

LEGENDab

INTRUSIVE CONTACT

HURONIAN SUPERGROUP

Cobalt Group

INTRUSIVE CONTACT

12a Polymictic, matrix-supported conglomerate

plane-laminated sandstone

12d Polymictic clast-supported conglomerate

siltstone-argillite

interbedded with pebbly sandstone and

trough cross-bedded sandstone and

17a Diabase dike

Mineral Deposits: no major deposits presently known in map area Age: unit ~20 km north of map area is ~2700 million years old Interpretation: formed during subduction-related, submarine, arc BOSTON ASSEMBLAGE

Units: banded oxide-facies iron formation, intermediate-felsic metavolcanic rocks, mafic-ultramafic metavolcanic rocks **Deformation:** moderately to strongly deformed: map units folded: most rocks foliated; deformation related to emplacement of Lebel Stock. Mineral Deposits: substantial oxide-facies iron formation; minor Cu

Abitibi Subprovince have been dated at 2725 Ma, 2727 Ma and 2740 Ma) Interpretation: possibly part of an older (2750-2720 Ma) structural and/or stratigraphic basement to some younger (2715-2700 Ma) metavolcanic 16b Feldspathic arenite, quartz arenite, arkose, CATHARINE ASSEMBLAGE

pebble conglomerate, argillite, Units: laterally continuous map units of magnesium-rich, pillowed, paraconglomerate, pebbly argillite, feldspathic tholeiitic metabasalt; iron-rich, amygdaloidal, pillowed tholeiitic metabasalt wacke, orthoconglomerate Iron-rich, pyroxene-spinifex metakomatiite; transitional (iron-rich, magnesium-rich, and intermeditate Fe-Mg) tholeiitic metabasalts Laminated siltstone, massive siltstone, arkose, commonly with plagioclase phenocrysts and/or glomeroporphyritic texture; extremely local argillite exposed near apparent stratigraphic top of assemblage; in part stratigraphic basement to Skead assemblage Geochemistry: tholeiitic suite; flat to slightly concave-down rare earth element profiles that are ~10 x chondrite; some units with negative Eu

> (emplaced between ~2700 and 2697 Ma); generally low strain and weakly Metamorphic Grade: no obvious metamorphic aureole adjacent to Round Lake Batholith; well-developed metamorphic aureole around the Otto Stock (2680 Ma) with isograds oriented perpendicular to trend of units and tectonic fabric Mineral Deposits: Au localized near Catharine Fault; low levels of platinum group elements associated with western iron-rich pyroxene-spinifex komatiite unit

Age: gabbroic unit dated at ~2720 Ma Interpretation: units erupted in submarine volcanic terrain with low paleoslope, possibly in a divergent plate setting (mid-ocean ridge, mature back-arc, or plateau environment are possibilities; komatiite may indicate either mantle plume or high-temperature mantle origin)

Deformation: occupies core of Spectacle Lakes anticline and is

banded chert-magnetite-facies iron formation units (e.g., north of Larder

consisting almost entirely of basalt and/or komatiite and rhyolite and/or

metavolcanic rocks"); some units display slump folds and ball and pillow

Deformation: highly folded at map scale with northwest- and northeast-

striking folds and faults prominent; outcrop-scale and hand-sample-scale

Age: undated (contains clasts representative of 2750-2700 million-year-old

contain distinctive 2675 million-year-old alkalic metavolcanic clasts and is

metavolcanic rocks and therefore likely postdates 2700 Ma; does not

intruded by syenitic rocks (generally 2685-2675 Ma) and therefore likely

Interpretation: proximal to distal submarine fan deposits representing the

first major clastic influx into the southern Abitibi greenstone belt which

correlates with termination of submarine volcanic environments occurring

predates alluvial-fluvial sedimentation and 2675 million-year-old alkalic

Units: magnesium-rich and iron-rich pillowed to massive metabasalt; very

before 2700 Ma, and the onset of regional deformation; apparently

Geochemistry: tholeiitic suite; flat rare earth element profiles ~10 x

Deformation: folded about Spectacle Lakes anticline; in general only a

weak and local fabric developed parallel to Spectacle Lakes anticline; a

weak, but apparantly more prevalent, cleavage trends northeastward and

cross-cuts the axial surface of the anticline; aeromagnetic maps display

well-developed north-of-northeast-striking faults in the eastern portion

Mineral Deposits: vein-hosted Cu-Au mineralization near contact with

Gauthier assemblage near Beaverhouse Lake; anthophyllite-garnet rocks ("dalmationite") in northwest McGarry township; shear-zone hosted Au

Age: undated (rhyolite from Kinojevis North assemblage, ~35 km north of

Lake); some peculiar bimodal conglomerate and/or breccia units

dacite clasts (some of these units previously mapped as "felsic

folds are most abundant adjacent to regional shear zones

Mineral Deposits: shear-zone hosted Au deposits

predates 2685-2675 Ma)

KINOJEVIS ASSEMBLAGE

of the map area

GAUTHIER ASSEMBLAGE Units: intermediate-felsic fragmental metavolcanic rocks Geochemistry: calc-alkalic suite

moderately to highly strained; wellfoliated with mica foliation and flattened fragments and/or clasts oriented parallel to axial trace of Spectacle Lakes 12b Matrix-supported conglomerate dominated Mineral Deposits: vein-hosted Cu-Au mineralization near contact with by alkalic volcanic clasts interbedded with Kinojevis South assemblage near Beaverhouse Lake

Age: fragmental unit dated at ~2700 Ma Interpretation: formed during subduction-related volcanism 12c Trough cross-bedded sandstone, HEARST ASSEMBLAGE commonly containing pebbly channel lags interbedded with polymictic clast-supported Units: turbidite-facies metasedimentary rocks including a variety of graded to massive sandstone units, pebbly sandstone units, matrix- and clastsupported conglomerates; some sandstone units associated with layers of

interbedded with trough-cross bedded sandstone commonly containing pebbly Metamorphosed Metavolcanic Rocks Alkalic Metavolcanic Rocks^e

11a Volcanic effusive and/or intrusive rocks including pyroxene-phyric units, pseudoleucite-bearing units, massive units and fragmental volcaniclastic and/or pyroclastic 11b Volcaniclastic and/or pyroclastic rocks^f

CONTACT RELATIONSHIP UNCERTAIN 10a Sandstone, commonly graded and interbedded with pebbly, matrix-supported sandstone, plane-laminated sandstone and matrix supported conglomerate with minor clastsupported conglomerate and siltstone-argillite 10b Matrix-supported conglomerate (locally clast supported) interbedded with graded sandstone, pebbly matrix-supported sandstone,

and plane-laminated sandstone 10c Conglomerate and/or breccia, commonly clast supported and dominated by clasts of komatiite and intermediate to felsic volcanic rock; minor clasts of sandstone, and minor interbeds of sandstone 10d Sandstone, commonly graded and interbedded

with chert-magnetite iron formation UNCONFORMITY Metamorphosed Felsic Intrusive Rocks

INTRUSIVE CONTACT

volcaniclastic and/or pyroclastic rocks

interlayered with massive, intermediate

fragmental volcaniclastic and/or pyroclastic

3a basalt and/or gabbro unsubdivided with

commonly bladed with dendritic-textured

pyroxene and/or hornblende; minor komatiite

respect to composition

3c Iron-rich basalt and/or gabbro units

3d Transitional basalt and/or gabbro units

to felsic rocks^f

Interpretation: formed in submarine volcanic terrain with low paleoslope, possibly in divergent plate setting (mid-ocean ridge, mature back-arc, or 8 Tonalite, Granodiorite (Round Lake Batholith) oceanic plateau are possibilities) LEBEL STRUCTURAL COMPLEX 8a Unsubdivided and relatively weakly strained Units: injection migmatites, metasomatized mafic-felsic metavolcanic rocks, highly strained metavolcanic rocks and oxide-facies iron formation 8b Unsubdivided and highly strained Deformation: highly sheared, strained, and folded as a result of Metamorphosed Mafic Intrusive Rocks emplacement of Lebel Stock

> Mineral Deposits: iron formation Age: undated Interpretation: possibly highly strained, metamorphosed, and metasomatized equivalents of Boston assemblage (see Boston assemblage) LARDER LAKE ASSEMBLAGE

map area, dated at ~2700 Ma)

Units: pillowed to massive metabasalt ranging from magnesium rich to iron rich, metakomatiite, subvolcanic mafic and/or ultramafic intrusions and/or massive flows; pillowed units commonly variolitic and/or

Geochemistry: tholeiitic suite; rare earth elements for metabasaltic units display ~flat, elevated (~10 x chondrite) chondrite-normalized profiles **Deformation:** assemblage occurs in a complexly deformed region bound to the north by the Larder Lake - Cadillac shear zone and to the south by the Lincoln Nipissing shear zone; two prominent sets of folds and faults are northwest and northeast trending Mineral Deposits: shear-zone-hosted Au deposits; Cu-Zn occurences near McElrov Stock

> Age: felsic metavolcanic unit presumed to be part of this assemblage dated at ~2705 Ma Interpretation: formed in submarine volcanic terrain, possibly in a divergent plate setting (mid-ocean ridge, mature back-arc, or oceanic plateau are possibilities; the presence of komatiite may indicate either mantle plume or high-temperature mantle affinity) McELROY ASSEMBLAGE

Units: pillowed and massive metabasalt, dendritic-textured gabbro and pyroxene and/or amphibole-bladed gabbro (or massive flows), gabbro, leucogabbro, serpentinized peridotite, komatiite, intermediate-felsic fragmental and massive units Geochemistry: tholeiitic (intermediate-felsic rocks not analyzed) Deformation: generally north facing and weakly deformed: deformation

intensity apparently highest near assemblage boundaries Mineral Deposits: Ni-Cu in regional peridotite unit that occurs near the top (northern) part of the assemblage Age: undated Interpretation: formed in submarine (?) volcanic terrain, possibly in divergent plate setting (e.g., mid-ocean ridge; back-arc basin) (bimodal

Deformation: highly sheared due to solid-state emplacement of Round

indicators suggest a combination of batholith-side-up deformation and

Mineral Deposits: replacement Cu-Au deposits near the northeast margin

Interpretation: possible portion of older (2750-2720 Ma), highly strained,

metavolcanic rocks that form structural and/or stratigraphic basement to

Units: eastern end of assemblage dominated by both fragmental and

"tuffaceous" or greywacke-like units; apparent base in faulted depositional

Geochemistry: calc-alkalic suite; rare earth elements fractionated; light

Deformation: units generally dip steeply and face northerly; generally

Interpretation: formed during subduction-related volcanism and was in

part erupted on older (>2720 Ma) metavolcanic rocks (e.g., Catharine

Units: alluvial-fluvial-facies metasedimenatry rocks including clast-

matrix-supported conglomerates and pebbly to plane-laminated

sandstones, minor siltstone; alkalic metavolcanic rocks including

fragmental and/or conglomeratic rocks and alkalic flows (commonly

Deformation: units between Kirkland Lake and Larder Lake form the

most units between Kirkland Lake and Larder Lake face to the south;

Age: most units appear to be 2675 million years old or younger; one

Interpretation: formed near steep fault scarps in subaerial to shallow

marine environment; deposition of the assemblage marks the final

highly strained, metamorphosed, and metasomatized equivalents of

emergence and consolidation of the Abitibi greenstone belt

Catharine assemblage (see Catharine assemblage)

deformed porphyry intrusion, dated at 2685 Ma, is presumed to intrude the

Timiskaming assemblage; deposition of Timiskaming may have spanned

shear zones but otherwise weakly to moderately deformed

Mineral Deposits: shear-zone-hosted Au deposits

OTTO STRUCTURAL COMPLEX

footwall to the steeply south-dipping Larder Lake - Cadillac shear zone;

however, there are many internal folds and faults; intensely deformed near

supported conglomerates, cross-bedded sandstones, debris-flow-related

Geochemistry: alkalic metavolcanic rocks display highly fractionated and

weakly to non-foliated; locally well fractured; stong foliation locally

developed adjacent to assemblage boundaries

Mineral Deposits: shear-zone-hosted Au deposits

extremely elevated rare earth element profiles

massive intermediate to felsic rocks; western end contains more

Lake Batholith; asymmetric folds, stretching lineations, and shear

large flattening strains across the strike of the penetrative foliation;

much of the banding in the rocks is due to strain

Age: an intermediate to felsic unit dated at ~2750 Ma

some younger (2715-2700 Ma) metavolcanic assemblages

mafic and/or ultramafic - intermediate and/or felsic nature may indicate a thicker crustal setting than other assemblages (e.g., Catharine, Kinojevis, PACAUD STRUCTURAL COMPLEX including pillowed metabasalt and metagabbro; thin units of oxide- and

sulphide-bearing iron formation present

of the Round Lake Batholith

SKEAD ASSEMBLAGE

Age: 2700 Ma

contact with Catharine assemblage

TIMISKAMING ASSEMBLAGE

pseudo-leucite bearing)

2b Pyroxene-spinifex textured units h 2c Olivine-spinifex textured units Highly Strained Metavolcanic Rocks a Unsubdivided rocks of chiefly mafic and ultramafic composition, but also including some rocks of intermediate (?) composition 1b Injection migmatites and highly metamorphosed and metasomatized rocks 1c Unsubdivided rocks of chiefly felsic and/or

by numbering of units. **b** Units whose distribution is largely inferred from aeromagnetic data are preceeded by "g" on the map face Syenite intrusions are known to both predate and postdate alluvialfluvial facies metasedimentary rocks of unit 8. d Some porphyritic rocks are known to predate emplacement of the

siliceous composition, but also including rocks

of mafic composition

Round Lake Batholith (2700Ma). e Only alluvial-fluvial facies rocks and alkalic metavolcanic rocks are included in Timiskaming assemblage; see inset 1. f Large variation in clast and fragment size from mud and ash to boulder and bomb. **g** At scale of portrayal, amygdaloidal, massive and pillowed flows are

not distinguished; see township maps listed in sources h Boston Creek Komatiite locally highly differentiated with associated pyroxene cumulates and gabbroic to "anorthositic-like" differentiates. ⁱ Highly variable in strain state, degree of metamorphism (greenschist adjacent to Round Lake Batholith and amphibolite facies adjacent to Otto and Lebel stocks), protolith composition (ultramafic, mafic, felsic and siliceous units), degree of metasomatism and extent of development of injection-migmatization (common adjacent to Lebel

Compilation and geology by S.L. Jackson and assistants 1988-1991.

Senior assistants were: R.Harrap (1989), C. Kimmerly (1990), and L. Wilkinson (1990). Cartographic production by J.W. Boyd. Issued 1995.

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SUPRACRUSTAL ASSEMBLAGES

BLAKE RIVER ASSEMBLAGE Units: intermediate to felsic, pillowed to fragmental, metavolcanic rocks Geochemistry: units north of map area are calc-alkalic; light rare earth element enriched with fractionated rare earth element profiles (generally Deformation: units dip gently to moderately northward and face north

©Queen's Printer for Ontario, 1995. Age: undated (other assemblages containing substantial iron formation in This map is published with the permission of the Director, Ontario Geological Survey.

Deformation: units consistently face away from Round Lake Batholith

LOCATION MAP

Ontario Geological Survey

Map 2628

PRECAMBRIAN GEOLOGY

LARDER LAKE AREA

NTS Reference: 32 D/4

Scale: 1:1 000 000 or 1 cm equals 10 km SYMBOLS Cross bedding arrow points to generally inferred) top of bed (dip unknown, inclined) Cross bedding; arrow points to top of bed (vertical. Pillowed flow;

approximate, position inferred Strain gradient (increasing from north to south) arrow points to unknown, inclined) Foliation (trend only, inclined, vertical) Second generation inclined, vertical) in metavolcanic Third generation rock; arrow

foliation (trend only, foliation (inclined. Bedding; top of Cleavage (trend bed unknown (dip only, inclined, unknown, trend and dip direction interpreted from cleavage (trend only

inclined, vertical) Bedding; top of Third generation bed unknown (inclined, vertical) cleavage (trend only inclined, vertical) Bedding; arrow points to top of Shear zone: bed (dip unknown, inclined, vertical) of displacement Bedding; arrow points to top of (subvertical, inclined bed (overturned) Shear zone; dextra

(dip unknown, dip uncertain) Shear zone; sinistral Graded bedding; arrow points to top (dip unknown, of bed (dip unknown inclined, vertical) Shear zone; dip-slip (normal, reverse); arrow points to top x indicates of bed (overturned, Tectonic foliation in granitoid rocks

overturned but magnitude of dip (inclined, vertical) Dike (inclined Fracture (inclined vertical) Joint (vertical) with plunge (measured in first generation plane,

Fold axes with measured in plunge (z-shaped second generation Fold axes with plunge (m-shaped, with plunge uncertain shape, uncertain shape bu Bedding-cleavage

magnitude of plunge Inclined fold axia surface (z-fold, Crenulation lineation with Vertical fold axial surface (z-fold) Quartz vein (trend only, inclined,

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Base maps derived from maps of the Ontario Basic Mapping Program urveys, Mapping and Remote Sensing Branch; Ontario Ministry of Natural Resources; scale 1:20 000. Published information used to construct the map includes:

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