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GEOLOGICAL SURVEY OF CANADA
CANADIAN GEOSCIENCE MAP 214
BRITISH COLUMBIA GEOLOGICAL SURVEY
GEOSCIENCE MAP 2015-3
SURFICIAL GEOLOGY

GNAWED MOUNTAIN AREA

British Columbia
Parts of NTS 92-I/6, NTS 92-I/7, NTS 92-I/10, and NTS 92-I/11

Map Information Document

Preliminary

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Geoscience Map 2015-3

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Scale

1:50 000

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ABSTRACT

The Gnawed Mountain area includes the Highland Valley Copper mine (porphyry Cu-Mo) which is a major copper producer in Canada. The most areally extensive glacial sediment in the region of the mine is till deposited during the Late Wisconsinan Fraser Glaciation. Glaciers dominantly flowed south to southeastward during this glacial event as indicated by the orientation of numerous drumlins and flutings. During ice retreat, lateral meltwater channels were eroded in the flanks of valleys and the hillsides of

mountains indicating that ice occupied low ground when higher elevations were ice-free. Accumulations of glaciofluvial sand and gravel, too small to be mapped at this scale, can be found in proximity to these meltwater channels. The glaciofluvial drainage was generally to the south during ice retreat with aggradation of glaciofluvial sediments in the Guichon Creek valley. Glacial lake sediments in the Witches Brook valley were deposited in a glacial lake which formed when the eastward drainage was blocked by a mixture of ice and sediments. Mine tailings (anthropogenic deposits) are present near the open-pits and in the valley which extends northwest from the mine (previously occupied by Pukaist Creek). Limited field work was completed in this region in 2011 and 2012. Field station locations are shown on the map.

RÉSUMÉ

La mine Highland Valley Copper (gîte porphyrique Cu-Mo) est l'un des principaux producteurs de cuivre au Canada et fait partie de la région de la montagne Gnawed. Le sédiment glaciaire le plus répandu dans la région de la mine est le till de la glaciation de Fraser du Wisconsinien tardif. Les glaciers se sont principalement écoulés vers le sud et sud-est pendant cet épisode glaciaire comme en témoigne l'orientation des nombreux drumlins et cannelures. Pendant le retrait glaciaire, des chenaux d'eau de fonte de marge glaciaire ont été érodés sur les flancs des vallées et les versants des montagnes indiquant que de la glace occupait les points les plus bas alors que les hautes régions étaient déglacées. Des accumulations de sable et gravier fluvioglaciaires, trop peu étendues pour être cartographiées à cette échelle peuvent se retrouver à proximité de ces chenaux d'eau de fonte. Le drainage fluvioglaciaire était généralement vers le sud pendant le retrait glaciaire avec une accumulation de sédiments fluvioglaciaires dans la vallée du ruisseau Guichon. Les sédiments glaciolacustres dans la vallée du ruisseau Witches ont été mis en place dans un lac glaciaire qui s'est formé suite à l'obstruction du drainage vers l'est par de la glace et des sédiments. Des résidus miniers (dépôts anthropiques) sont présents près des mines à ciel ouvert et dans la vallée qui s'étend au nord-ouest de la mine (anciennement occupée par le ruisseau Pukaist). Des travaux de terrain limités ont été faits dans cette région en 2011 et 2012. La localisation des stations de terrain est indiquée sur la carte.

ABOUT THE MAP

General Information

Authors: A. Plouffe and T. Ferbey

Geology by A. Plouffe and T. Ferbey, 2011, 2012

Geology conforms to Surficial Data Model v. 2.0.2

Geomatics by L. Robertson

Cartography by G.S. Hanna

Joint initiative of the Geological Survey of Canada and the British Columbia Geological Survey, conducted under the auspices of the Intrusion-Related Ore System project as part of Natural Resources Canada's Targeted Geoscience Initiative-4 program

Map projection Universal Transverse Mercator, zone 10.
North American Datum 1983

Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications.
Elevations in feet above mean sea level

Shaded relief image derived from the digital elevation
model supplied by Natural Resources Canada.
Illumination: azimuth 315°, altitude 45°, vertical factor 1x

Magnetic declination 2015, 16°36'E, decreasing 9.7' annually.

This map is not to be used for navigational purposes.

Title photograph: Looking north from the east edge of the Valley Pit at Highland Valley Copper Mine in south central British Columbia.
Photograph by A. Plouffe. 2014-250

The Geological Survey of Canada welcomes corrections or additional information from users.

Data may include additional observations not portrayed on this map.
See documentation accompanying the data.

This publication is available for free download through
GEOSCAN (http://geoscan.nrcan.gc.ca/).

Preliminary publications in this series have not been scientifically edited.

Map Viewing Files

The published map is distributed as a Portable Document File (PDF), and may contain a subset of the overall geological data for legibility reasons at the publication scale.

ABOUT THE GEOLOGY

Author Contact

Questions, suggestions, and comments regarding the geological information contained in the data sets should be addressed to:

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Coordinate System

Projection: Universal Transverse Mercator
Units: metres
Zone: 10
Horizontal Datum: NAD83
Vertical Datum: mean sea level

Bounding Coordinates

Western longitude: 121°11’00” W
Eastern longitude: 120°45’00” W
Northern latitude: 50°35’00” N
Southern latitude: 50°20’00” N

Surficial Data Model Information

The Geological Survey of Canada (GSC) through the Geomapping for Energy and Minerals Program (GEM) has undertaken the Geological Map Flow to develop protocols for the collection, management (compilation, interpretation), and dissemination of surficial and bedrock geology data and map information. To this end, a data model has been created.

The Surficial Data Model (SDM) was designed using ESRI geodatabase architecture. The XML workspace document provided can be imported into a geodatabase, and the geodatabase will then be populated with the feature datasets, feature classes, tables, relationship classes, subtypes and domains.

Shapefile and table (.dbf) versions of the data are included within the data. Column names have been simplified and the text values have been maintained within the shapefile attributes. The direction columns are numerical, to display rotation for points, and the symbol fields will hold the correct values to be matched to the appropriate style file.

For a more in depth description of the data model please refer to the official publication:

Deblonde, C., Plouffe, A., Eagles, S., Everett, D., Huntley, D.H., Inglis, E., Kerr, D.E., Moore, A., Parent, M., Robertson, L., Smith, I R., St-Onge, D.A., and Weatherston, A., 2014. Science language for an integrated Geological Survey of Canada data model for surficial geology maps, version 2.0; Geological Survey of Canada, Open File 7631, 464 p. doi:10.4095/294225

LICENCE AGREEMENT

ACCORD DE LICENCE

Abstract

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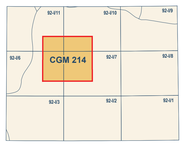

National Topographic System reference

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1:50 000

QUATERNARY

POST LAST GLACIATION

NONGLACIAL ENVIRONMENT

H — **ANTHROPOGENIC DEPOSITS:** rubble, diamicton, sand and gravel, and mine tailings; massive; more than 3 m thick; occurring as flat to steep surfaces emplaced by human activity near active mine sites.

ORGANIC DEPOSITS: peat and plant material in various stages of decomposition; 1 to 3 m thick on average; peat derived from decayed plant material in an eutrophic environment; generally occur as flat, wet terrain (swamps) over poorly drained substrates; form relatively open peatlands; may include minor lacustrine and fluvial sediments.

Owb — **Bog peat:** sphagnum or forest peat; may be treed or treeless.

Owf — **Fen peat:** peat derived from sedges and partially decayed shrubs; forms relatively open peatlands with a mineral-rich water table that persists seasonally near the surface; can be covered with low shrubs and sparse trees.

O — **Undifferentiated organic deposits:** undifferentiated bog and fen peat.

COLLUVIAL AND MASS WASTING DEPOSITS: diamicton and rubble; poorly sorted, massive to stratified debris deposited by direct gravity-induced movement; composition dependant on source material.

Cz — **Landslide deposits:** diamicton, generally 1 to 10 m thick, but may exceed 10 m near the toe of large landslides; hummocky topography; includes inactive and potentially active landslides.

Cv — **Colluvial veneer:** thin and discontinuous cover of slumped material; 1 to 2 m thick on average; dominantly overlies bedrock or till; occurs on moderate to steep slopes.

ALLUVIAL SEDIMENTS: sorted gravel, sand, minor silt, and organic detritus deposited by modern streams; commonly stratified.

Ap — **Alluvial floodplain sediments:** sorted sand, and silt with lesser amount of pebbly gravel, and organic detritus; more than 1 m thick; forming active floodplains close to river level with meander channels and scroll marks; prone to flooding.

Af — **Alluvial fan sediments:** poorly sorted gravel, sand, and diamicton; more than 2 m thick; occur where a stream issues from a narrow valley onto a plain or valley floor.

At — **Alluvial terrace sediments:** sorted gravel, sand, and minor silt; more than 2 m thick; forming inactive terraces above modern floodplain; represents a potential aggregate source.

A — **Undifferentiated alluvial sediments:** undivided floodplain, alluvial terrace, and alluvial fan sediments.

L — **LACUSTRINE SEDIMENTS, undifferentiated:** sand, silt, and minor clay, massive to laminated, intermixed with variable amount of organic material, deposited in a lake; more than 1 m thick; exposed following lowering of lake levels; includes organic deposits too small to be mapped separately.

GLACIAL AND LATE-GLACIAL

PROGLACIAL AND GLACIAL ENVIRONMENTS

GLACIOLACUSTRINE SEDIMENTS: fine sand, silt, and clay with minor debris-flow diamicton, and gravel; laminated, bedded, and massive; deposited in glacier-dammed lakes in valleys and along the margin of retreating glaciers.

GLd — **Deltaic glaciolacustrine sediments:** gravel, sand, and minor silt; massive to bedded; greater than 2 m thick; occurs at the mouth of meltwater channels entering former glacial lakes.

GLv — **Glaciolacustrine veneer:** fine sand, silt, and clay; dominantly laminated and bedded; 1 to 2 m thick on average; thin and discontinuous.

GL — **Undifferentiated glaciolacustrine sediments:** undivided glaciolacustrine sediments; more than 1 m thick.

GLACIOFLUVIAL SEDIMENTS: sand and gravel with minor diamicton; well to poorly stratified; deposited behind, at, or in front of the ice margin by glacial meltwater; represent a potential aggregate source.

GFp — **Outwash plain sediments:** poorly-sorted sand and gravel; bedded; 1 m to more than 10 m thick; deposited by meltwater at various positions in front of retreating glaciers; generally forms flat surfaces sloping away from the retreating glacier.

GFt — **Glaciofluvial terraced sediments:** sand and gravel; 1 m to 10 m thick; forming gently sloping flat surfaces perched above modern streams, meltwater channels, or alluvial deposits.

GFh — **Hummocky glaciofluvial sediments:** poorly-sorted sand and gravel with minor diamicton; bedded to massive; individual beds can be deformed; 1 m to more than 20 m thick; deposited in contact with a retreating glacier; forms hummocky topography that is related to melting of ice.

GFk — **Kame terraced sediments:** poorly-sorted sand and gravel with minor diamicton; bedded to massive; individual beds can be deformed; 1 m to more than 20 m thick; deposited in contact with a retreating glacier; forms terraces, generally unpaired, on valley walls; perched above modern valley floor.

GFr — **Esker sediments:** sand and gravel; massive to bedded; 3 m to more than 5 m thick; forming ridges deposited by meltwater flow within tunnels, channels, or openings in glacier ice.

GFb — **Glaciofluvial blanket:** sand and gravel; more than 2 m thick; occurs near the margins and at the mouth of meltwater channels; forms gently undulating, to flat surfaces.

TILL: diamicton consisting of clasts of all size in a sandy to silty-sand matrix; deposited directly by glaciers; clasts are of various lithologies and numerous ones are striated and faceted.

Th — **Hummocky till:** more than 2 m thick on average; hummocky to rolling surface including discontinuous lenses of glaciofluvial gravel.

Ts — **Streamlined and fluted till:** more than 2 m thick on average; till surface marked by streamlined landforms including flutings, drumlins, and crag-and-tails; rare bedrock outcrops can be present at the head or up-ice end of crag-and-tails.

Tv — **Till veneer:** 1 to 2 m thick on average; discontinuous till cover; underlying bedrock morphology is discernible; bedrock outcrops are abundant.

Tb — **Till blanket:** more than 2 m thick on average; continuous till cover forming undulating topography that locally obscures underlying units; rare bedrock outcrops.

PRE-QUATERNARY

R — **BEDROCK, undifferentiated:** volcanic, intrusive, sedimentary, and lesser amount of metamorphic bedrock of Paleozoic to Cenozoic age; can include pockets of till or colluvium rarely exceeding 1 m thickness.

Complex relationship: where the surficial cover forms a complex pattern and the map units are too small to be mapped individually, yet constitutes a significant aerial extent of the total polygon, a dot (˙) separates the first dominant map unit designator from the less abundant secondary unit (e.g. Ts.Tv, designates an area of streamlined and fluted till with some areas of till veneer).

K — Kettle large

Mine tailing

Open pit mine

- Geological contact, defined
- Limit of mapping
- Landslide escarpment
- Paleodrainage direction
- Minor meltwater channel (paleocurrent direction unknown)
- Minor meltwater channel (paleocurrent direction known)
- Large meltwater channel
- Esker (paleocurrent direction unknown)
- Esker (paleocurrent direction known)
- Buried drumlinoid ridge
- Drumlinoid ridge
- Drumlin
- Crag-and-tail (large, drawn to scale)
- Crag-and-tail (small)
- Fluted bedrock or drift (paleo ice-flow direction unknown)
- Lineament in bedrock (mostly faults and joints)
- Small landslide scar
- Kettle small
- Kame small
- Roche moutonnée (sense known)
- Glacial striations (paleo ice-flow direction unknown)
- Glacial striations (paleo ice-flow direction known)
- Outcrop
- Gravel pit
- Quarry
- Field station without sample
- Field station with sample

Recommended citation
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1 0 1 2 3 4 km

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