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2nd EDITION

CANADIAN GEOSCIENCE MAP 71

BEDROCK GEOLOGY

MOUNT RAYMOND

Yukon

NTS 116-I/8

Map Information Document

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ABSTRACT

The Mount Raymond map area incorporates the western limb of the Richardson anticlinorium, southern Richardson Mountains, northern Yukon. It is underlain by four Paleozoic sedimentary successions: middle Cambrian Slats Creek Formation,

Cambrian to Early Devonian Road River Group, Devonian Canol Formation, and Late Devonian to Carboniferous Imperial and Tuttle formations. The Richardson trough depositional setting of the first three successions is succeeded by a deep-marine, turbiditic, Ellesmerian, orogenic foredeep setting for the Imperial-Tuttle succession. Several major thrust faults and related folds transect the map area from north to south. The carbonate-dominated Road River Group defines a west-dipping homocline, modified by the Mount Raymond thrust fault together with minor folds in its footwall. In the overlying Imperial-Tuttle succession, map-scale folds are defined where shales are interbedded with persistent sandstones. Steep reverse faults in the east may have reactivated Cambrian rift faults. The structural geometry reflects Late Cretaceous—Cenozoic regional Cordilleran tectonism.

RÉSUMÉ

La région cartographique de Mount Raymond comprend le flanc ouest de l'anticlinorium de Richardson, dans la partie sud des monts Richardson (nord du Yukon). Elle renferme quatre successions sédimentaires du Paléozoïque : la Formation de Slats Creek du Cambrien moyen, le Groupe de Road River du Cambrien-Dévonien précoce, la Formation de Canol du Dévonien et les formations d'Imperial et de Tuttle du Dévonien tardif-Carbonifère. Au cadre sédimentaire de la cuvette de Richardson dans lequel se sont mises en place les trois premières successions sédimentaires a succédé le cadre de milieu marin profond à dépôt turbiditique de l'avant-fosse de l'orogenèse ellesmérienne dans lequel s'est déposée la succession d'Imperial-Tuttle. Plusieurs importantes failles de chevauchement et des plis apparentés traversent la région cartographique du nord au sud. Le Groupe de Road River, à prédominance de roches carbonatées, définit un homoclinal à pendage ouest, modifié par la faille de chevauchement de Mount Raymond ainsi que par des plis mineurs présents dans le mur de la faille. Dans la succession d'Imperial-Tuttle sus-jacente, des plis à l'échelle de la carte sont définis là où des grès persistants sont interstratifiés dans les shales. Des failles inverses abruptes à l'est ont pu réactiver des failles de rift du Cambrien. La géométrie structurale est un reflet du tectonisme régional de la Cordillère au Crétacé tardif-Cénozoïque.

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SHEET 1 OF 1, BEDROCK GEOLOGY

GENERAL INFORMATION

Author: L.S. Lane

Geology by L.S. Lane in 2011 to 2014, based on new mapping by L.S. Lane (2009 and 2010), evaluation of archival field data and fossil identifications from Operation Porcupine (1962–1976), additional field data from T.L. Allen (2009 and 2010), and K.M. Bell and D.A. Huntley (2012), new fossil identifications by J. Utting, G. Dolby, and S.A. Gouwy; and analysis of air photos and satellite imagery (2008–2018).

Geology conforms to Bedrock Data Model v. 4.0.

Geomatics and cartography by L.E. MacDonald, D. Lemay, F. Hardjowirogo, and K. Rentmeister.

Scientific editing by A. Weatherston

Initiative of the Geological Survey of Canada, conducted under the auspices of the Yukon Sedimentary Basins project as part of Natural Resources Canada's Geo-mapping for Energy and Minerals (GEM) program

Map projection Universal Transverse Mercator, zone 8
North American Datum 1983

Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications
Elevations in metres above mean sea level

Magnetic declination 2022, 19°36'E, decreasing 19.7' annually

This map is not to be used for navigational purposes.

Title photograph: Southern Richardson Mountains, view northwestward from Cambrian Shales in the core of the Richardson Mountains toward west-dipping Ordovician and Silurian limestones of the Road River Group forming the western slopes of the range, Yukon. Photograph by L.S. Lane. NRCan photo 2019-531

The Geological Survey of Canada welcomes corrections or additional information from users.

Data may include additional observations not portrayed on this map. *See* map info documents accompanying the downloaded data for more information about this publication.

This publication is available for free download through GEOSCAN (https://geoscan.nrcan.gc.ca/).

Map Viewing Files

The published map is distributed as a Portable Document File (PDF), and may contain a subset of the overall geological data for legibility reasons at the publication scale.

Cartographic Representations Used on Map

This map utilizes ESRI Cartographic Representations in order to customize the display of standard GSC symbols for visual clarity on the PDF of the map only. The digital data still contains the original symbol from the standard GSC symbol set. The following legend features have Cartographic Representations applied:

- Planar

Definition Queries Used on Map

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- Planar
- Fossils
- Stations
- Contacts

Descriptive Notes

The Mount Raymond 1:50 000 scale map area lies within the Eagle River map area (Norris, 1981) on the western margin of the Richardson anticlinorium. Targeted fieldwork augmented by new biostratigraphy and airphoto analysis has refined the map distribution of stratigraphic units and clarified the location and significance of major structures. The exposed stratigraphy consists of two Paleozoic successions.

In the east, the Richardson trough contains strata of Cambrian to Devonian age. The oldest strata present in the map area comprise sandstone, siltstone, and shale of the Slats Creek Formation of early and middle Cambrian age (Fritz, 1997) derived largely from a western source (reviewed in Lane and Gehrels, 2014). This unit is overlain gradationally by a deep-water succession dominated by limestone and graptolitic shale of the Road River Group, originally the Road River Formation (Jackson and Lenz, 1962). Here, we use the nomenclature previously used informally, in part, by Morrow (1999, based on Cecile et al., 1982), as revised by Cecile et al. (in press).

In the Mt. Raymond map area, an informal basal member of the Cronin Formation was mapped. It consists of interbedded shale and limestone, with minor siltstone, and is distinguished from the rest of the Cronin Formation by its darker, more recessive weathering character. This unit is presumably equivalent to the CDR0 unit of

Norris (1981) in that it occurs between the more resistant carbonate-dominated overlying beds and the underlying clastic beds of the Slats Creek Formation (e.g., Fritz, 1985, 1997). In the northeast, the outcrop width of this unit is nearly 5 km. However, in the southeast, this basal shaly interval is very thin or absent, and the Cronin Formation carbonate rocks appear to lie more or less directly on sandstone succession of the Slats Creek Formation. Accordingly, the shaly basal member of the Cronin is inferred to pinch out southward. Given the known tectonic environment during middle Cambrian time, characterized by block faulting in Richardson trough and local disconformities at the top of the Slats Creek Formation in this vicinity (Fritz, et al., 1991, p. 169-170), the significant thickness change in the basal Cronin member within the map area may reflect this active tectonic setting.

In the western part of the map area, exposed strata comprise deposits of the Ellesmerian orogenic foredeep succession, dominated by siltstone, shale, and turbiditic fine sandstones of the Late Devonian Imperial Formation (Braman and Hills, 1992), the overlying coarse clastic strata of the Tuttle Formation, comprising more proximal channelized slope deposits of latest Devonian and Early Carboniferous age (Lane, 2013a), and finally by shale and siltstone of the Ford Lake Formation, of Early Carboniferous age.

The (informal) lower member of the Imperial Formation predominantly consists of shale and siltstone. Exposures are largely confined to river cutbanks. The overlying middle member contains abundant prominent sandstone-rich units that commonly form distinct topographic ribs. Individual sandstone units are readily traceable for several kilometres; however, only a few of the the larger units are traceable for more than ~10 km. The persistent sandstone unit that defines the base of the middle member in the adjacent Mount Hare map area to the north becomes indistinct southward, presumably due to thinning and fining of the unit. Accordingly, the base of the middle member is mapped southward at the base of the next overlying sandstone unit, which persists for some 12 km until it is truncated by a fault.

Three major thrust faults transect the map area from north to south. The most westerly fault, Deception Fault, is a moderately east-dipping structure (Lane, 2013a) that juxtaposes rocks of Frasnian to Early Famennian (Late Devonian) age in the east against strata of Famennian to Viséan age in the west. As is the case in the adjacent map areas to the north (Lane, 2013a, 2013b), thermal maturities on the east side of the fault are distinctly higher than on the west; however, this effect diminishes southward as displacement diminishes in that direction. A minor splay in the footwall of the Deception Fault, the Vyàh K'ìt Gwinjik Fault, extends westward into adjacent map areas. An associated footwall syncline (Vyàh K'ìt Gwinjik syncline) is locally preserved beneath the fault.

The Mount Raymond Fault is oblique to the strike of other structures, cutting upsection (southward) from the Road River Group into the Imperial Formation. It juxtaposes Ordovician to Devonian strata in the hanging wall against Late Devonian Imperial Formation in the footwall. This fault appears to die out northward, within the Road River Group a few kilometres into the adjacent Mount Hare map area. In the hanging wall of the strike-oblique section of the fault, the map width of the Road River Group broadens, and the succession displays abundant minor folds. The Mount Raymond Fault merges southward with the Canyon Creek Fault, which continues southward parallel to structural strike.

The Canyon Creek Fault also appears to die out northward, a short distance into the adjacent map area. Previous reconnaissance mapping indicated that the Deception fault deflects eastward to link with the Canyon Creek Fault (Norris, 1981). However, the Deception anticline in the hanging wall of the Deception Fault appears to be continuous across the map, implying that the two faults remain distinct, subparallel structures in this area. Also, faunally dated Carboniferous Ford Lake strata in the west (locality F15; also Lane, 2013a) are abruptly juxtaposed against Late Devonian strata, requiring that a fault must lie to the west of Deception anticline. Thus, from north to south, as displacement diminishes on the Deception Fault, the regional shortening is increasingly accommodated on the Mount Raymond and Canyon Creek faults. These regional-scale structures are products of Late Cretaceous-Cenozoic regional orogenesis (Lane, 1998).

Trending north-south near the eastern edge of the map are two steeply east-dipping faults mapped as reverse faults, with associated splays. They appear to have east-side-up stratigraphic separation; however, their kinematics are unstudied. Although they define distinct lineaments on airphoto imagery, their displacement magnitudes appear to be modest. Possibly, they may be linked to reactivation of deeper faults, related to the middle Cambrian rifting in Richardson trough.

Diamond-drill cores were recovered from several mineral-exploration bore holes in the southern part of the map area, with the permission of the claimholder. These cores, penetrating lowermost Imperial and Canol formations, and uppermost Road River Group, provided valuable information about the age, mineralogy, thermal maturation, and organic carbon (TOC) content in relation to targeted studies of the regional hydrocarbon potential (Allen et al., 2011; Fraser et al., 2012).

ACKNOWLEDGMENTS

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ADDITIONAL INFORMATION

The Additional Information folder of this product's digital download contains figures and tables that appear in the map surround as well as additional geological information not depicted on the map, nor this document, nor the geodatabase.
-PDF of each figure/table that appears in the CGM surround.
-Excel file of the Master Legend Table (legend symbols, descriptions, headings, etc.).

AUTHOR CONTACT

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COORDINATE SYSTEM

Projection: Universal Transverse Mercator
Units: metres
Zone: 8
Horizontal Datum: NAD83
Vertical Datum: mean sea level

BOUNDING COORDINATES

Western longitude: 136°30'00"W
Eastern longitude: 136°00'00"W
Northern latitude: 66°30'00"N
Southern latitude: 66°15'00"N

SOFTWARE VERSION

Data has been originally compiled and formatted for use with ArcGIS™ desktop version 10.7.1 developed by ESRI®.

DATA MODEL INFORMATION

Bedrock (Calgary)

Surface bedrock data are organized into feature classes and themes consistent with logical groupings of geological features. All field observation point data are related

through the Station_ID property of the Station theme. These feature attribute names and definitions are identical in the shapefiles and the XML files.

Consult PDFs in Data folder for complete description of the feature classes, feature attributes, and attribute domains.

The Bedrock Data Model and the Bedrock Domains documents are intended to describe all bedrock features which may be compiled at the 1:50 000 scale. Therefore, some of the feature classes and feature attributes described in these documents may not be present.