

SCHEFFERVILLE PERMAFROST TEMPERATURE DATABASE

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INTRODUCTION

A number of permafrost research projects were conducted in the Schefferville area between the 1950s and early 1980s. The open pit mining of iron ore and the problems encountered in the extraction process provided the stimulus for much of this research. Researchers from the Iron Ore Company of Canada (IOCC) and from the McGill Subarctic Research Station at Schefferville carried out much of this research. During this period, a large amount of data were collected from temperature cables installed to depths of up to 137 m (although most boreholes are much shallower than this) in the Schefferville area. These data are valuable for climate change studies and can provide information on trends in permafrost temperature between the 1950s and 1980s.

In the early 1980s, scientists from McGill University were contracted by the former Earth Physics Branch of Energy Mines and Resources Canada (now the Geological Survey of Canada of Natural Resources Canada) to compile and synthesize permafrost information from the Schefferville area and to produce a digital permafrost temperature database. The permafrost temperature database and accompanying report were published as an EPB open file (Granberg et al. 1984).

The permafrost temperature database was provided on 9 track magnetic tape in a format that is not compatible with hardware and database software currently available. In 2000 with funding from the Government of Canada's Climate Change Action Fund and the assistance of W. Pollard of McGill University, the Schefferville database was rescued from the 9 track tape and reformatted into a structure that is compatible with most relational database programs currently available.

This report provides a description of the database and outlines its structure. The database is provided on this CD in both Microsoft Access and ASCII format which may be imported into most commercially available relational database programs.

DATABASE DESCRIPTION

Ground temperature data from 192 boreholes in the Schefferville area are provided in the accompanying database. Schefferville, Quebec (54°48'W, 66°50'W) is located within the

discontinuous permafrost zone (Fig. 1). Temperature cables were installed at the location of the Barney, Fleming, Knox mine, Timmins, Ferriman, Howse, Lance, Pinx, Red and Star ore deposits (Fig. 2 - maps still to come). Borehole depths ranged from 4 to 137 m with the majority of boreholes being between 25 and 125 m deep (Table 1). Data are provided for the period between 1957 to 1982. The length of record varies from only one temperature record to records greater than 10 years in length with the longest record being 16 years long.

Table 1. Distribution of boreholes according to depth.

Borehole Depth	Percent of boreholes
Surface, depth <10 m	10.5
Shallow, depth 10 to 25 m	25.5
Intermediate, depth 25 to 125 m	63.5
Deep geothermal, depth >125 m	0.5

Different types of temperature cables were employed. Thermocouple cables were used exclusively until 1971. Under ideal conditions, this method had an accuracy of 0.1°C but under field conditions the accuracy may be less. Thermistor cables were successfully installed in 1971 and were used almost exclusively in the latter part of the observation period. Epoxy bead thermistors manufactured by YSI and calibrated to an accuracy of 0.1°C were initially used. Fenwal glass probe thermistors were subsequently employed. Further details on temperature cables can be found in Granberg et al. (1984).

Database structure

The database is provided in both MS Access (Schefferville.mdb) and tab delimited ASCII formats (location.txt and temp table.txt). The database consists of two tables, one which contains information for individual boreholes such as location, length of record etc., and a second table which contains the ground temperature data for all boreholes. The two tables are linked by a unique borehole site number.

a. Location table (location.txt)

The following fields are included in the location table:

BH - Borehole site number (unique identifier)

Northing - Northing UTM coordinate (m) of borehole location based on NAD27 datum.

Easting - Easting UTM coordinate (m) of borehole location based on NAD27 datum.

Zone - UTM zone in which the borehole is located.

Elev - Elevation (m) above sea level of the borehole

Location - Ore deposit or mine the borehole is associated with.

Descriptive Name - Descriptive local name for the borehole site.

IOCC - ? Need to add to Access file - The IOCC designation for the borehole site.

Num of Records - The number of observations recorded for the borehole.

Start Date - The date of the first record in the observation period (mm/dd/yy in ASCII file)

End Date - The date of the last record in the observation period.

Max Depth - The depth of the deepest temperature sensor.

b. Temperature table (temp table.txt)

The temperature table contains the following fields:

BH - Borehole site number (unique identifier)

Date - Date of the observation (mm/dd/yy in ASCII file)

Depth - Depth of the observation (cm)

Temp - Ground temperature (°C)

Acknowledgement

Data rescue from the nine track tape was facilitated by W. Pollard of McGill University and funding from the Government of Canada's Climate Change Action Fund. Jason Chartrand assisted with reformatting of the database.

Reference

Granberg, H.B., Lewis, J.E., Moore, T.R., Steer, P. and Wright, R.K. 1984. Schefferville Permafrost Research Volume I, Parts 1a and 1b: summary review and recommendations and catalogue of available materials. Earth Physics Branch Open File 84-7.

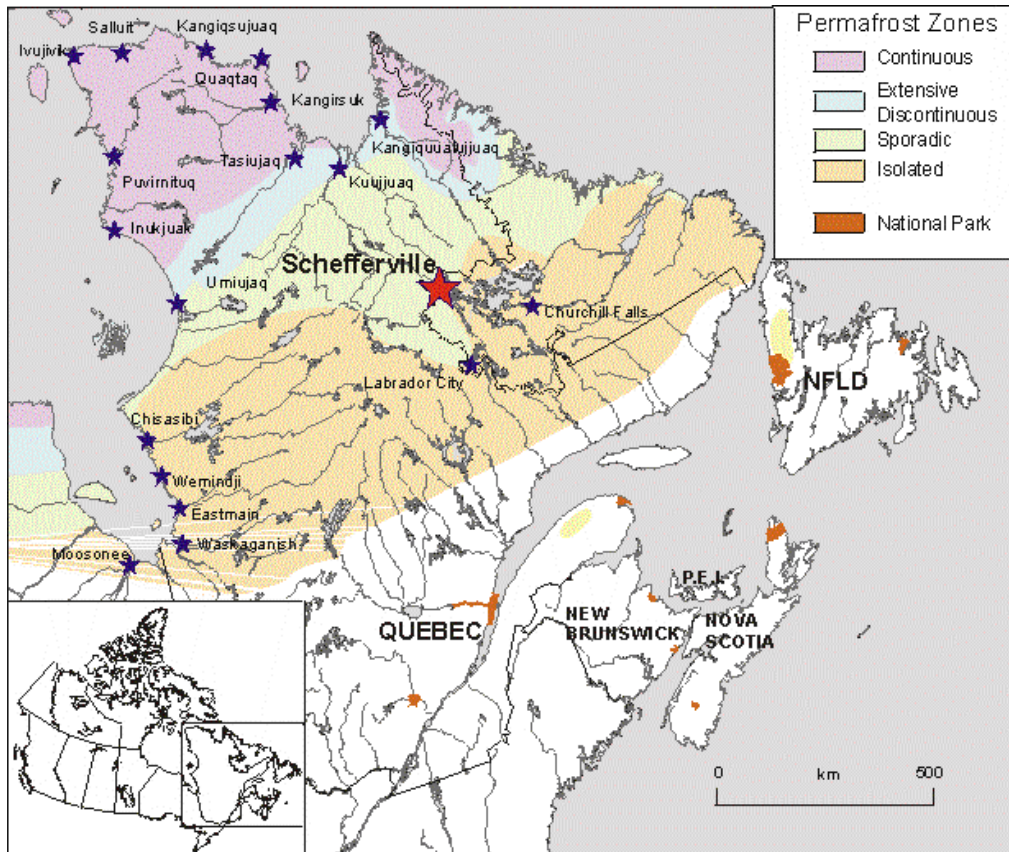


Figure 1. Location of the Schefferville study region.