

# Update on bedrock geology of the west Reed Lake area (part of NTS 63K10)

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#### Introduction

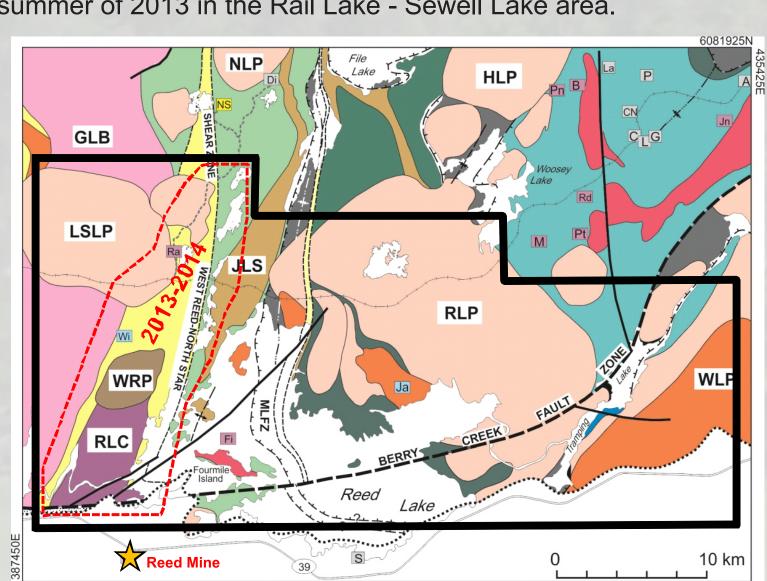
Significant stratigraphic, geochemical and isotopic differences exisit between the arc rocks in the Flin Flon and Snow Lake areas (Stern et al., 1995a). These suggest that the two segments of the Flin Flon belt formed in distinct tectonic settings (Lucas et al., 1996). The Reed Lake region represents a critical area of the Flin Flon belt, as it lies at the boundary between the Amisk collage sensu stricto and the Snow Lake segment. The Reed Lake area also includes the Fourmile Island assemblage (FIA), an arc-type bimodal succession of volcanic and volcaniclastic rocks that hosts several volcanogenic massive sulphide (VMS) deposits, including the recently discovered Reed Lake Cu-Zn deposit. Previous geological work (Leclair et al., 1997; Leclair and Viljoen, 1997) and geophysical data show that arc-related volcanic rocks extend south of Reed Lake beneath the Phanerozoic cover for a distance of more than 50 km. Therefore, gaining a better understanding of the geology of arc-related volcanic rocks of the exposed basement in the Reed Lake area will provide insight for base-metal exploration in the Reed Lake area and in the sub-Phanerozoic basement immediately south of Reed Lake. The Reed Lake area was the focus of a four-week reconnaissance study in the summer of 1995 (Syme et al., 1995b, a). The study enabled significant improvement in our understanding of the geology of the Reed Lake area. However, the geological investigation was limited to shoreline exposure on Reed Lake and roadcuts along the abandoned Chisel railbed, with some inland 1:50 000 scale bedrock mapping on the west side of Reed Lake (Morrison et al., 1996).

# Project objectives

The geological investigation of the Reed Lake area aims to characterize the various packages of volcanic rocks, refine our understanding of their tectonic setting, and increase our knowledge of the various granitic and mafic-ultramafic intrusions of the area. The stratigraphy of the supracrustal rocks will be a focus of the study as this will help gain a better knowledge of the VMS potential of the area and help refine our understanding of the deformational history of the belt. In that purpose, geological mapping was initiated during the summer of 2013 in the Rail Lake - Sewell Lake area.

Further fieldwork was conducted this past summer in e West Reed Lake area. The main focus for 2014 was to nvestigate the large package of tectonites belonging to the West Reed - North Star shear zone (yellow unit in map o the right) and try to further subdivide the rocks. Detailed sampling along several transects through the Reed Lake Complex (RLC) and the West Reed Pluton (WRP) was eted. The area mapped in 2013-2014 is shown as red outline in the map to the right.

this study will add to our understanding of the tectonic evolution of the central Flin Flon Belt and its economic potential.

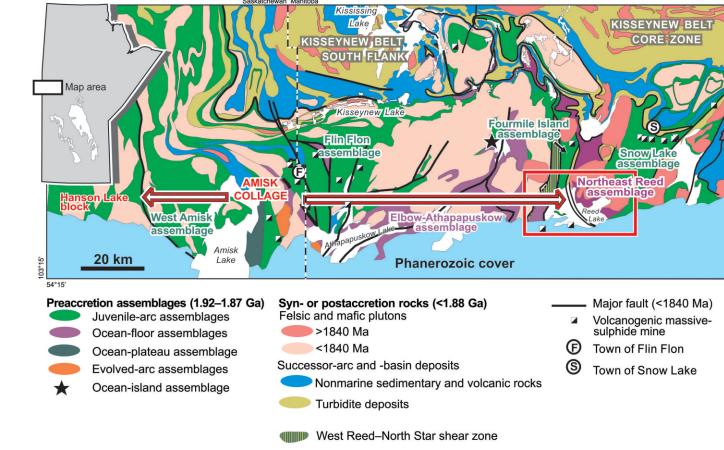


### **Project Location**

The Reed Lake area is located in the central part of the Flin Flon belt, which consists of a collage of distinct Paleoproterozoic (1.92–1.88 Ga) tectonostratigraphic formed the basement to widespread postaccretion magmatism, between 1.87 and 1.83 Ga which produced voluminous calcalkaline plutons and calcalkaline—alkaline volcanic rocks (Lucas et al., 1996). Younger sedimentary and subordinate volcaniclastic and volcanic rocks (1.85–1.83 Ga Missi calcalkaline–alkaline volcanic rocks (Lucas et al., 1996). Younger sedimentary and subordinate volcaniclastic and volcanic rocks (1.85–1.83 Ga Missi and Burntwood groups) may represent depositional basins that formed contemporaneously with postaccretion ('successor')

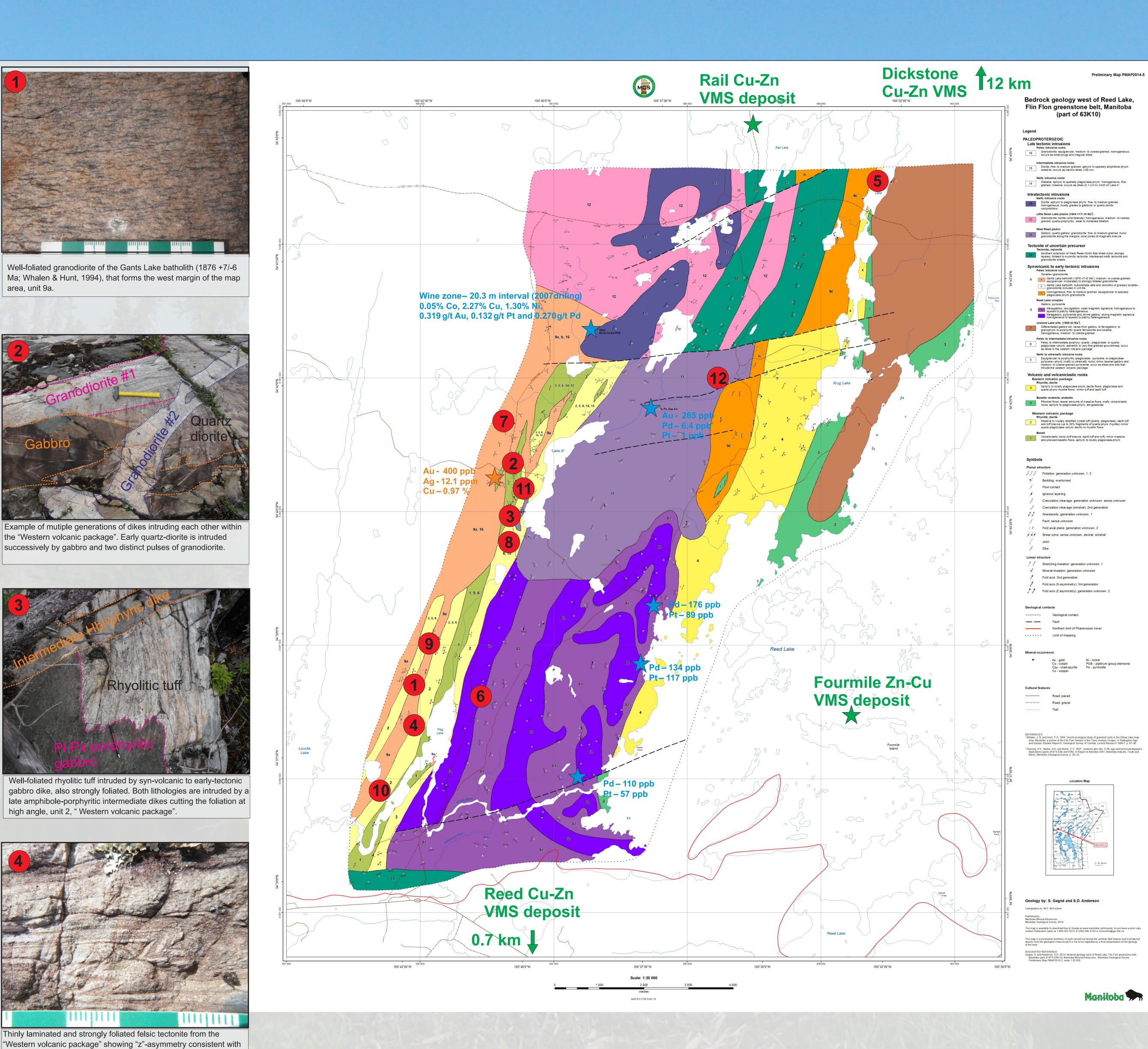
arc magmatism and deformation (Ansdell et al., 1995;

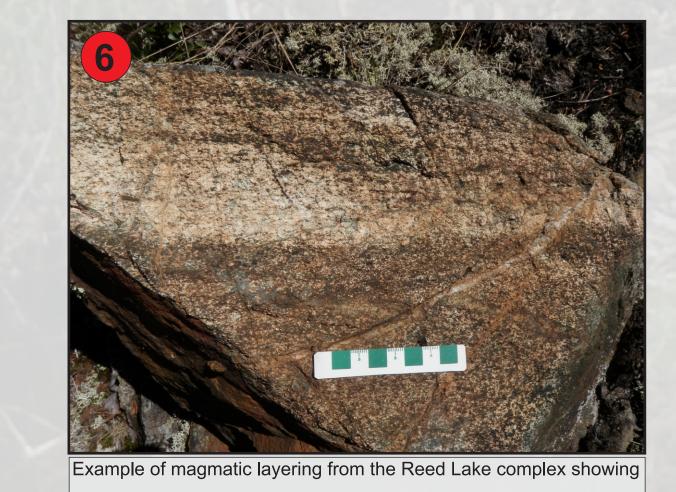
Lucas et al., 1996).



# Geology summary

The 2014 map area is underlain by two south-trending packages of bimodal volcanic and volcaniclastic rocks that flank the Reed Lake complex (RLC) and are intruded by the West Reed pluton (WRP). Toward the north, the western package is truncated by a late fault and appears to have been eliminated north of this structure by granitoid intrusions. North of the fault, the eastern package is bounded on the west by layered tectonite of the West Reed–North Star shear zone (WRNS). The eastern package is geochemically similar to volcanic-arc rocks of the Fourmile Island assemblage, host to severa Dickstone deposit to Reed Lake. The western package is geochemically distinct from the eastern package but likewise characterized by arc signatures typical of VMS-hosting volcanic sequences throughout the Flin Flon belt. The western part of the early 'juvenile arc' assemblage. The presence of arc-affinity rocks on both sides of the RLC contradicts previous nterpretations of a fundamental tectonic boundary in this location, préviously thought to separate rocks of oceanic affinity including the RLC) on the west from rocks of arc affinity on the east; any such boundary must lie farther west of the study àrea. The RLC is a gabbro-dominated layered intrusion of tholeiitic composition, perhaps representing a fault-bounded pane in the WRNS shear zone, whereas the WRP is a comparatively massive gabbro-leucogabbro intrusion that appears to stitch this shear zone.





gabbro and leuco-gabbro layers, unit 8a, Reed Lake complex.

bservation of a component of dextral transpression overprinting the

flow, observed along the northwest shore of Krug Lake, unit 4,

Eastern Volcanic package".

ain foliation, unit 2, "Western volcanic package",





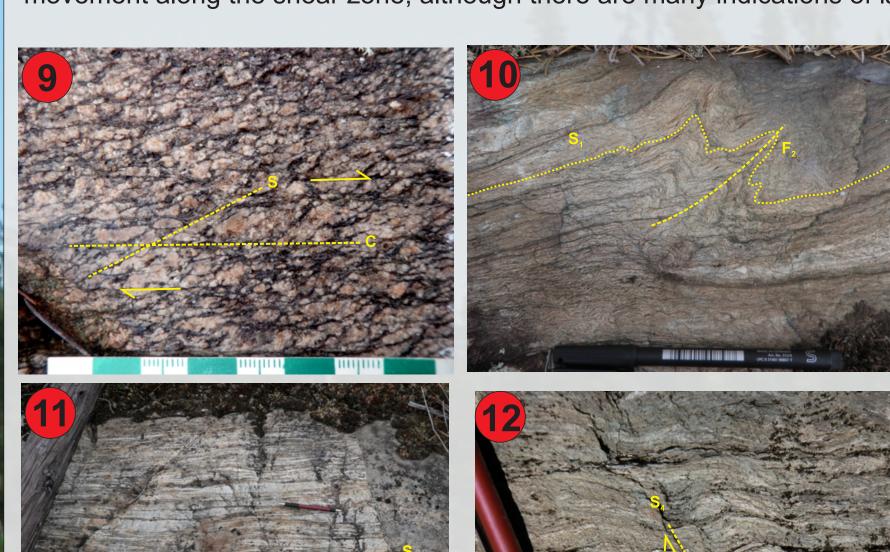
### Structural Geology

The West Reed Lake area is a polydeformed, low-grade part of the Flin Flon belt. The sequence of deformation presented here is based largely on crosscutting relations observed on outcrops.

Graded beds and other primary sedimentary structures in volcaniclastic rocks consistently indicate an overall easterly upright facing direction for both the "Eastern volcanic package", belonging to the FIA, and the "Western volcanic package".

The oldest deformation structure (D1) is a moderately to strongly developed north-trending mineral foliation (S1). The S1 foliation is present throughout the West Reed area. This event deformation may represent an early increment of the West Reed - North Star shear zone.

The second episode of deformation is characterized by a protomylonitic to mylonitic fabric (S2) likely representing reactivation of S1 surfaces. D2 deformation is also characterized by common small scale (2-40 cm amplitude) Z-folds that vary from tight chevron to isoclinal and generally do not have an axial-planar penetrative fabric. The D2 deformation appears to record dextral transpression along the north-northeast-trending WRNS. Shear-sense indicators reveal mainly dextral movement along the shear zone, although there are many indications of later sinistral slip



The third episode of deformation (D3) is characterized by the development of discrete dextral shear zones that strike northeast and are subvertical. Minor S-folds and left-lateral offsets of dikes and quartz veins in zones of reactivated S or S2 fabric may also be related to D3 deformation.

he Berry Creek fault zone contains a 200-300 m wide zone of mafic tectonite and is characterized by an inward-increasing strain gradient along its north margin. The S1 and S2 foliation rotate into ductile increment of deformation that postdates D2 deformation. The timing of ductile deformation along the Berry Creek fault zone is interpreted t be syn D3 to early D4.

A series of late narrow faults (D4) with apparent dextral offset at map scale typically trends eastortheast. These brittle faults clearly cut all earlie foliations. Minor chloritic alteration is locally observed along the walls of the larger brittle

# **Mineral Potential**

VMS mineralization: The Fourmile Island assemblage hosts several VMS deposits within the Reed Lake area. Geochemical data shows that the "Eastern volcanic package" (units 3 & 4) has an identical geochemical signature to FIAtype formations documented in the the Dickstone mine area, located 12 km north of the map area. Hence, the "Eastern volcanic package" is interpreted to have high potential for VMS mineralization. The "Western volcanic package" contains no known base metal mineralization. However, the sequence displays several features considered favorable for the formation of VMS depsits in the Flin Flon belt: 1) bimodal volcanism, 2) geochemical arc-signature, and 3) presence of abundant synvolcanic to pre-tectonic dike indicating a possible extensional environment. Rocks hosting the Reed Lake mine, just south of the map area, have a geochemical signature very similar to that of the Dickstone mine-hosting sequence. This indicate that rocks immediately south of the Berry Creek Shear zone also have a high potential for VMS mineralization.

Magmatic Ni-Cu-Co-PGE mineralization: Both the RLC and the WRP represent prospective targets for PGE exploration. Grab samples collected on a transect along the Grass River indicate minor enrichment of PGE in the basal portion of the RLC (Williamson, 1993). Of 124 grab samples, 24 yielded values above 20 ppb Pt, 32 yielded values of greater than 20 ppb Pd, and 5 showed combined (Pt+Pd) values greater than 100 ppb. The highest reported PGE values were 117 ppb Pt and 176 ppb Pd (Williamson, 1993)

The Wine Ni-Cu-Co-PGE occurrence is located northwest of the RLC and was discovered through drilling of a ground geophysical anomaly by Hudson Bay Exploration and Development Co. Ltd. in the early 1980s. The mineralization is described as disseminated sulphides and stringers associated with a mafic magmatic breccia hosted by leucogabbro (Augsten, unpublished company report, 2006; Assessment Files 94660, 94667, 94669). More recently (2007), Cream Minerals Inc. drilled two additional holes on the property (A.F. 74528). One drillhole returned 0.05% Co, 2.27% Cu, 1.30% Ni, 0.319 g/t Au, 0.132 g/t Pt and 0.270 g/t Pd over 20.36 m (66.8 ft.); the true width was estimated at 13.28 m (43.6 ft.). The north margin of the WRP includes examples of leucogabbro-hosted magmatic breccia, locally associated with trace to a few percent sulphide (pyrrhotite±chalcopyrite), indicating that the WRP may have potential to host mineralization similar to that of the Wine showing.

Although no Au occurrences have been reported in the west Reed Lake area, the WRNS shear zone hosts several significant Au showings farther north in the North Star Lake area. The major structures associated with Au mineralization in the North Star Lake area appear to extend continuously southward to the west Reed Lake area, which is considered to have similar potential for shear-hosted (i.e., orogenic) Au mineralization. Several minor occurrences of sheartype quartz veins were encountered within highly deformed supracrustal rocks along the eastern margin of the Gants Lake batholith. One sample of vein quartz with trace amounts of pyrite, chalcopyrite and malachite, collected from west of 'lake A yielded an assay of 425 ppb Au and 9660 ppm Cu. Quartz vein-hosted Au mineralization is also found in proximity to the Berry Creek fault zone at Bartlett Point, just south of Fourmile Island, as well as along Berry Bay on the east shore of Wekusko Lake, suggesting that this major structure, or one of its subsidiary structures, may also have potential to host Au mineralization in the 2014 map area.

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