DESCRIPTIVE NOTES

Three ice movements have been identified in this region. Striations and rat tails on an outcrop located approximately 400 m east of Cuisson Lake reveal a movement to the south-southeast. This ice movement might have occurred at the onset of the glaciation when glaciers first formed locally, north of the mine, over the unnamed mountain ridge marked with cirques and arêtes. An ice movement to the west to southwest is indicated from a few striations throughout the map area and flutings approximately 2 km east of the mine. This ice movement occurred when glaciers derived from the Cariboo Mountains (east of the map area) advanced over the area. Lastly, striations and macro-landforms (drumlins, flutings, crag-and-tails) indicate an ice movement to the north to northwest. This movement occurred at glacial maximum, when an ice-divide formed around the 52° latitude south of the map area. The ice divide formed following the coalescence of ice derived from the Coast Mountains to the west and Cariboo Mountains to the east.
Mineralized debris derived from the Gibraltar porphyry deposits have been eroded by glaciers and transported in these three directions of ice flow as interpreted from the till geochemistry and mineralogy. An overview of the till composition in the region of the Gibraltar Mine is provided in Plouffe et al. (2011, 2014) and Plouffe and Ferbey (2015).

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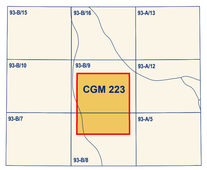
Abstract

The Granite Mountain area, located in south central British Columbia, includes the Gibraltar Mine (porphyry Cu-Mo deposit). Most of the map area is underlain by till of the Late Wisconsinan Fraser Glaciation. During deglaciation, meltwater channels were eroded in the hillsides of Granite Mountain and the mountainous ridge north of the mine indicating that ground at high elevation was deglaciated first. Meltwater was generally routed to the north through two dominant corridors: one in the west, in the region trending north from Cuisson Lake and a second one in the east, in the valleys of Ben and Skelton lakes and Arbuthnot Creek. Glaciofluvial sediments deposited during ice retreat represent potential granular resources. A glacial lake and associated delta are mapped north of Ben Lake from aerial photograph interpretation. At the western edge of the map area, large landslides most likely in bedrock and unconsolidated sediments occurred along the bedrock escarpment of the Fraser River valley. Anthropogenic deposits including wet and dry tailings surround Gibraltar Mine.

Résumé

La mine Gibraltar (gîte porphyrique Cu-Mo) est située dans la région de la montagne Granite, sise dans la partie centrale sud de la Colombie-Britannique. Cette région est principalement recouverte de till mis en place pendant la glaciation de Fraser du Wisconsinien tardif. Pendant la déglaciation, des chenaux d'eau de fonte ont été érodés sur les versants de la montagne Granite et de la crête montagneuse au nord de la mine indiquant que les régions à plus haute altitude ont été les premières déglacées. L'eau de fonte s'est principalement écoulée vers le nord à l'intérieur de deux corridors : l'un à l'ouest, s'étendant au nord du lac Cuisson et un second à l'est, occupant les vallées des lacs Ben et Skelton ainsi que la vallée du ruisseau Arbuthnot. Les sédiments fluvioglaciaires mis en place pendant le retrait glaciaire représentent des ressources granulaires potentielles. Au nord du lac Ben, des sédiments glaciolacustres et un delta sont cartographiés basés sur l'interprétation des photos aériennes. De grands glissements de terrain sont présents le long de la limite occidentale de la région d'étude. Ces glissements se sont probablement produits dans la roche en place et dans des sédiments non consolidés le long des escarpements rocheux dans la vallée du fleuve Fraser. Des dépôts anthropiques incluant des résidus miniers secs et humides sont présents aux environs de la mine Gibraltar.



National Topographic System reference

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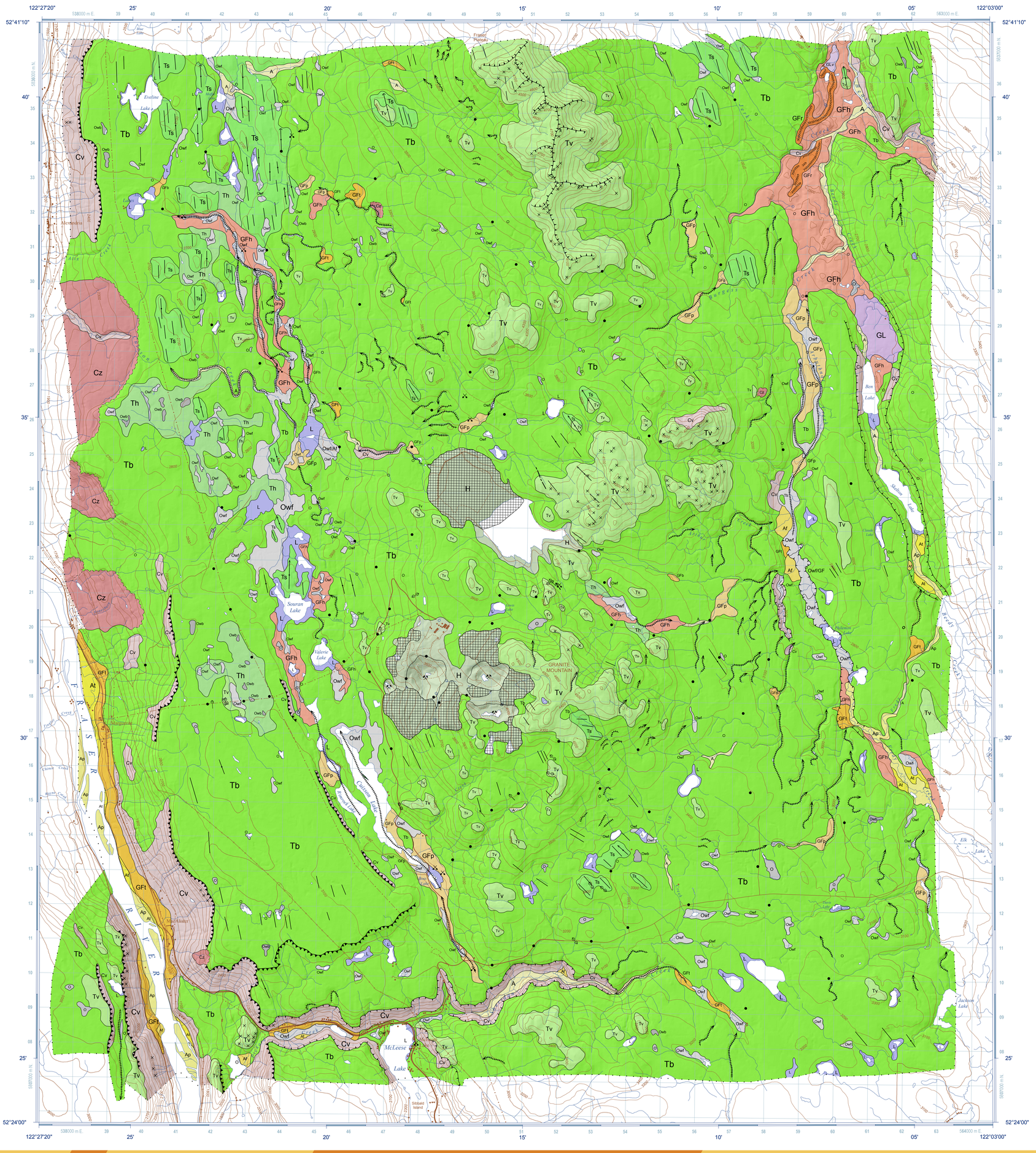
GEOLOGICAL SURVEY OF CANADA
CANADIAN GEOSCIENCE MAP 223
BRITISH COLUMBIA GEOLOGICAL SURVEY
GEOSCIENCE MAP 2015-4

SURFICIAL GEOLOGY

GRANITE MOUNTAIN AREA

British Columbia
Parts of NTS 93-B/8 and NTS 93-B/9
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.

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.

Stratigraphic relationship: A stratigraphic relationship is shown with two map-unit designators separated by a slash (e.g. Owf/Af indicates fen peat overlying alluvial fan sediments).

- Mine tailing
- Bedrock quarry (open-pit)
- Geological contact, defined
- Limit of mapping
- Landslide escarpment
- Minor meltwater channel (paleocurrent direction unknown)
- Minor meltwater channel (paleocurrent direction known)
- Major meltwater channel
- Esker (paleocurrent direction known)
- Drumlinoid ridge
- Drumlin
- Crag-and-tail (large, drawn to scale)
- Crag-and-tail (small)
- Fluted bedrock or drift (paleo ice-flow direction unknown)
- Cirque
- Arête
- Bedrock scarp
- Bedrock lineation (joints)
- Roche moutonnée
- Striations, poorly defined (paleo ice-flow direction unknown)
- Glacial striations (paleo ice-flow direction unknown)
- Glacial striations (paleo ice-flow direction known)
- Cross striations (1 = oldest; shown where relative age could be established)
- Small outcrop
- Gravel pit
- Field station without sample
- Field station with sample

Recommended citation
Plouffe, A. and Ferbey, T., 2015. Surficial geology, Granite Mountain area, British Columbia, Parts of NTS 93-B/8 and NTS 93-B/9; Geological Survey of Canada, Canadian Geoscience Map 223 (preliminary); British Columbia Geological Survey, Geoscience Map 2015-4, scale 1:50 000. doi:10.4095/296793

Preliminary GSC CANADIAN GEOSCIENCE MAP 223 • BCGS GEOSCIENCE MAP 2015-4 Preliminary Preliminary

Geological Survey of Canada
Canadian Geoscience Maps

Authors: A. Plouffe and T. Ferbey

Geology by A. Plouffe and T. Ferbey (2011, 2012, 2013)

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

SURFICIAL GEOLOGY
GRANITE MOUNTAIN AREA
British Columbia
Parts of NTS 93-B/8 and NTS 93-B/9
1:50 000

1 0 1 2 3 4 km

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, 17°25'E, decreasing 11.2' annually.

This map is not to be used for navigational purposes.

Title photograph: Looking northwest at a roche moutonnée trending 315°. The person is 1.7 m tall. The roche moutonnée is located approximately 500 m to the southeast of Gibraltar Mine tailing pond visible in the background. Photograph by A. Plouffe. 2012-009

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.

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Preliminary publications in this series have not been scientifically edited.

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