GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES

93C

LEGEND

CENOZOIC

QUATERNARY
PLEISTOCENE AND RECENT

16 — *Till, gravel, sand, silt, clay*

TERTIARY AND/OR QUATERNARY
PLIOCENE AND/OR PLEISTOCENE

15 — *Vesicular basalt, basalt breccia, basalt cinder cones*

TERTIARY
LATE MIOCENE AND/OR PLIOCENE

14 — *Vesicular and amygdaloidal andesite and basalt, fine-grained to porphyritic black, brown, and grey andesite and basalt; breccia, tuff.*

13 — *Greywacke, conglomerate, and siltstone;* **13a**, *bedded ash and breccia*

EOCENE TO MIOCENE

12 — *Andesite, dacite, related tuffs and breccias; minor rhyolite; includes dykes and sills of 14*

11 — *Thick, light-coloured ash and breccia beds interlayered with 12*

EOCENE (?), OLIGOCENE (?)

10 — *Andesite, dacite, basalt; minor rhyolite, breccias, tuffs, conglomerate, greywacke*

CRETACEOUS (?) AND TERTIARY
UPPER CRETACEOUS (?) PALEOCENE, EOCENE AND (?) LATER
OOTSA LAKE GROUP (in part)

9 — *Rhyolite, dacite, and associated tuff and breccia; minor andesite, basalt, conglomerate, greywacke, and tuffaceous shale*

MESOZOIC

JURASSIC AND/OR LATER
COAST INTRUSIONS (4-8)

8 — *Biotite granite; quartz diorite, quartz monzonite, granodiorite*

7 — *Gneissic granodiorite; minor hornblende diorite and granite*

6 — *Granodiorite; diorite, quartz diorite, granite*

5 — *Granite-gneiss, amphibolite, schist, migmatite, all highly metamorphosed and granitized equivalents of 1; dykes of granite, diorite, basalt*

4 — *Quartz-biotite gneiss; diorite, gneissic granodiorite amphibolite, migmatite, chlorite schist; minor pink biotite granite, quartz monzonite; porphyry dykes related to 9*

TRIASSIC (?) AND JURASSIC
MIDDLE JURASSIC
HAZELTON GROUP (in part)

3 — *Andesitic and basaltic tuffs and breccias, reddish brown, purple, green, and grey andesite and basalt, tuffaceous argillite, and argillite; minor conglomerate, greywacke, limy argillite*

LOWER AND/OR MIDDLE JURASSIC
HAZELTON GROUP (in part)

2 — *Andesite, related tuffs and breccias, chert pebble conglomerate, shale, sandstone*

PRE-MIDDLE JURASSIC

1 — *Andesite, basalt, related tuffs and breccias; greenstone, chlorite schist, phyllite, tuffaceous argillite;* **1a** *argillite, limy argillite, greywacke, argillaceous limestone*

Geological boundary (defined, approximate, assumed)
Bedding, tops known (inclined vertical)
Fault (defined, approximate, assumed)
Fossil locality . . . Ⓕ
Mineral occurrence (copper, **Cu**; *gold,* **Au**; *silver,* **Ag**; *zinc,* **Zn***)* . . . **Cu** ×

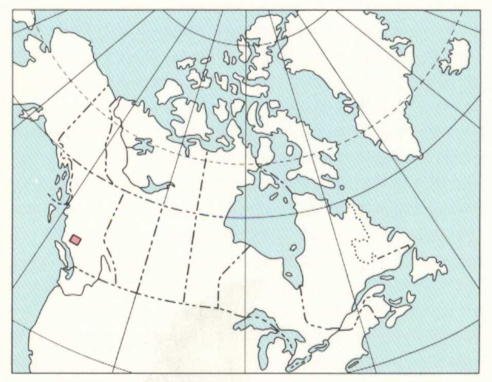
Geology by H.W. Tipper, 1954-1957.

Geological cartography by the Geological Survey of Canada, 1968

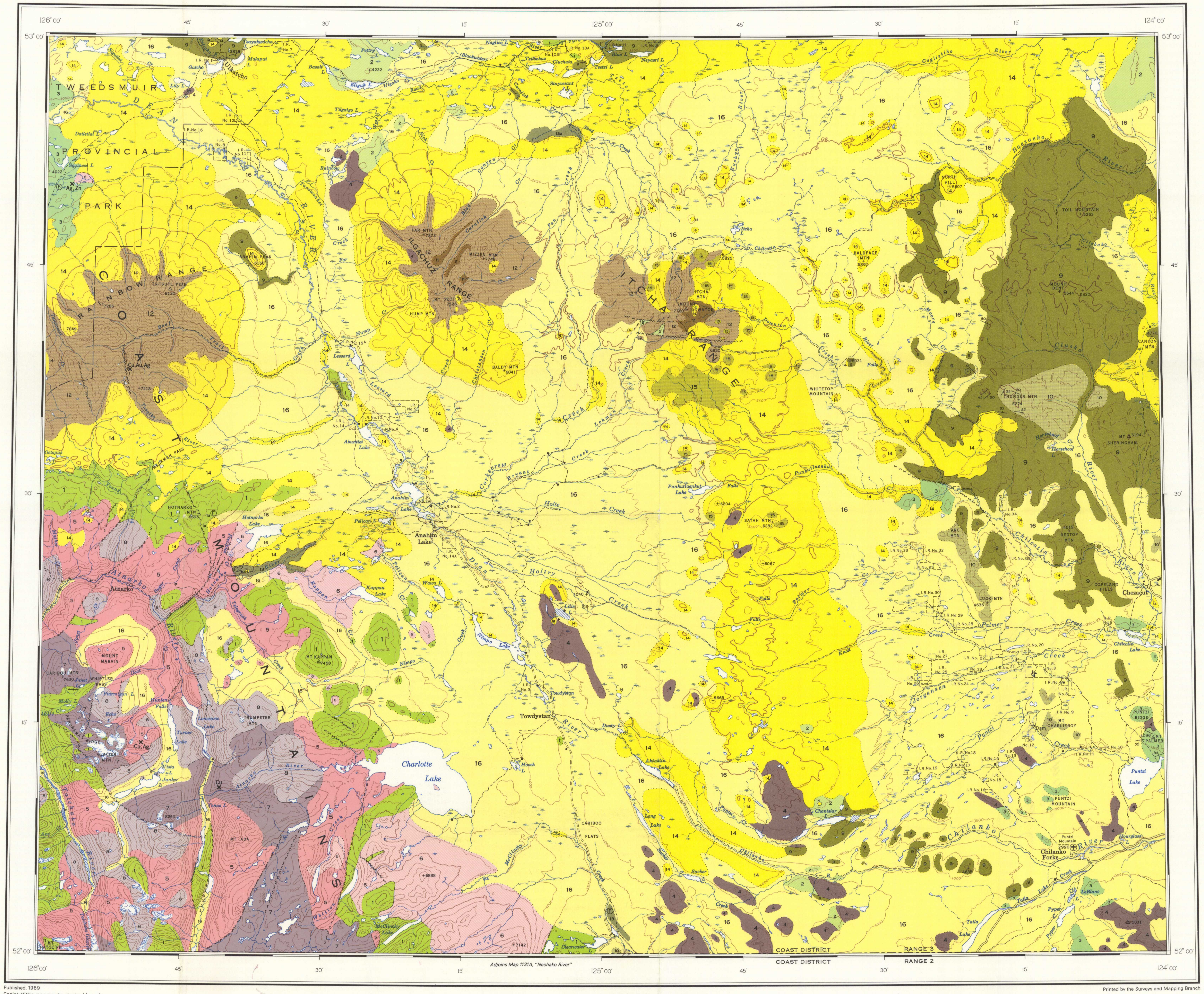
Road, all weather
Other roads
Cart track
Trail
Airfield
Horizontal control point
District boundary
Park boundary
Indian Reserve boundary
Intermittent lake and stream
Braided stream
Rapids
Alkali flat
Marsh
Glacier or snowfield
Contours (interval 500 feet)
Height in feet above mean sea-level . . . +8250

Base-map compiled and drawn by the Surveys and Mapping Branch, 1955

Magnetic declination 1967 varies from 25°02′ easterly at center of west edge to 24°43′ easterly at center of east edge. Mean annual change: 3.3′ westerly



INDEX MAP



Published, 1969
Copies of this map may be obtained from the Geological Survey of Canada, Ottawa

Printed by the Surveys and Mapping Branch

MAP 1202A
GEOLOGY
ANAHIM LAKE
BRITISH COLUMBIA

Scale 1:253,440
1 inch to 4 miles
Miles 4 0 4 8 12 Miles
Kilometres 6 0 6 12 18 Kilometres

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DESCRIPTIVE NOTES

Anahim Lake map-area is crossed by a good gravel road that connects Bella Coola to the west with Williams Lake on the PGE Railway to the east. Other roads passable to four-wheel-drive vehicles and wagons and a few horse trails reach out from this main road into much of the inhabited area. The few residents, mainly ranchers, Indians, resort operators, and hunting guides, are scattered throughout the area, except in the more mountainous parts.

Bedrock is well-exposed in the Coast Mountains, but elsewhere outcrops are scattered and drift-covered areas are extensive. Depth of drift throughout much of the area is 10 to 25 feet but in places is as much as 300 feet.

The oldest rocks in the area (1) are lithologically similar to Upper Triassic or Lower Jurassic rocks north and south of the map-area. This group is mainly structureless volcanic flows and breccias and little is known of their thickness and stratigraphy. The only significant sedimentary section lies northwest of Hotnarko Lake, where there is more than 1,500 feet of argillite and greywacke containing indeterminate marine shells. This group forms the eastern contact of the Coast Mountains granitic rocks as well as several areas within the granite complex. Although all these rocks are thought to be one unit and to be pre-Middle Jurassic, proof of this is lacking. Lithological similarity to pre-Middle Jurassic rocks and greater metamorphism than Middle Jurassic rocks suggests the older age.

Volcanic and sedimentary rocks (2,3) believed to belong to the Hazelton Group extend into the area from the north. Rocks of similar age and lithology are known also to the southeast of the area. Unit 2 is mainly dark green andesite and basalt with tuffs and breccias, but interbedded with these are distinctive black argillites and chert-pebble conglomerates and grits. The volcanic rocks are relatively fresh and primary volcanic features are common. In Nechako River area[1] they were considered to be early Middle Jurassic or possibly late Lower Jurassic. In the Itcha Range some red shales and red pebble-conglomerate may be Lower Jurassic or Triassic. Unit 3 is essentially volcanic and consists mainly of bedded breccias, waterlain tuffs, varicoloured andesites and basalts and rarely sedimentary rocks that are either derived from volcanic rocks or are tuffaceous. These rocks are usually fresh, and green, grey, and reddish brown colours predominate. One collection of marine shells is of probable Middle Jurassic age, and to the northwest in the adjoining area, Middle Jurassic (Bajocian) ammonites have been found.

The Coast Intrusions (4-8) comprise rocks of several origins and possibly several ages. Unit 4 is mainly gneisses that occur in a belt northeast of the Coast Mountains and can be traced beyond the area for more than 40 miles to the northwest and more than 60 miles to the southeast. Although some of the intrusive rocks may be as young as Tertiary, some of the rocks southeast of the area are known to be pre-Cretaceous[2]. The relation of unit 4 to most of the crystalline rocks of the Coast Mountains is not known.

In the Coast Mountains four units (5-8) have been mapped. Their position in the legend is not intended to signify relative ages. Coarse-grained biotite granite (8) with well-defined jointing, massive equigranular texture, low mafic mineral content, and no inclusions, has sharp intrusive contacts with units 5 and 7. This unit is distinctive because of its coarseness, uniform composition, white weathering, and coarse blocky jointing. Quartz diorite, quartz monzonite, and granodiorite occur in minor amounts. Associated with this granite are coarse quartz-feldspar pegmatites. The age of this granite is probably post-Middle Jurassic but it is older than late Tertiary. Similar granites near Taseko Lakes to the southeast are apparently Upper Cretaceous or Tertiary[2].

The granodiorite (6) and gneissic granodiorite (7) may be unrelated, but as they occur in two apparently different northwest-trending belts their relations are not known. Unit 6 is mainly granodiorite, medium to fine grained, and light to dark grey. Variations in composition and texture within any one mass are gradual and contacts with older rocks (1) are usually gradational, although sharp intrusive contacts occur north of McClinchy Lake. Unit 7 is typically a foliated granodiorite but is not uniform throughout. Some of the bodies mapped as this unit display a strong, well-defined gneissosity with a high content of hornblende and biotite, whereas other bodies, usually with a lower mafic mineral content, show only a faint lineation. The contacts with older units are invariably gradational, and they are drawn arbitrarily.

Unit 5 is closely related to units 1 and 7 and is transitional between the two. In it are included a variety of metamorphic rocks, inclusions of volcanic rocks (1), various dykes related to younger granitic and volcanic rocks (8,9,14), and pegmatites (8). Whereas units 1 and 7 are reasonably homogeneous and are distinct units, unit 5 is characterized by its inhomogeneity and variety of rock types. However, a unifying factor is that these rocks were, for the most part, a result of the processes of metamorphism and granitization, and intrusion, that produced units 6, 7, and possibly 8.

A thick, non-marine assemblage of rhyolitic to dacitic flows (9), outcropping mainly in the eastern half of the area, rests with angular discordance on all older rocks. The flows are varicoloured, red-mauve, buff, white-grey, or yellow, with minor amounts of green to black andesitic and basaltic varieties. They have a maximum thickness of 1,500 feet. The whole assemblage is flat-lying or gently warped into broad open folds. The age of this group has not been established from this map-area but it is lithologically identical with the mid-Tertiary rhyolitic rocks of the Ootsa Lake Group[1] to the north and mid-Tertiary rocks to the southeast.

Andesite, dacite, and basalt (10) overlie the Ootsa Lake Group but the relationship is not clear; a minor unconformity is believed to exist but exposures are poor. To the southeast this group becomes extensive, but its thickness, structure and age are difficult to determine. In this area and to the southeast these rocks seem to be areally related to the rhyolitic rocks (9) but are not recognized in the type locality of the Ootsa Lake Group.

In the Rainbow, Ilgachuz, and Itcha Ranges a group of varicoloured andesitic to dacitic flows and fragmental rocks (12) form the central part. Although these three areas are apparently centres of eruption for these rocks, the conical shape of the three ranges is due to later eruptions of basaltic flows (14). The flows of unit 12 are not greatly deformed although normal faulting has occurred, bringing up older rocks in the centre of two of the ranges. They are mainly porphyritic dacites and andesites with flow-banding prominent, but vesicular basalt and some rhyolite is also present. Breccias and tuffs are interbedded with these flows, and in places thick accumulations of buff-coloured to light yellow ash (11) are prominent features. The age of the group is not known. It is older than the plateau lavas (14), but because it is only slightly deformed is thought to be Tertiary.

Late Tertiary plateau lavas are extensive and are, for the most part, flat-lying and undeformed. In the Rainbow, Ilgachuz, and Itcha Ranges these flows have original dips of 5 to 10° and form the outer shell of these composite volcanoes. The flows flatten out and merge with the typical plateau lavas, with which they are identical. The rocks vary in composition from andesite to olivine basalt. They are mainly flows and vary in colour from grey to dark grey or black but are usually brownish on a weathered surface. The thickness of the group varies; it is rarely as much as 2,000 feet, usually less than 1,000 feet, and in places is only 100-300 feet over wide areas. Dykes and necks of basalt, which may have been the extrusive vents, are widespread and common. Anahim Peak is one such neck and it is surrounded by flat-lying flows. This group overlies unit 13 and has been glaciated; therefore it is very late Miocene or Pliocene. The group is correlative in part with the Endako Group to the north and with the extensive plateau lavas to the east.

Two separate areas of sedimentary rocks (13) underlie unit 14, one on Hotnarko River south of Hotnarko Lake and the other along the lower part of McClinchy Creek. On Hotnarko River a section is exposed that is over 500 feet thick, consisting of soft interbedded sandstone and siltstone with one thick conglomerate member. The total thickness and the thickness of individual units vary. The siltstone is apparently lacustrine but many sandy beds as well as the overlying conglomerate are not. Source of material was to the west. Along McClinchy Creek, about 50 to 75 feet of soft interbedded clay, silt, and sand occur, and although the outcrop area is small they may underlie the large drift-covered area along this creek. These sediments are poorly consolidated and have very low dips. Fossil plants occur abundantly in both sections and the age has been described as late Miocene or early Pliocene[3].

Several cinder cones made up of bright red, reddish brown, yellowish brown, and brown basaltic flows, breccias, and scoria rest with erosional discordance on the late Miocene and or Pliocene lavas (14) in the Itcha Range and the mountains to the south and east. Many of the cones are well formed and retain their original shape but all are modified by the last ice-advance or meltwater channels related thereto. Faults that intersect mid-Tertiary lavas (12) do not cut these flows or cones. To the east, in Quesnel map-area, Pleistocene and Recent flows and cones are recognized. Although a precise age is not established, a Pliocene and/or Pleistocene age seems reasonable, probably the latter.

The map-area was overridden by ice in the Pleistocene and the complex mode of deglaciation has left a confusion of conflicting evidence and of many and varied glacial features. Glacial erratics indicate that at some time, possibly when the ice was at a maximum, ice moved westward from the interior of the province into and through the Coast Mountains. Glacial features indicate that the main movement during deglaciation was off the Coast Mountains in a direction varying from east to N25°E. In a later stage of glaciation a readvance occurred in Anahim Lake valley so that ice poured out of the Coast Mountains and moved southeastward to the vicinity of Cariboo Flats and Chilanko River producing well-developed end moraines. After the retreat of the tongue of ice, activity was confined to the mountains where valley glaciers flowed westerly through the Bella Coola Valley. Glacial material (16) occurs as ground moraine, drumlins, eskers, kettles, lake clays, kame terraces, and outwash.

The great extent of flat-lying Tertiary rocks obscures the structural pattern of the pre-Tertiary rocks. The Mesozoic volcanic and sedimentary rocks are undoubtedly folded but as the rocks rarely outcrop, little is known of the nature of these folds; presumably the structures trend northwesterly as in Nechako River area to the north. A prominent feature of the Coast Mountains is the abundance of steeply dipping faults, mainly striking northeasterly but not uncommonly northwesterly. In the Tertiary rocks, faults with an almost vertical dip are common, even in late Tertiary lavas (12), and several faults have disrupted the Rainbow Range and Itcha Range cones.

No mineral occurrence of any size or importance is known within the map-area. No placer mining has been carried on. The area has had little prospecting activity and no mining ventures. Dolmage's[4] explanation of this apparent lack of mineral occurrences — that the more suitable prospecting zones are covered by Tertiary lavas and glacial drift — may well be the main reason. The Tertiary rocks of central British Columbia have always been considered as barren of ore mineral deposits, and little has been learned from this area to suggest otherwise. Along a few small shear zones in the early Tertiary rocks there is an insignificant amount of malachite but no primary ore minerals were seen. These rocks underlie more than two thirds of the area and in only a few areas are older, more favourable rocks exposed. These Triassic and Jurassic rocks are exposed mainly along the eastern contacts of the Coast plutonic rocks, and in areas to the northwest and southeast these have been found to contain ore minerals. Although the same may be true in this area, the rocks here are so obscured by Tertiary volcanic rocks, and particularly by glacial drift, that only a few mineral occurrences have ever been reported. Within the Coast granitic complex, several small occurrences of copper minerals, mainly chalcopyrite, have been reported near the intrusive contact of the younger granitic rocks, biotite granite and quartz diorite (8). This relationship may also apply to those few mineral occurrences within the Jurassic — Triassic volcanic and sedimentary rocks. This gives a discouraging view of the mineral potential of the area. It is possible that important mineral deposits may occur in the drift-covered areas, but only geophysical or geochemical prospecting could determine this. The field work connected with this project, the work of other geologists, and the limited searchings of prospectors have failed to reveal any mineral deposit with economic possibilities.

[1] Tipper, H. W.: Nechako River map-area, British Columbia; Geol. Surv. Can., Mem. 252 (1949).
[2] : Taseko Lakes, British Columbia; Geol. Surv. Can., Map 29 - 1963 (1963).
[3] Mathews, W. H., and Rouse, G. E.: Late Tertiary volcanic rocks and plant-bearing deposits in British Columbia; Bull. Geol. Soc. Amer., vol. 74, No. 1, pp. 55-60 (1963).
[4] Dolmage, V.: Tatla—Bella Coola area, Coast district, British Columbia; Geol. Surv. Can., Sum. Rept. 1925, pt. A, pp. 155-163 (1926).

NOTE: Since submitting the manuscript for this report, the map-area to the south, Mount Waddington 92N, was mapped by the writer, the Bella Coola map-area 93D to the west was mapped by A. J. Baer, and parts of the Anahim Lake map-area have been re-studied and new information has been obtained regarding map-unit 1. The area so mapped around Clearwater Lake is now considered to be Early Cretaceous (late Hauterivian) in age, the area northwest of Hotnarko Lake and westward to the edge of the map-area is probably late Middle Jurassic (Callovian), the areas along Talchako River are believed to be Late Triassic, and the several areas around Mount Kappan and eastward to Dean River are of unknown age.

1202A

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