Natural Resources Canada / Ressources naturelles Canada

GEOLOGICAL SURVEY OF CANADA / COMMISSION GÉOLOGIQUE DU CANADA

YUKON GEOLOGICAL SURVEY

REFERENCES

Colpron, M. and the Yukon-Tanana Working Group
2001: Ancient Pacific Margin- An update on stratigraphic comparison of potential volcanogenic massive sulphide-hosting successions of Yukon-Tanana Terrane, northern British Columbia and Yukon; In Yukon Exploration and Geology 2000. Exploration and Geological Services Division, Indian and Northern Affairs Canada., p. 97-110.

Deklerk, R. (Compiler)
2003: Yukon MINFILE Database and Mineral Occurrence Map - 105B-Wolf Lake; Yukon Geological Survey (CD-ROM and 1:250 000 scale map).

Driver, L.A.
1998: Petrogenesis of the Cretaceous Cassiar Batholith, Yukon-B.C., Canada: Implications for magmatism in the North American Cordilleran Interior; University of Alberta, Unpublished M.Sc. thesis, Department of Earth and Atmospheric Sciences, Edmonton, Alberta, 80 p.

Gabrielse, H.
1985: Major dextral transcurrent displacements along the Northern Rocky Mountain Trench and related lineaments in north-central British Columbia; Geological Society of America Bulletin 96, p. 1-14.

Gleeson, T.P., Friedman, R.M. and Wahl, K.
2000: Stratigraphy, structure, geochronology and provenance of the Logjam area, northwestern British Columbia (NTS 104O/14W; *in* Geological Fieldwork 1999, British Columbia Department of Energy, Mines and Petroleum Resources, p. 295-306.

Klassen, R.W.
1982: Surficial geology, Wolf Lake, Yukon Territory; Geological Survey of Canada Map 14-1982 (1 sheet ; scale 1:250 000).

Liverton, T. and Botelho, N.F.
2001: Fractionated alkaline rare-metal granites: two examples; Journal of Asian Earth Sciences 19, p. 399-412.

Mato, G., Ditson, G. and Godwin, C.
1983: Geology and geochemistry of the tin mineralization associated with the Seagull batholith, south-central Yukon Territory; Canadian Institute of Mining and Metallurgy Bulletin, 76,(854), p. 43-49.

Mihalynuk, M., Nelson, J.L. and Friedman, R.M.
1998: Regional geology and mineralization of the Big Salmon Complex (104N NE and 104O NW); *in* Geological Fieldwork 1997, British Columbia Ministry of Employment and Investment, Geological Survey Branch, Paper 1998-1, p. 6-1 to 6-20.

Mihalynuk, M.G., Nelson, J.L., Roots, C.F., Friedman, R.M. and de Keijzer, M.
2000: Ancient Pacific Margin, Part III: Regional geology and mineralization of the Big Salmon Complex (NTS 104N/9E,16 & 104O/12,13,14W); *in* Geological Fieldwork 1999, British Columbia Department of Energy, Mines and Petroleum Resources, p. 27-46.

Mortensen, J.K.
1992: Pre-mid-Mesozoic tectonic evolution of the Yukon-Tanana terrane, Yukon and Alaska; Tectonics, v. 111, no. 4, p. 836-853.

Mortensen, J.K.
1999: YUKONAGE, An isotopic age database for the Yukon Territory; *in* Yukon Digital Geology; S.P. Gordey and A.J. Makepeace (editors), Geological Survey of Canada, Open File D3826.

Mulligan, R.
1963: Geology of Teslin map area, Yukon Territory (105C); Geological Survey of Canada, Memoir 326 and Map 1125A

Murphy, D.C.
1988: Geology of Gravel Creek (105B/10) and Irvine Lake (105B/11) map area, southern Yukon; Exploration and Geological Services Division, Indian and Northern Affairs Canada, Yukon, Open File 1988-1 (uncoloured 1:50 000 scale maps and text)

Nelson, J.L.
2000: Ancient Pacific Margins Part VI: Still heading south: Potential VMS hosts in the eastern Dorsey Terrane, Jennings River (104O/1; 7,8,9,10); *in* Geological Fieldwork, 1999; British Columbia Ministry of Employment and Investment, Geological Survey Branch, Paper 2000-1, p. 107-126.

Nelson, J.L.
2001: Geology of north-central Jennings River map area 104-O/14E and 15, British Columbia; *in* Geological Fieldwork 2000, British Columbia Ministry of Energy and Mines, Paper 2001-1, p. 55-66.

Poole, W.H.
1956: Geology of the Cassiar Mountains in the vicinity of the Yukon-British Columbia boundary; Princeton University, unpublished Ph.D. thesis, Princeton, New Jersey. 247 p.

Poole, W.H., Roddick, J.A. and Green, L.H.
1960: Geology, Wolf Lake, Yukon Territory; Geological Survey of Canada, Map 10-1960. (uncoloured, scale 1:253 440, with marginal notes)

Roots, C.F. and Heaman, L.
2001: Mississippian U-Pb dates from Dorsey Terrane assemblages in the upper Swift River area, southern Yukon Territory; Geological Survey of Canada, Current Research 2001-A01, 16 p.

Roots, C.F., de Keijzer, M., and Nelson, J.L.
2000: Wolf Lake Project: Revision mapping of Dorsey Terrane assemblages in the upper Swift River area, southern Yukon and northern B.C; *in* Yukon Exploration and Geology 1999; D.S. Emond and L.H. Weston (eds.), Exploration and Geological Services Division, Yukon Region, Indian and Northern Affairs Canada, p. 115-125.

Roots, C.F., Liverton, T. and Heaman, L.
2003: Geology and U-Pb zircon geochronology of upper Dorsey assemblage near the TBMB claims, upper Swift River area, southern Yukon; *in* Yukon Exploration and Geology 2002, D.S. and L.L. Lewis (eds.), Exploration and Geological Services Division, Yukon Region, Indian and Northern Affairs Canada, p. 199-212.

Simard, R-L, Dostal, J. and Roots, C.F.
2003: Development of late Paleozoic volcanic arcs in the Canadian Cordillera: an example from the Klinkit Group, northern British Columbia and southern Yukon; Canadian Journal of Earth Sciences 40: p. 907-924.

Stevens, R.A.
1996: Dorsey Assemblage: pre-mid-Permian high temperature and pressure metamorphic rocks in the Dorsey Range, southern Yukon Territory; *in* Lithoprobe report No. 56. SNORCLE and Cordilleran Tectonics Workshop, p. 70-75.

Stevens, R.A. and Harms, T.A.
1995: Investigations in the Dorsey terrane, Part 1: stratigraphy, structure and metamorphism in the Dorsey Range, southern Yukon Territory and northern British Columbia; in Current Research 1995-A; Geological Survey of Canada, p. 117-127.

Stevens, R.A. and Harms, T.A.
2000: Bedrock geology of the Dorsey Range, southern Yukon Territory and northern British Columbia; Geological Survey of Canada, Open File 3926, scale 1:100 000.

NOTES

ACCESS

The map area has no roads, although old pack-horse trails are present in most major valleys. It lies within the traditional territory of the Teslin Tlingit Council. There are site-specific land claims at the outlet of Slim Lake, and on the east side of Morris Lake.

PHYSIOGRAPHY

The map area is part of the Nisutlin Plateau (c.f. Mulligan, 1963; p. 4-11). The granitic bedrock produces high rounded hills and slopes of frost-fractured boulders. The central part of the map area is underlain by metamorphic rocks that are exposed as knobs and spines. Large ice sheets from the south and east covered this area (Klassen, 1982) as recently as 15,000 years ago.

PREVIOUS WORK

Reconnaissance mapping in 1953-55 (Poole et al., 1960) defined the major rock types. The south central area was examined by Stevens and Harms (1995; 2000). Helicopter-supported traverses and spot-checks in 1999 and 2000 as part of regional investigations (see Roots et al., 2000; Colpron and the Yukon-Tanana Working Group, 2001) contributed to this map.

REGIONAL GEOLOGY

Between the Cretaceous granites (Hake Batholith on the west; Cassiar Batholith to the east) are three belts of metamorphic rocks, collectively part of Yukon-Tanana Terrane (Mortensen, 1992). These are remnants of oceanic and continental volcanic arcs, and marginal basin sediments of Early to mid-Paleozoic age. At the head of Borden Creek are thick carbonate and andesitic volcanic rocks correlated with Klinkit Group (Simard et al., 2003).

The Ram Creek Fault (Poole, 1956) and Hidden Lake Fault are not exposed but deduced to be steeply dipping brittle structures with northeastward thrust or transpressional offset, based upon more comlete exposure to the southeast in 105B/3 map area. The former is likely of Cetaceous age; the latter was active between mid-Permian and Early Jurassic time.

YUKON-TANANA TERRANE

The Ram Creek Complex constitutes a narrow volcano-sedimentary belt between Dorsey Complex and the recessive sediments of Cassiar Terrane, bounded below by the Ram Creek fault and above by the Hidden Lake Fault. A large knoll 2 km east of Slim Lake is a plexus of dykes of gabbroic and green pyroxenite, interpreted as an intrusive complex. Ridge spurs 2 km southwest of Ram Creek reveal sheared low-grade mafic schist intruded by a foliated granite of circa 340 Ma (Roots and Heaman, 2001). This intrusive age is consistent with both extrusive and intrusive rocks in analogous tectono-stratigraphic position in northern BC (Nelson, 2000).

The Dorsey Complex includes amphibolite, streaky meta-chert, quartzite and gneissic meta-sediments that exhibit an additional to that seen in overlying and adjacent units. Metamorphic mineral assemblages in the Lower Unit of Dorsey Complex attest to high temprature and pressure conditions (Stevens, 1996) prior to intrusion of the Ram Stock (ca. 258 Ma; Mortensen, 1999). Minor marble lenses and colour banding reveal abundant rootless isoclinal folds.

The contact to the west with Swift River Group is not exposed. It is likely a tectonically modified sedimentary gradation through fine grained clastics, now accentuated by the upward decrease in metamorphic grade (c.f. Nelson, 2001; Roots et al., 2003). The Swift River Group includes monotonously bedded black meta-chert and argillite, lesser quartzite and stretched quartz-pebble conglomerate. No carbonate layers are known.

The Big Salmon Complex is exposed on a single ridge in the southwest part of the map area. Strongly foliated biotite-chloritic banded meta-tuff and flows predominate, including at least three exposures of manganiferous and hematitic meta-chert (possibly tectonic repetitions) of likely hydrothermal origin (c.f. Mihalynuk et al., 1998).

Regionally the Big Salmon and Ram Creek complexes have similar lithological and metamorphic characteristics. In this map area both include a distinctively banded chlorite-epidote rock interpreted as an altered tuff-quartzite (e.g. Poole, 1956: p. 64-65; well exposed downstream of Slim Lake). The two arc successions are coeval and considered correlative by Nelson (2000).

Klinkit Group carbonate and volcanic rocks were deposited on both Swift River and Big Salmon rocks but the stratigraphic contact has not been observed in this map area. Here the ridges of light grey limestone and volcaniclastic breccia are strongly hormfelsed by the adjacent Hake batholith.

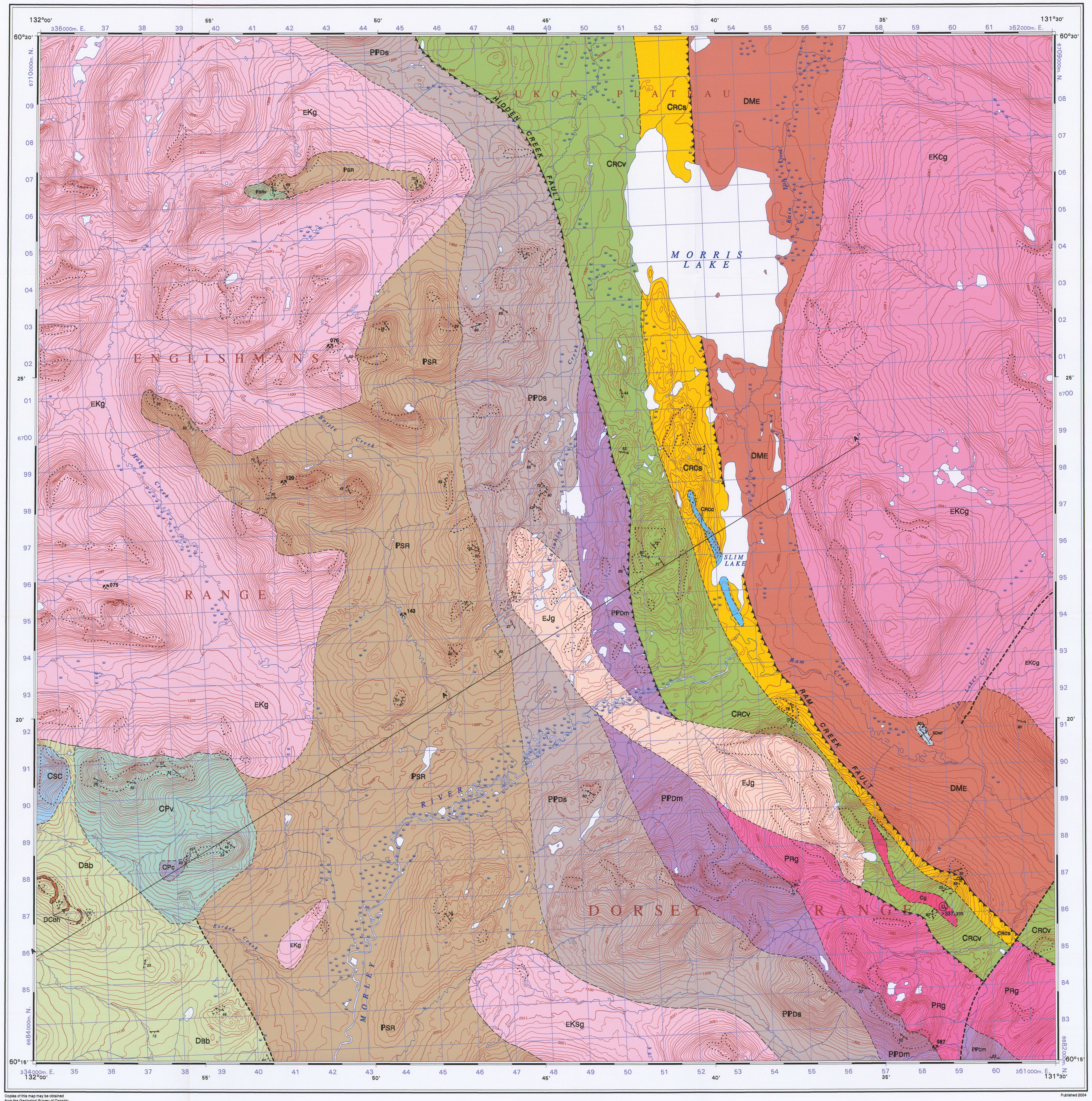
UNFOLIATED PLUTONIC ROCKS

Seagull batholith (ca 101 Ma, K-Ar; Mato et al. 1983, Mortensen, 1999) extends across the southern edge of the map area, on trend with Hake batholith to the northwest and likely connected to it at depth. Samples from this trend indicate an evolved magma, with Fe-rich mica and alkaline characteristics (Liverton and Botelho, 2001).

The 350 km long Cassiar batholith reaches its northwestern limit in this map area. A belt from several hundred metres to a few kilometers wide along its western side is deformed in both ductile and brittle fashion, interpreted as intrusion during activity of the Cassiar Fault (Gabrielse, 1985; Driver, 1998) approximately 112 Ma (Mortensen, 1999).

ECONOMIC MINERALIZATION

Minor vein occurrences and geochemical anomalies occur near the east margin of the Hake batholith. At the Kartuhini occurrence (Convert claims) 10 km west of Slim Lake are galena-bearing veins with relatively high silver and 1% tin.



LEGEND

OVERLAP ASSEMBLAGES

LAYERED ROCKS

UPPER CARBONIFEROUS TO PERMIAN
KLINKIT GROUP

- **CPc** Beige-weathering marble, locally silicified; rare chloritic interbeds
- **CPv** Volcanic fragmental member: Undifferentiated meta-tuff and volcanic breccia of intermediate composition; minor chloritic meta-sandstone and meta-siltstone 'dust-tuffs'
- **CSc** Screw Creek Limestone: Thin- to thick-bedded, light grey weathering, commonly bioclastic limestone and dolomitic marble; minor maroon to phyllite and bedded green chert.

YUKON-TANANA TERRANE

DEVONIAN TO LOWER CARBONIFEROUS
BIG SALMON COMPLEX

- **DCsh** Laminated quartzite, locally rich in pink piedmontite and hematite (Crinkle chert of Mihalynuk et al., 1998; 2000)
- **Dsb** Smart River Greenstone: Chloritic metabasalt and meta-tuff of intermediate to mafic composition; minor volcanic meta-sandstone

fault, sense of motion unclear

PERMIAN

- **PRg** Ram Stock: Coarse-grained monzonite, granodiorite (U-Pb zircon 258 ± 2 Ma; J.K. Mortensen, pers. comm., 2002) (intrudes Dorsey Complex)

LOWER CARBONIFEROUS TO UPPER SILURIAN
SWIFT RIVER GROUP

- **PSR** Dark-coloured quartz-plagioclase grit, meta-sandstone; minor phyllitic argillite, quartzite, conglomerate, limestone and chloritic meta-tuff (U-Pb detrital zircons as young as 422 Ma; Gleeson et al., 2001), carbonaceous siltstone, grey chert and volcanic breccia (intermediate composition)
- **PSRv** Chloritic andesitic intrusions, breccia and tuff; green siliceous argillite

CARBONIFEROUS AND OLDER
DORSEY COMPLEX

- **PPDs** Upper Dorsey unit: Biotite ± garnet schist, quartz meta grit, minor marble
- **PPDm** Lower Dorsey unit: Hornblende schist and gneiss, (locally contains felsic leucosome with U-Pb zircon date: 373 ± 14 Ma; amphibolite)

Hidden Lake Fault

RAM CREEK COMPLEX
EARLY CARBONIFEROUS

- **Cg** Foliated granodiorite (U-Pb zircon age: >337 Ma; Roots and Heaman, 2001) (intrudes Ram Creek Complex)

DEVONIAN TO LOWER CARBONIFEROUS

- **CRCv** Chloritic metabasalt and meta-tuff of intermediate to mafic composition; minor volcanic meta-sandstone (Amphibolite unit); includes metagabbro-basalt complex 2 km west of Slim Lake
- **CRCs** Quartzite, phyllite, biotite-muscovite-garnet schist; minor quartz-sericite schist (felsic meta-tuff)
- **CRCc** Beige-weathering limestone and marble

Ram Creek Fault

SYN- AND POST-OROGENIC

INTRUSIVE ROCKS

EARLY CRETACEOUS

- **EKg** Biotite granite, granodiorite, leuco-quartz monzonite, alaskite
- **EKSg** Seagull Batholith
- **EKCg** Cassiar Batholith: Granite, granodiorite, quartz monzonite, diorite

EARLY JURASSIC

- **EJg** Non-foliated, K-feldspar porphyritic granodiorite, monzonite; minor diorite, gabbro

ANCESTRAL NORTH AMERICA
CASSIAR TERRANE

LAYERED ROCKS

LOWER DEVONIAN TO LOWER MISSISSIPPIAN
EARN GROUP

- **DME** Recessive, carbonaceous shale and slate, locally phyllitic

SILURIAN TO UPPER DEVONIAN

- **SDm** McDame Formation: Grey to black laminated and thin-bedded fetid limestone

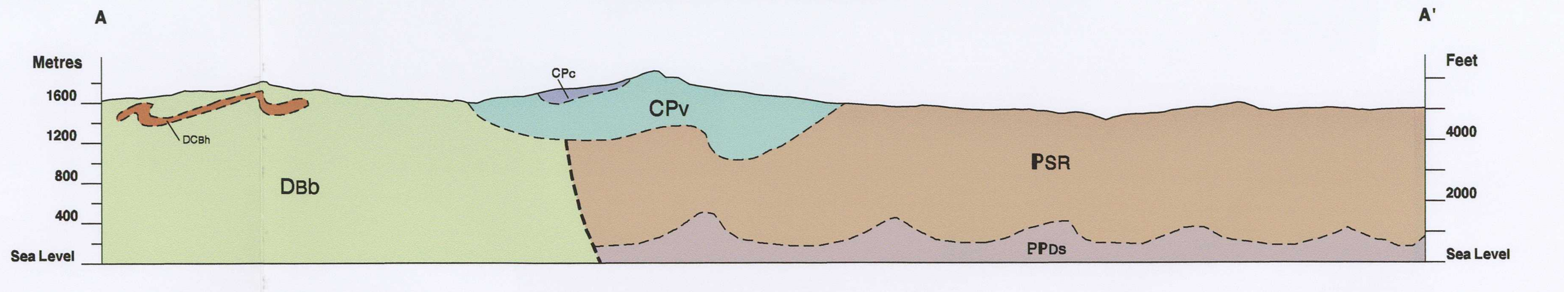
SYMBOLS

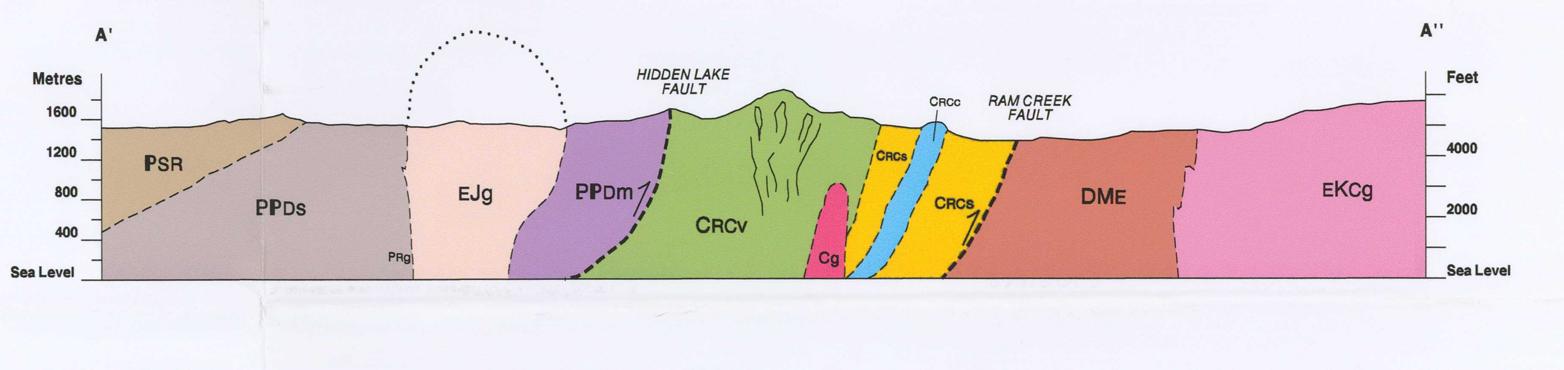
- Bedding: inclined, upright, overturned
- Dominant foliation (transposition foliation; commonly parallel to compositional layering): inclined, vertical
- Igneous layering
- Compositional layering
- Crenulation lineation
- Elongation or mineral lineation
- Intersection lineation, with vergence: M fold
- Folds, with vergence: M fold
- Cleavage
- Jointing
- U/Pb zircon date, age in Ma — 258
- Fossil locality
- Geological contact: defined, approximate, assumed
- Limit of outcrop
- Normal fault: defined, approximate, inferred; solid circle on downthrown side
- Thrust fault: defined, approximate, inferred; teeth on upthrust side
- Upright folds: antiform, synform
- Overturned folds: antiform, synform
- Cross-section line — A A'
- Yukon MINFILE (105B) occurrence — 113

Mineral Occurrences 105B/5
Yukon MINFILE (Deklerk, 2003)

No.	Name	Minerals
105B 075	Hake	unknown
105B 076	Mork	unknown
105B 087	Mcpress	Cu, Mo porphyry
105B 120	Kartuhini	Sn skarn
105B 143	Convert	volcanogenic

Interpretive Vertical Cross-sections
Morris Lake, Yukon (1:50 000)





Ancient Pacific Margin / NATMAP / CARTNAT / Ancienne marge du Pacifique

Yukon Energy, Mines and Resources

GSC OPEN FILE 4631
YGS OPEN FILE 2004-3
BEDROCK GEOLOGY

MORRIS LAKE
YUKON TERRITORY

Scale 1:50 000/Échelle 1/50 000

Universal Transverse Mercator Projection, North American Datum 1983 / Projection transverse universelle de Mercator, Système de référence géodésique nord-américain, 1983

Geology by: C. Roots, and J.L. Nelson, 1999 - 2000; R. Stevens, 1995 includes traverses by R-L. Simard and T. Harms, 2000

Digital cartography by P. Oheil, Geological Survey of Canada, Pacific Division

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

Digital base map from data compiled by Geomatics Canada, modified by the Geoscience Information Division

Universal Transverse Mercator Grid Zone 9

Mean magnetic declination 2003, 25°28'E, decreasing 18.0' annually.

Elevations in metres above mean sea level. Contour interval 20 metres

NATIONAL TOPOGRAPHIC SYSTEM REFERENCE

Published 2004

Yukon Geological Survey
Energy, Mines and Resources
Yukon Government

Open File 2004-3

Bedrock geology, Morris Lake (NTS 105B/5)
Yukon Territory
(1:50,000 scale)

by

C. Roots, J. Nelson and R. Stevens

OPEN FILE / DOSSIER PUBLIC
4631
GEOLOGICAL SURVEY OF CANADA / COMMISSION GÉOLOGIQUE DU CANADA
2004

Recommended citation:
Roots, C., Nelson, J., and Stevens, R.
2004: Bedrock geology, Morris Lake, Yukon Territory; Geological Survey of Canada, Open File 4631; Yukon Geological Survey, Open File 2004-3, scale 1:50 000.

LOCATION MAP

Canada