The English version is the authoritative version of this report.

Kivalliq Inter-Community Road Study - Summary Report

This study was made possible through 75% funding contributed by Transport Canada under the National Trade Corridors Fund.

Prepared for:

Government of Nunavut
Transportation and Infrastructure Nunavut

Prepared by:

Nunami Stantec Limited

July 25, 2025

Project No.: 144903275

NUNAMI
STANTEC LIMITED

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Glossary of Acronyms

Acronym	Full Form	Description / Context
AASHTO	American Association of State Highway and Transportation Officials	Used for preliminary gravel surface road structure design methodology.
CAD	Computer-Aided Design	Used in digital terrain modeling and alignment design.
CCRA	Climate Change Resilience Assessment	Assesses vulnerability of infrastructure to climate hazards.
CIRNAC	Crown-Indigenous and Northern Affairs Canada	Federal authority for land use and quarry permits.
DEM	Digital Elevation Model	Used for terrain analysis and route planning.
EMP/W	Geostudio Temp/W	Thermal modeling software used for ground thermal analysis.
GHG	Greenhouse Gas	Emissions assessed for construction and operation phases.
GN	Government of Nunavut	Project client and regulatory authority.
ICHA	Initial Centerline Horizontal Alignment	Preliminary route alignment used for design and analysis.
ICVP	Initial Centerline Vertical Profile	Preliminary vertical alignment of the route.
INFC	Infrastructure Canada	Provides Climate Lens guidance for GHG assessments.
KHFL	Kivalliq Hydro-Fibre Link	Related infrastructure project considered in planning.
KICR	Kivalliq Inter-Community Road	Main project under study.
KRLUP	Keewatin Regional Land Use Plan	Regional land use plan guiding development.
LIC	Linear Infrastructure Corridor	Designation in the Recommended Nunavut Land Use Plan.
NLCA	Nunavut Land Claims Agreement	Governs land use and development in Nunavut.
NLUP	Nunavut Land Use Plan	Territorial land use planning document.

Acronym	Full Form	Description / Context
NIRB	Nunavut Impact Review Board	Conducts environmental screening and review.
NPC	Nunavut Planning Commission	Reviews land use conformity and project proposals.
NUPPAA	Nunavut Planning and Project Assessment Act	Governs project planning and regulatory approvals.
O&M	Operations and Maintenance	Refers to ongoing road upkeep and administration.
PGC	Polar Geospatial Center	Source of satellite-derived DEM data.
SSP5-8.5	Shared Socioeconomic Pathway 5 – High Emissions Scenario	Climate projection scenario used in thermal modeling.
TAC	Transportation Association of Canada	Provides design standards for roadway geometry.
TIN	Transportation and Infrastructure Nunavut	GN department overseeing the project.

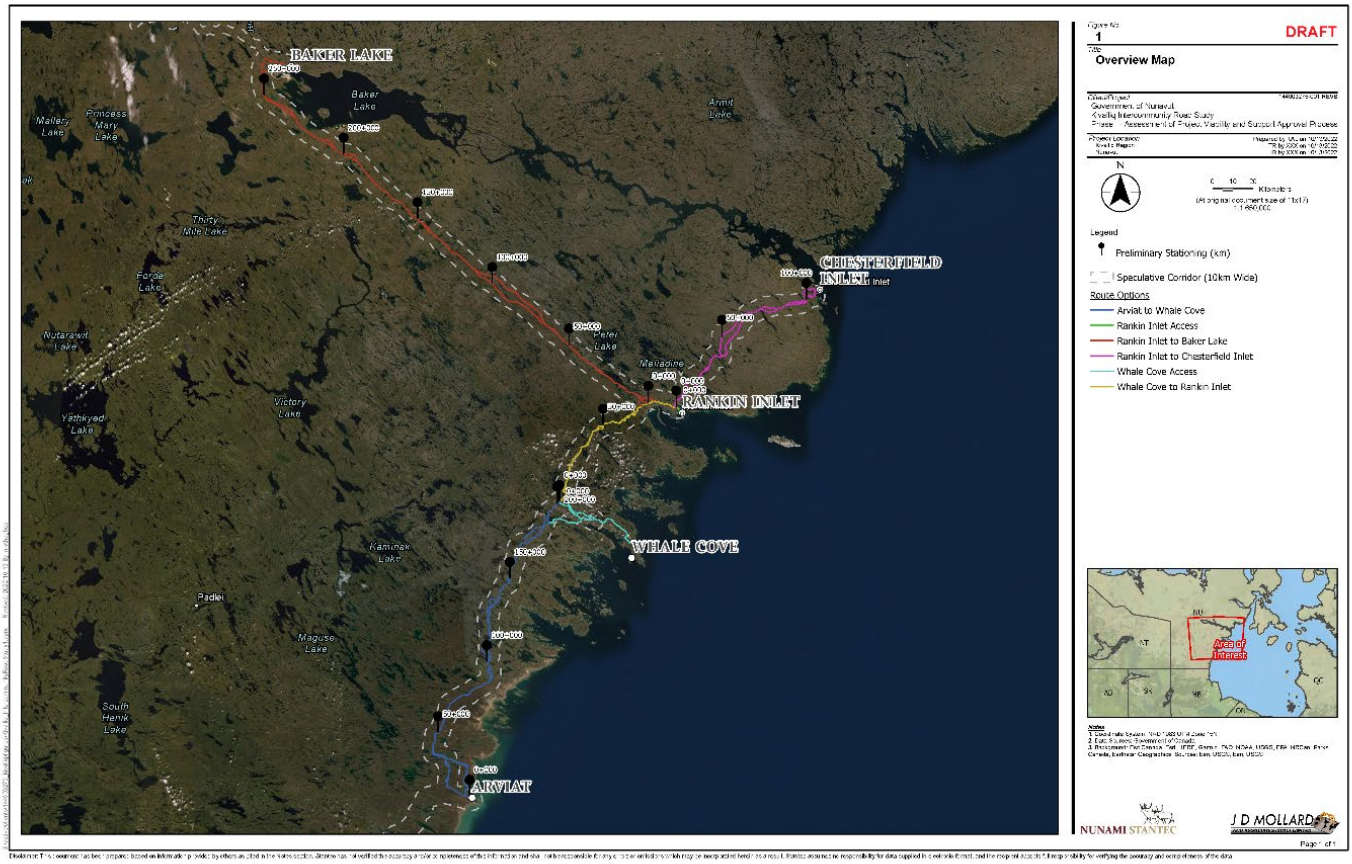
1 PROJECT SCOPE

1.1 Background of Kivalliq Inter-Community Road Study

Nunami Stantec Limited (Nunami Stantec) was contracted by the Government of Nunavut (GN) to complete an inter-community road study in support of the development and planning of an all-season road.

The Kivalliq Inter-Community Road (KICR) project area is in the Kivalliq region of Nunavut and spans over 725 km between the communities of Arviat, Whale Cove, Rankin Inlet, and Chesterfield Inlet, located along the west coast of Hudson Bay, and Baker Lake, located approximately 320 km inland from Hudson Bay.

Figure 1.1 Project Area



The assignment included a number of specific tasks and deliverables which are listed below:

1.2 Phase I - Assess Viability and Support Approval Process

Nunami Stantec conducted a desktop analysis to support the assessment of the proposed road alignment. The analysis confirmed the sustainability and viability of the road. It also guided the planning and execution of the progressive project phases, as well as provided critical inputs to the 30% roadway design task.

1.2.1 Background Review

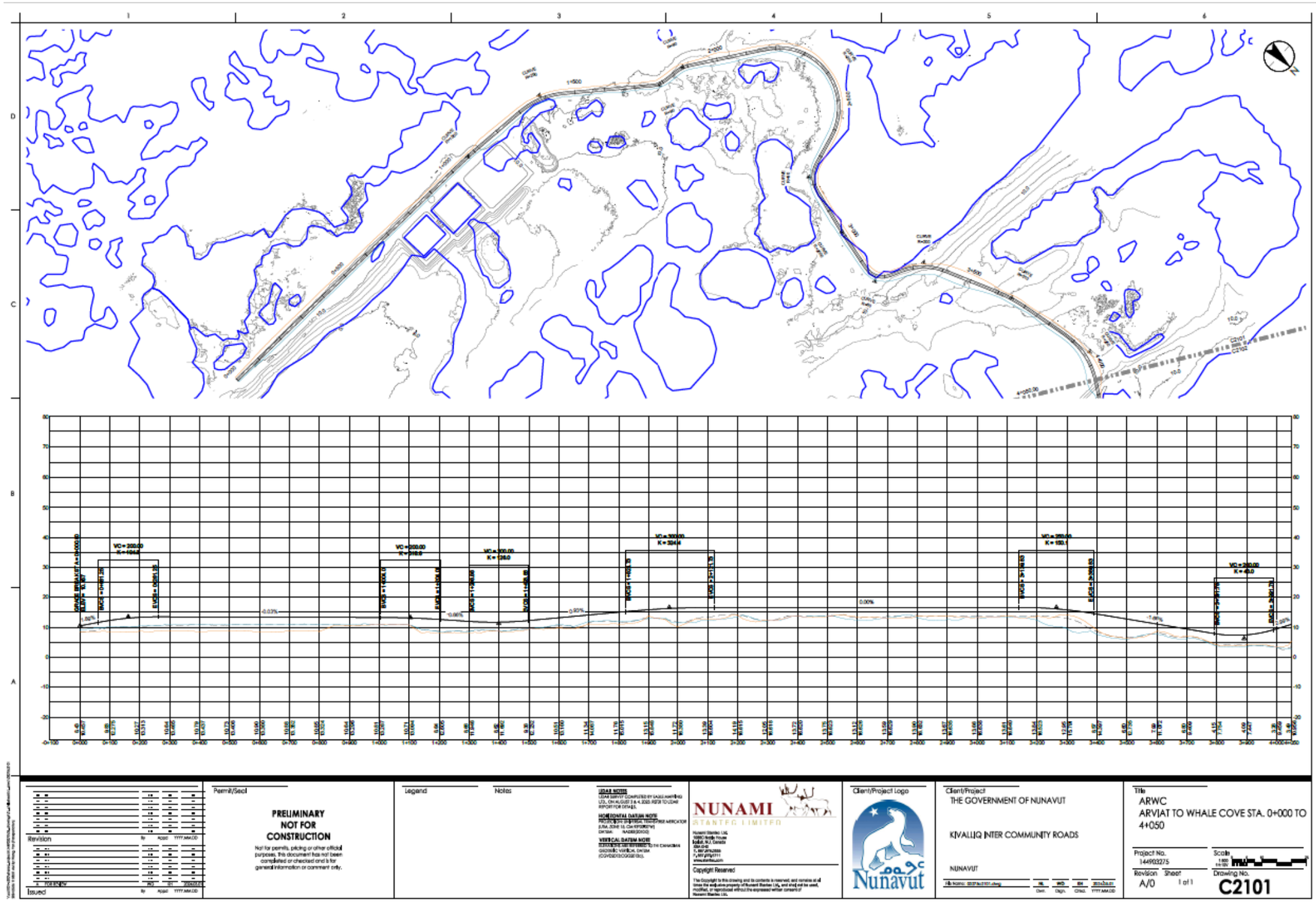
Nunami Stantec completed a review of background material on the proposed corridor using publicly available data and data provided by the GN. Data used included existing bedrock and surficial geology mapping, air photos, satellite imagery, LiDAR data, and Digital Elevation Model (DEM).

1.2.2 Assessment of Technical Viability of Proposed Route

Information gathered as part of the background review was used to conduct a preliminary assessment of terrain conditions along the proposed road centerline and alternate options. The assessment included the identification of key terrain types, crossing locations and widths, adverse topography, and sensitive permafrost areas. Potential granular and bedrock borrow sources located along the corridor were documented. These potential sources were assessed further in Phase III.

Initial Centerline Horizontal Alignment (ICHA): Nunami Stantec reviewed the existing route centerlines prepared from past evaluations and prepared the initial centerline horizontal alignment (ICHA). The alignment routing developed considered past studies, the current 10 km wide corridor centerline, and the existing LiDAR topography and photography. The ICHA included more than one option at appropriate locations including around large lakes where the most appropriate directional choice was not immediately clear. The ICHA developed within this study is based on the most direct, least costly route subject to other constraints. Nunami Stantec considered high quality stable terrain where available and appropriate and avoided visibly wet and polygonal terrain wherever possible. The ICHA also avoids terrain with variable large uphill and downhill gradients and crosses water bodies (streams and rivers) at locations deemed the best while considering the road geometry. Nunami Stantec maintained route centerline separation to waterbodies of at least 50 meters where practical in the development of the ICHA and met design criteria constraints for desirable and minimum horizontal corner radii. The study corridor developed for the ICHA was used by the geotechnical and geomorphology, environmental, and crossings teams.

1.2.3 Example Initial Centerline Horizontal Alignment (ICHA): ARVIAT TO WHALE COVE STA. 0+000 TO 4+050



1.2.4 Regulatory Assistance with Nunavut Planning Commission

Nunami Stantec presented the corridor to the Nunavut Planning Commission (NPC). The purpose of this presentation was for the NPC to consider integration of the corridor into the Draft Nunavut Land Use Plan.

1.3 Phase II - Consultations Including Follow-up

Our engagement conducted comprehensive community consultations events held in Baker Lake, Rankin Inlet, Whale Cove, Arviat, and Chesterfield Inlet. This consultation messaging and presentation were consistent across communities with the exception of local concerns for the project adjacent to the community being visited. The consultation process included a variety of methods for gathering input (online, in-person, questionnaires, and presentations); and was transparent, understandable, and delivered in English and Inuktitut. The consultation exercise revealed the issues and challenges that community members, regulators, and stakeholders had with the development of the new road as well as the opportunities it may create for commerce and family connections.

1.3.1 Community and Stakeholder Consultations – Preparation

Nunami Stantec worked with the GN to develop an Engagement Plan with the purpose of identifying desired outcomes, specific consultation techniques, information needed, schedules, and venues. Events were planned so they did not interfere with harvesting times. All events included an opportunity for attendees to participate in question and answer sessions.

Nunami Stantec identified stakeholders including hunters and trappers' groups, community organizations, local businesses, Governments of Canada and Nunavut, Kivalliq Inuit Association, Nunavut Planning Commission, Chamber of Mines, and mining and exploration companies. Our engagement process included 25 community stakeholders in the five communities including the Beverly and Qamanirjuaq Caribou Management Board and 15 non-community stakeholders. Nunami Stantec reached out to key stakeholders prior to the workshops to confirm key themes, issues, and opportunities. The Engagement Plan examined the opportunities and benefits of integrating the road corridor project with the Kivalliq Hydro-Fibre Link.

1.3.2 Community Consultation Arviat, Baker Lake, Chesterfield Inlet, Rankin Inlet and Whale Cove

Nunami Stantec delivered in-person community consultations to reach as many people as possible. Interpreters were present at the events and all notification and presentation material were provided in English and Inuktitut. Nunami Stantec met with many of the Mayors and Councils in the communities.

1.3.3 Consultation Follow- Up Communications

Following completion of the engagements, Nunami Stantec summarized input into a What We Heard report. The report was presented as a draft for consideration by the GN. Nunami Stantec incorporated comments from the draft in the final What We Heard report.

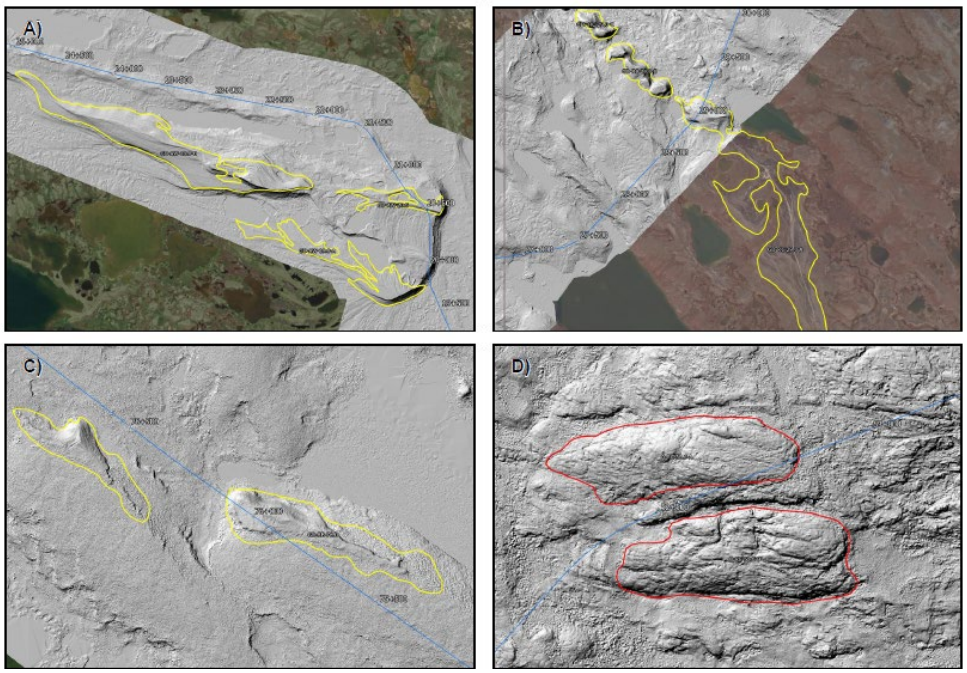
1.4 Phase III - Physical Assessment and Design

1.4.1 Geotechnical Investigation

Detailed terrain mapping was completed within a 1 km wide corridor centered on the proposed road alignment, and within a 3 km wide corridor at the major watercourse crossing locations. Mapping delineates and codifies homogeneous terrain units based on surficial material, surface expression, geomorphic processes, and depth to bedrock. Special attention was given to inventory and characterization of the watercourse crossing locations, as well as delineate terrain constraints (e.g., sensitive permafrost) and geohazards (e.g., landslide) that had the potential to affect the construction and operation of the road.

Terrain mapping is presented as a series of maps along the proposed alignment. Potential granular and bedrock borrow source prospects identified as part of Phase I were reviewed, and new prospects were identified while conducting the terrain mapping. Areas and/or landforms assumed to comprise potential prospects were delineated as individual polygons, and a list of the most promising prospects is provided in the package.

Figure 1.4.1a Examples of Potential Borrow Sources



Typical embankment cross sections were modelled (using Geostudio Temp/W thermal modeling software) over representative terrain types to determine approximate embankment thicknesses required to preserve permafrost beneath the highway embankment, while considering the effects of climate change over the roadway design life.

A preliminary gravel surface road structure design was developed for each subgrade type (assumed a maximum of 4 types) to support the 30% geometric roadway design, considering projected traffic volume inputs as determined by the transportation design team. Geotechnical engineering input was provided on general suitability of borrow source material types, geotechnical constraints of terrain mapping, and preliminary roadway design.

Figure 1.4.1b Example Ground Thermal Analysis EMP/W Output

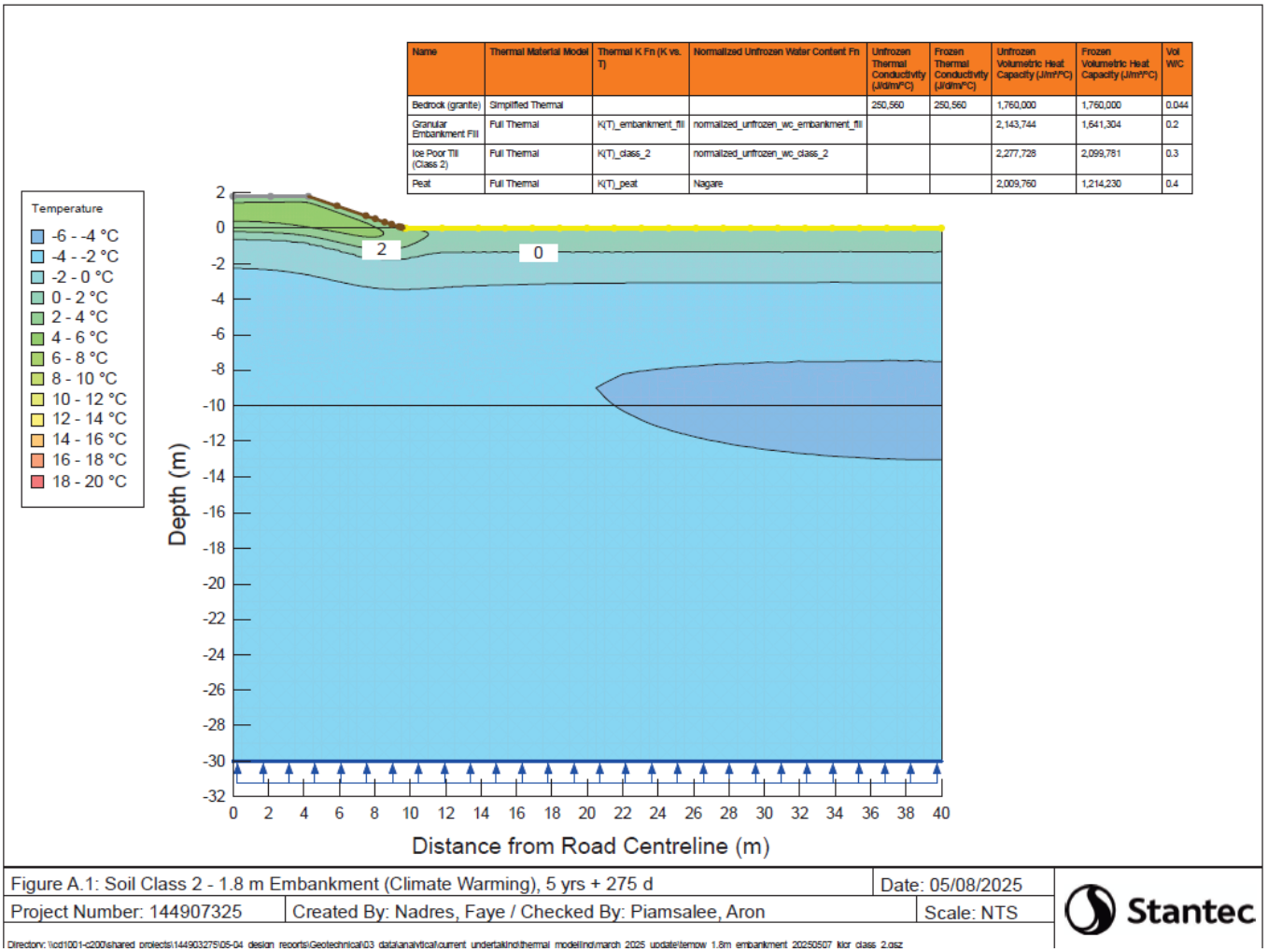


Figure A.1: Soil Class 2 - 1.8 m Embankment (Climate Warming), 5 yrs + 275 d		Date: 05/08/2025
Project Number: 144907325	Created By: Nadres, Faye / Checked By: Piamsalee, Aron	Scale: NTS

Directory: \\cd1001-c200\shared projects\144903275\05-04 design reports\Geotechnical\03 data\analytical\current undertaking\thermal modelling\march 2025 update\temow 1.8m embankment 20250507 kkr class 2.osz

1.4.2 30% Geometric Roadway Design

Our geometric design team developed appropriate design criteria for the KICR project. The design criteria included design classification using Transportation Association Canada (TAC) standards; design speed, impacting horizontal and vertical alignment requirements; cross section elements including lane widths, shoulder widths, side slope grades, minimum embankment heights, granular topping thickness, for required structural and thermal performance; and varied embankment heights for the different terrain types and conditions.

Crossings Identification: Nunami Stantec prepared a list of major, mid-sized and minor crossings apparent from LiDAR photography and topography.

Digital Terrain Model: Nunami Stantec utilized the ICHA Corridor to prepare a digital terrain model for the preparation of preliminary profiles. The digital terrain model was subdivided into linear tiles to provide workable CAD file sizes. These were developed as a maximum of 5 km x 1 km per tile. Nunami Stantec used the digital terrain mapping tiles to prepare original ground profiles of preliminary working centerline alignment for the entire route and route options.

Initial Centerline Vertical Alignment: Nunami Stantec prepared an initial centerline vertical profile (ICVP) for the entire route utilizing original ground profiles. The ICVP was designed to meet criteria for maximum gradient, crest and sag curve K values, length of vertical curve.

1.4.3 Construction Quantity Estimate and Cost Estimates for Ongoing Annual Administration, and Operations & Maintenance

Our technical team completed an end-to-end quantity estimate. We developed Class C cost estimates for construction of the corridor. The cost estimates considered the final design, construction, and Order of Magnitude estimates of the cost of ongoing administration, operation and maintenance. Costs considered both the roadway and the roadway structures. Nunami Stantec validated the cost estimates with market trends and consulted with road builders and heavy civil contractors to confirm the cost reporting.

1.4.4 Greenhouse Gas Assessment

Nunami Stantec completed a greenhouse gas (GHG) emissions assessment (the Assessment), comparing the estimated GHG emissions from the construction, maintenance, and ongoing utilization of the proposed KICR to the business-as-usual estimated emissions (the Baseline) based on Infrastructure Canada's Climate Lens – General Guidance (the Guidance). The GHG emissions for both the Project and Baseline scenarios include direct emissions sources (Scope 1), and indirect electricity emissions sources (Scope 2).

1.4.5 Climate Resilience Assessment

Nunami Stantec assessed the vulnerability of the project's infrastructure and components to climate events based on the design standards, anticipated maintenance, and the type, frequency, and intensity of climate events.

Our Climate Change Resilience Assessment approach followed the key steps of the ISO 31000 Risk Management Standard and the Canadian Climate Lens. It includes both current and future climate conditions and impacts in the analysis.

Our research and analysis included review of background documents and climate data (historical trends and future climate projections).

1.5 Comprehensive Plan / Report

Upon completion of the various tasks of the assignment Nunami Stantec completed this submission that gathers all of the information and compiles it into this comprehensive document. This document includes summaries of the consultation sessions and collates the materials developed to provide regulatory assistance to the GN with Nunavut Planning Commission. The report presents the findings of the geomorphology, geotechnical studies, and route alignment. The Comprehensive Plan / Report is supported by various diagrams and sketches that present the findings and recommendations of the study. The Comprehensive Report includes a chapter identifying the anticipated regulatory approvals and timelines for constructing the KICR. This included a preliminary identification of considerations such as mitigating impact to wildlife, harvesting and traditional land use.

1.6 Virtual Oral Presentations

Nunami Stantec is scheduled to lead up to three virtual sessions to present the findings of the Kivalliq Inter-Community Road Study.

1.7 Phase I - Assess Viability and Support Approval Process

1.7.1 Background of Kivalliq Inter-Community Roads Project

Phase I included an assessment and review of viability of the project. It also included a review of the Approvals necessary to meet the requirements of the Regulators.

1.7.2 Background Data Compilation and Review

Baseline data available and used for the study included the following:

i. 2010 to 2021 satellite imagery (ESRI Service Layer)

ii. 2018 satellite-derived 2 m Digital Elevation Model (DEM) from Polar Geospatial Center (https://www.pgc.umn.edu/data/arcticdem/)

iii. Cadastral data and land use plans (Nunavut Planning Commission, 2021)

iv. Guideline documents (CSA S501:14; CSA PLUS 4011:19)

These data sets were considered sufficient to complete the Phase I (Assessment of Project Viability and Support Approval Process) portion of the project.

1.7.3 Route Selection

The route selection task for the KICR included determining a route or routes joining the five communities of the region, in the most appropriate and efficient way.

The ICHA was used to define the project study corridor, within which the final recommended route was developed.

All Weather Road Design Criteria

One of the most important design criteria that was determined prior to design was to identify the design speed of the road. Design speeds largely impact a road's minimum corner radius, maximum slope, and how far a driver can see ahead over hills, although there are other more minor impacts.

1.7.4 Preliminary Terrain Assessment

The third task of Phase 1 of the project consisted of completing a preliminary terrain assessment along the ICHA and alternate options. The preliminary terrain assessment exercise used expert judgement, experience and training in the identification and delineation of geomorphological landforms and processes visible on Earth's surface. The preliminary terrain assessment was completed along the ICHA and alternate route options. It was carried out through the interpretation of available satellite imagery and DEM data.

i. The proposed ICHA along the Arviat to Whale Cove section consists of a 201.39 km alignment, and comprises thirteen (13) secondary route options, and two (2) secondary-alternate route options that cumulate for 113.86 and 6.14 km, respectively.

ii. The proposed ICHA along the Whale Cove Access section consists of a 48.65 km alignment, and comprises three (3) secondary route options that cumulate for 27.14 km.

iii. The proposed ICHA along the Whale Cove to Rankin Inlet section consists of a 95.43 km alignment, and comprises eight (8) secondary route options that cumulate for 29.69 km.

iv. The proposed ICHA along the Rankin Inlet to Chesterfield Inlet section consists of a 110.48 km alignment, and comprises seven (7) secondary route options that cumulate for 76.67 km.

v. The proposed ICHA along the Rankin Inlet to Baker Lake section consists of a 267.40 km alignment, and comprises thirteen (13) secondary route options that cumulate for 136.02 km.

1.7.5 Identification of Potential Borrow Sources

The use of local aggregate sources is a key factor in reducing overall construction and maintenance costs. If aggregate material must be transported over long distances, construction and maintenance costs will rise.

Typically, granular aggregate materials are extracted from glaciofluvial, marine, alluvial, and sometimes till deposits; mostly eskers and beach ridges were targeted as part of previous studies by JD Mollard and Associates (2003, 2006). Bedrock sources generally require that the rock contains homogeneous materials that meet the specifications associated to the aggregates to be produced.

More than 300 potential borrow sources, gravels or bedrock, have been identified within five km of the ICHA.

1.7.6 Geometric Design

As this would be the first public highway of any significant length in Nunavut, this study references the standards for similar highways in the Northwest Territories highways that are constructed in similar remote cold regions. These include the Inuvik to Tuktoyaktuk Highway (ITH), completed in 2017, the Tli Cho All Season Road (TASR) and the current NWT Mackenzie Valley Highway extension project. We have also considered the design criteria for the proposed Grays Bay Road and Port project in the Kitikmeot region of Nunavut.

Design Standards

The most fundamental highway design criteria are: the horizontal design, where the highway is located, and the shape of the highway laterally. Highways are basically straight sections of road, joined by corners. In highway design the straight lines are called tangents, and the corners are referred to as curves. The faster the design speed of the highway, the greater the radius of the curve must be to allow vehicles to safely drive around the curve at the design speed.

Horizontal design can have a significant impact on cost. Longer horizontal alignments will typically be more costly than shorter alignments. However, longer alignments are often chosen to avoid poor quality terrain. Considering maintenance costs as well as capital costs, a longer route can have a lower life cycle cost than a shorter route.

This project will be a two-lane gravel highway. Similar roads in the NWT and Yukon are typically constructed with an 8.5 m top width.

On a remote highway in the arctic, an elevated embankment serves a few functions:

1. Provides structural support for vehicle loads.
2. Elevates the road above the surrounding terrain to assist in snow clearing by wind.
3. Provides thermal protection of the existing ground from degradation of the permafrost.

The embankments should be constructed of sufficient depth to satisfy the structural requirements plus reduce the impacts of snow drifting.

Thermal projection of the permafrost requires a significant depth of material, and sophisticated analysis in detailed design. Other similar projects such as the ITH have used minimum embankments ranging from 1.7 to 1.9 m in typical areas, with 3.5 m in ice rich polygon areas. This constraint normally governs the minimum embankment height for a project in similar northern permafrost conditions.

1.7.7 Crossings and Bridges

The project primary alignments are 725 km in length. In that distance there are 37 identified bridge crossings. There are 15 large bridges of greater than 50 m in width, and 22 smaller bridges of less than 50 m in width.

These crossings were identified using strictly visual examination of available satellite imagery. Past similar projects such as the Inuvik Tuktoyaktuk Highway have found that for every bridge crossing there are typically 5 to 10 smaller streams which typically require culverts larger than a simple small surface drainage culvert. The full length of the project will include between 200 and 500 stream crossings, most of which will be identified in the design phases of the work.

For the larger river crossings identified at this route planning phase of the project Nunami Stantec reviewed whether to use a single lane or two-lane bridges. It was noted that a narrow two-lane bridge allows two highway vehicles to pass each other at reduced speeds, where a wider bridge does not require a speed reduction. Single lane bridges can be appropriate and safe for use on low volume roads. There are constraints however to the design of a safe highway with single lane bridges.

1.7.8 Select Recommendations

1. Nunami Stantec recommended the use of a 90 kph design speed for this project. This would result in a road with a posted speed limit of 80 kph, 10 kph less than the design speed. As the great majority of drivers drive slightly faster than the posted speed limit, this provides a road which is safe at the speeds most drivers travel.
2. Nunami Stantec recommended that the study corridor for the Kivalliq Intercommunity Roads Project be based upon the 2022 Nunami Stantec Initial Centerline Horizontal Alignment (ICHA) primary and alternate alignments.
3. Nunami Stantec recommended that the ICHA primary and alternate alignments should form the 1 km design corridor for the Kivalliq Intercommunity Roads.
4. Nunami Stantec recommended that the horizontal measurement of the KICR along the centerline of the coastal project (stationing) start with Station 0 at the outskirts of Arviat.
5. Nunami Stantec recommended that the Stationing of the section of the KICR from Baker Lake start with Station 0 at the outskirts of Baker Lake
6. Nunami Stantec recommended for consistency, all Project Stationing should be based upon the ICHA project stationing.

1.7.9 Environmental Regulatory Approvals Assistance

1.7.9.1 Basis of Regulatory Scoping

The Government of Nunavut (GN), Department of Transportation and Infrastructure Nunavut (TIN), is conducting a study of a potential road connecting five communities in the Kivalliq region of Nunavut (the "Kivalliq Intercommunity Road [KICR] project"). This 725 km road would run between Arviat, Whale Cove, Rankin Inlet, and Chesterfield Inlet along the West coast of Hudson Bay and from Rankin Inlet to Baker Lake, located 320 km inland.

The KICR project includes:

1. Two-lane gravel road for year-round use
2. 37 bridge crossings (15 bridges over 50 m wide and 22 smaller bridges)
3. 200 to 500 culvert stream crossings
4. More than 300 potential quarries and borrow sources, gravels or bedrock, have been identified within five km of the ICHA.

An overview of the KICR project location is provided in Figure 1.1.

1.7.9.2 Regulatory Approvals

The construction and operation of the KICR project is expected to be subject to various Acts and Regulations, and will require approvals or authorizations from regulators, as summarized in Table 2.1.9.2. The approvals required will depend on the project's final design, including location within municipal boundaries.

Table 1.7.9.2 Potentially applicable legislation and approvals to construct and operate Kivalliq Inter-Community Roads

Legislation	Authority	Activity	Authorization / Action
Nunavut Planning and Project Assessment Act (NUPPAA)	Nunavut Planning Commission	Project in Nunavut requiring authorization from federal or territorial government	Conformity review and determination of need for screening
Nunavut Planning and Project Assessment Act (NUPPAA)	Nunavut Impact Review Board	Project proposal not exempt from screening	Screening determination
Nunavut Waters and Surface Rights Tribunals Act and Waters Regulations	Nunavut Water Board	Watercourse crossings, water use during construction, and waste discharged to environment	Type A Water Licence
Nunavut Agreement [NLCA]	Kivalliq Inuit Association	Land use, quarrying, land occupancy on Inuit Owned Lands	Land Use Licence and other mechanism for long-term tenure of right-of way
Territorial Land Use Regulations	Crown-Indigenous and Northern Affairs Canada (CIRNAC)	Camps, excavation, use of equipment, use of explosives	Land Use Permit(s)
Quarry Regulations	CIRNAC	Quarrying on federal lands	Quarry Permits

Legislation	Authority	Activity	Authorization / Action
Aeronautics Act	NAV Canada	Land Use near airport	Land Use No Objection
Nunavut Scientists Act	Nunavut Research Institute	Collection of scientific information (e.g., water quality, fish and fish habitat, vegetation, etc.)	Scientific Research Licence
Fishery (General) Regulations	Fisheries and Oceans Canada	Collection of biological information	Licence to Fish for Scientific Purposes; Research Permit and Animal Use Protocol
Fisheries Act	Fisheries and Oceans Canada	Harmful alteration, degradation or destruction of fish or fish habitat	Request for review / Authorization
Nunavut Archaeological and Paleontological Sites Regulations	Nunavut Culture and Heritage	Documentation of an archaeological site in the field; no disturbance or collection of specimens	Class 1 permit
Nunavut Archaeological and Paleontological Sites Regulations	Nunavut Culture and Heritage (GN-DCH)	Documentation and/or disturbance of artifacts	Class 2 permit
Arviat, Rankin Inlet, Baker Lake, Chesterfield Inlet, Whale Cove Zoning By-Laws	Respective Hamlets and GN-Community Services (CS)	Any development within municipal boundary	Development Permit
Arviat, Rankin Inlet, Baker Lake, Chesterfield Inlet, Whale Cove Zoning By-Laws	Respective Hamlets and GN-CS	If applicable - Project is located in Zone where such development is not currently permitted	Approval of council

1.7.9.3 Keewatin Regional Land Use Plan and Recommended Nunavut Land Use Plan (RNLUP)

The *Nunavut Planning and Project Assessment Act* (NUPPAA) requires all project proposals to be submitted to the Nunavut Planning Commission to: (1) determine if the project proposal conforms to an applicable land use plan; and, (2) to determine whether the project proposal is exempt from screening.

The KICR project is within the area of the Keewatin Regional Land Use Plan (KRLUP). The KRLUP identifies principles, recommendations, and requirements for all projects proposed within the planning region, while recognizing the interest in, and benefits from economic development, and the long-term interest in development of infrastructure to link Keewatin communities to southern Canada.

The project must also respect the 2023 Recommended Nunavut Land Use Plan (RNLUP) which was developed pursuant to the Nunavut Agreement and Nunavut Project Planning and Assessment Act.

The KRLUP gives importance to: community use areas; environmental protection and wildlife conservation; mineral, oil and gas exploration and development; heritage resources; transportation and regional infrastructure; and scientific research. A portion of the KICR overlaps with the calving area of the Qamanirjuaq and/or Beverly barren-ground caribou herds, and areas along the Kazan River where heritage resources have been identified.

The KRLUP currently prohibits development activities in caribou calving areas during caribou calving season, and within caribou water crossings areas, in accordance with caribou protection measures.

This includes restricted activity periods during caribou calving and caribou migration. While not a focus of this report, these requirements would be relevant if/once a transportation corridor were to be approved for construction.

The KRLUP identifies specific conformity requirements, which must be met by all project proposals in the area where the KRLUP applies:

> *A project proposal conforms to this plan if:*
>
> 1. *it* satisfies *the "conformity requirements" identified in Chapter 6 of the NUPPAA; and*
> 2. *it involves land use of a type*
>   a. *engaged in or previously contemplated by the communities and land use authorities in the Keewatin region, or*
>   b. *not previously engaged in or contemplated, yet the proposal is consistent with the principles identified in the following section* [ref.p.76 Principles and Factors Guiding Interpretation].

The conformity requirements specifically relating to the development of Transportation and Regional Infrastructure are found in Chapter 6:

> *(5.4) Low-level flights shall not take place unless absolutely necessary. Should they be necessary, pilots shall avoid disturbance to people and wildlife wherever possible.*
>
> *(5.6) All parties wishing to develop a transportation and/or communications corridor shall submit to the NPC a detailed application for an amendment*. [emphasis added] *This application must include an assessment of alternative routes, plus the cumulative effects of the preferred route. It shall provide reasonable options for other identifiable transportation and utility facilities. In particular, this application must meet the information requirements set out in Appendix I.*
>
> *(5.7) The NPC and either NIRB or a panel acting under s. 12.4.7 of the NLCA shall publicly review the proposed corridor to determine whether the proposal adequately meets the requirements of Appendix I and the guidelines of Appendix J. Once it is determined that a proposal meets the guidelines, the NPC may request the Minister of DIAND to amend the plan to include the new transportation corridor*.

Consequently, a proposal to advance the KICR project would need to submit the information required in Appendix I of the KRLUP to support a plan amendment in accordance with Section 59(1) of NUPPAA and follow the planning guidelines of Appendix J of the KLRUP when submitting an application to the NPC to amend the plan to allow for the KICR. Section 82 of NUPPAA also provides the GN-TIN, as proponent, option to request a Ministerial exemption from the KRLUP.

A summary of how/where the KRLUP conformity requirements are or are not addressed by the KICR is included in Table 2.1.9.3 A.

However, and of special consideration, is that since the issuance of the last version of the KRLUP (2000), the NPC has been developing a Nunavut-wide land use plan (Nunavut Land Use Plan [NLUP]) that would replace regional land use plans, such as the KRLUP. This is relevant, because the current version of the NLUP – the Recommended NLUP – (NPC, 2023a) expressly identifies a proposed new land use designation for a Linear Infrastructure Corridor (LIC), including one such corridor in the Kivalliq Region.

The NPC included this new designation as an option to address consultation comments on previous versions of the draft NLUP with affected Designated Inuit Organizations, Indigenous Governments, federal government departments, Government of Nunavut, municipalities, industry, and the public. As such, a Ministerial exemption to the KRLUP could potentially be justified and should be further discussed with the NPC. Furthermore, though the KICR project may require an amendment to the KRLUP (if no other plan is approved at the time), the information requirements to propose such an amendment may already be satisfied, at least in part, by the NPC itself, in the development of the Recommended NLUP. Specifically:

1. The NPC itself has identified a new proposed LIC corridor land use designation.
2. The location of a Kivalliq-Manitoba linear infrastructure LIC entirely encompasses the location of the KICR route.
3. The NPC has based this corridor on extensive consultation input, which has been reflected in the draft NLUP[1]

The consideration of the new LIC in the Recommended NLUP has been incorporated into the conformity requirements presented in Table 2.1.9.3 A, and the guidelines presented in Table 2.1.9.3 B.

[1] For example the Kivalliq Inuit Association supported the inclusion of the Kivalliq-Manitoba Road, as based on an assessment of route alternatives, 2016-05-04. NPC Registry #14-182E

Table 2.1.9.3 A Conformity Requirements of the KRLUP

KRLUP Requirement	How / Where Addressed	Not Addressed
1. A description of the proposed corridor, including its use, its general routing, the possible environmental and social impacts, and any seasonal considerations that may be appropriate.	• Nishi-Khon/SNC-Lavalin (2007) • Nunami Stantec Phase I Report; Section 3 – Route Selection (Nunami Stantec, 2023) • Recommended NLUP Map A (NPC 2023a)	• Possible environmental and social impacts and seasonal considerations
2. A comparison of the proposed route with alternative routes in terms of environmental and social factors as well as technical and cost considerations.	• The KICR is within a 10 km wide corridor, which is understood to have been identified by GN based on past evaluations of alternative routes (Nishi-Khon/SNC-Lavalin [2007]; Section 3.1.1 of Nunami Stantec, 2023) • The Manitoba-Kivalliq LIC in the Recommended NLUP was presented in response to public interest in such a corridor (NPC 2023b). • Technical criteria are discussed in Sections 3 – 6 of Nunami Stantec (2023)	• Nunami Stantec is not aware of previous consideration of environmental and social factors in route selection. • Cost of alternative routes has not been evaluated.
3. An assessment of the suitability of the corridor for the inclusion of other possible communication and transportation initiatives (roads, transmission lines, pipelines, etc.). This assessment should include: – the environmental, social and terrain engineering consequences, and the cumulative impacts of the project, and – the environmental and social impact of the project on nearby settlements or on nearby existing and proposed transportation systems	• The Kivalliq Hydro-Fibre Link (Nukik Corporation) is conceptually located within the same corridor as the KICR project. It is understood that environmental studies are underway for that project. • Nunami Stantec is not aware of environmental and social impact studies completed for the project.	• Environmental screening-level assessment

Table 2.1.9.3 B Transportation and Communications Corridor Guidelines

KRLUP Requirement	How / Where Addressed
1. The corridor width shall be a function of: – The number and type of identified facilities within the corridor – Physical and biophysical conditions – Availability of detailed engineering data for one or more transportation modes within the corridor – Safe distances between different facilities within the corridor – Aesthetics 2. Corridors shall: – Minimize negative impacts on community lifestyles – Improved access to other resources having high potential for development, while still maintaining the shortest practicable distance between the primary resource areas and the trans-shipment location – Be designed in accordance with existing and prospective land use capability including topography, soil, permafrost and wildlife – Be designed in accordance with the availability of granular supplies 3. In keeping with existing legal and legislative requirements, including the NLCA, corridors shall not negatively impact: – Community business, residential and projected expansion areas – Important fish and wildlife harvesting areas – Key habitat for fish and wildlife species, especially areas used by endangered species – Areas of high scenic, historic, cultural and archaeological value	• The NPC has identified a LIC corridor in its latest version of the NLUP (NPC 2023a) • It is not clear what the basis of the NPC's LIC location was. This is beyond the scope of this report. • No project-specific environmental studies have been completed • A summary of feedback received during engagement with potentially affected parties, is included in the What We Heard Report • The Recommended NLUP identifies areas of high ecological and socio-economic value and how they overlap with the LIC. This information can be used in part to meet this requirement.

Based on the general concordance of available information against the information requirements of the KRLUP, there would be a need to gather additional environmental and socio-economic information to support an application for an amendment to the plan.

The NPC has published a guide outlining the steps to amending a land use plan: Nunavut Planning Commission. The process involves submission of a proposed amendment to the NPC, public review (which may include a hearing), recommendation by the NPC whether the proposed amendment be rejected or accepted in whole or in part, followed by – "as soon as practical" – a decision by the federal Minister, territorial Minister, and Designated Inuit Organization, whether the recommendation is to be accepted or rejected (NUPPAA s.62(1)).

In considering the process required to amend the KRLUP to accommodate the KICR, it is relevant that the precise location of the KICR route within the new proposed LIC in the Recommended NLUP is not coincidental. In the KRLUP, the NPC provided itself direction to "*implement the concept of a transportation and/or communications "corridor" as a land use policy having general application and*

applying to land and water routes throughout the Keewatin, based on the process outlined in 5.6 and 5.7." (Chapter 6, Term 5.4 of the KLRUP). The NPC has subsequently done so, by identifying the new LIC land use designation in the Recommended NLUP (NPC, 2023a). This new draft designation is relevant, because if the current draft designation is retained in the final NLUP, it would remove the requirement for a plan amendment. This scenario is discussed further in the sections that follow.

1.7.9.4 Recommended Nunavut Land Use Plan

The "2023 Recommended Nunavut Land Use Plan" (NPC 2023a) was submitted to the Government of Canada, Government of Nunavut, and Nunavut Tunngavik Incorporated, as signatory parties, in June 2023. There is no timeline set for these parties to respond, and no parties have responded as of September 2024.The NLUP is therefore not in effect.

Should the NLUP be approved prior to the advancement of the KICR through the regulatory process of the NUPPAA, the project will need to take into consideration the requirements of this new plan.

1.7.9.4.1 Kivalliq Inter-Community Roads is Within a Linear Infrastructure Corridor

The Recommended NLUP includes the following designations:

1. Limited Use areas: characterized by the year-round prohibition of one or more types of land use, with conformity requirements
2. Conditional Use areas: characterized by conformity requirements
3. Mixed Use areas: no prohibited uses or conformity requirements

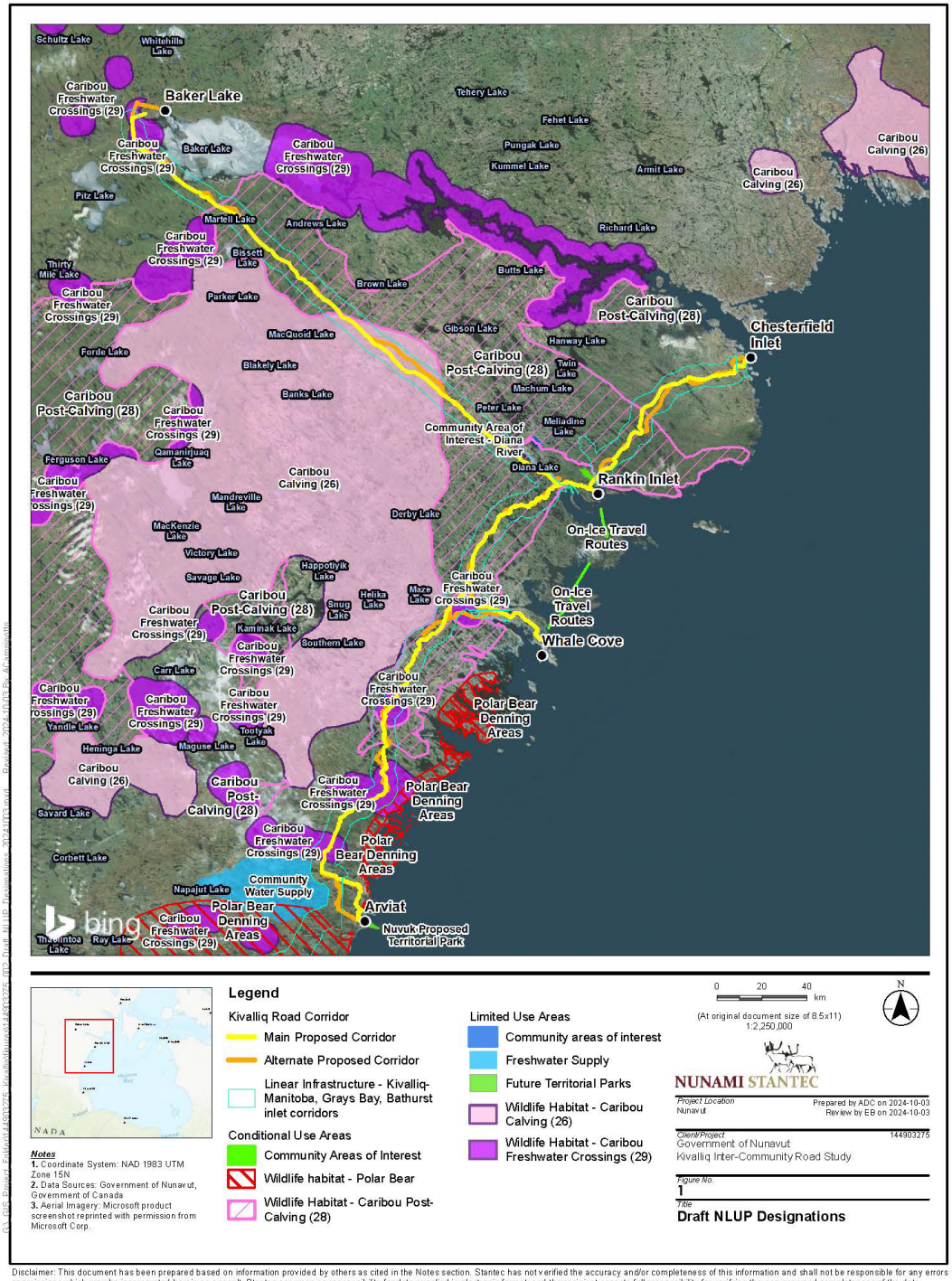
The Recommended NLUP then includes overlays, which are areas where the above designations are modified:

1. Inuit Owned Lands: modifies Limited Use areas; certain prohibited uses may proceed if supported by the Designated Inuit Association
2. Existing Conservation Management Areas: areas managed by other regulatory authorities
3. Linear Infrastructure Corridors (LIC): prohibitions of linear infrastructure do not apply; conformity requirements apply

Figure 2.1.9.4.1 A shows the location of the Manitoba-Kivalliq LIC overlay in relation to other designations in the Recommended NLUP. The KICR is within the LIC.

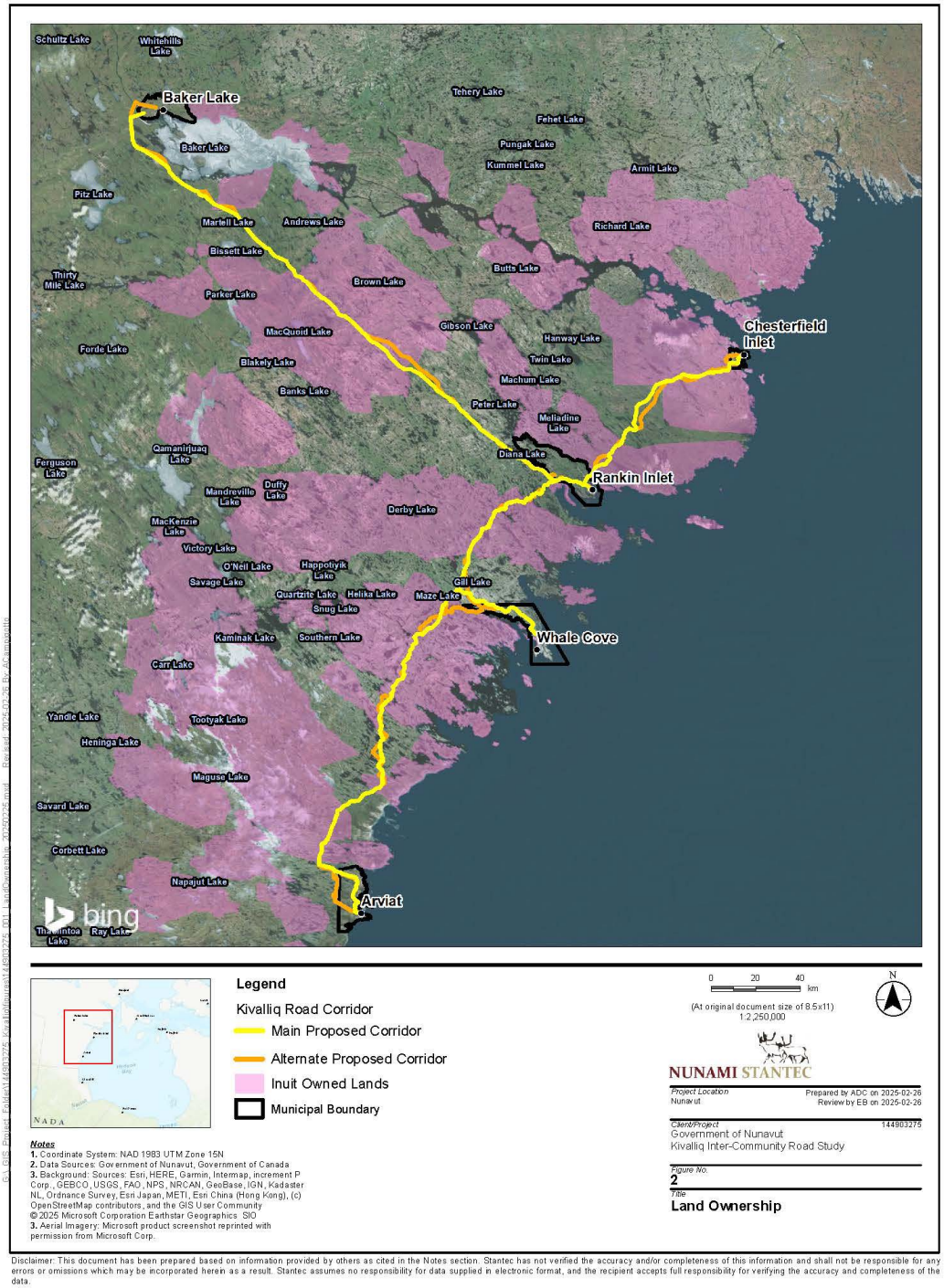
Furthermore, the KICR traverses Inuit Owned Lands as shown in Figure 2.1.9.4.1 B.

Figure 2.1.9.4.1 A - Location of Kivalliq Inter-Community Roads within Linear Infrastructure Corridor



Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Figure 2.1.9.4.1 B - Location of Kivalliq Inter-Community Roads in Relation to Inuit Owned Lands



Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

1.7.9.4.2 Conformity Requirements Apply

The KICR Corridor overlays the following Limited Use Areas of the Recommended NLUP:

1. Caribou Calving (26)
2. Caribou Freshwater Crossings (29)

The KICR Corridor overlays the following Conditional Use Areas of the Recommended NLUP:

1. Caribou Post-Calving (28)

A summary of the conformity requirements related to these areas is provided in Table 2.1.9.4.2.

Table 2.1.9.4.2 Table of Conformity Requirements

Conformity Requirement (NPC 2023a)	Notes
Caribou Calving Areas (26)	
2.2.1-1 The caribou calving areas shown on Map A are Limited Use areas within which the following incompatible uses are prohibited: (a) oil and gas exploration and production; (b) mineral exploration and production; (c) quarries; (d) hydro-electrical and related infrastructure; (e) wind turbines for electrical generation that are over 15 m in height and related infrastructure; and (f) linear infrastructure.	Not applicable to LIC overlay
2.2.1-2 Project proponents must cease all uses at those sites, except research and tourism related to caribou conservation, and maintenance of project infrastructure, during the dates identified in Table 2: Caribou Seasonal Restrictions.	Qamanirjuaq Herd: June 9 – July 3 Beverly Herd: June 6 – July 8
2.2.1-3 The seasonal restrictions set out in section 2.2.1-2 do not apply to operating mines with approved project certificates containing caribou protection measures.	-
2.2.1-4 Helicopters and airplanes must maintain a vertical distance of at least 300 meters during the dates identified in Table 2: Caribou Seasonal Restrictions, except as required for the safe operation of the aircraft and for specified operational purposes, such as take-offs and landings.	Qamanirjuaq Herd: June 9 – July 3 Beverly Herd: June 6 – July 8
Caribou Post-Calving Areas (28)	
2.2.2-1 The caribou post-calving areas shown on Map A are Conditional Use areas within which project proponents must cease all activities, except research and tourism related to caribou conservation, during the dates set out in Table 2: Caribou Seasonal Restrictions.	Qamanirjuaq Herd: June 23 – July 3 Beverly Herd: June 20 – July 8
2.2.2-2 These seasonal restrictions do not apply to operating mines with approved project certificates containing caribou protection measures.	-
2.2.2-3 Helicopters and airplanes must maintain a vertical distance of at least 300 meters during the dates identified in Table 2: Caribou Seasonal Restrictions, except as required for the safe operation of the aircraft and for specified operational purposes, such as take-offs and landings.	Qamanirjuaq Herd: June 23 – July 3 Beverly Herd: June 20 – July 8

Conformity Requirement (NPC 2023a)	Notes
Caribou Freshwater Crossings (29)	
2.2.4-1 The caribou freshwater crossings shown on Map A are Limited Use areas within which the following incompatible uses are prohibited: (a) oil and gas exploration and production; (b) mineral exploration and production; (c) quarries; (d) hydro-electrical and related infrastructure; (e) wind turbines for electrical generation that are over 15 m in height and related infrastructure; and (f) linear infrastructure.	Not applicable to LIC overlay

1.7.9.4.3 Valued Components to be Included in Screening / Review

The following valued ecosystem and socio-economic components (VCs) would need to be considered during the screening / review of a project proposal for the KICR, per Map B of the Recommended NLUP. These areas overlap with at least part of the KICR:

1. McConnell River Key Migratory Bird Habitat (outside of Migratory Bird Sanctuary)
2. Caribou Winter Range
3. Caribou Summer Range
4. Caribou Migration
5. Areas of Mineral Potential
6. Heritage Rivers (Kazan River)
7. Denesuline Areas (Ghotelnene K'odtineh Dene area of asserted rights)
8. Char Areas of Abundance
9. Community Identified Priority Locations
10. Locations Identified in Use and Occupancy Interviews

Other VCs would be selected based on science requirements and engagement. The scoping of specific desktop studies and/or field studies needed to support advancement of the KICR project through the requirements of NUPPAA is beyond the scope of this report.

1.7.9.4.4 Approvals Under the Nunavut Planning and Project Assessment Act

The KICR would require one or more approvals from the federal or territorial government (per Table 2.9.1.2), automatically triggering the provisions of Part 4 of the NUPPAA. With feasibility level drawings and details, the process to obtain the regulatory approvals required by the NUPPAA can be initiated. There are two regulators (Institutions of Public Government) and three steps, in sequence involved:

1. Upon submission of a project proposal, the NPC determines whether the project proposed conforms to an approved land use plan and determines whether the project requires screening by the Nunavut Impact Review Board (NIRB).
2. The NIRB, conducts a public screening process, and recommends whether the project can proceed, whether it requires a more thorough review, or whether it needs to be reconsidered or abandoned.
3. The Minister of Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) accepts or rejects the NIRB's screening recommendation

If an amendment to the KRLUP is required (i.e., if the NLUP is not in effect), the amendment is processed prior to the submission of the project proposal. The steps described here follow either:

1. The successful amendment to the KLURP; or
2. The approval, by the signatory parties, and the Governor in Council, of the NLUP such that it is in full force and effect.

1.7.9.4.4.1 Nunavut Planning Commission

To initiate the screening process, the NPC receives a project proposal – a technical and non-technical summary of the project being proposed, identification of authorizations being sought and evidence of engagement with potentially affected communities (called "prescribed information"). Demonstration of conformity to the KRLUP or NLUP (as applicable) is required. The NPC will, within seven (7) days, determine whether the application is complete. It then has up to forty-five (45) days to issue a determination of conformity, and of whether screening by the Nunavut Impact Review Board (NIRB) is required. The proponent can request that the project go directly to screening.

1.7.9.4.4.2 Nunavut Impact Review Board

Upon determining that screening is required, the NIRB will open a file and check that the project proposal is complete. The key outcome being sought of the screening is whether the project *could* be a cause of significant environmental impacts. The information required by the NIRB in a project proposal includes:

1. A description of the proposed project, including location of all activities, timing, all works and activities, camp, fuel, waste and transportation details, supported by maps.
2. A discussion of alternatives to and alternate means of undertaking the development.
3. A description of the biophysical environment that could be impacted by the development.
4. A description of traditional and other land uses, harvesting areas.
5. Detailed summary of engagement, issues and concerns raised and how the project addressed the issues and concerns.
6. A description of how traditional knowledge has been used in the project proposal.

7. A screening of potential adverse, mitigable and unknown environmental impacts and cumulative impacts, including impacts to VCs of the biophysical and socio-economic environment.
8. The proposed mitigation measures to address potential impacts, including draft plans consolidating such measures, for example environmental management plans, or a list of such plans as part of an environmental management system for the project.
9. Concept plans for clean-up, reclamation, disposal and or decommissioning of the various elements of the project (as applicable).

The NIRB will request additional information until the project proposal is deemed complete. At that time, a 45-day public comment period is initiated. During this time, the public may ask questions of the proponent. Once the NIRB has made its recommendation, the Minister of Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) has 45 days to respond with a decision, with the option to extend for an additional 45 days.

The same process would apply to any individual segments of the KICR proposed. It is very likely that the NIRB, based on public comment, would conclude that a review of the project is required on the basis of potential for significant adverse impacts or significant public concern.

Should a NIRB review be undertaken, the outcome would be a Project Certificate, providing approval to proceed with construction permitting for the project.

1.7.9.4.4.3 Topics of Focus in a NIRB Review

Based on the KICR's overlay over several important areas for barren-ground caribou (calving, post-calving, water crossings, migration), the potential effects of the KICR project on caribou should be anticipated to be a key focus or a NIRB review. Secondarily, the road will facilitate access to areas of high mineral potential, and interest in developing additional utilities within the corridor. Cumulative effects of potential future developments may also be a key focus of the review.

1.7.9.5 Permits to Construct and Operate

Permits, licenses, and other approvals required to construct and operate the KICR may be sought after the requirements of the NUPPAA are met, and a Project Certificate is issued. Permits, licenses and other approvals are required for activities on federal land, Inuit Owned Lands, and potentially on municipal lands. Potential approvals are listed in Table 2.9.1.2.

The processes to obtain these additional authorizations is beyond the scope of this report.

1.7.9.6 References

1. Nishi-Khon/SNC-Lavalin. 2007. Nunavut-Manitoba Route Selection Study: Final Report. Submitted to Kivalliq Inuit Association.
2. Nunavut Planning Commission (NPC). 2023a. Recommended Nunavut Land Use Plan (June 2023)
3. NPC. 2023b. Nunavut Land Use Plan. Options and Recommendations Report. Draft

1.8 Phase II - Consultations

Community Engagement and Consultations for the Kivalliq Road project included thorough and meaningful engagement with community members, regulators, industries, local businesses, governments, Inuit organizations and other stakeholders.

Broadly, the purpose of this engagement program was to:

1. Share information about this project
2. Seek to understand:
    a. Community benefits and community concerns
    b. Challenges with the development of the Kivalliq Road within the proposed alignment
    c. Potential opportunities for commerce and community connections
    d. Pros and cons of route options, especially near communities
    e. Local and traditional knowledge relevant to the project
    f. Environmental impacts and potential mitigation measures
    g. Benefits of integrating the road corridor project with the Kivalliq Hydro-Fibre Link

In conducting the Engagement, Nunami-Stantec met with over 240 people including:

1. Elected officials and municipal staff
2. Hunters and Trappers Organizations
3. Representatives from the Kivalliq Inuit Association
4. Local and regional business representatives
5. Kivalliq Chamber of Commerce and Nunavut Chamber of Mines
6. Regulators and various service providers
7. Community members including youth and Elders

In-person meetings were held in five communities. Advertisements for public meetings were distributed territory-wide and locally through newspapers, Facebook ads, radio ads, and printed posters.

In addition, over 190 representatives from the communities, Inuit Organizations, and government agencies were sent direct emails and phone calls inviting them to engage on this topic. Meetings with interested parties were held both online and in-person.

Feedback was collected through meeting notes, an online survey with 64 responses, an online comment form, and email submissions.

Engagement meetings began in November 2023 and ran until March 2024. In-person community meetings were held in the following locations on these dates:

- Arviat January 30, 2024
- Baker Lake January 31, 2024
- Chesterfield Inlet February 2, 2024
- Whale Cove February 5, 2024
- Rankin Inlet February 6, 2024

1.8.1 Community Engagement - Summary of What We Heard

During the engagements, we asked questions to help inform how the road could be used in the future and to identify potential benefits, risks, impacts, or hesitations people feel should be considered or addressed.

1.8.1.1 Key themes

From the input received during the in-person and online engagement, six key themes were identified:

1. Increased freedom and flexibility

   The road would allow residents to travel throughout the region more freely, at a lower cost, and more comfortably throughout the year.

2. Enhanced social connectivity

   The road would connect family and friends living in different communities in the region and allow residents to attend more social, cultural, and sports gatherings.

3. Reduction in the cost of living

   Due to the existing reliance on air travel and shipping, the cost of living is very high in the region; with this road, it is assumed that the cost of living could go down as the cost of personal travel and goods would be reduced.

4. Negative impacts on caribou

   The construction and presence of the road could negatively impact caribou by requiring them to cross the road during migration. Traffic on the road would generate noise, light, and dust; and potentially disturb caribou calving and post-calving grounds.

5. Increased influence of alcohol

   The road could facilitate alcohol entering communities with prohibition or committee liquor restriction systems, from those with unrestricted liquor systems. In addition, drinking and driving poses a safety risk to users.

6. Lacking the desired connection to Southern Canada

After decades of conversations about this roadway, a connection to Southern Canada, specifically Manitoba, is still desired for easier and more flexible shipment of goods and personal access to Churchill and Winnipeg.

1.8.1.2 How the road may be used.

1. Shipping goods of a variety of sizes, year-round, at lower rates.
    a. Quicker, more reliable transport of all items, including perishable goods, between communities.
    b. Transporting modular homes, which, starting in 2030, will be constructed in Arviat and shipped across Nunavut as part of the Nunavut 3000, Nunavut Housing Corporation's strategy.
2. Being able to more easily access and offer/sell goods or services in other communities.
3. Moving exploration and mining equipment.
4. More flexible and affordable personal travel: visiting family and friends, attending gatherings or events like sports tournaments or cultural festivals.
5. Increased access to hunting, fishing, berry-picking, and cabin areas.
6. Attending medical or other critical appointments.
    a. For those unable to drive themselves, a shuttle or bus may be needed if scheduled air service is discontinued or reduced.
7. While an inter-community road was seen as beneficial, there is still a strong desire to see a future connection of this road to Southern Canada, preferably Manitoba.

1.8.1.3 What the potential benefits may be.

1. A road would impact every part of community life, which would have both positives and negatives.
2. The freedom and flexibility of movement will transform residents' way of life, reducing feelings of isolation.
    a. Enhanced social connectivity.
    b. There may be fewer barriers when considering moving away for education or employment opportunities, if coming back home to visit was easier.
    c. More flexible and predictable travelling as residents won't have to rely on airplane schedules, delays, and cancellations.

3. Goods of all sizes could be shipped and received year-round on more flexible and predictable timelines, at a lower cost.
    a. Enhanced predictability would help organizations plan their budgets and apply for grants as they can purchase materials year-round.
4. The cost of living would hopefully go down as shipping would be cheaper, and personal flights wouldn't be needed as often.
    a. Concerns were raised about whether food would be as subsidized as they are now, should the road be built.
5. Easier, more convenient access to services in other communities such as health care and education.
6. Accessing hunting, fishing, and berry-picking areas may be easier, more comfortable, or more convenient.

1.8.1.4 What the potential opportunities may be.

1. New or enhanced economic opportunities as trading networks become larger and new industries may emerge (e.g., storage facilities, public transport, roadway monitoring, and surveying).
2. New employment and training:
    a. as a direct result of the roadway (e.g., design, construction, and maintenance) and
    b. through spin-offs (e.g., government jobs in the new GN highway department, health care workers, seaport operation, goods hauling, storage facilities, RCMP staff, potential mineral exploration, and wildlife monitoring).
3. Partnership opportunities to use best practices and lessons learned during the design, construction, operation, monitoring, and maintenance of the roadway. Suggestions to connect with Agnico Eagle Mines and the Government of Northwest Territories and/or the designers who worked on the Inuvik to Tuktoyaktuk highway.
4. Enhanced tourism.
5. Emergency preparedness improvements through new evacuation options and resource-sharing between communities (e.g., generators, volunteers).
6. Additional community growth to accommodate new development such as expanded servicing, additional water sources, and alternative landfill locations.

1.8.1.5 What the potential negative impacts may be.

1. Caribou would be negatively impacted. Having a road cross the caribou migration routes would impact them. Crossing would be more difficult due to the higher road surface and type of rocks used during road construction. Increased smells, noise, light, and dust disturbances would also have a negative impact on caribou migration.
    a. When considering what routes to select, calving and post-calving grounds must be protected.
    b. During times of migration, the road should be closed to allow the caribou to move freely, which is how the Agnico Eagle's Meliadine Road is currently managed.
    c. A road would increase hunters' access to caribou which must be carefully managed to prevent over-hunting.
2. A road would negatively impact the environment through:
    a. quarrying and blasting for the materials to build and maintain it,
    b. dust generation,
    c. increased vehicle emissions,
    d. potentially more cabin developments,
    e. littering, and
    f. disturbance of Canadian Heritage Rivers during the construction of crossings.
3. Small communities may experience out-migration with residents having access to more populated communities.
4. Businesses in the smaller communities may lose customers due to increased competition with those in other communities, or face increased operating costs, and be forced to shut down.
5. The traditional way of life could be negatively impacted, with increased pressure on berry picking or hunting, and more cabins.
6. Airlines may reduce their flight frequency between communities. For residents and businesses relying on those flights, that would be negative.

1.8.1.6 What the potential risks may be.

1. Driver safety.
    a. Vehicle accidents at highway speeds could be very dangerous and there are limited emergency rescue and medical care resources available to respond.
    b. Extreme weather conditions could quickly change road conditions and blizzards can last up to five days. There would need to be a way to close the road and communicate the dangers to drivers.
    c. Drivers could become stranded; they would need to be prepared for the journey with enough gas, check in with their family before they leave, and potentially have access to cellular or emergency communication methods along the way. It may be necessary to provide emergency shelters along the route.
2. Roadway operation, maintenance, and enforcement.
    a. The Government of Nunavut does not currently have a Highways Operations Division to ensure proper standards for maintenance, operations and enforcement are in place and adhered to. The GN will need to develop the necessary resources to ensure that roadway operation, maintenance, and enforcement are appropriately managed.
    b. The road may be closed frequently during extreme weather events, caribou migration, and spring conditions when the surface may not be safe.
    c. The road will need to be monitored to ensure road safety and reduce any potential conflicts or incidents.
    d. Drivers will need to be licensed and educated about how to drive the road.
    e. All vehicles on the road should be registered, insured, and in good working order.
    f. Speed limits will need to be enforced.
3. Increased influence of alcohol.
    a. Communities with prohibited or restricted liquor systems may experience challenges upholding this system, potentially resulting in more alcohol entering the community and causing negative health, social, and safety impacts.
    b. As more alcohol may enter communities with prohibited or restricted liquor systems, existing programs and programs and facilities intended to address negative issues related to drug and alcohol use may need to be expanded (e.g., treatment and healing, domestic violence support services, policing).
4. The road would face extreme weather conditions and challenging terrain and be used by a variety of vehicle types; as such, proper construction and attentive maintenance will be required.
5. Economic benefits may go largely to companies based outside Nunavut, especially if local people do not receive the training needed to participate in this project in a meaningful way.

1.9 Phase III - Physical Assessment and Design

1.9.1 Geotechnical Investigation

Nunami Stantec Limited (Nunami Stantec) has completed a geotechnical desktop assessment in support of the development and planning of the Kivalliq Inter-Community Road (KICR) project.

The geotechnical desktop assessment included the following scope:

1. Preliminary gravel surface road structure design
2. Thermal analysis to determine approximate embankment thicknesses required to preserve permafrost beneath the road embankment, while considering the effects of climate change over the road's design life
3. A review of potential foundation options for water crossings along the proposed road alignment
4. Recommendations for future geotechnical studies

This geotechnical assessment considered the geometric design and crossing outlined in the geometric design report: No geotechnical drilling and sampling have been conducted along the proposed road alignment as part of this current study. Geotechnical information along the proposed road alignment has been derived from publicly available geotechnical information (e.g., geotechnical reports, permafrost mapping) and the physical assessment (terrain mapping) report prepared by Nunami Stantec for the KICR project.

1.9.1.1 Preliminary Gravel Surface Road Structure Design

A preliminary gravel surface road structure design has been developed for the proposed KICR. The design is based on the AASHTO design method using assumed traffic design parameters for the KICR. Three preliminary design options are provided below in consideration the road embankment will be constructed using granular fill and/or rock shatter based on potential borrow sources identified in the terrain mapping report:

1. 525 mm base course, over 500 mm granular fill
2. 490 mm base course, over 250 mm rock shatter
3. 240 mm base course over 500 mm rock shatter

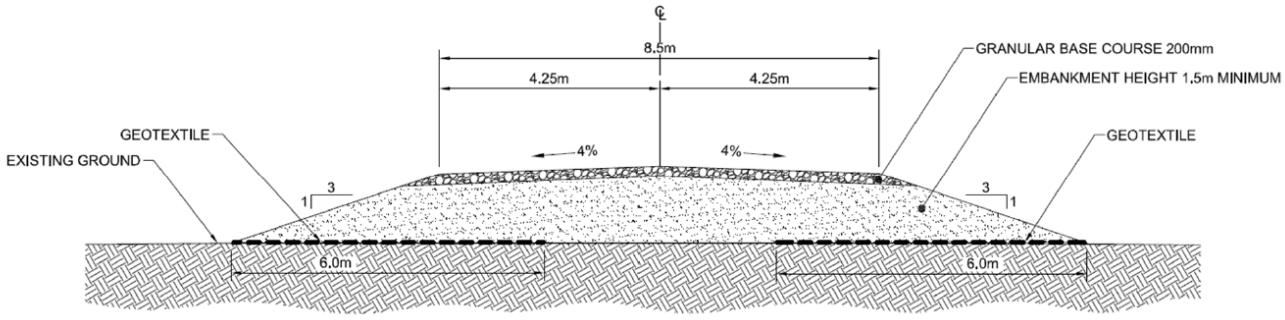


Figure 1.9.1.1 Typical Embankment Cross Section

1.9.1.2 Thermal Analysis for Preliminary Embankment Design

Design of highway embankments within permafrost areas must consider the effects of climate warming and geotechnical concerns associated with permafrost degradation within and below the embankment fill and subgrade materials.

The potential geotechnical concerns identified for the KICR project include:

1. Self-weight settlement of the embankment structure.
2. Thaw settlement of subgrade soils resulting in the road surface settling following construction.
3. Longitudinal cracking along edges of road where thaw settlement occurs beneath embankment side-slopes.
4. Thaw settlement leading to unintended alteration of drainage (e.g., ponding water in localized depressions), which can then contribute to even more thawing of permafrost.
5. Thawing of permafrost soils beneath the highway embankment can also result in loss of structural support to the embankment, and side-slope instability.
6. Interruption of surface drainage, leading to ponding of water on the upslope side of the embankment and the promotion of thermokarst processes adjacent to the embankment.
7. The maintenance and repair costs associated with unintended permafrost thawing can therefore be significant.

The impact of the thawing of permafrost soils is dependent on the degree of thaw-sensitivity of the native subgrade soils (i.e., thaw-sensitive versus thaw-stable). As such, the preliminary embankment design considered the thaw sensitivity of the various terrain types which will be traversed by the KICR. Terrain types were grouped into the following soil classes 1a, 1b, 2, 3, and 4 (ranging from non-thaw sensitive to very-high thaw sensitivity).

Preliminary thermal analyses have been performed to determine the approximate embankment thicknesses required to preserve permafrost conditions beneath the highway embankment. The following three design targets were used for the preliminary embankment design.

1. **No Thermal Protection**: Within the non thaw-sensitive (thaw-stable) soil class (i.e., Class 1a - bedrock), no thermal mitigation is required as part of the embankment design. Rather the minimum embankment thickness design is governed by other factors (e.g., minimum embankment thickness for road structure, minimum requirements to minimize snow accumulation, transportation line of sight considerations, etc.).
2. **Partial Thermal Protection:** Within soil classes of very low to low thaw-sensitivity (i.e., Soil Classes 1b and 2), provide partial thermal protection beneath the embankment, by maintaining the new permafrost table above the original permafrost table but within the current (pre-construction) active layer soils below natural ground surface (within the projected zone directly beneath the road surface).
3. **Full Thermal Protection:** Within soil classes of moderate to very high thaw-sensitivity (i.e., Soil Classes 3 and 4), provide full thermal protection beneath the embankment, by having the permafrost table aggrade up to the elevation of the original ground surface or higher within the embankment (within the projected zone directly beneath the road surface), and maintaining the thaw-sensitive subgrade materials in a frozen condition.

Nunami Stantec assessed the vulnerability of the project's infrastructure and components to climate events based on the design standards, anticipated maintenance, and the type, frequency, and intensity of climate events.

The thermal analysis incorporated projected climate warming (SSP5-8.5), as outlined in Nunami Stantec's Climate Change Resilience Assessment (CCRA) report, dated July 31, 2024.

The following discussion and recommendations for embankment design are provided based on the results of the preliminary thermal modelling:

1. Modelling results are preliminary only. The recommendations provided herein will require updating at future stages of the project. In the current preliminary geothermal analysis, the results are likely non-conservative for the south portion of the road.
2. Following construction, the embankment core will be mostly or entirely unfrozen by the end of each thawing season. This is noteworthy because recent industry experience obtained from other all-season roads over permafrost with frozen embankment cores (e.g., Inuvik-Tuktoyaktuk Highway) will have different behaviour than unfrozen embankments. Borrow materials used for embankment construction on the KICR should consist of non-frost susceptible materials (e.g., granular fill with low ice content, or rock shatter).
3. The following minimum embankment thicknesses may be considered for preliminary design:

    a. Soil Class 1a: embankment thickness not governed by thermal requirements (refer to minimum requirements for gravel surface road structure design).

    b. Soil Classes 1b and 2: 1.8 m thick embankment (including gravel road structure). Anticipate requirement for routine maintenance to increase significantly (i.e., major maintenance or rehabilitation) when design target is no longer met (i.e., thaw penetration extends below the existing active layer, expected to occur around 2080).

c. Soil Classes 3 and 4: 3.0 m thick embankment (including gravel road structure). Anticipate requirement for routine maintenance to increase significantly (i.e., major maintenance or rehabilitation) when design target is no longer met (i.e., thaw penetration extends below the existing ground surface, expected to occur around 2040). Anticipate further maintenance requirements when thaw penetration extends below the existing active layer (expected to occur around 2090).

4. It is emphasized that maintenance requirements for highways in permafrost regions are generally significantly higher than in non-permafrost regions. Routine maintenance such as snow and ice removal, grading, and traction sanding should be expected to be required on a day-to-day or frequent basis. Major maintenance such as traffic-course patching and repairs, inspection and cleanout of drainage structures, and vegetation control should be expected on a seasonal basis. Rehabilitation activities such as addition of granular layers, embankment reconstruction, cross section improvements or drainage repairs should be anticipated at the end of the service life or where deterioration is occurring at an accelerated rate.

1.9.1.3 Foundation Options for Water Crossings

The design of water crossings are in a very early state of development and analysis, with no hydrotechnical or geotechnical investigations yet conducted. Forty-four bridges have been proposed within the Geometric Design and Crossings Phase III Report and are located throughout the KICR alignment over various terrain types.

Major geotechnical design considerations for the bridge foundations include:

1. Presence of permafrost, with consideration of localized permafrost features adjacent to water bodies (e.g., taliks, ice wedges, ice-rich permafrost)
2. Taliks (unfrozen zones within the surrounding permafrost) are more likely to be present near larger water bodies versus smaller water bodies.
3. Impacts of climate change and thermal degradation on foundation performance, and requirement for permafrost protection measures
4. Presence of suitable bearing stratum (e.g., bedrock)
5. Slope stability and riverbank erosion
6. Constructability of foundation alternatives, considering remote access, in-water works for major bridges

A list of design considerations has been provided for the following preliminary bridge alternatives:

1. Shallow foundation (footings)
2. Cast-In-Place Concrete Piles
3. Driven Piles (steel-H/pipe sections, or concrete)
4. Rock-socketed piles (steel pipe sections)
5. Adfreeze piles (steel pipe sections)
6. Thermopiles and/or adaptive adfreeze piles (steel pipe sections)

1.9.1.4 Recommendations for Future Geotechnical Studies

The following future studies will be required to support the detailed design of the KICR:

1. Ground truthing investigations to refine the terrain mapping.
2. Geotechnical drilling and sampling and topographic survey/LiDAR along the proposed road alignment, water crossings, and borrow sources.
3. Traffic projection studies, to refine the gravel surface road structure design.
4. Climate projection studies, considering climate differences within the KICR project road alignment.
5. Snow drifting studies, to evaluate effects of snow accumulation for embankment thermal design.
6. Thermal modelling to refine embankment design.

1.9.2 Physical Assessment and Design Report – Terrain Mapping (Geomorphology)

Nunami Stantec completed a desktop terrain mapping and identification of potential borrow sources in support of the development and planning of the Kivalliq Inter-Community Road project.

The physical assessment and terrain mapping tasks (geomorphology) consisted of the following scope:

1. Terrain mapping and identification of terrain-related constraints and geohazards
2. Identification of potential granular and bedrock borrow sources
3. Production of a report summarizing the findings of the above-listed activities.

The project area for the assessment consists of a 1 km-wide corridor linking the communities of Arviat, Whale Cove, Rankin Inlet, Chesterfield Inlet, and Baker Lake. The corridor was selected based on the evaluation of the Phase I Initial Centerline Horizontal Alignment (ICHA) and alternate route options.

The geomorphology work was conducted by personnel from Nunami Stantec and JD Mollard and Associates.

1.9.2.1 Background Data Compilation and Review

The background data compilation and review were conducted as part of the Phase I portion of the project that includes an overview of the physiographic setting and landforms, bedrock geology, surficial geology and permafrost. The objective of the present task was to incorporate the data compiled and reviewed as part of the Phase I portion of the project, as well as incorporate the new data acquired as part of the Phase III.

The data reviewed as part of Phase I included baseline data (e.g., satellite imagery, Digital Elevation Model (DEM), cadastral data and land use plans, and guideline documents) as well as geoscience data (e.g., previous route selection study, field data from the Geological Survey of Canada (GSC), regional bedrock and surficial geology mapping, publicly available literature, and potential borrow sources reports).

Other data compiled, reviewed and incorporated as part of Phase III included Light Detection and Ranging (LiDAR) data and imagery data acquired in 2021 as part of the Kivalliq Hydro-Fibre Link (KHFL) project, newly acquired 2023 LiDAR data, and surficial geology mapping and reports completed by Palmer in 2020.

1.9.2.2 *Methodology*

The terrain mapping was carried out through the interpretation of imagery and LiDAR data using the ESRI ArcGIS software. The phase I preliminary mapping and mapping by Palmer (2023) conducted as part of the KHFL project provided a baseline for the corridor and refinements to the mapping were completed to support the project-specific requirements.

Terrain units (polygons) were delineated at scales varying between 1:5,000 and 1:10,000, and codified to complement previous mapping conducted by Palmer (2023). Relatively homogeneous terrain units were delineated and codified based on the nature of the deposits and their stratigraphy. Surficial material and their expression (e.g., till veneer (Tv), glaciofluvial ridge (GFr)) were mapped as either primary or secondary materials or as a stratigraphic relation (where the first unit overlies the second). Geomorphological processes (e.g., patterned ground, reworked) were also identified within the polygon units.

An estimation of soil properties for the different soil types identified was then conducted to assist the design team with the development of typical embankment types. Soil classes used for the assessment included bedrock (1a), ice-poor granular material (1b), ice-poor till (2), ice-rich till or granular material (3), ice-rich organic and fine-grained soils (4), and anthropogenic (5).

Potential granular and bedrock borrow sources identified as part of the Phase I were also reviewed and new prospects were identified.

1.9.2.3 Findings

The findings of the study indicated that till is generally the most widely distributed deposit along the ICHA with 36.9%, followed by glaciomarine coarse-grained (35.5%), bedrock (8.8%), organic (7.7%), glaciofluvial (5.0%), fluvial (2.4%), glaciomarine fine-grained (1.6%), colluvial (0.3%), and lacustrine (< 0.1%). Anthropogenic units (0.5%) and waterbodies (1.2%) were also identified.

Terrain-related constraints and geohazards were identified along the ICHA. They included ice-rich permafrost, gully erosion, and slope failure. Features generally indicative of ice-rich permafrost identified included ice-wedges, thermokarst, organic soils, and fine-grained glaciomarine deposits. Ice-wedges and thermokarst were identified throughout the ICHA and organic soils generally occurred in low-lying terrain. Gully erosion, which refers to the modification of surficial materials and bedrock by the process from which the convergence of surface water results in the formation of parallel and sub-parallel, long V- and U-shaped channels, was crossed by the ICHA affecting various deposits at 74 locations. Slope failures were crossed by the ICHA at 26 locations. Examples of slope failures identified are thaw flows and debris slides which

generally occurred following permafrost thaw degradation or were sometimes initiated or exacerbated by fluvial erosion. Slope failures mostly developed in till and coarse-grained glaciomarine deposits.

As many as 118 potential borrow sources were identified along the project area of which 75 are granular and 43 are bedrock. Granular sources identified consist of eskers, beach ridges, and other glaciofluvial deposits, whereas bedrock sources include various igneous, metamorphic, and sedimentary rock types. The prospect borrow sources were identified to provide materials and have a good coverage of the ICHA for the construction of the Kivalliq Inter-Community Road (KICR) highway. The prospect sources were often located adjacent to the ICHA and were sometimes up to 5 km away from the ICHA.

1.9.3 30% Geometric Roadway Design

1.9.3.1 Geometric Design Criteria

The road design is based on a 90 km/h design speed, which influences various parameters such as road width, curve radii, and gradients. The design criteria aim to enhance safety while keeping construction costs manageable. A lower speed road is generally less costly to construct. The recommended design criteria include minimum and desirable curve radii, sight distances, and roadway grades and width specifications.

1.9.3.2 Design Methodology

The design methodology encompasses six project segments, each with primary and secondary alignments. The primary alignments have progressed to a preliminary vertical design phase, which includes cost estimations based on material volumes and lengths. Constraints such as a standard minimum embankment height and the exclusion of cutting in certain terrains have not been determined by analysis in this report and will affect material quantities and costs.

1.9.3.3 *Project Segments*

The project segments are as follows:

Segment 1 - Arviat to Whale Cove – (Approximately 202 km)

Segment 2 - Whale Cove Access Road – (Approximately 48 km)

Segment 3 - Whale Cove to Rankin Inlet – (Approximately 96 km)

Segment 4 - Rankin Inlet Access Road – (Approximately 5 km)

Segment 5 - Rankin Inlet to Chesterfield Inlet – (Approximately 111 km)

Segment 6 - Rankin Inlet to Baker Lake – (Approximately 280 km)

1.9.3.4 *Road Alignment and Geometry*

The report evaluates horizontal and vertical geometry compliance across project segments. While most horizontal alignments meet or exceed desirable criteria, some coastal sections do not. The vertical design generally conforms to the 90 km/h speed limit, indicating potential for material quantity reduction. Specific segment analyses, such as the Arviat to Whale Cove section, highlight the terrain's characteristics and their implications for design.

1.9.3.5 Material Quantities and Costs

The report provides estimates for embankment material quantities, suggesting an average of **78,000 cubic meters per kilometer** for the entire project. This figure is higher than anticipated due to the preliminary design status, with expectations for up to a **30% potential reduction** in quantities upon optimization. Each segment's material requirements are detailed, along with associated costs, emphasizing that embankment fill constitutes a significant portion of overall project expenses.

1.9.3.6 Watercourse Crossings

Preliminary design evaluations for watercourse crossings categorize them into major (requiring bridges) and minor (requiring culverts). The report highlights the need for hydrotechnical analysis to accurately size these crossings, as current estimates are based on visual assessments and assumptions regarding water flow. The anticipated lengths and costs for both bridges and culverts are presented, illustrating the importance of these structures in the overall project budget.

1.9.3.7 Capital Construction Costs

1. The document outlines the overall capital construction costs, incorporating material construction cost estimates derived from analysis and comparison with similar projects in the Northwest Territories. It details anticipated costs for embankment construction, bridge and culvert installation, and miscellaneous items, concluding with a total projected cost for the entire Kivalliq Inter-Community Roads Project.

1.9.3.8 Conclusion and Recommendations

The report emphasizes the need for further design advancement, particularly in vertical design and hydrotechnical evaluations, to refine cost estimates and ensure project viability. Recommendations include

1. Completing a desktop hydrotechnical study
2. Advancing the preliminary design of crossings to enhance the project's size and costing accuracy and feasibility
3. Advancing the preliminary design of the vertical gradeline to enhance the project's costing accuracy and feasibility

This comprehensive overview of the Kivalliq Inter-Community Roads Project aims to provide a clear understanding of its objectives, design considerations, and anticipated costs, serving as a foundational document for future phases of development.

1.9.4 Construction Quantity Estimate and Cost Estimates for Ongoing Annual Administration, and Operations & Maintenance

1.9.4.1 Overall Project Construction Cost

The overall capital construction cost of the entire project, in 2024 dollars, is shown in the following table. The project is broken into the six project segments with each costed separately. As noted in the discussion, the embankment cost reflects a reduced quantity estimate for the road embankment, as anticipated quantities would be reduced with project design optimization prior to construction.

The following table summarizes the overall project cost in 2024.

Overall Project Construction Cost

	Road Segment	Length	Embankment Cost	Bridge Cost	Culvert Cost	Total Cost
1	Arviat to Whale Cove	201+000	$462,790,000	$290,666,000	$39,626,000	$793,083,000
2	Whale Cove Access Road	24+000	$132,666,000	-	$13,110,000	$145,777,000
3	Whale Cove to Rankin Inlet	96+093	$183,718,000	$146,550,000	$28,001,000	$358,271,000
4	Rankin Inlet Access Road	3+080	$3,830,000	-	-	$3,830,000
5	Rankin Inlet to Chesterfield Inlet	111+225	$349,313,000	$176,281,000	$11,238,000	$536,832,000
6	Rankin Inlet to Baker Lake	268+679	$496,678,000	$319,035,000	$40,420,000	$856,134,000
		704+078	$1,628,995,000	$932,532,000	$132,395,000	$2,693,927,000
				Misc Other Project Components @	2.0%	$53,879,000
				Engineering and Permitting @	10%	$269,393,000
						$3,017,198,000

1.9.4.2 Overall Project Maintenance Costs

The following table summarizes the anticipated maintenance costs, in 2024 Canadian dollars, of the Kivalliq Inter Community Road Project.

Overall Project Maintenance Cost per Year

	Road Segment	Culvert	Bridge	Embankment	Total Annual Maintenance Costs
1	Arviat to Whale Cove	$396,000	$2,900,000	$1,080,594	$4,376,594
2	Whale Cove Access Road	$131,000	$0	$129,026	$260,026
3	Whale Cove to Rankin Inlet	$280,000	$900,000	$516,602	$1,696,602
4	Rankin Inlet Access Road	$112,000	$1,500,000	$16,561	$1,628,561
5	Rankin Inlet to Chesterfield Inlet	$0	$0	$597,958	$597,958
6	Rankin Inlet to Baker Lake	$404,000	$2,800,000	$1,444,443	$4,648,443
		$1,323,000	$8,100,000	$3,785,183	$13,208,183

1.9.5 Climate Lens –Greenhouse Gas Mitigation Assessment

Nunami Stantec was retained by the Government of Nunavut (GN) to complete a Greenhouse Gas (GHG) Mitigation Assessment (the Assessment) of the all-season Kivalliq Intercommunity Road (KICR; the Project) using guidance from Infrastructure Canada (INFC) Climate Lens Guidance (the Guidance) (INFC, 2023). The Assessment estimates the expected GHG emissions during the construction and operation phases of the Project over its 75-year lifespan. This Assessment was conducted during the Project's viability phase. The quantities to inform the GHG assessment were derived from probable design, professional judgment of the Project design team, and similar construction projects.

The KICR project area is located in the Kivalliq region of Nunavut and spans over 725 km among the communities of Arviat, Whale Cove, Rankin Inlet, and Chesterfield Inlet, along the west coast of Hudson Bay, and Baker Lake, approximately 320 km inland from Hudson Bay. As the first public highway in Nunavut, the Project covers the full extent of the highway's construction area, which is currently considered to include approximately 725 km of two-lane gravel highway and associated infrastructure.

Based on a preliminary terrain assessment, the Project also includes 61 identified bridge crossings and 177 stream crossings requiring culverts. The number of bridge and stream crossings are expected to be updated in subsequent design phases. It is also assumed that four new permanent road maintenance facilities (referred to as “grader stations”) will be developed. For the purposes of this Assessment, it has been assumed that each grader station consists of a maintenance garage, storage building and living complex to support the maintenance and operation of the KICR.

The Assessment considers direct (Scope 1) emissions from construction, operation, and maintenance of the highway, as well as indirect (Scope 3) emissions from the upstream emissions of the transport and manufacturing of major materials, such as gravel, concrete, and steel. This Project has no anticipated

Scope 2 emissions because no purchased or imported electricity will be used by the Project. Emissions from other potential sources, such as user emissions are not included in the scope of this Assessment.

Per the Guidance, quantifying the potential GHG emissions reductions from mitigation measures is optional and as such has not been included in this Assessment, which results in a conservative estimate of emissions. The total net Project GHG emissions is expected to be 1,431,000 tCO2e. Table 1 breaks down the GHG emissions by Project stage and phase.

The Project stages that contribute the most to the overall emissions include the Product Stage (A1-A3), Construction Process Stage (A4 and A5), and Maintenance and Replacements (B2-B5).

Table 1 Summary of Net GHG Emissions Estimate by Project Stage

No.	Stage	% of Total Project Emissions	Total Net Project Scenario Emissions and Removals (tCO2e)
Project Construction Emissions			
1	Land Use Conversion – Loss in Biomass	1%	14,600
2	Land Use Conversion – Soil Disturbance	0.4%	5,700
3	Land Use Conversion – Forgone Carbon	0.1%	700
4	Product Stage (A1-A3)	30%	429,000
5	Construction Process Stage (A4 and A5)	24%	340,100
Project Operation Emissions			
6	Carbonation of Bridges (B1)	-0.2%	-3,200
7	Maintenance and Replacements (B2-B5)	36%	517,100
8	Operational Energy (B6)	9%	127,000
Lifespan Total		**-**	**1,431,000**

1.9.6 Climate Resilience Assessment

The Government of Nunavut has contracted Nunami Stantec to complete a physical investigation and design study on the proposed Kivalliq Inter-Community Road. Once constructed, the road would connect several communities along the route of Arviat to Chesterfield Inlet through Rankin Inlet and connecting to Baker Lake. A key component of this study is the completion of a climate change resilience assessment (CCRA). The CCRA contributes to Phase III of the Kivalliq Inter-Community Road Project Study through the identification of the potential risks to the future roadway posed by local climate hazards and resilience measures that can be considered to reduce those risks.

The objectives of the CCRA are to:

1. Identify climate hazards to which the roadway may be exposed once constructed.
2. Identify potential impacts climate hazards may have on Project infrastructure.
3. Determine risks associated with these climate hazard-infrastructure interactions.
4. Recommend possible adaptation measures to be considered in the design, construction, and/or operation of the roadway.

This report provides a summary of the process, results, and recommendations of the complete CCRA.

The assessment identified risks from 15 climate hazards. The results of the risk assessment show that 14 of the climate hazards assessed for the Kivalliq region pose a medium or higher risk to at least one infrastructure component of the inter-community road by the 2080s. The hazards presenting the highest risks are extreme heat, heatwaves, annual freeze-thaw, long duration rainfall, high winds, and changes in permafrost. The hazards impacting the greatest number of infrastructure components are short duration high intensity rainfall, long duration rainfall, and changes in permafrost. The hazards with increasing risk due to an increasing likelihood are extreme heat, heatwaves, short and long duration rainfall, high winds, freezing rain, and changes in permafrost. The hazards with decreasing risk due to decreasing likelihood are extreme cold, frost days, coastal flooding/sea level change, and freezing degree days. Extreme risks were identified in association with changes in permafrost.

Adaptation recommendations were formulated to address the medium and higher risks identified. Because the road is a new construction, these recommendations were primarily considerations for design and operations and maintenance (O&M), such as installation of erosion control measures, establishment of O&M policies for routine inspections, and heat mitigation systems for areas of permafrost where thawing may be of greater concern.

Building Nunavut Together
Nunavu liuqatigiingniq
Bâtir le Nunavut ensemble

What We Heard

During the Kivalliq Road engagements

January 2025

Contents

1. Project background

Presently, there are no all-season roads connecting communities in the Kivalliq region of Nunavut. With the exception of a limited sealift resupply service for durable goods, all movement between communities is undertaken by air. This makes the transport of goods and passengers expensive and difficult. The result is an extremely high cost of living for Kivalliq residents and a challenge climate for regional economic development.

In 2019, the Government of Nunavut's Department of Economic Development and Transportation secured funding under the National Trade Corridors Fund to study a potential road connecting five communities in the Kivalliq region. This 725 km road would run between Arviat, Whale Cove, Rankin Inlet, and Chesterfield Inlet along the west coast of Hudson Bay and to Baker Lake, located 320 km inland.

In 2022, EDT hired Nunami Stantec to conduct a feasibility study related to this potential road. This study involved three phases; the first phase, which has been completed, involved identifying the potential route and appropriate design standards for this road. The second phase is community and stakeholder engagement, the results of which are summarized in this report. The third phase included geotechnical design, preliminary engineering and cost estimates for the proposed road.

Road Design

The proposed road would:

- be a two-lane gravel road for year-round use;
- be at least 7 m wide in the narrowest sections;
- be designed for a speed limit of 80 km/h;
- have 47 bridge crossings (31 of which would be longer, multi-span bridges); and
- have 171 culvert stream crossings.

Preferred Route

After reviewing previous route studies, the Draft Nunavut Land Use Plan and information regarding permafrost, slopes, ground conditions, and the presence of rivers, lakes and wetlands, a 10 km wide corridor was identified as the preferred route. In some locations, route options were considered. The maps, found in Appendix A of this report show the route options and connection opportunities to each community.

2. Engagement overview

Why?

The Kivalliq Road project cannot move ahead without thorough and meaningful engagement with community members, regulators, industries, local businesses, governments, Inuit organizations and other stakeholders. Broadly, the purpose of this engagement program was to:

- Share information about this project
- Seek to understand:
  - Community benefits and community concerns
  - Challenges with the development of the Kivalliq Road within the proposed alignment
  - Potential opportunities for commerce and community connections
  - Pros and cons of route options, especially near communities
  - Local and traditional knowledge relevant to the project
  - Environmental impacts and potential mitigation measures
  - Benefits of integrating the road corridor project with the Kivalliq Hydro-Fibre Link

Who?

We met with **over 240 people** including:

- Elected officials and municipal staff
- Hunters and Trappers Organizations
- Representatives from the Kivalliq Inuit Association
- Local and regional business representatives
- Kivalliq Chamber of Commerce and Nunavut Chamber of Mines
- Regulators and various service providers
- Community members including youth and Elders

How?

In-person meetings were held in five communities. Advertisements for public meetings were distributed territory-wide and locally through newspapers, Facebook ads, radio ads, and printed posters.

In addition, over 190 representatives from the communities, Inuit Organizations, and government agencies were sent direct emails and phone calls inviting them to engage on this topic. Meetings with interested parties were held both online and in-person.

Feedback was collected through meeting notes, an online survey with 64 responses, an online comment form, and email submissions.

When?

Engagement meetings began in November 2023 and ran until March 2024. In-person community meetings were held in the following locations on these dates:

- Arviat January 30, 2024
- Baker Lake January 31, 2024
- Chesterfield Inlet February 2, 2024
- Whale Cove February 5, 2024
- Rankin Inlet February 6, 2024

3. Summary of what we heard

During the engagements, we asked questions to help inform how the road could be used in the future and to identify potential benefits, risks, impacts, or hesitations people feel should be considered or addressed.

Key themes

From the input received during the in-person and online engagement, six key themes were identified:

Increased freedom and flexibility

The road would allow residents to travel throughout the region more freely, at a lower cost, and more comfortably throughout the year.

Enhanced social connectivity

The road would connect family and friends living in different communities in the region and allow residents to attend more social, cultural, and sports gatherings.

"This would be a game changer, tomorrow would be totally different."

Reduction in the cost of living

Due to the existing reliance on air travel and shipping, the cost of living is very high in the region; with this road, it is assumed that the cost of living could go down as the cost of personal travel and goods would be reduced.

Negative impacts on caribou

The construction and presence of the road could negatively impact caribou by requiring them to cross the road during migration. Traffic on the road would generate noise, light, and dust; and potentially disturb caribou calving and post-calving grounds.

Increased influence of alcohol

The road could facilitate alcohol entering communities with prohibition or committee liquor restriction systems, from those with unrestricted liquor systems. In addition, drinking and driving poses a safety risk to users.

Lacking the desired connection to Southern Canada

After decades of conversations about this roadway, a connection to Southern Canada, specifically Manitoba, is still desired for easier and more flexible shipment of goods and personal access to Churchill and Winnipeg.

> *"If the road doesn't connect to Manitoba, is it worth it?"*

How the road may be used.

- **Shipping goods** of a variety of sizes, year-round, at lower rates.
  - Quicker, more reliable transport of all items, including perishable goods, between communities.
  - Transporting modular homes, which, starting in 2030, will be constructed in Arviat and shipped across Nunavut as part of the Nunavut 3000, Nunavut Housing Corporation's strategy.
- Being able to **more easily access and offer/ sell goods or services** in other communities.

> *"Any construction project has to wait to ship supplies until the summertime which makes it really stressful."*

- Moving **exploration and mining equipment**.
- More **flexible and affordable personal travel**: visiting family and friends, attending gatherings or events like sports tournaments or cultural festivals.
- Increased **access to hunting, fishing, berry-picking, and cabin areas**.
- **Attending medical or other critical appointments**.
  - For those unable to drive themselves, a shuttle or bus may be needed if flights are no longer provided.

While an inter-community road was seen as beneficial, there is still a strong desire to see a future connection of this road to Southern Canada, preferably **Manitoba**.

What the potential benefits may be.

- A road would **impact every part of community life**, which would have both positives and negatives.
- The **freedom and flexibility of movement** will transform residents' way of life, reducing feelings of isolation.
  - Enhanced social connectivity.
  - There may be fewer barriers when considering moving away for education or employment opportunities, if coming back home to visit was easier.
  - More flexible and predictable travelling as residents won't have to rely on airplane schedules, delays, and cancellations.

"There would be a lot of pros, and there will always be a risk; but it would be nice to have."

- **Goods of all sizes could be shipped and received year-round** on more flexible and predictable timelines, at a lower cost.
  - Enhanced predictability would help organizations plan their budgets and apply for grants as they can purchase materials year-round.
- **The cost of living would hopefully go down** as shipping would be cheaper, and personal flights wouldn't be needed as often.
  - Concerns were raised about whether foods would be as subsidized as they are now, should the road be built.
- **Easier, more convenient access to services** in other communities such as health care and education.
- **Accessing hunting, fishing, and berry-picking areas** may be easier, more comfortable, or more convenient.

What the potential opportunities may be.

- **New or enhanced economic opportunities** as trading networks become larger and new industries may emerge (e.g., storage facilities, public transport, roadway monitoring, and surveying).

“Build Nunavut from within Nunavut. Yes, bring in the outside experts, but use us –we are here.”

- **New employment and training**:
  - as a direct result of the roadway (e.g., design, construction, and maintenance) and
  - through spin-offs (e.g., government jobs in the new GN highway department, health care workers, seaport operation, goods hauling, storage facilities, RCMP staff, potential mineral exploration, and wildlife monitoring).
- **Partnership opportunities** to use best practices and lessons learned during the design, construction, operation, monitoring, and maintenance of the roadway. Suggestions to connect with Agnico Eagle Mines and the Government of Northwest Territories and/ or the designers who worked on the Inuvik to Tuktoyaktuk highway.
- **Enhanced tourism.**
- **Emergency preparedness improvements** through new evacuation options and resource-sharing between communities (e.g., generators, volunteers).
- **Additional community growth** to accommodate new development such as expanded servicing, additional water sources, and alternative landfill locations.

What the potential negative impacts may be.

- **Caribou would be negatively impacted.** Having a road cross the caribou migration routes would impact them. Crossing would be more difficult due to the higher road surface and type of rocks used during road construction. Increased smells, noise, light, and dust disturbances would also have a negative impact on caribou migration.
  - When considering what routes to select, calving and post-calving grounds must be protected.
  - During times of migration, the road should be closed to allow the caribou to move freely, which is how the Agnico Eagle’s Meliadine Road is currently managed.
  - A road would increase hunters’ access to caribou which must be carefully managed to prevent over-hunting.
- A road would **negatively impact the environment** through:
  - quarrying and blasting for the materials to build and maintain it,
  - dust generation,
  - increased vehicle emissions,

  - potentially more cabin developments,
  - littering, and
  - disturbance of Canadian Heritage Rivers during the construction of crossings.

"I see the destruction of the land when I see the road, that's all I see."

- **Small communities may experience out-migration** with residents having access to more populated communities.
- **Businesses in the smaller communities may lose customers** due to increased competition with those in other communities, or face increased operating costs, and be forced to shut down.
- The **traditional way of life** could be negatively impacted, with increased pressure on berry picking or hunting, and more cabins.
- **Airlines may reduce their flight frequency** between communities. For residents and businesses relying on those flights, that would be negative.

What the potential risks may be.

- **Driver safety**.
  - Vehicle accidents at highway speeds could be very dangerous and there are limited emergency rescue or medical care available to respond.
  - Extreme weather conditions could quickly change road conditions and blizzards can last up to five days. There would need to be a way to close the road and communicating the dangers to drivers.
  - Drivers could become stranded; they would need to be prepared for the journey with enough gas, check in with their family before they leave, and potentially have access to cellular or emergency communication methods along the way. It may be necessary to provide emergency shelters along the route.
- **Roadway operation, maintenance, and enforcement**.
  - The road may be closed frequently during extreme weather events, caribou migration, and spring conditions when the surface may not be safe.
  - The road will need to be monitored to ensure road safety and reduce any potential conflicts or incidents.
  - Drivers will need to be licensed and educated about how to drive the road.
  - All vehicles on the road should be registered, insured, and in good working order.
  - Speed limits will need to be enforced.

- **Increased influence of alcohol**.
  - Communities with prohibited or restricted liquor systems may experience challenges upholding this system, potentially resulting in more alcohol entering the community and causing negative health, social, and safety impacts.
  - Drivers on the roadway may be under the influence of alcohol.
  - As more alcohol may enter communities with prohibited or restricted liquor systems, existing programs and programs and facilities intended to address negative issues related to drug and alcohol use may need to be expanded (e.g., treatment and healing, domestic violence support services, policing).

"If they build the road, can they stop selling alcohol in Rankin Inlet first?"

- The road would face extreme weather conditions and challenging terrain, and be used by a variety of vehicle types; as such, **proper construction and attentive maintenance** will be required.
- **Economic benefits** may go largely to companies based outside Nunavut, especially if local people do not receive the training needed to participate in this project in a meaningful way.

4. What we heard from regional groups

Who we met with:

- Kivalliq Inuit Association
- Kivalliq Chamber of Commerce
- Nunavut Chamber of Mines
- Desgagnés Transarctik Inc
- Riptyde Resources
- Nukik Corporation
- Sakku Investments Corporation
- RCMP, Iqaluit V Division HQ
- Qikiqtaaluk Environmental Inc.
- Nunavut Impact Review Board (NIRB)
- Beverly and Qamanirjuaq Caribou Management Board (Representatives)
- Keewatin Regional Mayors

Events attended to share information and gather feedback:

- Nunavut Mining Symposium, Iqaluit NU, April 2024
- Kivalliq Trade Show, Rankin Inlet NU, September 2023
- Kivalliq Socio-Economic Monitoring Committee Meeting, Rankin Inlet NU, August 2024

Prominent topics

- **Connectivity and accessibility**
  Many see the road as a significant opportunity to connect the Kivalliq communities, reducing reliance on expensive flights and allowing for easier movement of people and goods. The construction of a road may lead to a reduction in the number of flights to each community, which could have negative impacts.

- **Economic development**
  The road may boost local economies through enabling the movement of cargo more efficiently, facilitating trade, and supporting local business activities. Some groups wanted to see the proposed route be tied more closely to areas with mineral potential. Groups acknowledged that some businesses might see benefits whereas others might experience more negative impacts; and some of these impacts may not be fully understood until the road is completed.

- **Community impacts**
  The road may have positive and negative impacts on communities: bringing families closer and improving social ties while also potentially introducing or expanding threats to the communities such as those associated with drugs and alcohol. Also, inequity could be

an issue, with some people benefiting from the road, and some people experiencing more negative impacts.

- **Construction, operation, and maintenance**
  The road may be unfeasible to build and difficult to maintain; there was concern related to logistical challenges of building this road, impact of the road materials on caribou, and high road maintenance costs.

- **Government support and funding**
  Some regional groups expressed disappointment in not seeing the necessary federal funding and support for this project through to construction.

- **Feasibility and additional studies**
  There was interest in seeing additional studies assessing the feasibility, cost, and regulatory requirements for this project. Also, groups expressed that continuing to gather local opinions and insights will be important. The outcomes of similar road projects should be carefully considered, and lessons learned should be incorporated where appropriate. Several groups suggested that the feasibility of each road segment should be considered separately; some sections may make more sense than others.

- **Community policing**
  RCMP generally flies staff and prisoners between communities and does not anticipate that this will change significantly with the construction of a road. RCMP are concerned that they may need to change their staffing levels and vehicles to respond to accidents along the road and that increased access to alcohol may lead to more incidents in communities outside of Rankin Inlet where alcohol is currently limited. If a road is built, RCMP will need to adapt to these new conditions.

5. What we heard from Arviat

Who we met with

- Hamlet of Arviat Mayor, Council, and CAO
- Arviat Hunters and Trappers Organization
- Community meeting (approximately 25 attendees)

Prominent topics

- **Impact to caribou**
  There are concerns about the proposed roads impacting caribou, specifically the protection of calving and post-calving areas, and the possible impacts on migration routes and patterns.

- **Route selection and desired connectivity to Churchill**
  Residents in Arviat expressed a strong desire to see the road connect to Churchill, and expressed frustration over the perceived lack of investment and the slow progress of the road's various feasibility studies.

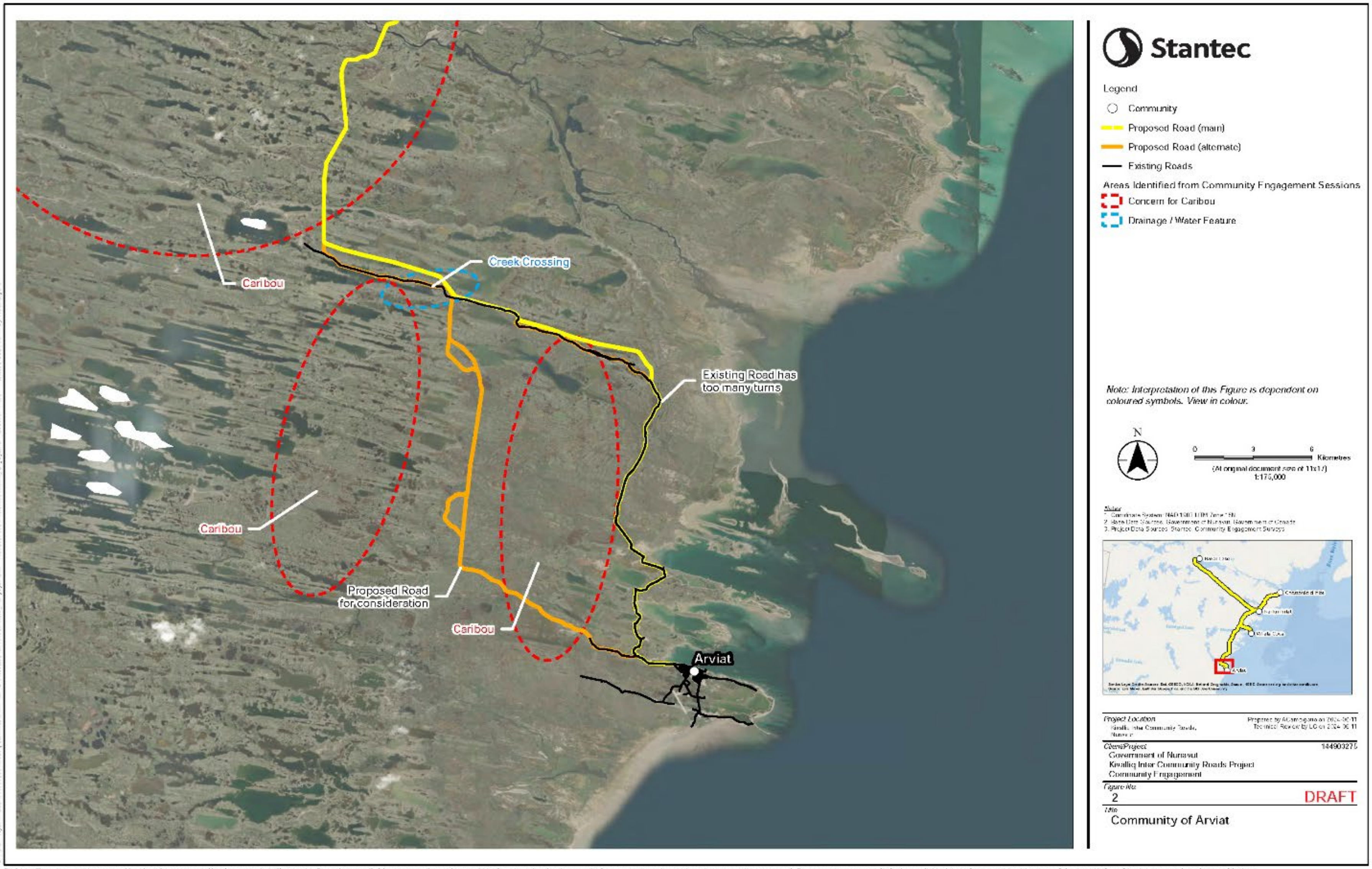
- **Roadway safety**
  There are concerns about the risk of drivers getting caught in severe weather, vehicle breakdowns, and the consequences of/ ability to respond to high-speed vehicle accidents.

- **Social impacts**
  Concerns about the potential increase and influence of alcohol in the community, including lack of local resources to address potential impacts. There is also concern about the potential negative impacts to residents if local services and businesses shut down because of increased connectivity to Rankin Inlet. For example, there is concern that if access to daily needs (e.g, groceries, home supplies, medical care) is reduced in Arviat, residents would have to drive to Rankin Inlet. This is seen as a risk and could lead to inequity, as only some residents have vehicles.

- **Improved access to family, friends, and services**
  Many community members were excited about the potential for improved connectivity to other communities, specifically to see family/ friends/ seniors, or access medical care and shopping in Rankin Inlet. This enhanced connectivity was also assumed to reduce the cost of living by allowing for easier movement of essential goods and services.

- **Economic opportunities**
  The road was viewed as a significant opportunity for economic development by facilitating trade and business activities, making it easier to move cargo (including modular houses being manufactured in Arviat), and support local businesses.

Comments from respondents in Arviat on the potential roadway alignment


Caribou
Creek Crossing
Existing Road has too many turns
Caribou
Proposed Road for consideration
Caribou
Arviat
Stantec
Legend
Community
Proposed Road (main)
Proposed Road (alternate)
Existing Roads
Areas Identified from Community Engagement Sessions
Concern for Caribou
Drainage / Water Feature
Note: Interpretation of this Figure is dependent on coloured symbols. View in colour.
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Client/Project
Government of Nunavut
Kivalliq Inter Community Roads Project
Community Engagement
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Community of Arviat

6. What we heard from Whale Cove

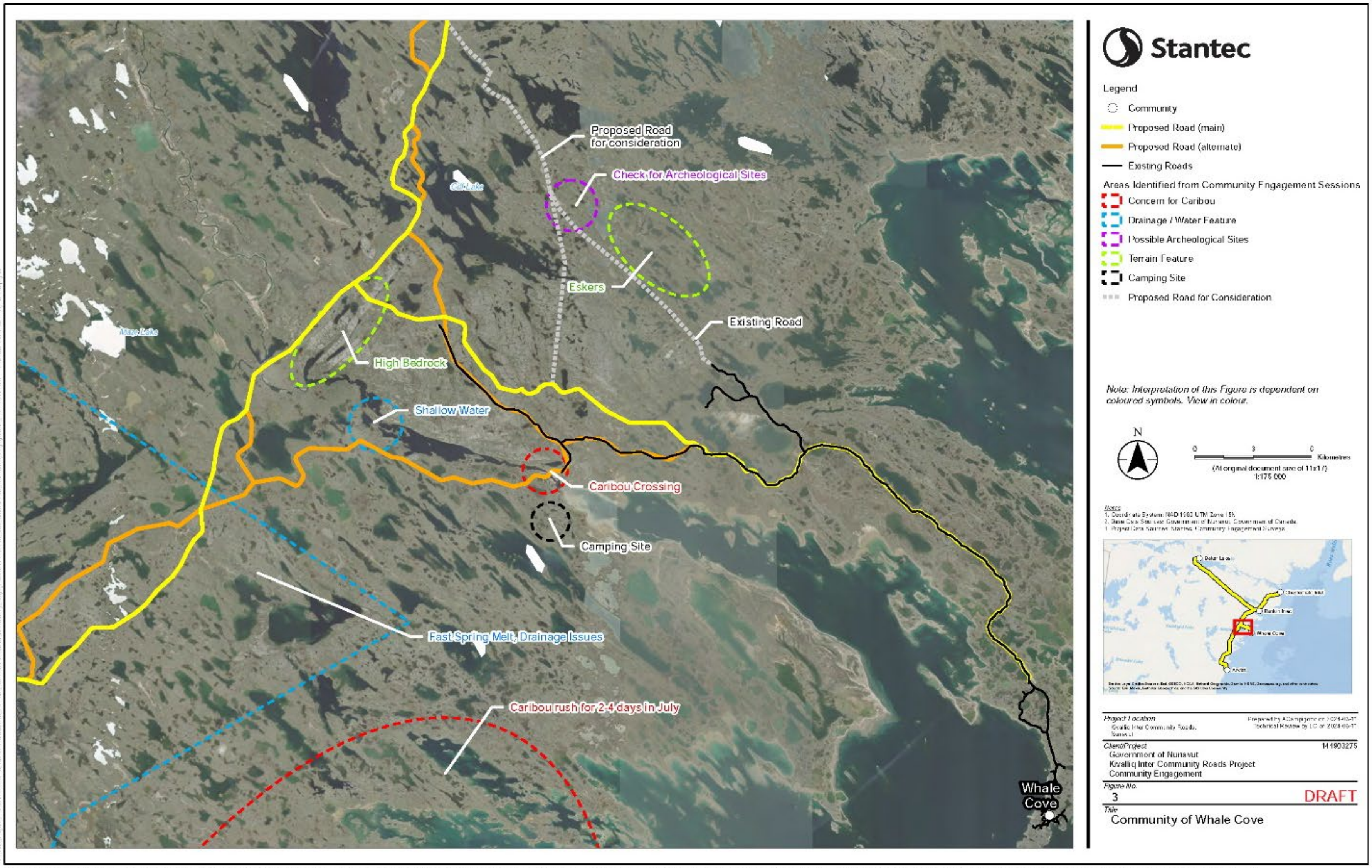
Who we met with

- Mayor and CAO, during the Kivalliq Regional Mayors Meeting
- Issatik Hunters and Trappers Organization
- Community meeting (Approximately 19 attendees)

Prominent topics

- **Impact to caribou**
  Concerns were raised about the impact on caribou, particularly the caribou's comfort crossing the road.
- **Route selection**
  There was a desire to see the road connect to Manitoba, particularly Winnipeg, and to have the Whale Cove to Rankin Inlet be the first portion of the roadway constructed.
- **Economic impact**
  The road is seen as an opportunity for local employment and enhance the shipping of goods.
- **Environmental impact**
  Dust generation was identified as a concern as it could impact human health through reduced air quality, and it could settle on vegetation and berries.
- **Construction, operation, and maintenance**
  The opportunity to learn from the teams that built and operate the Tuktoyaktuk highway and Agnico Eagle Mining roadways was discussed.

Comments from respondents in Whale Cove on the potential roadway alignment


Proposed Road for consideration
Check for Archeological Sites
Eskers
Existing Road
High Bedrock
Shallow Water
Caribou Crossing
Camping Site
Fast Spring Melt, Drainage Issues
Caribou rush for 2-4 days in July
Whale Cove
Stantec
Legend
Community
Proposed Road (main)
Proposed Road (alternate)
Existing Roads
Areas Identified from Community Engagement Sessions
Concern for Caribou
Drainage / Water Feature
Possible Archeological Sites
Terrain Feature
Camping Site
Proposed Road for Consideration
Note: Interpretation of this Figure is dependent on coloured symbols. View in colour.
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Kivalliq Inter Community Roads Project
Community Engagement
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Title
Community of Whale Cove

7. What we heard from Rankin Inlet

Who we met with

- Hamlet of Rankin Inlet Deputy Mayor, Councillors, and SAO
- RCMP Rankin Inlet Detachment
- Community meeting with residents (Approximately 17 attendees)

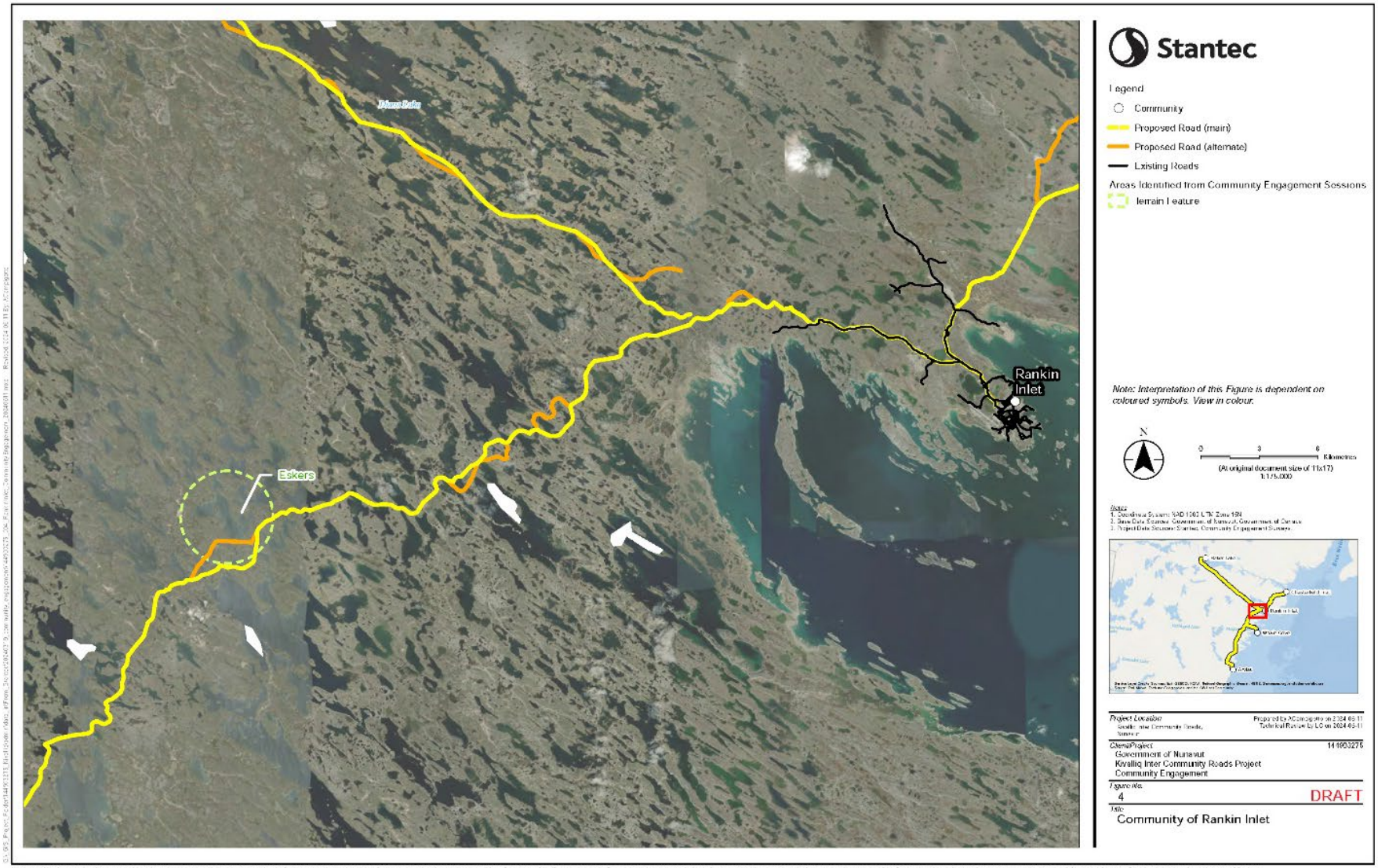
Prominent topics

- **Community growth**
  If the road is built, there is an understanding that Rankin Inlet would experience increased community growth pressures, such as the need for more amenities to serve the larger population and associated upgrades to municipal servicing, which would need to be thoroughly understood and planned for.
- **Roadway safety**
  Drivers' safety was identified as a concern with risks associated with extreme weather events and high-speed accidents specifically mentioned.
- **Support for smaller communities**
  There was a concern expressed that the road may result in services being centralized in Rankin Inlet, leading to the decline of the smaller communities.
- **Freedom and social connectivity**
  The road is seen as a way for residents to have enhanced freedom and social connectivity; being able to more easily travel on a flexible schedule and at a lower cost to visit friends and family and attend events. This flexibility may change the way community members view moving out of the community, if they know they can come back more easily.
- **Impact to caribou**
  While the route was seen as acceptable, there was concern over the caribou's comfort crossing the road.
- **Economic opportunities**
  There were discussions about how the road could benefit the economy by improving connectivity to mines, reducing shipping costs, and supporting local businesses.
- **Operation and maintenance**
  The ongoing maintenance of the road was identified as a concern given the weather conditions the region experiences, and types of vehicles anticipated to use it. It was asked

that these specific elements be considered during the design, construction, and maintenance of the road.

- **Route selection and connection to Manitoba**
  There was a desire to see the roadway connect to Manitoba, as was studied at length in the past, and inquiries about whether existing roadways would be used in the construction of the new routes. Support was shown for constructing one or more portions of the road separately, rather than considering it all as one project.

Comments from respondents in Rankin Inlet on the potential roadway alignment



8. What we heard from Baker Lake

Who we met with

- Mayor, during the Kivalliq Regional Mayors Meeting
- Baker Lake Hunters and Trappers Organization
- Peter's Expediting
- Community meeting with residents (Approximately 63 attendees)

Prominent topics

- **Route selection, caribou and archeological protection**
  The community's reliance on caribou was highlighted and requests were made the GN to explore an alternative route, one that would run along the north shore of Baker Lake, to avoid negatively impacting caribou and impacts on two heritage rivers, the Kazan and Thelon. Regardless of route, the impact on archeological sites was identified as a concern.

- **Social benefits**
  Enhanced social connectivity was seen as a main benefit of the road.

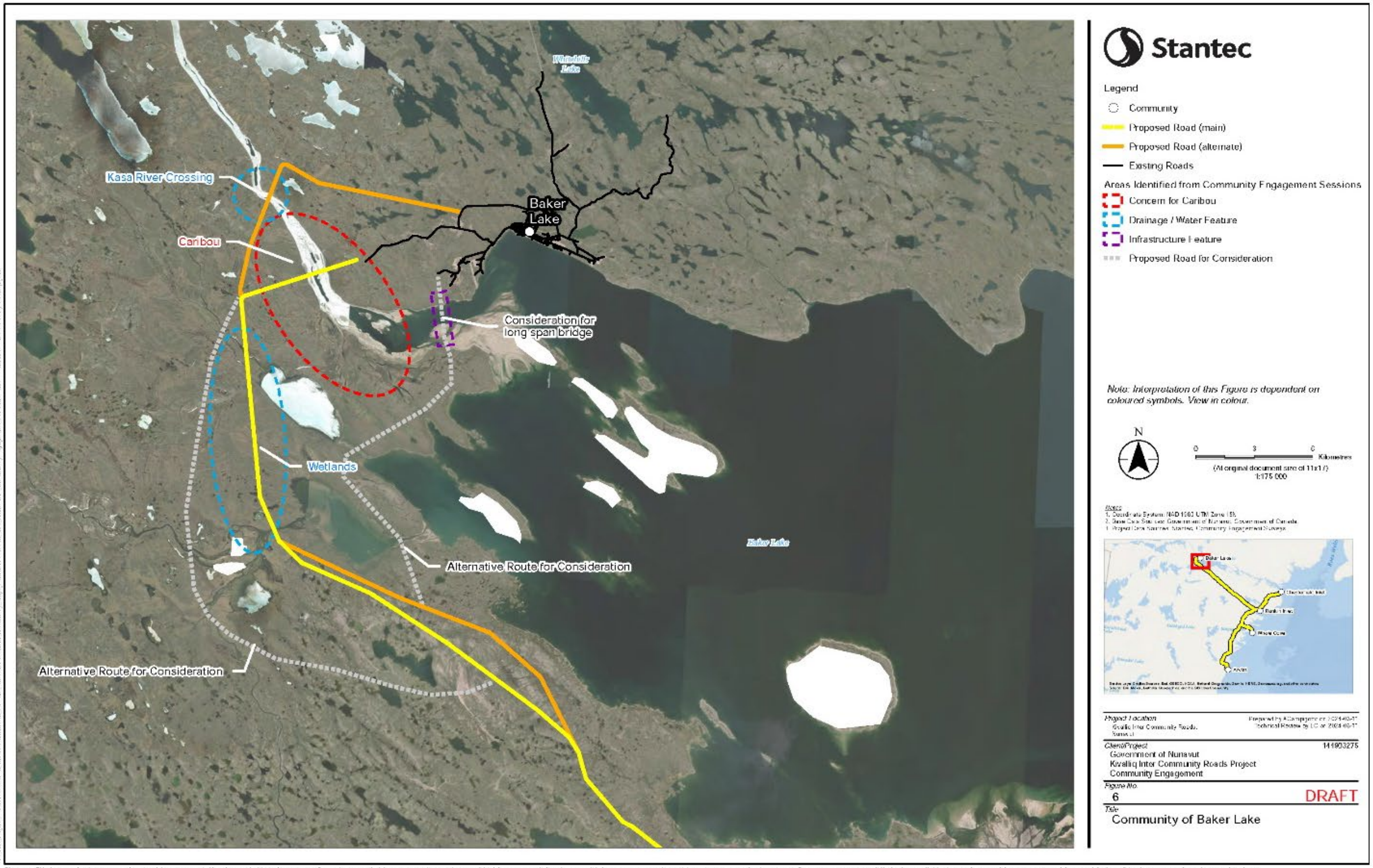
- **Economic opportunities**
  The road's value in boosting the local economy was discussed, including opportunities for education, training, and jobs in all industries, as well as its role in supporting exploration and mining activities.

- **Health and safety risks**
  Roadway safety is identified as a concern, including the potential for high-speed collisions and the communities' ability to respond to those types of emergencies. The potential for negative influence associated with alcohol coming into the community more freely was also discussed as a concern.

- **Cost of living**
  The potential for reduced shipping costs and lower prices for goods and services was seen as a benefit of the road –reducing the cost of living for residents.

- **Environmental impact**
  There was concern expressed about the generation of dust and its impact on caribou, streams, fish, lichen, caches, berry picking areas, and human health, as well as the potential for oil spills. There were also questions about the road's impact on heritage rivers.

Comments from respondents in Baker Lake on the potential roadway alignment


Kasa River Crossing
Caribou
Baker Lake
Consideration for long span bridge
Wetlands
Alternative Route for Consideration
Alternative Route for Consideration
Stantec
Legend
Community
Proposed Road (main)
Proposed Road (alternate)
Existing Roads
Areas Identified from Community Engagement Sessions
Concern for Caribou
Drainage / Water Feature
Infrastructure Feature
Proposed Road for Consideration
Note: Interpretation of this Figure is dependent on coloured symbols. View in colour.
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Kivalliq Inter Community Roads Project
Community Engagement
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Community of Baker Lake

9. What we heard from Chesterfield Inlet

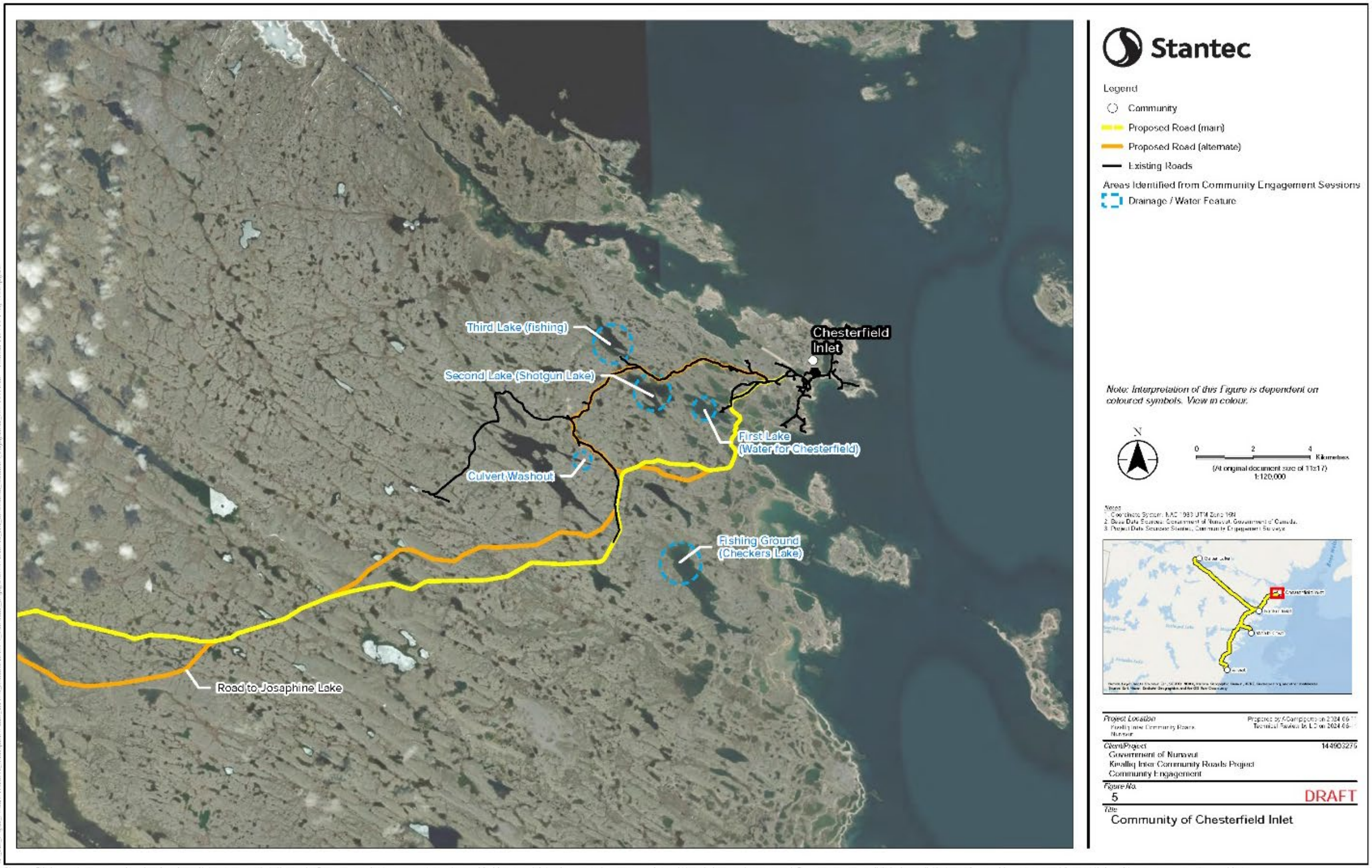
Who we met with

- Hamlet of Chesterfield Inlet Deputy Mayor, Councillors, and CAO
- Aqigiq Hunters and Trappers Organization
- Community meeting with residents (Approximately 10 attendees)

Prominent topics

- **Route selection and archeological site impacts**
  There is a desire to see the route moved closer to the shoreline to protect drinking water sources and migration areas for caribou, polar bears, and geese. Concerns were also raised about the potential route having negative impacts on unmarked archeological sites.
- **Support for enhanced connectivity**
  Chesterfield Inlet has been progressively extending its roadway network south; as such, there is support for the road as a more reliant means of travelling to Rankin Inlet, enhancing social connectivity and better access to goods and services.
- **Economic opportunities**
  The opportunity to develop a deep-sea port in Chesterfield Inlet, and expand support industries, is identified as an economic opportunity associated with the road.
- **Health and safety impacts**
  The potential for more alcohol entering the community, and issues related to roadway safety (e.g., requiring licensed drivers, having insured vehicles, enforcing speed limits, and prohibiting drinking and driving) is identified as a concern that could impact resident health and safety. Conflicts between passenger travel and vehicles hauling dangerous goods also concerned participants.
- **Environmental impacts**
  Concerns were raised about various environmental impacts; people specifically mentioned the potential for oil spills and littering along the road. Positive impacts were also identified--namely if the road resulted in fewer sealift boats, there would be less negative impact on sea life (e.g., seals, belugas).
- **Design, construction, and operation**
  There is a concern about how the road would be constructed given the difficult terrain and shifting land; as well as potential washouts caused by rapid melt.

Comments from respondents in Chesterfield Inlet on the potential roadway alignment


Third Lake (fishing)
Second Lake (Shotgun Lake)
Chesterfield Inlet
First Lake (Water for Chesterfield)
Culvert Washout
Fishing Ground (Checkers Lake)
Road to Josephine Lake
Stantec
Legend
Community
Proposed Road (main)
Proposed Road (alternate)
Existing Roads
Areas Identified from Community Engagement Sessions
Drainage / Water Feature
Note: Interpretation of this figure is dependent on coloured symbols. View in colour.
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Kivalliq Inter Community Roads Project
Community Engagement
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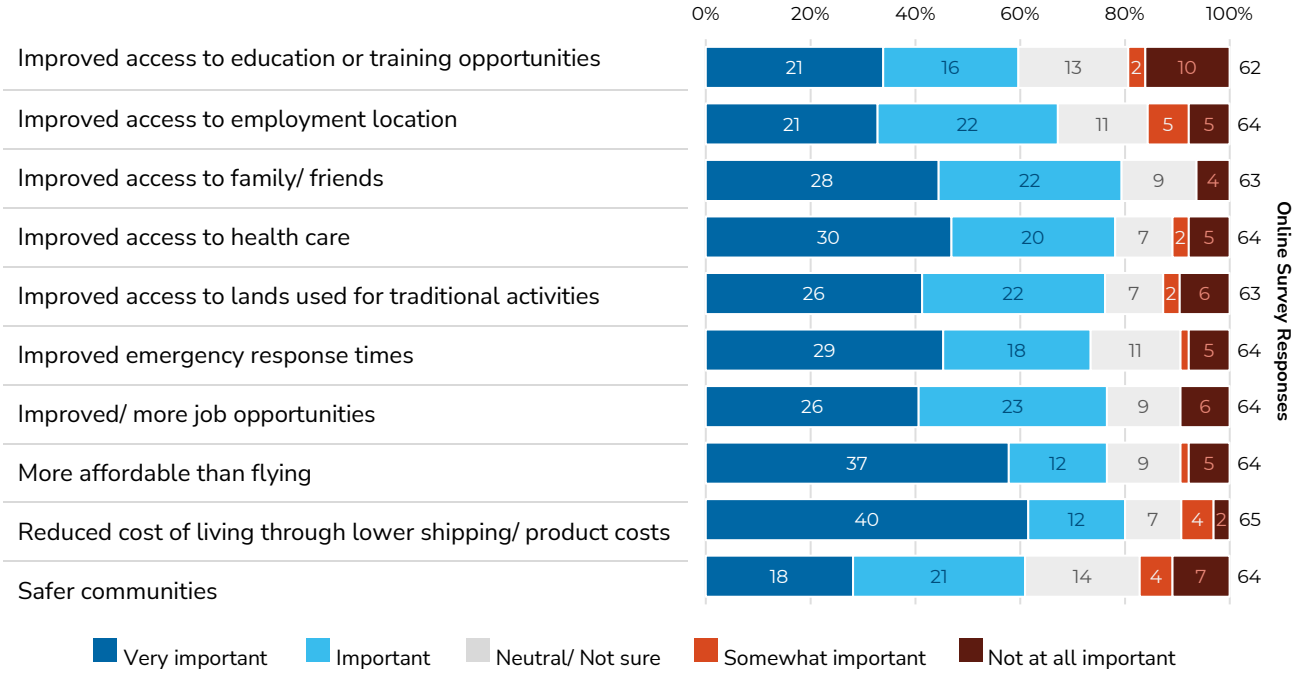
Community of Chesterfield Inlet

10. Online survey highlights

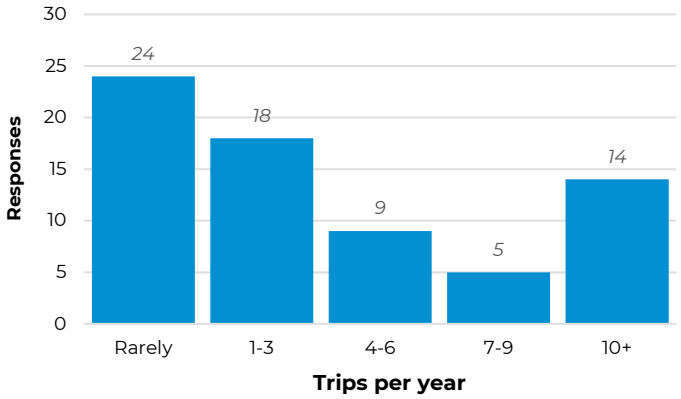
Which of the following potential benefits of the proposed Kivalliq Road are most important to you?



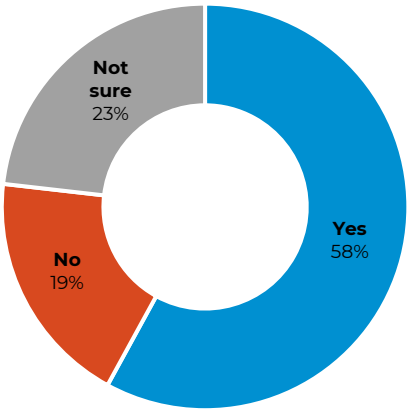
Comments

- Enhancing connectivity between communities, fostering social interactions, cultural exchange, and collaboration.
- The road may contribute to the preservation and promotion of local cultures.
- Improved connectivity may support mental health and wellness, contributing to the overall well-being and cohesion of the communities along the route.
- The road may stimulate economic development in the region by facilitating trade, tourism, and the transportation of resources.
- Roads are a more reliable and consistent mode of transport than air travel, which is often subject to weather-related disruptions.
- Opportunity to explore the development of an inter-community electrical grid.
- More affordable housing with lower transportation costs.

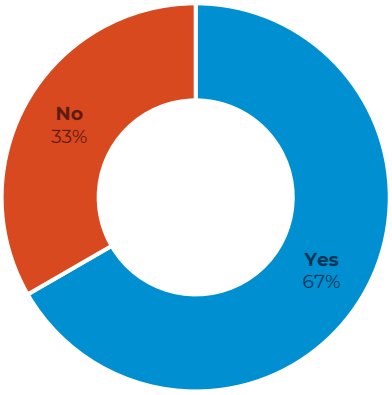
How many times per year do you fly between communities in the Kivalliq region, for any reason?



If the proposed Kivalliq Road is built, would you fly less between communities in the Kivalliq region?



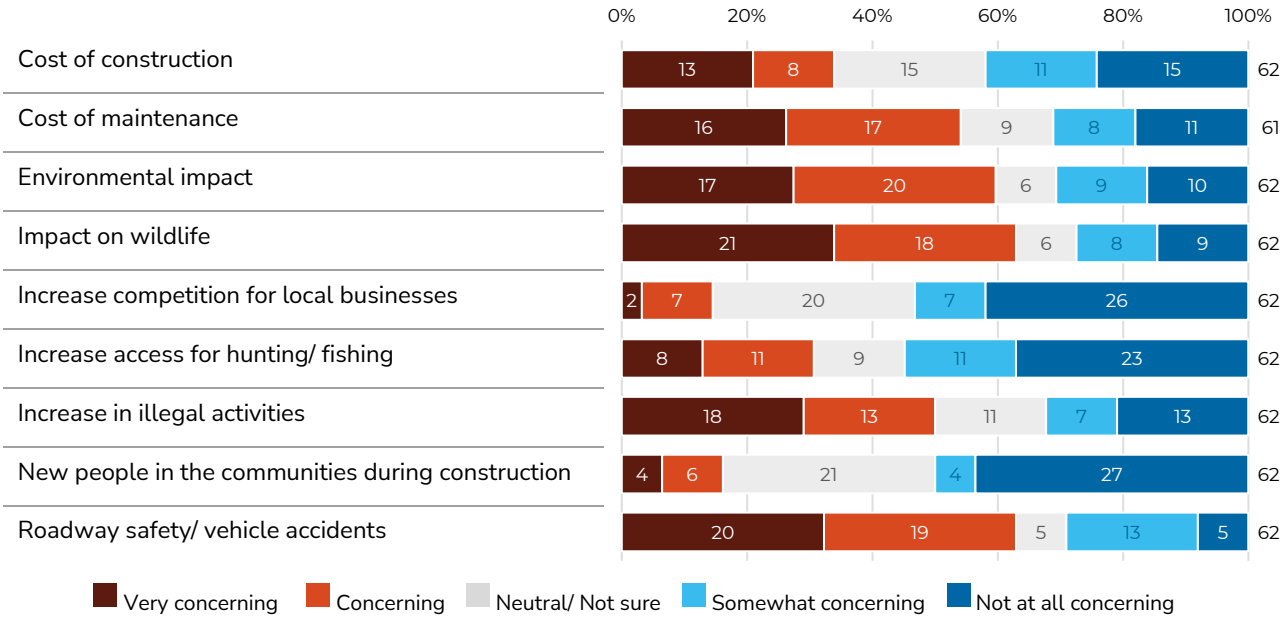
If you are a business owner, do you think the proposed Kivalliq Road will benefit your business?



Comments:

- More affordable freight/ cost of materials/ shipping goods.
- Opportunities to reduce customer costs.
- Increased customers through visitors to the community.
- More opportunities to hire long-term employees.
- More affordable to travel around and promote the business.
- Concern over potentially fewer sealift and air cargo offloading contracts.

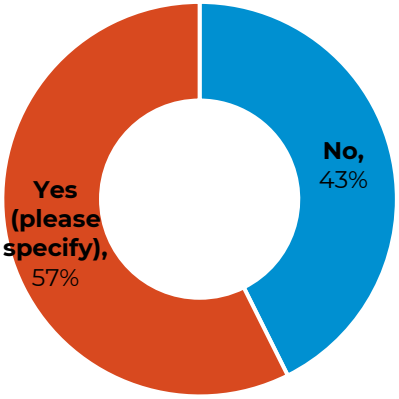
Which of the following potential negative impacts of the proposed Kivalliq Road are most concerning to you?



Ideas about how to reduce the negative impacts of the proposed Kivalliq Road project:

- Develop an investment strategy to cover training, education, business creation, municipal infrastructure, and services so that local businesses and residents can be better positioned to take advantage of opportunities.
- Invest in local people so they can do all the jobs from top to bottom, not just entry level jobs – engineers, geologists, mechanics, health care professionals, and lawyers.
- Strengthen procurement policies to ensure strong investment in Nunavut businesses and people, especially Inuit.
- Prioritize roadway safety by educating drivers about roadway conditions and distance so they are prepared for their trip. Develop and enforce driver laws (e.g., licences, impaired driving), monitor roadway conditions and limit access when unsafe, build emergency communications and shelters along the route.
- Design the road to respect archeological resources like graves, and existing cabin areas.
- Monitor and limit hunting very closely along the roadway.

Do you think the Kivalliq Road will impact traditional activities on the land, either positively or negatively?



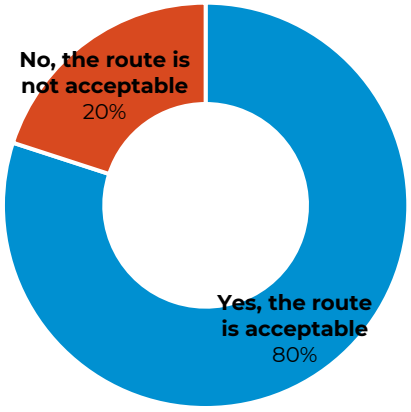
Comments:

- There will be positive and negative impacts.
- Will allow for cultural exchange and easier access to events in other communities.
- There will be increased access to the land for hunting and fishing.
- Increase in harvesting without traditional practices.
- Will impact caribou and their migration routes.
- There may be littering and trash along the roadway.
- Easier to get emergency assistance while on the land if needed.

Do you think the proposed Kivalliq Road route is acceptable? –How could it be improved?

Comments:

- Should have community mapping sessions again before the routes are finalized.
- Get Elders' feedback on more specific alignments.
- Should hire locals to maintain the road and provide environmental monitoring.
- Concern over impact on the two heritage rivers: Thelon River and Kazan River.
- Would like to see a connection to Manitoba.



11. Next Steps

As this project moves ahead, ongoing engagement will be required with communities, people, and interested parties in the Kivalliq region to share updates about the project and gather feedback as more detailed plans are prepared. It is also recommended that a collaborative meeting be held with all Kivalliq HTOs to allow for collective conversation between members.

In addition to engagement in the Kivalliq region, communications may be required with other groups located outside the region, with lands and interests that may be affected by this project. This could include engagement with the Dene in Manitoba, Saskatchewan, and the Northwest Territories; the Northwest Territories Métis; or the Government of Manitoba. Priority issues, such as impacts to caribou or potential economic connections, will be used to guide engagement with those located outside the region and the focus will be on the development of cooperative solutions.