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CANADIAN GEOSCIENCE MAP 448

BEDROCK GEOLOGY

MOUNT HULEY AND MOUNT HARBOTTLE

YUKON

NTS 116-G/15 and 16

Map Information Document

Geological Survey of Canada
Canadian Geoscience Maps

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1:50 000

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ABSTRACT

This map encompasses two 1:50 000 scale map areas at the southwestern margin of Eagle Plain sedimentary basin, in the northern Canadian Cordillera. The eastern part is underlain by the Upper Cretaceous Parkin, Fishing Branch, Burnthill Creek, and Cody Creek formations of the Eagle Plain Group, where shale and sandstone beds dip gently eastward to northward. The western part of the map contains three large anticline-syncline pairs trending north-northwest–south-southeast that expose Lower Cretaceous Whitestone River Formation lying unconformably on Paleozoic strata of Middle Devonian to Permian age, comprising Ogilvie, Hart River, Ettrain, and Jungle Creek formations. The folds define domes and basins reflecting the influence of two orthogonal fold-thrust events during Cretaceous-Paleogene Cordilleran deformation. At the level of the Cretaceous units, the synclines define symmetrical continuous structures, whereas the anticlines, exposing Paleozoic strata, define asymmetric en échelon structures suggesting that pre-existing structural or stratigraphic trends influenced their deformation.

RÉSUMÉ

Cette carte s'étend à deux feuillets cartographiques à l'échelle 1/50 000 situés à la marge sud-ouest du bassin sédimentaire d'Eagle Plain, dans le nord de la Cordillère canadienne. Le sous-sol de la partie est constitué des formations de Parkin, de Fishing Branch, de Burnthill Creek et de Cody Creek du Groupe d'Eagle Plain du Crétacé supérieur, où les couches de shale et de grès sont légèrement inclinées dans une direction variant de l'est au nord. La partie ouest de la carte présente trois grands couples anticlinaux-synclinaux d'orientation nord–nord-ouest—sud–sud-est qui exposent la Formation de Whitestone River du Crétacé inférieur. Celle-ci surmonte en discordance des strates paléozoïques s'échelonnant en âge du Dévonien moyen au Permien, qui appartiennent aux formations d'Ogilvie, de Hart River, d'Ettrain et de Jungle Creek. Les plis définissent des structures en dômes et bassins qui rendent compte de l'influence de deux événements de plissement-chevauchement orthogonaux pendant la déformation de la Cordillère au Crétacé-Paléogène. Au niveau des unités du Crétacé, les synclinaux définissent des structures continues et symétriques, tandis que les anticlinaux, qui exposent des strates du Paléozoïque, définissent des structures asymétriques en échelon, ce qui laisse supposer que des alignements structuraux ou stratigraphiques préexistants ont influencé leur déformation.

SHEET 1 OF 1, BEDROCK GEOLOGY

GENERAL INFORMATION

Authors: L.S. Lane and S. Zhao

Geology by D.K. Norris, 1962 and 1970; E.W. Bamber, 1962; A.W. Norris, 1970; G.C. Taylor, 1970; F.G. Young, 1970; J. Dixon, 1984 to 1986; L.S. Lane, 2010 and 2019 to 2022; S. Zhao, 2012; D.H. Huntley, 2012; K.M. Bell, 2012

Geological compilation by L.S. Lane, 2012, 2016 to 2022; S. Shao, 2012 to 2015

Geological data conforms to Bedrock Data Model v. 4.0.

Geological data conversion by K. Rentmeister, 2019 to 2021; S. Zhao, 2012 to 2014; L.S. Lane, 2018 to 2022; M. Le, 2021 and 2022

Geomatics and cartography by K. Rentmeister, L.S. Lane, S. Zhao, and M. Le

Scientific editing by L. Ewert

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

Map projection Universal Transverse Mercator, zone 7
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 2023, 18°49'E, decreasing 19.2' annually

This map is not to be used for navigational purposes.

Title photograph: Aerial view toward the northeast, down Whitestone River from 2012WS019 sample site on the west limb of North Cluett anticline, Yukon. Gently west-dipping limestone beds of the Carboniferous Ettrain Formation form the bluff in the foreground. Photograph by S. Zhao. NRCan photo 2021-261

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Data may include additional observations not portrayed on this map. *See* map info document 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
- Folds

Definition Queries Used on Map

This map utilizes definition queries in order to customize the display for visualization on the PDF of the map only and does not affect the digital data. The following features have a definition query applied:

- Stations
- Wells
- Planar
- Folds

Descriptive Notes

Previous reconnaissance mapping (Norris, 1982) effectively captures the key characteristics of the map area. With limited fieldwork, additional imagery analysis (Zhao, 2015), and the incorporation of subsequent stratigraphic and paleontological data (e.g. Dixon, 1992; Bell, 2018), we have refined the distribution of map units and structures. Some of the significant findings are highlighted here.

This map area straddles the transition from the north-south-trending Nahoni range in the west, in which Paleozoic successions are widely exposed, to the more gently deformed Eagle Plain to the east, where Cretaceous strata are exposed at surface. Immediately to the south of the map area, the east-west-trending Taiga range of the Ogilvie Mountains also exposes Paleozoic strata. Both ranges developed more or less contemporaneously in Late Cretaceous to Paleogene time. The dome and basin fold geometry evident in this and adjacent map areas is due to the interference of these two orthogonal deformation trends (Lane, 1998). Although major structures are well outlined by resistant Paleozoic carbonate and Cretaceous sandstone units, many details of the structural geometry are obscured by poor outcrop. Subsurface data in adjacent Eagle Plain demonstrate that the exposed structures are detached on décollement surfaces at depth (e.g. Lane, 1996; Hall and Cook, 1998).

The exposed stratigraphy consists of alternating competent intervals (early Paleozoic carbonates, late Paleozoic carbonates, and Cretaceous sandstones) interbedded with substantial thicknesses of incompetent, shale-dominated intervals (the Devonian to early Carboniferous Canol-Ford Lake-Hart River succession, and the Albian-Cenomanian Whitestone River and Parkin formations). This alternating arrangement

permits the competent intervals to deform disharmonically, creating more complex map patterns.

In short, the outcrop geometry derives from three related factors: the eastward-decreasing deformation intensity toward the Cordilleran foreland, the mutual interference of two orthogonal deformation trends, and the alternating mechanical characteristics of the layers.

Competent limestones of the Carboniferous Ettrain Formation form strongly asymmetric anticlines with sharp hinges and planar limbs. The eastern limbs have steep to vertical dips, whereas the western limbs have shallow to moderate dips. The anticlines tend to be left-stepping en échelon structures. In contrast, the Upper Cretaceous sandstone-dominated Fishing Branch and Cody Creek formations define broad symmetrical synclines that tend to be continuous at this scale. Taken together, these observations imply that some degree of structural disharmony between the Carboniferous and Upper Cretaceous successions is required to accommodate these differing structural styles.

A minor tight anticline is mapped adjacent to the east limb of North Cluett anticline near the south bank of Whitestone River. This fold, previously interpreted as accommodating two en échelon segments of the Huley syncline (Norris, 1982), is here interpreted as lying above a local back-thrust fault. In the absence of evidence to the contrary, the Huley syncline is interpreted as being continuous across the Whitestone River valley. Also, we have established that the sandstone rib outlining the anticline is Permian in age, therefore it is mapped as Jungle Creek Formation and the underlying strata are presumed to be Ettrain Formation. The sandstone unit also defines a prominent rib on the adjacent east limb of the Huley syncline, both north and south of Whitestone River. Thin section examination of samples from both limbs of the syncline supports this interpretation. Accordingly, this Permian sandstone unit, a thin erosional remnant between the Ettrain Formation and the Cretaceous succession, persists across much of the north-central part of the map area. It pinches out in the southeast, near the south nose of North Huley anticline, but appears to persist northward along its west limb into the adjacent 116-J map area. On previous regional maps, this unit was included within the Lower Cretaceous succession (mapped largely as Mount Goodenough; Norris, 1984).

In the south-central area of the map, six small transverse faults disrupt the continuity of the Fishing Branch Formation, which underlies a long north-trending ridge on the east limb of the South Huley anticline. The faults' orientations vary and their kinematics are undefined. However, the strike separation of bedding in all cases is consistent with an important component of north-south shortening.

ACKNOWLEDGMENTS

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and Myranda Charlie, and Yudii Mercredi in 2010. Helicopter support was provided by Fireweed Helicopters, Dawson; and by Gwich'in Helicopters, Inuvik.

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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: 7
Horizontal Datum: NAD83
Vertical Datum: mean sea level

Bounding Coordinates

Western longitude: 139°00'00"W
Eastern longitude: 138°00'00"W
Northern latitude: 66°00'00"N
Southern latitude: 65°45'00"N

Software Version

Data has been originally compiled and formatted for use with ArcGIS™ desktop version 10.8.1 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.