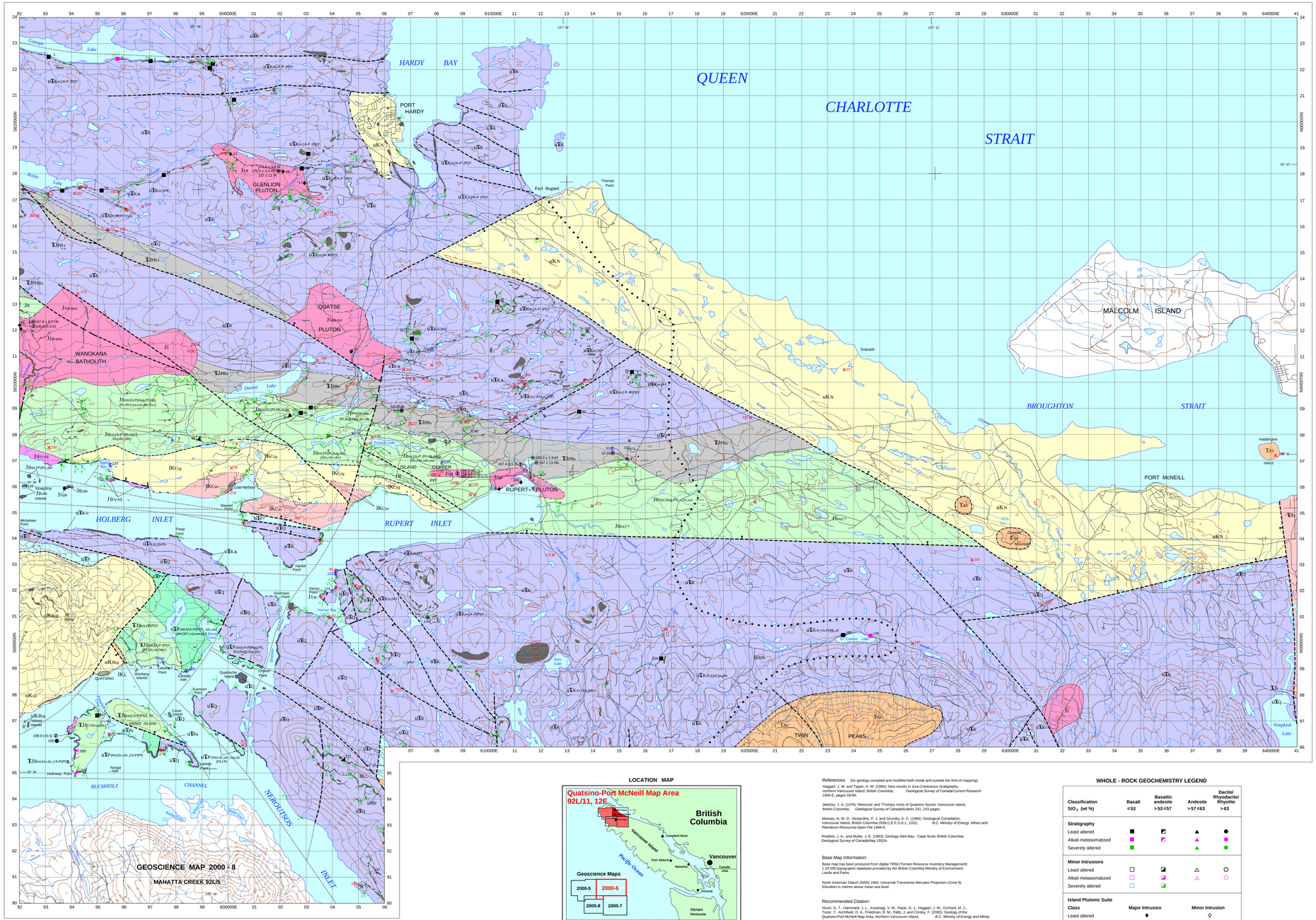


LOCATION MAP


References (for geology compiled and modified both inside and outside the limit of mapping):

Haggart, J. W. and Tipper, H. W. (1994): New results in Jura-Cretaceous stratigraphy, northern Vancouver Island, British Columbia; *Geological Survey of Canada* Current Research 1994-E, pages 59-66.

Jeletzky, J. A. (1976): Mesozoic and Tertiary rocks of Quatsino Sound, Vancouver Island, British Columbia; *Geological Survey of Canada* Bulletin 242, 243 pages.

Massey, N. W. D., Desjardins, P. J. and Grunsky, E. C. (1994): Geological Compilation, Vancouver Island, British Columbia (92B,C,E,F,G,K,L; 102O); *B.C. Ministry of Energy, Mines and Petroleum Resources* Open File 1994-6.

Roddick, J. A., and Muller, J. E. (1983): Geology Alert Bay - Cape Scott, British Columbia; *Geological Survey of Canada* Map 1552A.


Base Map Information:

Base map has been produced from digital TRIM (Terrain Resource Inventory Management) 1:20 000 topographic database provided by the British Columbia Ministry of Environment, Lands and Parks.

North American Datum (NAD) 1983. Universal Transverse Mercator Projection (Zone 9). Elevation in metres above mean sea level.

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Digital Cartography: Mainly by J. L. Armitage.

## WHOLE - ROCK GEOCHEMISTRY LEGEND

| Classification $SiO_2$ (wt %) | Basalt ≤53 | Basaltic andesite >53 ≤57 | Andesite >57 ≤63 | Dacite/ Rhyodacite/ Rhyolite >63 |
|---|---|---|---|---|
| **Stratigraphy** | | | | |
| Least altered | ■ | ◪ | ▲ | ● |
| Alkali metasomatized | ■ | ◪ | ▲ | ● |
| Severely altered | ■ | ◪ | ▲ | ● |
| **Minor Intrusions** | | | | |
| Least altered | □ | ◪ | △ | ○ |
| Alkali-metasomatized | □ | ◪ | △ | ○ |
| Severely altered | □ | ◪ | | |

| Island Plutonic Suite Class | Major Intrusion | Minor Intrusion |
|---|---|---|
| Least altered | ◆ | ◇ |
| Alkali metasomatized | ◆ | ◇ |

# DRAFT COPY

British Columbia
Ministry of Energy and Mines
Energy and Minerals Division

Geological Survey Branch

GEOSCIENCE MAP 2000 - 6

# GEOLOGY OF THE QUATSINO-PORT McNEILL MAP AREA, NORTHERN VANCOUVER ISLAND

NTS 92L/11, 12E


G. T. NIXON, J. L. HAMMACK, V. M. KOYANAGI, G. J. PAYIE, J. W. HAGGART, M. J. ORCHARD, T. TOZER, D. A. ARCHIBALD, R. M. FRIEDMAN, J. PALFY and F. CORDEY

GEOLOGY
by
G. T. NIXON, J. L. HAMMACK, V. M. KOYANAGI and G. J. PAYIE (B. C. Geological Survey)
J. W. HAGGART (Geological Survey of Canada)

PALEONTOLOGY
by
M. J. ORCHARD and T. TOZER (Geological Survey of Canada)
J. PALFY (Hungarian Natural History Museum)
F. CORDEY (University of Lyon)

GEOCHRONOLOGY
by
D. A. ARCHIBALD (Queen's University)
R. M. FRIEDMAN (The University of British Columbia)


SCALE 1 : 50 000

1 0 1 2 3 4
Kilometres

## LAYERED ROCKS

**TERTIARY**

***NEOGENE***

ALERT BAY VOLCANICS

**TAv** Basaltic to rhyolitic, aphanitic to porphyritic flows, flow domes and volcanic breccia and minor volcanic conglomerate (see table of abbreviations and nomenclature).

**UPPER CRETACEOUS**

***CAMPANIAN TO ?MAASTRICHTIAN***

NANAIMO GROUP EQUIVALENTS

**uKN** Medium to coarse-grained arkosic to lithic wacke, pebble to cobble conglomerate, siltstone and minor coal. Locally fossiliferous.

***CENOMANIAN OR EARLY TURONIAN TO ?SANTONIAN***

BLUMBERG FORMATION

**uKBq** Massive conglomerate and minor lenses of coarse-grained lithic wacke.

***CENOMANIAN TO ?TURONIAN***

UPPER SHALE UNIT

**uKsn** Dark grey, calcareous to non-calcareous siltstone, shale and impure limestone interbedded with subordinate wacke and minor pebble conglomerate.

**LOWER CRETACEOUS**

***?ALBIAN***

COAL HARBOUR GROUP

**lKCsn** Upper sandstone facies: trough cross-laminated lithic wacke intercalated with siltstone, minor pebble conglomerate and rare coal.

**lKCcg** Lower conglomerate facies: massive conglomerate with minor lenses of coarse-grained lithic wacke.

***LATE VALANGINIAN TO BARREMIAN***

LONGARM FORMATION EQUIVALENTS

**lKL** Thinly bedded to massive sandstone, siltstone, mudstone and pebble conglomerate and minor coal.

**UPPER TRIASSIC TO MIDDLE JURASSIC**

**BONANZA GROUP**

***HETTANGIAN (?RHAETIAN in part) TO MID-BAJOCIAN***

"BONANZA VOLCANICS"

**JB / KJB** Basaltic to rhyolitic, predominantly subaerial lavas and pyroclastic rocks locally intercalated with marine to non-marine, coarse to fine-grained pyroclastic, epiclastic and sedimentary rocks. Subdivided according to composition and lithology (see table of abbreviations and nomenclature).

KJB, lithologies are probably ***Rhaetian Hettangian***

**JHf / JHff** Predominantly felsic lavas and/or pyroclastic rocks or intermediate to felsic lavas and/or pyroclastic rocks.

***HETTANGIAN (?RHAETIAN in part)***

**JBm/P(P)** Pegloclase-megacrystic basaltic lavas locally intercalated with, and laterally equivalent to, aphanitic flows near the base of the "Bonanza Volcanics".

***CARNIAN(?) TO SINEMURIAN***

SILICICLASTIC UNIT

**TJPBs** Undivided siliciclastic facies of the Parson Bay Formation and conformably overlying unnamed marine siliciclastic strata of the Bonanza Group: black to greenish grey, predominantly non-calcareous, very thin to medium bedded siltstone, sandstone, mudstone and shale with minor intercalated tuff and tuffaceous breccia and rare impure limestone.

***(LATE) LOWER NORIAN TO RHAETIAN (south of Holberg-Rupert inlets)***

PARSON BAY FORMATION

**uTP** Undivided thin to medium bedded impure limestone, calcareous to non-calcareous mudstone, siltstone, and shale intercalated with fine-grained volcaniclastic rocks including tuff and debris-flow breccia.

**uTPs** Arenaceous facies: grey green, calcareous to non-calcareous volcanic sandstone and siltstone, mudstone and shale interbedded with variable proportions of impure limestone. Locally contains vitric, lithic and crystal tuff or reworked equivalents, volcaniclastic debris-flow breccia, and minor pebbly sandstone and conglomerate.

**uTPv** Volcanic rocks: predominantly basaltic lithic tuff and tuff-breccia of phreatomagmatic origin, lesser pillow lava, hyaloclastite, and interbedded water-washed equivalents (see table of abbreviations and nomenclature).

***CARNIAN(?) TO HETTANGIAN OR SINEMURIAN***

**TJs** Undivided strata of the Parson Bay Formation and overlying unnamed sedimentary and volcaniclastic rocks of the Bonanza Group outside the limit of mapping.

**UPPER TRIASSIC**

**VANCOUVER GROUP**

***CARNIAN TO (LATE) LOWER NORIAN (south of Holberg-Rupert inlets)***
***CARNIAN (north of Holberg-Rupert inlets)***

QUATSINO FORMATION

**uTQ** Thinly bedded to massive lime mudstone; silica replacements common and rare chert nodules; rare laminated interbeds and oolitic layers; locally fossiliferous.

***CARNIAN***

KARMUTSEN FORMATION

**uTK / uTKb** uTK, aphanitic to coarsely plagioclase-phyric, commonly amygdaloidal, subaerial basaltic lava flows with minor pillow basalt, pillow breccia and hyaloclastite (see table of abbreviations and nomenclature).

uTKb thin horizons of pale grey limestone intercalated with Karmutsen basalt near the top of the succession.

## INTRUSIVE ROCKS

**EARLY TO MIDDLE JURASSIC**

ISLAND PLUTONIC SUITE

**Jt** Medium to coarse-grained, equigranular granitoid rocks and porphyry; includes hornblende ± biotite-bearing gabbro (gb), diorite (di), quartz diorite (qd), monzonite (mz), quartz monzonite (qmz) and granodiorite (gd).

## ABBREVIATIONS AND NOMENCLATURE FOR VOLCANIC AND SEDIMENTARY ROCKS

**JBx / D** where x is composition, is lithology, and D is other descriptors listed below

**JB** where undivided

**Composition:**
- m mafic (basaltic)
- i intermediate (andesitic)
- f felsic (rhyolitic-rhyodacitic-dacitic)

A compositional range is compounded (e.g. m/i, mafic to intermediate)

| Epiclastic* | | Pyroclastic | | Other** | |
|---|---|---|---|---|---|
| **Lithology:** | | | | | |
| br | breccia | pbr | pyroclastic breccia | f | lava flow (includes flow breccia) |
| cg | conglomerate | a-br | tuff-breccia | | |
| sn | sandstone | b | lapilli tuff | pl | pillow lava |
| sl | siltstone | t | tuff | pbr | pillow breccia |
| sh | shale | | | | |
| md | mudstone | | | | |
| ls | limestone | | | | |

**Descriptors:**

**Prefixes:**

| | | | | | |
|---|---|---|---|---|---|
| v | volcanic [1] | w | welded | h | hyaloclastite |
| t | tuffaceous [2] | | | | |
| s | silty / sandy | | | | |
| m | manganiferous | | | | |
| z | siliceous | | | | |
| c | calcareous | | | | |
| d | debris flow | | | | |

**Suffixes:**

| | | | |
|---|---|---|---|
| v | vitric | Y | amygdaloidal |
| x | crystal | S | laminar flowage structures [3] |
| l | lithic | A | aphanitic / fine-grained (<1mm) |
| | | P | porphyritic (1-5mm) |
| | | **P** | megacrystic (>5mm<15mm) |
| | | Pl | plagioclase |
| | | Aug | high-Ca clinopyroxene |
| | | Ol | olivine |
| | | Opx | orthopyroxene |
| | | Hb | hornblende |

Volcaniclastic nomenclature after Cas and Wright (1988)

* volcanic and/or nonvolcanic constituents ** includes autoclastic and quench-fragmented products

1 pyroclastic or epiclastic (non-genetic) 2 mixed epiclastic/pyroclastic (tuffites) 3 includes flow folds

*(sn, vbr)*: parentheses denote minor lithologies

GRID NORTH
TRUE NORTH
MAGNETIC NORTH
1° 09'
20° 53'

Approximate mean magnetic declination 2000 for the centre of the map area: 20° 53'E decreasing annually 9.8' to 2005

## MAP SYMBOLS

Geological contact:
- defined
- approximate
- inferred
- hidden
- facies boundary, inferred

Unconformity:
- approximate
- inferred

High-angle fault (ball on downthrown side if known)
- defined
- approximate
- inferred
- hidden

Limit of mapping

Bedding (facing known: inclined, vertical)

Bedding (facing unknown: inclined)

Primary flowage structures in volcanic rocks (inclined, welding in tuff)

Primary mineral foliation in plutonic rocks (inclined)

Stylolite orientation (bedding parallel, non-parallel)

Dike (inclined, vertical,Tertiary)

Minor fault (inclined, vertical, with plunge and trend of slickenside striations)

Plunge and trend of minor fold axes ('M', '2', vergence unknown)

MINFILE locality (092L 010; Table 1) 10

Lithogeochemical assay locality (Table 2) 53

Macrofossil locality (Tables 3, 4) 5

Conodont locality (Tables 5, 6) 8

Radiolarian locality (Table 7) 8

U-Pb Zircon date (Ma ± 2σ; Table 8) 170±2

$Ar^{40} - Ar^{39}$ mineral date (Ma ± 2σ ; Hb, hornblende; Bi, biotite; Pl, plagioclase; Kf, potassium feldspar; Table 9) 167.8 ± 8.2 Hb

Whole-rock geochemistry locality (Tables 11, 13) (see whole-rock geochemistry legend) 277

X-ray diffraction mineral identification (Lmt, laumontite; Kf, potassium feldspar; Table 10) Kf

Outcrop examined (control)