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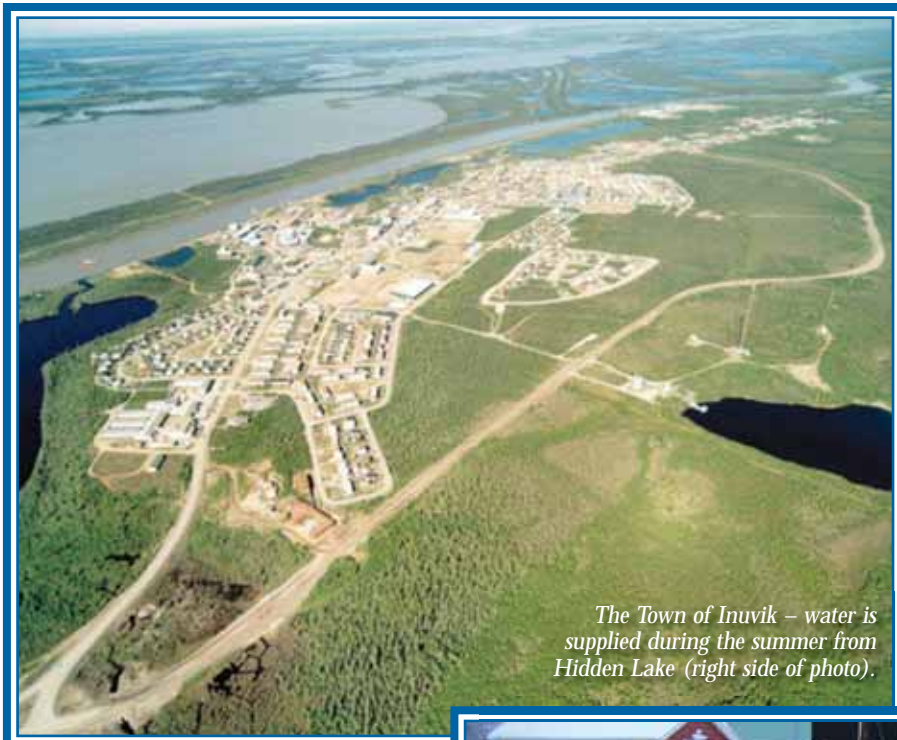
*50 Years of
Engineering for
Pipes, Permafrost
and People
in Inuvik, NWT*



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FIFTY YEARS OF ENGINEERING FOR PIPES, PERMAFROST & PEOPLE OF INUVIK, NWT



The Town of Inuvik – water is supplied during the summer from Hidden Lake (right side of photo).

community north of the Arctic Circle built to provide the facilities of a southern Canadian town. It was designed not only as a base for development and administration, but as a centre to bring education, medical care and new opportunity to the people of the western Arctic."

The site for Inuvik was chosen for its elevation above the Mackenzie River flood zone, abundant gravel deposits, ample space for an airport, freshwater lakes and navigable waters. The community sits on a broad terrace between the East Channel of the Mackenzie River and the upland that forms the present-day Mackenzie Delta's eastern boundary.

Inuvik's long, very cold winters, permafrost, and great distance from sources of supply continue to challenge engi-

Celebrating its fiftieth anniversary in 2008, the Town of Inuvik is Canada's largest community north of the Arctic Circle, and has a unique history as the first completely "engineered" northern community. According to some, there has never been a Canadian town so "pondered, proposed, projected, planned, prepared and plotted" as East-3, which was its original site identification back in the 1950's. Inuvik was planned and engineered by the Canadian government in the late 1950's to replace the flood-prone Aklavik as the region's administrative centre. Canadian Prime Minister John G. Diefenbaker dedicated Inuvik as, "The first



New utilidor construction in Inuvik.

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neers. Inuvik depends on southern sources for supplies and materials of all sorts, with the exception of drinking water. The built environment of Inuvik must contend with the permafrost and the extreme cold for buildings, water, sewer, roads and drainage; each of these elements requires unique design and construction considerations.

The permafrost ground below Inuvik is "ice rich", which means that when it partially melts, the ground may settle by hundreds of millimetres as it fills the voids left by the melting ice. This magnitude of settlement can cause major structural damage to buildings and pipes. The heat from houses, and water and sewer pipes may also melt permafrost, therefore all of the buildings and pipes in Inuvik are built on piles to provide a "thermal break" between the building and the ground.

The water and sewer mains, referred to

collectively as the "utilidor", run along a dedicated right-of-way along the back of each lot along with the power poles that service each building; the cost of installing these services is over \$50,000 per lot. The service connections exit above ground from each building and resemble a large "metal centipede" as they connect to the water and sewer mains. Road crossings of the utilidor create another challenge because the road must literally bridge the utilidor, at a cost of nearly \$50,000.

Inuvik's utilidor was originally constructed in one single enclosed conduit supported on wood piles; the utilidor originally included a dedicated pipe carrying high temperature hot water for buildings and freeze protection of the water and sewer mains. The high temperature hot water system was eventually taken out of service, and the utilidor

structure has been undergoing incremental replacement.

Inuvik's methods of development access and site preparation have also adapted to the extreme conditions. Roads are built above the natural grade, with embankments thick enough to provide an insulating layer to minimize permafrost melting. Road grades and building lots are never excavated for pre-grading purposes to avoid the effects of continuing thaw settlement, which can continue for several years in the developed or disturbed areas. Building lots are often filled to provide grading for drainage and a drivable access for construction vehicles, as well as to reduce thaw settlement. Drainage runs in ditches on the surface, except where it passes through culverts under roads.

Inuvik originally developed with a reasonably compact and efficient downtown

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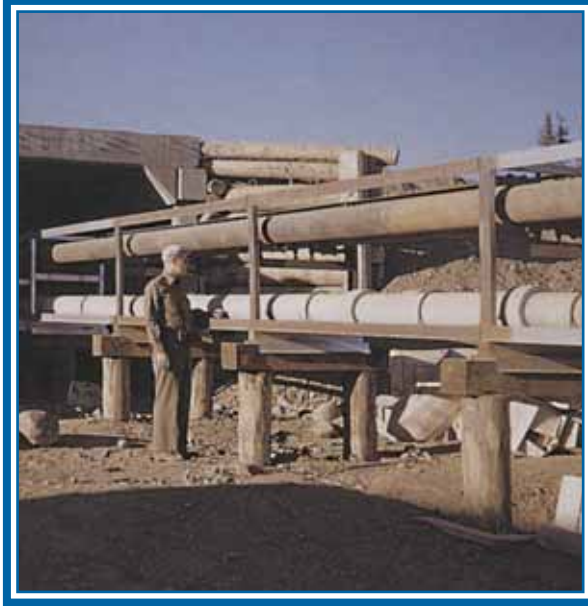
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Left – Construction of original Inuvik utilidor in the 1950's (photo by Jack Grainge). Right – Some segments of the original utilidor are still visible.

business core just east of the East Channel. Primary and secondary schools were located on large blocks of land between the downtown core and surrounding residential areas. A large regional hospital was sited at the south end of the townsite. The residential areas radiate outward from the central core area, and there is a considerable amount of undeveloped space between the current margins of developed residential dis-

tricts and the perimeter collector road.

New residential housing in Inuvik has taken on a southern look, but the occasional new house maintains a very northern flair. Inuvik acts as its own developer of serviced land for townsite expansion, undertaking both financing and administrative work itself in order to supply serviced lots at the lowest cost reasonably achievable.

The Town of Inuvik continues to anticipate the economic growth associated with the proposed Mackenzie Gas Pipeline. The pipeline may open another chapter for the community, and will present some very interesting challenges for engineers, not only on the pipeline itself, but also for the engineering of community expansion for "pipes, permafrost, and people." ♦

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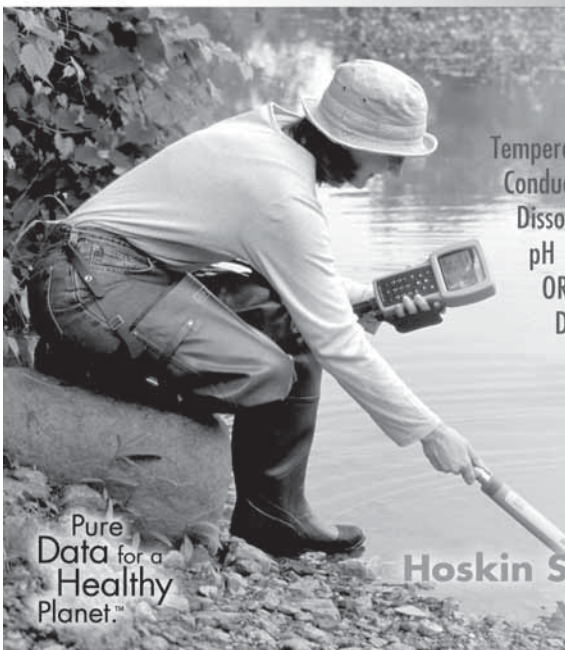
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