GEOLOGICAL SURVEY OF CANADA COMMISSION GÉOLOGIQUE DU CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES
MINISTÈRE DE L'ÉNERGIE, DES MINES ET DES RESSOURCES

LEGEND

CENOZOIC

QUATERNARY

Unconsolidated sediments: till, sand, gravel, silt

TERTIARY
EOCENE
MIDDLE EOCENE

Ec — *CORYELL INTRUSIONS:* Ecs, *syenite;* Ecm, *biotite monzonite, biotite - augite monzonite*

CRETACEOUS AND/OR TERTIARY

KTip, KTia, KTil — KTip, *quartz-feldspar-augite porphyry dykes;* KTia, *aplite dykes;* KTil, lamprophyre and diabase dykes

KTp — *Pegmatitic granite*

JURASSIC AND (?) CRETACEOUS

Jski — *SILVER KING PORPHYRY: porphyritic hornblende quartz diorite*

Jgd — *NELSON INTRUSIONS: granodiorite, granite, diorite;* Jdi, *diorite porphyry*

MESOZOIC

JURASSIC (?)

Ju — *Pyroxene - hornblende - biotite rock*

Jp — *Pseudodiorite*

JURASSIC
LOWER AND MIDDLE JURASSIC

ImJhs — *HALL FORMATION: argillite, sandstone, shale, siltstone, conglomerate; some argillaceous quartzite*

LOWER JURASSIC

lJev — *ELISE FORMATION: andesite and basalt flows and flow breccia, agglomerate, augite porphyry; minor tuff*

lJas — *ARCHIBALD FORMATION: argillaceous and micaceous quartzite, siltstone, argillite; minor tuff*

ROSSLAND GROUP

TRIASSIC (?) AND JURASSIC (?)
LOWER JURASSIC (?) AND OLDER
YMIR GROUP

TJys — *Argillaceous quartzite, micaceous quartzite, argillite, slate; minor limestone; locally layered gneiss*

Geological contact (defined, approximate, assumed)
Bedding, tops known (inclined, vertical, overturned)
Bedding, tops unknown (inclined, vertical)
Compositional layering in gneisses; primary foliation in igneous rocks (inclined, vertical)
Schistosity (inclined, vertical)
Lineation (plunging)
Fault (defined with dip where known, assumed)
Anticline (approximate)
Syncline (defined, approximate)
Glacial striae (direction of ice movement unknown)
Fossil locality
Pit and/or Trench
Adit

MINERAL PROPERTIES

1. Monarch
2. Queen Victoria
3. Orinoco
4. George V
5. Ophir
6. Pingree
7. Rover
8. Whitewater
9. Royal Canadian
10. Venango
11. Granite-Poorman (Kenville)
12. Central
13. Eureka
14. May and Jennie
15. Star and Alma N
16. Venus and Juno
17. Birdseye
18. Athabaska
19. California
20. Shamrock
21. Perrier
22. Great Eastern
23. Victoria and Jessie
24. Daylight and Berlin
25. Silver King
26. Golden Eagle and T.S.
27. Bear
28. Fern
29. Gold King
30. Canadian Belle
31. Second Relief
32. Spotted Horse
33. Porto Rico
34. Stewart
35. Lion

Geology revision by H.W. Little, modified after Mulligan (1952), from field work by H.W. Little in parts of the field seasons of 1948 and 1981, and by R. Mulligan, 1949

Geological cartography by M. Sigouin, Geological Survey of Canada

Any revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada

Base map assembled by the Geological Survey of Canada from map published at the same scale by Surveys and Mapping Branch in 1974

Copies of the topographical edition of this map may be obtained from the Canada Map Office, Department of Energy, Mines and Resources, Ottawa, Ontario K1A 0E9

Approximate magnetic declination 1982, 20°27' East, decreasing 9.5' annually

Elevations in feet above mean sea level

Copies of this map may be obtained from the Geological Survey of Canada:
601 Booth Street, Ottawa, Ontario K1A 0E8
3303-33rd Street N.W., Calgary, Alberta T2L 2A7
100 West Pender Street, Vancouver, B.C. V6B 1R8

INDEX MAP

MAP 1571A

GEOLOGY

BONNINGTON MAP AREA

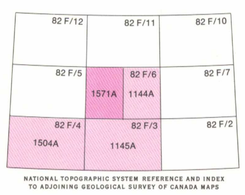
BRITISH COLUMBIA

Scale 1:50 000

Kilometres 1 0 1 2 3 4 Kilometres

Miles 1 0 1 2 Miles

Universal Transverse Mercator Projection



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA MAPS

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DESCRIPTIVE NOTES

Since the publication of Mulligan's (1952) preliminary map of Bonnington map area, much information has been obtained on the Jurassic Rossland Group in adjacent map areas (see selected bibliography below).

The Beaver Mountain Formation, named by McConnell and Brock in 1904, was believed by them and by Daly in 1912 to be younger than the Rossland Group, and was mapped separately from the Elise Formation by Mulligan (1952). Meagre fossil evidence indicated that the Archibald and Hall Formations were chronologically closely related, and therefore supported the concept of a post-Hall volcanic succession. Subsequent fossil collections (Frebold, 1959; Frebold and Little, 1962) established the Archibald and Hall as formations of different ages and proved that the Beaver Mountain and Elise Formations are equivalent. It seems appropriate, therefore to re-examine those units briefly and to produce a revised edition of Bonnington map area.

The oldest rocks in the map area are believed to be those of the Ymir Group (**TJys**), a thick succession of apparently unfossiliferous sediments that are best exposed in Ymir map area to the east. At the type locality and in Bonnington map area the Ymir Group is overlain with apparent conformity by predominantly volcanic rocks of the Elise Formation. The base of the Ymir Group is not exposed in either map area. Toward the north the rocks display increasing proportions of argillaceous and calcareous rocks and resemble the Slocan Group which lies north of the Nelson Batholith. For this reason the Ymir Group is assumed to be partly of Triassic age, and because it underlies the Elise Formation, as does the Archibald Formation, the upper part is believed to be Early Jurassic.

The Archibald Formation (**lJas**) has been traced northward from its type locality in Salmo map area where it is at least 1,200 m thick and is dominantly siltstone that commonly shows graded bedding. In Bonnington map area, argillaceous quartzite, locally micaceous, seems to predominate and bedding tops are difficult to determine. Fossils have not been found in the formation north of Salmo map area, where several Sinemurian and one Hettangian? collection were made. The Archibald Formation is therefore mainly or entirely of Early Jurassic age.

All predominantly volcanic succesions of the Rossland Group are now known to belong to the Elise Formation (**lJev**), and the term Beaver Mountain is discarded. The Elise Formation is characterized by spilitic flows, flow breccias, agglomerate, and augite porphyry, the last possibly being intrusive. The thickness of the formation appears to be of the order of 3,000 m but the structure is imperfectly known.

The type locality of the Hall Formation is in Hall Creek, where it was named by Drysdale (1917). There, several bedding top determinations based upon crossbeds and graded beds, supported by the form of dragfolds and bedding-cleavage relationships showed the structure to be synclinal, so that both east and west of the synclinal axis the Hall Formation rests upon Elise volcanic rocks. In the type locality, conglomerate beds form a moderate proportion of the succession, but, southward, conglomerate is less abundant. A characteristic rock, though not the most common, is soft black shale, which in places is fossiliferous. Toarcian fossils (late Early Jurassic) have been identified less than 100 m east of the map area, about halfway between Hall and Barrett Creeks, and at a few localities to the south in Salmo map area. The only fossils found within Bonnington map area (about 3.2 km south of Barrett Creek, and about 2.4 km west of the east border of the map area) are of early Middle Bajocian (early Middle Jurassic) age. In Salmo map area, fossils collected southwest of Mount Kelly are younger than Middle Bajocian. The age of the Hall Formation is therefore late Early Jurassic to early Middle Jurassic or later. The Hall Formation rests with apparent structural conformity upon the volcanic rocks of the Elise Formation, but conglomerate in the Hall contains pebbles that resemble Elise lavas, so the contact is probably a disconformity. The top of the formation has not been identified. Rocks formerly thought to be younger in Salmo map area are now believed to be Lower Jurassic sediments and volcanics thrust above Hall Formation.

A large body of dioritic rock straddles Kootenay River west of Taghum bridge and was termed pseudodiorite (map-unit **Jp**) by Mulligan (1952). It is strongly foliated, and in places is compositionally layered. It is believed to be at least partly reconstituted volcanic rock. Small bodies of pyroxene-hornblende-biotite rock (**Ju**) are peripheral to the pseudodiorite and are probably genetically related to it. The pseudodiorite is younger than the Rossland Group and older than the Nelson Intrusions and is with little doubt Jurassic.

Nelson Intrusions (**Jgd**) underlie an area extending a few kilometres south and west of Nelson, and a small area in the northwest corner of the map area, and are contiguous with the Nelson Batholith to the north. A large body of granodiorite is centred about Siwash and Grassy Mountains with smaller peripheral bodies of granodiorite to the north and east. Along the east side of the map area between Hall and Stewart Creeks are bodies of diorite porphyry (**Jdi**), elongated in a northerly direction; these occur also to the east in Ymir map area, and are regarded as satellitic bodies of the Nelson Batholith. Radiogenic ages of the Nelson Intrusions have been determined in a number of studies; the latest indicates a Late Jurassic age, with possible plutonic activity extending into the Early Cretaceous (Duncan and Parrish, 1979).

The Silver King Porphyry (**Jski**) forms a large, irregular intrusion, that extends southward form the California porperty. A smaller mass occurs in Gold Creek, three small, dyke-like bodies to the south in Hall Creek, and a fourth, somewhat sheared and sericitized, high on the ridge between Referendum and Fortynine Creeks. The porphyry appears to be younger than the Nelson Intrusions (Drysdale, 1917, p. 33; McAllister, 1950, p. 141), but is assumed to be of roughly equivalent age and is probably Jurassic.

A single body of pegmatitic granite (**KTp**) of unknown age lies south of the head of Stewart Creek. A number of minor intrusions (**KTi**) have been identified in various parts of the map area and are probably of Cretaceous and Tertiary age.

Bodies of hornblende syenite (**Ecs**) in the northwest corner of the map area were thought by Mulligan (1951) to be partly gradational into and genetically related to pseudodiorite (**Jp**). However the syenite cuts the pseudodiorite, and closely resembles parts of the Coryell Intrusions and is so classified by this writer. The Coryell Intrusions are of Middle Eocene age. Small bodies of biotite monzonite and biotite-augite monzonite (**Ecm**) are more widely scattered. These occur from the vicinity of Ymir westward to Christina Lake and have been classified as Coryell Intrusions.

The Archibald Formation near Erie Creek is exposed in a southward plunging anticline that may be the faulted continuation of an anticline that lies east of Archibald Creek south of the map area. The Hall Formation in the southeastern part of the map area marks the trough of a southward plunging syncline that continues into Salmo map area to the south.

A probable fault near Gold Creek was detected on air photographs but could not be identified on the ground. Because several faults were identified in Salmo map area to the south it can be assumed that many undetected faults occur in Bonnington map area.

Metamorphism increases northward from greenschist facies in the south. In the northwest corner of the map area, metasomatic processes have apparently converted volcanic rocks of the Elise Formation into pseudodiorite and limestone of the Ymir Group into marble. On the lower part of the ridge between Bird and Rover Creeks, argillaceous quartzite of the Ymir Group passes progressively into micaceous quartzite and compositionally layered biotite-quartz-feldspar gneiss.

Beddoe-Stephens, B., and Lambert, R. St. J.
1981: Geochemical, mineralogical, and isotope data relating to the origin and tectonic setting of the Rossland volcanic rocks, southern British Columbia; Canadian Journal of Earth Sciences, volume 18, number 5, p. 858-868

Drysdale, C.W.
1917: Ymir mining camp, B.C.; Geological Survey of Canada, Memoir 94

Duncan, I.J., and Parrish, R.R.
1979: Geochronology and Sr isotope geochemistry of the Nelson Batholith: a post-tectonic intrusive complex in southeast British Columbia; Geological Society of America, 75th Annual Meeting, Cordilleran Section, Abstracts, volume 11, number 3, p. 76

Frebold, H.
1959: The marine Jurassic rocks in Nelson and Salmo areas, southern British Columbia; Geological Survey of Canada, Bulletin 49

Frebold, Hans, and Little, H.W.
1962: Palaeontology, Stratigraphy, and Structure of the Jurassic rocks in Salmo map area, British Columbia; Geological Survey of Canada, Bulletin 81

Fyles, J.T.
1971: Rossland bulletin, open file report; British Columbia Department of Mines and Petroleum Resources

LeRoy, O.E.
1912: Geology of Nelson map area, British Columbia; Geological Survey of Canada, Summary Report 1911, p. 139-157

Little, H.W.
1960: Nelson map area, west half, British Columbia; Geological Survey of Canada, Memoir 308

Little, H.W.
1964: Geology, Ymir (Nelson, east half), British Columbia, Geological Survey of Canada, Map 1144A

Little, H.W.
1965: Geology, Salmo, British Columbia; Geological Survey of Canada, Map 1145A

Little, H.W.
1982: Rossland-Trail map area, British Columbia; Geological Survey of Canada, Paper 79-26

McAllister, A.L.
1950: The geology of the Ymir map area, British Columbia; McGill University, Montreal, unpublished Ph. D. thesis

McAllister, A.L.
1951: Ymir map area, British Columbia; Geological Survey of Canada, Paper 51-4

Mulligan, R.
1951: The geology of the Nelson (Bonnington) and adjoining part of Salmo map areas, Brirish Columbia; McGill University, Montreal, unpublished Ph. D. thesis

Mulligan, R.
1952: Bonnington map area, British Columbia, Geological Survey of Canada, Paper 52-13

Simony, P.S.
1979: Pre-Carboniferous basement near Trail, British Columbia; Canadian Journal of Earth Sciences, volume 16, number 1 p. 1-11