LEGEND

VOLCANIC AND SEDIMENTARY ROCKS

QUATERNARY
PLEISTOCENE AND RECENT

- **Q** — TILL, GRAVEL, SAND, AND ALLUVIUM

TERTIARY
UPPER MIOCENE, PLIOCENE, AND (?) YOUNGER

- **uTv** — VESICULAR BASALT AND ANDESITE FLOWS, RELATED BRECCIA AND TUFF; GRAVEL AND SAND;
  uTvb: VOLCANIC BRECCIA

PALEOCENE (?), EOCENE AND OLIGOCENE (?)

- **lTvr** — DACITE, RHYOLITE PORPHYRY

CRETACEOUS
CENOMANIAN AND (?) YOUNGER
KINGSVALE GROUP

- **uKKv** — DIVISION B: ANDESITIC AND BASALTIC BRECCIA AND TUFF
- **uKKpw** — DIVISION A: SILTSTONE, GREYWACKE, AND CONGLOMERATE

ALBIAN
JACKASS MOUNTAIN GROUP

- **lKJM** — GREYWACKE, SILTSTONE, AND CONGLOMERATE

TAYLOR CREEK GROUP

- **lKTC** — SHALE, SILTSTONE, GREYWACKE AND PEBBLE CONGLOMERATE

ROCKS ON THE SOUTHWEST SIDE OF TYAUGHTON TROUGH

CRETACEOUS
HAUTERIVIAN AND (?) YOUNGER

- **lKvb2** — REDDISH TO PURPLISH ANDESITIC BRECCIA AND TUFF
- **lKpw2** — SILTSTONE, GREYWACKE, CONGLOMERATE, BRECCIA, QUARTZ SANDSTONE, AND LIMESTONE
- **lKvb1** — ANDESITIC AND BASALTIC BRECCIA AND TUFF; MINOR SHALE, GREYWACKE, AND CONGLOMERATE;
  lKms: METASEDIMENTS AND MIGMATITE
- **lKpw1** — SILTSTONE, GREYWACKE, AND CONGLOMERATE

ROCKS ON THE NORTH AND EAST SIDES OF TYAUGHTON TROUGH

BERRIASIAN TO BARREMIAN
RELAY MOUNTAIN GROUP

- **lKRM** — ARKOSE, CONGLOMERATE, GREYWACKE, SILTSTONE, COQUINOID LIMESTONE

JURASSIC AND CRETACEOUS
OXFORDIAN TO BERRIASIAN

- **JKpw** — SILTSTONE, GREYWACKE, CONGLOMERATE, AND ARKOSE

JURASSIC
KIMMERIDGIAN OR TITHONIAN

- **uJcq** — CONGLOMERATE, SHALE, ARKOSE, GREYWACKE, AND TUFF

JURASSIC
HETTANGIAN (?), SINEMURIAN, BAJOCIAN, AND CALLOVIAN

- **lmJpw** — SILTSTONE, SHALE, GREYWACKE, GRIT, AND CONGLOMERATE

BAJOCIAN AND (?) CALLOVIAN

- **mJv** — TUFF AND VOLCANIC BRECCIA; MINOR CONGLOMERATE AND SHALE

TRIASSIC
UPPER NORIAN

- **uT̄p** — SHALE, SILTSTONE, GREYWACKE, CONGLOMERATE, VOLCANIC BRECCIA, AND TUFF;
  uT̄cg: CONGLOMERATE, LIMESTONE AND GREYWACKE
- **uT̄ls** — LIMESTONE, SHALE, AND GREYWACKE;

NORIAN

- **uT̄vw** — BASALT, ANDESITE, GREYWACKE, SILTSTONE, AND CONGLOMERATE

CARNIAN (?) AND LOWER NORIAN

- **uT̄ps** — SHALE, SANDSTONE, PEBBLE CONGLOMERATE; MINOR SHALY LIMESTONE;
  uT̄sc: MAINLY PHYLLITE AND GARNETIFEROUS SCHIST

CARNIAN

- **uT̄lsp** — LIMESTONE, SHALE, GREYWACKE, TUFF AND VOLCANIC BRECCIA
- **uT̄vb** — DARK GREEN ANDESITIC BRECCIA, TUFF AND FLOWS; MINOR SHALE AND LIMESTONE

PLUTONIC AND METAMORPHIC ROCKS (AGE UNCERTAIN)

COAST PLUTONIC COMPLEX

- **gn** — GRANITE;
  gng: GRANITE AND GRANODIORITE
- **g** — GRANODIORITE;
  gt: GRANODIORITE AND TONALITE;
  gap: APLITIC GRANODIORITE
- **t** — TONALITE;
  tqd: TONALITE AND QUARTZ DIORITE;
  tg: TONALITE AND GRANODIORITE
- **qd** — QUARTZ DIORITE;
  qdd: QUARTZ DIORITE AND DIORITE;
  qdt: QUARTZ DIORITE AND TONALITE;
  qm: QUARTZ MONZODIORITE;
  qmdap: APLITIC QUARTZ MONZODIORITE;
  lKqd: QUARTZ DIORITE DATED BY K-AR
- **d** — DIORITE;
  dqd: DIORITE AND QUARTZ DIORITE;
  du: DIORITE AND GABBRO

CENTRAL GNEISS COMPLEX

(XN, XNS, XND, XNF, XAG, NSC, NSCA, NB, NR, NK, SCN, SCQU, XLS, SCMU, SK)

- **xn** — GRANITOID GNEISS;
  xns: SILICEOUS GRANITOID GNEISS;
  xnd: DIORITIC GRANITOID GNEISS AND/OR DIORITIC COMPLEX;
  xnf: GRANITOID GNEISS WITH FLUIDAL STRUCTURES;
  xag: AGMATITIC COMPLEX
- **nsc** — GNEISS AND SCHIST;
  nsca: GNEISS, SCHIST AND AMPHIBOLITE;
  nb: BANDED GNEISS;
  nr: RUSTY GNEISS;
  nk: STOCKWORK;
  scn: SCHIST AND GNEISS
- **scqu** — SCHIST AND QUARTZITE;
  scmv: SCHIST AND METAVOLCANIC ROCK
- **xls** — CRYSTALLINE LIMESTONE;
  sk: SKARN
- **rp** — RHYOLITE PORPHYRY
- **ms** — PELITIC METASEDIMENTS
- **mv** — METAVOLCANIC ROCK;
  mvsc: METAVOLCANIC AND SCHIST;
  am: AMPHIBOLITE
- (diagonal hatching) — RUSTY, RHYOLITIC FELDSPAR-QUARTZ PORPHYRY DYKE SWARM

SYMBOLS

GEOLOGICAL BOUNDARY (DEFINED, APPROXIMATE, ASSUMED)
LIMIT OF GEOLOGICAL MAPPING
BEDDING, TOPS KNOWN (INCLINED, VERTICAL, OVERTURNED, DIP UNKNOWN) 30
SCHISTOSITY, GNEISSOSITY (HORIZONTAL, INCLINED, VERTICAL)
FAULT (DEFINED, APPROXIMATE, ASSUMED; (SOLID CIRCLE INDICATES DOWNTHROW SIDE, ARROWS INDICATE RELATIVE MOVEMENT)
THRUST FAULT (DEFINED, APPROXIMATE, ASSUMED)
ANTICLINE (DEFINED, APPROXIMATE; ARROW INDICATES DIRECTION OF PLUNGE)
SYNCLINE (DEFINED, APPROXIMATE; ARROW INDICATES DIRECTION OF PLUNGE)
ANTICLINE AND SYNCLINE (OVERTURNED)
FOSSIL LOCALITY (F)
K-AR AGE DETERMINATION •bK67
BIOTITE - b HORNBLENDE - h

CHLORITE - cl EPIDOTE - ep
SPHENE - sp GARNET - ga

GEOLOGY BY

J.A. RODDICK AND W.W. HUTCHISON 1967
H.W. TIPPER 1967
J.A. RODDICK AND G.J. WOODSWORTH 1976, 1979

COMPILED BY

J.A. RODDICK 1985
H.W. TIPPER (NORTHEAST PART, 1969)

BASE-MAP FROM 1/250,000 SCALE MAP PRODUCED BY THE SURVEYS AND MAPPING BRANCH, 1959

APPROXIMATE MAGNETIC DECLINATION 1968, 24°12'EAST, DECREASING 3.1' ANNUALLY

ELEVATIONS IN FEET ABOVE MEAN SEA-LEVEL

MOUNT WADDINGTON 92N

MISCELLANEOUS NOTES

This open file represents the first compilation of the **Mount Waddington** map area from geological reconnaissance mapping carried out during parts of the 1967, 1976 and 1979 field seasons. The map area extends from near the axis of the **Coast Mountains** (southwest corner of the area) to well within the subdued terrain of the **Intermontane Belt** where outcrop is sparse (northeast corner). Three quarters of the area is underlain by the northwest-trending **Coast Plutonic Complex,** which in turn is dominated by the poorly defined **Central Gneiss Complex,** which spans the map area diagonally from **Knot Lake** in the northwest to the **Homathko Snowfield** in the southeast, and also extends into the **Anahim Lake** map area to the north and into the northeastern part of **Bute Inlet** map area to the south.

The **Central Gneiss Complex** is essentially a unit of convenience, a grab-bag term that covers a wide variety of metamorphic, commonly granitoid lithologies. With further work the complex could be resolved into units of lesser internal variation, but gradational contacts and uncertain inter-relationships will still have a corrosive effect on the integrity of the units. Although not well understood the common gradations between amphibolites (and metasedimentary rocks), gneisses and plutonic rock suggest that the **Central Gneiss Complex** may be the parental material of the plutons. The protolith of the **Central Gneiss Complex** itself is not known.

In most places the complex consists of granitoid gneiss (xn) which on available data can be subdivided only locally into siliceous (xns) and dioritic (xnd) phases. The most common plutonic equivalent is quartz diorite. Spectacular megagneiss is exposed here and there, but the most impressive is the grossly banded steeply dipping gneisses in the region of **Mount Waddington, Mount Geddes and Harkness Tower** (about 6 km east of **Remote Mountain**).

In the southern part of the map area the west side of the **Central Gneiss Complex** is flanked by a dioritic complex (xnd) which dips steeply to moderately beneath the main body of the **Central Gneiss Complex** to the east. The dioritic phase resembles the **Pemberton Dioritic Complex** about 225 km to the southeast. It consists mainly of variable textured hornblende diorite gneiss which grades into foliated gabbro and hornblendite. Locally the diorite is unfoliated. Migmatites consisting of diorite and layers (as well as irregular bodies) of amphibolite are common. Aplite, pegmatite and epidote veins are found here and there. Locally the gneissosity reflects a plastic or fluidal deformation.

East of **Knot Lake** the **Central Gneiss Complex** appears to be thrust eastward over Lower Cretaceous quartz diorite, a dark dioritic-looking rock characterized by epidote and chlorite. At the surface the thrust dips about 50 degrees to the west. The thermal effects caused by, or simply associated with, the overthrusting may account for the marked discordance of the isotopic ages of the hornblende and the biotite in the quartz diorite (140 vs 86 Ma at one place, and 121 vs 66 Ma at another nearby). It may account also for the chloritization and epidotization that is widespread in the quartz diorite. As a similar discordance is shown by the hornblende and biotite of the **Page Pluton** south of **Monarch Mountain** (about 20 km to the west), a thermal event associated with the thrusting rather than the thrusting itself seems to be a more probable cause.

Tiedemann Pluton, the largest in the map area, consists mainly of clean coarse grained granodiorite and tonalite, and minor quartz diorite. It extends about 100 km southeasterly from **Mount Tiedemann** to the southeast corner of the map area and into northeast **Bute Inlet** map area. In width it varies from about 8 to more than 20 km. The northern half of the pluton lies within the **Central Gneiss Complex,** which on the northeast side dips moderately beneath the pluton, and on the southwest side overlies the pluton also at moderate dips (about 40 degrees to the southwest). The contacts are difficult to examine but where observed they are gradational. The overall structure suggests that the pluton may be a homogeneous layer within the **Central Gneiss Complex** and what mobilization took place was confined to that layer. North of **Mount Tiedemann** the gneiss near the contact is granitoid and characterized by fluidal structures. Gneissic bands simply become fewer as one moves into the pluton. Southeast of the **Homathko River** sphene and 'old' epidote are common within the pluton. One K-Ar age determination on biotite from granodiorite collected from just east of **Klattasine Glacier** yielded an Early Eocene age of 54 Ma.

Klinaklini Pluton lies east of the **Central Gneiss Complex** in the northern part of the map area. It is more irregular in shape than the **Tiedemann Pluton** but is roughly 60 km long and about 20 km wide. Although it consists mainly of granodiorite and tonalite, in both composition and texture it is much more heterogeneous than **Tiedemann Pluton.** Gradations to beta granite and to quartz diorite are common. The pluton is garnet-bearing about 12 kilometres south of **Perkins Peak.** It contains irregular bodies of gneiss, apparently relics of the **Central Gneiss Complex.** From **Klinaklini Lake** a long narrow (1 to 3 km) body of fine grained to aplitic granodiorite to granite extends southward about 20 km. Although it occupies a core position in the northern part of the pluton, no contact with the main body of the pluton was seen. Southeast of where **Knot Creek** joins the **Klinaklini River** the pluton dips westward beneath the **Central Gneiss Complex** at about 50 degrees (very similar to the southwestern contact of the **Tiedemann Pluton**). South of **Perkins Peak** the contact between the pluton and Lower Cretaceous volcanic and metasedimentary rocks is a fault which where examined dips about 35 degrees to the southwest. There the **Klinaklini Pluton** may be thrust to the northeast but the sense of movement has not been established.

Page Pluton is a relatively clean, high contrast quartz diorite body which lies south of **Monarch Mountain** in the northwest corner of the map area. It is a tadpole-shaped pluton about 30 km long and about 8 km across the head end (north). Young epidote is common along joint planes, and can be distinguished from the 'old' epidote which forms scattered discrete grains, commonly associated with the mafic minerals. The body includes minor diorite and rare biotite schist screens. Foliation is lacking or faint in most places. The contact with the volcanic breccia to the north is sharp. It was seen only from the air and not examined on the ground. Most of the pluton was emplaced in rusty metasedimentary rocks (ms). The plutonic rock along the eastern contact is strongly foliated medium- to coarse-grained diorite which contains a few schlieren parallel with the foliation. The metasediments are schistose in the contact zone. The contact dips outwards from the pluton at steep to moderate angles. K-Ar age determinations on biotite and hornblende yielded discordant ages of 56 and 74 Ma, respectively.

The northeastern part of the map area is underlain by volcanic and sedimentary rocks of Late Triassic to Miocene age. Those in contact with the **Coast Plutonic Complex** are mainly Upper Triassic basic volcanic, clastic sedimentary and carbonate rocks. Rocks of the **Tyaughton Trough,** which developed in Late Jurassic time, include Lower Cretaceous volcanic and sedimentary rocks on the southwest side of the Trough (in the region south and west of **Tatlayoko Lake**) and Upper Jurassic and Lower Cretaceous sedimentary rocks of the Relay Mountain Group on the northeast side of the Trough (mainly in the **Potato Range**). Upper Cretaceous rocks were also deposited in the Trough but were not restricted to it as they cover broad areas. On the southwest side of the Trough **Tyaughton** rocks lie unconformably on Triassic strata but along **Tatlayoko Lake Valley** and to the east the relationship seems to be conformable.

This part (northeast) of the map area is cut by many faults. They are probably also abundant in the granitoid region of the **Coast Plutonic Complex** but are much more difficult to detect there. The most important fault, the **Yalakom,** is a right-lateral transcurrent break which trends northwesterly across the northeast corner of the map area, where it divides the **Coast Mountains** from the **Intermontane Belt.** Shearing and brecciation is intense close to the fault and the rocks on either side are completely different. Many small faults parallel the **Yalakom** on its southwest side, and they extend the zone of movement from a hundred metres or so along the main fault to several kilometres. The **Yalakom Fault** is known to be more than 225 km long and may exceed 400 km. Displacement of Middle Jurassic sedimentary rocks from near **Ashcroft** (on the northeast side of the fault) to the border area between **Taseko Lakes** and **Mount Waddington** map areas (southeast side) indicates an offset of about 130 to 190 km. The fault disrupts Lower Cretaceous (Hauterivian) and possibly the Lower Tertiary (or Upper Cretaceous) plutons that intrude them, but in the **Taseko Lakes** map area, Miocene-Pliocene plateau lavas cross the fault zone undisturbed.

The **Tchaikazan Fault** is roughly parallel with the **Yalakom Fault** and lies 12 to 20 km to the southwest. West of **Niut Mountain** where the fault is vertical to steeply westward dipping, horizontal striations on slickensided surfaces indicate strike-slip displacement. If **Ottarasko Fault** which extends southward from the **Tchaikazan Fault** is the southern continuation of the **Niut Fault** which extends northward from the **Tchaikazan,** about 32 km of right-lateral offset is indicated. The fault cuts Upper Cretaceous (Cenomanian) Kingsvale Group rocks and the Upper Cretaceous to Lower Tertiary granitic rocks that intrude them. **Tchaikazan** movement if thought therefore to be probably Early Tertiary.

Southwest of **Tchaikazan, Stikelan** and **Ottarasko** faults, the structure is dominated by southwest-dipping thrust faults which extend northwesterly from north of **Franklyn Arm** to near **Miner Lake.** They are characterized by low dips ranging from 5 to 10 degrees to a maximum of about 40 degrees. The **Blackhorn Thrust** brings Upper Triassic over Lower Cretaceous (Hauterivian) rocks south and southeast of **Ottarasko Mountain.** Wherever the **Blackhorn Thrust** is intersected by or is close to the major **Ottarasko** or **Stikelan** transcurrent faults the thrust plate shows major disruption. The thrust faulting is post-Hauterivian and earlier than both the transcurrent faulting and the granitic rocks south of **Ottarasko Mountain** which cut the thrusts.

Normal faults are late features younger than most of the transcurrent and thrust faults and probably younger than all of the granitic rocks. Near **Moseley Creek** they formed a graben in which a segment of the Triassic overthrust sheet of the **Blackhorn Thrust** was dropped against Cretaceous rocks below the thrust.

No regional fold pattern was recognized. The steep dips of the **Central Gneiss Complex** involve at least some and probably much isoclinal folding. The stratified rocks to the northeast show open folding where it is not masked by later faulting, and most of the folds appear to be related to movement on the transcurrent faults.