.

References

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- Gilbert, H.P. and Bailes, A.H. 2005: *Geology of the southern Wekusko Lake area, Manitoba (NTS 63112NW)*; Manitoba Industry, Economic Development and Mines, Manitoba Geological Survey, Geoscientific Map MAP2005-2, scale 1:20 000.
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- Reid, K.D. 2019: Bedrock geological mapping of the Puella Bay area (Wekusko Lake), north-central Manitoba (part of NTS 63112); in Report of Activities 2019, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p.

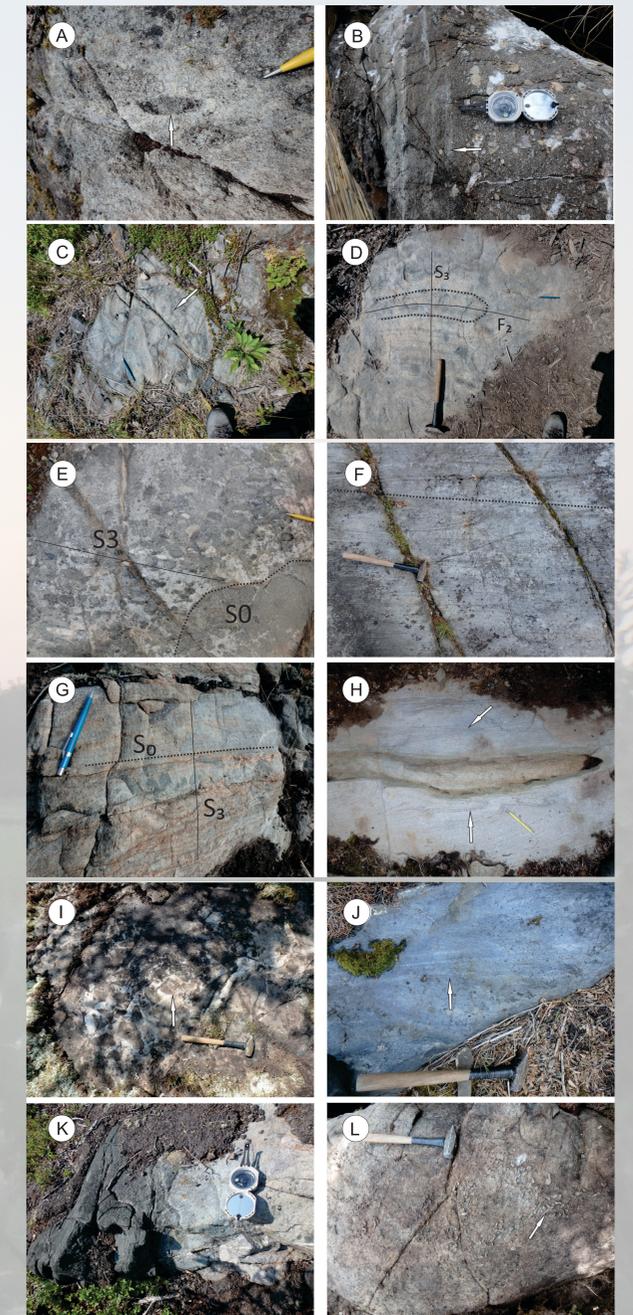


Figure 3: Outcrop photographs from project area – see map Figure 2 for location: a) recessively weathered, subrounded andesite clast (arrow) in an intermediate (dacite) matrix (unit S1; NAD83, UTM Zone 14N, 450513E, 6071429N); b) normally graded rhyolite pebble conglomerate and feldspathic wacke (arrow shows younging direction; unit S3c; UTM 452299E, 6063126N); c) amygdaloidal pyroxene- and plagioclase-phyric pillow fragments (arrow; unit S4; UTM 453770E, 6059601N); d) isoclinally folded (F2), plagioclase-crystal-rich mafic tuff cut by S3 foliation (unit S4; UTM 453781E, 6059863N); e) weak clast flattening defines S3 foliation relative to bedding contact (S0) between clast-supported polymictic conglomerate and feldspathic arenite (unit M1; UTM 453428E, 6061649N); f) trough crossbedded, magnetite-rich, feldspathic arenite with approximate strike of the bedding surface (S0; unit M2a; UTM 452534E, 6063202N); g) planar bedding (S0) is defined by biotite seams/hematite whereas the orientation of biotite perpendicular to bedding defines the S3 foliation (unit M2c; UTM 453554E, 6062724N); h) trough crossbedded feldspathic arenite with a possible concretion or volcanic dropstone – note contorted bedding stratigraphically below (lower arrow) but not above the structure (upper arrow; unit M2a; UTM 452727E, 6062969N); i) granitic (unit P2) intrusive breccia with subangular gabbro (unit G1) fragments (arrow) east of Puella Bay (UTM 455243E, 6062910N); j) feldspar-phyric dacite dike with flow layering (arrow) in feldspathic arenite (unit L3; UTM 452534E, 6063202N); k) gabbro dike cutting feldspathic arenite (unit L2; UTM 452951E, 6063741N); l) feldspar porphyritic (arrow) granodiorite (unit L1; UTM 453305E, 6060394N).