Permafrost Information Network (PIN) Geotechnical Borehole Database (beta)

Summary and database field descriptions

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PIN Geotechnical Borehole Database

The PIN geotechnical borehole database combines existing database compilations into a standard structure, similar to that of the *Digital borehole geotechnical database for the Mackenzie Valley/Delta region* (Smith et al. 2005). The standardized database was created to be accessible from the Permafrost Information Network web application as a data layer. Many fields in the original databases containing qualitative information were removed for the PIN compilation. To view all of the original information please see the original database sources. Some geotechnical data that did not fit the PIN database structure were omitted from the compilation, particularly those from Chartrand et al. (2002), but the borehole locations are shown in the web application. These data can be accessed from the original Open File report.

The PIN geotechnical borehole database currently includes data from the following published reports:

Chartrand, J; Lysyshyn, K; Couture, R; Robinson, S; Burgess, M. 2002. Digital geotechnical borehole databases and viewers for Norman Wells and Tuktoyaktuk, Northwest Territories. Geological Survey of Canada, Open File 3912, 2002; 1 CD-ROM, https://doi.org/10.4095/213818

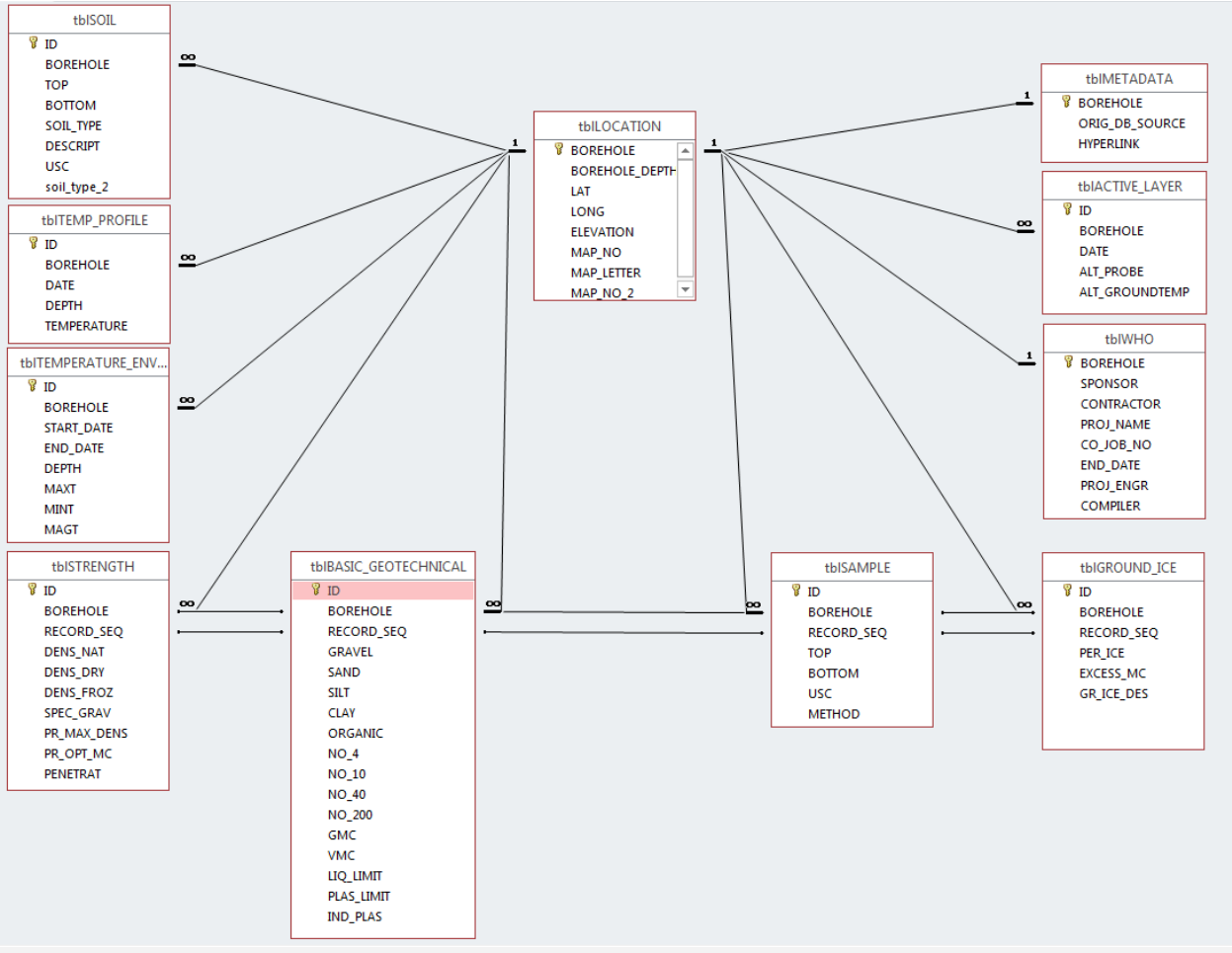
EBA Engineering Consultants Ltd. Canada. 1989. ESEBase borehole/testpit database, north Alaska Highway corridor (km 1748 - km 1966, Alaska Highway, Yukon). Indian and Northern Affairs Canada [Sponsor]. 600 p. http://pubs.aina.ucalgary.ca/gran/33585.pdf

Smith, S L; Burgess, M M; Chartrand, J; Lawrence, D E. 2005. Digital borehole geotechnical database for the Mackenzie Valley/Delta region. Geological Survey of Canada, Open File 4924, 2005, 30 pages; 1 CD-ROM, https://doi.org/10.4095/220383

Smith, S L; Chartrand, J; Nguyen, T -N; Riseborough, D W; Ednie, M; Ye, S. 2009. Geotechnical database and descriptions of permafrost monitoring sites established 2006-07 in the central and southern Mackenzie Corridor. Geological Survey of Canada, Open File 6041, 2009, 188 pages; 1 CD-ROM, https://doi.org/10.4095/226435

Wolfe, S A; Smith, S L; Chartrand, J; Kokelj, S; Palmer, M; Stevens, C W. 2010. Geotechnical database and descriptions of permafrost monitoring sites established 2006-2010 in the northern Mackenzie Corridor, Northwest Territories. Geological Survey of Canada, Open File 6677, 2010, 81 pages; 1 CD-ROM, https://doi.org/10.4095/287167

PIN database structure:



PIN database table and field descriptions

tblLOCATION

This table contains location information for each borehole.

BOREHOLE: Unique identifier assigned to the borehole.

BOREHOLE_DEPTH: Total depth of the borehole (m).

LAT: Latitude in decimal degrees.

LONG: Longitude in decimal degrees.

ELEVATION: Elevation above mean sea level (m).

MAP_NO: This refers to the National Topographic System (NTS) primary quadrangle and denotes a 1:1,000,000 series map.

MAP_LETTER: This refers to the secondary NTS map designation (1:250,000).

MAP_NO_2: This refers to the third NTS map scale designation (1:50,000).

tblMETADATA

This table includes the original publication name and hyperlink to the GEOSCAN page for each GSC publication.

BOREHOLE: Unique identifier assigned to the borehole.

ORIG_DB_SOURCE: Indicates the original report number.

HYPERLINK: Hyperlink to the original published database on GEOSCAN.

tblWHO:

This table contains information referring back to the original borehole record.

BOREHOLE: Unique identifier assigned to the borehole.

SPONSOR: The name of the client for whom the information was collected.

CONTRACTOR: The name of the consultant/contractor who collected the information and/or drilled the boreholes for the client.

PROJ_NAME: Provides name or description of the original project.

CO_JOB_NO: The consultant's job number.

END_DATE: The date the geological expertise was performed or drilling was completed. The date is given in YYYY/MM/DD format. For several sites, only the month and year were given and in these cases the first day of the month is given for the day value.

PROJ_ENGR: Initials of the project engineer.

COMPILER: Initials of the data compiler.

tblSAMPLE

This table contains sample information including level in the borehole and material type.

BOREHOLE: Unique identifier assigned to the borehole.

RECORD_SEQ: This refers to the position of the sample in the sequence.

TOP: The depth from the top of the borehole to the top of the sampled interval (m).

BOTTOM: The depth from the top of the borehole to the bottom of the sampled interval (m).

USC: Description of the soil, rock, or other material. For soils, the modified Unified Soils Classification (USC) System code is given:

USC Code	**Material Type**
GW	well-graded gravel, fine to coarse gravel
GP	poorly graded gravel
GM	silty gravel
GC	clayey gravel
SW	well-graded sand, fine to coarse sand
SP	poorly graded sand
SM	silty sand
SC	clayey sand
ML	silt
CL	clay of low plasticity, lean clay
OL	organic silt, organic clay
MH	silt of high plasticity, elastic silt
CH	clay of high plasticity, fat clay
OH	organic clay, organic silt

For all other materials the following codes are used:

Code	Material type
BR	Bedrock
BTTM	Bottom
COAL	Coal
DLMT	Dolomite
FILL	Fill
GARB	Garbage
I, ICE, ICEE	Ice
LMSN	Limestone
MDSN	Mudstone
MOSS	Moss
OB, OV	Overburden
QRTZ	Quartz
RBLE	Rubble
ROCK	Rock
SH, SHL, SHLE, SHALE	Shale
SI, SLSN, SILT	Siltstone
SNDS	Sandstone
TILL	Till
UNSP	Unspecified
VGTN	Vegetation
WATR	Water

METHOD: The method of sampling given by the following codes:

Code	Sample Type
0	No sample taken
1	Split-Spoon sample
2	Shelby Tube sample
3	Rock core or Barrel sample
4	Method unspecified
5	Cuttings
6	Hammer
Core	Rock Core
Crre	CRREL drill
G	Grabber
B	Barrel sample

tbl_BASIC_GEOTECHNICAL

This table contains basic geotechnical data such as the grain size distribution and Atterberg Limits.

BOREHOLE: Unique identifier assigned to the borehole.

RECORD_SEQ: This refers to the position of the sample in the sequence.

Grain Size: A general grain size assessment is expressed in percent gravel, sand, silt, clay and organic content and is given in the following fields:

GRAVEL: percent gravel (greater than #4 size sieve or 0.4 mm).
SAND: percent sand (from #4 to #200 size sieve or from 0.4 to 0.01 mm).
SILT: percent silt (from #200 to 2µ sieve or from 0.01 to 0.002 mm).
CLAY: percent clay (less than 2µ sieve or 0.002 mm).
ORGANIC: percent organic matter content.

Sand Component: A detailed breakdown of the sand fraction is given by the following fields:

NO_4: percent passing through the #4 size sieve
NO_10: percent passing through the #10 size sieve
NO_40: percent passing through the #40 size sieve
NO_200: percent passing through the #200 size sieve

GMC: The gravimetric moisture content expressed as a percent of the dry weight. (For values in excess of 998%, 999% is used).

VWC: The volumetric water content expressed as a percentage.

Atterberg Limits
LIQ_LIMIT: The liquid limit or an estimate of the liquid limit relative to the moisture content (given as % dry weight). The liquid limit is the water content at which soil starts to exhibit plastic behaviour.

PLAS_LIMIT: The plastic limit, which is the water content at which a soil starts to break apart and crumble when rolled. The plastic limit is expressed as a moisture content (% dry weight) or an indication of the plasticity expressed by the following codes:

Code	Definition
N	Nonplastic
NS	Nonplastic to slightly plastic
S	Slightly plastic
SM	Slightly to moderately plastic
M	Moderately plastic
MH	Moderately to highly plastic
H	Highly plastic

IND_PLAS: The index of plasticity (liquid limit % - plastic limit %) or a qualitative indication given by the codes below. The index of plasticity is the water content range over which soil exhibits plastic behaviour (or the ability of soil to undergo unrecoverable deformation without cracking or crumbling).

Code	Definition
H	High

MH Medium to High
M Medium
LM Low to Medium
L Low

tblSTRENGTH

This table contains strength parameters.

BOREHOLE: Unique identifier assigned to the borehole.

RECORD_SEQ: This refers to the position of the sample in the sequence.

DENS_NAT: Density of natural soil sample (kg/m^3).

DENS_DRY: Density of the soil sample after drying (kg/m^3).

DENS_FROZ: Density of the frozen soil sample (kg/m^3).

SPEC_GRAV: Specific gravity of the sample defined as the ratio of the particle density to the density of water.

Proctor compaction values
PR_MAX_DENS: The maximum density of the soil sample (kg/m^3).

PR_OPT_MC: Optimum moisture content of the soil sample given as a percent of the dry weight.

PENETRAT: This value represents penetration resistance of the soil and is given as the number of blows per 300 mm (1 foot) of penetration. The values were obtained from the Standard Penetration Test, i.e. a 65 kg (140 lb) weight dropped from a height of 760 mm (30 inches).

tblGROUND_ICE

This table contains ground ice related information.

BOREHOLE: Unique identifier assigned to the borehole.

RECORD_SEQ: This refers to the position of the sample in the sequence.

PER_ICE: Estimate of the percentage of visible ice by volume.

EXCESS_MC: Excess moisture content expressed as a percent of the total volume.

GR_ICE_DESC: General description of the ground ice. Some are coded as the classification defined below (Pihlainen and Johnston 1963).

Code	Ground Ice Description
X	Material not frozen
F	Material frozen - type unknown
FX	Material partially frozen - type unknown
N	Ice not visible
NF	Ice not visible - poorly bonded
NB	Ice not visible - well bonded
NBN	Ice not visible - well bonded - no excess ice
NBE	Ice not visible - well bonded - excess ice
V	Visible ice
VX	Visible ice - individual ice crystals or inclusions
VC	Visible ice - ice coating on particles
VR	Visible ice - random or irregular orientations
VS	Visible ice - stratified or oriented ice
ICE	Ice
Blank	Permafrost not recorded

tblSOIL

This table provides information on the borehole lithology.

BOREHOLE: Unique identifier assigned to the borehole.

TOP: The depth from the top of the borehole to the top of the sampled interval (m).

BOTTOM: The depth from the top of the borehole to the bottom of the sampled interval (m).

SOIL_TYPE: The material type.

DESCRIPT: The soil description for each unit/interval.

USC: Unified Soils Classification (USC) System code for the unit/interval (see Table 2). This field was added when the database was reformatted in 2002. The USC code for each interval was determined using the description of the soil (i.e. information in the fields Soil Type and Descript) and the USC codes provided for the sample (from the sample table).

soil_type_2: This is a simplified soil type descriptor based on SOIL_TYPE. It is used to generate the colour on the PIN borehole viewer and is not part of the original data.

tblACTIVE_LAYER

This table contains active layer depths estimated either from mechanical probing or derived from ground temperature profiles.

BOREHOLE: Unique identifier assigned to the borehole.

DATE: The date associated with the active-layer thickness measurement.

ALT_PROBE: The active-layer thickness estimated by probing to the depth of refusal.

ALT_GROUNDTEMP: The active-layer thickness estimated from ground temperature profiles.

tblTEMPERATURE_ENVELOPES

This table gives temperature data referenced to allow the assembly of ground temperature envelopes (annual maximum and minimum annual temperature at each depth), and the mean annual ground temperature profile.

BOREHOLE: Unique identifier assigned to the borehole.

START_DATE: The start year of the measurement period.

END_DATE: The end year of the measurement period.

DEPTH: Depth of sensor (m)

MAXT: Maximum annual ground temperature (°C)

MINT: Minimum annual ground temperature (°C)

MAGT: Mean annual ground temperature (°C)

tblTEMPERATURE_PROFILES

This table includes records of temperatures measured in instrumented boreholes.

BOREHOLE: Unique identifier assigned to the borehole.

DATE: The date of the temperature measurement.

DEPTH: The depth at which the temperature is measured (m).

TEMPERATURE: The measured temperature (°C).