

THESE TERMS GOVERN YOUR USE OF THIS DOCUMENT

Your use of this electronic information product (“EIP”), and the digital data files contained on it (the “Content”), is governed by the terms set out on this page (“Terms of Use”). By opening the EIP and viewing the Content, you (the “User”) have accepted, and have agreed to be bound by, the Terms of Use.

EIP and Content: This EIP and Content is offered by the Province of Ontario’s *Ministry of Northern Development and Mines* (MNDM) as a public service, on an “as-is” basis. Recommendations and statements of opinions expressed are those of the author or authors and are not to be construed as statement of government policy. You are solely responsible for your use of the EIP and its Content. You should not rely on the Content for legal advice nor as authoritative in your particular circumstances. Users should verify the accuracy and applicability of any Content before acting on it. MNDM does not guarantee, or make any warranty express or implied, that the Content is current, accurate, complete or reliable or that the EIP is free from viruses or other harmful components. MNDM is not responsible for any damage however caused, which results, directly or indirectly, from your use of the EIP or the Content. MNDM assumes no legal liability or responsibility for the EIP or the Content whatsoever.

Links to Other Web Sites: This EIP or the Content may contain links, to Web sites that are not operated by MNDM. Linked Web sites may not be available in French. MNDM neither endorses nor assumes any responsibility for the safety, accuracy or availability of linked Web sites or the information contained on them. The linked Web sites, their operation and content are the responsibility of the person or entity for which they were created or maintained (the “Owner”). Both your use of a linked Web site, and your right to use or reproduce information or materials from a linked Web site, are subject to the terms of use governing that particular Web site. Any comments or inquiries regarding a linked Web site must be directed to its Owner.

Copyright: Canadian and international intellectual property laws protect the Content. Unless otherwise indicated, copyright is held by the Queen’s Printer for Ontario.

It is recommended that reference to the Content be made in the following form:

Magnus, S.J. 2016. Geological, geochemical, geophysical, geochronological and petrographic data from the Lang Lake greenstone belt, central Uchi Domain, Superior Province; Ontario Geological Survey, Miscellaneous Release—Data 328.

Use and Reproduction of Content: The EIP and the Content may be used and reproduced only in accordance with applicable intellectual property laws. *Non-commercial* use of unsubstantial excerpts of the Content is permitted provided that appropriate credit is given and Crown copyright is acknowledged. Any substantial reproduction of the Content or any *commercial* use of all or part of the Content is prohibited without the prior written permission of MNDM. Substantial reproduction includes the reproduction of any illustration or figure, such as, but not limited to graphs, charts and maps. Commercial use includes commercial distribution of the Content, the reproduction of multiple copies of the Content for any purpose whether or not commercial, use of the Content in commercial publications, and the creation of value-added products using the Content.

Contact:

FOR FURTHER INFORMATION ON	PLEASE CONTACT:	BY TELEPHONE:	BY E-MAIL:
The Reproduction of the EIP or Content	MNDM Publication Services	Local: (705) 670-5691 Toll-Free: 1-888-415-9845, ext. 5691 (inside Canada, United States)	Pubsales.ndm@ontario.ca
The Purchase of MNDM Publications	MNDM Publication Sales	Local: (705) 670-5691 Toll-Free: 1-888-415-9845, ext. 5691 (inside Canada, United States)	Pubsales.ndm@ontario.ca
Crown Copyright	Queen’s Printer	Local: (416) 326-2678 Toll-Free: 1-800-668-9938 (inside Canada, United States)	Copyright@ontario.ca

These data accompany:

Preliminary Map P.3794, *Precambrian Geology of the Lang Lake Greenstone Belt (West Half)*

Preliminary Map P.3795, *Precambrian Geology of the Lang Lake Greenstone Belt (East Half)*

For information on purchasing all publications, including digital data, contact:

Publication Sales

Ministry of Northern Development and Mines

933 Ramsey Lake Rd., Level A3

Sudbury, Ontario P3E 6B5

Tel: 1-888-415-9845, ext. 5691 (toll-free inside Canada and the United States)

Tel: (705) 670-5691 (local calls)

Fax: (705) 670-5770

Users of OGS products are encouraged to contact those Aboriginal communities whose traditional territories may be located in the mineral exploration area to discuss their project.



Miscellaneous Release—Data 328

Geological, Geochemical, Geophysical, Geochronological and Petrographic Data from the Lang Lake Greenstone Belt, Central Uchi Domain, Superior Province

by S.J. Magnus

This publication can be downloaded from

http://www.geologyontario.mndm.gov.on.ca/mndmaccess/mndm_dir.asp?type=pub&id=MRD328

This release contains field notes, outcrop photographs and magnetic susceptibility data collected between May and September 2014 as part of 1:20 000 scale bedrock geology mapping in the Lang Lake greenstone belt (Project Unit 13-002). Whole-rock geochemical data, geochronological data and petrographic data are provided for collected samples. Also included are previously published articles and presentations to the public related to the project. These data augment Preliminary Maps P.3794, *Precambrian Geology of the Lang Lake Greenstone Belt (West Half)* and P.3795, *Precambrian Geology of the Lang Lake Greenstone Belt (East Half)* (Magnus 2015a, 2015b, respectively), which were released in April 2015; the geological legend and marginal notes for these maps are also provided. This release comprises 95 images (as .jpg files), 11 Microsoft® Excel® 2010 (.xlsx) workbook files and 21 documents in portable document format (.pdf).

The Lang Lake greenstone belt mapping project was undertaken to improve on outdated bedrock maps and to gather data to produce an updated genetic model for the greenstone belt that may be used as a framework for more detailed academic and mineral exploration activities. Inferences made about the petrogenesis of magmatic rocks in the belt based on whole-rock geochemistry and U/Pb geochronology data are presented by Magnus et al. (2015) and in a presentation. A structural history for the belt is presented by Magnus (2014) and in the marginal notes for Preliminary Maps P.3794 and P.3795.

An unpublished BSc (Hons) thesis project was completed by Hanewich (2015) comprising whole rock major element, trace element and Sm/Nd isotopic geochemistry data; however, these petrographic and isotopic data are not included herein.

Data are organized into 7 folders:

1. Field Data
2. Geology
3. Geochemistry
4. Geochronology
5. Geophysics
6. Petrography
7. Presentations and Publications

1. Field Data. This folder contains 6 Microsoft® Excel® 2010 (.xlsx) workbook files, which contain raw data collected while working in the field during the summers of 2011 and 2012 using a customized ESRI® ArcPad® application on a portable computer (Trimble® Juno™ SB Handheld).

MRD328_Lang Lake_Station-field notes.xlsx consists of 1 worksheet, in which is provided a brief description of each station visited, including descriptions of the observed outcrops, their surroundings and the environmental conditions, as well as the date of each visit and the geographic co-ordinates for each station (in Universal Transverse Mercator (UTM) co-ordinates in North American Datum 1983 (NAD83), Zone 15).

MRD328_Lang Lake_Sample-field notes.xlsx consists of 1 worksheet, in which a brief description of each rock sample collected in the field is provided, along with the purpose for collecting each sample.

MRD328_Lang Lake_Alteration-field notes.xlsx consists of 1 worksheet, in which any features that may have changed the bulk geochemistry of the rock from its original composition are described.

MRD328_Lang Lake_Mineralization-field notes.xlsx consists of 1 worksheet, in which any ore minerals (particularly sulphide and oxide minerals) are reported, along with their textures, abundances, and associations.

MRD328_Lang Lake_Structure-field notes.xlsx consists of 1 worksheet, in which any planar, linear and curvilinear (folded) structural features contained within each observed outcrop are reported, including the classification, orientation and a brief description for each feature. Abbreviations in this worksheet correspond to those listed in Jackson, Muir and Romkey (1995, 2010).

MRD328_Lang Lake_Lithology-field notes.xlsx consists of 5 worksheets, labelled “Volcanic Flow”, “Volcanic Pyroclastic”, “Sedimentary”, “Metamorphic” and “Intrusive”, in which the mineral, rock, and outcrop textures and relationships for each station visited are described.

2. Geology. This folder contains 3 portable document format (.pdf) files; and 2 subfolders with 20 subfolders containing 93 field photographs (as .jpg files) and 1 portable document format (.pdf) file.

P3794-P3795_Legend.pdf is the general legend (rock codes) used as the base for Ontario Geological Survey Preliminary Maps P.3794, *Precambrian Geology of the Lang Lake Greenstone Belt (West Half)*, and P.3795, *Precambrian Geology of the Lang Lake Greenstone Belt (East Half)*. Material in the geochemistry file and the photograph captions file are cross-referenced to rock codes in the legend.

P3794-P3795_Marginal Notes.pdf provides additional information on the study area using a version of the marginal notes, with 2 figures and 2 tables, from Preliminary Maps P.3794 and P.3795.

MRD328_Lang Lake_Photo Descriptions and Explanations.pdf provides for photographs in the subfolders:

- under “Rock Type Photos” (see below), descriptions of each photograph;
- under “Structural Photos” (see below), descriptions of each photograph and a brief explanation of the deformational event to supplement the marginal notes.

Rock Type Photos subfolder contains 13 additional subfolders corresponding to the 13 rock units in the legend (*P3794-P3795_Legend.pdf*). Each subfolder contains a number of photographs that are representative of the rock units described in the legend. Each photograph is labelled with its corresponding legend code, followed by the station number for the outcrop from which it was collected (example *1b - 14SJM225.jpg* is a photograph of pillowed mafic flow at station 14SJM225).

Structural Photos subfolder contains 4 additional subfolders corresponding to the 4 deformational events described in the marginal notes (*P3794-P3795_Marginal Notes.pdf*). Each folder contains a number of photographs, labelled by station number, which represent structural features related to the deformational events. The subfolder “D1 upright folding” does not contain any photographs, since this deformational event is largely inferred based on map-scale structural and geophysical data; a portable document format (.pdf) file provides a brief explanation. The photos in subfolder “D3 dextral and normal transpression” have been subdivided into 3 separate subfolders.

Location information (UTM co-ordinates) for the stations that the photographs correspond to can be found in the file *MRD328_Lang Lake_Station-field notes.xlsx*.

3. Geochemistry. This folder contains 1 Microsoft[®] Excel[®] 2010 (.xlsx) workbook file and 1 portable document format (.pdf) file.

MRD328_Lang Lake_Major and Trace Elements.xls consists of 1 worksheet that contains the results of all geochemical analyses performed at the Geoscience Laboratories (Geo Labs), Ontario Geological Survey, Sudbury. The methods used, lower detection limit for each method, and reported units for each method are included for each element (and oxide) listed. This worksheet also contains location data (“Easting”, “Northing” and “Township”), “Rock Type”, and stratigraphic information, if known, for each sample collected; UTM co-ordinates are provided in North American Datum 1983 (NAD83), Zone 15.

2015 Geo Labs Brochure.pdf describes the analytical methods used at the Ontario Geological Survey Geoscience Laboratories.

4. Geochronology. This folder contains 1 portable document format (*.pdf*) file and 2 Microsoft® Excel® 2010 (*.xlsx*) workbook files; and 1 subfolder with 4 subfolders containing 10 portable document format (*.pdf*) files and 4 images (as *.jpg* files).

MRD328_Lang Lake_U-Pb_ID-TIMS_data.xlsx consists of 1 worksheet that contains the results of zircon U/Pb isotopic analysis using isotopic dilution thermal ionization mass spectrometry (ID-TIMS) from the Jack Satterly Geochronology Laboratory. These data include trace element ratios and isotopic ratios, calculated errors at the 2 sigma (2σ) level, and age estimates for each grain analyzed.

MRD328_Lang Lake_U-Pb_ID-TIMS_figures.pdf is a collection of photomicrographs and geochronological diagrams for the 3 samples analyzed using ID-TIMS.

MRD328_Lang Lake_U-Pb_LA-ICP-MS_data.xlsx consists of 5 worksheets, labelled according to sample number and type of grain analyzed, which contain the results of U/Pb isotopic analysis using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) from the Mineral Exploration Research Centre at Laurentian University. These data include raw measurements (trace element concentrations and isotopic ratios), calculated errors at the 2 sigma (2σ) level, and age estimates for each grain analyzed.

MRD328_Lang Lake_U-Pb_LA-ICP-MS_figures subfolder contains 4 additional subfolders corresponding to the 4 samples (14SJM062A, 14SJM205A, 14SJM246 and 14SJM295) analyzed using LA-ICP-MS, each of which contains 4 photomicrographic images (as *.jpg* files) and 10 geochronological diagrams (as *.pdf* files).

5. Geophysics. This folder contains 1 Microsoft® Excel® 2010 (*.xlsx*) workbook file.

MRD328_Lang Lake_Magnetic Susceptibility Data.xlsx contains 2 worksheets.

“MagSus_Data” worksheet provides magnetic susceptibility data from the study area collected during the summer of 2014.

Measurements were collected using an Exploranium® KT-10 magnetic susceptibility meter. Magnetic susceptibility is defined as the degree to which a substance can be magnetized and, in this case, is expressed as the ratio of the intensity of magnetization (k) to the ratio of the Earth’s magnetic field to magnetic field induced by the susceptibility meter. The readings (k) are expressed as 10^{-3} times the SI unit for susceptibility and are dimensionless. The minimum value that can be recorded by the meter is 0.01×10^{-3} SI units; the largest value is 999×10^{-3} SI units. Sample location information is given in UTM co-ordinates, Zone 15, NAD83.

“Pick Lists, Notes” worksheet provides additional information about the pick-lists for fields (“Geological Province”, “Meter Number”, “UTM Zone”, “Rock Type Pick List”, “Rock Types Corresponding to Pick List”, “Dike Swarm Name”, “Metamorphic Grade”) used in the workbook.

6. Petrography. This folder contains 1 Microsoft® Excel® 2010 (*.xlsx*) workbook file.

MRD328_Lang Lake_Petrographic Data.xlsx consists of 1 worksheet that contains a modal analysis for every sample collected during this study. Notes on the mineral and rock textures and relationships are included for each sample. For samples that contain a modal abundance reported under the column “other”, the known or speculated mineral is discussed in the “Notes” column.

7. Presentations and Publication. This folder contains 5 portable document format (*.pdf*) files, 2 of which are publications and 3 of which are presentations (oral or poster) associated with this project.

MRD328_SoFW2014-03.pdf: An article (Magnus 2014), published in the Ontario Geological Survey *Summary of Field Work and Other Activities, 2014* volume, outlines the activities and results of field work for this project (Project Unit 13-002) during the summer of 2014.

MRD328_SoFW2015-04.pdf: An article (Magnus et al. 2015), published in the Ontario Geological Survey *Summary of Field Work and Other Activities, 2015* volume, reports on the results of geochemical and geochronological analyses for this project (Project Unit 13-002).

MRD328_Magnus_NWOMMS-2015_presentation.pdf: An oral presentation given by Seamus Magnus on April 15, 2015, at the Northwestern Ontario Mines and Minerals Symposium held in Thunder Bay, Ontario.

MRD328_Magnus_ILSG-2015_presentation.pdf: An oral presentation given by Seamus Magnus on May 22, 2015, at the 61st annual Institute on Lake Superior Geology conference held in Dryden, Ontario.

MRD328_Magnus_OEGS-2014_poster.pdf: A poster presented by Seamus Magnus on November 4–5, 2014, at the Ontario Exploration and Geoscience Symposium, held in Sudbury, Ontario.

Acknowledgments

This study focussed on the geology and geochemistry of the Lang Lake greenstone belt with the intent of interpreting a depositional (for supracrustal rocks), emplacement (for intrusive rocks) and structural history of the belt. It is the intent of this author that these data and interpretations be used as a broad framework upon which more detailed academic and mineral exploration activities may improve and expand.

The author would like to thank the field crew, which consisted of Vincent Dubé-Bourgeois (senior assistant), Sheree Hinz (junior assistant), Sarah Pemberton (junior assistant) and Matthew Hanewich (junior assistant), who utilized some of this data and acquired Sm/Nd isotopic data at Carleton University for his honours BSc thesis project (Hanewich 2015). The author would also like to thank the community of Cat Lake for their hospitality; Slate Falls Airways for their timely delivery of peoples and groceries; Andrew Fitch, an outstanding MNRF helicopter pilot; and to Wayne Clark and his tourist guests, for their hospitality and great neighbourly attitude. Finally, the author would like to thank his colleagues, at the Ontario Geological Survey, for their support and guidance throughout this project.

Further information pertaining to this body of work is available through the author.

References

Hanewich, M. 2015. The petrology and geochemistry of metavolcanic rocks in the Lang Lake greenstone belt of northwestern Ontario; unpublished BSc (Hons) thesis, Carleton University, Ottawa, Ontario, 66p.

Jackson, S.L., Muir, T.L. and Romkey, S.W. 1995. A library of digital bedrock mapping symbols. Part 1: Figures and descriptions; Ontario Geological Survey, Open File Report 5909, 56p.

——— 2010. Digital bedrock mapping symbols; Ontario Geological Survey, Miscellaneous Release—Data 252.

Magnus, S.J. 2014. Geology and mineral potential of the Lang Lake greenstone belt, central Uchi Domain; *in* Summary of Field Work and Other Activities 2014, Ontario Geological Survey, Open File Report 6300, p.3-1 to 3-12.

——— 2015a. Precambrian geology of the Lang Lake greenstone belt (west half), Ontario Geological Survey, Preliminary Map P.3794, scale 1:20 000.

——— 2015b. Precambrian geology of the Lang Lake greenstone belt (east half), Ontario Geological Survey, Preliminary Map P.3795, scale 1:20 000.

Magnus, S.J., Hanewich, M., Kamo, S.L. and Petrus, J.A. 2015. Geochemistry and uranium-lead zircon geochronology of the Lang Lake greenstone belt, central Uchi Domain; *in* Summary of Field Work and Other Activities 2015, Ontario Geological Survey, Open File Report 6313, p.4-1 to 4-30.