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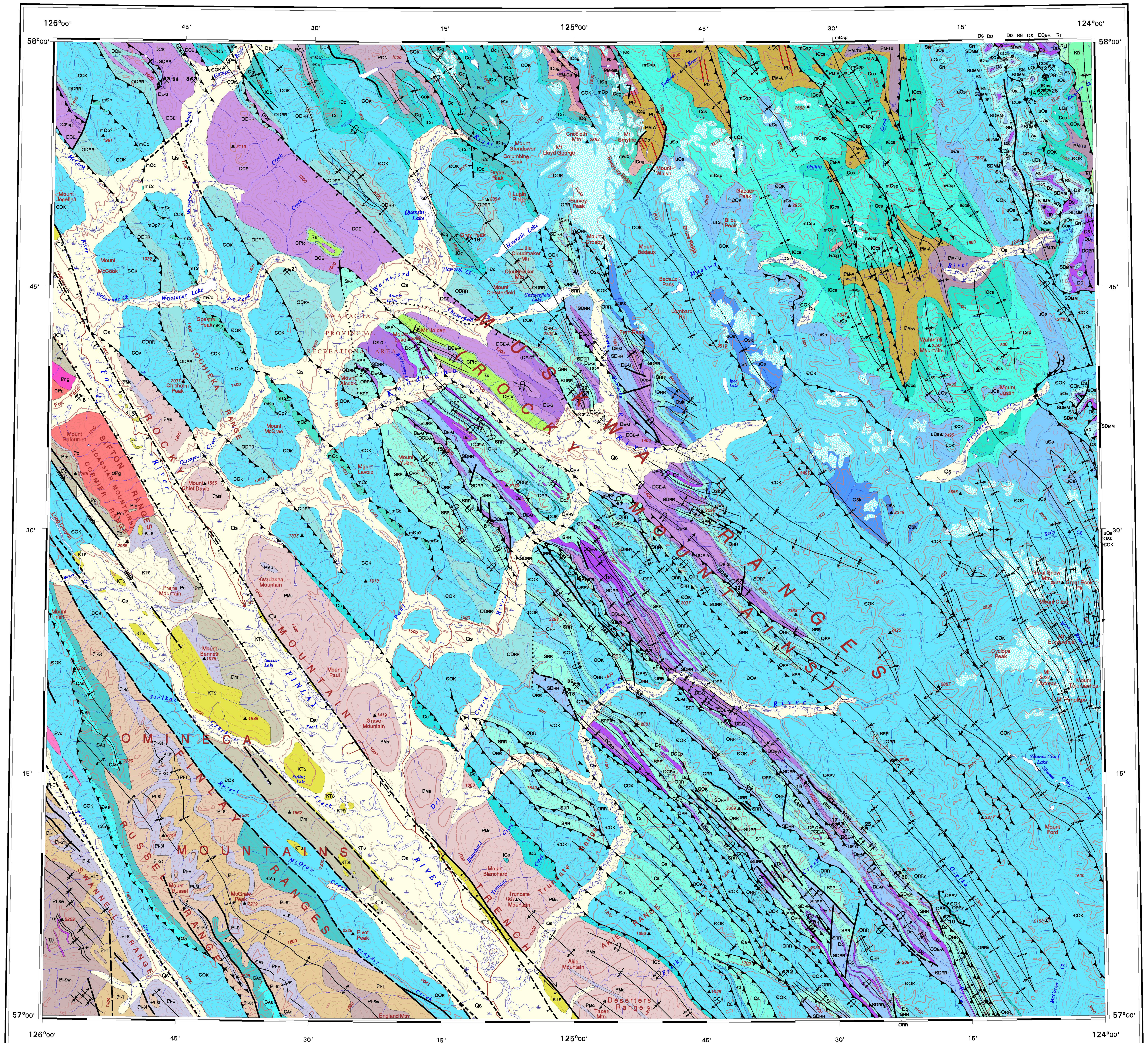
GÉOLOGICAL SURVEY OF CANADA — COMMISSION GÉOLOGIQUE DU CANADA



OPEN FILE 4276

GEOLOGY

WARE

BRITISH COLUMBIA

Scale 1:250 000/Échelle 1/250 000

kilometres 5 0 5 10 15 20 kilomètres

Universal Transverse Mercator Projection
North American Datum 1983
© Her Majesty the Queen in Right of Canada, 2002

Projection transverse universelle de Mercator
Système de référence géodésique nord-américain, 1983
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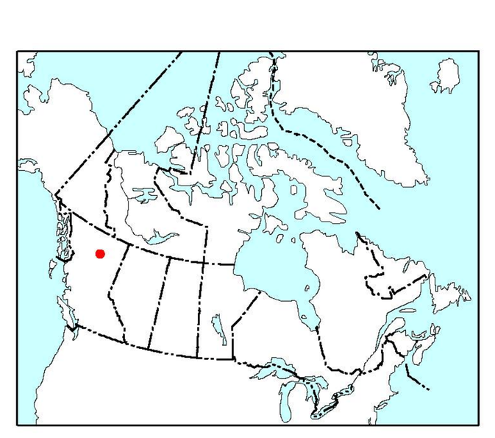


LOCATION MAP

Geology by D.F. Stott, G.L. Goruk, and B.R. Pelletier, 1962, E.W. Bamber, R.T. Bell, B.S. Norford, D.F. Stott, and G.C. Taylor, 1964, G.H. Eisbacher, 1969-1971, H. Gabrielse, C.J. Dodds, and J.L. Mansy, 1971-1975, M.P. Cecile, G.H. Eisbacher, W.H. Fritz, C.W. Jefferson, B.S. Norford, and G.C. Taylor, 1978, D.G. MacIntyre, K. Heather, J. Lowey, K. Downing, and L. Diakow, 1979-1981, K.R. McClay, M.W. Insley, N.A. Way, and R. Anderton, 1985-1986, and L.J. Pyle and C.R. Barnes, 1998-1999

Geology compilation by H. Gabrielse, 1977 (west half), G.C. Taylor, 1979 (east half), D.G. MacIntyre, 1994-1995 (central and south-central), and A.V. Okulitch, 2001

Contribution by H. Gabrielse and A.V. Okulitch, 2001

Critical review by M. McMechan, 1985 (east half) and H. Gabrielse, 2000-2001 (west half)

Data digitization by D.G. MacIntyre, 1994-1995 (in MacIntyre et al., 1995), S.J. Hinds, 1998, A.V. Okulitch and C.L. Wagner, 2001-2002

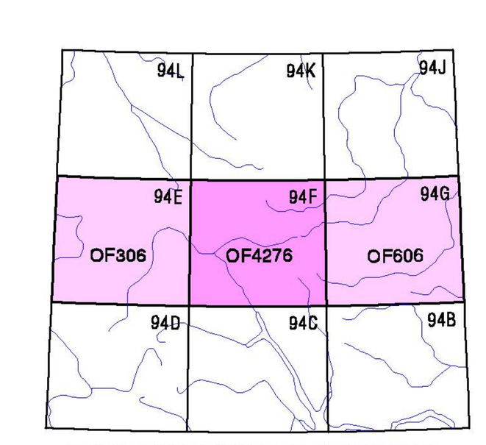
Digital geological cartography by C.L. Wagner, Earth Sciences Sector Information Division (ESS Info)

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 ESS Info

Mean magnetic declination 2002, 23°56'E, decreasing 15.8' annually. Readings vary from 23°25'E in the SE corner to 24°25'E in the NW corner of the map

Elevations in metres above mean sea level
Contour interval 200 metres



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA MAPS

Canada

LEGEND

PHANEROZOIC

CENOZOIC
QUATERNARY

- **Qs** — *unconsolidated glacial, fluvioglacial, unconsolidated deposits*

PALEOGENE

- **Ᵽvd** — *dacite dykes*

OLIGOCENE

- **OᵽG** — *granite, quartz monzonite (33.4 Ma)*

MESOZOIC AND CENOZOIC
CRETACEOUS AND TERTIARY

- **KTs** — *Sifton Formation: conglomerate, sandstone, siltstone, coal; locally abundant dacitic volcanic rocks*

MESOZOIC
CRETACEAOUS
LOWER CRETACEOUS
ALBIAN

- **KB** — *Buckinghorse Formation: dark grey marine shale, siltstone, sideritic concretions; minor sandstone (marine)*

TRIASSIC

- **Ŧs** — *dolomitic siltstone, minor limestone, dolostone*

LATE TRIASSIC

- **Ŧb** — *hornblende gabbro*

MIDDLE AND UPPER TRIASSIC

- **ŦLi** — *Liard Formation: dolomitic and calcareous sandstone, siltstone*

LOWER AND MIDDLE TRIASSIC

- **ŦT** — *Toad Formation: calcareous siltstone, shale; minor sandstone, limestone*

PALEOZOIC
CARBONIFEROUS AND PERMIAN

- **CPtc** — *'western' Prophet, Kindle and Fantasque Formations: grey chert*

DEVONIAN AND CARBONIFEROUS
UPPER DEVONIAN AND LOWER CARBONIFEROUS
EARN GROUP (DCE-G, DCE-A, DCEp, DCEcg)

- **DCE-A** — *Akie Formation: brown-weathering silty shale; minor siltstone*
- **DCEp** — *shale: black siliceous shale; minor sandstone, pebble conglomerate, barite*
- **DCEcg** — *coarse, polymictic conglomerate*
- **DCE** — *Earn Group: undivided*

MIDDLE DEVONIAN TO LOWER CARBONIFEROUS

- **DCBR** — *Besa River Formation: black, siliceous shale; minor siltstone (marine)*

DEVONIAN
UPPER DEVONIAN

- **DE-G** — *Gunsteel Formation: blue, grey-weathering chert, cherty mudstone, argillite, shale; nodular and bedded barite; minor pelagic limestone*

MIDDLE DEVONIAN

- **DD** — *Dunedin Formation: limestone; rare dolostone (marine)*

LOWER AND MIDDLE DEVONIAN

- **Dc** — *micritic and bioclastic limestone reefs; dark grey argillaceous limestone (possible DUNEDIN FORMATION equivalent); minor slaty argillite, chert*
- **Ds** — *Stone Formation: light grey, finely crystalline dolomite, dolomite breccia*

SILURIAN AND DEVONIAN
UPPER SILURIAN AND LOWER DEVONIAN

- **SDMM** — *Muncho-McConnell Formation: dolostone; minor sandstone, shale (marine) (may include Upper Silurian beds near base)*

ROAD RIVER GROUP (ORRv, ORR, SRR, SDRR)

- **SDRR** — *rusty-weathering black silty shale, limy siltstone; ; lower section includes interbedded limestone debris flows, crinoidal siltstone, calcarenite, graptolitic black shale, quartzose conglomerate and wacke near carbonate platform and reefs; basal chert*

SILURIAN

- **SRR** — *Pesika Formation: carbonaceous and dolomitic limestone, graptolitic shale, dolomite breccia; minor shale, dolostone; and Kwadacha formation: silty dolostone, sandstone, shale, grey, brown to buff-weathering argillaceous and dolomitic siltstone; minor quartz wacke (both formations in part equivalent to Nonda Formation)*

SILURIAN
LOWER SILURIAN

- **SN** — *Nonda Formation: dolostone, sandstone; minor limestone (marine)*

ORDOVICIAN
UPPER ORDOVICIAN

- **uOs** — *sandstone, dolostone; minor siltstone, shale (marine)*

LOWER ORDOVICIAN TO MIDDLE DEVONIAN

- **ODRR** — *Road River Group: undivided*

ORDOVICIAN
ARENIG TO ASHGILL

- **ORR** — *Ospika Formation: black graptolitic shale, brown- to orange-weathering shale; minor thin-bedded limestone, dolostone, siltstone, chert; basal limestone debris flows, quartz wacke turbidite*
- **ORRv** — *orange weathered ankeritic tuffs, altered flows and sills*

LOWER AND MIDDLE ORDOVICIAN
EARLY ARENIG TO EARLY CARADOC

- **Osk** — *Skoki Formation : medium- to thin-bedded dolostone, crinoidal limestone, limy mudstone (marine)*

CAMBRIAN AND ORDOVICAIN
UPPER CAMBRIAN AND LOWER ORDOVICIAN

- **ꞒOK** — *Kechika Formation: nodular, wavy-banded silty and argillaceous limestone, phyllitic siltstone, calcareous shale; minor green tuff*

CAMBRIAN
UPPER CAMBRIAN

- **uꞒs** — *calcareous fine-grained turbidites, limestone debris flows, sandstone (marine)*

MIDDLE AND UPPER CAMBRIAN

- **ꞒL** — *Lynx Formation: nodular limestone, limestone pebble conglomerate, calcarenite (marine)*
- **Ꞓs** — *quartzite, orange weathering dolostone; minor siltstone, shale (marine); may include Lynx Formation equivalents*

MIDDLE CAMBRIAN

- **mꞒp** — *shale, calcareous shale, limestone debris flows (marine)*
- **mꞒsp** — *siliceous fine-grained turbidite, sandstone, shale, conglomerate (marine)*
- **mꞒc** — *thick-bedded to massive, cryptocrystalline to coarse-grained limestone patch reefs, in part oolitic*

LOWER AND MIDDLE CAMBRIAN

- **lꞒcs** — *dolostone, sandstone, minor shale; thick basal sandstone, conglomerate (marine); may include Middle Cambrian in upper part*

LOWER CAMBRIAN
ATAN GROUP: (ꞒAq, ꞒAs, ꞒAc)

- **lꞒc** — *thick-bedded to massive limestone, locally oolitic and sandy*
- **ꞒAc** — *limestone, siltstone, dolomite*
- **ꞒAs** — *impure quartzite, shale, local sandstone, conglomerate; minor limestone*
- **ꞒAq** — *quartzite; minor pebble conglomerate (marine)*
- **lꞒq** — *orthoquartzite, calcareous shale, silty quartzite, siltstone, shale; minor quartz pebble conglomerate*
- **lꞒcg** — *conglomerate, dolomite olistostrome*

LATE PROTEROZOIC (HADRYNIAN) AND (?) PALEOZOIC
NEOHADRYIAN AND (?) CAMBRIAN

- **PꞒN** — *Narchilla Formation: sandstone, shate, chloritic phyllite, slate; minor greenstone, limestone, sandstone, conglomerate*

PROTEROZOIC

LATE PROTEROZOIC (HADRYNIAN)
NEOHADRYNIAN (723-544 Ma)
MISINCHINKA GROUP (PMc and PMs)

- **PMs** — *phyllitic slate, chloritic phyllite and schist, garnet-mica schist, calcareous sericite schist, schistose siltstone, quartzite, amphibolite, grit, pebble conglomerate, diamictite, limestone, dolostone*
- **Pc** — *crystalline limestone*
- **Pm** — *amphibolite, quartzite*

INGENIKA GROUP (PI-Sw TO PI-St)

- **PI-St** — *Stelkuz Formation: green and maroon siltstone and shale; sandstone, limestone, locally pisolitic*
- **PI-E** — *Espee Formation: limestone, locally oolitic and pisolitic*
- **PI-T** — *Tsaydiz Formation : sericitic phyllite; minor calcareous phyllite*
- **PI-Sw** — *Swannell Formation: quartz-feldspar gritty sandstone, siltstone, shale, conglomerate; minor limestone, metamorphic equivalents from chlorite to kyanite grade*

PALEOHADRYNIAN

- **Pb** — *gabbro dykes (779 Ma)*

MIDDLE AND/OR LATE PROTEROZOIC (HELIKIAN AND/OR HADRYNIAN)
MUSKWA ASSEMBLAGE (PM-Tu TO PM-Ga)

- **PM-Ga** — *Gataga Formation: carbonaceous mudstone, siltstone, sandstone (marine)*
- **PM-A** — *Aida Formation: dolomitic mudstone, siltstone, dolostone; minor chamositic and carbonaceous mudstone, limestone (marine)*
- **PM-Tu** — *Tuchodi Formation: dolomite, dolomitic siltstone, sandstone, shale*

EARLY PROTEROZOIC (APHEBIAN)
NEOAPHEBIAN (1860-1750 Ma)

- **Png** — *Tochieka Gneiss: partly mylonitic K-feldspar augen orthogneiss (1850 Ma)*

Geological boundary (defined, approximate, assumed)
Fault, unknown displacement (defined, approximate, assumed)
Thrust fault (defined, approximate, assumed)
Ornament on hanging wall side
Normal fault (defined, approximate, assumed)
Ornament on downthrown side
Strikeslip fault, dextral
Anticline (defined, approximate, assumed)
Syncline (defined, approximate, assumed)
Overturned anticline, overturned syncline
Nomenclature change
Mineral Occurrence (B.C. Minfile number) 15

COMPILERS' NOTE

The Ware map sheet was compiled from three sources: Gabrielse (1977), Taylor (1979) and MacIntyre (1998), which in turn were products of field mapping by numerous geologists conducted in 1964, 1969, 1969-1975, 1978, and 1979-1981. Gabrielse (1977) and Taylor (1979) provided the first complete reconnaissance coverage of the area. Differences across their mutual boundary (125° W) have been resolved with only minor changes to each map. Additional information was provided by Gabrielse (personal communication, 2001).

The more detailed mapping (MacIntyre, 1998) however, resulted in a map of the central and south-central portion of the map-area that differed markedly from the earlier works. Reconciliation was not possible and the more recent work was chosen, for the most part, to represent the geology of that area because of its more detailed mapping and the better regional stratigraphic framework available to its author than to earlier mappers. Some adjustments along the borders were made in the preparation of that map and for the present compilation.

This choice must be tempered by a number of considerations. First, the stratigraphy is complex and undergoes a transition from carbonate shelf to basinal shale from northeast to southwest across the map-area. Identification and correlation of shale units throughout the Paleozoic section become problematical and in places may significantly affect the interpretation of structures and map patterns. Second, the tectonic style changes from fault-dominated to fold-dominated from northeast to southwest as panels of thick carbonate units give way to fine-grained clastic rocks. Nonetheless, in the south-central portion of the map-area, some of the incompatibilities between early and late mapping may have arisen not only from more data but from interpretations being guided by the differing tectonic pattern of the area. Repetition of units was ascribed to thrust faulting or to folding by different mappers. Although later work documented many folds not mapped during early reconnaissance, it is also possible that more minor thrust faults are present than were shown.

There are 3 main differences between this compilation and the 3 source maps, aside from some simplifications demanded by the reduction in scale. First, innumerable cartographic errors in one map were amended to create a map that was, as much as possible, geologically internally consistent. Some new errors may have been introduced in the process. Several southwest-directed thrust faults were reinterpreted as normal faults based on stratigraphic displacement, apparent dips as deduced from their ground traces and their appearance on cross-sections. Second, stratigraphic studies by Pyle and Barnes (2000) suggested that the lowest unit of the Road River Group of MacIntyre (1998) is the upper member of the Kechika Formation (formerly Group) and the presumably spurious contact was removed. Third, the belt of Middle Cambrian reefoid carbonates and bounding strata in the northwest part of the map-area has been enigmatic, partly because of the difficulty in distinguishing lithologies of the Road River Group and Kechika Formation. Tentative resolution of the field relationships has been attempted by placing an assumed thrust fault along the northeast side of the belt and by assuming that all strata immediately southwest of the belt are of the Kechika Formation. Finally, a number of changes were made that arose out of critical reviews by M. McMechan (east half) and Gabrielse (west half).

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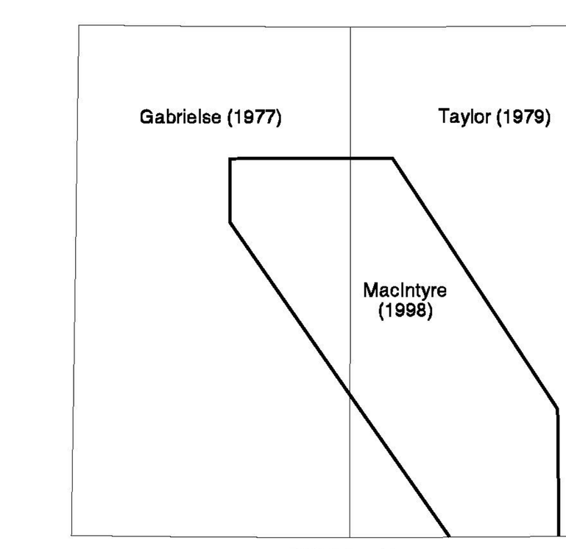

Reference Map

MINERAL OCCURRENCES

MinFile No.	Name / Secondary Name	Status	Latitude	Longitude	Commodities	Deposit Type
1	Ern	Showing	57° 5' 51"	124° 33' 1"	Zn, Pb, Ba	Sedimentary exhalative
2	Wedge / Protection	Prospect	57° 2' 48"	124° 36' 6"	Cu	
3	Spa / Stage	Showing	57° 47' 44"	125° 44' 6"	Zn, Ba, Va, Ag, Ur, Fe	
4	Fram	Showing	57° 59' 53"	124° 36' 36"	Cu, Ag, Pb	Cu±Ag quartz veins
5	Blue	Showing	57° 56' 24"	124° 7' 19"	Cu, Ag	Kipushi
6	Fox Pass	Showing	57° 38' 5"	125° 56' 54"	Cu, Wo, Mo	
7	Akie River	Showing	57° 15' 46"	124° 23' 39'	Cu	
8	Cirque / Stronsay	Developed Prospect	57° 30' 35"	125° 9' 36"	Zn, Pb, Ag	Sedimentary exhalative
9	Fluke	Showing	57° 24' 21"	124° 54' 57	Pb, Zn, Ag, Ba	Sedimentary exhalative
10	Ct / Cut	Showing	57° 6' 7"	124° 17' 48"	Zn, Pb, Ba	Sedimentary exhalative
11	Elf	Showing	57° 18' 16"	124° 42' 33"	Pb, Zn, Ba, Ag	Sedimentary exhalative
12	Grayling	Showing	57° 58' 26"	124° 4' 39"	Cu, Ag, Ni, Co, Pt	
13	Yule / Active	Showing	57° 34' 49"	125° 14' 43"	Ba	
14	Waterfall	Showing	57° 56' 57"	124° 5' 57"	Cu, Ag	
15	Mount Alcock	Prospect	57° 39' 53"	125° 24' 3"	Zn, Pb, Ag, Ba	Sedimentary exhalative
16	Gnome / Dba1	Showing	57° 14' 26"	124° 33' 27"	Ba	Sediment-hosted barite
17	Gin	Showing	57° 11' 51"	124° 30' 26"	Ba	Sediment-hosted barite
18	Del	Showing	57° 20' 12"	125° 0' 48"	Ba	Sediment-hosted barite
19	Grey Peak / Kechika	Showing	57° 47' 59"	125° 12' 6"	Pp, Ur	Upwelling-type phosphate
20	Kwadacha	Showing	57° 38' 32"	124° 58' 43"	Ba	Sediment-hosted barite
21	North Kwad	Showing	57° 45' 59"	125° 33' 6"	Ba	Sediment-hosted barite
22	Sika / Aikie-Sika	Showing	57° 26' 55"	124° 41' 6"	Ba	Sediment-hosted barite
23	Pie	Showing	57° 26' 59"	124° 58' 6"	Ba, Pb, Zn, Cu	Sedimentary exhalative
24	Bear	Showing	57° 57' 42"	125° 47' 14"	Ba, Pb, Zn, Ag	Sedimentary exhalative
25	Pesika	Showing	57° 11' 36"	124° 27' 4"	Ba	
26	Del East	Showing	57° 20' 33"	124° 59' 44"	Ba, Pb	Sedimentary exhalative
27	Aki / Akie	Showing	57° 11' 53"	124° 29' 43"	Zn, Ag	Sedimentary exhalative
28	Atan Copper	Showing	57° 56' 57"	124° 5' 14"	Cu, Ag	Cu±Ag quartz veins
29	Grayling Creek	Showing	57° 57' 50"	124° 5' 23"	Cu, Ag	Cu±Ag quartz veins
30	Family	Showing	57° 8' 50"	124° 23' 18"	Cu, Zn	Sedimentary exhalative
31	Akie / Cardiac Creek	Developed Prospect	57° 22' 37"	124° 51' 31"	Zn, Pb, Ag	Sedimentary exhalative

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2002

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Okulitch, A.V., Gabrielse, H., MacIntyre, D.G., and Taylor, G.C.
2002: Geology, Ware, British Columbia (94F); Geological Survey of Canada, Open File 4276, scale 1:250 000.