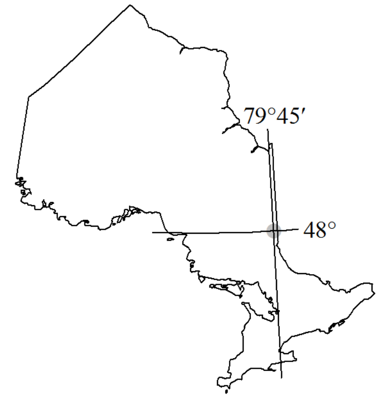
37. Preliminary Results from Mapping a New Exposure of the Basal Unconformity Between the Hearst and Larder Lake Assemblages, Skead Township, Northeastern Ontario



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INTRODUCTION

This work is part of the multiyear Metal Earth project carried out by MERC (Mineral Exploration Research Centre, Laurentian University, Sudbury) to refine the geological knowledge of the Abitibi greenstone belt. The southern portion of the Larder Lake transect, part of the larger Metal Earth project, crosses through Skead, Hearst, McVittie and Katrine townships in northeastern Ontario. The Larder Lake transect was designed to address regional geologic problems related to the overall stratigraphic and structural framework of the area. As part of the Metal Earth 2017 summer field program, geological mapping was undertaken in Skead Township, approximately 12 km southeast of the town of Larder Lake. The purpose of this targeted mapping was to provide further insight into the nature and timing of the Hearst assemblage clastic sedimentary rocks and their relationship to the Larder Lake assemblage, a predominantly older succession of mafic to ultramafic volcanic rocks.

REGIONAL GEOLOGY

Skead Township has been mapped on a regional scale by Hewitt (1949, 1951) and later by Jackson (1995). The geology is dominated by older mafic and felsic volcanic rocks, mapped by Hewitt (1949) as the Keewatin Formation, that are overlain unconformably by younger sedimentary rocks ranging from conglomerates to mudstones. The volcanic rocks underlie the majority of the study area, with smaller northwest-trending sedimentary packages (Hewitt 1949) present locally. Although Hewitt recognized differences between the sedimentary rocks north of the Larder–Cadillac deformation zone (LCDZ) and those in Skead Township, he considered all sedimentary units as Timiskaming in age. This classification was revised by Ridler (1970) and Jensen (1985), who considered the sedimentary packages south of the LCDZ as part of the Larder Lake group. The rationale for this distinction is the variation in clast composition, as there is a distinct lack of red jasperoid clasts and trachyte clasts in the sedimentary belts south of the LCDZ, suggesting different provenances. Jackson (1995) further divided the Larder Lake group and assigned the sedimentary rocks south of the LCDZ to the Hearst assemblage, which he described as turbiditic, in contrast to the Timiskaming alluvial-fluvial sedimentary units with associated alkali volcanic rocks (Jackson and Fyon 1991). The tholeiitic basalts, komatiitic basalts and ultramafic komatiites in northern Skead Township were considered by Jackson (1995) to be part of the Larder Lake assemblage. Thurston et al. (2008) further refined the stratigraphy into 7 discrete volcanic episodes, rather than assemblages; their terminology is used here.

Summary of Field Work and Other Activities 2017,
Ontario Geological Survey, Open File Report 6333, p.37-1 to 37-7.

The Lincoln–Nipissing shear zone trends west-northwesterly through the north-central part of Skead Township. This shear zone is poorly exposed and is better seen as a pronounced magnetic feature on geophysical maps. Numerous mafic to felsic alkalic stocks and associated gold prospects are related to the shear zone (Brace and Sherlock, this volume). The Lincoln–Nipissing shear zone marks a break in stratigraphy. To the south of the shear zone (Figure 37.1) is a uniform northwest-striking, northeast-younging volcanic succession with the Pacaud assemblage (*circa* 2750 Ma; 2750–2735 Ma volcanic episode) at its base and the Skead and McElroy assemblages (*circa* 2700 Ma; 2704–2695 Ma volcanic episode, or Blake River assemblage) at the top (Jackson 1995; Thurston et al. 2008). To the north of the shear zone are rocks of the older Larder Lake assemblage (*circa* 2705 Ma; 2710–2704 Ma volcanic episode, or Tisdale assemblage), which are unconformably overlain by clastic sedimentary rocks of the Hearst (>2700 Ma) and potentially Timiskaming (2677–2670 Ma) assemblages (Hewitt 1949; Jackson 1995; Thurston et al. 2008). In addition to the juxtaposition of strata of different ages, the style of

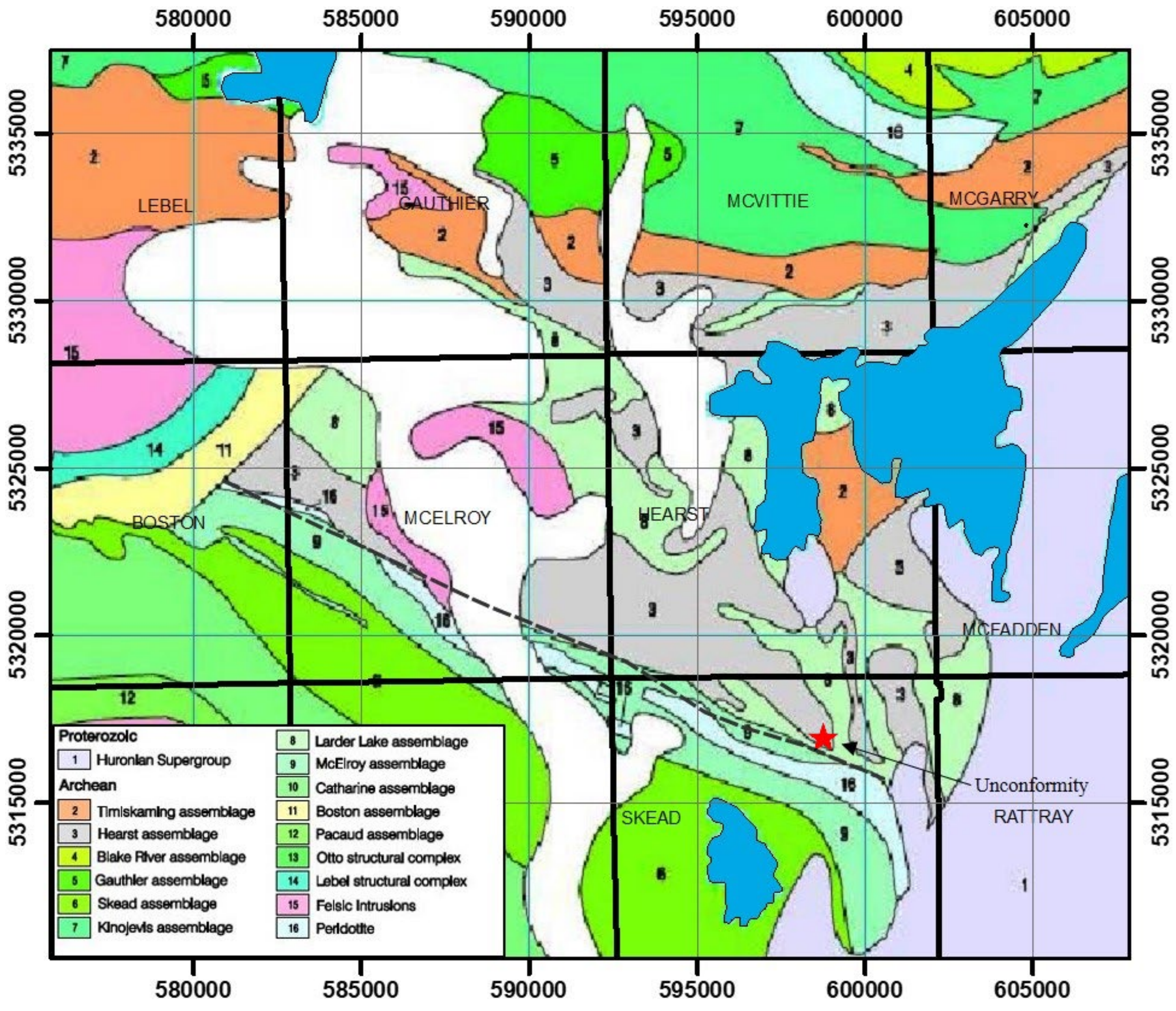

Figure 37.1. Geological map of the Larder Lake area (*after* Jackson 1995) outlining the various assemblages underlying the area. Also shown is the approximate location of the inferred Lincoln–Nipissing shear zone (thick black dashed line) and the recently discovered unconformity (red star) in northern Skead Township. Note the presence of several sedimentary packages north of the shear zone, but their absence south of the shear zone. Universal Transverse Mercator (UTM) co-ordinates are provided using North American Datum 1983 (NAD83) in Zone 17N. Deep blue areas represent lakes; white areas are till.

deformation is different north of the shear zone, with complex fold geometries to the north that are not recognized south of the shear zone. This change in stratigraphy and structural framework at the Lincoln–Nipissing shear zone is poorly understood.

FIELD WORK AND OBSERVATIONS

The sedimentary packages that underlie the northeastern part of Skead Township (Figure 37.2), north of the Lincoln–Nipissing shear zone, are dominated by mudstone to sandstone, with local interbedded conglomerates. The conglomerates are typically matrix-supported and polymict, with rounded to subangular gabbroic, syenitic, granitic, basalt, quartz vein, sedimentary and sulphidized clasts. The deformation in these rocks is weak, but is best recorded in the conglomerates, in which clasts are locally stretched and elongated. This stretching and elongation fabric plunges steeply to the northwest.

A recently uncovered outcrop in the northeastern part of Skead Township exposes the basal contact between the sedimentary rocks and the underlying Larder Lake assemblage ultramafic volcanic rocks (Figure 37.3). The underlying komatiite is fine grained, with polyhedral, serpentinized joints and common coarse-grained spinifex textures. The overlying basal conglomerate is matrix supported and contains angular to subangular clasts up to 90 cm across composed predominantly of veined granitoid and spinifex-textured komatiite clasts in a silty to muddy matrix (Photo 37.1). The limited variety in clast composition and their angularity indicates a proximal source. The syenite stocks mapped by Brace and Sherlock (this volume) in the area are a potential source for these clasts, because they exhibit similar mineralogy, sulphide mineralization and veining.

Photo 37.1. Contact (thick black dashed line) between the komatiite flow and the basal conglomerate. The sharp, well-preserved contact shows little to no strain. The basal conglomerate here is composed of angular komatiitic and granitoid clasts in a very fine-grained silty to muddy matrix. Compass indicates north. Location: UTM 605343E 5332095N, NAD83, Zone 17N.

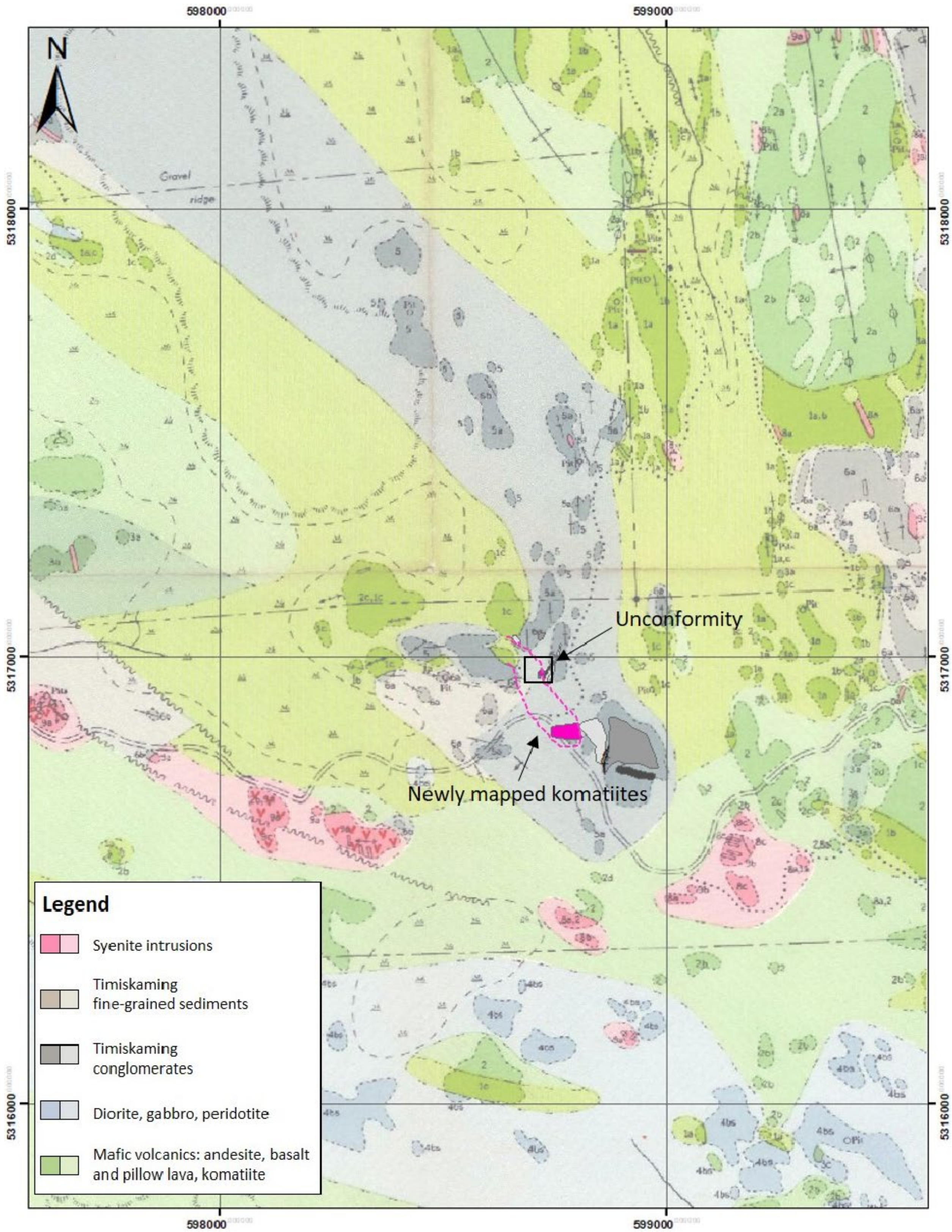

Figure 37.2. Geology of northern Skead Township (*modified after* Hewitt 1949). Outcrops mapped during the 2017 field season are overlain on Hewitt's geology. The location of the unconformity and the outline of the newly mapped komatiite units within the sedimentary rocks are also indicated. The UTM co-ordinates are provided using NAD83 in Zone 17N.

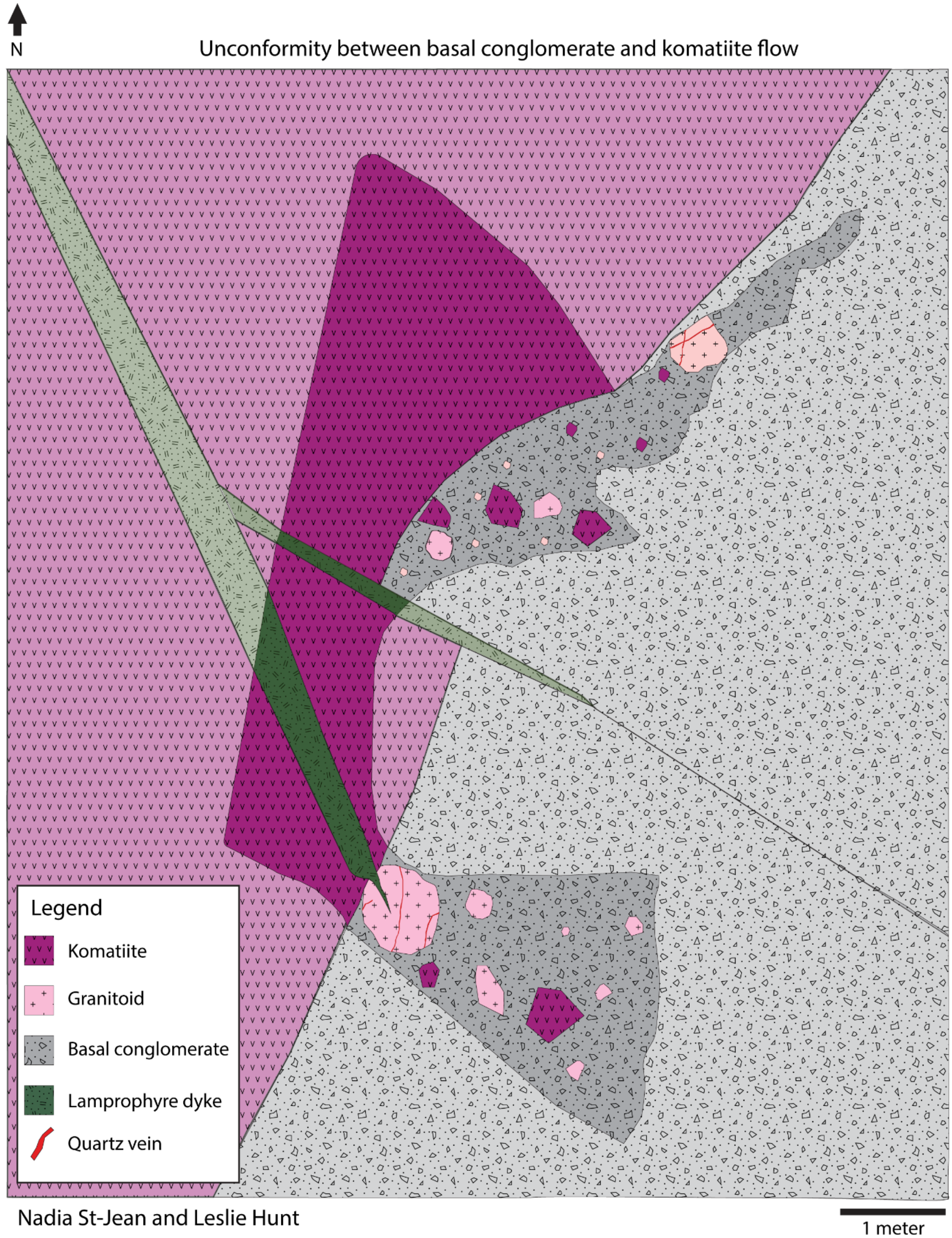

Figure 37.3. Detailed map of the recently exposed unconformity between a Keewatin komatiite flow and a basal conglomerate. The basal conglomerate is composed of angular to subrounded komatiitic and veined granitoid clasts. Both units are later crosscut by lamprophyre dikes of unknown age. Darker colours show the extent of the exposed outcrop; lighter colours show the extrapolated geological interpretation.

Away from the contact, the conglomerates become increasingly polymict, with a wider range of clast compositions that includes gabbro, mudstone, fine-grained mafic rock, granitoid and minor sulphidized clasts. Facing directions in the adjacent pebble and cobble conglomerates indicate younging to the east, away from the contact, consistent with the interpreted stratigraphic relationship.

FUTURE WORK

Samples were collected from granitic boulders in the basal conglomerate for geochronological analysis. Samples were also collected from surrounding conglomerates and sandstones, and detrital zircons from these samples will also be analyzed for geochronology. This study seeks to place the sedimentary rocks into context within the local and regional stratigraphy.

Additional mapping in 2018 will trace the contact between the sedimentary rocks and the komatiite along strike and in different locations, to determine the extent of the komatiite flows and to place the unconformity in a more regional structural and stratigraphic context.

RELEVANCE

The presence of large areas dominated by Timiskaming-like sediments south of the LCDZ is generally restricted to McElroy, Hearst and Skead townships (Hewitt 1963; *see* Figure 37.1). The varying interpretations and confusion surrounding the provenance of these sedimentary packages in Skead and Hearst townships warrants further work, which will contribute to the overall interpretation of the stratigraphy along Metal Earth's Larder Lake transect.

The presence of an unconformity between the Hearst assemblage sedimentary rocks and Larder Lake assemblage volcanic rocks in the north part of Skead Township was recognized by Hewitt (1963) at several locations. The basal sedimentary unit was mapped as a basal "grit", composed mainly of mafic, fine-grained material in the north, and a pebble conglomerate farther south (Hewitt 1963). At the time of Hewitt's (1949) regional mapping, the concept of komatiite flows was not yet developed, therefore, any ultramafic units were mapped as mafic volcanic rocks of the Keewatin Formation. Consequently, the presence of an unconformity between komatiite flows and conglomerates has not yet been documented in this area. This relationship could bring further insight into the depositional environment of the basin at the time of sedimentation and may have implications for development of the LCDZ.

ACKNOWLEDGMENTS

The author would like to thank the Gold Candle and Metal Earth teams for their assistance in uncovering the unconformity. Special thanks to Howard Poulsen for his visit to the site and discussions of regional implications. This is MERC Metal Earth publication number MERC-ME2017-005.

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ISSN 1916-6117 (online)
ISBN 978-1-4868-0716-1 (PDF)
(for entire OFR 6333)

ISSN 0826-9580 (print)
ISBN 978-1-4868-0715-4 (print)
(for entire OFR 6333)

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St-Jean, N., Hunt, L. and Sherlock, R.L. 2017. Preliminary results from mapping a new exposure of the basal unconformity between the Hearst and Larder Lake assemblages, Skead Township, northeastern Ontario; *in* Summary of Field Work and Other Activities, 2017, Ontario Geological Survey, Open File Report 6333, p.37-1 to 37-7.

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