



# Multidisciplinary geological fieldwork in the Russell Lake area - Kisseynew domain north flank; Manitoba

T. Martins, C.G. Couëslan and T.J. Hodder



## Summary

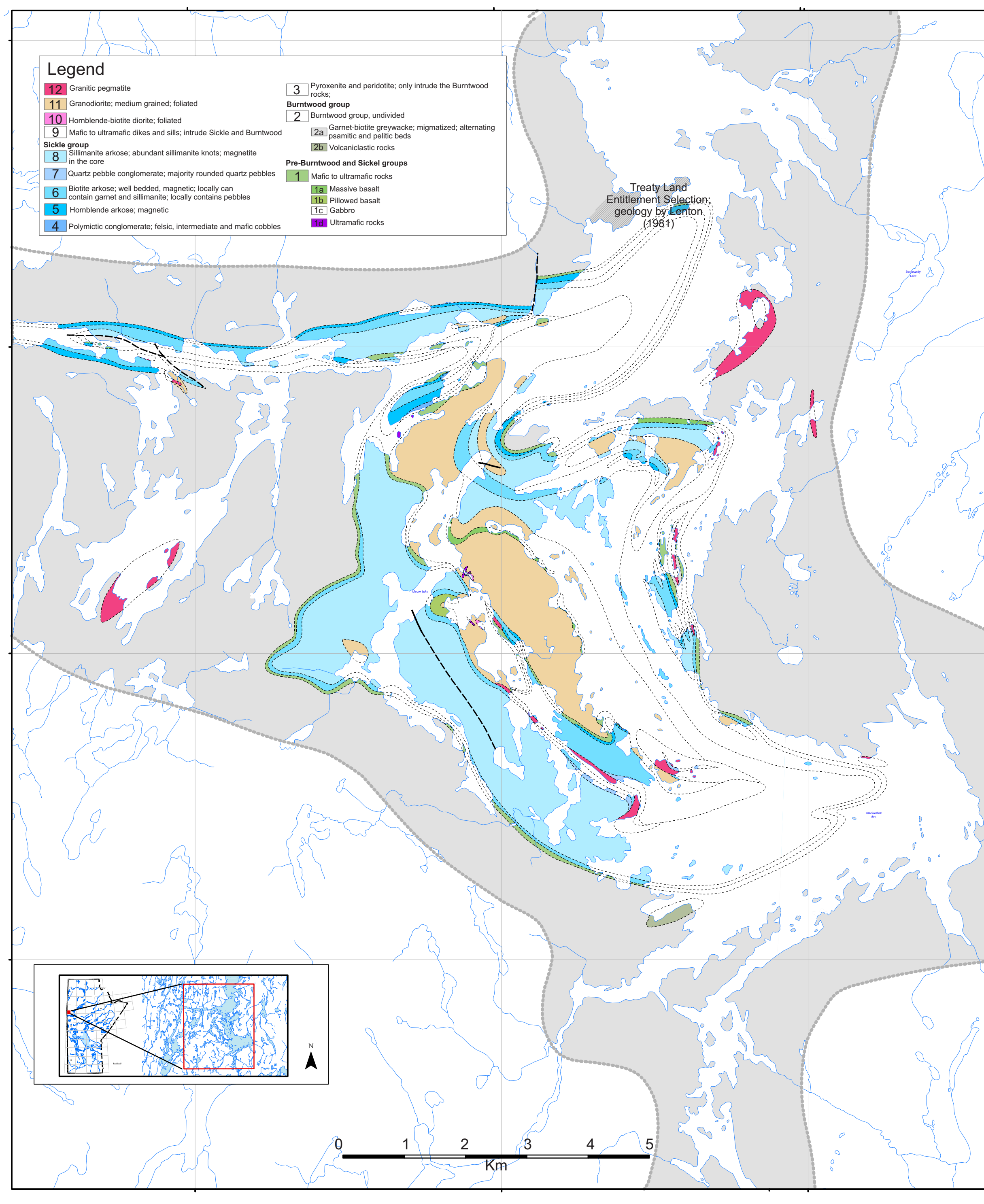
Multidisciplinary geological fieldwork, investigating bedrock and surficial geology, was undertaken by the Manitoba Geological Survey (MGS) in the Russell-McCallum lakes area in 2019.

Bedrock mapping was focused on the central and southern areas of Russell Lake as well as the east-west channel that links Russell Lake to McCallum Lake (Martins and Couëslan, 2019a, b).

Quaternary geology fieldwork included till sampling and ice-flow indicator mapping Hodder (2019). A total of 18 till samples for kimberlite-indicator-mineral (KIM) analyses were collected at a reconnaissance-scale.

Here we present preliminary results from both studies.

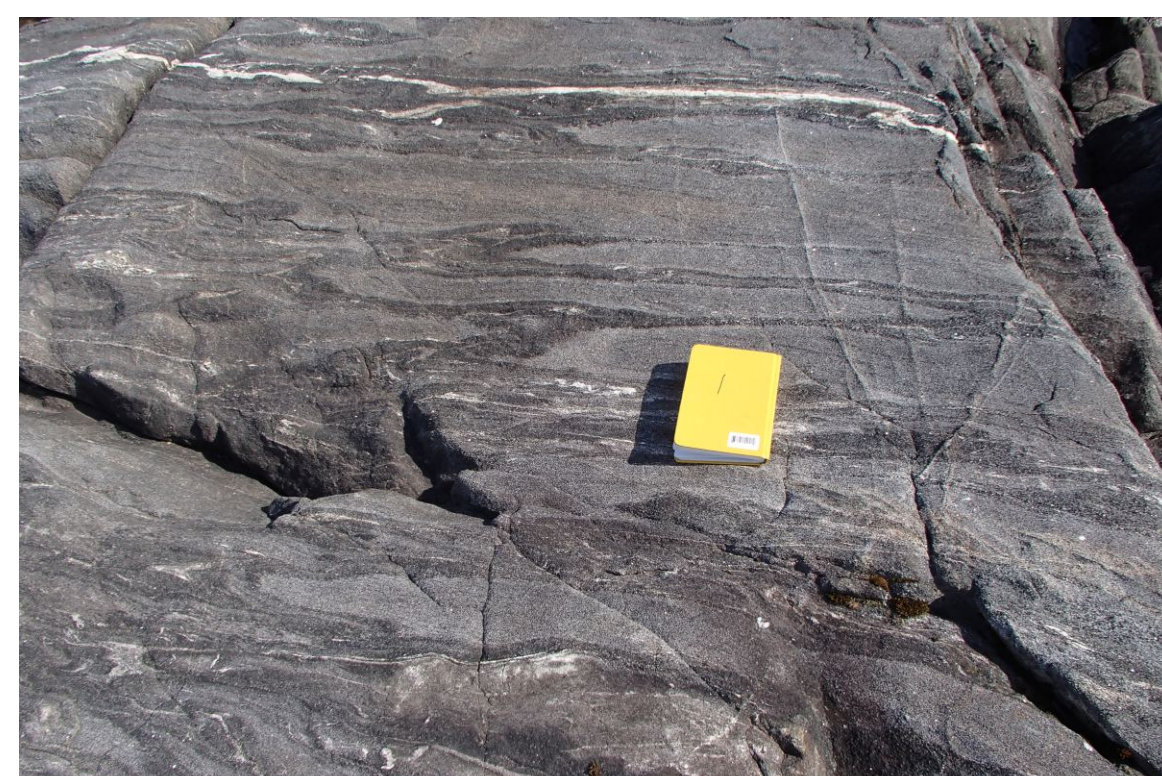
## Bedrock geology of Russell Lake, southern half (NTS 64C3–6)



## Outcrop photographs of representative rock units described at Russell Lake



Massive basalt (**unit 1a**) with garnet partially replaced by plagioclase.



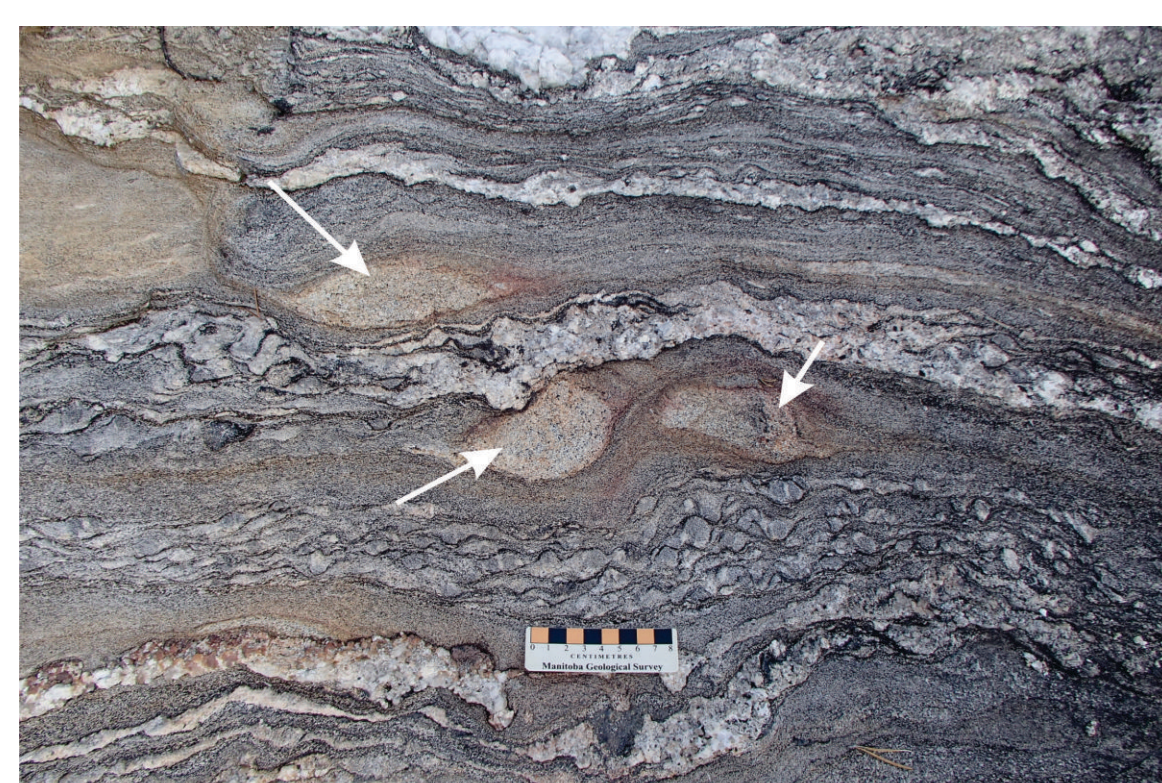
Pillowed basalt (**unit 1b**) characterized by pillow selvages with positive relief.



Peridotite (**unit 1d**) exhibiting knobby-textured surfaces; brown granular groundmass is possibly olivine, with negative relief.



Garnet-biotite greywacke of the Burntwood group (**unit 2a**) showing a rare example of preserved graded bedding.



Rounded felsic clasts (arrows) in garnet-biotite greywacke of the Burntwood group (**unit 2a**).



Fragmental volcanoclastic rock of the Burntwood group (**unit 2b**) with felsic matrix and mafic fragments.



Intrusive breccia (unit 3) with felsic matrix located in the southwest shore of Russell Lake.



Polymictic conglomerate of the Sickle group (**unit 4**) in contact (dashed line) with gabbro along the channel to Moyer Lake.



Well-bedded biotite arkose of the Sickle group (**unit 6**).



Attenuated clasts in the quartz pebble conglomerate of the Sickle group (**unit 7**).

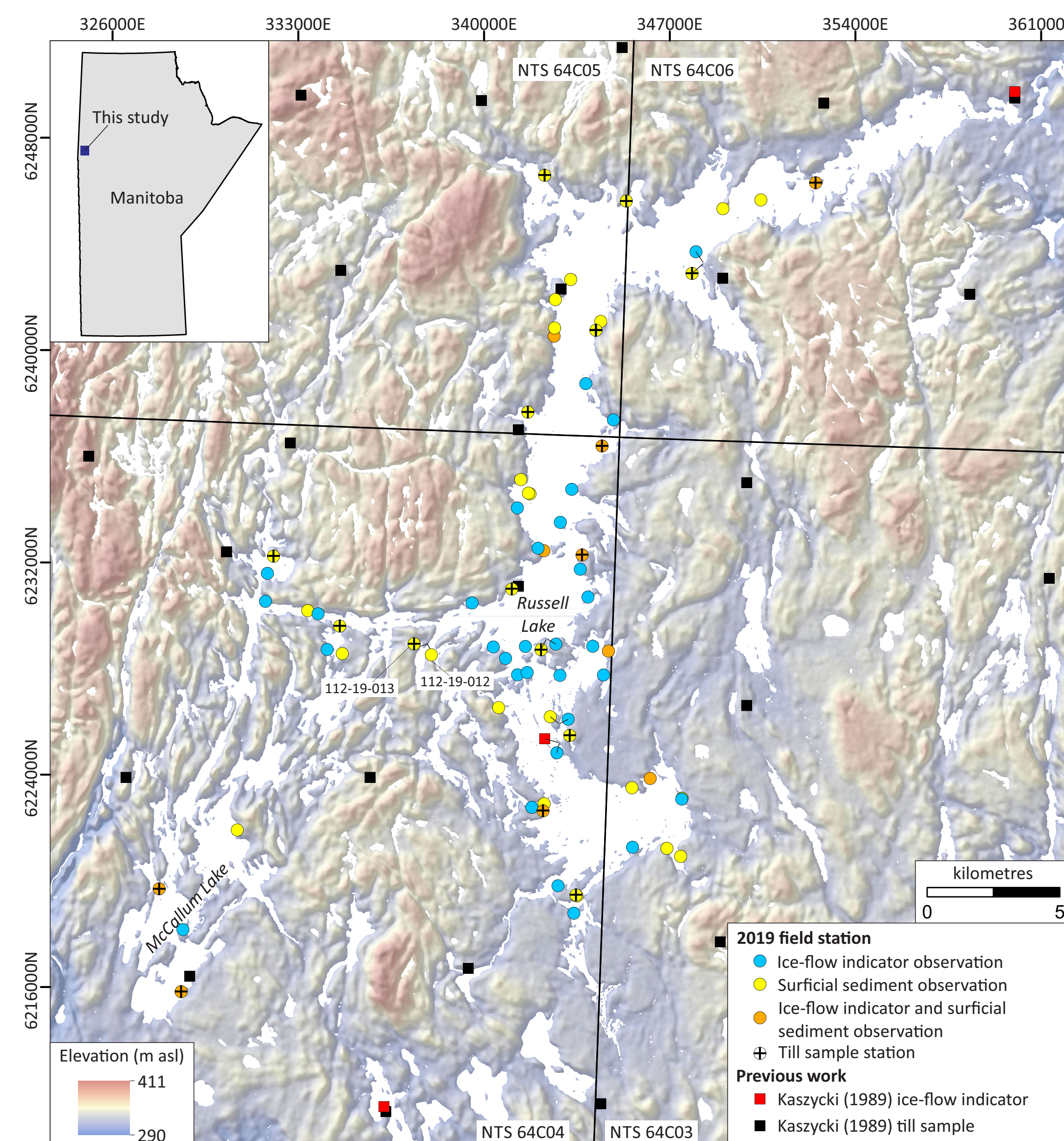


Sillimanite knots in sillimanite arkose (**unit 8**), Sickle group.



Ultramafic dike (unit 9) intruding biotite arkose of the Sickle group.

## Till sampling and ice-flow mapping



2019 field stations and digital elevation model of the Russell-McCallum lakes area (Hodder, 2019).

## Economic considerations

Infrastructure and accessibility are important aspects in any mineral-development project. The Russell-McCallum lakes area is easily accessible by float plane out of Lynn Lake and rail from The Pas, and a power line and two power-generating stations (Laurie River I and II) are situated pnearby.

This area has potential to host several types of deposits:

\* Natural graphite mineralization: up to 0.16 wt. % total carbon reported in pelitic rocks from the Burntwood group; Assessment files from the area reveal that drill testing of geophysical conductors typically resulted in the intersection of graphite mineralization, and graphite is noted in the majority of drill logs;

\* Rare metals: A syenite complex with potential to host rare-earth-element mineralization occurs at Brezden Lake (Martins et al., 2012). Similar intrusions were not observed during the course of the 2019 fieldwork. However, the Kisseynew domain (KD) in general is considered to have potential for these types of intrusions.

\* Diamonds: Archean cratons can be important regional vectors for diamond exploration. In east-central Saskatchewan, two diamond occurrences (the Fort à la Corne kimberlite field and the Pikoo kimberlite) are located in areas thought to be underlain at depth by the mostly buried Archean Sask craton. Some authors have interpreted the Sask craton to extend significantly under the KD, including the Russell-McCallum lakes area (Zwanzig and Bailes, 2010).

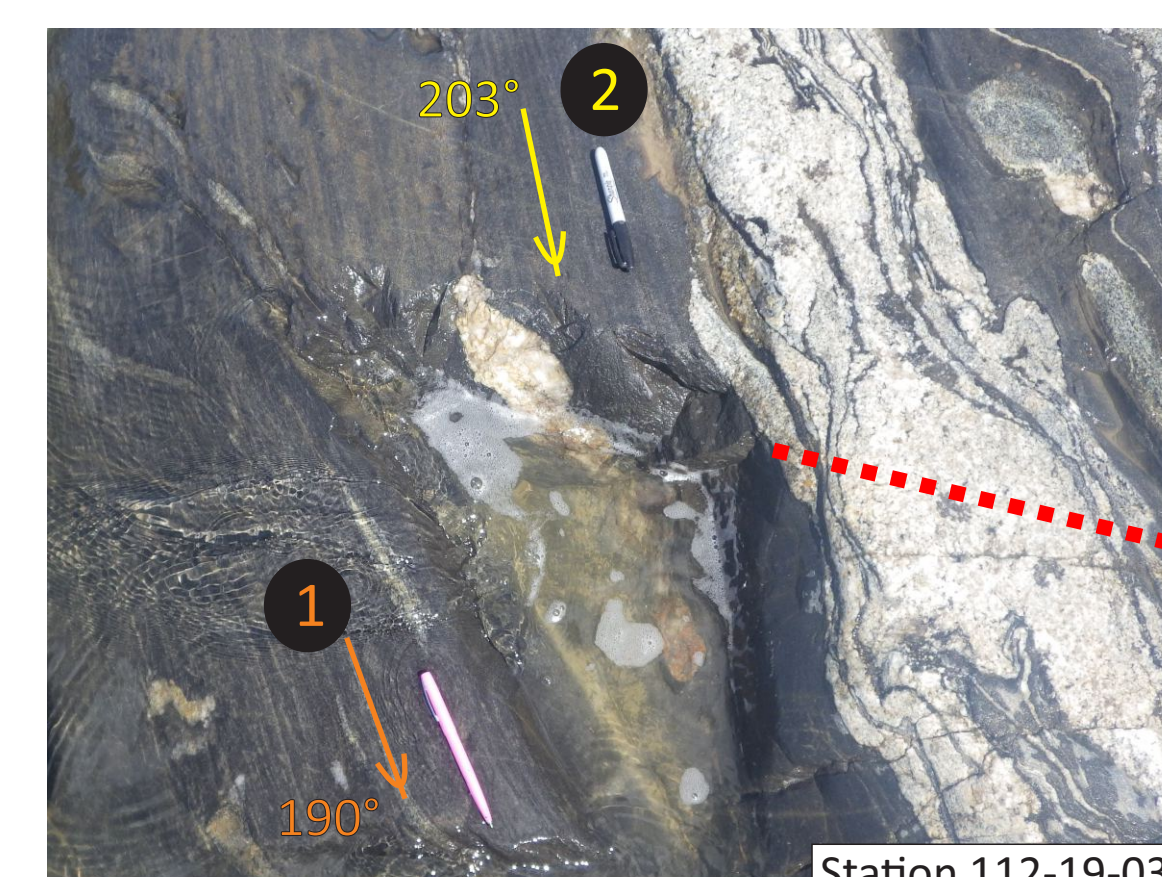
Understanding the surficial geology of Manitoba is essential to facilitate drift prospecting in the province's northern region. Till-sample analysis is commonly used in drift-covered regions to help determine the source area for mineralized erratics and boulder trains, and establish background geochemical signatures. The KIM analysis of till in the Russell-McCallum lakes area will provide the first insight into the diamond potential of the region from an indicator-mineral perspective. The outcomes of these studies are geared toward providing mineral exploration geologists with an up-to-date surficial geology knowledge base and adequate tools to more accurately locate exploration targets in Manitoba's north.

## References

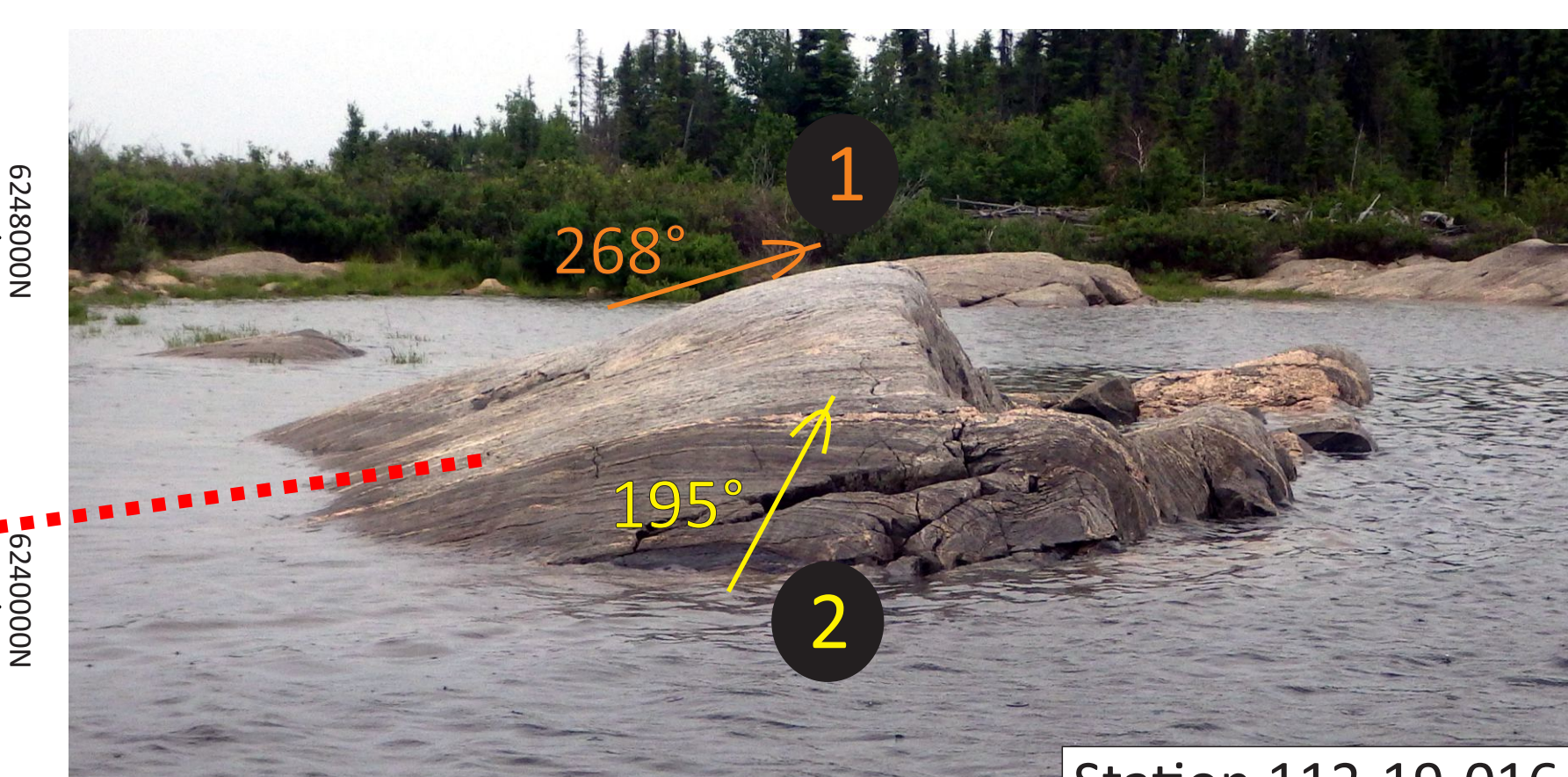
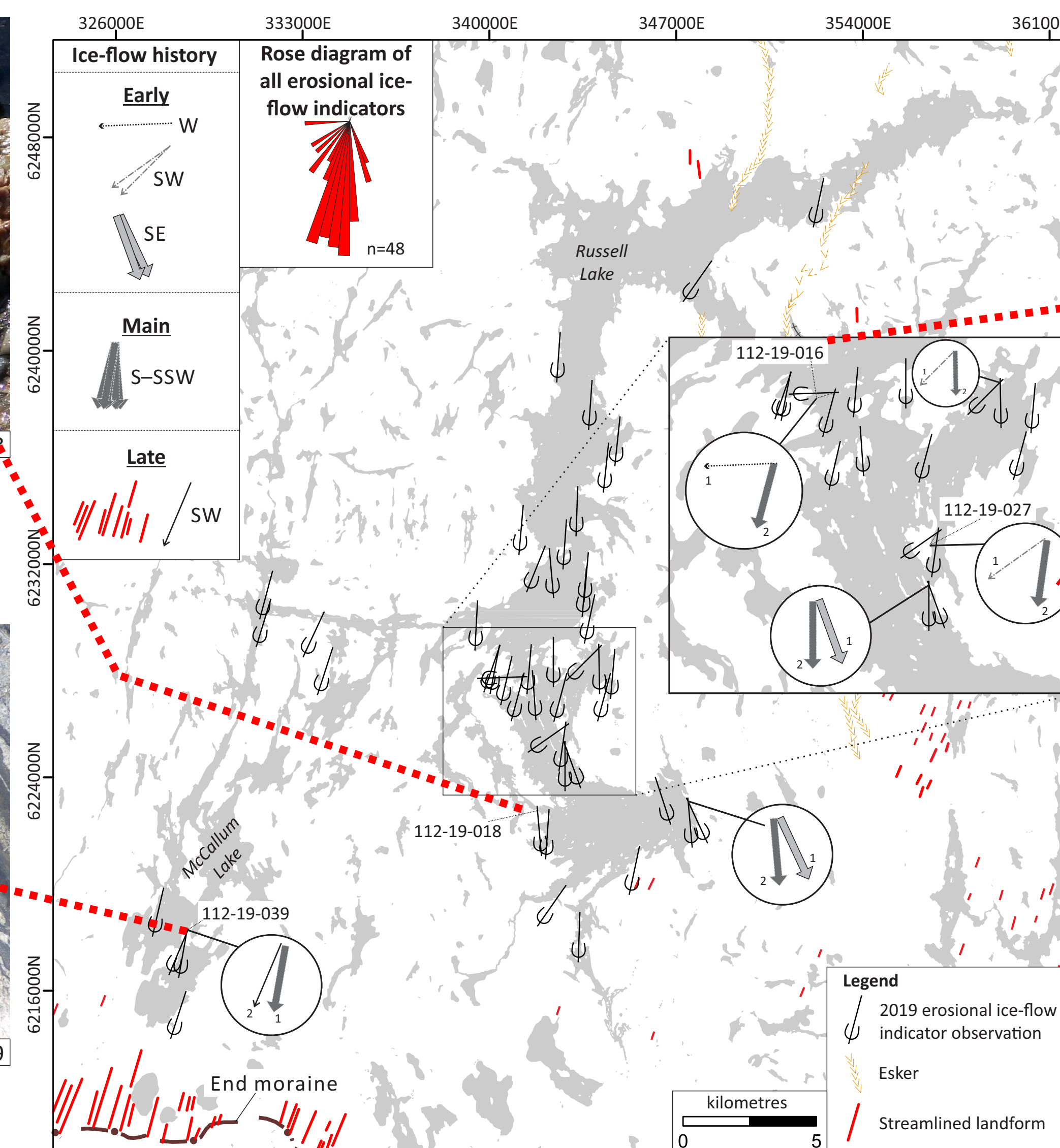
- Hodder, T.J. 2019: Till sampling and ice-flow mapping in the Russell-McCallum lakes area, northwestern Manitoba (parts of NTS 64C3–6); Manitoba Agriculture and Resource Development, Manitoba Geological Survey.
- Lenton, P.G. 1981: Geology of the McKnight-McCallum Lakes area; Manitoba Energy and Mines, Geological Services, Geological Report GR79-1, 39 p.
- Martins, T. and Couëslan, C.G. 2019a: Geological investigations in the Russell-McCallum lakes area, northwestern Manitoba (parts of NTS 64C3–6); in Report of Activities 2019, Manitoba Agriculture and Resource Development, Manitoba Geological Survey, p. 30–41.
- Martins, T. and Couëslan, C.G. 2019: Bedrock geology of the Russell-McCallum lakes area, northwestern Manitoba (parts of NTS 64C3–6); Manitoba Agriculture and Resource Development, Manitoba Geological Survey, Preliminary Map PMAP2019-3, scale 1:20 000.
- Martins, T., Couëslan, C.G. and Böhm, C.O. 2012: Rare metals scoping study of the Brezden Lake intrusive complex, western Manitoba (part of NTS 64C4); in Report of Activities 2012, Manitoba Innovation, Energy and Mines, Manitoba Geological Survey, p. 115–123.
- Zwanzig, H.V. and Bailes, A.H. 2010: Geology and geochemical evolution of the northern Flin Flon and southern Kisseynew domains, Kisseynew-File lakes area, Manitoba (parts of NTS 63K, N); Manitoba Innovation, Energy and Mines, Manitoba Geological Survey, Geoscientific Report GR2010-1, 135 p.



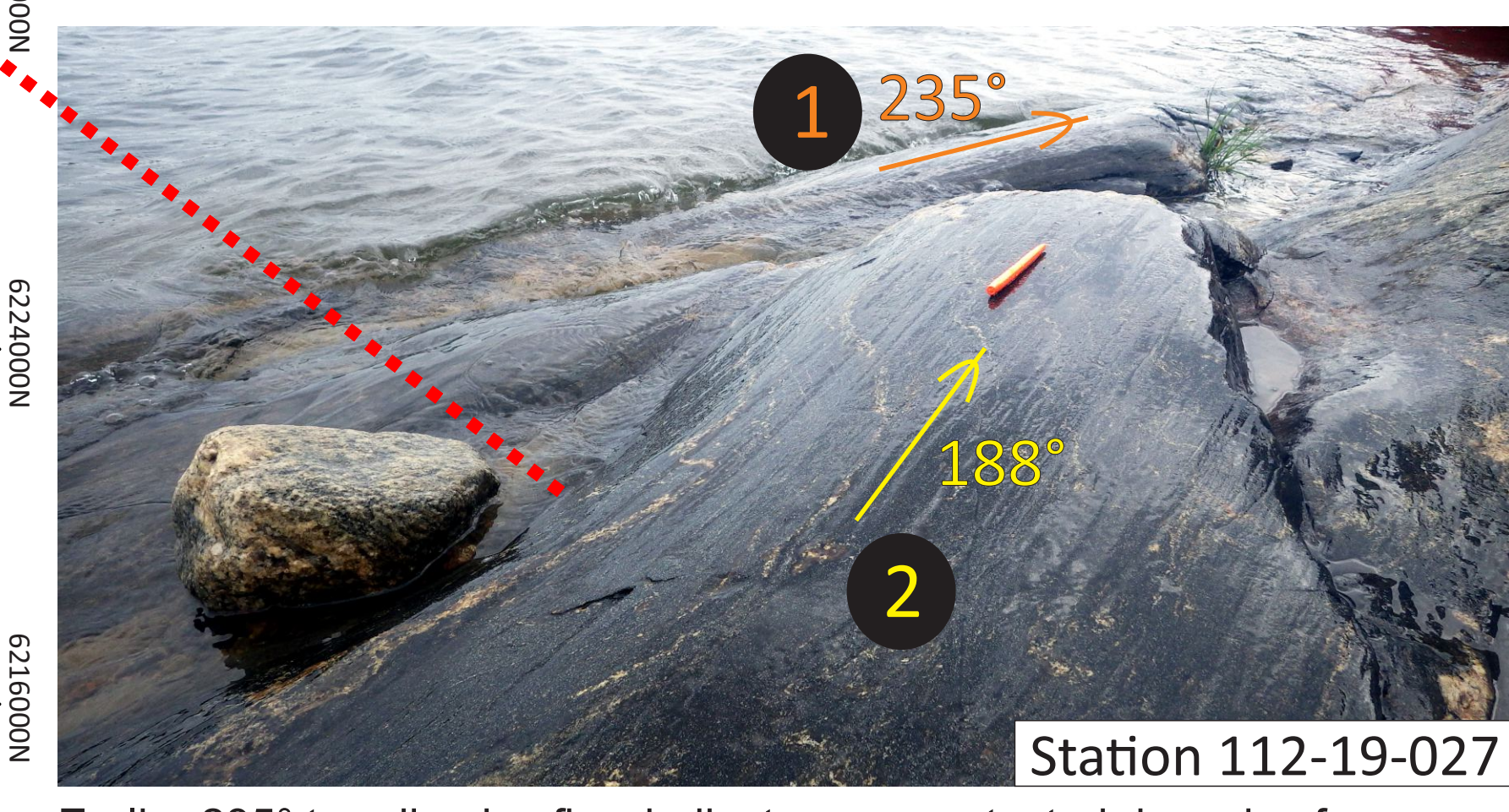
Striations indicating 175° trending ice flow were observed on a quartz-feldspar dike, a bedrock type that is more resistant to postglacial subaerial weathering.



Earlier 190° trending ice-flow indicator was protected on a down-ice facet from later 203° trending ice flow



Roche moutonnée indicating 268° ice-flow indicator was overprinted by grooves indicating a later 195° trending ice flow



Earlier 235° trending ice flow indicator was protected down-ice from a later 188° trending ice flow

**THE CANADIAN MINERALS AND METALS PLAN**

As a component of the Canadian Minerals and Metals Plan, the National Geological Surveys Committee is seeking your input on the development of a Pan-Canadian Geoscience Strategy.

Please take a few minutes to complete the survey, accessible with this QR Code.

Simply point your smartphone camera to the code and fill out the survey.

**Pan-Canadian Geoscience Strategy Survey**

**We want to hear from you!**