Natural Resources Canada / Ressources naturelles Canada

British Columbia Ministry of Energy and Mines

LEGEND

Layered Rocks

POST-ACCRETION OVERLAP ROCKS

QUATERNARY

- Qv — Basaltic scoria, unconsolidated ash, agglomerate and columnar basalt flows; brown, red and black; distinctly alkaline

MIDDLE JURASSIC - LOWER CRETACEOUS

Gravina Belt

- JKGsb — Sandstone, conglomerate and shale as submarine turbidite deposits interlayered with andesitic to basaltic volcanic rocks; metamorphosed to amphibolite facies, locally kyanite-staurolite grade
- JKGm — Predominantly mafic metavolcanic rocks and lesser undivided metaclastic rocks

LOWER to MIDDLE JURASSIC

Moffat volcanics

- lmJMmv — Basaltic flows with pillows and quartz-bearing rhyolite tuff; minor thin volcanic unit stratigraphically underlying Unit JKG in Chatham Sound area

Regional Unconformity

WRANGELLIA

UPPER TRIASSIC

Karmutsen Group

- uTRb — Pillow basalt. Exposed on Bonilla Island 10 km west of North Sheet

ALEXANDER TERRANE

TRIASSIC (?)

- Tmsₙmv — Metasiltstone, mudstone and conglomerate, quartzite and metavolcanic rocks of mafic to felsic compositions; metamorphosed to amphibolite facies
- Tmc — Marble; grey, thickly bedded

PALEOZOIC or MESOZOIC

- P-Mms — Metagreywacke; olive green, biotite and garnet bearing, well sorted, medium grained and thickly bedded

UPPER PALEOZOIC (PERMIAN?)

Kumealon unit

- uPmc — Marble; grey, coarsely crystalline, thinly to thickly bedded, contains solitary corals and crinoid columnals

LOWER PERMIAN

Kumealon unit

- lPmc — Carbonate and laminated metasiltstone, minor andesite lapilli tuff and breccia
- lPmr — Metarhyolite, quartz-sericite schist
- lPms — Biotite schist, pelite and metatuff with minor thin marble and calc-silicate layers
- lPmv — Mainly meta-andesite, metabasalt and metarhyolite; metasedimentary strata in Baker Inlet
- lPmb — Amphibolite, garnet amphibolite

DEVONIAN to MISSISSIPPIAN

- DMsg — Quartz-pebble conglomerate and garnet-bearing carbonaceous pelite

DEVONIAN

Mathieson Channel Formation

- DMCmc — Marble; white with tan weathering, discontinuous plastically deformed layers and enclaves in Units DMCmb and DMCms
- DMCmr — Metarhyolite, locally quartz-sericite schist; off-white, pyrite bearing
- DMCmb — Metabasite and mafic schist containing rare pillows; dark green, interlayered thin marble and narrow metadiorite bodies
- DMCms — Meta-arenaceous micaceous siltstone, sandstone and biotite-rich, orange-brown, rusty, oxidized metagreywacke, lesser contorted marble and calc-silicate-rich layers; minor narrow, layer-parallel fine-grained diorite and amphibolite (dikes?)
- DMCcg1 — Plutonic-cobble conglomerate interlayers in finer metasedimentary rocks of Unit DMCms
- DMCcg2 — Quartzite-cobble conglomerate containing lesser metavolcanic clasts, interlayers of calcareous metasiltstone; scarce isolated exposures near Jonkins Point in Fitzhugh Channel

ORDOVICIAN

Porcher Formation

- OPa — Andesitic lapilli tuff and breccia in greenschist metamorphic facies
- OPl — Dacite and andesite tuff, tuffaceous sedimentary beds, narrow marble interlayers
- OPcg — Volcanic-pebble conglomerate and sandstone
- OPex — Meta-exhalite as iron formation, minor interlayered felsic metatuff
- OPls — Limestone interbedded with andesitic tuff, and andesite breccia with carbonate matrix
- OPmb — Pillow basalt and metabasite in amphibolite metamorphic facies
- OPmc — Marble; grey weathered; with thin, green metatuff interlayers
- OPmf — Metarhyolite and metadacite, aphyric and quartz-phyric felsic metatuff with magnesian zoisite (axinite ?) on northeast Pitt Island, quartz-sericite schist
- OPms — Meta-siltstone, mudstone, conglomerate and quartzite, minor thin marble, mafic and felsic volcanic rocks in amphibolite metamorphic facies
- OPmsf — Quartz-biotite schist and sericitic quartzite, narrow bands of pyritic quartz-sericite schist (felsic volcanic protolith) with quartz veins carrying lead sulphide
- OPmv — Meta-basalt and andesite, garnet amphibolite and fine grained metadiorite, metre-scale intervals of metatuff and marble
- OPsₙ — Volcanic-lithic arenite and greywacke

LOWER PALEOZOIC

- lPms — Pelite, calc-schist, marble and quartzite; distinctly laminated mylonite

Bonilla Dextral Strike-Slip Fault

Cryptic fault

YUKON - TANANA TERRANE

PALEOZOIC to TERTIARY

Central Gneiss Complex

- P-Tms — Metasedimentary and lesser metavolcanic rocks
- P-Tum — Gneissic quartz diorite, rusty gneiss and schist, migmatite, minor garnet sillimanite-biotite schist and garnet-staurolite-kyanite schist, marble and skarn

MIDDLE DEVONIAN and younger

Ecstall Belt/Scotia Quail Belt

- mDEq — Quartzite, locally pyritiferous, lesser black argillite to phyllite, pelitic schist, mica schist and biotite-hornblende gneiss
- mDEms — Metasedimentary rocks; fine- to medium-grained; locally conglomeratic with granitoid clasts, hornblende-biotite gneiss; well foliated and lineated
- mDEmv — Mafic and intermediate metavolcanic rocks; minor metasedimentary rocks with pyritic felsic metavolcanic layers; amphibolite, chlorite schist

Intrusive Rocks

SYN- and POST-ACCRETION INTRUSIVE ROCKS

PALEOCENE - EOCENE

- Egm — Quartz monzonite

LATE CRETACEOUS to PALEOCENE

- lK-PQgd — QUATTOON PLUTON: Granodiorite, quartz monzonite, tonalite, granite; generally fresh and with biotite-hornblende, commonly well foliated

LATE CRETACEOUS

Kynoch Suite (ca. 81-87 Ma)

- lKt — Biotite-hornblende tonalite
- lKqm — Biotite-quartz monzonite
- lKgd — Biotite-hornblende granodiorite

Ecstall Suite (ca. 90-95 Ma)

- lKEt — Tonalite distinguished regionally by abundant prismatic titanite and magmatic epidote; numerous mafic enclaves
- lKEqm — Quartz monzonite
- lKEgd — Hornblende-biotite granodiorite
- lKEqd — Quartz diorite
- lKEd — Diorite, gneissic metadiorite

EARLY to LATE CRETACEOUS

Captain Cove Suite (ca. 94-115 Ma)

- eKCCt — Tonalite and quartz diorite; greenish grey-white, medium- to coarse-grained, locally abundant elliptical enclaves of diorite and amphibolite
- eKCCgd — Garnet-biotite tonalite; non- to moderately foliated
- eKCCt — Tonalite; texturally varied from protomylonitic to nonfoliated with rafts of orthogneiss, locally with variably flattened mafic enclaves that are difficult to distinguish from those found in adjacent plutons of Unit eKCCt
- eKCCqm — Quartz monzonite
- eKCCgd — Granodiorite, minor tonalite and diorite; overall homogeneous, coarse grained, weak to strong foliation
- eKCCqd — Hornblende-biotite-quartz diorite, minor diorite and granodiorite
- eKCCd — Mainly foliated diorite cross-cut by non-foliated pegmatitic gabbro, hornblendite and clinopyroxenite
- eKCCog1 — Mafic orthogneiss with enclaves of metasandstone and marble of Unit DMC
- eKCCgb — Gabbroic pegmatite

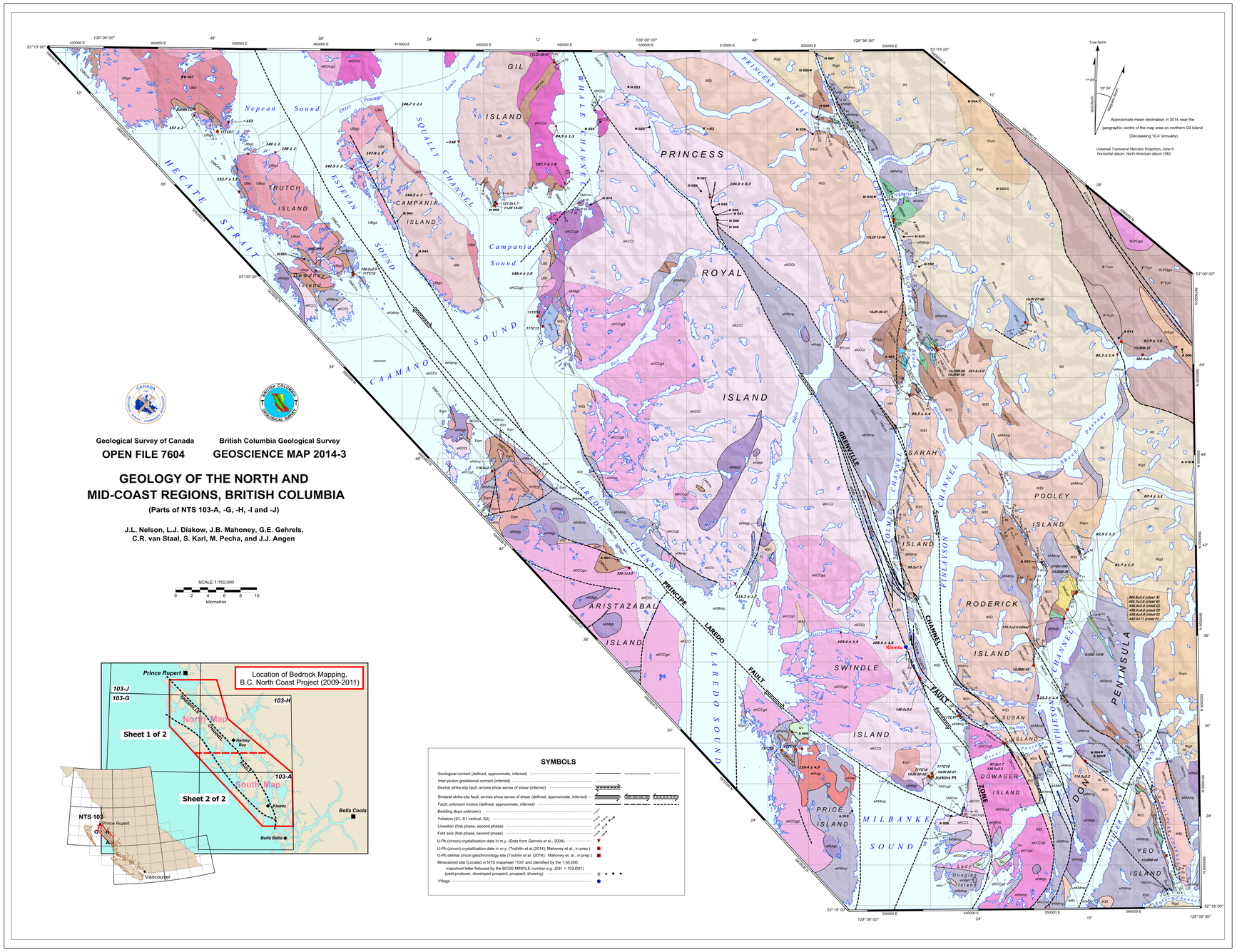
McCauley Suite (ca. 113-123 Ma)

- eKMgr — Granite
- eKMtr — Trondhjemite and granodiorite, coarse-grained; moderately strained and locally protomylonitic
- eKMmp — Predominantly mafic plutons with broad textural and compositional diversity including foliated diorite, dioritic orthogneiss, cross-cutting minor nonfoliated pegmatitic gabbro, hornblendite and clinopyroxenite
- eKMgb — Gabbro and metagabbro, coarse-grained equigranular and locally layered, foliated metadiorite; unit may include younger gabbro and ultramafic bodies

LATE JURASSIC

Banks Island Suite (ca. 142-157 Ma)

- lJBt — Foliated tonalite
- lJBqm — Biotite-hornblende-quartz monzonite; white, locally aplitic to coarse grained
- lJBgd — Hornblende-biotite granodiorite; medium- to coarse-grained, non- to well-foliated
- lJBqd — Hornblende-biotite-quartz diorite
- lJBd — Diorite



Geological Survey of Canada
OPEN FILE 7604

British Columbia Geological Survey
GEOSCIENCE MAP 2014-3

GEOLOGY OF THE NORTH AND MID-COAST REGIONS, BRITISH COLUMBIA

(Parts of NTS 103-A, -G, -H, -I and -J)

J.L. Nelson, L.J. Diakow, J.B. Mahoney, G.E. Gehrels, C.R. van Staal, S. Karl, M. Pecha, and J.J. Angen

SCALE 1:150,000

0 2 4 6 8 10 kilometres

SYMBOLS

- Geological contact (defined, approximate, inferred)
- Inter-pluton gradational contact (inferred)
- Dextral strike-slip fault; arrows show sense of shear (inferred)
- Sinistral strike-slip fault; arrows show sense of shear (defined, approximate, inferred)
- Fault; unknown motion (defined, approximate, inferred)
- Bedding (tops unknown)
- Foliation (S1, S1 vertical, S2)
- Lineation (first phase, second phase)
- Fold axis (first phase, second phase)
- U-Pb (zircon) crystallization date in m.y. (Data from Gehrels et al., 2009)
- U-Pb (zircon) crystallization date in m.y. (Tochilin et al.(2014); Mahoney et al., in prep.)
- U-Pb detrital zircon geochronology site (Tochilin et al. (2014); Mahoney et al., in prep.)
- Mineralized site (Located in NTS mapsheet "103" and identified by the 1:50,000 mapsheet letter followed by the BCGS MINFILE number e.g. J031 = 103JJ031) (past producer, developed prospect, prospect, showing)
- Village

PRE-ACCRETION INTRUSIVE ROCKS

ALEXANDER TERRANE

EARLY PERMIAN

- ePPgm — Muscovite-rich orthogneiss, with or without kyanite; strongly foliated and lineated

DEVONIAN to MISSISSIPPIAN

Swede Point Suite

- DMSPq — Protomylonitic diorite
- DMSPgd — Undivided granodiorite, granite, tonalite and diorite with protomylonitic fabric; some phases are small-plagioclase phyric, local metamorphic garnet

LATE SILURIAN to EARLY DEVONIAN

Ogden Channel Intrusive Complex

- sDOCPm — PORCHER PLUTON: Diorite, gabbro, tonalite and basalt; heterogeneous, late syn- to post-kinematic Silurian to Devonian deformation in Ogden Channel Complex
- SDOCmb — Metabiotite, metagabbro, metatonalite and lesser metavolcanic and metasedimentary screens; polydeformed under amphibolite facies conditions

CAMBRIAN to ORDOVICIAN

- Ot — Tonalite and diorite; texturally heterogeneous
- Otr — Trondhjemite; mostly coarse grained, equigranular
- Ogb — Mafic igneous complex composed mainly of metagabbro; lesser metabasalt
- Ott — Tonalite, leucotonalite; commonly with blue quartz eyes, primary mafic minerals recrystallized to lower greenschist facies assemblages

PALEOZOIC (?)

- PZum — Feldspar-quartz-biotite gneiss, garnet-biotite gneiss, amphibolite

Cryptic fault

YUKON - TANANA TERRANE

MIDDLE to LATE DEVONIAN

Big Falls Orthogneiss

- mDBFogn — Tonalite: muscovite-biotite-hornblende augen gneiss, garnet and epidote-bearing migmatite, amphibolite
- mDEum — Ortho- and paragneiss, schist, migmatite, marble and skarn

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2014

SHEET 2 OF 2
FEUILLET 2 DE 2

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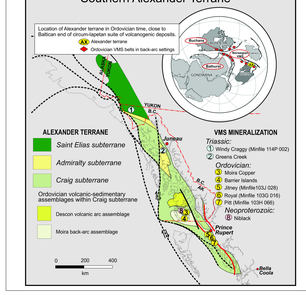
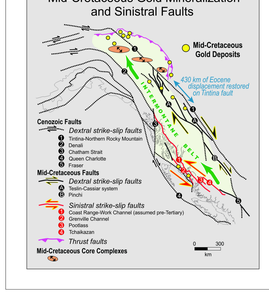
Ordovician Volcanogenic Mineralization, Southern Alexander Terrane



The southern part of the Craig subterrane of the Alexander terrane, which extends from Prince of Wales Island southward into coastal British Columbia, contains an Ordovician volcanic-sedimentary-intrusive suite of probable back-arc affinity. On southern Prince of Wales Island, these rocks were assigned to the informal Moira Sound unit, distinct from the more widespread arc-axial Descon Formation (Ayuso et al., 2005). Probable correlatives in coastal northern British Columbia are here assigned to the Porcher Formation, named for the excellent exposures on and near Porcher Island (see NORTH MAP SHEET). Several sulphide deposits occur in and adjacent to Ordovician rhyolites and rhyolite breccias of this unit. The previously known Pitt VMS occurrence on Pitt Island consists of a 3.5 kilometre-long trend of base-metal sulphide bodies aligned along a major shear zone that marks the southwestern limit of ductile shearing related to the mid-Cretaceous Grenville Channel fault. Deformation of the sulphides and their host quartz-muscovite schists is so intense that an epigenetic, synkinematic origin cannot be ruled out on geological grounds. However, chalcopyrite and sphalerite separates from the main Pitt showing yield lead isotopic ratios of $^{206}Pb/^{204}Pb$: 18.1701-18.1911; $^{207}Pb/^{204}Pb$: 15.5643-15.5660 and $^{208}Pb/^{204}Pb$: 38.1015-38.0893 (Nelson et al., 2013). These values, in particular the $^{207}Pb/^{204}Pb$ ratio, are significantly lower than those of Cretaceous syngenetic and epigenetic deposits elsewhere in the Coast belt (ca 18.4 – 18.7; Nelson et al., 2013) and are thus incompatible with an epigenetic origin linked to the Grenville Channel fault or its splays, the spatial association notwithstanding. Instead, they closely match leads from Ordovician volcanogenic deposits of New Brunswick, Newfoundland, Quebec and Norway. In terms of $^{207}Pb/^{204}Pb$ vs $^{206}Pb/^{204}Pb$, the Pitt lead is identical to that of the Bathurst camp. Current tectonic models place the Alexander terrane near the northern end of the Caledonide chain in early to mid-Paleozoic time, based on faunal affinities and Baltican-Caledonian detrital zircon patterns (Tochilin et al., 2014). The Pitt Pb isotopic data support these models. They indicate that Ordovician volcanogenic massive sulphides in the Alexander terrane may link to a chain of deposits that originated in now dismembered arcs and back-arcs that constituted a circum-Iapetus Ocean "ring of fire".

Mid-Cretaceous Gold Mineralization and Sinistral Faults



The map area is transected by the Early to mid-Cretaceous sinistral Grenville Channel fault and its many splays. This ductile shear zone coincides with the belt of Early Cretaceous (McCauley suite) and mid-Cretaceous (Captain Cove suite) plutons; faulting and magmatism were likely interrelated. Penetrative ductile deformation with sinistral shear sense also affects the older McCauley plutonic suite as a whole, whereas mid-Cretaceous Captain Cove intrusions are only sheared next to faults. Total displacement on the Grenville Channel fault is about 10 kilometres, as suggested by offset of the northwestern margin of a mid-Cretaceous pluton from northern Princess Royal Island to the mainland near Hartley Bay. A similar offset is apparent north of the map area, where the Ogden Channel complex is displaced from its extension onto Stephens Island, across Brown Passage, to a coeval pluton on Dundas Island (revised digital provincial geological map released on Mapplace, January 30, 2013). A dextral splay of the Grenville Channel fault in Telegraph Passage is probably a ductile shear conjugate; overall the system is thought to be the result of nearly orthogonal compression and northwest-southeast extension (Angen, 2013; Angen et al., 2012, 2014).

Orogenic gold quartz vein deposits are associated with 2nd and 3rd order shears of the Grenville Channel fault array. They include the Surf Inlet mine on northern Porcher Island (Nelson et al., 2010) and the Surf Inlet mine on Princess Royal Island (Nelson et al., 2011). On a Cordilleran-wide scale, the Grenville Channel and other major sinistral faults in the Coast belt (e.g. Tchaikazan, Pootlass) are coeval with regional dextral faulting in the northern Omineca belt (e.g. Teslin-Thibert-Cassiar fault system), which, farther north, feeds into the northwest-vergent thrust and northwest-southeast extensional structures in the Tombstone strain zone and Yukon-Tanana upland. Together, these structures outline a broad zone in the Intermontane region that displays the kinematics of a northwesterly escape block. Its margins were the focus of pluton emplacement and gold mineralization, most notably the Fairbanks and Tintina gold belts near its northwestern, leading edge.