Résumé

Cette carte présente le potentiel de construction et les types de fondations selon les conditions de pergélisol et les pentes de la région d'Akulivik. Ce village se situe au Nunavik, sur la rive est de la baie d'Hudson, à l'embouchure de la rivière Illukotat (61.04° N ; 69.57° O).

Note

Cette carte a été compilée principalement par photo-interprétation et validée avec un nombre limité d'observations de terrain, de sondages et de forages dans le pergélisol. Toute information pouvant en améliorer la précision et éventuellement conduire à la production d'une mise à jour sera appréciée.

Abstract

This map shows the construction potential and foundation design options based on permafrost conditions and slopes of the Akulivik region. This Nunavik village is located on the east shore of the Hudson Bay at the mouth of the Illukotat River (61.04° N ; 69.57° W).

Note

This map was compiled mainly by air photo interpretation and validated by a limited number of terrain observations, probing and drill holes in the permafrost. Any information leading to an improvement of precision and, eventually, an update of the map will be received with thanks.

The National Topographic System of Canada

Vector Indexes of the National Topographic System of Canada. Government of Canada, Natural Resources Canada, Earth Sciences Sector, Mapping Information Branch, Centre for Topographic Information (2008).

Cover illustration:
Akulivik, Nunavik, Québec.
Photocredits: Chantal Lemieux

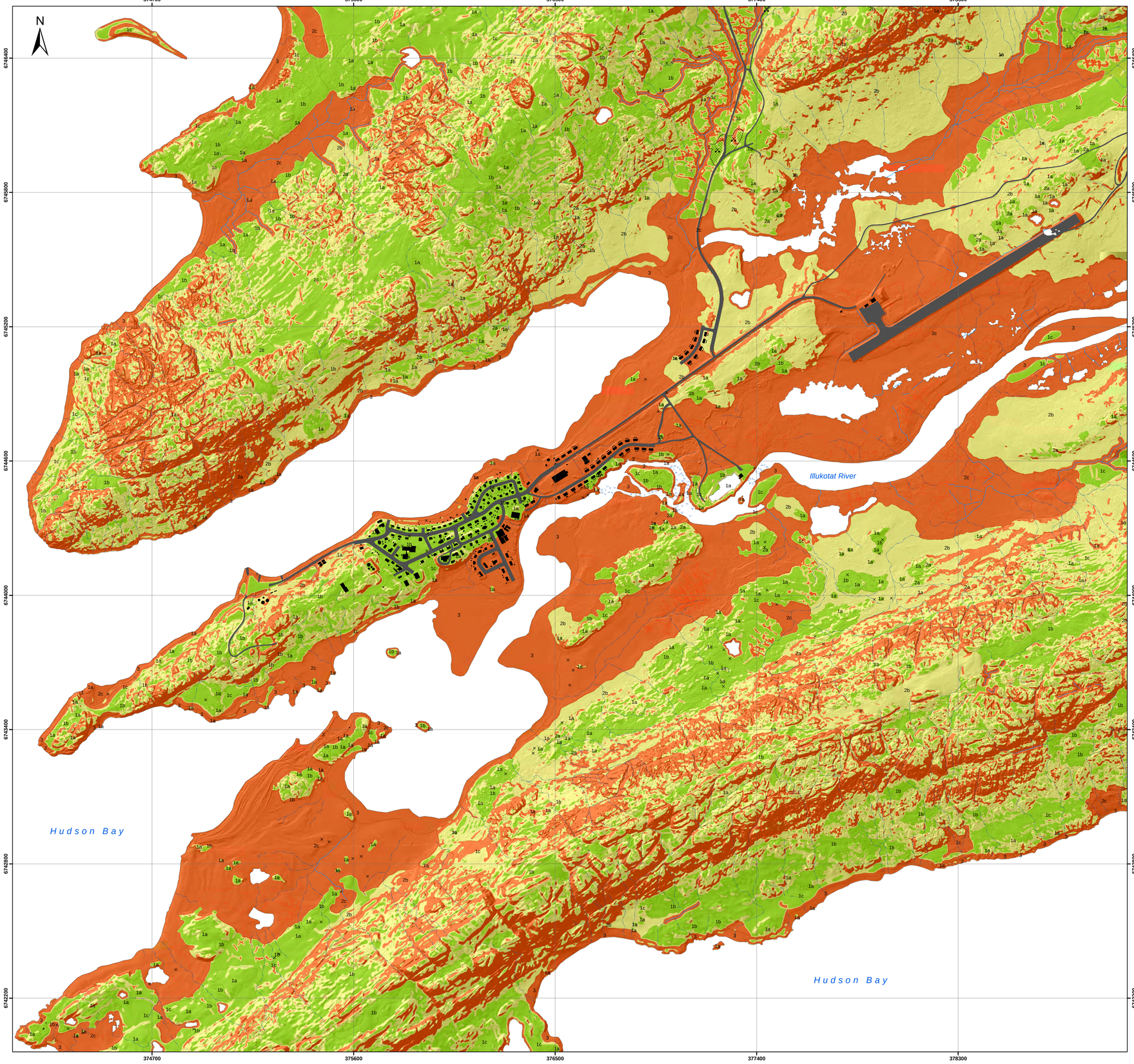
Centre d'études nordiques, Québec, 2019

Construction potential and foundation design options based on permafrost conditions and slopes

AKULIVIK

Québec, Nunavik

1 : 8 000



THAW-STABLE GROUND: BEDROCK AND SUPERFICIAL DEPOSITS WITH NO OR LITTLE ICE CONTENT

1a

Proterozoic age volcanic bedrock, sometimes covered by a thin layer of sand, gravel, or blocks. It is present in the form of east-west-oriented elongated hills whose sheepback surface is characterized by many glacial grooves and ridges implying south-north regional ice flow. Generally characterized by a steep slope upstream of the ice flow (south side) and the downstream (north side) sheltering of a glacial deposit (Crag and Tail). Active layer thickness is generally about 4 m. Rock joints may contain a small amount of ice.

- All types of northern foundations. Adaptations to rugged topography are often necessary.

Terrain manageable for construction (slope < 7.5°).

Terrain manageable for construction but may require significant earthwork (slope between 7.5 and 15°).

Terrain unsuitable for construction (slope > 15°).

1b

- Thin cover of sand and gravel over bedrock. The thickness of the deposit is generally less than 2 m and the topography is controlled by bedrock. Presence of scattered rock outcrops. The active layer thickness is generally ranging from 1.5 to 2.5 m. Contains pore ice whose volume is generally less than 10%.

- Deep northern foundations on the underlying bedrock applicable (ex.: pile foundations). Adjustable post and pad foundations also feasible. Buildings with slab-on-grade foundations need elaborated techniques of terrain preparation (ex.: removal or pre-thaw of frozen sediments and consolidation).

Terrain manageable for construction (slope < 7.5°).

Terrain manageable for construction but may require significant earthwork (slope between 7.5 and 15°).

Terrain unsuitable for construction (slope > 15°).

1c

Deposit of thick stratified sand and gravel. The deposit is generally greater than 2 m thick. Precoastal sand and gravel (Mn) appear in the form of a succession of arched cordons and may contain a significant proportion of shell fragments (Mnf). The active layer thickness is generally ranging from 1.5 to 2.5 m. Contains pore ice and occasional ice lenses may be present in fine-grained material layers. Possibility of ice wedges occurrence.

- Northern foundations on adjustable post and pad or on piles. Buildings with slab-on-grade foundations might need elaborated techniques to retain permafrost in its frozen state (ex.: thermosyphons).

Terrain manageable for construction (slope < 5°).

Terrain manageable for construction but may require significant earthwork (slope between 5 and 10°).

Terrain unsuitable for construction (slope > 10°).

THAW-UNSTABLE GROUND: ICE-RICH PERMAFROST IN SUPERFICIAL DEPOSITS

2a

- Thin cover of heterogeneous deposit (till) over bedrock. Composed mainly of sand and silt with some gravel and boulders. The thickness of the deposit is generally less than 2 m and the topography is controlled by bedrock. Presence of scattered rock outcrops. The active layer thickness is generally ranging from 2.5 to 3 m. Contains pore ice and ice lenses in fine-grained material layers. The volumetric ice content is generally less than 30%. Occurrence of mudboils and gelifluction lobes on slopes. Creep and differential settlements may occur upon thawing, but are limited due to the shallow thickness of the deposit.

- Deep northern foundations on the underlying bedrock applicable (ex.: pile foundations). Adjustable post and pad foundations also feasible. Buildings with slab-on-grade foundations need elaborated techniques of terrain preparation (ex.: removal or pre-thaw of frozen sediments and consolidation).

Terrain manageable for construction (slope < 4°).

Terrain manageable for construction but may require significant earthwork (slope between 4 and 8°).

Terrain unsuitable for construction (slope > 8°).

2b

- Thick cover of heterogeneous deposit (till) over bedrock. Composed mainly of sand and silt with some gravel and boulders. The thickness of the deposit is generally more than 2 m with occasional bedrock outcrop. The active layer thickness is generally ranging from 2.5 to 3 m. Contains pore ice and ice lenses in fine-grained material layers. The volumetric ice content is generally less than 30%. Occurrence of mudboils and gelifluction lobes on slopes. Creep and differential settlements may occur upon thawing.

- Pile foundations feasible but require deeper drill-holes for pile driving. Adjustable post and pad foundations also feasible. Buildings with slab-on-grade foundations need elaborated techniques to retain permafrost in its frozen state (ex.: thermosyphons). Excavation shall be avoided.

Terrain manageable for construction, but caution is needed (slope < 8°).

Terrain unsuitable for construction (slope > 8°).

2c

- Fine-grained deposit of marine origin (sand, silt and clay) sometimes covered with a thin layer of organic, alluvial or coastal sediments. Poorly drained. The active layer thickness is ranging from 0.5 to 1.5 m. Contains ice lenses. The volumetric ice content regularly exceeds 30% and may reach almost 100%. Possibility of ice wedges occurrence. Material subject to significant differential settlements and failure on slopes upon thawing.

- Adjustable post and pad foundations. Buildings with slab-on-grade foundations need elaborated techniques to retain permafrost in its frozen state (ex.: thermosyphons). Excavation shall be avoided.

Terrain unsuitable for construction.

SEVERE LIMITATIONS: DYNAMIC ACTIVE PERIGLACIAL AND SLOPE PROCESSES, LITTORAL ZONE OR FLOODPLAINS

3

- Contemporary deposit affected by current and dynamic geomorphological processes. Subjects to erosion, flooding and slope movements.

- Problematic terrains to be avoided.

Problematic terrain unsuitable for construction.

SAND OR GRAVEL PIT (active or inactive)

BUILDING

TRANSPORT INFRASTRUCTURE

GEOLOGICAL UNIT BOUNDARY

FROST CRACK (possibility of ice wedge occurrence)

WATERCOURSE - creek or stream running occasionally during spring melt

WATERCOURSE - creek or stream running throughout all arctic summer

× ISOLATED ROCK OUTCROP

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Hillshade created by L'Hérault, E. from LIDAR data (MRNF 2010, gouvernement du Québec). Illumination: azimuth 315°, altitude 45°, vertical exaggeration 1x

Projection: MTM zone 10, NAD83

Construction potential and foundation design options based on permafrost conditions and slopes

AKULIVIK

Québec, Nunavik

1 : 8 000

0 200 400 600 800 1 000 Meters

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