

# **WHITE GLACIER – THOMPSON GLACIER REGION AXEL HEIBERG ISLAND CANADIAN ARCTIC ARCHIPELAGO 1:5000**

**By D. Haumann and D. Honegger (1962)**

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## **Coverage, Surveying, and Plotting Information**

This map of the terminus of White Glacier (-90.6670 W, 79.4450 N) represents an area of 12 km<sup>2</sup>, approximately 5 km<sup>2</sup> of which is ice-covered area. Elevations range from 30 m a.s.l. in the proglacial region to 450 m a.s.l. on the glacier, and up to 614.8 m a.s.l. at Marie Antoinette, a small but prominent peak above the eastern margin of White Glacier. Mapped at 5 m contour intervals on the ice, the structure of glaciological features is particularly well represented and crevasses, abandoned and active drainage channels, moulins, transverse and longitudinal faults, debris covers, and supraglacial streams are all clearly illustrated and enhanced with a hillshade effect in the background. Survey sites and signal cairns used during ground control collection in 1960 are shown, as is the Lower Ice Station where several detailed studies were conducted. The moraines formed at the Little Ice Age maximum are clearly visible in the glacier forefield and along the glacier margins.

Contour intervals: 5 m on glaciers & moraines, 10 m on surrounding terrain

Field work: summer 1960

Aerial photography: August 2<sup>nd</sup>, 1960

Flying Height: 3050 metres a.s.l.

Air Photography by the Royal Canadian Air Force.

Photogrammetric plotting by D. Haumann N.R.C.

Draughting & graphical representation by D. Honegger N.R.C.

Produced by the Photogrammetric Research Section of the National Research Council of Canada in conjunction with the Axel Heiberg Island Expedition of McGill University.

## **Map Reference**

*National Research Council, 1962, White Glacier, Thompson Glacier Region, Axel Heiberg Island, Canadian Arctic Archipelago. Map at 1:5,000 scale, covering lower glacier tongue and terminus. Photogrammetric Research Section, National Research Council of Canada, Ottawa, in conjunction with Axel Heiberg Island Expedition, McGill University, Montreal.*

## Site Description

White Glacier, approximately 14 km long and 40 km<sup>2</sup> at the time of map production, is an alpine valley glacier located 7 km inland from the head of Expedition Fiord, Axel Heiberg Island, NU, Canada. It was the focus of numerous glaciological, meteorological, and hydrological studies from 1960 to present (e.g. Muller, 1963; Cogley et al., 2011). White Glacier was the site of several early breakthroughs in polar glaciology including defining work on glacier facies (Müller, 1962) and the detection of short-term velocity fluctuations from a mostly cold, polythermal glacier (Iken, 1974; Blatter, 1987). The mass balance record for White Glacier is available from 1960-1979, and 1984 to the present and it is one of the 37 reference glaciers recognized in the United Nations Global Terrestrial Network for Glaciers.

*Blatter, H., 1987, On the thermal regime of an arctic valley glacier: a study of White Glacier, Axel Heiberg Island, N.W.T., Canada, Journal of Glaciology, 33, 200-211.*

*Cogley, J.G., W.P.Adams and M.A.Ecclestone, 2011, Half a century of measurements of glaciers on Axel Heiberg Island, Nunavut, Canada, Arctic, 64(3), 371-375.*

*Iken, A., 1974, Velocity Fluctuations of an Arctic Valley Glacier, A Study of the White Glacier, Axel Heiberg Island, Canadian Arctic Archipelago, Axel Heiberg Island Research Reports, Glaciology No. 5, McGill University, Montreal, Quebec, Canada. 115p.*

*Müller, F., 1962, Zonation of the accumulation area of the glaciers of Axel Heiberg Island, N.W.T., Journal of Glaciology, 4, 302-310.*

*Müller, F. et al., 1963a, Preliminary Report, 1961-1962, Axel Heiberg Island Research Reports, McGill University, Montreal. 241p.*

## GENERAL COMMENTS ON THE EXPEDITION FIORD MAP SERIES

### *Motivation*

The maps covering the Expedition Fiord area of Axel Heiberg Island (1:100,000), including Baby Glacier (1:5,000), White Glacier (1:5,000 and 1:10,000), and Thompson glacier (1:5,000 and 1:50,000) were produced as part of a mapping campaign in support of the interdisciplinary research program initiated at the McGill Arctic Research Station under the leadership of Fritz Müller at McGill University (Müller, 1961; Müller, 1963a). These maps supported studies in geology, glaciology, meteorology, geophysics, zoology, permafrost geomorphology, and botany; together, they can be considered some of the best quality maps produced for the Canadian high Arctic during the 20<sup>th</sup> century. Cogley and Jung-Rothenhäusler (2002) offer a clear and useful explanation of the region's cartographic history, the plotting methods, and the associated uncertainties. It is the primary reference for this summary.

### *Surveying, Photogrammetry, and Plotting*

Fritz Müller and Peter Adams conducted the first surveys of the Expedition Fiord area in McGill University's reconnaissance campaign of Western Axel Heiberg Island in the summer of 1959 (Müller, 1961; Adams, 2007). The maps were produced using photogrammetry techniques alongside intensive ground surveys conducted throughout the summer of 1960 (Blachut, 1961; Haumann, 1961). The Royal Canadian Air Force carried out the air photo survey in August, 1960, and a particular effort was made to improve contrast in the glacier accumulation (snow covered) areas by surveying multiple times with the sun at different angles. As noted in the Preliminary Report: 1961-1962, "A detailed discussion of the factors pertaining to the production of these maps has been given in a series of articles in the 'Canadian Surveyor' (Blachut, 1963; Haumann, 1963; McKortel, 1963; Müller, 1963b)." Plotting of the maps was overseen by T. J. Blachut at the Photogrammetric Research Section of the National Research Council (of Canada) and the Army Survey Establishment supported printing of the maps. The digital copies of the maps provided here were scanned at the Canada Centre for Remote Sensing, Natural Resources Canada (Budkewitsch, 2002).

### *Coordinate System*

The Expedition Fiord maps were plotted in a local plane coordinate system with a baseline defined by the coordinates of Astro 1 (Local: 30,000 m E, 60,000 m N; Geographic: 90.74280563 W, 79.41003063 N) and Astro 2 (Local: 36764.06 m E, 69598.47 m N; Geographic: 90.41190283 W, 79.49597503 N). Detailed information is missing from the earlier publications, however it has been estimated that the maps were plotted under a transverse Mercator projection (centered on Astro 1) on a Clarke 1866 ellipsoid (NAD27) (Cogley and Jung-Rothenhäusler, 2002). With these assumptions, Cogley and Jung-Rothenhäusler (2002) provide equations that will enable users to convert the local planar coordinate system to geographic coordinates.

## SELECTED REFERENCES

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- Müller, F., 1963b, An arctic research expedition and its reliance on large-scale maps, Canadian Surveyor, 17(2), 96-112.
- Access to many of these references is available through the Glaciology at Trent website: <http://people.trentu.ca/~gcogley/glaciology/index.htm>